Frequency Products Data Book 2011

IQD Frequency Products

Quartz Crystals

Clock Oscillators

Fast Make Oscillators

MEMS Oscillators

VCXOs

TCXOs

OCXOs

Automotive Crystals & Oscillators to AEC-Q200/TS16949

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COMPANY PROFILE

Worldwide Frequency Products

Backed by a pedigree that has been developed over nearly 40 years, IQD Frequency Products is a recognised market leader in the frequency control market. We have operations in America, Asia and Europe with active customers in over 60 countries. We offer one of the most comprehensive frequency product ranges available, from low cost commercial grade product to that used in high reliability military and professional grade applications, including:

- Quartz Crystals
- Crystal Clock Oscillators
- Silicon/MEMS Clock Oscillators
- VCXOs
- TCXOs
- OCXOs
- Industrial & Automotive Crystals & Oscillators (AEC-Q200 & TS16949 release)

Quality and Customer Service

Quality and customer service are the cornerstones of our success and we are absolutely focused on consistently meeting and exceeding customer expectations. We have invested in being able to assure our customers of the highest standards throughout our businesses and regularly open ourselves up for customer and other audits. Our quality management system is constantly evolving to meet the changing requirements of the electronics industry.

Customer Partnerships

We take a partnership approach to working with our customers. Our experienced multilingual Sales and Application Support teams guide customers from design stage through to full production. IQD's products are specified by leading manufacturers in the aerospace, automotive, communications, computing, consumer, industrial, medical and military industries throughout the world. We work with several premier chip-set designers on a variety of key projects and hold approvals on a number of products including high specification oscillators.

Technology Partnerships

We also invest in strategic technology partnerships such as those with Rakon and Statek to enhance our extensive product range. This ensures that our customers have the widest range of frequency products available from a single source.

Our full range of products is available direct via our sales offices (detailed on the back cover) or through our extensive worldwide distribution and representative network (see page 379) or on our multilingual website at www.iqdfrequencyproducts.com.

IQD Frequency Products is an IQD Group company

Registration No. FS566088

Plating

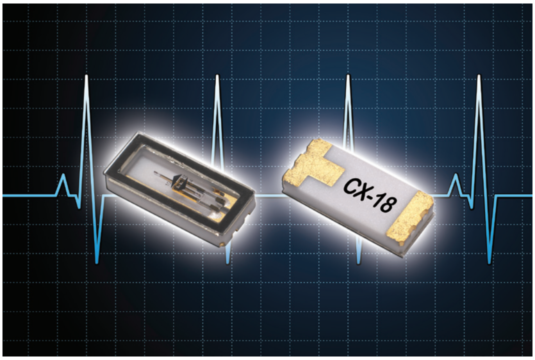
Mounting & Bonding (SMD)

Seam Sealing

FEATURED PRODUCTS

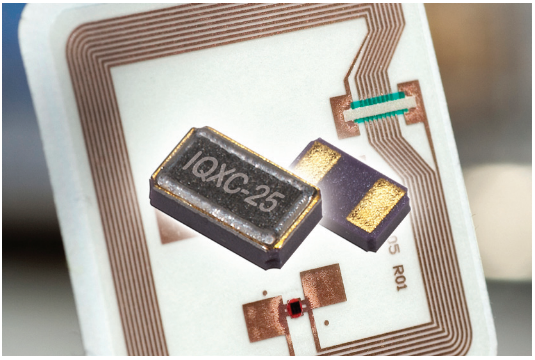
Possibly the smallest & lightest crystal in the world

- New CX18SM surface mount crystal measures just 1.55 x 0.95 x 0.35mm with a typical weight of 1.8mg - see page 68



New ultra miniature watch crystal

- The new 32.768kHz IQXC-25 measures just 2.00 x1.2 x 0.6mm - see page 88



New range of AEC-Q200 qualified industrial quartz crystals

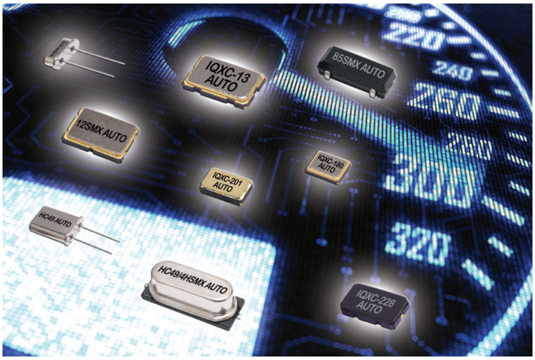
- Four different package sizes; IQXC-30, IQXC-31, IQXC-32 & IQXC-33 all available with an extended operating temperature range of -20 to +125°C - see pages 92, 94, 96 and 98

New high frequency MEMS oscillator

- The IQMS-900 series MEMS (Micro Electro Mechanical Systems) oscillator is available in an exceptionally wide frequency range from 1MHz up to 800MHz - see page 228

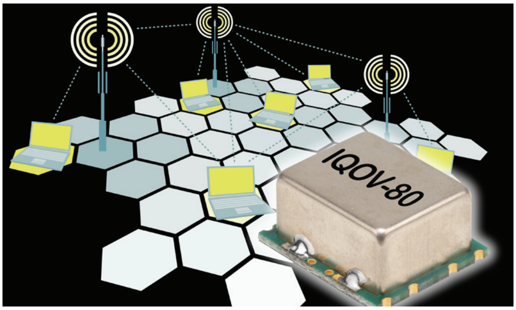
AEC-Q200/TS16949 qualified automotive crystals & oscillators

- Suitable for a wide range of applications including safety critical applications such as braking systems, engine management systems and anti-skid control in addition to more standard requirements such as instrumentation and entertainment systems; full PPAP documentation (levels 1 to 5) available - see page 245



New SMD OCXO housed in a 25.4 x 22.0 x 15.2mm package.

- The low phase noise and frequency stability of +/-10ppb over an operating temperature range of -40 to +75°C makes the IQOV-80 ideal for use in telecom, medical & instrumentation applications - see page 359



ORDERING INFORMATION

Minimum Ordering Charge

Account Orders £50.00; Prepaid £50.00; or other currency equivalent (+ postage & packaging).

Quotations

Quotations are valid for 30 days unless otherwise stated.

Certificate of Conformance (C of C)

C of C's are available upon request for a fixed charge of £11.00 (or other currency equivalent) if the order is confirmed in writing.

Order Acknowledgement

Order Acknowledgements are sent out for all orders within three days of order.

Order Cancellation

Purchase orders for made-to-order products are non-cancellable and non-returnable.

Despatch

Orders received by 4pm for ex-stock items can normally be despatched the same day for delivery within U.K. if specifically requested at time of order. Please see Standard Conditions of Sale regarding postponement of delivery dates.

Terms

30 days from date of invoice for approved credit accounts. A credit application form is available on our website at www.iqdfrequencyproducts.com/credit/apply/

Bar Coding

We offer bar coded packaging (code 39 as standard) where required; please contact your account manager.

Payment in Currencies other than Sterling

Our preferred international currency is US dollars, but we can operate an account for you in any one of a number of different currencies; please agree this with your sales contact when placing your first order. Please ensure that remittance in the agreed currency reaches us in full without deduction of charges.

All major credit and debit cards accepted.

Returns

Customers wishing to return goods for whatever reason must obtain an RMA number from our sales department before returning goods, otherwise considerable delays can result in processing the return.

Specifications

As part of its continuing efforts to provide customers with the very latest technology in crystal components, IQD Frequency Products reserves the right to change specification, designs and models without notice.

OVERVIEW OF QUARTZ CRYSTAL PRODUCTION

NATURAL & CULTURED QUARTZ

Quartz is a crystalline form of silicon dioxide ($Si0_2$) which is abundant in nature, forming about 12% of the Earth's crust. A combination of the limited supply of natural quartz along with its high cost has resulted in the development of cultured quartz.

Crystals of quartz are grown by a hydrothermal process at high temperature and pressure. This process takes place in autoclaves built to withstand the extreme conditions required, typically 350°C and 2000 atmospheres.

Seed crystals are mounted in frames in the cooler part of the autoclave whilst a solution of sodium carbonate or hydroxide and fragments of $Si0_2$ are placed in the warmer portion. Convection currents carry the dissolved nutrient material from the hotter to the cooler region, where the material deposits on the seed crystal. The temperature difference between the two regions determines the rate of growth, and has to be tightly controlled throughout the process.

Large bars of crystal can be grown in about ten to twelve weeks. The quality of the quartz depends on the conditions of growth, in particular the growth rate. Crystals are grown in shapes and sizes that minimise wastage of time and material.

The bars of crystal are cut into wafers. The angle at which these wafers are cut relative to the crystal axes is crucial in determining the frequency and temperature stability of the final crystal. The most common cut is the AT-cut, which is a thickness shear mode resonator with a frequency range of 1MHz to 300MHz.

PIEZOELECTRIC PROPERTIES OF QUARTZ

Since the discovery of the piezoelectric properties of quartz in 1880 by Pierre Curie, quartz has become a significant factor in the electronics industry.

By stretching or compressing a piezoelectric material a voltage is generated. The reverse is also true: a voltage applied to the material causes it to become mechanically stressed.

In the case of crystal resonators, the piezoelectric effect is used to excite mechanical vibrations at a particular resonant frequency. In thickness shear mode resonators such as the AT-cut, this frequency is a function of the thickness of the crystal. By carefully preparing a crystal, it can be made to oscillate at any frequency within its operating range.

MANUFACTURING

The manufacturing process begins by reducing the thickness of the blank. Frequency is determined by thickness; blanks are cut thicker than required so that they can be reduced according to the frequency desired. This reduction is achieved by lapping with an abrasive such as aluminium oxide, to produce a fine surface finish. The crystal is lapped until it is slightly above the required final frequency.

This process is followed by cleaning and etching the blanks which further improves the surface finish and also reduces the frequency spread within the batch of crystals.

Electrical connections are formed by depositing a metal (usually silver) on the blank by evaporation under vacuum.

The crystal is then mounted on its base that has formed clips to hold the crystal. Once the crystal is positioned, a conductive adhesive bonds the tails of the electrode to the clips.

Next the crystal requires adjustment to final frequency. This can be achieved by plating more silver on the crystal until the exact frequency is reached.

Once the frequency is correct, the crystals are baked in ovens before being encapsulated into their package. When this is complete, the crystal unit can be fully tested.

The intricacy of the production process, with considerations for frequency and stability throughout, highlights the need for detailed specifications from customers as to what they require from their crystals. The minimum specifications that are typically required when placing an order for crystal products are outlined at the beginning of each section.

Final Test

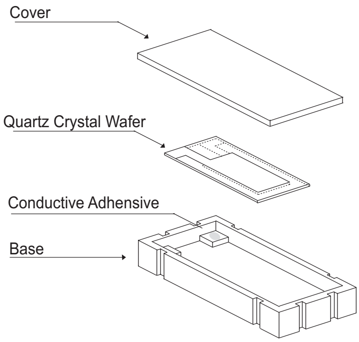
X-Ray Analysis

CRYSTAL HANDLING PRECAUTIONS

CRYSTAL UNIT STRUCTURE

A quartz crystal unit includes a small strip or disk of quartz that is processed to an exact size and thickness dependent on the customer specified resonating frequency. The quartz is plated with conducting electrodes and mounted in a hermetically sealed protective enclosure (see Figure 1).

Figure 1



SMD Ceramic Package Crystal

Crystal units are often encapsulated together with other circuitry to realise a fully functional module, e.g. an oscillator or a complex filter. Figures 2 and 3 illustrate simple crystal oscillators. Because of the nature of the crystal unit, correct handling is very important.

Figure 2

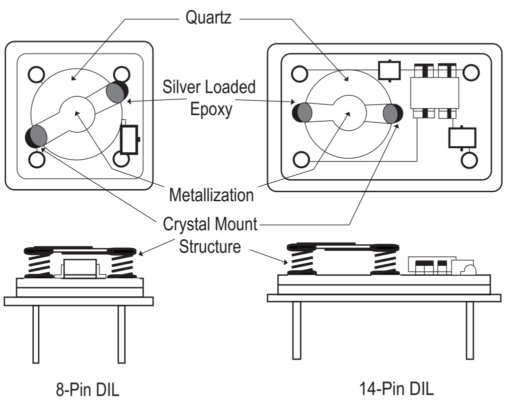
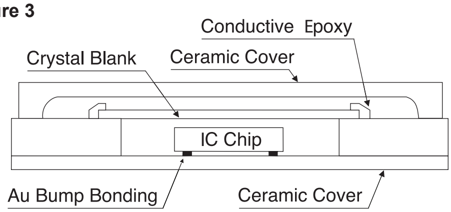


Figure 3

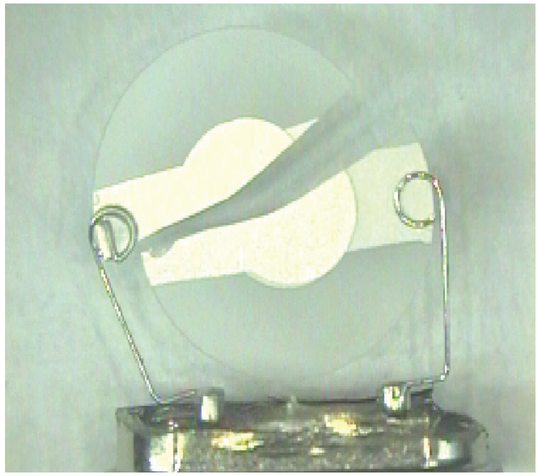


SMD Ceramic Package Osciliator

MECHANICAL SHOCK

Crystal components are manufactured to withstand a certain level of mechanical shock. These levels are outlined within the environmental specifications for each individual component type throughout out the specification sheets.

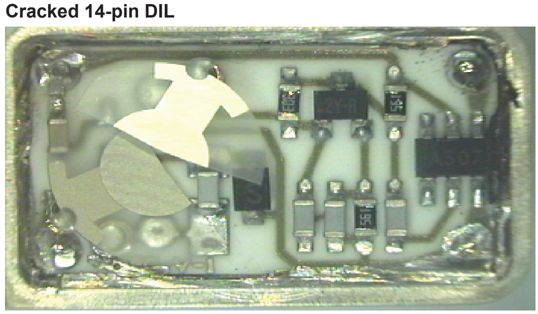
Cracked HC49



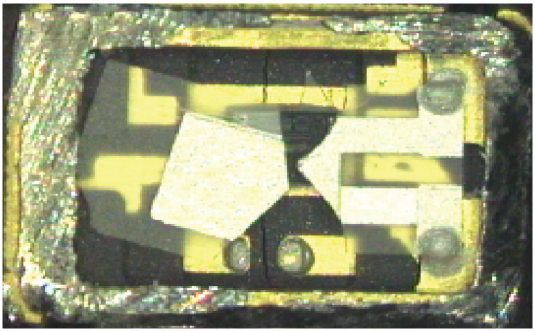
Excessive levels of shock can cause a change to the electrical characteristics, which will most likely manifest itself as a change of frequency. Severe mistreatment, such as dropping onto a hard surface, may well result in actual breakage of the quartz blank. In the case of ceramic packaged components it is also possible that the ceramic may crack, resulting in a loss of hermeticity.

Broken Watch Crystal

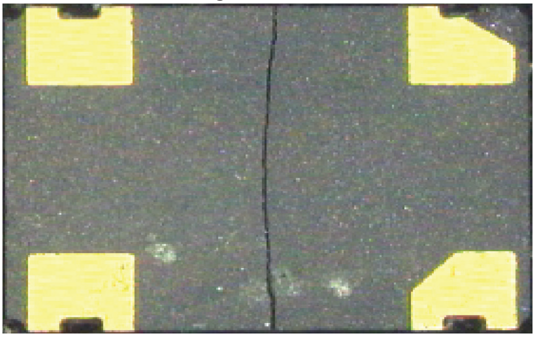
Cracked 14-pin DIL



Cracked Strip Resonator



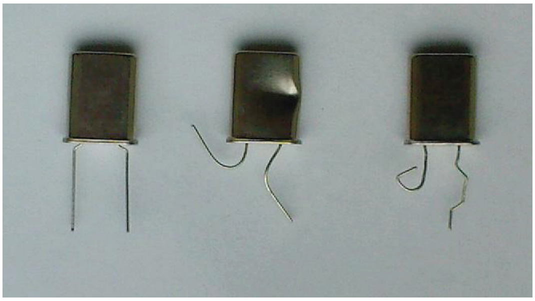
Cracked Ceramic Package



HANDLING LEADS

Excessive bending of leads can cause damage to the glass-to-metal seal, which can result in loss of hermeticity of the enclosure. Enclosures are filled with a dry inert gas and loss of hermeticity will result in a rapid deterioration of the product due to atmospheric contamination. Care should therefore be taken when handling a crystal not to pull or bend the leads. If the component needs to be moved in a way that involves bending, the lead should be bent slightly away from the glass seal to avoid cracking it. The recommended minimum radius of curvature is product dependent, e.g. 2 mm for HC49 crystals and 1 mm for UM1s.

Bent Leads



TAPE-AND-REEL PRODUCT

Before using crystal components on automated placement machines, tests should be undertaken to assess the level of shock that the crystal devices will be subjected to during the placement process. If necessary the shock level should be reduced.

TEMPERATURE

If crystals are subjected to extreme temperatures outside storage temperature limits, the electrical performance can be affected, resulting in eventual failure. During soldering it will be necessary to subject the components to high temperatures for limited periods of time, please refer to the Soldering Guidelines in the Application Notes chapter.

ELECTROSTATIC DISCHARGE (ESD)

Only at extreme voltages can static electricity be seen, heard or even felt, but even the lowest voltages can damage electronic circuits. The damage caused to oscillators as a result of ESD may not immediately be evident but can be delayed, causing the oscillator circuitry to degrade, which in turn can cause failure of the oscillator in the field. Although quartz is not necessarily susceptible to ESD damage, the associated electronic circuitry contained within an oscillator is, and should be considered as an Electro Static Discharge Sensitive (ESDS) device. ESDS devices should only be handled in an ESD Protected Area (EPA), where proper precautions against ESD damage are taken.

Any transportation should be undertaken using the appropriate protective packaging. All packaging should be marked with a warning notice, and protective measures and packaging should conform to BS EN 61340-5-1. For a more detailed breakdown of the precautions that should be taken, please contact our Customer Support Department.

GENERAL INFORMATION

The approximate thickness of the quartz disc or strip is given by the following equation:

$$Thickness\,(mm)\,\frac{1.67}{f\,(MHz)}$$

Note: Multiply thickness (mm) x O/T mode if using overtone crystal (e.g. 16MHz crystal = 0.1mm thick).

STABILITY CONVERSION TABLE

Crystal and oscillator accuracy is generally refered to in Parts Per Million (ppm). The table below shows convertion factors.

10X	PPM	%
10^{-3}	1000	0.1
10^{-4}	100	0.01
10^{-5}	10	0.001
10^{-6}	1	0.0001
10^{-7}	0.1	0.00001
10^{-8}	0.01	0.000001
10^{-9}	0.001	0.0000001
10^{-10}	0.0001	0.00000001

FIRMENPROFIL & BESTELLINFORMATION

Rückführend auf eine fast 40 jährige Firmengeschichte, ist IQD Frequency Products ein anerkanntes Unternehmen unter den Marktführern im Frequenzproduktbereich. Unsere Niederlassungen befinden sich in Amerika, Asien und Europa mit aktiven Kunden in über 60 Ländern. Wir bieten eine der umfassendsten Frequenzproduktpaletten, von handelsüblichen Low-Cost-Produkten, bis hin zu Produkten mit einer hohen Zuverlässigkeit für militärische und professionelle Anwendungen an. Unser Sortiment umfasst:

- Quarze
- Oszillatoren
- Silizium / MEMS Oszillatoren,
- VCXO's
- TCXO's
- OCXO's
- Industrielle & Automotive- Quarze & Oszillatoren mit (AEC-Q200 und TS16949 Qualifizierung)

Qualität und Kundenservice

Qualität und Kundenservice sind die Hauptmerkmale unseres Erfolges und wir arbeiten konsequent und kontinuierlich am Erreichen und Übertreffen der Erwartungen des Kunden.

Partnerschaften mit Kunden

Wir arbeiten auf einer partnerschaftlichen Basis mit unseren Kunden zusammen. Unser ausgebildetes und mehrsprachiges Verkaufsteam steht unserem Kunden vom Design bis hin zur vollen Serienproduktion und darüber hinaus zur Verfügung. IQD-Produkte werden von führenden Herstellern in der Luft-und Raumfahrt, Automotive, Kommunikation, Computer, Verbraucher, sowie in industriellen, medizinischen und militärischen Anwendungen auf der ganzen Welt eingesetzt. Wir arbeiten mit mehreren führenden Chip-Set-Designern auf einer Vielzahl von wichtigen Projekten zusammen und halten Zulassungen auf eine Reihe von Produkten, einschließlich Oszillatoren mit einer hohen Spezifikation.

Technologhy Partnerschaften

Des weiteren investieren wir in strategisch technologische Partnerschaften, wie beispielsweise die Bestehenden zu Rakon und Statek, um unser Produktangebot kontinuierlich auszuweiten und zu erweitern. Dieses bietet dem Kunden die Möglichkeit, alle benötigen Artikel aus einer Hand zu beziehen.

Unsere komplette Produktpalette können Sie direkt über unsere Verkaufsbüros (sind auf der Buchrückseite detailliert aufgeführt) oder über unsere weltweiten Distributoren und Vertreter (siehe Seite 379) beziehen. Weitere Informationen finden Sie auch auf unserer mehrsprachigen Webseite unter www.iqdfrequencyproducts.com zu finden.

BESTELLINFORMATIONEN

Mindestbestellwert

Für bestehende Kundenkonten sowie für Vorkassenkonten beträgt der Mindestbestellwert 50.00 GBP. Die Rechnung kann auch in den gängigen Währungen ausgewiesen werden. Der Mindestbestellwert versteht sich zzgl. der Versand- und Verpackungskosten.

Angebote

Angebote haben eine Gültigkeit von 30 Tagen sofern nicht anders vereinbart.

Certificate of Conformance (C of C)

Auf Anfrage können C of C's ausgestellt und beglaubigt werden. Die Bearbeitungsgebühr dafür beträgt 11.00 GBP und ist auch in weiteren Währungen ausweisbar.

Auftragsbestätigung

Auftragsbestätigungen werden innerhalb von 3 Werkstagen nach Erhalt der Bestellung zugesendet.

Stornierung einer Bestellung

Bestellungen für Bauteile die gesondert und speziell gefertigt werden sind nicht stornierbar und nicht rücksendbar.

Abfertigung

Bestellungen von Lagerartikeln, die bei uns bis spätestens 16.00 Uhr schriftlich eingehen, können innerhalb Grsssbritanien's am selben Tage versendet werden.

Weitere Informationen finden Sie auch auf unserer Webseite www.iqdfrequencyproducts.de/credit/apply/

Kreditbedingungen für Kundenkonten

Zahlungsziel ist 30 Tage nach Warenauslieferung und Rechnungsstellung. Ein Neukundenformular zur Eröffnung eines Kundenkonto's ist auf unserer Webseite verfügbar: www.iqdfrequencyproducts.com/credit/apply/

Bar-codes/Strich-codes

Auf Anfrage besteht die Möglichkeit die Ware mit Barcodierung zu versenden. (Code 39) Bitte kontaktieren Sie dazu Ihren Ansprechpartner bei IQD Frequency Products Ltd.

Bezahlungen in weiteren gängigen Währungen als Sterling (britische Pound)

Unsere bevorzugte internationale Währung ist US Dollar. Des weiteren besteht die Möglichkeit, in weiteren gängigen Währungen zu zahlen. Kontaktieren Sie dazu bitte unser Kundenteam oder Ihren Ansprechpartner. Bei Banküberweisungen bitten wir den Gesamtbetrag zzgl. eventuell entstehender Bankgebühren zu überweisen. Kredit . und Debitkartenzahlungen Wir akzeptieren alle gängigen Kredit- und Debitkarten.

Rücksendungen

Bei Warenrücksendungen, unabhängig des Rücksendegrundes, kann dies nur im Zusammenhang mit einer von uns ausgestellten RMA- Nummer erfolgen. Kontaktieren Sie bitte vorab unser Kundenteam, welche Ihnen die notwendigen Informationen gibt und Ihnen die RMA- Nummer und das Rücksendeformular zukommen lasst. Sollte eine Rücksendung ohne RMA-Nummer erfolgen, kann sich der Bearbeitungsvorgang verzögern.

Spezifikationen

Wir sind stehts bemüht, unsere Ware auf dem neuesten Stand zu halten und zu erweitern. Daher behält sich IQD Frequency Products Ltd. das Recht vor, Spezifikationen, Entwürfe und Modelle ohne längere vorherige Benachrichtigung zu ändern.

ENTSTEHUNG EINES QUARZES

Quarze

Quarz ist eine Kristallform des Silikondioxids (Si02) das in der Natur reichlich vorhanden ist und beträgt ungefähr 12% der Erdkruste. Eine Kombination der begrenzten Quarzvorkomnisse zusammen mit seinen hohen Kosten hat die Entwicklung des Quarzes ergeben.

Quarzkristalle wachsen durch einen hydrothermalen Prozess bei hoher Temperatur und hohem Druck. Dieser Prozess findet im Autoklaven statt, welche errichtet werden um den extrem aber erforderlichen Bedingungen, gewöhnlich 350 Grad C und 2000 Atomsphären, zu widerstehen.

Impfkristalle werden im Rahmen, im kühleren Teil des Autoklaven angebracht, während eine Lösung des Natruimkarbonats oder -hydroxids und Fragmente von Si02 in den wärmeren Teil gelegtwerden.

Konvektionstrom, der das aufgelöste Nährmaterial von der heisseren zur kühleren Region trägt, genau dort, wo die Materialablagerungen auf dem Impfstrom trift.

Der Temperaturunterschied zwischen den beiden Regionen stellt die Zuwachsrate fest und muss während des Prozesses hochstrukturiert sein.

Grosse Stäbe des Kristalles können in ungefähr 10 bis 12 Wochen wachsen.

Die Qualität des Quarzes hängt vom Zustand des Wachstums insbesondere der Wachstumsrate ab.

Kristalle wachsen in den erforderlichen Formen und in den benötigten Grössen um Zeit- und Materialverschwendungen zu minimieren.

Die Stäbe des Kristalles werden in Oblaten geschnitten. Die Winkel, in dem diese Oblaten im Verhältnis zu den Kristallaxten geschnitten werden, ist entscheidend, wenn man die Frequenz und die Temperaturbeständigkeit des abschliessenden Kristalles feststellt.

Der allgemeinste Schnitt ist der AT-Schnitt, der ein Resonator im Frequenzbereich von 1MHz bis hin zu 300MHz verfügt.

Piezoelektronische Eigenschaften des Quarzes

Seit der Entdeckung der piezoelektrischen Eigenschaften des Quarzes 1880 durch Pierre Curie, ist der Quarz ein bedeutender Faktor in der Elektronikindustrie geworden. Indem man ein piezoelektrisches Material ausdehnt oder zusammendrückt, wird eine Spannung erzeugt. Im Falle der Kristallresonatoren wird der piezoelektrische Effekt verwendet, um mechanische Erschütterungen bei einer bestimmten Resonanzfrequenz anzuregen. Wie bei AT-Schnitt Resonatoren, ist diese Frequenz eine Funktion der Stärke des Kristalles.

Ein Kristall kann gebildet werden, indem man ihn vorsichtig vorbereitet, um bei irgendeiner Frequenz innerhalb seines Betriebsbereichs zu oszillieren.

Überblick der Kristallproduktion

Das Herstellungsverfahren fängt an, indem es die Stärke des freien Raumes verringert. Frequenz wird durch Stärke festgestellt; freie Räume werden dicker als erforderlich geschnitten, damit sie entsprechend der gewünschten Frequenz verringert werden können. Diese Verkleinerung wird erzielt, indem man mit einem Poliermittel wie Aluminiumoxyd, diese zu einem feinen Oberflächenende produziert. Der Kristall wird eingehüllt, bis er etwas über der erforderlichen abschliesenden Frequenz ist. Dieser Prozess wird vom Säubern und von der Ätzung der freien Räume ausgeführt, welches weiter das Oberflächenende verbessert und auch die Frequenz verringert, die innerhalb der Reihe der Kristalle verbreitet wird. Elektrische Anschlüsse werden gebildet, indem man ein Metall (normalerweise Silber) auf dem freien Raum durch Verdampfung unter Vakuum niederlegt. Der Kristall wird dann an seiner Unterseite angebracht, die Clipps gebildet hat, um den Kristall zu halten. Sobald der Kristall in Position gebracht wird, verbindet ein leitender Kleber die Endstücke der Elektrode zu den Clipps. Dieses kann erzielt werden, indem man mehr Silber auf dem Kristall überzieht, bis die genaue Frequenz erreicht ist. Sobald die Frequenz korrekt ist, werden die Kristalle in den Ofen erhitzt, bevor man sie im Gehäuse eingekapselt werden. Wenn dieses komplett ist, kann die Kristalleinheit völlig geprüft werden. Die Verwicklung des Produktionsprozesses, auf Betrachtungen der Frequenz und Stabilität, hebt die Notwendigkeit an Einzelspezifikationen von den Kunden hinsichtlich hervor ab, was sie von ihren Kristallen erfordern. Die minimalen Spezifikationen, die gewöhnlich Voraussetzung sind, wenn man einen Auftrag für Kristallprodukte vergibt, werden zu Beginn jedes Abschnitts umrissen.

KRISTALLE, VORSCHRIFTSMASSIG BEHANDELT

Kristalleinheits-Struktur

Eine Quarzkristalleinheit umfast einen kleinen Streifen oder eine Scheibe des Quarzes, der zu einer genauen grössen- und stärkenabhängigen, auf dem Kunde spezifizierten mitschwingenden Frequenz, verarbeitet wird. Der Quarz wird mit Leitelektroden überzogen und in eine luftdicht verschlossene und geschützte Hülle angebracht (siehe Tabelle 1). Die Elektroden schliesen an Bleiarten, die durch die niedrige Versammlung über Glas-zu Metalldichtungen im Falle eines SMD-Keramikgehäuses an (siehe Tabelle 2); die Elektroden sindan den überzogenen keramischen Pads angeschlossen. Kristalleinheiten werden häufig zusammen mit anderen Schaltkreisen eingekapselt, um die Funktion der Module zu garantieren, z.B. um einen Oszillator oder einen komplizierten Filter völlig zu verwirklichen. Tabellen 3 und 4 veranschaulichen einfache Quarzoszillatoren. Aufgrund der Quarzstruktur ist eine genaue und saubere Arbeitsweise sehr wichtig.

Mechanischer Schock

Kristall-Komponente werden hergestellt um ein gewisses Mass an mechanischen Schock standzuhalten. Diese Ebenen sind in den umweltbezogenen Spezifikationen für jedes einzelne Bauteil in den Datenblättern beschrieben.

Übermässig hoher Schock kann eine Änderung der elektronischen Eigenschaften hervorrufen,welches höhstwahrscheinlich eine Änderung der Frequenz bedeutet.

Handhabung

Übermässiges Biegen kann die Glass auf Metall Dichtung beschädigen, welches zum Dichtheitsverlust des Gehäuses führen kann. Gehäuse sind mit einem trockenen Gas gefüllt, der Verlust der Dichte würde eine rasche Verschlechterung des Produktes aufgrund der atmosphärischen Kontamination bedeuten. Daher sollte die Handhabung und der Umgang mit dem Quarz mit grosster Vorsicht erfolgen und darauf geachtet werden, dass dieser nicht gezogen oder gebogen wird. Wenn ein Bauteil durch biegen verschoben werden muss, sollte die Zuleitung von der Glasabdichtung leicht weggebogen werden,um eine Rissbildung zu vermeiden. Der empfohlene minimale Krümmungsgrad ist Produkt abhängig,z,B, 2mm bei HC49 Quarzen und 1mm bei UM1's.

Gegurtete Rollenware

Vor dem Einsatz von Quarzen in automatisierten Bestückerautomaten,sollten Tests bezgl.des Schockniveau's durchgeführt werden. Falls notwendig sollter der Schock-Bereich reduziert werden.

Temperatur

Wenn Quarze extreme Temperaturen ausserhalb der maximalen Lagertemperatur ausgesetzt sind, kann die elektrische Leistung beschädigt werden, was zum Ausfall führen kann. Während des Lötvorganges wird es notwendig sein, die Komponenten für einen bestimmten Zeitraum den hohen Temperaturen zu unterziehen, bitte machen Sie daher nähere Angaben bezgl. der Lötrichtlininen in der Anwendungsnotizen.

Elektrostatische Entladung (ESD)

Nur bei extremen Spannungen kann statische Elektrizität gesehen, gehört oder sogar gefühlt werden, aber auch die niedrigen Spannungen können elektronische Schaltungen beschädigen. Schäden an Oszillatoren als Folge der ESD werden oftmals nicht sofort auftreten und erst später offensichtlich, wodurch die Schaltung des Oszillators ausgesetzt wird und es zum Ausfall des Oszillators führen kann.

Allgemein ist der Quarz nicht anfällig in Bezug auf ESD Schäden,welches an die damit verbundene elektronische Schaltung innerhalb eines Oszillators liegt und sollte als elektrostatischer Ablauf (ESDS) für empfindliche Geräte betrachtet werden. ESDS-Geräte sollten nur in ESD geschützten Bereichen (EPA) angewendet werden, wo die entsprechenden Vorsichtsnassnahmen gegen ESD-Schäden getroffen werden können.

Jeglicher Transport sollte nur in der angemessenen und geschützten Verpackung erfolgen. Alle Verpackungen sollten mit einem Wahrnhinweis versehen sein und die geschützte Verpackung sollte die Norm BS EN 61340-5-1 erfüllen. Für weitere Informationen dies bezgl, steht Ihnen unser Kunden-Service-Team gern zur Verfügung.

Allgemeine Information

Die ungefähre Dicke einer Quarzscheibe oder- streifens berechnet sich aus der folgenden Gleichung:

$$Dicke\,(mm)\,\frac{1.67}{f\,(MHz)}$$

Notizen: Multipliziere die Dicke (mm) x O/T falls overtone Quarze eingesetzt werden (z.B. 16MHz. Quarz= 0.1mm dick)

Stabilitäts-Umrechnungstabelle

10X	PPM	%
10^{-3}	1000	0.1
10^{-4}	100	0.01
10^{-5}	10	0.001
10^{-6}	1	0.0001
10^{-7}	0.1	0.00001
10^{-8}	0.01	0.000001
10^{-9}	0.001	0.0000001
10^{-10}	0.0001	0.00000001

PROFIL DE L'ENTREPRISE ET RENSEIGNEMENTS POUR COMMANDER

L'ENTREPRISE

Des Produits Fréquentiels dans le monde entier

Avec une expérience de près de 40 ans, IQD Frequency Products est un leader reconnu du marché des produits fréquentiels. Nous avons des divisions en Amérique, en Asie et en Europe avec des clients dans plus de 60 pays. Notre gamme va du produit à bas coût au produit extrêmement fiable utilisé dans les applications militaires et professionnelles. Elle comprend :

- Les Cristaux de quartz
- Les Oscillateurs
- Les Oscillateurs MEMS/Silicium
- Les VCXOS
- Les TCXOS
- Les OCXOS
- Les Cristaux et Oscillateurs spécifiques à l'industrie automobile (AEC-Q200 et TS16949)

La qualité et le service clientèle

La qualité et le service clientèle sont la base de notre succès et nous cherchons sans cesse à répondre et dépasser les attentes de nos clients. Notre société répond aux standards les plus élevés et nous ouvrons régulièrement nos portes à nos clients et aux différents auditeurs. Notre système de gestion de la qualité se développe constamment de manière à répondre aux besoins de l'industrie électronique en perpétuelle évolution.

La relation clientèle

Nous traitons nos clients comme des partenaires. Notre équipe commerciale expérimentée et qui parle plusieurs langues et nos ingénieurs guident le client du design à la production. Les produits IQD sont utilisés par les fabricants leader de l'industrie automobile, médicale, informatique, industrielle, militaire et aérospatiale à travers le monde. Nous travaillons avec les designers de chip-set sur différents projets et nos produits dont certains oscillateurs à hautes spécifications ont été retenus.

Les partenariats technologiques

Nous investissons également beaucoup dans des partenariats technologiques comme avec Rakon et Statek pour améliorer notre gamme de produits. Cela permet à nos clients de couvrir chez un seul fournisseur tous leurs besoins fréquentiels. Vous pouvez vous procurer notre gamme complète de produits en contactant une de nos agences (leurs coordonnées figurent au dos de notre catalogue), un membre de notre réseau mondial de distribution (voir page 379) ou bien alors vous pouvez consulter notre site internet édité en plusieurs langues www.iqdfrequencyproducts.com.

IQD Frequency Products fait partie du groupe IQD.

COMMANDER

Montant minimum

Montant minimum de commande de £50 ou l'équivalent en devises plus frais de port.

Devis

Nos devis sont valides 30 jours sauf négociation préalable.

Certificat de conformité

Les certificats de conformité sont disponibles sur demande pour un montant fixe de £11 (ou l'équivalent en devises) pour une commande confirmée par écrit.

Accusés de réception

Les AR sont envoyés dans les 3 jours qui suivent la commande.

Annulation

Les commandes concernant les produits fabriqués sur demande ne peuvent ni être annulées ni retournées.

Livraison

Les commandes de produits en stock, reçues avant 16 heures, peuvent être expédiées le jour même au Royaume-Uni, sur demande expresse à la commande. Pour un éventuel ajournement de livraison, se référer aux conditions générales de vente.

Conditions de facturation

30 jours à la date de facture pour les clients en compte. Le formulaire d'ouverture de compte est disponible sur notre site internet www.iqdfrequencyproducts.fr/credit/apply/

Code barre

Nous réalisons si nécessaire un conditionnement avec code barre (code standard 39). Prière de contacter la personne responsable en charge de votre compte.

Paiement en devises (autres que la livre sterling)

Notre devise principale est le dollar (US). Toutefois nous acceptons les transactions dans les principales devises internationales. Merci de spécifier la devise avec laquelle vous souhaitez travailler avec la personne en charge de votre compte. Le paiement doit nous parvenir dans sa totalité et les frais bancaires restent à votre charge. La majorité des cartes bleues sont acceptées.

Retour de marchandise

Les clients souhaitant retourner du matériel doivent obtenir préalablement un numéro RMA auprès du service commercial, faute de quoi, le délai de prise en compte du retour sera considérablement plus long.

Spécifications

Afin de fournir à ses clients les produits fréquentiels toujours plus performants, IQD se réserve le droit de modifier les spécifications, boîtiers et designs de ces produits sans notification préalable

INTRODUCTION AU QUARTZ

Le quartz naturel et le quartz de synthèse

Le quartz est un minéral composé de dioxyde de silicium de formule SiO2 (silice), qui se trouve en abondance dans la nature ; il constitue 12% de la lithosphère. Le quartz de synthèse a été élaboré en raison de la diminution d'exploitation et du coût élevé du matériau brut.

Les cristaux de quartz sont formés par un procédé hydrothermique à haute température et haute pression. Ce procédé se déroule dans un autoclave résistant à des températures atteignant 350°C et 2000 atmosphères.

Les cristaux souches sont montés en cadre dans la partie froide de l'autoclave, pendant qu'une solution de carbone de sodium ou d'hydroxyde avec des fragments de Si02, est placée dans la partie chaude. La convection du courant achemine les éléments nutritifs dissous de la zone chaude vers la zone froide, où le matériau se dépose sur le cristal souche. La différence de température entre les deux zones détermine la vitesse de fabrication qui doit être contrôlée avec précision durant tout le processus.

Le cristal peut être synthétisé en barres sur une période allant de dix à douze semaines. La qualité du quartz est liée étroitement aux conditions de synthétisation, en particulier de sa vitesse. Le cristal est synthétisé de manière à optimiser les pertes de temps et de matériaux.

Les barres de cristal sont découpées en galettes. L'angle de découpe par rapport à l'axe du cristal est déterminant pour garantir la fréquence et la stabilité en température du produit fini. La découpe la plus commune est nommée AT-cut, laquelle possède un mode de résonnance dont l'épaisseur offre une variation en fréquence de 1MHz à 300MHz.

Propriétés piézoélectriques du quartz

Depuis la découverte des propriétés piézoélectriques du quartz en 1880 par le français Pierre Curie, le quartz est devenu un élément incontournable de l'industrie électronique.

La piézoélectricité est la propriété que possède certains corps à se polariser électriquement sous l'action d'une contrainte mécanique et inversement. En compressant ou étirant le matériau, une tension est générée, de même, en appliquant une tension, le matériau se déforme mécaniquement.

Dans le cas d'un oscillateur, l'effet piézoélectrique est utilisé pour générer une vibration mécanique à la fréquence de résonance. Tout comme dans le AT-cut, la fréquence de résonnance dépend de l'épaisseur du cristal. En travaillant avec précision le cristal, on peut le faire résonner à une / toutes fréquence(s) d'une plage donnée.

LA FABRICATION DU CRISTAL

Le processus de fabrication commence par la réduction de l'épaisseur du cristal brut. La fréquence étant déterminée par l'épaisseur, les cristaux sont coupés légèrement plus épais que la taille requise, pour qu'ils puissent être réduits plus finement par la suite et permettre ainsi l'obtention précise de la fréquence désirée. Cette réduction est obtenue par abrasion (à l'aide d'oxyde d'aluminium) de la surface. Le cristal est poli jusqu'à ce qu'il se situe légèrement au dessus de la fréquence finale désirée.

Ce processus se poursuit par le nettoyage et l'abrasion fine de la surface des cristaux.

Les connections électriques sont quant à elles, formées par un dépôt de métal (habituellement de l'argent) via un procédé d'évaporation sous vide.

Le cristal est ensuite monté sur sa base avec des clips. Une fois le cristal en position, un adhésif conducteur est appliqué, reliant l'extrémité de l'électrode aux clips.

Le cristal nécessite ensuite un ajustement très précis pour obtenir sa fréquence finale. Celle-ci peut être atteinte par un placage d'argent supplémentaire sur sa surface.

Une fois que la fréquence souhaitée est obtenue, les cristaux sont déposés dans un four, puis encapsulés dans leur réceptacle Ces opérations achevées, le cristal est testé.

Compte tenu de la complexité du processus de fabrication, le client doit préciser à la commande ses besoins quand à la fréquence et à la stabilité.

Toutes les informations nécessaires pour passer une commande sont indiquées à la fin de chaque section.

PRECAUTIONS SUR LA MANIPULATION DU CRISTAL

Structure de l'élément de cristal

Un élément de cristal de quartz comprend une petite bande ou disque de quartz dont la taille et l'épaisseur exacte ont été spécifiées par le client pour obtenir une certaine résonance.

Le quartz est recouvert d'électrodes conductrices et monté dans un boîtier scellé, hermétique et protecteur (voir figure 1).

Les éléments de cristal sont souvent encapsulés avec d'autres montages pour réaliser un module pleinement fonctionnel, comme un oscillateur ou un filtre complexe par exemple. Les figures 3 et 4 illustrent les cristaux oscillateurs simples. Du fait de la nature de l'élément de cristal, la manipulation du composant est très importante.

Les chocs mécaniques

Les cristaux sont conçus pour résister à un certain niveau de chocs mécaniques.

Ces niveaux de chocs sont spécifiés pour chaque groupe de produit sur les fiches techniques dans la section environnementale.

Des chocs répétés ou violents peuvent occasionner un changement des caractéristiques électriques qui se manifestent la plupart du temps, par un changement de fréquence. Une chute sur une surface rigide pourrait également induire une cassure du cristal.

Dans le cas d'un composant céramique, le boîtier pourrait se briser et ne plus être hermétique.

Manipuler les fiches

Si les fiches sont pliées de manière excessive, le joint entre le verre et le métal pourrait être endommagé et le boîtier ne serait plus hermétique. Les boîtiers contiennent un gaz inerte et si l'environnement n'est plus hermétique, le produit, pollué, se détériorerait. Donc il est dont très important de manipuler les fiches avec précaution. Si le composant doit être déplacé et la fiche pliée, le contact avec le joint doit être évité pour ne pas l'endommager. Le rayon de courbure recommendé dépend du produit (2mm pour les HC49 et 1mm pour les UM1 par exemple)

Les produits sur bobines à ruban.

Avant de placer les cristaux sur les machines automatiques, des tests préalables doivent être effectués pour vérifier le niveau de chocs que les cristaux subiront lors du placement. Le niveau de choc devra être réduit le cas échéant.

Température

Si les cristaux sont soumis à une température extrême, supérieure à la plage de température de stockage recommandée, la performance éléctrique pourrait être affectée allant jusqu'à la panne. Lors de la soudure, l'exposition aux hautes températures doit être limitée. Pour plus de conseils, référez vous aux notes applicatives.

Décharge électrostatique (DES)

L'électricité statique ne peut être vue, entendue ou sentie qu'à des tensions extrêmes mais la plus petite des tensions peut endommager un circuit électronique. Le dégât causé à un oscillateur à la suite d'un DES n'est pas forcément apparent immédiatement et peut apparaitre ultérieurement. Le montage de circuits peut se dégrader et conduire à la panne. Bien que le quartz ne soit pas sensisble aux décharges DES, les circuits intégrés sont catégorisés comme des appareils sensibles (ESDS) aux décharges. De ce fait ces appareils doivent être manipulés dans des endroits désignés (EPA) où les précautions nécessaires contre les décharges ont été prises.

Les produits doivent être conditionnés de manière appropriée, conformément au BS EN 61340-5-1 et clairement faire mention des précautions à prendre. Pour plus d'informations, merci de prendre contact avec notre service relation-clientèle.

Informations générales

L'épaisseur du disque ou de la bande de quartz est calculée en utilisant l'équation suivante

$$Epaisseur\,(mm)\,\frac{1.67}{f\,(MHz)}$$

Table de conversion de stabilité

10X	PPM	%
10^{-3}	1000	0.1
10^{-4}	100	0.01
10^{-5}	10	0.001
10^{-6}	1	0.0001
10^{-7}	0.1	0.00001
10^{-8}	0.01	0.000001
10^{-9}	0.001	0.0000001
10^{-10}	0.0001	0.00000001

享誉全球的频率产品

承袭近40年的发展，IQD频率产品在频率控制领域是市场公认的行业领先者。我们的价值客户遍布60多个国家，横跨美洲，亚洲和欧洲。我们提供的频率产品范围广泛而全面，从低成本的商业级别产品到高可靠性要求的军用和专业级别，包括以下种类：

- 石英晶体
- 时钟振荡器
- 硅/MEMS时钟振荡器
- 压控晶体振荡器
- 温度补偿晶体振荡器
- 恒温晶体振荡器
- 汽车电子和工业应用的晶体和振荡器（参考AEC-Q200 & TS 16949 发布标准）

品质和客户服务

品质和客户服务是我们成功的基石，我们致力于持续不断地满足和超越客户的需求。我们竭诚以高标准、严要求和其它审核等来确保客户。为迎合电子行业瞬息万变的要求，我们的质量管理体系也在不断改进。

业务合作伙伴

我们有业务合作伙伴近距离服务我们的客户。我们经验丰富的多语种销售团队和应用支持团队能从设计到量产各阶段为客户提供引导和技术支持。IQD产品被遍布全球的航空航天，汽车电子，通讯，计算机，消费类电子，工业，医疗和军事等领先制造商列为指定应用产品。我们与很多一流的芯片设计师在一系列重要芯片项目上进行合作，并获得审核认证，其中就包括我们与之匹配的高性能振荡器。

技术合作伙伴

为加强和延伸我们的产品线，我们同如Rakon和Statek这样的公司建立了战略技术合作伙伴关系，这也保证了我们的客户能够从我们这里获得范围最为广泛的频率产品。

我们的所有频率产品您可以直接通过我们的办事处或全球分销商和代理商获得。详细联系信息请浏览我们的网站：www.iqdfrequencyproducts.com

IQD频率产品成就IQD集团

定购须知

最低收费标准

订单付款£50.00；　预付订单£50.00；　或等额之外币值货币（加邮费和包装费)

报价

报价由IQD频率器件有限公司提供,有效期限:30天,除非另作说明.

依照证明书 (C of C)

我司可按客户书面要求，如书信或传真，提供依照证明书 (C of C)， 费用为£11.00(其他等价货币)。

订单确认

所有的订单确认收到客户定单三天之内发出。

订单取消

因为我们都是按客户订单生产，故此所有以下的定单都不能取消.

急件

在4pm前收到的库存项目订单，　若订单上有明确的急件要求,我们可即日在UK的同一天可寄出,请参考我司网站关于销售标准条款的相关说明.www.iqdfrequencyproducts.com/credit/apply/ regarding postponement of delivery dates

付款期限

如客户申请以期限付款并获得我司同意确认，付款期限为发票日计30天。期限付款申请表详见我司网页www.iqdfrequencyproducts.com/credit/apply/

条形码

我司提供条形码封装(标准:代码code 39），如有要求,请联系阁下之客户经理.

英国货币以外的付款

我们优先接纳的国际货币为美元。如阁下希望以其他国际流通货币付款，　我司财务可以特别安排一个户口来操作。在发出订单之前请先与我司的业务员确定。恳请确保我司收到货款的全数汇款，所有汇款和其他费用由客户负责，不在货款内包含.

信用证及借记卡付款

接受所有的信用证及借记卡

客退品

无论基于何种原因要求退货，在退回品前请先向销售部索取一个RMA编号，否则可能导致退回品的延误处理。

规格

本着我司持续努力为客户提供晶体最新技术, IQD频率器件保留在不预先通知情况下更改规格,设计及型号.

石英的介绍

天然石英及人工培养石英

石英是二氧化硅（Si02）的晶体形式，　广泛分布在自然界，组成的地壳的12%。自然形成的石英供应有限，价格高昂，因此促进了人工石英的发展.石英晶体通过热液过程在高温高压下生长。使用设备为高温灭菌器，内以抵受极限要求,典型温度为350°C和压力为2000 大气压.

籽晶贴在高压灭菌器较冷部分的框架内,同时碳酸钠（sodium carbonate）或氢氧化钠(Sodium Hydroxide)溶液　和二氧化硅（SiO_2）碎片放在较暖和的部分。对流作用把溶解的养物从热区进行至冷区。 在这里物质沉积在籽晶上。两个区域温度的不同决定了生长率, 整个工序中必须严格控制.大块晶体棒的生长需10/12周。晶体的品质取决于生长条件,尤其是生长率。晶体形状和尺寸的生长也要顾及尽量减少时间和材料消耗.

晶棒被切成晶片。切割角度：晶片相对晶棒轴线的切割角度，对最终晶体成品之频率和的温度稳定性有决定性之关系。 最常用的切割是AT-cut, 成品为厚度切变之谐振器，其频率范围为1MHz to 300MHz。

石英的压电效应

自从1880年Pierre　Curie发现石英的压电效应,石英就成为电子行业一个重要的角色.通过拉伸或压缩一压电材料产生电压,相反的,将电压应用于压电材料会引起机械振动。在石英谐振器，　压电效应被用于在一特殊的共鸣频率下激发机械振动。厚度切变之谐振器如　AT-切谐振器，这频率与晶片厚度有函数关系。　如果能够小心精准的处理一个晶体，可以在其有效频率范围做出任何一个频率点。

成品晶振的生产概况

生产流程开始于减少晶片的厚度.频率取决于厚度。　切割晶片时会切的较厚，因为预留生产流程中按成品晶振频率要求而被减少的晶片厚度。晶片的厚度减少的过程是要用研磨剂，如铝化物，研磨成光滑的表面。研磨直至达到比所需的最终频率再稍稍厚一点。

再下来的制程是清洗及腐蚀晶片。　这进一步改善表面层的光滑度，并减少同一批晶片内的频率扩散。电极的形成是在真空状态下给晶片表面镀金属层(通常为银).然后将晶体架放在有特别形位的底座上。晶体一旦被定位,用导电胶固定并连通电极的尾部.接着要将晶片进行最终频率微调。这是通过在晶体上镀更多银层，直至达到所要求的频率后停止。一旦频率正确,在封装晶振前将其放在炬炉上烘烤。完成后,成品晶振便可进行测试.

整个生产过程要维持过程晶振的频率及稳定性，更凸显了客户需要提供其所需要的成品晶振的详细规格。请参照每章节起始段，概述了订购晶振产品的一般最低规格。

处理晶振之预防措施

晶体结构

石英晶振内含有 一块长方条失迎片或圆形石英片。依据客户指定的谐振率，　该石英片被加工成准确尺寸及厚度并以镀上导电电极，架放于一个气密的包装体内（见图一）。

电极被连接到引线。引线穿过支架的密封玻璃。如果是陶瓷表贴封装 (见图二)；电极经过层状被镀陶瓷连接到底部的金属垫

晶振通常和其他线路一起封装成一功能微型组件,比如:振荡器或合成滤波器.图3和图4说明了简单晶体振荡器。由于晶体的特性,正确的处理非常重要.

过多的冲击会引起电性能的改变,极有可能引致自身频率的改变.在严重的失当处理，如掉落到坚硬的表面物上,可能会导致晶片的实际破损.若为陶瓷封装,也可能造成陶瓷破裂,导致漏气.

NOTES

QUARTZ CRYSTALS - SELECTION TABLE

Model	Package (mm)	Frequency Range	Frequency Tolerance (Tightest*)	Frequency Stability (Tightest*)	Temperature Range (Widest*)	Load	Stock	Page
Specifying Quartz Crystals								20
Stock Quartz Crystals								22
Surface Mount Models								
IQXC-26	1.6 x 1.2	26 to 80MHz	±10ppm	±10ppm	–40 to 85°C	16pF std		90
CX18SM	1.6 x 1.2	30 to 50MHz	±100ppm	±10ppm	–55 to 125°C	10pF std		68
IQXC-25	2 x 1.2	32.768kHz	±20ppm	–0.03/°C^2	–40 to 85°C	9pF & 12.5pF		88
CFPX–188	2 x 1.6	20 to 50MHz	±10ppm	±10ppm	–10 to 60°C	10 to 30pF or SR		56
IQXC-42	2 x 1.6	20 to 50MHz	±10ppm	±10ppm	–40 to 85°C	8 to 30pF or SR		100
CFPX–56	2 x 6 cyl	32.768kHz	±20ppm	–0.035/°C^2	–10 to 60°C	12.5pF std	✓	46
CFPX–181	2.5 x 2	16 to 50MHz	±10ppm	±10ppm	–10 to 60°C	10 to 30pF or SR	✓	54
CFPX-218	2.5 x 2	16 to 50MHz	±10ppm	±15ppm	–40 to 85°C	10 to 30pF or SR		62
CX11L AT	3 x 1.5	20 to 250MHz	±100ppm	±10ppm	–55 to 125°C	10pF		*
CX11SM AT	3 x 1.5	20 to 250MHz	±100ppm	±10ppm	–55 to 125°C	10pF		*
CX11SM TF	3 x 1.5	32 to 180kHz	±20ppm	–0.035/°C^2	–55 to 125°C	9pF		*
CFPX-217	3.2 x 1.5	32.768kHz	±20ppm	-0.034/°C^2	–40 to 85°C	12.5pF std	✓	60
CFPX–180	3.2 x 2.5	12 to 67MHz	±10ppm	±10ppm	–40 to 85°C	16pF std	✓	52
CX9 HT	4 x 1.5	14 to 250MHz	±40ppm	±10ppm	–55 to 200°C	10pF		*
CX9SM AT	4 x 1.5	14 to 250MHz	±100ppm	±10ppm	–55 to 125°C	10pF		*
CX9V HT	4 x 1.5	32 to 160kHz	±30ppm	–0.035/°C^2	–55 to 200°C	5 to 9pF		*
CX7SM AT	4 x 2	14 to 250MHz	±100ppm	±10ppm	–55 to 125°C	10pF		*
CX9SM TF	4 x 2	32 to 160kHz	±30ppm	–0.035/°C^2	–55 to 125°C	5 to 9pF		*
CX7SM TF	4 x 2	80 to 160kHz	±50ppm	–0.035/°C^2	–55 to 125°C	5pF		*
CFPX–201	4 x 2.5	12 to 50MHz	±10ppm	±10ppm	–40 to 85°C	9pF std		58
CX4HT	5 x 2	14MHz to 250MHz	±100ppm	±150ppm	–55 to 200°C	10pF		*
CX4SM AT	5 x 2	14MHz to 250MHz	±100ppm	±10ppm	–55 to 125°C	10pF		*
CX4HGSM AT	5 x 2	14MHz to 50MHz	±100ppm	±10ppm	–55 to 125°C	10pF		*
CX4VHT	5 x 2	30 to 250kHz	±30ppm	–0.035/°C^2	–55 to 200°C	8 to 9pF		*
CX4VSM TF	5 x 2	30 to 250kHz	±30ppm	–0.035/°C^2	–55 to 125°C	5 to9pF		*
CX4 EXT	5 x 2	600kHz to 2.5MHz	±1000ppm	–0.035/°C^2	–55 to 125°C	7pF		*
CX4HT EXT	5 x 2	600kHz to 2.5MHz	±500ppm	–0.035/°C^2	–55 to 125°C	7pF		*
4SMX	5 x 3.2	10 to 67MHz	±50ppm	±50ppm	–10 to 60°C	10 to 75pF or SR		28
CFPX–104	5 x 3.2	8 to 150MHz	±10ppm	±10ppm	–40 to 85°C	10 to 30pF or SR	✓	50
CFPX-225	5 x 3.2	8 to 150MHz	±10ppm	±15ppm	–40 to 85°C	10 to 30pF or SR		64
CFPX-228	6 x 3.5	8 to 133MHz	±10ppm	±15ppm	–40 to 85°C	10 to 30pF or SR		66
3SMX	6 x 3.5	9 to 67MHz	±30ppm	±50ppm	–10 to 60°C	10 to 75pF or SR		26
CX2HSM TF	6.5 x 2.3	16 to 600kHz	±30ppm	–0.035/°C^2	–55 to 125°C	8 to 10pF		*
CX2VSM TF	6.5 x 2.3	16 to 600kHz	±30ppm	–0.035/°C^2	–55 to 125°C	8 to 10pF		*
CX3HSM TF	6.5 x 2.3	18 to 600kHz	±30ppm	–0.035/°C^2	–55 to 125°C	SR		*
CX3VSM TF	6.5 x 2.3	18 to 600kHz	±30ppm	–0.035/°C^2	–55 to 125°C	4 to 10pF		*
CX2SM EXT	6.5 x 2.3	760kHz to 1.35MHz	±500ppm	–0.035/°C^2	–55 to 125°C	7pF		*
CX3SM EXT	6.5 x 2.3	800kHz to 1.35MHz	±500ppm	–0.035/°C^2	–55 to 125°C	7pF		*
CX2SM AT	6.5 x 2.3	9.6 to 250MHz	±100ppm	±10ppm	–55 to 125°C	10 or 20pF		*
CX3HGSM AT	6.5 x 2.3	9.6 to 250MHz	±100ppm	±10ppm	–55 to 125°C	10 or 20pF		*
CX3SM AT	6.5 x 2.3	9.6 to 250MHz	±100ppm	±10ppm	–55 to 125°C	10 or 20pF		*
CX6VSM TF	6.5 x 2.5	18 to 600kHz	±30ppm	–0.035/°C^2	–55 to 125°C	5 to 10pF		*
CX6SM EXT	6.5 x 2.5	800kHz to 1.35MHz	±500ppm	–0.035/°C^2	–55 to 125°C	7pF		*
CX6SM AT	6.5 x 2.5	9.6 to 250MHz	±500ppm	–0.035/°C^2	–55 to 125°C	7pF		*

QUARTZ CRYSTALS - SELECTION TABLE

Model	Package (mm)	Frequency Range	Frequency Tolerance (Tightest*)	Frequency Stability (Tightest*)	Temperature Range (Widest*)	Load	Stock	Page
12SMX	7 x 5	6 to 84MHz	±20ppm	±20ppm	–40 to 85°C	10 to 75pF or SR	✓	32
14SMX	7 x 5	8 to 100MHz	±10ppm	±5ppm	–40 to 85°C	10 to 75pF or SR		34
CX1 AT	8 x 3.5	10 to 155.52MHz	±100ppm	±10ppm	–55 to 125°C	10 & 20pF		72
CX1H TF	8 x 3.5	10 to 600kHz	±30ppm	–0.035/°C^2	–55 to 125°C	SR		70
CX1HHT TF	8 x 3.5	10 to 600kHz	±30ppm	–0.035/°C^2	–55 to 200°C	9pF		*
CX1VHT TF	8 x 3.5	10 to 600kHz	±30ppm	–0.035/°C^2	–55 to 200°C	8 to 9pF		*
CX1VSM TF	8 x 3.5	10 to 600kHz	±30ppm	–0.035/°C^2	–55 to 125°C	4 to 11pF		*
CX1HT EXT	8 x 3.5	530kHz to 2.1MHz	±500ppm	–0.035/°C^2	–55 to 125°C	7pF		*
CX1 EXT	8 x 3.5	555kHz to 2.1MHz	±500ppm	–0.035/°C^2	–55 to 125°C	7pF std		74
CX1HGSM AT	8 x 3.5	8 to 250MHz	±100ppm	±10ppm	–55 to 125°C	10 to 20pF		*
CX1HT AT	8 x 3.5	8 to 250MHz	±100ppm	±150ppm	–55 to 125°C	10 to 20pF		*
85SMX	8.7 x 3.7	32.768kHz	±20ppm	–0.035/C^2	–40 to 85°C	6pF & 12.5pF	✓	36
90SMX	10.4 x 4	32.768kHz	±20ppm	–0.035/°C^2	–40 to 85°C	6pF & 12.5pF	✓	44
91SMX	10.4 x 4	32.768kHz	±20ppm	–0.035/°C^2	–40 to 85°C	6pF & 12.5pF	✓	44
HC49/4HSMX	11.4 x 4.9	3.2 to 100MHz	±10ppm	±15ppm	–55 to 105°C	10 to 75pF or SR	✓	86
88SMX	11.7 x 5.5	3.2 to 100MHz	±10ppm	±15ppm	–55 to 105°C	10 to 75pF or SR		42
6SMX	12 x 5	3.2 to 70MHz	±20ppm	±15ppm	–40 to 85°C	10 to 32pF or SR		30
CFPX–98	12 x 5.5	3.2 to 100MHz	±10ppm	±15ppm	–55 to 105°C	10 to 75pF or SR		48
87SMX	13.1 x 5	3.2 to 100MHz	±10ppm	±15ppm	–55 to 105°C	10 to 75pF or SR		40
86SMX	13.1 x 5	3.5 to 90MHz	±10ppm	±10ppm	–40 to 85°C	10 to 50pF or SR	✓	38
Surface Mount Models (Industrial to AEC-Q200)								
IQXC-32	3.2 x 2.5	16 to 32MHz	±10ppm	±15ppm	–20 to 125°C	8pF std		96
IQXC-31	5 x 3.2	12 to 32MHz	±10ppm	±15ppm	–20 to 125°C	8pF std		94
IQXC-30	7 x 5	6 to 80MHz	±10ppm	±15ppm	–20 to 125°C	8pF std		92
IQXC-33	11.4 x 4.9	3.01 to 100MHz	±10ppm	±15ppm	–20 to 125°C	16pF std		98
Leaded Models								
Cylinder (Watch) Crystals	2x6, 3x8 cyl	32.768kHz	±20ppm	–0.035/°C^2	–10 to 60°C	6pF & 12.5pF	✓	76
Cylinder Crystals	3x9, 3x10	3.5 to 60MHz	±50ppm	±50ppm	–20 to 70°C	16pF std		77
HC35 (TO5)	HC35 (TO5)	6 to 210MHz	±5ppm	±10ppm	–55 to 125°C	10 to 75pF or SR		78
HC49	HC49	1.8 to 270MHz	±5ppm	±5ppm	–55 to 125°C	10 to 75pF or SR	✓	80
HC49/4H	HC49/4H	3.2 to 100MHz	±10ppm	±15ppm	–55 to 105°C	10 to 75pF or SR	✓	84
UM1	UM1	6 to 175MHz	±5ppm	±5ppm	–55 to 125°C	10 to 75pF or SR		102
* Please contact your nearest sales office for detailed specification								

NOTES

SPECIFYING QUARTZ CRYSTALS

Quartz crystals are the most technically simple product IQD offer, the package contains only a piece of quartz wafer, all the supporting circuitry needed to create the oscillation must be provided by the customer's circuit. The quartz wafer inside is cut and shaped to give a resonant frequency within the specified limits. IQD's quartz crystal part numbers all contain the code XTAL.

The electrical parameters are given on the specification to facilitate the correct circuit design. Further guidance can be found in the Application Notes chapter of this book. Our Application Support team can also provide assistance if required; please contact one of our sales offices for this support.

The limits given in the following specifications are indicative of the standard crystal design, in the event that a specification is needed which is outside the standard crystal designs offered please contact our Sales team.

A typical quartz crystal specification reads like this:

10.0MHz 12SMX-B
50/50/–20 to 70C/20/ FUND TE

The data in the example above is translated in the following order

- Frequency
- Model & Variant
- Frequency Tolerance @ 25°C
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Load Capacitance
- Overtone
- Additional Text Code

Frequency

Frequency is normally specified in kilohertz (kHz) up to 999.999kHz and in megahertz (MHz) from 1.0MHz. All our computer-generated transaction documents follow this standard convention automatically.

The frequency should be described to seven significant figures. If seven significant figures are not used, we assume that any figure that might follow those given may be taken as zero. Thus a frequency given as 16.6MHz will be taken as 16.60, not 16.66667.

Some specifiers extend the use of kHz to all crystals operating in fundamental mode, reserving MHz for overtones, this method is not used by IQD. To minimise the possibility of misunderstanding it is best to use the standard method and specify fundamental or overtone mode separately.

Please contact a sales office for details of developed frequencies.

Model

Before manufacture of the crystal can start, the model must be defined. Each model covers a frequency range which is defined in the relevant specification.

The model information should also cover any mechanical variants required such as a top wire or cropped leads.

For leaded versions, the following variants for example are available for most crystals, either singly or in some cases, in combination:

- 3 lead base
- Top wire
- Insulating sleeve
- Fitted insulator
- Cropped leads
- Formed leads

Frequency Tolerance

The cost of manufacture depends partly on the accuracy required at reference temperature (which in the case of the AT-cut crystal, is usually 25°C).

Where high initial accuracy is important the additional manufacturing cost should be weighed against the cost of including a frequency trimming facility within the oscillator circuit design.

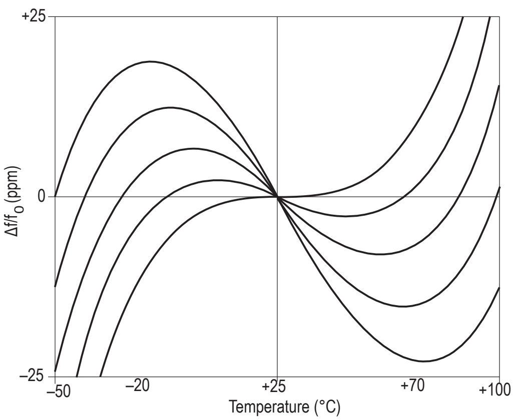
Frequency Stability

Frequency stability is normally specified as a frequency variation over a defined operating temperature range with respect to the frequency at reference temperature. The temperature ranges are defined for each crystal in the relevant data sheet. However the majority of crystals will continue to operate quite satisfactorily outside the temperature range for which they are specified, but with a possible degradation in the value of frequency stability. Under normal conditions this will not damage the crystal.

A crystal designed for operation over a restricted operating temperature range, (such as from 0 to 50°C) generally has a better frequency stability over that range than one designed for operation over a wide operating temperature range. Therefore it is important not to over specify the temperature range, as doing so will result in inferior performance for the same or greater cost; or greater cost for the same or inferior performance.

Generalised frequency vs temperature curves for the AT-cut crystal types are illustrated below. These indicate that, without compensation, a crystal specified for operation over a wide frequency range will probably have an inferior performance over a narrower range than one whose design was optimised for the narrower range. The angle of cut of the quartz blank from its quartz stone determines which curve will be followed; the chosen angle being subject to its own tolerance. Thus, since manufacturing cost is tolerance-dependent it is wise not to specify a wider operating temperature range than is actually needed unless some sacrifice of stability, or an increase in cost, can be accepted.

Typical Frequency vs Temperature Curves for various angles of AT-cut crystals



Standard Frequency Tolerances and Stabilities

- ±5ppm
- ±10ppm
- ±15ppm
- ±20ppm
- ±30ppm
- ±50ppm
- ±100ppm

Operating Temperature Ranges

The standard operating temperature ranges for a crystal are:

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –30 to 80°C
- –40 to 85°C
- –55 to 105°C
- –55 to 125°C

Load Condition

The characters 'SR' are used to denote calibration of the crystal at series resonance. If it is to be calibrated at load resonance the characters represent the circuit load capacitance in pF.

Overtone Order

Quartz crystals resonate in specific "modes" depending upon the frequency in question and oscillator circuit configuration in which it is used. The main mode of operation is called "fundamental". i.e. a 10MHz crystal vibrates at a frequency of 10MHz

However for high frequency use, quartz crystals can be made to operate at odd multiples of its fundamental frequency.

These multiples are termed "overtones" and are denoted by their multiple as: 3rd , 5th, 7th, 9th. e.g. a 10MHz crystal can be made to operate at its 3rd overtone which is approximately 3 times its fundamental frequency.

If an overtone mode crystal is chosen then the circuit design must include the relevant components required to suppress the fundamental mode of operation to ensure oscillation at the intended frequency.

Where there is a cross-over band in the modes available, the mode required must be specified when ordering. For general use and simplicity of circuit design we recommend that fundamental mode be chosen where possible.

Additional Text Code

If the product is non-standard, the letter 'T' and/or 'E' will appear at the end of the product specification. This refers to additional text on the quotation/sales order to identify the special requirements.

Packaging Codes

These are given directly after the part number for example LFXTAL012345Bulk and LFXTAL012345Reel are the same part packaged either loose in bulk pack or on tape and reel.

Tray packaging is available as an option for some products outlined in the individual data sheets.

Unless individual data sheets state Bulk packaging, surface mount versions will be Tape & Reel packed. Please note: only complete reels are sold. Sample quantities are avialable on request

- Bulk = Bulk packed
- Reel = Tape and reel packed
- Tray = Tray packed

Outline Drawings

Dimensions on the crystal outline drawings are shown only as a guide. Precise dimensions of crystal holders are available upon request. All dimensions are shown in mm and are nominal unless otherwise stated.

Marking

Due to the small size of modern SMT devices many components are now not marked with any customer readable information beyond the pad 1 denominator. In these cases the marking will be production specific data.

STOCK QUARTZ CRYSTALS

QUARTZ CRYSTALS

12SMX-B (7 x 5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
8.0MHz	30/50/-20 to 70C/16 FUND	LFXTAL026380	✓	✓
11.05920MHz	30/50/-20 to 70C/16 FUND	LFXTAL026382	✓	✓
12.0MHz	30/50/-20 to 70C/16 FUND	LFXTAL026384	✓	✓
14.74560MHz	30/50/-20 to 70C/16 FUND	LFXTAL026388	✓	✓
16.0MHz	30/50/-20 to 70C/16 FUND	LFXTAL026392	✓	✓
20.0MHz	30/50/-20 to 70C/16 FUND	LFXTAL026394	✓	✓
24.5760MHz	30/50/-20 to 70C/16 FUND	LFXTAL026396	✓	✓

85SMX (8.7 x 3.7mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
32.7680kHz	20/-/-/6	LFXTAL016178	✓	✓
32.7680kHz	20/-/-/12.5	LFXTAL003000	✓	✓

86SMX (13.1 x 5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
3.579545MHz	50/100/-20 to 70C/20 FUND	LFXTAL003057	✓	✓
3.68640MHz	50/100/-20 to 70C/16 FUND	LFXTAL003258	✓	✓
4.0MHz	50/100/-20 to 70C/30 FUND	LFXTAL003069	✓	✓
4.91520MHz	50/100/-20 to 70C/16 FUND	LFXTAL003112	✓	✓
6.0MHz	50/100/-20 to 70C/30 FUND	LFXTAL003129	✓	
7.37280MHz	50/100/-20 to 70C/16 FUND	LFXTAL003331	✓	
8.0MHz	50/100/-20 to 70C/16 FUND	LFXTAL003149	✓	✓
10.0MHz	50/100/-20 to 70C/20 FUND	LFXTAL003163	✓	
11.05920MHz	50/100/-20 to 70C/20 FUND	LFXTAL003516	✓	
12.0MHz	50/100/-20 to 70C/16 FUND	LFXTAL003209	✓	✓
14.74560MHz	50/100/-20 to 70C/16 FUND	LFXTAL003220	✓	
16.0MHz	50/100/-20 to 70C/16 FUND	LFXTAL003232	✓	✓
16.0MHz	50/100/-20 to 70C/SR FUND	LFXTAL003235	✓	✓
18.4320MHz	50/100/-20 to 70C/20 FUND	LFXTAL003175	✓	

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
20.0MHz	50/100/-20 to 70C/16 FUND	LFXTAL003178	✓	✓

90SMX (10.4 x 4mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
32.7680kHz	20/-/-/6	LFXTAL015822	✓	✓
32.7680kHz	20/-/-/12.5	LFXTAL003004	✓	✓

91SMX (10.4 x 4mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
32.7680kHz	20/-/-/6	LFXTAL010193	✓	✓
32.7680kHz	20/-/-/12.5	LFXTAL003003	✓	✓

CFPX-56 (2 x 6mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
32.7680kHz	20/-/-/12.5	LFXTAL025159	✓	✓

CFPX-104 (5 x 3.2mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
12.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL032878	✓	
14.318180MHz	50/50/-10 to 60C/18 FUND	LFXTAL033643	✓	
14.74560MHz	50/50/-10 to 60C/18 FUND	LFXTAL033328	✓	
16.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL030819	✓	
20.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL033265	✓	
24.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL032817	✓	
24.5760MHz	50/50/-10 to 60C/18 FUND	LFXTAL033644	✓	
25.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL033075	✓	
30.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL030820	✓	
40.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL033645	✓	

CFPX-180 (3.2 x 2.5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
16.0MHz	50/50/-10 to 60C/16 FUND	LFXTAL035264	✓	✓
16.3840MHz	50/50/-10 to 60C/16 FUND	LFXTAL035503	✓	✓

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
20.0MHz	50/50/-10 to 60C/16 FUND	LFXTAL035265	✓	✓
24.0MHz	50/50/-10 to 60C/16 FUND	LFXTAL035266	✓	✓
24.5760MHz	50/50/-10 to 60C/16 FUND	LFXTAL035267	✓	✓
25.0MHz	50/50/-10 to 60C/16 FUND	LFXTAL035268	✓	✓
30.0MHz	50/50/-10 to 60C/16 FUND	LFXTAL035269	✓	✓
40.0MHz	50/50/-10 to 60C/16 FUND	LFXTAL035270	✓	✓

CFPX-181 (2.5 x 2mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
16.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL035612	✓	✓
20.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL035613	✓	✓
24.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL035614	✓	
24.5760MHz	50/50/-10 to 60C/18 FUND	LFXTAL035615	✓	✓
25.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL035616	✓	✓
32.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL035617	✓	✓
40.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL035618	✓	✓
50.0MHz	50/50/-10 to 60C/18 FUND	LFXTAL035619	✓	✓

CFPX-217 (3.2 x 1.5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
32.7680kHz	20/-/-/12.5	LFXTAL009678		✓

HC49/4HSMX (11.4 x 4.9mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
3.579545MHz	30/50/-10 to 60C/16 FUND	LFXTAL003058	✓	✓
3.68640MHz	30/50/-10 to 60C/16 FUND	LFXTAL003260	✓	✓
4.0MHz	30/50/-10 to 60C/16 FUND	LFXTAL003071	✓	✓
4.0MHz	30/50/-10 to 60C/30 FUND	LFXTAL011300	✓	✓
4.91520MHz	30/50/-10 to 60C/16 FUND	LFXTAL018153	✓	✓
4.91520MHz	30/50/-20 to 70C/18 FUND	LFXTAL028392		✓
5.0MHz	30/50/-10 to 60C/30 FUND	LFXTAL012312	✓	✓

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
6.0MHz	30/50/-10 to 60C/30 FUND	LFXTAL016788	✓	✓
6.0MHz	20/50/-10 to 60C/16 FUND	LFXTAL026900	✓	✓
7.37280MHz	30/50/-10 to 60C/16 FUND	LFXTAL003334	✓	✓
7.37280MHz	30/50/-10 to 60C/30 FUND	LFXTAL010689	✓	✓
8.0MHz	30/50/-10 to 60C/16 FUND	LFXTAL003151	✓	✓
8.0MHz	30/50/-10 to 60C/30 FUND	LFXTAL011301	✓	✓
8.0MHz	30/50/-20 to 70C/18 FUND	LFXTAL020423		✓
8.1920MHz	20/50/-10 to 60C/16 FUND	LFXTAL026902	✓	✓
9.83040MHz	30/50/-10 to 60C/30 FUND	LFXTAL017048	✓	
10.0MHz	30/50/-10 to 60C/30 FUND	LFXTAL017145	✓	✓
10.0MHz	30/50/-20 to 70C/18 FUND	LFXTAL021675		✓
10.0MHz	30/50/-10 to 60C/16 FUND	LFXTAL003166	✓	✓
11.05920MHz	30/50/-10 to 60C/16 FUND	LFXTAL003519	✓	✓
12.0MHz	30/50/-10 to 60C/16 FUND	LFXTAL003210	✓	
12.0MHz	30/50/-10 to 60C/30 FUND	LFXTAL010043	✓	✓
14.74560MHz	20/50/-10 to 60C/16 FUND	LFXTAL026908	✓	✓
14.74560MHz	30/50/-10 to 60C/30 FUND	LFXTAL012313	✓	✓
16.0MHz	30/50/-10 to 60C/16 FUND	LFXTAL003237	✓	✓
18.4320MHz	20/50/-10 to 60C/16 FUND	LFXTAL026911	✓	✓
20.0MHz	30/50/-10 to 60C/16 FUND	LFXTAL003181	✓	✓
20.0MHz	30/50/-10 to 60C/30 FUND	LFXTAL017146	✓	✓
20.0MHz	30/50/-20 to 70C/18 FUND	LFXTAL020131		✓
24.0MHz	30/50/-10 to 60C/16 FUND	LFXTAL012504	✓	✓
24.0MHz	30/50/-20 to 70C/18 FUND	LFXTAL026548		✓
25.0MHz	30/50/-10 to 60C/16 FUND	LFXTAL010595	✓	✓
25.0MHz	30/50/-20 to 70C/18 FUND	LFXTAL033342		✓

QUARTZ CRYSTALS

Cylinder (Watch) 2x6

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
32.7680kHz	20/-/-/12.5	LFXTAL002997	✓	
32.7680kHz	20/-/-/6	LFXTAL014219	✓	

Cylinder (Watch) 3x8

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
32.7680kHz	20/-/-/12.5	LFXTAL002995	✓	
32.7680kHz	15/-/-/12.5	LFXTAL002996	✓	

HC49

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
1.84320MHz	20/50/-10 to 60C/30 FUND	LFXTAL003033	✓	
2.0MHz	50/100/0 to 50C/20 FUND	LFXTAL003037	✓	
2.45760MHz	20/50/-10 to 60C/30 FUND	LFXTAL003044	✓	
3.27680MHz	20/30/-10 to 60C/12 FUND	LFXTAL003051	✓	
3.579545MHz	20/50/-10 to 60C/20 FUND	LFXTAL003056	✓	
3.68640MHz	20/50/-10 to 60C/30 FUND	LFXTAL003257	✓	
4.0MHz	20/50/-10 to 60C/30 FUND	LFXTAL003068	✓	
4.0960MHz	20/50/-10 to 60C/30 FUND	LFXTAL003083	✓	
4.194304MHz	20/30/-10 to 60C/12 FUND	LFXTAL003086	✓	
4.433619MHz	20/30/-10 to 60C/20 FUND	LFXTAL003099	✓	
4.6080MHz	20/50/-10 to 60C/30 FUND	LFXTAL003107	✓	
4.91520MHz	20/50/-10 to 60C/30 FUND	LFXTAL003110	✓	
6.0MHz	20/50/-10 to 60C/30 FUND	LFXTAL003127	✓	
6.1440MHz	20/50/-10 to 60C/30 FUND	LFXTAL003134	✓	
7.37280MHz	20/50/-10 to 60C/30 FUND	LFXTAL003329	✓	
8.0MHz	20/50/-10 to 60C/30 FUND	LFXTAL003147	✓	
9.83040MHz	20/50/-10 to 60C/30 FUND	LFXTAL003277	✓	
10.0MHz	20/50/-10 to 60C/30 FUND	LFXTAL003164	✓	
11.0MHz	20/30/-10 to 60C/30 FUND	LFXTAL003327	✓	
11.05920MHz	20/30/-10 to 60C/20 FUND	LFXTAL003515	✓	
12.0MHz	20/30/-10 to 60C/30 FUND	LFXTAL003206	✓	
14.74560MHz	20/30/-10 to 60C/30 FUND	LFXTAL003218	✓	
16.0MHz	20/30/-10 to 60C/30 FUND	LFXTAL003231	✓	
17.734470MHz	20/30/-10 to 60C/30 FUND	LFXTAL003298	✓	
18.4320MHz	20/50/-10 to 60C/SR FUND	LFXTAL003174	✓	
20.0MHz	20/50/-10 to 60C/30 FUND	LFXTAL003177	✓	
20.0MHz	20/30/-10 to 60C/SR FUND	LFXTAL003179	✓	
22.11840MHz	20/50/-10 to 60C/SR FUND	LFXTAL003312	✓	
24.0MHz	20/50/-10 to 60C/SR FUND	LFXTAL003320	✓	
24.5760MHz	20/50/-10 to 60C/30 FUND	LFXTAL003386	✓	
30.0MHz	20/50/-10 to 60C/SR FUND	LFXTAL003342	✓	

HC49/4H

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
3.27680MHz	30/50/-10 to 60C/12 FUND	LFXTAL024985	✓	
3.579545MHz	30/50/-20 to 70C/20 FUND	LFXTAL003063	✓	
3.68640MHz	30/50/-20 to 70C/30 FUND	LFXTAL003263	✓	
4.0MHz	20/50/-10 to 60C/30 FUND	LFXTAL003074	✓	
4.0960MHz	30/50/-10 to 60C/30 FUND	LFXTAL003084	✓	
4.194304MHz	30/50/-10 to 60C/12 FUND	LFXTAL003093	✓	
4.433619MHz	30/50/-10 to 60C/20 FUND	LFXTAL003102	✓	
4.91520MHz	30/50/-20 to 70C/30 FUND	LFXTAL003115	✓	
5.0MHz	30/50/-10 to 60C/30 FUND	LFXTAL003119	✓	
6.0MHz	30/50/-10 to 60C/30 FUND	LFXTAL003132	✓	
6.1440MHz	30/50/-10 to 60C/30 FUND	LFXTAL003137	✓	
7.37280MHz	30/50/-10 to 60C/30 FUND	LFXTAL003335	✓	
8.0MHz	30/50/-20 to 70C/30 FUND	LFXTAL003156	✓	
9.83040MHz	30/50/-10 to 60C/30 FUND	LFXTAL003279	✓	
10.0MHz	30/50/-20 to 70C/30 FUND	LFXTAL003169	✓	
11.05920MHz	30/50/-20 to 70C/30 FUND	LFXTAL003523	✓	

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
12.0MHz	30/50/-20 to 70C/30 FUND	LFXTAL003215	✓	
12.2880MHz	30/50/-10 to 60C/30 FUND	LFXTAL003286	✓	
14.318180MHz	30/50/-20 to 70C/30 FUND	LFXTAL003200	✓	
14.74560MHz	30/50/-10 to 60C/30 FUND	LFXTAL003224	✓	
16.0MHz	30/50/-20 to 70C/30 FUND	LFXTAL003240	✓	
18.4320MHz	30/50/-20 to 70C/30 FUND	LFXTAL003176	✓	
20.0MHz	30/50/-20 to 70C/12 FUND	LFXTAL003185	✓	
24.0MHz	30/50/-10 to 60C/30 FUND	LFXTAL003325	✓	
24.5760MHz	30/50/-10 to 60C/20 FUND	LFXTAL003046	✓	

3SMX CRYSTALS

ISSUE 7; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Not recommended for new designs

For alternative see model CFPX-228

Description

- 6 x 3.5mm SMD crystal
- Available in 2 or 4 pad design
- Ceramic package with a resin sealed ceramic lid, hermetically sealed

General Specifications

- Load Capacitance (C_L): 10pF to 75pF or Series
- Drive Level: 100µW max
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±30ppm, ±50ppm, ±100ppm

Operating Temperature Range

- –10 to 60°C

Storage Temperature Range

- –40 to 85°C

Environmental

- Shock: MIL-STD-202F, Method 213B: 1000G, 0.5ms
- Vibration: MIL-STD-202F, Method 204D, Test Condition D: 20G (10Hz-2000Hz), 4hrs in 3 mutually perpendicular planes (total 12hrs)

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

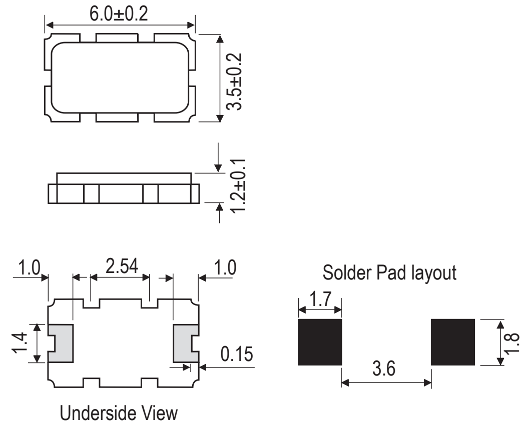
Ordering Information (*minimum required)

- Frequency*
- Model*
- Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

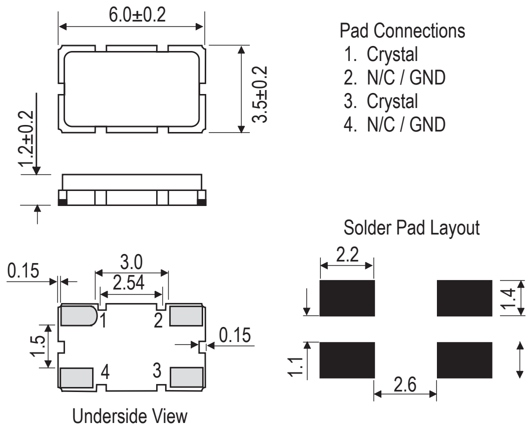
Example

- 20.0MHz 3SMX-A
  50/50/–10 to 60C/10 FUND

Outline (mm) – 3SMX-A



Outline (mm) – 3SMX-B



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
9.0 to <12.0MHz	±30ppm, ±50ppm	–10 to 60°C	±50ppm	±100ppm	80Ω	Fundamental AT cut
12.0 to <16.0MHz					60Ω	
16.0 to 50.0MHz					40Ω	
40.0 to 67.0MHz					70Ω	3rd Overtone AT cut
Note: For any other frequency / specification combinations, please contact our sales offices						

QUARTZ CRYSTALS

4SMX CRYSTALS

ISSUE 6; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Not recommended for new designs

For alternative see model CFPX-228

Description

- 5 x 3.2mm SMD crystal
- Ceramic package with a resin sealed ceramic lid, hermetically sealed

General Specifications

- Load Capacitance (C_L): 10pF to 75pF or Series
- Drive Level: 100µW max
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerance and Stabilities

- ±50ppm, ±100ppm

Operating Temperature Range

- –10 to 60°C

Storage Temperature Range

- –40 to 85°C

Environmental

- Shock: MIL-STD-202F, Method 213B: 1000G, 0.5ms
- Vibration: MIL-STD-202F, Method 204D, Test Condition D: 20G (10Hz-2000Hz), 4hrs in 3 mutually perpendicular planes (total 12hrs)

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

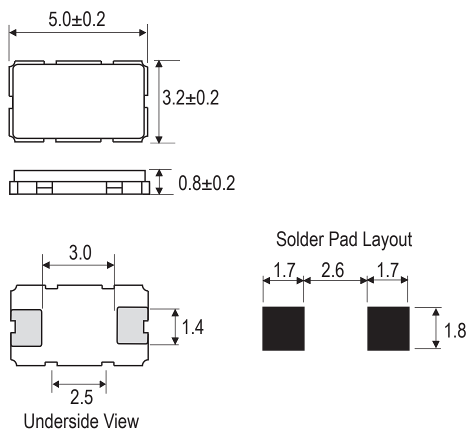
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

Example

- 20.0MHz 4SMX
  50/50/–40 to 85C/10 FUND

Outline (mm)



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range	ESR Max	Vibration Mode
10.0 to <12.0MHz	±50ppm	–10 to 60°C	±50ppm	80Ω	Fundamental AT cut
12.0 to <16.0MHz				60Ω	
16.0 to 40.0MHz				40Ω	
>40.0 to 67.0MHz	Inclusive		±100ppm		
Note: For other frequency/specification combinations, please contact our sales offices					

NOTES

6SMX CRYSTALS

ISSUE 9; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- 12 x 5mm SMD crystal
- Ceramic package with a resin sealed ceramic lid, hermetically sealed
- A pad to pad replacement for the 5SMX and 32SMX crystal

General Specifications

- Load Capacitance (C_L): 16pF to 32pF or Series
- Drive Level: 100µW max
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±15ppm to ±50ppm

Operating Temperature Ranges

- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: MIL-STD-202F, Method 213B: 1000G, 0.5ms, 1/2 sine wave
- Vibration: MIL-STD-202F, Method 204D, Test Condition D: 20G (10Hz-2000Hz), 4hrs in 3 mutually perpendicular planes (total 12hrs)

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

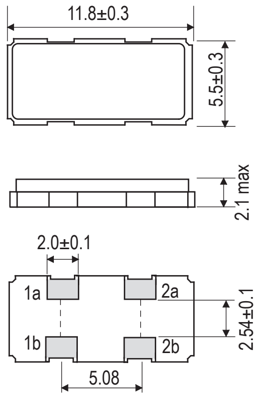
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz 6SMX
  50/50/–20 to 70C/16 FUND

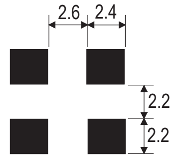
Outline (mm)



Underside View

Pad Connections
1a & 1b. Crystal
2a & 2b. Crystal

Solder Pad Layout



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
3.2 to <3.5MHz	±20ppm to ±50ppm	–10 to 60°C	±30ppm	±50ppm	200Ω	Fundamental AT cut
		–20 to 70°C				
		–40 to 85°C				
3.5 to <4.0MHz		–10 to 60°C			140Ω	
		–20 to 70°C				
		–40 to 85°C				
4.0 to <4.4MHz		–10 to 60°C			120Ω	
		–20 to 70°C				
		–40 to 85°C				
4.4 to <4.9MHz		–10 to 60°C			100Ω	
		–20 to 70°C				
		–40 to 85°C				
4.9 to <6.0MHz		–10 to 60°C			80Ω	
		–20 to 70°C				
		–40 to 85°C				
6.0 to <7.0MHz		–10 to 60°C			60Ω	
		–20 to 70°C				
		–40 to 85°C				
7.0 to <8.0MHz		–10 to 60°C			50Ω	
		–20 to 70°C				
		–40 to 85°C				
8.0 to <11.0MHz		–10 to 60°C	±20ppm		45Ω	
		–20 to 70°C				
		–40 to 85°C	±30ppm			
11.0 to <12.0MHz		–10 to 60°C	±15ppm		40Ω	
		–20 to 70°C				
		–40 to 85°C	±30ppm			
12.0 to <15.0MHz		–10 to 60°C	±15ppm		35Ω	
		–20 to 70°C				
		–40 to 85°C	±30ppm			
15.0 to <27.0MHz		–10 to 60°C	±15ppm		30Ω	
		–20 to 70°C				
		–40 to 85°C	±30ppm			
27.0 to 70.0MHz		–10 to 60°C	±15ppm		100Ω	3rd Overtone AT cut
		–20 to 70°C				
		–40 to 85°C	±30ppm			
Note: For other frequency/specification combinations, please contact our sales offices						

12SMX CRYSTALS

ISSUE 13; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- Standard 7 x 5mm SMD crystal
- 7 x 5mm SMD crystal available in three different pad designs and two different package materials
- 12SMX-A, -C, -D are ceramic package with a resin sealed ceramic lid, hermetically sealed
- 12SMX-B is a ceramic package with a seam sealed metal lid, hermetically sealed. Please Note: 12SMX-B is the standard package style
- For low profile version of a 7 x 5mm crystal please see our 14SMX
- For tighter tolerances and stabilities please see our 14SMX
- Stock parts listed at the beginning of this chapter

General Specifications

- Load Capacitance (C_L): 10pF to 75pF or Series
- Drive Level: 100µW max
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stability

- ±30ppm, ±50ppm, ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –40 to 85°C

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

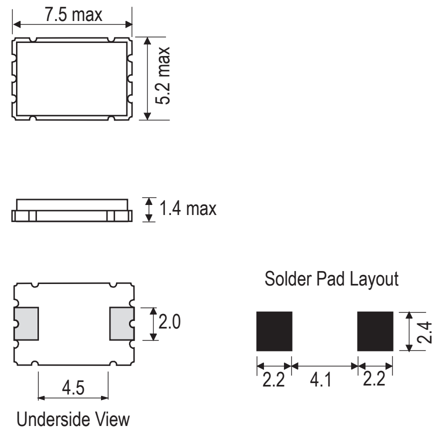
Ordering Information (*minimum required)

- Frequency*
- Model*
- Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

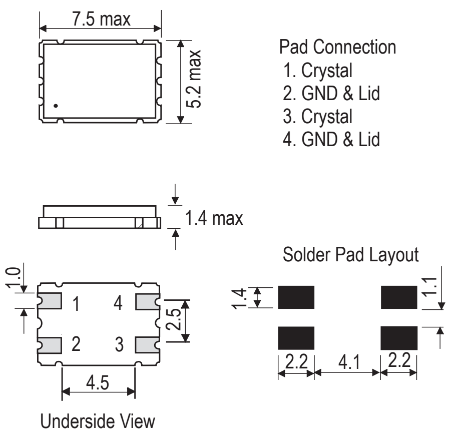
Example

- 10.0MHz 12SMX-B
  50/50/–20 to 70C/10 FUND

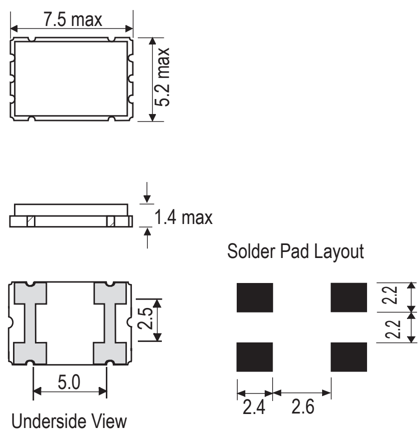
Outline (mm) 12SMX–A



Outline (mm) 12SMX–B



Outline (mm) 12SMX–C

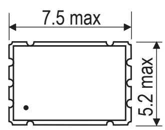


Electrical Specifications – maximum limiting values

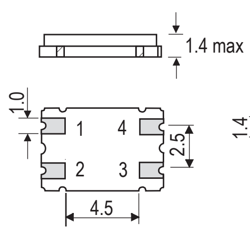
Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
6.0 to <8.0MHz	±20ppm to ±100ppm	0 to 50°C	±20ppm	±100ppm	150Ω	Fundamental AT cut
		–10 to 60°C				
		–20 to 70°C				
		–40 to 85°C	±30ppm			
8.0 to <10.0MHz		0 to 50°C	±20ppm		80Ω	
		–10 to 60°C				
		–20 to 70°C				
		–40 to 85°C	±30ppm			
10.0 to <16.0MHz		0 to 50°C	±20ppm		60Ω	
		–10 to 60°C				
		–20 to 70°C				
		–40 to 85°C	±30ppm			
16.0 to <50.0MHz		0 to 50°C	±20ppm		40Ω	
		–10 to 60°C				
		–20 to 70°C				
		–40 to 85°C	±30ppm			
50.0 to 84.0MHz		0 to 50°C	±20ppm		60Ω	3rd Overtone AT cut
		–10 to 60°C				
		–20 to 70°C				
		–40 to 85°C	±30ppm			

Note :
12SMX–A, –C, –D packages may not be available for all combinations
For other frequency/specification combinations, please contact our sales offices

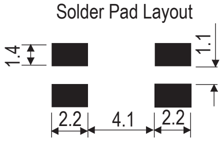
Outline (mm) 12SMX–D



Pad Connection
1. Crystal
2. NC
3. Crystal
4. NC



Underside View



14SMX CRYSTALS

ISSUE 12; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- 7 x 5mm SMD crystal
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Offers lower profile than the standard 12SMX
- Offers tighter stability than the standard 12SMX
- Please see our 12SMX part for standard stock items in this package type

General Specifications

- Load Capacitance (C_L): 10pF to 75pF or Series
- Drive Level: 100μW max
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stability

- ±15ppm, ±20ppm, ±30ppm, ±50ppm, ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –40 to 85°C

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

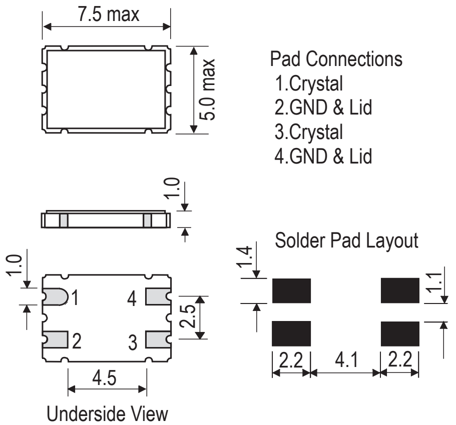
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz 14SMX
  50/50/–20 to 70C/10 FUND

Outline (mm)



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
8.0 to <10.0MHz	±10ppm to ±100ppm	0 to 50°C	±5ppm	±100ppm	60Ω	Fundamental AT cut
		–10 to 60°C				
		–20 to 70°C				
		–30 to 80°C	±15ppm			
		–40 to 85°C	±20ppm			
10.0 to <16.0MHz		0 to 50°C	±5ppm		50Ω	
		–10 to 60°C				
		–20 to 70°C				
		–30 to 80°C	±15ppm			
		–40 to 85°C	±20ppm			
16.0 to 32.0MHz		0 to 50°C	±5ppm		40Ω	
		–10 to 60°C				
		–20 to 70°C				
		–30 to 80°C	±15ppm			
		–40 to 85°C	±20ppm			
28.0 to <84.0MHz		0 to 50°C	±5ppm		60Ω	3rd Overtone AT cut
		–10 to 60°C				
		–20 to 70°C				
		–30 to 80°C	±15ppm			
		–40 to 85°C	±20ppm			
84.0 to 100.0MHz		0 to 50°C	±5ppm		80Ω	5th Overtone AT cut
		–10 to 60°C				
		–20 to 70°C				
		–30 to 80°C	±15ppm			
		–40 to 85°C	±20ppm			
Note: High frequency fundamentals are available up to 200.0MHz, please contact sales offices						

85SMX CRYSTALS

ISSUE 9; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Industry standard SMD package with 5.5mm lead spacing
- Suitable for real time clock applications
- Plastic encapsulated
- Stock parts listed at the beginning of this chapter

General Specifications

- Load Capacitance (C_L): 6pF and 12.5pF
- Drive Level: 1.0µW max
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 1pF typ

Standard Frequency Tolerance

- ±20ppm

Operable Temperature Range

- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Drop: 75cm drop (3 times) onto hard wooden board
- Vibration: 1.5mm amplitude, 10Hz-60Hz, 2-3mins in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 3kpcs per reel (please see pages 372 & 373)

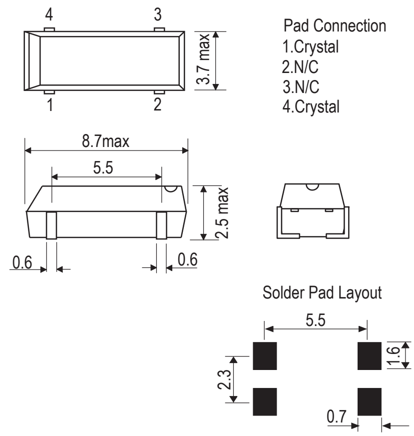
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Load Capacitance*

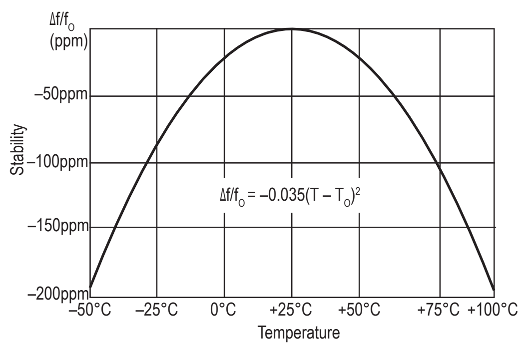
Example

- 32.768kHz 85SMX 20/-/-/12.5

Outline (mm)



Typical Frequency Stability Characteristic



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @ 25°C ±5°C	Operable Temperature Range	Typical Frequency Stability Coefficient	ESR Max	Vibration Mode
32.7680kHz	±20ppm	–40 to 85°C	–0.035/°C^2	50kΩ	Tuning Fork

NOTES

QUARTZ CRYSTALS

86SMX CRYSTALS

ISSUE 10; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Not recommended for new designs

Description

- Industry standard SMD crystal
- Plastic encapsulated
- Low profile version also available please contact our sales offices for details
- Please see the 87SMX for a low cost alternative
- Stock parts listed at the beginning of this chapter

General Specifications

- Load Capacitance (C_L): 10pF to 50pF or Series
- Drive Level: 100µW max
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 5pF max

Standard Frequency Tolerances and Stabilities

- ±10ppm, ±20ppm, ±30ppm, ±50ppm, ±100ppm, ±150ppm,

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –40 to 90°C

Enviornmental

- Drop: 75cm drop (3 times) onto hard wooden board
- Vibration: 1.5mm amplitude, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

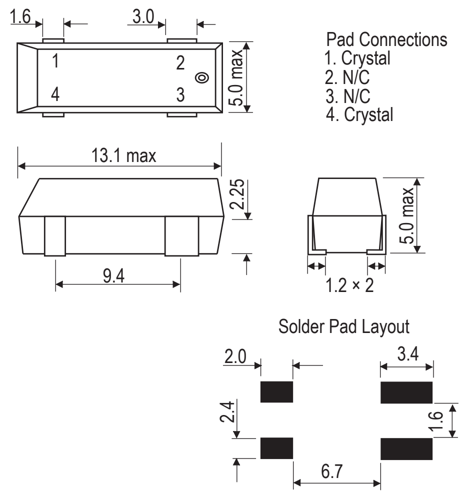
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz 86SMX
  50/50/–40 to 85C/10 FUND

Outline (mm)



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
3.579545 to <4.0MHz	±10ppm to ±100ppm	0 to 50°C	±10ppm	±100ppm	200Ω	Fundamental AT cut
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
4.0 to <4.5MHz		0 to 50°C	±10ppm	±100ppm	150Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
4.5 to <5.0MHz		0 to 50°C	±10ppm	±100ppm	120Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
5.0 to <6.0MHz		0 to 50°C	±10ppm	±100ppm	100Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
6.0 to <9.0MHz		0 to 50°C	±10ppm	±100ppm	80Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
9.0 to <10.0MHz		0 to 50°C	±10ppm	±100ppm	60Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
10.0 to <13.0MHz		0 to 50°C	±10ppm	±100ppm	50Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
13.0 to <19.0MHz		0 to 50°C	±10ppm	±100ppm	35Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
19.0 to 40.0MHz		0 to 50°C	±10ppm	±100ppm	25Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
30.0 to < 35.0MHz		0 to 50°C	±10ppm	±100ppm	80Ω	3rd Overtone AT cut
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
35.0 to <40.0MHz		0 to 50°C	±10ppm	±100ppm	70Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
40.0 to <45.0MHz		0 to 50°C	±10ppm	±100ppm	65Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
45.0 to <50.0MHz		0 to 50°C	±10ppm	±100ppm	60Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
50.0 to <90.0MHz		0 to 50°C	±10ppm	±100ppm	80Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C	±30ppm			
		–40 to 85°C	±50ppm	±150ppm		
Note: For other frequency / specification combinations please contact our sales offices						

87SMX CRYSTALS

ISSUE 7; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- Low cost drop on alternative to the 86SMX
- HC49/3.5H-3L package mounted on a SMD base
- Resistance welded, hermetically sealed in an inert atmosphere, glass to metal seals on leads

General Specifications

- Load Capacitance (C_L): 10pF to 75pF or Series
- Drive Level: 500µW max
- Ageing: ±3ppm typ per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±30ppm, ±50ppm, ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –40 to 85°C
- –55 to 105°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-500Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

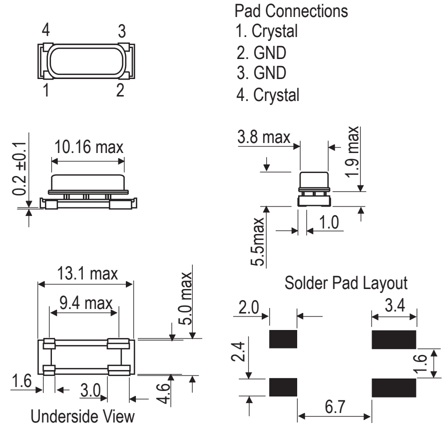
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz 87SMX
  50/50/–40 to 85C/10 FUND

Outline (mm)



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
3.2 to <4.0MHz	±10ppm to ±100ppm	0 to 50°C	±15ppm	±100ppm	300Ω	Fundamental AT cut
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
4.0 to <5.5MHz		0 to 50°C	±15ppm	±100ppm	130Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
5.5 to <8.0MHz		0 to 50°C	±15ppm	±100ppm	60Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
8.0 to 40.0MHz		0 to 50°C	±15ppm	±100ppm	40Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
27.0 to 50.0MHz	Inclusive with Frequency Stability	0 to 50°C	±50ppm	±100ppm		Fundamental BT cut
		–10 to 60°C	±70ppm			
		–20 to 70°C	±100ppm			
26.0 to 100.0MHz	±10ppm to 100ppm	0 to 50°C	±15ppm	±100ppm	100Ω	3rd Overtone AT cut
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±50ppm			
		–55 to 105°C	±100ppm	±500ppm		
Note: For any other frequencies / specification please contact our sales offices						

88SMX CRYSTALS

ISSUE 7; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- SMD 6 pad version of the HC49/3.5H
- Resistance welded, hermetically sealed in an inert atmosphere, glass to metal seals on leads
- Please see our CFPX-98 for a 4 pad version of this package
- Please see our HC49/4HSMX for standard stock items in this package type

General Specifications

- Load Capacitance (C_L): 10pF to 75pF or Series
- Drive Level: 500μW max
- Ageing: ±5ppm typ per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±30ppm, ±50ppm, ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –40 to 85°C
- –55 to 105°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-500Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

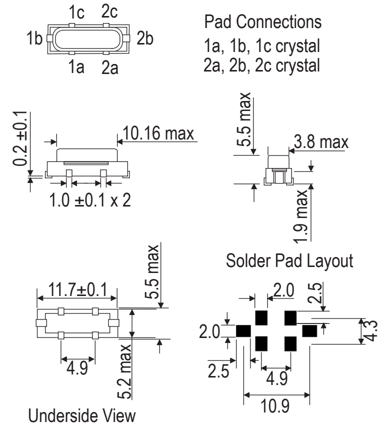
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz 88SMX
  50/50/–40 to 85C/10 FUND

Outline (mm)



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
3.2 to <4.0MHz	±10ppm to ±100ppm	0 to 50°C	±15ppm	±100ppm	300Ω	Fundamental AT cut
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
4.0 to <5.5MHz		0 to 50°C	±15ppm	±100ppm	130Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
5.5 to <8.0MHz		0 to 50°C	±15ppm	±100ppm	60Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
8.0 to 40.0MHz		0 to 50°C	±15ppm	±100ppm	40Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
27.0 to 50.0MHz	Inclusive with Frequency Stability	0 to 50°C	±50ppm	±100ppm		Fundamental BT cut
		–10 to 60°C	±70ppm			
		–20 to 70°C	±100ppm			
26.0 to 100.0MHz	±10ppm to 100ppm	0 to 50°C	±15ppm	±100ppm	100Ω	3rd Overtone AT cut
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±50ppm			
		–55 to 105°C	±100ppm	±500ppm		
Note: For any other frequencies / specification please contact our sales offices						

90SMX & 91SMX CRYSTALS

ISSUE 11; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- Industry standard package
- Suitable for real time clock applications
- Plastic encapsulated
- Stock parts listed at the beginning of this chapter

General Specifications

- Load Capacitance (C_L): 6pF and 12.5pF
- Drive Level: 1.0µW max
- Ageing ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 1pF typ

Standard Frequency Tolerance

- ±20ppm

Operable Temperature Range

- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Drop: 75cm drop (3 times) onto hard wooden board
- Vibration: 1.5mm amplitude, 10Hz-60Hz, 2-3mins in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 2kpcs per reel (please see pages 372 & 373)

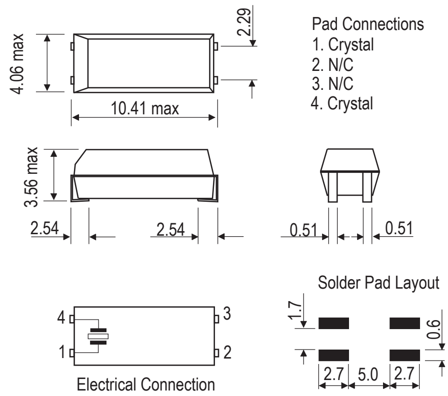
Ordering Information (*minimum required)

- Frequency*
- Model*
- Tolerance @25°C
- Load Capacitance*

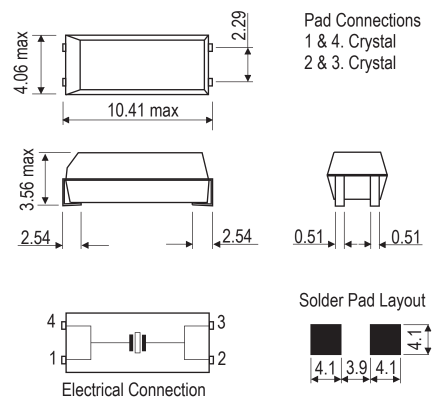
Example

- 32.768kHz 90SMX 20/-/-/12.5

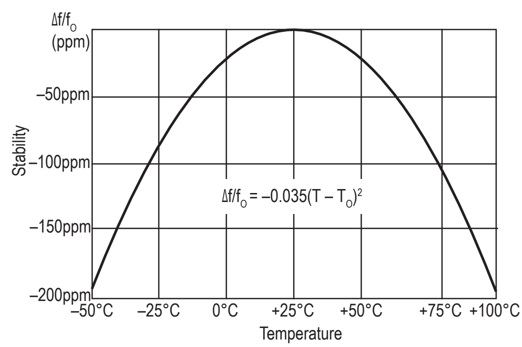
Outline (mm) 90SMX



Outline (mm) 91SMX



Typical Frequency Stability Characteristic



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operable Temperature Range	Typical Frequency Stability Coefficient	ESR Max	Vibration Mode
32.7680kHz	±20ppm	–40 to 85°C	–0.035/°C^2	50kΩ	Tuning Fork

CFPX–56 CRYSTALS

ISSUE 5; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- 2 x 6mm watch crystal with pre-formed legs to make a SMD package
- Suitable for real time clock applications
- Stock parts listed at the beginning of this chapter

General Specification

- Load Capacitance (C_L): 12.5pF standard
- Drive Level: 1.0μW max
- Ageing ±5ppm max in 1st year
- Shunt Capacitance (C_0) 1.6pF typ
- Motional Capacitance (C_1) 3.2fF typ

Standard Frequency Tolerance

- ±20ppm

Operable Temperature Range

- –10 to 60°C

Storage Temperature

- –40 to 85°C

Environmental

- Drop: 75cm drop (3 times) onto hard wooden board
- High Temperature Storage: 85°C for 24hrs

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 3kpcs per reel (please see pages 372 & 373)

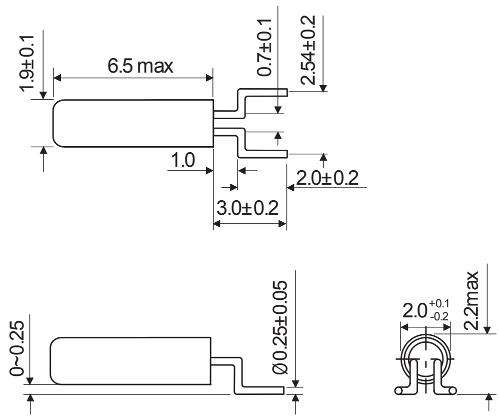
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance @25°C
- Load Capacitance*

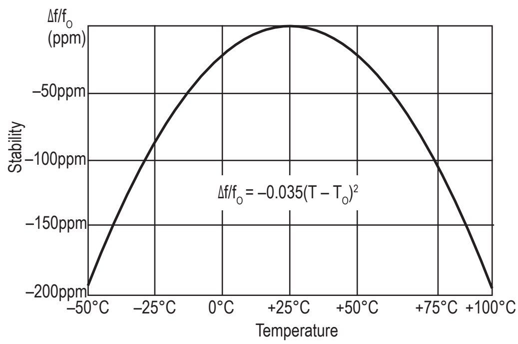
Example

- 32.768kHz CFPX-56
  20/-/-/12.5

Outline (mm)



Typical Frequency Stability Characteristic



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operable Temperature Range	Typical Frequency Stability Coefficient	ESR Max	Vibration Mode
32.7680kHz	±20ppm	–10 to 60°C	–0.035/°C2	40kΩ	Tuning Fork

NOTES

CFPX–98 CRYSTALS

ISSUE 7; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- SMD 4 pad version of the HC49/3.5H
- Resistance welded, hermetically sealed in an inert atmosphere, glass to metal seals on leads
- Please see our 88SMX for a 6 pad version of this package
- Please see our HC49/4HSMX for standard stock items in this package type

General Specifications

- Load Capacitance (C_L): 10pF to 75pF or Series
- Drive Level: 500μW max
- Ageing: ±5ppm typ per year
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±30ppm, ±50ppm, ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –40 to 85°C
- –55 to 105°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-500Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

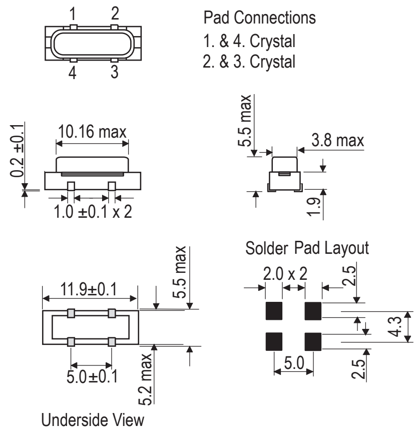
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz CFPX-98
  50/50/–40 to 85C/10 FUND

Outline (mm)



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
3.2 to <4.0MHz	±10ppm to ±100ppm	0 to 50°C	±15ppm	±100ppm	300Ω	Fundamental AT cut
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
4.0 to <5.5MHz		0 to 50°C	±15ppm	±100ppm	130Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
5.5 to <8.0MHz		0 to 50°C	±15ppm	±100ppm	60Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
8.0 to 40.0MHz		0 to 50°C	±15ppm	±100ppm	40Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
27.0 to 50.0MHz	Inclusive with Frequency Stability	0 to 50°C	±50ppm	±100ppm	40Ω	Fundamental BT cut
		–10 to 60°C	±70ppm			
		–20 to 70°C	±100ppm			
26.0 to 100.0MHz	±10ppm to 100ppm	0 to 50°C	±15ppm	±100ppm	100Ω	3rd Overtone AT cut
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±50ppm			
		–55 to 105°C	±100ppm	±500ppm		

Note: For any other frequencies / specification please contact our sales offices

CFPX–104 CRYSTALS

ISSUE 9; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- Standard 5 x 3.2mm SMD crystal with 4 pads
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Please see our CFPX-225 for a two pad alternative
- Stock parts listed at the beginning of this chapter

General Specifications

- Load Capacitance (C_L): 10pF to 30pF or Series
- Drive Level: 100µW max
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±10ppm to ±50ppm

Operating Temperature Ranges

- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Drop: 75cm drop (3 times) onto hard wooden board
- Vibration: MIL-STD-202F, Method 204D, Test Condition D: 20G (10Hz-2000Hz), 4hrs in 3 mutually perpendicular planes (total 12hrs)

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

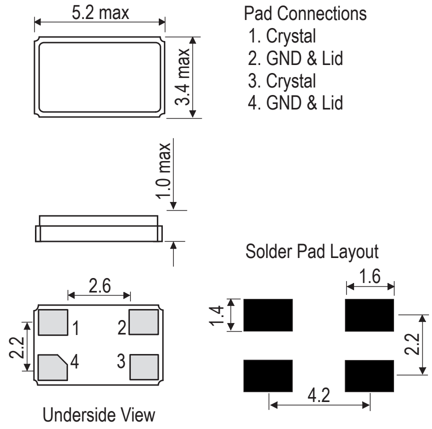
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz CFPX-104
  50/50/–40 to 85C/10 FUND

Outline (mm)



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Ranges	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
8.0 to 10.0MHz	±10ppm to ±50ppm	–10 to 60°C	±10ppm	±50ppm	150Ω	Fundamental AT cut
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
>10.0 to 12.0MHz		–10 to 60°C	±10ppm		90Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
>12.0 to 15.0MHz		–10 to 60°C	±10ppm		70Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
>15.0 to 20.0MHz		–10 to 60°C	±10ppm		50Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
>20.0 to 30.0MHz		–10 to 60°C	±10ppm		40Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
>30.0 to 40.0MHz		–10 to 60°C	±10ppm		30Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
>40.0 to 52.0MHz		–10 to 60°C	±10ppm		20Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
40.0 to 80.0MHz		–10 to 60°C	±10ppm		100Ω	3rd Overtone AT cut
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
>80.0 to 150.0MHz		–10 to 60°C	±10ppm		80Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
Note: For any other frequencies / specification please contact our sales offices						

CFPX–180 CRYSTALS

ISSUE 7; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- Standard 3.2 x 2.5mm SMD crystal
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Stock parts listed at the beginning of this chapter

General Specifications

- Load Capacitance (C_L): 16pF standard
- Drive Level: 100µW max
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stability

- ±10ppm to ±50ppm

Operating Temperature Ranges

- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: MIL-STD-202F, Method 213B: 1000G, 0.5ms, 1/2 sine wave
- Vibration: MIL-STD-202F, Method 204D, Test Condition D: 20G (10Hz-2000Hz), 4hrs in 3 mutually perpendicular planes (total 12hrs)

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

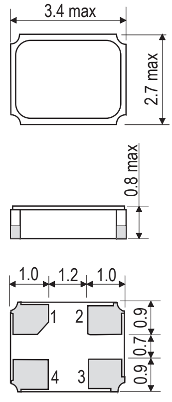
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

Example

- 20.0MHz CFPX-180
  50/50/–40 to 85C/16 FUND

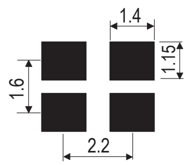
Outline (mm)



Underside View

Pad Connections
1. Crystal
2. GND
3. Crystal
4. GND

Solder Pad Layout



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Ranges	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	**Maximum**		
12.0 to <13.0MHz	±10ppm to ±50ppm	–10 to 60°C	±10ppm	±50ppm	250Ω	Fundamental AT Cut
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
13.0 to <16.0MHz		–10 to 60°C	±10ppm		150Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
16.0 to <30.0MHz		–10 to 60°C	±10ppm		100Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
30.0 to 67.0MHz		–10 to 60°C	±10ppm		60Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
Note: For any other frequencies / specification combinations, please contact our sales offices						

CFPX–181 CRYSTALS

ISSUE 7; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- 2.5 x 2mm SMD crystal
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Offers lower ageing than the standard CFPX-218 package
- Please see our CFPX-218 for standard 2.5 x 2mm crystal
- Stock parts listed at the beginning of this chapter

General Specifications

- Load Capacitance (C_L): 10pF to 30pF or Series
- Drive Level: 100µW max
- Ageing: ±1ppm max per year at 25°C
- Shunt Capacitance (C_0): 5pF max

Standard Frequency Tolerance and Stability

- ±10ppm to ±100ppm

Operating Temperature Range

- –10 to 60°C

Storage Temperature Range

- –40 to 90°C

Environmental

- Drop: 75cm drop (3 times) onto hard wooden board
- Vibration: 1.5mm amplitude, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

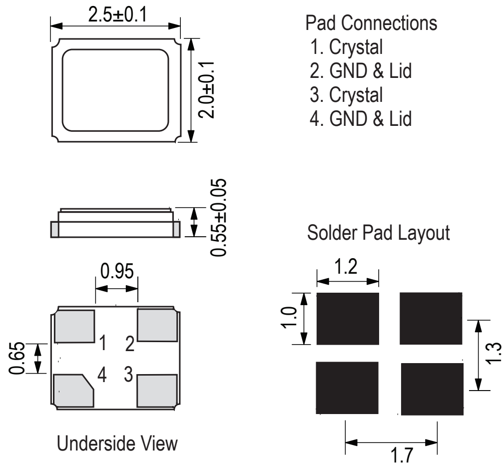
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

Example

- 20.0MHz CFPX-181
  50/50/–10 to 60C/10 FUND

Outline (mm)



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
16.0 to <20.0MHz	±10ppm to ±50ppm	–10 to 60°C	±10ppm	±100ppm	100Ω	Fundamental AT cut
20.0 to <30.0MHz					80Ω	
30.0 to <40.0MHz					60Ω	
40.0 to 50.0MHz					50Ω	
Note: For other frequency / specification combinations, please contact our sales offices						

CFPX–188 CRYSTALS

ISSUE 5; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- Low profile 2 x 1.6mm SMD crystal
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Please see our IQXC-42 for standard 2 x 1.6mm crystals

General Specifications

- Load Capacitance (C_L): 10pF to 30pF or Series
- Drive Level: 100µW max
- Ageing: ±3ppm max per year at 25°C
- Shunt Capacitance (C_0): 5pF max

Standard Frequency Tolerance and Stability Range

- ±10ppm to ±50ppm

Operating Temperature Range

- –10 to 60°C

Storage Temperature Range

- –40 to 90°C

Environmental

- Drop: 75cm drop (3 times) onto hard wooden board
- Vibration: 1.5mm amplitude, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

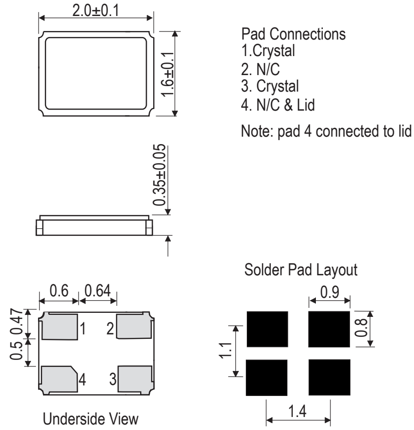
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

Example

- 20.0MHz CFPX-188
  50/50/–10 to 60C/10 FUND

Outline (mm)



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
20.0 to <24.0MHz	±10ppm to ±50ppm	–10 to 60°C	±10ppm	±50ppm	120Ω	Fundamental AT cut
24.0 to <30.0MHz					100Ω	
30.0 to <38.0MHz					80Ω	
38.0 to 50.0MHz					60Ω	
Note: For any other frequency / specification combinations, please contact our sales offices						

NOTES

CFPX–201 CRYSTALS

ISSUE 4; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- Standard 4 x 2.5mm SMD crystal
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Often used in Bluetooth, ZigBee and similar RF applications

General Specifications

- Load Capacitance (C_L): 9pF standard
- Drive Level: 100µW max
- Ageing: ±1ppm max per year at 25°C
- Shunt Capacitance (C_0): 5pF max

Standard Frequency Tolerance and Stability Ranges

- ±10ppm to ±50ppm

Operating Temperature Range

- –10 to 60°C

Storage Temperature Range

- –40 to 90°C

Environmental

- Drop: 75cm drop (3 times) onto hard wooden board
- Vibration: 1.5mm amplitude, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

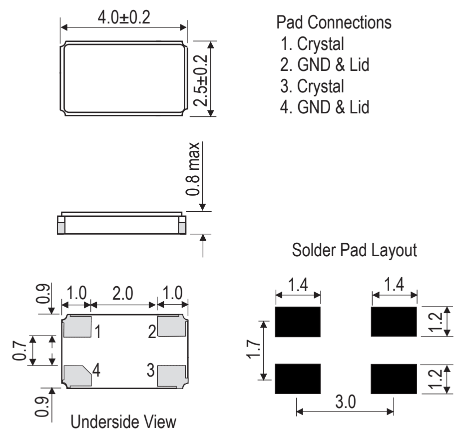
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 20.0MHz CFPX-201
  50/50/–10 to 60C/10 FUND

Outline (mm)



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
12.0 to <13.0MHz	±10ppm to ±50ppm	–10 to 60°C	±10ppm	±50ppm	100Ω	Fundamental AT cut
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
13.0 to <19.0MHz		–10 to 60°C	±10ppm		80Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
19.0 to <40.0MHz		–10 to 60°C	±10ppm		60Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
40.0 to 50.0MHz		–10 to 60°C	±10ppm		50Ω	
		–20 to 70°C	±15ppm			
		–40 to 85°C	±20ppm			
Note: For any other frequency / specification combinations, please contact our sales offices						

CFPX–217 CRYSTALS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- 3.2 x 1.5mm SMD crystal
- Suitable for real time clock applications
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Stock parts listed at the beginning of this chapter

General Specification

- Load Capacitance (C_L): 12.5pF standard
- Drive Level: 1μW max
- Ageing: ±3ppm max first year at 25°C
- Shunt Capacitance (C_0): 1.05pF typ

Standard Frequency Tolerance

- ±20ppm

Operable Temperature Range

- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Drop: 100g dummy, 150cm drop (3 directions x 10 times) onto concrete
- Vibration: 1.5mm amplitude, 10Hz-500Hz, full sine wave or acceleration 10G, 1.5mins in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 3kpcs per reel (please see pages 372 & 373)

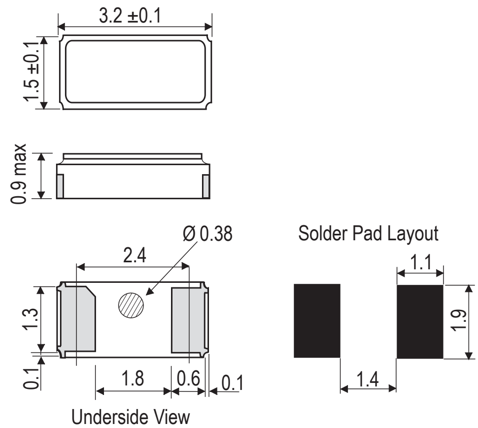
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Load Capacitance*

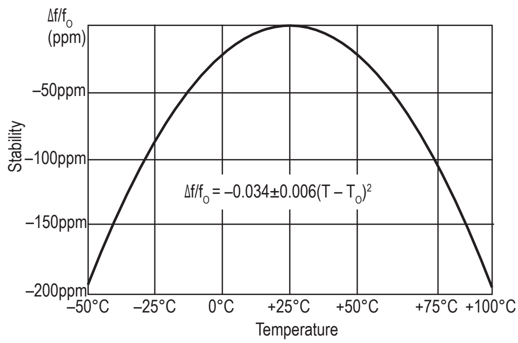
Example

- 32.768kHz CFPX-217
  20/-/-/12.5

Outline (mm)



Typical Frequency Stability Characteristic



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±5°C	Operable Temperature Range	Typical Frequency Stability Coefficient	ESR Max	Vibration Mode
32.768kHz	±20ppm	–40 to 85°C	–0.034/°C2	70kΩ	Tuning Fork

NOTES

CFPX-218 CRYSTALS

ISSUE 3; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- Standard 2.5 x 2mm SMD crystal
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Please see our CFPX-181 for a low aging version

General Specifications

- Load Capacitance (C_L): 10pF to 30pF or Series
- Drive Level: 100µW max
- Ageing: ±3ppm max per year at 25°C
- Shunt Capacitance (C_0): 5pF max

Standard Frequency Tolerances and Stabilites

- ±10ppm to ±100ppm

Operating Temperature Ranges

- -10 to 60°C
- -20 to 70°C
- -40 to 85°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Drop: 100cm drop (3 times) onto hard wooden board
- Vibration: MIL-STD-883F, Method 2007.3: 20G (20Hz-2000Hz), 1.52mm amplitude, 20mins in 3 mutually perpendicular planes (total 4hrs)

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

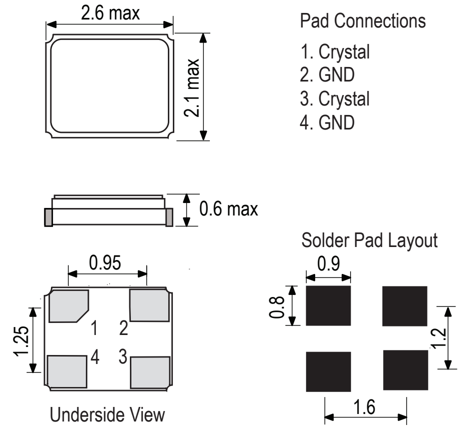
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

Example

- 20.0MHz CFPX-218
  50/50/–40 to 85C/16 FUND

Outline (mm)



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
16.0 to <30.0MHz	±10ppm to ±50ppm	–10 to 60°C	±15ppm	±100ppm	100Ω	Fundamental AT cut
		–20 to 70°C				
		–40 to 85°C	±20ppm			
30.0 to 50.0MHz		–10 to 60°C	±15ppm		70Ω	
		–20 to 70°C				
		–40 to 85°C	±20ppm			
Note: For any other frequency / specification combinations, please contact our sales offices						

CFPX-225 CRYSTALS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Replacement for the 4SMX
- Standard 5 x 3.2mm SMD crystal with 2 pads
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Please see our CFPX-104 for a 4 pad alternative held as stock

General Specifications

- Load Capacitance (C_L): 10pF to 30pF or Series
- Drive Level: 100µW max
- Ageing: ±3ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±10ppm to ±50ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Drop: 100cm drop (3 times) onto hard wooden board
- Vibration: MIL-STD-883F, Method 2007.3: 20G (20Hz-2000Hz), 1.52mm amplitude, 20mins in 3 mutually perpendicular planes (total 4hrs)

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

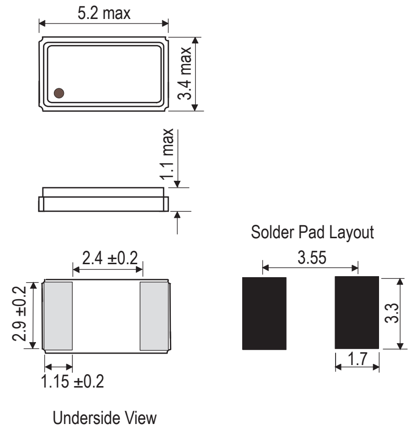
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz CFPX-225
  50/50/–40 to 85C/10 FUND

Outline (mm)



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @ 25°C ±3ppm	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
8.0 to 10.0MHz	±10ppm to ±50ppm	0 to 50°C	±15ppm	±50ppm	150Ω	Fundamental AT cut
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>10.0 to 12.0MHz		0 to 50°C	±15ppm		90Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>12.0 to 15.0MHz		0 to 50°C	±15ppm		70Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>15.0 to 20.0MHz		0 to 50°C	±15ppm		50Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>20.0 to 30.0MHz		0 to 50°C	±15ppm		40Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>30.0 to 40.0MHz		0 to 50°C	±15ppm		30Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>40.0 to 52.0MHz		0 to 50°C	±15ppm		20Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
40.0 to 80.0MHz		0 to 50°C	±15ppm		100Ω	3rd Overtone AT cut
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>80.0 to 150.0MHz		0 to 50°C	±15ppm		80Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
Note: For any other frequency / specification combinations, please contact our sales offices						

CFPX-228 CRYSTALS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Replacement for the 3SMX
- Standard 6 x 3.5mm crystal
- Available in a 2 or 4 pad package
- Ceramic package with a seam sealed metal lid, hermetically sealed

General Specifications

- Load Capacitance (C_L): 10pF to 30pF or Series
- Drive Level: 100µW max
- Ageing: ±3ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±10ppm to ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Drop Test: Unit dropped from height of 100cm onto hard wooden plate (>30mm thickness), three times. JIS-C-0044
- Vibration: MIL–STD–883F: 2007.3 Frequency range 20 to 2000Hz, peak amplitude 1.52mm, peak acceleration 20G, 20min/axis X, Y & Z, total test time 4 hrs

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

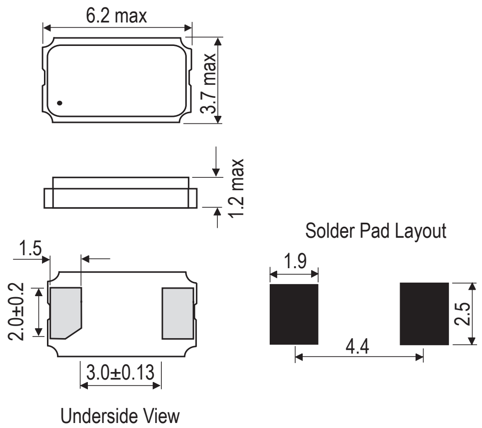
Ordering Information (*minimum required)

- Frequency*
- Model*
- Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

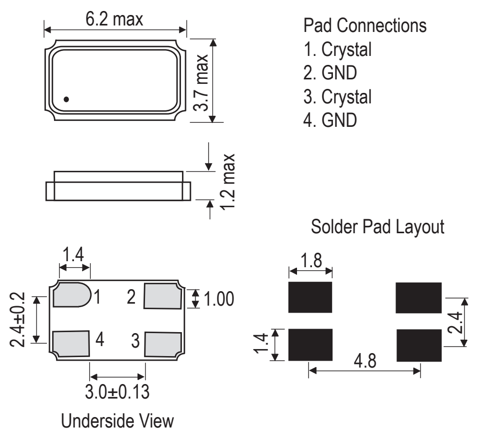
Example

- 10.0MHz CFPX-228
  50/50/–40 to 85C/10 FUND

Outline (mm) CFPX-228-A



Outline (mm) CFPX-228-B



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @ 25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
8.0 to 10.0MHz	±10ppm to ±50ppm	0 to 50°C	±15ppm	±100ppm	150Ω	Fundamental AT cut
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>10.0 to 12.0MHz		0 to 50°C	±15ppm		80Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>12.0 to 15.0MHz		0 to 50°C	±15ppm		60Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>15.0 to 20.0MHz		0 to 50°C	±15ppm		50Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>20.0 to 30.0MHz		0 to 50°C	±15ppm		40Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>30.0 to 40.0MHz		0 to 50°C	±15ppm		30Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>40.0 to 52.0MHz		0 to 50°C	±15ppm		20Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
40.0 to 52.0MHz		0 to 50°C	±15ppm		100Ω	3rd Overtone AT cut
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>52.0 to 80.0MHz		0 to 50°C	±15ppm		80Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
>80.0 to 133.0MHz		0 to 50°C	±15ppm		70Ω	
		–10 to 60°C	±20ppm			
		–20 to 70°C				
		–40 to 85°C	±30ppm			
Note: For any other frequency / specification combinations, please contact our sales offices						

CX18SM CRYSTALS

ISSUE 0.1; 1 NOVEMBER 2010

Description

When miniaturization is paramount, Statek's ultra-miniature CX18SM quartz crystal is the ideal choice. This crystal is available in frequencies from 30MHz to 50MHz, and has typical overall dimensions of 1.55mm x 0.95mm x 0.35mm. This surface mount crystal is hermetically sealed within an ultra-miniature package to ensure high stability and low ageing. The extremely small size of this crystal makes the CX18SM ideally suited for many high frequency applications

Features

- Extremely small footprint (1.55mm x 0.95mm)
- Ultra-low profile (0.35mm)
- Ultra-low weight (1.8mg)
- Hermetically sealed package
- Tight calibration tolerance
- Excellent ageing characteristics

Applications

- Cardiac Rhythm Management Telemetry (CRMT)
- Implantable pacemakers (CRT's)
- Implantable defibrillators (ICD's)
- Hearing assistance and cochlear implants
- Infusion pumps
- Wildlife tracking

General Specifications

- Load Capacitance (C_L): 10pF standard
- Drive Level: 200µW max
- Ageing: ±5ppm max in 1st year, ±1ppm available on request
- Shunt Capacitance (C_0): 0.6pF typ
- Motional Capacitance (C_1): 1.2fF typ
- Quality Factor (Q): 44000 typ

Termination Variants

- SM1 = Gold Plated (RoHS Compliant)
- SM2 = Solder Plated (non RoHS Compliant)
- SM3 = Solder Dipped (non RoHS Compliant)
- SM4 = Solder Plated (RoHS Compliant)
- SM5 = Solder Dipped (RoHS Compliant)

Standard Frequency Tolerances and Stabilities

- ±10ppm, ±20ppm, ±30ppm, ±50ppm, ±100ppm

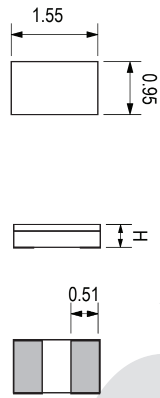
Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C
- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

Outline (mm) typ



Underside View

Height (H) =
SM1 0.35
SM2 0.37
SM3 0.42
SM4 0.37
SM5 0.42

Environmental

- Shock: 5000G, 0.3ms, 1/2 sine wave
- Vibration: MIL-STD-202G, Method 204D, Test Condition D: 20G (10Hz-2000Hz), swept sine wave

Packaging

- Tray pack

Ordering Information (*minimum required)

- Frequency*
- Model*
- Termination Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

Example

- 40.0MHz CX18SM SM1 100/100/–55 to 125C/10 FUND

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Tolerance @25°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Typical @ 50MHz	Vibration Mode
			Minimum	Maximum		
30.0 to 50.0MHz	±100ppm	–10 to 70°C	±10ppm	±50ppm	60Ω	Fundamental AT cut
		–40 to 85°C	±20ppm	±100ppm		
		–55 to 125°C	±30ppm	±100ppm		
Note: For other frequency / specification combinations please contact our sales offices						

QUARTZ CRYSTALS

CX1H TF CRYSTALS

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

The CX1H quartz crystal is a high quality tuning fork resonator for use in Series (two cascaded inverters) oscillators. The CX1HSM is hermetically sealed in a rugged, miniature ceramic package. The CX1H crystal is manufactured using the Statek-developed photo-lithographic process, and was designed utilizing the experience acquired by producing millions of crystals for industrial, commercial, military and medical applications. Maximum process temperature should not exceed 260°C

Features

- Miniature tuning fork design
- High shock resistance
- Designed for low power applications
- Compatible with hybrid or PC board packaging
- Low ageing
- Full military testing available

General Specifications

- Load Capacitance (C_L): Series Resonance only
- Drive Level: 1.5µW max 10-24.9kHz, 3µW max 25-600kHz
- Ageing: ±5ppm max in 1st year
- Shunt Capacitance (C_0): 2pF max
- Motional Capacitance (C_1): 5fF max
- Quality Factor (Q): 3000 min

Terminations

- SM1 = Gold Plated (RoHS Compliant)
- SM2 =Solder Plated (non RoHS Compliant)
- SM3 = Solder Dipped (non RoHS Compliant)
- SM4 = Solder Plated (RoHS Compliant)
- SM5 = Solder Dipped ((RoHS Compliant)

Standard Frequency Tolerances

- ±30ppm, ±50ppm, ±100ppm, ±200ppm, ±500ppm, ±1000ppm, ±2000ppm, ±5000ppm

Operating Tempaerature Ranges

- –10 to 70°C
- –40 to 85°C
- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

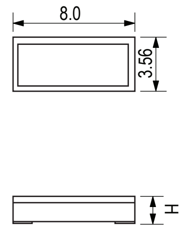
Environmental

- Shock: 1000G, 1ms, 1/2 sine wave
- Vibration: 20G (10Hz-2000Hz)

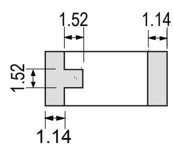
Packaging

- Tray pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

Oultine (mm) typ

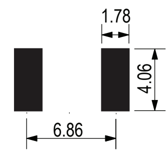


Height (H) =	Glass Lid	Ceramic Lid
SM1	1.65	1.78
SM2	1.70	1.83
SM3	1.78	1.90
SM4	1.70	1.83
SM5	1.78	1.90



Underside View

Solder Pad Layout



Ordering Information (*minimum required)

- Frequency*
- Model*
- Termination Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance
- Overtone

Example

- 40.0kHz CX1H TF SM1 100/-/–10 to 70C/SR FUND

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Tolerance @25°C	Operating Temperature Range	Typical Frequency Stability Coeffeicient	ESR Typical
10.0kHz to 74.9kHz	±30ppm ±100ppm ±1000ppm	–10 to 70°C –40 to 85°C –55 to 125°C	–0.035/°C2	1MΩ to 50kΩ
75.0kHz to 169.9kHz	±50ppm ±100ppm ±1000ppm			50kΩ to 20kΩ
170.0kHz to 249.9kHz	±100ppm ±200ppm ±2000ppm			20kΩ
250.0kHz to 600.0kHz	±200ppm ±500ppm ±5000ppm			20kΩ to 15kΩ
Note: For other frequency / specifications combinations please contact our sales offices				

CX1 AT CRYSTALS

ISSUE 2; 1 NOVEMBER 2010

Description

Statek's miniature CX1 AT crystals in leadless ceramic packages are designed for surface mounting on printed circuit boards or hybrid substrates. Due to its robust design, this product has gained wide acceptance in the frequency product industry

Features

- Designed for surface mount applications using infrared, vapor phase, or epoxy mount techniques
- Low profile hermetically sealed ceramic package
- Excellent ageing characteristics
- Available with glass or ceramic lid
- High shock and vibration resistance
- Custom designs available
- Full military testing available

Applications

Medical

- Infusion Pumps
- Monitoring Equipment

Industrial, Computer & Communications

- Instrumentation
- Process Control
- Environmental Control
- Telemetry

Military & Aerospace

- Communications
- Satellite Command and Control
- Cockpit Electronics
- Smart Munitions
- Timing Devices (Fuzes)

General Specifications

- Load Capacitance (C_L): 20pF ≤50MHz, 10pF >50MHz
- Drive Level: 500μW max ≤50MHz, 200μW max >50MHz
- Ageing: ±5ppm max in 1st year
- Shunt Capacitance (C_0): 2.3pF typ
- Motional Capacitance (C_1): 5.5fF typ
- Quality Factor (Q): 30000 min

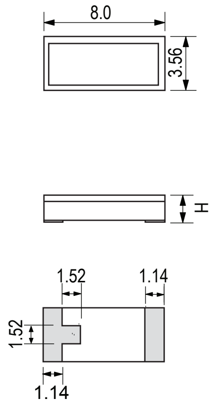
Terminations

- SM1 = Gold Plated (RoHS Compliant)
- SM2 =Solder Plated (non RoHS Compliant)
- SM3 = Solder Dipped (non RoHS Compliant)
- SM4 = Solder Plated (RoHS Compliant)
- SM5 = Solder Dipped ((RoHS Compliant)

Standard Frequency Tolerance

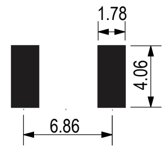
- ±100ppm

Oultine (mm) typ



Height (H) =	Glass Lid	Ceramic Lid
SM1	1.65	1.78
SM2	1.70	1.83
SM3	1.78	1.90
SM4	1.70	1.83
SM5	1.78	1.90

Solder Pad Layout



Standard Frequency Stabilities

- ±10ppm, ±20ppm, ±30ppm, ±50ppm, ±100ppm

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C
- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: 3000G, 0.3ms, 1/2 sine wave
- Vibration: MIL-STD-202G, Method 204D, Test Condition D: 20G (10Hz-2000Hz), swept sine wave

Packaging

- Tray pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Termination Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

Example

- 10.0MHz CX1 AT SM1
  100/50/–10 to 70C/20 FUND

Electrical Specifications - maximum limiting values

Example Frequencies	Frequency Tolerance @25°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Typical	Vibration Mode
			Minimum	Maximum		
10.0MHz	±100ppm	–10 to 70°C	±10ppm	±50ppm	30Ω	Fundamental AT cut
32.0MHz		–40 to 85°C	±20ppm	±100ppm	25Ω	
155.52MHz		–55 to125°C	±30ppm	±100ppm	15Ω	
Note: For other frequency / specification combinations, please contact our sales offices						

CX1 EXT CRYSTALS

ISSUE 1; 1 NOVEMBER 2010

Description

The CX1 EXT quartz crystals are leadless devices designed for surface mounting on printed circuit boards or hybrid substrates. They are hermetically sealed in a rugged, miniature ceramic package. The CX1 EXT crystal is manufactured using the Statek-developed photo-lithographic process, and was designed utilizing the experience acquired by producing millions of crystals for industrial, commercial, military and medical applications. Maximum process temperature should not exceed 260°C

Features

- Extensional mode
- Ideal for use with microprocessors
- Designed for low power applications
- Compatible with hybrid or PC board packaging
- Low ageing
- Full military testing available
- Ideal for battery operated applications

General Specifications

- Load Capacitance (C_L): 7pF standard
- Drive Level: 3µW max
- Ageing: ±5ppm max in 1st year
- Shunt Capacitance (C_0): 1.2pF typ
- Motional Capacitance (C_1): 2.5 typ
- Quality Factor (Q): 70000 min

Terminations

- SM1 = Gold Plated (RoHS Compliant)
- SM2 = Solder Plated (non RoHS Compliant)
- SM3 = Solder Dipped (non RoHS Compliant)
- SM4 = Solder Plated (RoHS Compliant)
- SM5 = Solder Dipped ((RoHS Compliant)

Standard Frequency Tolerances

- ±500ppm, ±1000ppm ±10000ppm

Operating Tempaerature Ranges

- –10 to 70°C
- –40 to 85°C
- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

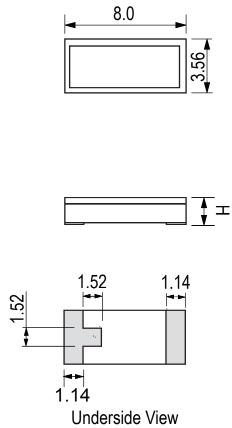
Environmental

- Shock: 750G, 0.3ms, 1/2 sine wave
- Vibration: 1.5mm amplitude, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

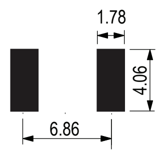
- Tray pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

Oultine (mm) typ



Height (H) =	Glass Lid	Ceramic Lid
SM1	1.65	1.78
SM2	1.70	1.83
SM3	1.78	1.90
SM4	1.70	1.83
SM5	1.78	1.90

Solder Pad Layout



Ordering Information (*minimum required)

- Frequency*
- Model*
- Termination Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 1.0MHz CX1 EXT SM1
  500/-/–10 to 70C/7 FUND

Electrical Specifications - maximum limiting values

Example Frequencies	Frequency Tolerance @25°C	Operating Temperature Range	Typical Frequency Stability Coeffeicient (ref 35°C)	ESR Typical	Vibration Mode
555.0kHz	±500ppm ±1000ppm ±10000ppm	–10 to 70°C –40 to 85°C –55 to 125°C	$-0.035/°C^2$	600Ω	Fundamental
614.0kHz				275Ω	
1.0MHz				500Ω	
1.4MHz				775Ω	
1.8432MHz				300Ω	Overtone
2.1MHz				475Ω	
Note: For other frequency / specification combinations, please contact our sales offices					

CYLINDER (WATCH) CRYSTALS

ISSUE 12; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Leaded crystal
- Suitable for real time clock applications
- Press sealed metal can
- Available in two sizes 3 x 8 and 2 x 6
- Please see our CFPX-56 for an SMD alternative
- Stock parts listed at the beginning of this chapter

General Specifications

- Standard Load Capacitances (C_L): 6pF and 12.5pF
- Drive Level: 1.0μW max
- Ageing ±5ppm max per year
- Shunt Capacitance (C_0): 1.6pF typ

Standard Frequency Tolerance

- ±20ppm

Operable Temperature Range

- –10 to 60°C

Storage Temperature Range

- –40 to 85°C

Environmental

- Drop: 75cm drop (3 times) onto hard wooden board

Packaging

- Loose in bulk pack, 100pcs per bag

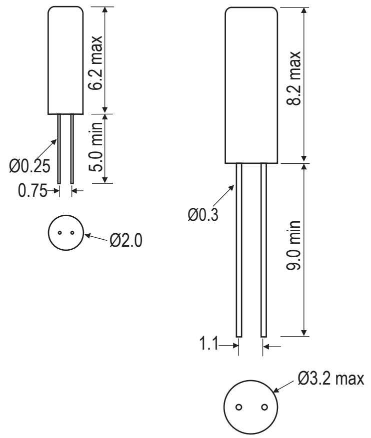
Ordering Information (*minimum required)

- Frequency*
- Model*
- Variant*
- Frequency Tolerance (@25°C)*
- Load Capacitance*

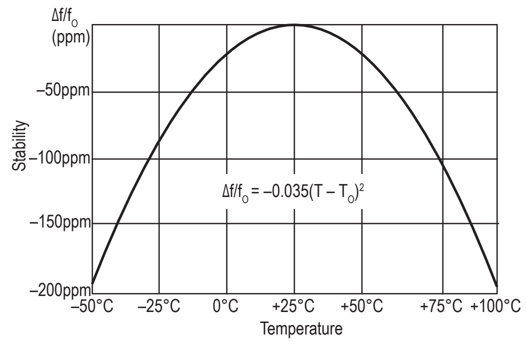
Example

- 32.768kHz WATCH-3x8
  20/-/-/12.5

Outline (mm)



Typical Frequency Stability Characteristics



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±5°C	Operable Temperature Range	Typical Frequency Stability Coefficient	ESR Max	Vibration Mode	Package Type
32.768kHz	±20ppm	–10 to 60°C	–0.035/°C2	50kΩ	Tuning Fork	2x6mm & 3x8mm

CYLINDER CRYSTALS

ISSUE 15; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Leaded crystal
- Press sealed metal can
- Package high dependent on frequency

General Specifications

- Load Capacitance (C_L): 16pF standard
- Drive Level: 100µW max
- Ageing ±5ppm max at 25°C ±3°C in 1st year
- Shunt Capacitance (C_0): 5pF typ

Standard Frequency Tolerance and Stability

- ±50ppm

Operating Temperature Range

- –20 to 70°C

Storage Temperature Range

- –55 to 125°C

Packaging

- Loose in bulk pack, 100pcs per bag

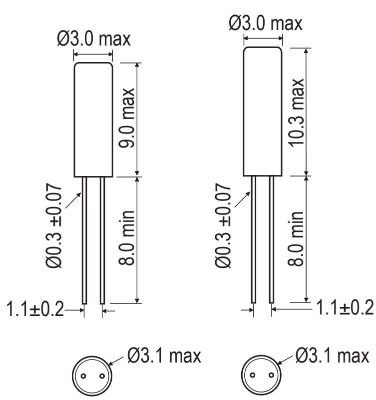
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz CYL(3x9)
  50/50/–20 to 70C/16 FUND

Outline (mm)



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature	ESR Max	Vibration Mode	Package Type
3.579545 to <4.0MHz	±50ppm	–20 to 70°C	±50ppm	200Ω	Fundamental AT	3x10mm
4.0 to <5.0MHz				150Ω		3x9mm
5.0 to <6.0MHz				120Ω		
6.0 to <7.0MHz				100Ω		
7.0 to <9.0MHz				80Ω		
9.0 to <15.0MHz				60Ω		
15.0 to <20.0MHz				50Ω		
20.0 to 36.0MHz				40Ω		
32.0 to 45.0MHz		–10 to 60°C	±100ppm	40Ω	Fundamental BT	
32.0 to 60.0MHz		–20 to 70°C	±50ppm	70Ω	3rd Overtone AT	

Note: For other frequency / specification combinations, please contact our sales offices

HC35 (TO5) CRYSTALS

ISSUE 14; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Industry standard T05 package
- Resistance welded, hermetically sealed in an inert atmosphere, glass to metal seals on leads

General Specifications

- Load Capacitance (C_L): 10pF to 75pF or Series
- Drive Level: 1.0mW max
- Ageing: ±3ppm typ per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±5ppm, ±10ppm, ±15ppm, ±20ppm, ±30ppm, ±50ppm, ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –30 to 80°C
- –40 to 85°C
- –55 to 105°C
- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-2000Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

Packaging

- Loose in bulk pack, 100pcs per bag

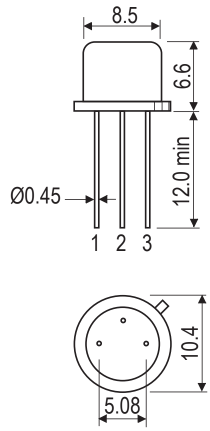
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

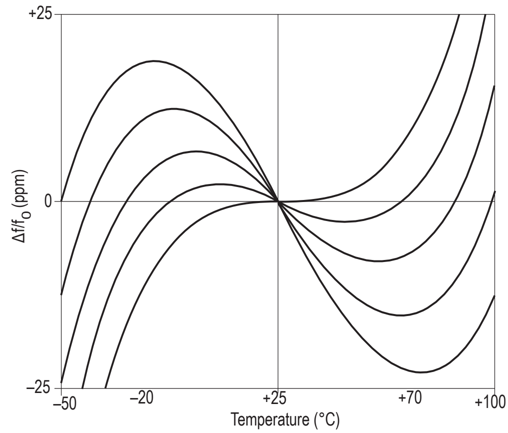
- 10.0MHz HC35
  50/50/–40 to 85C/10 FUND

Outline (mm)



Pin Connections
1. Crystal
2. Case & GND
3. Crystal

Typical Frequency vs Temperature Curves for various angles of AT-cut crystals



Electrical Specifications - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
6.0 to <8.0MHz	±5ppm to ±100ppm	0 to 50°C	±10ppm	±100ppm	60Ω	Fundamental AT cut
		–10 to 60°C	±15ppm			
		–20 to 70°C				
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
8.0 to <15.0MHz		0 to 50°C	±10ppm		30Ω	
		–10 to 60°C	±15ppm			
		–20 to 70°C				
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
15.0 to 30.0MHz		0 to 50°C	±10ppm		20Ω	
		–10 to 60°C	±15ppm			
		–20 to 70°C				
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
25.0 to 90.0MHz		0 to 50°C	±10ppm		40Ω	3rd Overtone AT cut
		–10 to 60°C	±15ppm			
		–20 to 70°C				
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
60.0 to 150.0MHz		0 to 50°C	±10ppm		60Ω	5th Overtone AT cut
		–10 to 60°C	±15ppm			
		–20 to 70°C				
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
125.0 to 175.0MHz		0 to 50°C	±10ppm		100Ω	7th Overtone AT cut
		–10 to 60°C	±15ppm			
		–20 to 70°C				
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
170.0 to 210.0MHz		0 to 50°C	±10ppm		200Ω	9th Overtone AT cut
		–10 to 60°C	±15ppm			
		–20 to 70°C				
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
Note: For other frequency / specification combinations, please contact our sales offices						

HC49 CRYSTALS

ISSUE 15; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Industry standard leaded package
- Resistance welded, hermetically sealed in an inert atmosphere, glass to metal seals on leads
- Variants available include but are not limited to:-
  3L = a centre mounted third leg grounds the can
  T = a truncated height of 11.1mm
  Gull-Wing = SMD version see outline drawing
- Please contact our sales offices for more options
- Stock parts listed at the beginning of this chapter

General Specifications

- Load Capacitance (C_L): 10pF to 75pF or Series
- Drive Level: 1mW max
- Ageing: ±3ppm typ per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±5ppm, ±10ppm, ±15ppm, ±20ppm, ±30ppm, ±50ppm, ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –30 to 80°C
- –40 to 85°C
- –55 to 105°C
- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

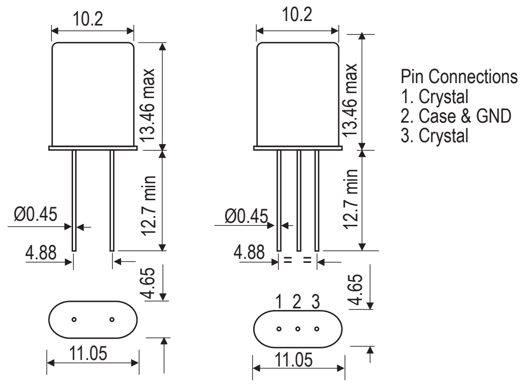
Environmental

- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-500Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

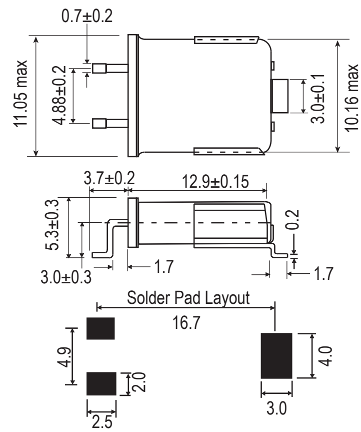
Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-468-C, 1kpcs per reel (please see pages 372 & 373)
- Gull-Wing Surface Mount - Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

Outline (mm) - HC49 & HC49-3L



Outline (mm) - HC49 Gull-Wing



Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz HC49
  50/50/–40 to 85C/10 FUND

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
1.84320 to <2.0MHz	±5ppm to ±100ppm	0 to 50°C	±15ppm	±200ppm	800Ω	Fundamental AT cut
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C	±100ppm			
2.0 to <3.0MHz		0 to 50°C	±15ppm		600Ω	
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C	±100ppm			
3.0 to <4.0MHz		0 to 50°C	±15ppm		150Ω	
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C	±100ppm			
4.0 to <7.0MHz		0 to 50°C	±15ppm	±100ppm	100Ω	
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C	±100ppm			
7.0 to <10.0MHz		0 to 50°C	±15ppm		50Ω	
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C	±100ppm			

Note: For other frequency / specification combinations, please contact our sales offices

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	**Maximum**		
10.0 to 36.0MHz	±5ppm to ±100ppm	0 to 50°C	±15ppm	±100ppm	35Ω	Fundamental AT cut
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C	±100ppm			
20.0 to 45.0MHz	Inclusive with Frequency Stability	0 to 50°C	±50ppm		35Ω	Fundamental BT cut
		-10 to 60°C				
		-20 to 70°C	±100ppm			
		-30 to 80°C				
21.0 to 90.0MHz	±5ppm to ±100ppm	0 to 50°C	±15ppm		40Ω	3rd Overtone AT cut
		-10 to 60°C	±20ppm			
		-20 to 70°C				
		-30 to 80°C	±25ppm			
		-40 to 85°C	±30ppm			
		-55 to 105°C	±50ppm			
		-55 to 125°C	±100ppm			
45.0 to 135.0MHz	Inclusive with Frequency Stability	0 to 50°C	±50ppm		35Ω	3rd Overtone BT cut
		-10 to 60°C				
		-20 to 70°C	±100ppm			
		-30 to 80°C				
60.0 to 150.0MHz	±5ppm to ±100ppm	0 to 50°C	±10ppm		70Ω	5th Overtone AT cut
		-10 to 60°C	±15ppm			
		-20 to 70°C				
		-30 to 80°C	±20ppm			
		-40 to 85°C	±25ppm			
		-55 to 105°C	±50ppm			
		-55 to 125°C				
90.0 to 225.0MHz	Inclusive with Frequency Stability	0 to 50°C	±50ppm			5th Overtone BT cut
		-10 to 60°C				
		-20 to 70°C	±100ppm			
		-30 to 80°C				
Note: For other frequency / specification combinations, please contact our sales offices						

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
85.0 to 210.0MHz	±5ppm to ±100ppm	0 to 50°C	±5ppm	±100ppm	100Ω	7th Overtone AT cut
		-10 to 60°C				
		-20 to 70°C	±10ppm			
		-30 to 80°C	±20ppm			
		-40 to 85°C	±25ppm			
		-55 to 105°C	±50ppm			
		-55 to 125°C				
125.0 to 300.0MHz	Inclusive with Frequency Stability	0 to 50°C	±50ppm			7th Overtone BT cut
		-10 to 60°C				
		-20 to 70°C	±100ppm			
		-30 to 80°C				
110.0 to 270.0MHz	±5ppm to ±100ppm	0 to 50°C	±5ppm		150Ω	9th Overtone AT cut
		-10 to 60°C				
		-20 to 70°C	±10ppm			
		-30 to 80°C	±20ppm			
		-40 to 85°C	±25ppm			
		-55 to 105°C	±50ppm			
		-55 to 125°C				

Note: For other frequency / specification combinations, please contact our sales offices

HC49/4H CRYSTALS

QUARTZ CRYSTALS

ISSUE 15; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Industry standard leaded package
- Resistance welded, hermetically sealed in an inert atmosphere, glass to metal seals on leads
- Variants available include but are not limited to:-
  3L = a centre mounted third leg grounds the can
- Low profile versions available please contact our sales offices for details
- Please see our HC49/4HSMX for a SMD standard stock alternative
- Stock parts listed at the beginning of this chapter

General Specifications

- Load Capacitance (C_L): 10pF to 75pF or Series
- Drive Level: 500µW max
- Ageing: ±5ppm typ per year at 25°C, ±1ppm available on request
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±10ppm, ±20ppm, ±30ppm, ±50ppm, ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –30 to 80°C
- –40 to 85°C
- –55 to 105°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-500Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-468-C, 1kpcs per reel (please see pages 372 & 373)

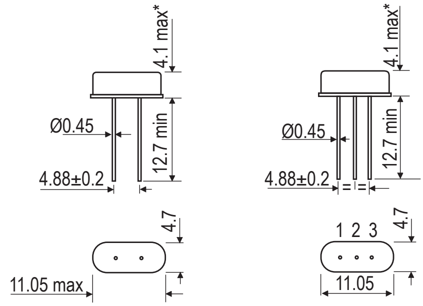
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz HC49/4H
  50/50/–40 to 85C/10 FUND

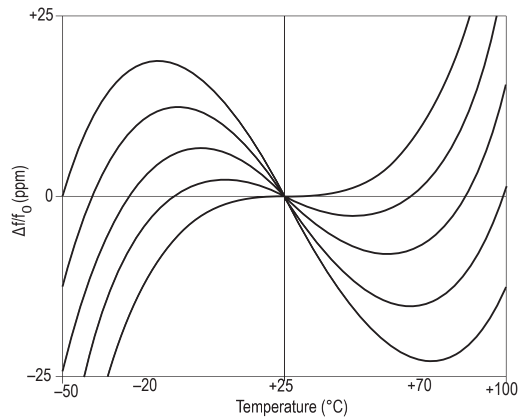
Outline (mm) - HC49/4H & HC49/4H-3L



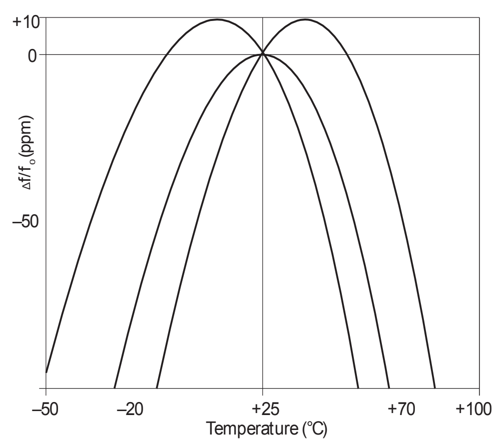
* Lower Profile Options
HC49/3.5H 3.7mm max
HC49/3H 3.1mm max
HC49/2.5H 2.7mm max

Pin connections
1. Crystal
2. Case & GND
3. Crystal

Typical Frequency vs Temperature Curves for various angles of AT-cut crystals



Typical Frequency vs Temperature Curves for various angles of BT-cut crystals



Electrical Specifications - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
3.2 to <4.0MHz	±10ppm to ±100ppm	0 to 50°C	±15ppm	±100ppm	300Ω	Fundamental AT cut
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
4.0 to <5.5MHz		0 to 50°C	±15ppm	±100ppm	130Ω	
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
5.5 to <8.0MHz		0 to 50°C	±15ppm	±100ppm	60Ω	
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
8.0 to 40.0MHz		0 to 50°C	±15ppm	±100ppm	40Ω	
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
27.0 to 50.0MHz	Inclusive with Frequency Stability	0 to 50°C	±50ppm	±100ppm	40Ω	Fundamental BT cut
		–10 to 60°C	±70ppm			
		–20 to70°C	±100ppm			
26.0 to 100.0MHz	±10ppm to 100ppm	0 to 50°C	±15ppm	±100ppm	100Ω	3rd Overtone AT cut
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		

Note: For other frequency / specification combinations, please contact our sales offices

HC49/4HSMX CRYSTALS

ISSUE 17; 1 NOVEMBER 2010 – RoHS 2002/95/EC

Description

- Industry standard low cost SMD crystal
- SMD version of the HC49/4H
- Resistance welded, hermetically sealed in an inert atmosphere, glass to metal seals on leads. Lead wires are mounted onto a plastic former to create a gull wing mount
- Low profile versions available please contact our sales offices for details
- Stock parts listed at the beginning of this chapter

General Specifications

- Load Capacitance (C_L): 10pF to 75pF or Series
- Drive Level: 500µW max
- Ageing: ±5ppm typ per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±30ppm, ±50ppm, ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –30 to 80°C
- –40 to 85°C
- –55 to 105°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-500Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

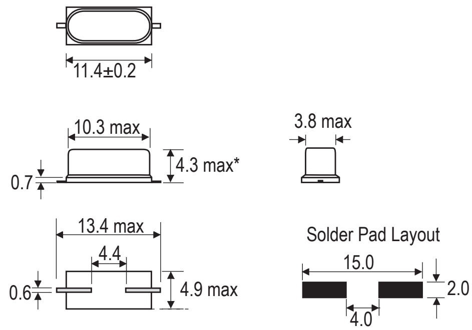
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.00MHz HC49/4HSMX
  50/50/–40 to 85C/10 FUND

Outline (mm)



* Lower Profile Options
HC49/3.5H 3.7mm max
HC49/3H 3.1mm max
HC49/2.5H 2.7mm max

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
3.2 to <4.0MHz	±10ppm to ±100ppm	0 to 50°C	±15ppm	±100ppm	300Ω	Fundamental AT cut
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
4.0 to <5.5MHz		0 to 50°C	±15ppm	±100ppm	130Ω	
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
5.5 to <8.0MHz		0 to 50°C	±15ppm	±100ppm	60Ω	
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
8.0 to <40.0MHz		0 to 50°C	±15ppm	±100ppm	40Ω	
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		
27.0 to 50.0MHz	Inclusive with Frequency Stability	0 to 50°C	±50ppm	±100ppm		Fundamental BT cut
		–10 to 60°C	±70ppm			
		–20 to70°C	±100ppm			
26.0 to 100.0MHz	±10ppm to 100ppm	0 to 50°C	±15ppm	±100ppm	100Ω	3rd Overtone AT cut
		–10 to 60°C	±20ppm			
		–20 to70°C				
		–30 to 80°C	±25ppm			
		–40 to 85°C	±30ppm			
		–55 to 105°C	±100ppm	±500ppm		

Note: For other frequency / specification combinations, please contact our sales offices

IQXC-25 CRYSTALS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- 2 x 1.2mm SMD crystal
- Suitable for real time clock applications
- Ceramic package with a seam sealed metal lid, hermetically sealed

General Specifications

- Load Capacitance (CL): 9pF and 12.5pF
- Drive Level: 500nW max
- Ageing: ±3ppm max per year at 25°C
- Motional Capacitance (C1): 7fF typ

Standard Frequency Tolerance

- ±20ppm

Operable Temperature Range

- –40 to 85°C

Storage Temperature Range

- –40 to 85°C

Environmental

- Shock: IEC 60068-2-27: 1000G, 1ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6: 1.5mm amplitude, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane (total 6hrs)

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 3kpcs per reel (please see pages 372 & 373)

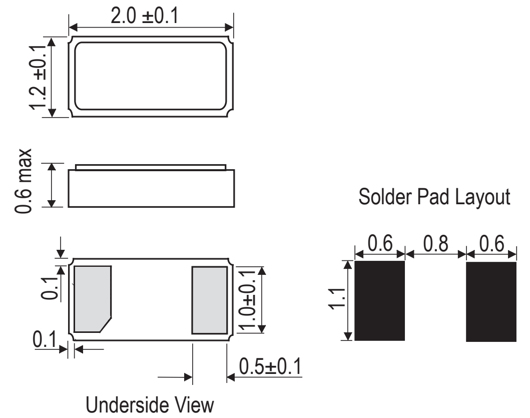
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Load Capacitance*

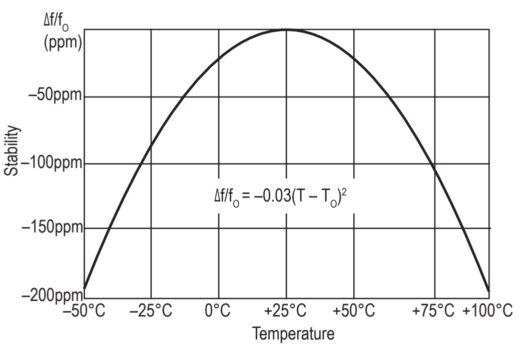
Example

- 32.768kHz IQXC-25 20/-/-/12.5

Outline (mm)



Typical Frequency Stability Characteristics



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @ 25°C ±5°C	Operable Temperature Range	Frequency Stability Coefficient	ESR Max	Vibration Mode
32.768kHz	±20ppm	–40 to 85°C	-0.03/°C2	90kΩ	Tuning Fork

NOTES

IQXC-26 CRYSTALS

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 1.6 x 1.2mm crystal
- Ceramic package with a seam sealed metal lid, hermetically sealed

General Specifications

- Load Capacitance (CL): 16pF standard
- Drive Level: 100µW max
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (Co): 7pF max

Standard Frequency Tolerances and Stabilities

- ±10ppm to ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –40 to 85°C

Environmental

- Shock: IEC 60068-2-27: 1000G, 1ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6: 1.5mm amplitude, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane (total 6hrs)

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

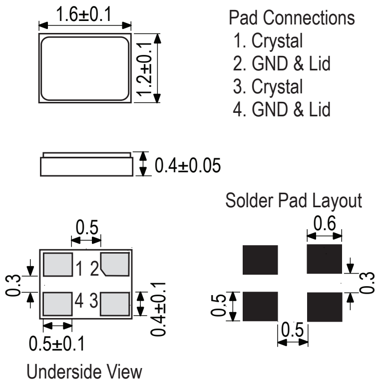
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

Example

- 30.0MHz IQXC-26
  50/50/–40 to 85C/16 FUND

Outline (mm)



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @ 25°C	Operating Temperature Ranges	Frequency Stability Available Over Operating Temperature Range		ESR*	Vibration Mode
			Minimum	Maximum		
26.0 to 30.0MHz	±10ppm to ±100ppm	0 to 50°C	±10ppm	±100ppm	200Ω	Fundamental AT cut
		–10 to 60°C	±15ppm			
		–20 to 70°C	±20ppm			
		–40 to 85°C	±30ppm			
>30.0 to 80.0MHz		0 to 50°C	±10ppm		100Ω	
		–10 to 60°C	±15ppm			
		–20 to 70°C	±20ppm			
		–40 to 85°C	±30ppm			
Note: For other frequency / specification combinations, please contact our sales offices						
*ESR values for reference only. The final spec shall be confirmed for each frequency after sample production						

IQXC-30 CRYSTALS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- 7 x 5mm SMD crystal
- Available in a 2 or 4 pad package
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Suitable for Industrial applications qualified to AEC-Q200
- Please see our 12SMX for standard stock alternative

General Specifications

- Load Capacitance (C_L): 8pF standard
- Drive Level: 50µW standard
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances

- ±10ppm to ±50ppm

Standard Frequency Stabilities

- ±15ppm to ±100ppm

Operating Temperature Ranges

- –40 to 85°C
- –20 to 125°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

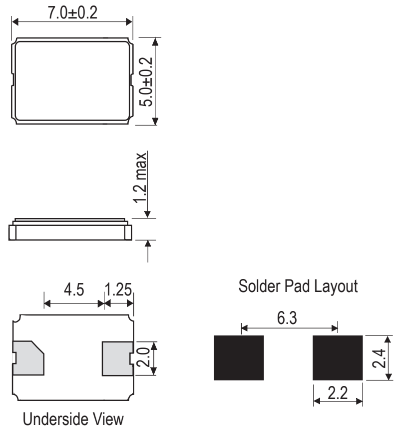
Ordering Information (*minimum required)

- Frequency*
- Model*
- Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

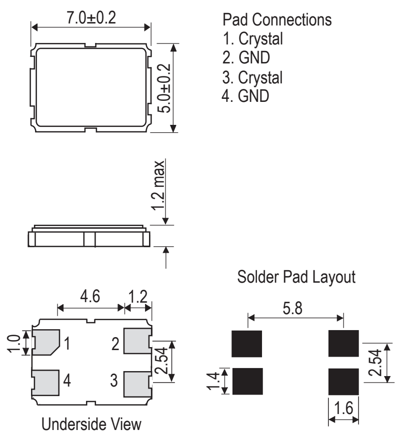
Example

- 10.0MHz IQXC-30-B
  50/50/–40 to 85C/8 FUND

Outline (mm) IQXC-30-A



Outline (mm) IQXC-30-B



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
6.0 to 8.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	150Ω	Fundamental AT cut
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
>8.0 to 9.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	100Ω	
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
>9.0 to 11.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	60Ω	
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
>11.0 to 40.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	40Ω	
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
26.0 to 80.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	100Ω	3rd Overtone AT cut
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
Note: For other frequency / specification combinations, please contact our sales offices						

IQXC-31 CRYSTALS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- 5 x 3.2mm SMD crystal
- Available in a 2 or 4 pad package
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Suitable for Industrial applications qualified to AEC-Q200
- Please see our CFPX-104 for standard stock alternative

General Specifications

- Load Capacitance (C_L): 8pF standard
- Drive Level: 50µW standard
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances

- ±10ppm to ±50ppm

Standard Frequency Stabilities

- ±15ppm to ±100ppm

Operating Temperature Ranges

- –40 to 85°C
- –20 to 125°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

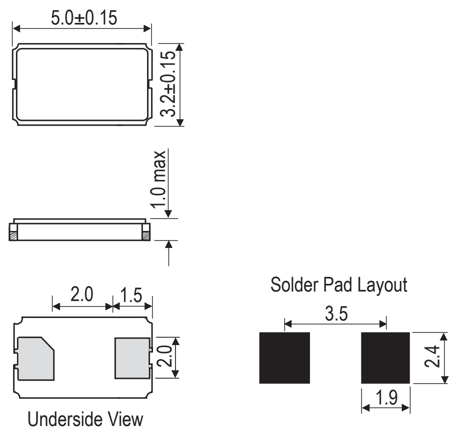
Ordering Information (*minimum required)

- Frequency*
- Model*
- Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

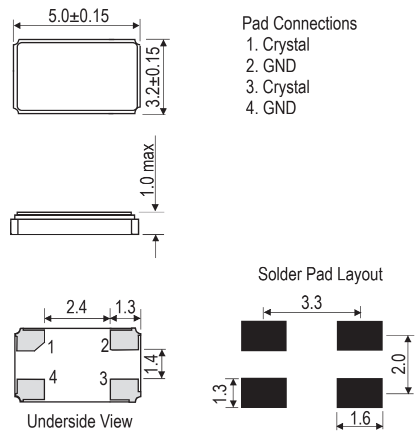
Example

- 20.0MHz IQXC-31-B
  30/50/–40 to 85C/8 FUND

Outline (mm) IQXC-31-A



Outline (mm) IQXC-31-B



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
12.0 to <20.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	150Ω	Fundamental AT cut
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
20.0 to 32.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	100Ω	
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
Note: For other frequency / specification combinations, please contact our sales offices						

IQXC-32 CRYSTALS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- 3.2 x 2.5mm SMD crystal
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Suitable for Industrial applications qualified to AEC-Q200
- Please see our CFPX-180 for standard stock alternative

General Specifications

- Load Capacitance (C_L): 8pF standard
- Drive Level: 50µW standard
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances

- ±10ppm to ±50ppm

Standard Frequency Stabilities

- ±15ppm to ±100ppm

Operating Temperature Ranges

- –40 to 85°C
- –20 to 125°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

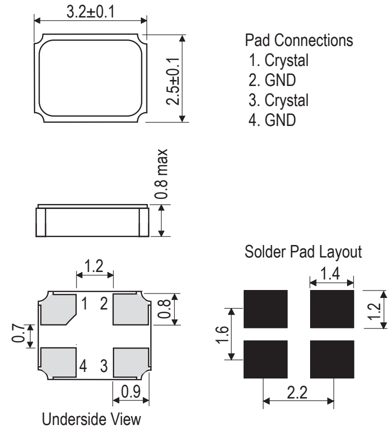
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

Example

- 20.00MHz IQXC-32-B
  30/50/–40 to 85C/8 FUND

Outline (mm) IQXC-32-B



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
16.0 to 26.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	100Ω	Fundamental AT Cut
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
>26.0 to 32.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	50Ω	
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
Note: For other frequency / specification combinations, please contact our sales offices						

IQXC-33 CRYSTALS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Industry standard package SMD crystal
- Resistance welded, hermetically sealed in an inert atmosphere, glass to metal seals on leads. Lead wires are mounted onto a plastic former to create a gull wing mount
- Suitable for Industrial applications qualified to AEC-Q200
- Please see our HC49/4HSMX for standard stock alternative

General Specifications

- Load Capacitance (C_L): 16pF standard
- Drive Level: 50µW standard
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances

- ±10ppm to ±50ppm

Standard Frequency Stabilities

- ±15ppm to ±100ppm

Operating Temperature Ranges

- –40 to 85°C
- –20 to 125°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

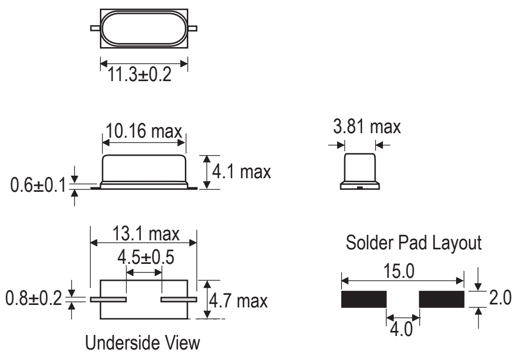
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz IQXC-33
  30/50/–40 to 85C/16 FUND

Outline (mm)



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
3.01 to 4.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	300Ω	Fundamental AT cut
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
>4.0 to 5.5MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	130Ω	
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
>5.5 to 8.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	80Ω	
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
>8.0 to 40.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	50Ω	
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
26.0 to 100.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	100Ω	3rd Overtone AT cut
	±20ppm to ±50ppm	–20 to 125°C	±50ppm	±100ppm		
Note: For other frequency / specification combinations, please contact our sales offices						

IQXC-42 CRYSTALS

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 2 x 1.6mm SMD crystal
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Please see our CFPX-188 for a low profile 2 x 1.6mm crystal

General Specifications

- Load Capacitance (CL): 8pF to 30pF or Series
- Drive Level: 100µW max
- Ageing: ±3ppm max per year at 25°C
- Shunt Capacitance (Co): 3pF max

Standard Frequency Tolerances and Stabilities

- ±10ppm to ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: IEC 60068-2-27: 1000G, 1ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6: 1.5mm amplitude, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane (total 6hrs)

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

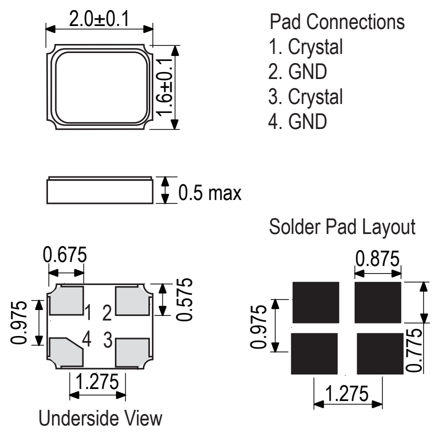
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 30.0MHz IQXC-42
  30/50/–40 to 85C/16 FUND

Outline (mm)



QUARTZ CRYSTALS

Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @ 25°C	Operating Temperature Ranges	Frequency Stability Available Over Operating Temperature Range		ESR*	Vibration Mode
			Minimum	Maximum		
20.0 to <24.0MHz	±10ppm to ±100ppm	0 to 50°C	±10ppm	±100ppm	120Ω	Fundamental AT Cut
		–10 to 60°C	±15ppm			
		–20 to 70°C	±20ppm			
		–40 to 85°C	±30ppm			
24.0 to <30.0MHz		0 to 50°C	±10ppm		100Ω	
		–10 to 60°C	±15ppm			
		–20 to 70°C	±20ppm			
		–40 to 85°C	±30ppm			
30.0 to <38.0MHz		0 to 50°C	±10ppm		80Ω	
		–10 to 60°C	±15ppm			
		–20 to 70°C	±20ppm			
		–40 to 85°C	±30ppm			
38.0 to 50.0MHz		0 to 50°C	±10ppm		60Ω	
		–10 to 60°C	±15ppm			
		–20 to 70°C	±20ppm			
		–40 to 85°C	±30ppm			
Note: For other frequency / specification combinations, please contact our sales offices						
*ESR values for reference only. The final spec shall be confirmed for each frequency after sample production						

UM1 CRYSTALS

ISSUE 13; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Industry standard leaded package
- Resistance welded, hermetically sealed in an inert atmosphere, glass to metal seals on leads
- Variants available include but are not limited to:-
  3L = a centre mounted third leg grounds the can
  Gull-Wing = SMD version see outline drawing
- Please contact our sales offices for more options
- HC45 package is not dimensionally identical to the UM1 but for most applications the two packages are interchangeable
- For UM4 and UM5 package type please contact the sales offices

General Specifications

- Load Capacitance (C_L): 10pF to 75pF or Series
- Drive Level: 1mW max
- Ageing: ±3ppm typical per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances and Stabilities

- ±5ppm, ±10ppm, ±15ppm, ±20ppm, ±30ppm, ±50ppm, ±100ppm

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –30 to 80°C
- –40 to 85°C
- –55 to 105°C
- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

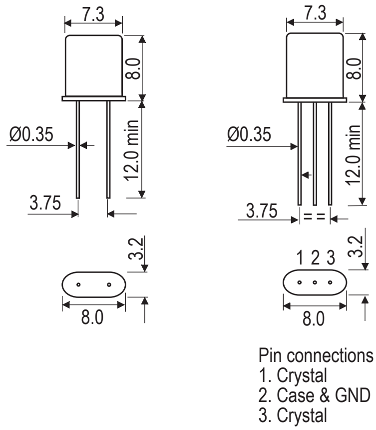
Environmental

- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-2000Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

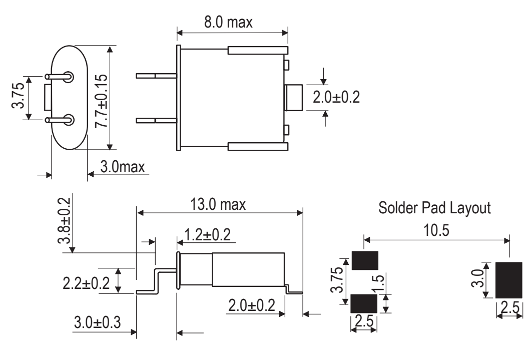
Packaging

- Loose in bulk pack, 100pcs per bag
- Tape & reel in accordance with EIA-468-C, 1kpcs per reel (please see pages 372 & 373)
- Gull-Wing Surface Mount - Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see pages 372 & 373)

Outline (mm) - UM1 & UM1-3L



Outline (mm) - UM1 Gull-Wing



Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.0MHz UM1
  50/50/–40 to 85C/10 FUND

QUARTZ CRYSTALS

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
6.0 to <10.0MHz	±5ppm to ±100ppm	0 to 50°C	±10ppm	±100ppm	80Ω	Fundamental AT cut
		–10 to 60°C	±15ppm			
		–20 to70°C				
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
10.0 to <15.0MHz		0 to 50°C	±10ppm		60Ω	
		–10 to 60°C	±15ppm			
		–20 to70°C				
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
15.0 to 30.0MHz		0 to 50°C	±5ppm		30Ω	
		–10 to 60°C				
		–20 to70°C	±10ppm			
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
25.0 to 90.0MHz		0 to 50°C	±5ppm		45Ω	3rd Overtone AT cut
		–10 to 60°C				
		–20 to70°C	±10ppm			
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
60.0 to 150.0MHz		0 to 50°C	±5ppm		100Ω	5th Overtone AT cut
		–10 to 60°C				
		–20 to70°C	±10ppm			
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
125.0 to 175.0MHz		0 to 50°C	±5ppm		200Ω	7th Overtone AT cut
		–10 to 60°C				
		–20 to70°C	±10ppm			
		–30 to 80°C	±20ppm			
		–40 to 85°C	±25ppm			
		–55 to 105°C	±50ppm			
		–55 to 125°C				
Note: For other frequency / specification combinations, please contact our sales offices						

NOTES

CLOCK OSCILLATORS - SELECTION TABLE

Model Number	Supply Voltage	Output Compatibility	Package (mm)	Frequency Range	Frequency Stability (Tightest*)	Operating Temperature Range (Widest*)	Stock Items	Page
Specifying Clock Oscillators								108
Stock Clock Oscillators								109
Surface Mount Models								
CXOQ	1.8V	CMOS/TTL	2.5 x 2	400kHz to 100MHz	±50ppm	–55 to 125°C		144
CXOQHG	1.8V	CMOS/TTL	2.5 x 2	400K 100M	±50ppm	–55 to 125°C		**
HGXO	1.8V	CMOS	7.5 x 5	460kHz to 50MHz	±10ppm	–55 to 125°C		**
CXOX	1.8V	CMOS/TTL	3.2 x 2.5	1 to 160MHz	±50ppm	–55 to 125°C		146
CXOXHGHT	1.8V	CMOS/TTL	3.2 x 2.5	1 to 160MHz	±50ppm	–55 to 125°C		**
HFXO	1.8V	CMOS/TTL	6.5 x 5	218.75kHz to 200MHz	±10ppm	–55 to 125°C		148
IQXO-642	1.8V	CMOS	1.6 x 1.2	1 to 80MHz	±30ppm	–40 to 85°C		176
IQXO-542	1.8V	CMOS	2 x 1.6	1 to 80MHz	±30ppm	–40 to 85°C		170
CFPS-53	1.8V	CMOS	2.5 x 2	0.75 to 50MHz	±30ppm	–40 to 85°C		122
CFPS-107	1.8V	CMOS	2.5 x 2	32.768kHz	±20ppm	–40 to 85°C	✓	130
CFPS-112	1.8V	CMOS	2.5 x 2	26 to 44MHz	±30ppm	–40 to 85°C		132
CFPS-41	1.8V	CMOS	3.2 x 2.5	2 to 50MHz	±25ppm	–40 to 85°C		120
CFPS-102	1.8V	CMOS	3.2 x2.5	32.768kHz	±20ppm	–40 to 85°C		128
CFPS-31	1.8V	CMOS	7 x 5	0.5 to 156MHz	±25ppm	–40 to 85°C		114
CXO	1.8V	CMOS/TTL	10 x 4.5	300kHz to 170MHz	±50ppm	–55 to 125°C		**
HGXO	2.5V	CMOS	7.5 x 5	460kHz to 50MHz	±10ppm	–55 to 125°C		**
IQXO-641	2.5V	CMOS	1.6 x 1.2	1 to 80MHz	±30ppm	–40 to 85°C		176
IQXO-541	2.5V	CMOS	2 x 1.6	1 to 80MHz	±30ppm	–40 to 85°C		170
CFPS-54	2.5V	CMOS	2.5 x 2	0.75 to 50MHz	±30ppm	–40 to 85°C		122
CFPS-108	2.5V	CMOS	2.5 x 2	32.768kHz	±20ppm	–40 to 85°C	✓	130
CFPS-113	2.5V	CMOS	2.5 x 2	26 to 44MHz	±30ppm	–40 to 85°C		132
CFPS-40	2.5V	CMOS	3.2 x 2.5	2 to 50MHz	±25ppm	–40 to 85°C		120
CFPS-103	2.5V	CMOS	3.2 x 2.5	32.768kHz	±20ppm	–40 to 85°C		128
CFPS-37	2.5V	CMOS	5 x 3.2	1.8 to 125MHz	±25ppm	–40 to 85°C		118
CFPS-67	2.5V	CMOS	5 x 3.2	1.8 to 50MHz	±25ppm	–40 to 85°C		124
IQXS-11	2.5V	CMOS	5 x 3.2	1 to 166MHz	±25ppm	–40 to 85°C		186
CFPS-32	2.5V	CMOS	7 x 5	0.5 to 156MHz	±25ppm	–40 to 85°C	✓	114
IQXS-31	2.5V	CMOS	7 x 5	1 to 166MHz	±25ppm	–40 to 85°C		188
CXOQ	2.5V	CMOS/TTL	2.5 x 2	400kHz to 100MHz	±50ppm	–55 to 125°C		144
CXOQHG	2.5V	CMOS/TTL	2.5 x 2	400K 100M	±50ppm	–55 to 125°C		**
CXOXHGHT	2.5V	CMOS/TTL	3.2 x 2.5	1 to 160MHz	±50ppm	–55 to 125°C		**
CXO	2.5V	CMOS/TTL	10 x 4.5	300kHz to 170MHz	±50ppm	–55 to 125°C		**
IQXO-661	2.5V	LVDS	7 x 5	15 to 160MHz	±25ppm	–40 to 85°C		178
IQXO-621	2.5V	LVPECL	7 x 5	15 to 160MHz	±25ppm	–40 to 85°C		172
CFPS-68	2.8V	CMOS	5 x 3.2	1.8 to 50MHz	±25ppm	–40 to 85°C		124
CFPS-55	3.0V	CMOS	2.5 x 2	0.75 to 50MHz	±30ppm	–40 to 85°C		122
CFPS-114	3.0V	CMOS	2.5 x 2	26 to 44MHz	±30ppm	–40 to 85°C		132
HGXO	3.0V	CMOS	7.5 x 5	460kHz to 50MHz	±10ppm	–55 to 125°C		**
CXOQ	3.0V	CMOS/TTL	2.5 x 2	400kHz to 100MHz	±50ppm	–55 to 125°C		144
CXOQHG	3.0V	CMOS/TTL	2.5 x 2	400K 100M	±50ppm	–55 to 125°C		**
CXOXHGHT	3.0V	CMOS/TTL	3.2 x 2.5	1 to 160MHz	±50ppm	–55 to 125°C		**
HFXO	3.0V	CMOS/TTL	6.5 x 5	218.75kHz to 200MHz	±10ppm	–55 to 125°C		148

Model Number	Supply Voltage	Output Compatibility	Package (mm)	Frequency Range	Frequency Stability (Tightest*)	Operating Temperature Range (Widest*)	Stock Items	Page
IQXO-640	3.3V	CMOS	1.6 x 1.2	1 to 80MHz	±30ppm	–40 to 85°C		176
IQXO-540	3.3V	CMOS	2 x 1.6	1 to 80MHz	±30ppm	–40 to 85°C		170
CFPS-56	3.3V	CMOS	2.5 x 2	0.75 to 50MHz	±30ppm	–40 to 85°C		122
CFPS-109	3.3V	CMOS	2.5 x 2	32.768kHz	±20ppm	–40 to 85°C	✓	130
CFPS-115	3.3V	CMOS	2.5 x 2	26 to 44MHz	±30ppm	–40 to 85°C		132
CFPS-39	3.3V	CMOS	3.2 x 2.5	2 to 50MHz	±25ppm	–40 to 85°C	✓	120
CFPS-104	3.3V	CMOS	3.2 x2.5	32.768kHz	±20ppm	–40 to 85°C		128
CFPS-69	3.3V	CMOS	5 x 3.2	1.8 to 50MHz	±25ppm	–40 to 85°C	✓	124
IQXS-10	3.3V	CMOS	5 x 3.2	1 to 200MHz	±25ppm	–40 to 85°C		186
CXO3M	3.3V	CMOS	6.5 x 5	200kHz to 220MHz	±50ppm	–55 to 125°C		138
CXO3M(W)	3.3V	CMOS	6.5 x 5	32.768kHz	±10ppm	–55 to 125°C		140
HGXO	3.3V	CMOS	7.5 x 5	460kHz to 50MHz	±10ppm	–55 to 125°C		**
IQXS-30	3.3V	CMOS	7 x 5	1 to 200MHz	±25ppm	–40 to 85°C		188
CXOQ	3.3V	CMOS/TTL	2.5 x 2	400kHz to 100MHz	±50ppm	–55 to 125°C		144
CXOQHG	3.3V	CMOS/TTL	2.5 x 2	400K 100M	±50ppm	–55 to 125°C		**
CXOXHGHT	3.3V	CMOS/TTL	3.2 x 2.5	1 to 160MHz	±50ppm	–55 to 125°C		**
CXOX	3.3V	CMOS/TTL	3.2 x 2.5	1 to 160MHz	±50ppm	–55 to 125°C		146
CXO3MHG	3.3V	CMOS/TTL	6.5 x 5	200kHz to 220MHz	±50ppm	–55 to 125°C		**
HFXO	3.3V	CMOS/TTL	6.5 x 5	218.75kHz to 200MHz	±10ppm	–55 to 125°C		148
LFXO	3.3V	CMOS/TTL	6.5 x 5	32.768kHz	±10ppm	–55 to 125°C		190
CXO	3.3V	CMOS/TTL	10 x 4.5	300kHz to 170MHz	±50ppm	–55 to 125°C		**
IQXO-10	3.3V	HCMOS	14.4 x 9.5	2 to 800MHz	±10ppm	–40 to 85°C		150
IQXO-730	3.3V	HCMOS	14 x 9.8	1 to 70MHz	±50ppm	–40 to 85°C		184
IQXO-731	3.3V	HCMOS	14 x 9.8	1 to 70MHz	±50ppm	–40 to 85°C		184
CFPS-9	3.3V	HCMOS	5 x 3.2	0.5 to 160MHz	±25ppm	–40 to 85°C	✓	112
IQXO-63	3.3V	HCMOS	6 x 3.5	1.8 to 50MHz	±50ppm	–40 to 85°C		156
CFPS-74	3.3V	HCMOS	7 x 5	Spot Frequencies	±20ppm 15yr	0 to 70°C		126
CFPS-73	3.3V	HCMOS/TTL	7 x 5	0.5 to 156MHz	±20ppm	–40 to 85°C	✓	114
IQXO-660	3.3V	LVDS	7 x 5	15 to 160MHz	±25ppm	–40 to 85°C		178
IQXO-710	3.3V	LVDS	7 x 5	160 to 622.08MHz	±25ppm	–40 to 85°C		182
CFPS-34	3.3V	LVPECL	7 x 5	40 to 270MHz	±25ppm	–40 to 85°C	✓	116
IQXO-620	3.3V	LVPECL	7 x 5	15 to 160MHz	±25ppm	–40 to 85°C		172
IQXO-690	3.3V	LVPECL	7 x 5	160 to 622.08MHz	±25ppm	–40 to 85°C		180
IQXO-10	3.3V	LVPECL	14.4 x 9.5	2 to 800MHz	±10ppm	–40 to 85°C		150
DQXO3SM	3.3V	CMOS	10 x 10	1Hz to 10kHz	±150ppm	–55 to 125°C		**
SQXO2AT	3.3V	CMOS	10 x 10	312kHz to 120MHz	±5ppm	–55 to 125°C		**
LSM	3.3V	CMOS	10 x 4.5	30 to 200kHz	±25ppm	–55 to 125°C		**
LSC	3.3V	CMOS	10 x 4.5	32.768kHz	±25ppm	–40 to 85°C		**
CXOXHT	3.3V	CMOS/TTL	3.2 x 2.5	1 to 50MHz	±100ppm	–25 to 225°C		**
CXOMHT	3.3V	CMOS/TTL	6.5 x 5	300kHz to 50MHz	±100ppm	–25 to 225°C		**
CXOHT	3.3V	CMOS/TTL	10 x 4.5	300kHz to 50MHz	±100ppm	–25 to 225°C		**
CXOM	5.0V	CMOS	6.5 x 5	300kHz to 120MHz	±50ppm	–55 to 125°C		142
HGXO	5.0V	CMOS	7.5 x 5	460kHz to 50MHz	±10ppm	–55 to 125°C		**
DQXO3SM	5.0V	CMOS	10 x 10	1Hz to 10kHz	±150ppm	–55 to 125°C		**
SQXO2AT	5.0V	CMOS	10 x 10	312kHz to 120MHz	±5ppm	–55 to 125°C		**
LSM	5.0V	CMOS	10 x 4.5	30 to 200kHz	±25ppm	–55 to 125°C		**
LSC	5.0V	CMOS	10 x 4.5	32.768kHz	±25ppm	–40 to 85°C		**
CXOX	5.0V	CMOS/TTL	3.2 x 2.5	1 to 160MHz	±50ppm	–55 to 125°C		146
CXOXHT	5.0V	CMOS/TTL	3.2 x 2.5	1 to 50MHz	±100ppm	–25 to 225°C		**
CXOXHGHT	5.0V	CMOS/TTL	3.2 x 2.5	1 to 160MHz	±50ppm	–55 to 125°C		**

Model Number	Supply Voltage	Output Compatibility	Package (mm)	Frequency Range	Frequency Stability (Tightest*)	Operating Temperature Range (Widest*)	Stock Items	Page
CXOMHT	5.0V	CMOS/TTL	6.5 x 5	300kHz to 50MHz	±100ppm	–25 to 225°C		**
CXOMHG	5.0V	CMOS/TTL	6.5 x 5	300kHz to 120MHz	±50ppm	–55 to 125°C		**
HFXO	5.0V	CMOS/TTL	6.5 x 5	218.75kHz to 200MHz	±10ppm	–55 to 125°C		148
SQXO2SM	5.0V	CMOS/TTL	10 x 10	10kHz to 2MHz	±0.035ppm	–55 to 125°C		**
CXOHT	5.0V	CMOS/TTL	10 x 4.5	300kHz to 50MHz	±100ppm	–25 to 225°C		**
CXO	5.0V	CMOS/TTL	10 x 4.5	300kHz to 170MHz	±50ppm	–55 to 125°C		**
IQXO-10	5.0V	HCMOS	14.4 x 9.5	2 to 800MHz	±10ppm	–40 to 85°C		150
IQXO-753	5.0V	HCMOS	14 x 9.8	1 to 70MHz	±50ppm	–40 to 85°C		184
IQXO-757	5.0V	HCMOS	14 x 9.8	1 to 70MHz	±50ppm	–40 to 85°C		184
CFPS-12	5.0V	HCMOS	5 x 3.2	0.5 to 100MHz	±25ppm	–40 to 85°C		112
IQXO-62	5.0V	HCMOS/TTL	6 x 3.5	1.8 to 50MHz	±50ppm	–40 to 85°C		156
CFPS-72	5.0V	HCMOS/TTL	7 x 5	0.5 to 156MHz	±20ppm	–40 to 85°C	✓	114
IQXO-10	5.0V	LVPECL	14.4 x 9.5	2 to 800MHz	±10ppm	–40 to 85°C		150
QC6111, QC6112	Custom build Oscillators manufactured and tested to BS specification							192
Leaded Models								
CFPS-306	3.3V	HCMOS/LSTTL	14-pin DIL	500kHz to 125MHz	±25ppm	–40 to 85°C		136
CFPS-307	3.3V	HCMOS/LSTTL	14-pin DIL	500kHz to 125MHz	±25ppm	–40 to 85°C		136
CFPS-302	3.3V	HCMOS/LSTTL	8-pin DIL	500kHz to 125MHz	±25ppm	–40 to 85°C		134
CFPS-303	3.3V	HCMOS/LSTTL	8-pin DIL	500kHz to 125MHz	±25ppm	–40 to 85°C		134
LXO1	3.3, 5.0V	CMOS	14 pin DIL	10kHz to 2.1MHz	±25ppm	–55 to 125°C		**
LXOM	3.3, 5.0V	CMOS	8 PIN	10kHz to 2.1MHz	±25ppm	–55 to 125°C		**
LQXO4	3.3, 5.0V	CMOS	T039	32kHz to 200KHz	±25ppm	–55 to 125°C		**
DQXO3	3.3, 5.0V	CMOS	T039	1 to 10KHz	±150ppm	–55 to 125°C		**
LXOAT	3.3, 5.0V	CMOS/TTL	14 pin DIL	500kHz to 120MHz	±30ppm	–55 to 125°C		**
LXOMAT	3.3, 5.0V	CMOS/TTL	8 PIN	500kHz to 120MHz	±30ppm	–55 to 125°C		**
SQXO2	3.3, 5.0V	CMOS/TTL	T039	10kHz to 2MHz	±0.035ppm	–55 to 125°C		**
SQXO2AT	3.3, 5.0V	CMOS/TTL	T039	500kHz to 120MHz	±30ppm	–55 to 125°C		**
IQXO-331	5.0V	ACMOS/TTL	14-pin DIL	70 to 150MHz	±25ppm	–40 to 85°C		162
IQXO-336	5.0V	ACMOS/TTL	14-pin DIL	70 to 150MHz	±25ppm	–40 to 85°C		162
IQXO-149	5.0V	HCMOS/TTL	14-pin DIL	500kHz to 160MHz	±25ppm	–40 to 85°C		160
IQXO-350	5.0V	HCMOS/TTL	14-pin DIL	1kHz to 160MHz	±25ppm	–40 to 85°C		164
IQXO-366	5.0V	HCMOS/TTL	14-pin DIL	500kHz to 70MHz	±25ppm	–40 to 85°C		166
IQXO-365	5.0V	HCMOS/TTL	14-pin DIL	500kHz to 70MHz	±25ppm	–40 to 85°C		166
IQXO-415	5.0V	HCMOS/TTL	14-pin DIL	250kHz to 80MHz	±15ppm	–40 to 85°C		168
IQXO-625	5.0V	HCMOS/TTL	14-pin DIL	250kHz to 72MHz	±50ppm	–55 to 125°C		174
IQXO-626	5.0V	HCMOS/TTL	14-pin DIL	250kHz to 72MHz	±50ppm	–55 to 125°C		174
IQXO-627	5.0V	HCMOS/TTL	14-pin DIL	250kHz to 72MHz	±50ppm	–55 to 125°C		174
IQXO-628	5.0V	HCMOS/TTL	14-pin DIL	250kHz to 72MHz	±50ppm	–55 to 125°C		174
IQXO-22	5.0V	HCMOS/TTL	8-pin DIL	500kHz to 160MHz	±25ppm	–40 to 85°C		152
IQXO-23	5.0V	HCMOS/TTL	8-pin DIL	500kHz to 160MHz	±25ppm	–40 to 85°C		152
IQXO-35	5.0V	HCMOS/TTL	8-pin DIL	500kHz to 70MHz	±25ppm	–40 to 85°C		154
IQXO-36	5.0V	HCMOS/TTL	8-pin DIL	500kHz to 70MHz	±25ppm	–40 to 85°C		154
IQXO-85	5.0V	HCMOS/TTL	8-pin DIL	250kHz to 72MHz	±50ppm	–55 to 125°C		158
IQXO-86	5.0V	HCMOS/TTL	8-pin DIL	250kHz to 72MHz	±50ppm	–55 to 125°C		158
IQXO-87	5.0V	HCMOS/TTL	8-pin DIL	250kHz to 72MHz	±50ppm	–55 to 125°C		158
IQXO-88	5.0V	HCMOS/TTL	8-pin DIL	250kHz to 72MHz	±50ppm	–55 to 125°C		158
QC6107, QC6108	Custom build oscillators manufactured and tested to BS specification							192
* Tighter stability and wider temperautre ranges are available. Please contact our sales offices								
** Please contact your nearest sales office for detailed specification								

SPECIFYING CLOCK OSCILLATORS

Clock oscillators are the most technically simple oscillator IQD offer, the package contains a quartz wafer and also the necessary circuit to make the quartz resonate. Consequently by applying the correct power supply to the device a stable output clock waveform is provided at the output pin. IQD's clock oscillator part numbers all contain the code SPXO. SPXO is an acronym for Simple Packaged Xtal Oscillator.

The electrical parameters are given on the specification to facilitate the correct circuit design. Further guidance can be found in the Application Notes chapter of this book. Our Application Support team can also provide assistance if required; please contact one of our sales offices for this support.

The limits given in the following specifications are indicative of the standard oscillator design, in the event that a specification is needed which is outside the standard oscillator designs offered please contact our Sales team.

A typical clock oscillator specification reads like this:

10.0MHz CFPS-37
CMOS ±50ppm -10 to 70C 2.5V

The data in the example above is translated in the following order

- Frequency
- Model
- Output
- Frequency Stability
- Operating Temperature Range
- Supply Voltage

Frequency

Frequency is normally specified in kilohertz (kHz) up to 999.999kHz and in megahertz (MHz) from 1.0MHz. All our computer-generated transaction documents follow this standard convention automatically.

The clock oscillator frequency should be specified to seven significant figures. If seven significant figures are not used, we assume that any figure that might follow those given may be taken as zero. Thus a frequency given as 16.6MHz will be taken as 16.60, not 16.6666.

Please contact our sales offices for details of developed frequencies.

Model

The model incorporates information which describes output compatibility, holder style and supply voltage.

Frequency Stability

The frequency stability of a clock oscillator includes the initial adjustment tolerance at room temperature, the tolerance over operating temperature range and the effect of supply voltage variation. This value is specified as 'parts per million' (ppm) and is available in various ranges as shown below.

- ±20ppm
- ±25ppm
- ±30ppm
- ±50ppm
- ±100ppm

Operating Temperature Range

- 0 to 70°C
- –10 to 70°C
- –40 to 85°C
- –55 to 125°C

Although in general clock oscillators will continue to operate outside their normal temperature range with a degradation in frequency stability, damage can result if the temperatures reached are excessive.

Additional Text Code

If the product is non-standard, the letter 'E' and/or 'T' will appear at the end of the product specification. This refers to additional text on the quotation/sales order to identify the non-standard requirements.

Packaging Code

Tape and Reel packaging is available as an option on many of the products outlined in this chapter.

Unless individual data sheets state Tape and Reel packaging, items will be Bulk packed. Please note: only complete reels are sold.

- Bulk = Bulk packed
- Reel = Tape and Reel packed

Outline Drawings

Dimensions on the clock oscillators drawings are shown only as a guide. Precise dimensions of the clock oscillators holders are available upon request. All dimensions are shown in mm and are nominal unless otherwise stated.

Marking

Where space is limited some or all of the information will be omitted/truncated at IQD's discretion. Full product description will be found on the individual batch packaging.

Ordering Information

- See individual data sheets

STOCK CLOCK OSCILLATORS

CFPS-9 (5 x 3.2mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
4.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO024978	✓	✓
6.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025820	✓	✓
10.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO024807	✓	✓
12.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO026152	✓	✓
24.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO024986	✓	✓
32.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO024880	✓	✓
40.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO026068	✓	✓
50.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO024589	✓	✓

CFPS-32 (7 x 5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
3.68640MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO025921	✓	
10.0MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO025912	✓	
20.0MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO025913	✓	
24.0MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO025914	✓	
24.5760MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO025915	✓	
25.0MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO025225	✓	
32.0MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO025916	✓	
40.0MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO025917	✓	
50.0MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO025918	✓	
64.0MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO009615	✓	
100.0MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO009616	✓	
106.250MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO009617	✓	
125.0MHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO009618	✓	

CFPS-34 (7 x 5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
100.0MHz	LVPECL ±100ppm -10 to 70C 3.3V	LFSPXO024888	✓	✓
106.250MHz	LVPECL ±100ppm -10 to 70C 3.3V	LFSPXO026794	✓	✓
125.0MHz	LVPECL ±100ppm -10 to 70C 3.3V	LFSPXO026795	✓	✓
155.520MHz	LVPECL ±100ppm -10 to 70C 3.3V	LFSPXO025111	✓	✓
156.250MHz	LVPECL ±100ppm -10 to 70C 3.3V	LFSPXO026796	✓	✓

CFPS-39 (3.2 x 2.5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
12.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025492		✓
14.318180MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025493		✓
16.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025494		✓
20.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025495		✓
24.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025558		✓
24.5760MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025496	✓	✓
25.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025165		✓
30.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025497		✓
32.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025019		✓
40.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025559		✓
48.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025166		✓
50.0MHz	HCMOS ±50ppm -40 to 85C 3.3V	LFSPXO025560		✓

CFPS-69 (5 x 3.2mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
3.68640MHz	CMOS ±50ppm -40 to 85C 3.3V	LFSPXO009581	✓	
4.0MHz	CMOS ±50ppm -40 to 85C 3.3V	LFSPXO009582	✓	
6.0MHz	CMOS ±50ppm -40 to 85C 3.3V	LFSPXO009583	✓	
10.0MHz	CMOS ±50ppm -40 to 85C 3.3V	LFSPXO009584	✓	
12.0MHz	CMOS ±50ppm -40 to 85C 3.3V	LFSPXO009585	✓	
14.74560MHz	CMOS ±50ppm -40 to 85C 3.3V	LFSPXO009586	✓	
22.0MHz	CMOS ±50ppm -40 to 85C 3.3V	LFSPXO009587	✓	

CLOCK OSCILLATORS

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
24.0MHz	CMOS ±50ppm -40 to 85C 3.3V	LFSPXO009588	✓	
25.0MHz	CMOS ±50ppm -40 to 85C 3.3V	LFSPXO009589	✓	
40.0MHz	CMOS ±50ppm -40 to 85C 3.3V	LFSPXO009591	✓	
50.0MHz	CMOS ±50ppm -40 to 85C 3.3V	LFSPXO009592	✓	

CFPS-72 (7 x 5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
8.0MHz	HCMOS ±50ppm 0 to 70C 5V	LFSPXO019079	✓	✓
16.0MHz	HCMOS ±50ppm 0 to 70C 5V	LFSPXO018034	✓	✓
20.0MHz	HCMOS ±50ppm 0 to 70C 5V	LFSPXO018032	✓	✓
40.0MHz	HCMOS ±50ppm 0 to 70C 5V	LFSPXO018739	✓	✓
48.0MHz	HCMOS ±50ppm 0 to 70C 5V	LFSPXO019884	✓	✓

CFPS-73 (7 x 5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
3.68640MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018610	✓	✓
4.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018041	✓	✓
6.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018534	✓	✓
8.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018045	✓	✓
10.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018036	✓	✓
12.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018037	✓	✓
12.2880MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO020465	✓	
14.318180MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018538	✓	✓
16.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018038	✓	✓
20.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018039	✓	✓
24.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018541	✓	✓
25.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018077	✓	✓
40.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018042	✓	✓
48.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018043	✓	

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
50.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018044	✓	✓
60.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO018545	✓	✓
100.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO009437	✓	
100.0MHz	HCMOS ±50ppm 0 to 70C 3.3V	LFSPXO009438		✓

CFPS-107 (2.5 x 2mm)

Frequency	Frequency Stability	Part Number	Packaging	
			Bulk	Reel
32.7680kHz	CMOS ±50ppm -40 to 85C 1.8V	LFSPXO009682	✓	

CFPS-108 (2.5 x 2mm)

Frequency	Frequency Stability	Part Number	Packaging	
			Bulk	Reel
32.7680kHz	CMOS ±50ppm -40 to 85C 2.5V	LFSPXO009684	✓	✓

CFPS-109 (2.5 x 2mm)

Frequency	Frequency Stability	Part Number	Packaging	
			Bulk	Reel
32.7680kHz	CMOS ±50ppm -40 to 85C 3.3V	LFSPXO009686	✓	✓

NOTES

CFPS-9, CFPS-12 SMD CLOCK OSCILLATORS

ISSUE 6; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 5 x 3.2 crystal oscillators
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Please see our CFPS-37 for a 2.5V version of this package
- Please see our CFPS-69 for a low current version of this package
- Stock parts listed at the beginning of this chapter
- Fast Make capability: CFPP-9 and CFPP-12 series programmable oscillators are the nearest equivalent fast make model
- MEMS capability: IQMS-510 series oscillators are the nearest equivalent MEMS model

Frequency Range

- 0.5 to 160MHz CFPS-9
- 0.5 to 100MHz CFPS-12

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage and output load variations over the operating temperature range)

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Standby Operation

- Logic ‘1’ (>70% V_S) to pad 1 enables oscillator output
- Logic ‘0’ (<30% V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max

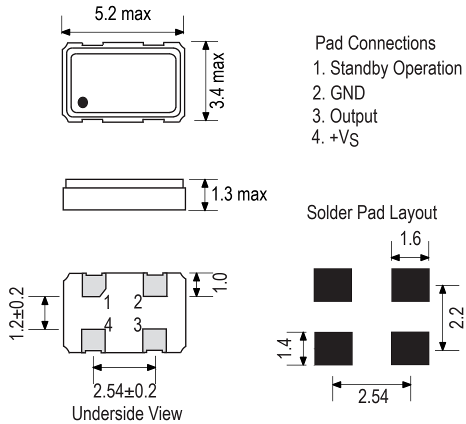
Environmental

- Shock: MIL-STD-202F, Method 213B: 1000G, 0.5ms, 1/2 sine wave
- Vibration: MIL-STD-202F, Method 204D, Test Condition D: 20G (10Hz-2000Hz), 4hrs in 3 mutually perpendicular planes (total 12hrs)

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

Example

- 10.0MHz CFPS-9
  CMOS ±50ppm -10 to 70C 3.3V

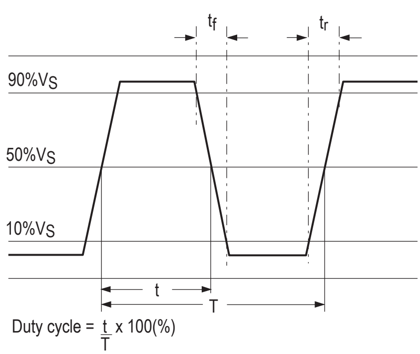
Electrical Specification - maximum limiting values CFPS-9 (3.3V)

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
0.5 to <10MHz	±25ppm ±50ppm ±100ppm	3.3V ±0.3V	20mA	10ns	10ns	40/60%	CFPS-9
10.0 to <20.0MHz							
20.0 to <32.0MHz							
32.0 to <50.0MHz							
50.0 to <80.0MHz			30mA	8ns	8ns		
80.0 to <100.0MHz			40mA	5ns	5ns		
100.0 to 160.MHz			50mA	4ns	4ns		
Note: For other frequency/specification combinations, please contact our sales offices							

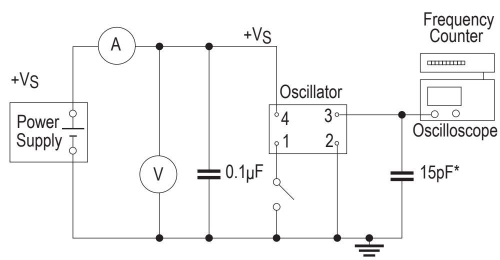
Electrical Specification - maximum limiting values CFPS-12 (5.0V)

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
0.5 to <10MHz	±25ppm ±50ppm ±100ppm	5.0V ±0.5V	45mA	10ns	10ns	40/60%	CFPS-12
10.0 to <20.0MHz							
20.0 to <32.0MHz							
32.0 to <50.0MHz				6ns	6ns		
50.0 to <80.0MHz			50mA	5ns	5ns		
80.0 to 100.0MHz			60mA				
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Test Circuit



* Inclusive of jigging and equipment capacitance

CFPS-31, -32, -72, -73 SMD CLOCK OSCILLATORS

ISSUE 12; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 7 x 5 crystal oscillators
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Stock parts listed at the beginning of this chapter
- Fast Make capability: CFPP-72 and CFPP-73 series programmable oscillators are the nearest equivalent fast make model
- MEMS capability: IQMS-500 series oscillators are the nearest equivalent MEMS model

Frequency Range

- 0.5 to 156MHz (CFPS-31, CFPS-32, CFPS-73)
- 0.5 to 100MHz (CFPS-72)

Output Compatibility & Load

- CMOS 15pF max (CFPS-31, CFPS-32)
- HCMOS/TTL (CFPS-72), HCMOS (CFPS-73)

Maximum Drive Capability	
1.5MHz to 50MHz	50pF max
>50MHz to 80MHz	30pF max
>80MHz to 160MHz	15pF max

Frequency Stabilities

- ±20ppm, ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage and output load variations over the operating temperature range)

Operating Temperature Ranges

- 0 to 70°C (CFPS-72, -73 only)
- –10 to 70°C (CFPS-31, -32 only)
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Standby Operation

- Logic ‘1’ (>70% V_S) to pad 1 enables oscillator output
- Logic ‘0’ (<30% V_S) to pad 1 disables oscillator output; the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max

Environmental

- Shock: MIL-STD-202, Method 213, Condition E
- Vibration: MIL-STD-883, Method 2007, Condition A

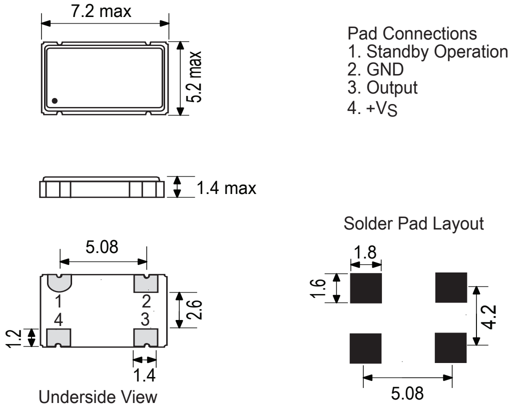
Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

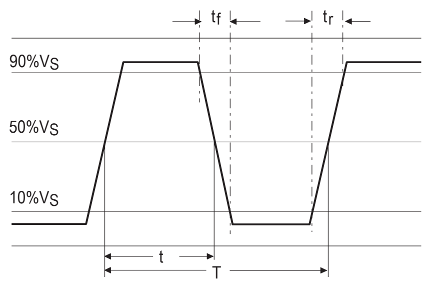
Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

Outline (mm)

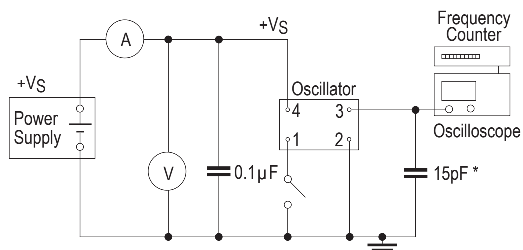


Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



* Inclusive of jigging and equipment capacitance

Example

- 10.0MHz CFPS-73
  HCMOS ±50ppm 0 to 70C 3.3V

Electrical Specifications - maximum limiting values CFPS-31 (1.8V)

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
0.5 to <10.0MHz	±25ppm ±50ppm ±100ppm	1.8V ±5%	5mA	5ns	5ns	40/60%	CFPS-31
10.0 to <20.0MHz			6mA				
20.0 to <32.0MHz							
32.0 to <50.0MHz			15mA				
50.0 to <80.0MHz				4ns	4ns		
80.0 to <100.0MHz			20mA	3ns	3ns		
100.0 to 156.0MHz			25mA				

Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices

Note: For other frequency/specification combinations, please contact our sales offices

Electrical Specifications - maximum limiting values CFPS-32 (2.5V)

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
0.5 to <10.0MHz	±25ppm ±50ppm ±100ppm	2.5V ±5%	6mA	5ns	5ns	40/60%	CFPS-32
10.0 to <20.0MHz			8mA				
20.0 to <32.0MHz							
32.0 to <50.0MHz			20mA				
50.0 to <80.0MHz				4ns	4ns		
80.0 to <100.0MHz			25mA	3ns	3ns		
100.0 to 156.0MHz			30mA				

Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices

Note: For other frequency/specification combinations, please contact our sales offices

Electrical Specifications - maximum limiting values CFPS-73 (3.3V)

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
0.5 to <10.0MHz	±20ppm* ±25ppm ±50ppm ±100ppm	3.3V ±10%	7mA	10ns	10ns	45/55%	CFPS-73
10.0 to <20.0MHz							
20.0 to <32.0MHz			12mA				
32.0 to <50.0MHz			20mA				
50.0 to <80.0MHz			25mA	8ns	8ns		
80.0 to <100.0MHz			30mA	5ns	5ns		
100.0 to 156.0MHz			40mA	4ns	4ns		

* Note: ±20ppm over –40 to 85°C is not availiable

Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices

Note: For other frequency/specification combinations, please contact our sales offices

Electrical Specifications - maximum limiting values CFPS-72 (5.0V)

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
0.5 to 20.0MHz	±25ppm ±50ppm ±100ppm	5.0V ±10%	20mA	10ns	10ns	45/55%	CFPS-72
20.0 to 35.0MHz			30mA	6ns	6ns		
35.0 to 70.0MHz			50mA				
70.0 to 100.0MHz			70mA				

Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices

Note: For other frequency/specification combinations, please contact our sales offices

CFPS-34 SMD CLOCK OSCILLATORS

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Description

- LVPECL output using a high frequency fundamental crystal to give very low jitter
- Ceramic package with a seam sealed metal lid, hermetically sealed
- For higher frequencies please see our IQXO-690
- Please see our IQXO-621 for a 2.5V version of this package
- Stock parts listed at the beginning of this chapter
- MEMS capability: IQMS-900 series oscillators are the nearest equivalent MEMS model

Frequency Range

- 40 to 270MHz

Output Compatibility & Load

- LVPECL
- Output Load 50Ω terminated to Vs-2.0V

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage and output load variations over the operating temperature range)
  Note: ±25ppm is not available over –40 to 85°C

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Standby Operation

- Logic '1' (>70% V_S) to pad 1 enables oscillator output
- Logic '0' (<30% V_S) to pad 1 disables oscillator output; the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Stand-by Current: 30μA max

Start-Up Time

- 10ms max

Output Voltage

- '0' Level V_{OL} +1.7V max
- '1' Level V_{OH} +2.2V min

Phase Jitter (12kHz to 20MHz)

- 1ps rms max

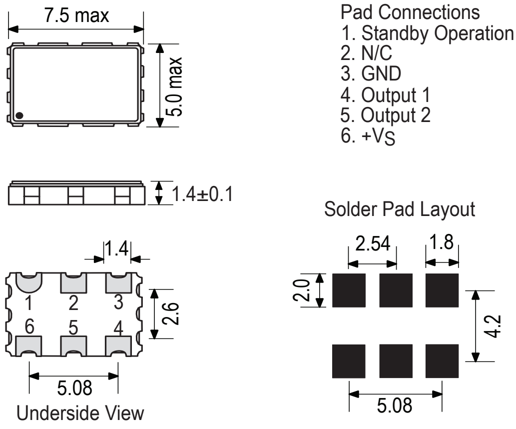
Environmental

- Shock: MIL-STD-202F, Method 213B: 1000G, 0.5ms, 1/2 sine wave
- Vibration: MIL-STD-202F, Method 204D, Test Condition D: 20G (10Hz-2000Hz), 4hrs in 3 mutually perpendicular planes (total 12hrs)

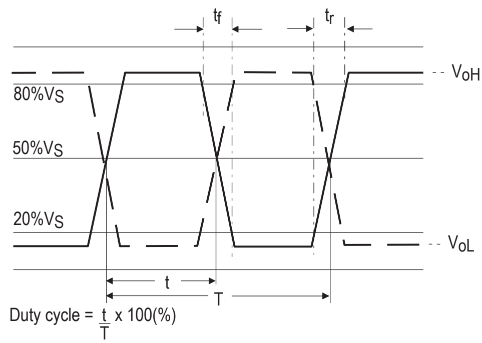
Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Output Waveform



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

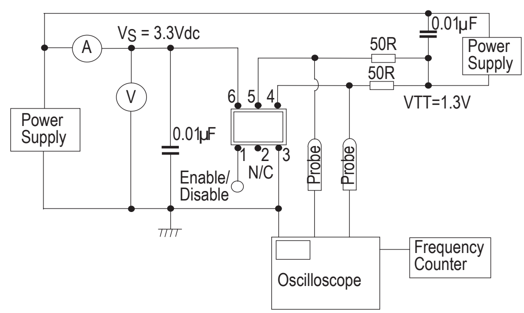
Example

- 100.0MHz CFPS-34
  LVPECL ±50ppm -10 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
40.0 to 170.0MHz	±25ppm ±50ppm ±100ppm	3.3V±5%	60mA	1ns	1ns	40/60%	CFPS-34
>170.0 to 270.0MHz			88mA				
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



CFPS-37 SMD CLOCK OSCILLATORS

ISSUE 7; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 5 x 3.2 crystal oscillators
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Please see our CFPS-9 or CFPS-12 for a 3.3 or 5.0V version of this package
- Please see our CFPS-67 for a low current draw version of this package
- MEMS capability: IQMS-512 series oscillators are the nearest equivalent MEMS model

Frequency Range

- 1.8 to 125MHz

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage and output load variations over the operating temperature range)
Note: ±25ppm is not available over –40 to 85°C

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Standby Operation

- Logic ‘1’ (>70% V_S) to pad 1 enables oscillator output
- Logic ‘0’ (<30% V_S) to pad 1 disables oscillator output and oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max

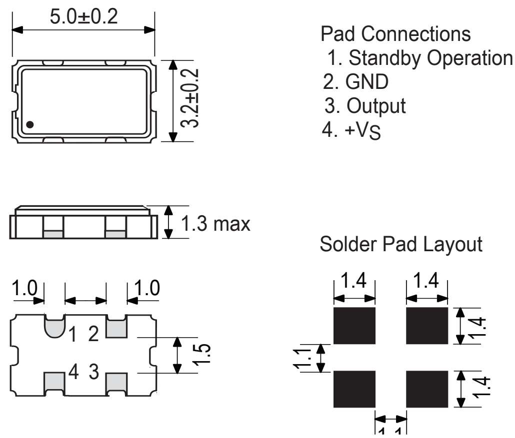
Environmental

- Shock: MIL-STD-202F, Method 213B: 1000G, 0.5ms, 1/2 sine wave
- Vibration: MIL-STD-202F, Method 204D, Test Condition D: 20G (10Hz-2000Hz), 4hrs in 3 mutually perpendicular planes (total 12hrs)

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

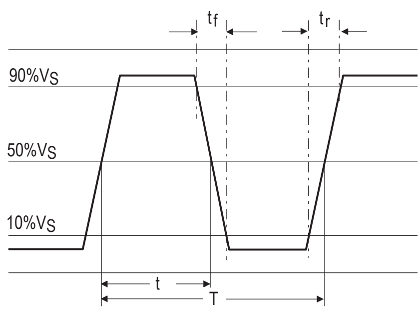
Example

- 10.0MHz CFPS-37
CMOS ±50ppm -10 to 70C 2.5V

Electrical Specifications - maximum limiting values

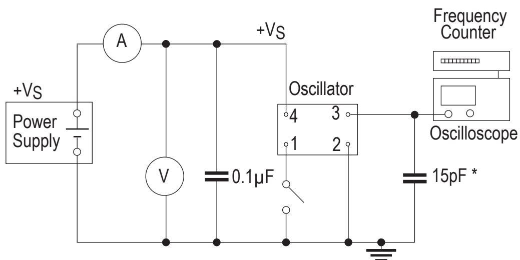
Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.8 to 32.0MHz	±25ppm ±50ppm ±100ppm	2.5V±5%	10mA	5ns	5ns	45/55%	CFPS-37
>32.0 to 50.0MHz			20mA				
>50.0 to 80.0MHz						40/60%	
>80.0 to 125.0MHz			30mA	4ns	4ns		
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



* Inclusive of jigging & equipment capacitance

CFPS-39, -40, -41 SMD CLOCK OSCILLATORS

ISSUE 4; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 3.2 x 2.5 crystal oscillators
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Stock parts listed at the beginning of this chapter
- Fast Make capability: CFPP-39, CFPP-40 and CFPP-41 series programmable oscillators are the nearest equivalent fast make model
- MEMS capability: IQMS-520 series oscillators are the nearest equivalent MEMS model

Frequency Range

- 2 to 50MHz

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 1.8V CFPS-41
- 2.5V CFPS-40
- 3.3V CFPS-39

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage and output load variations over the operating temperature range)

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Standby Operation

- Logic ‘1’ (>70% V_S) to pad 1 enables oscillator output
- Logic ‘0’ (<30% V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max
- Start-Up Time: 10ms max

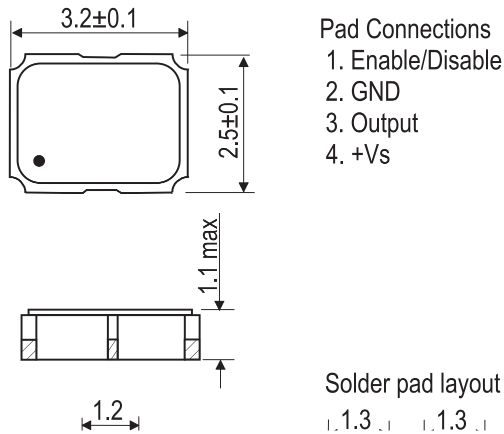
Environmental

- Shock: MIL-STD-202F, Method 213B: 1000G, 0.5ms, 1/2 sine wave
- Vibration: MIL-STD-202F, Method 204D, Test Condition D: 20G (10Hz-2000Hz), 4hrs in 3 mutually perpendicular planes (total 12hrs)

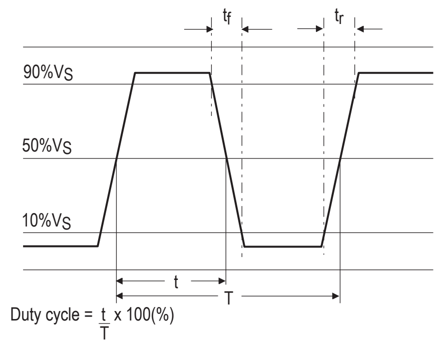
Packaging

- Loose in bulk pack, 10pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Output Waveform



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

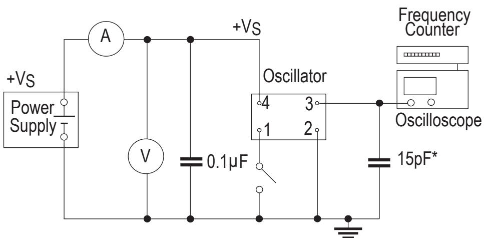
Example

- 10.0MHz CFPS-39
  CMOS ±50ppm –10 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (tr) (10-90%)	Fall Time (tf) (90-10%)	Duty Cycle	Model Number
2.0 to <10.0MHz	±25ppm ±50ppm ±100ppm	3.3V±10%	7mA	5ns	5ns	45/55%	CFPS-39
		2.5V±5%	6mA			40/60%	CFPS-40
		1.8V±5%	5mA	7ns	7ns		CFPS-41
10.0 to <20.0MHz		3.3V±10%	7mA	5ns	5ns	45/55%	CFPS-39
		2.5V±5%	8mA			40/60%	CFPS-40
		1.8V±5%	6mA	7ns	7ns		CFPS-41
20.0 to <32.0MHz		3.3V±10%	12mA	5ns	5ns	45/55%	CFPS-39
		2.5V±5%	8mA			40/60%	CFPS-40
		1.8V±5%	6mA	6ns	6ns		CFPS-41
32.0 to 50.0MHz		3.3V±10%	20mA	5ns	5ns	45/55%	CFPS-39
		2.5V±5%				40/60%	CFPS-40
		1.8V±5%	15mA	6ns	6ns		CFPS-41
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



Inclusive of jigging & equipment capacitance

CFPS-53, -54, -55, -56 SMD CLOCK OSCILLATORS

ISSUE 5; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 2.5 x 2 crystal oscillators
- Ceramic package with a seam sealed metal lid, hermetically sealed
- For low phase noise versions of this package please see our CFPS-112 CFPS-113 CFPS-114 and CFPS-115
- Fast Make capability: CFPP-53, CFPP-54 and CFPP-55 series programmable oscillators are the nearest equivalent fast make model
- MEMS capability: IQMS-530 series oscillators are the nearest equivalent MEMS model

Frequency Range

- 0.75 to 50MHz

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 1.8V CFPS-53
- 2.5V CFPS-54
- 3.0V CFPS-55
- 3.3V CFPS-56

Frequency Stabilities

- ±30ppm, ±50ppm, ±100ppm (inclusive of supply voltage output load variations over the operating temperature range)

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 100°C

Tri-State Operation

- Logic ‘1’ (>80%V_S) to pad 1 enables oscillator output
- Logic ‘0’ (<20% V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

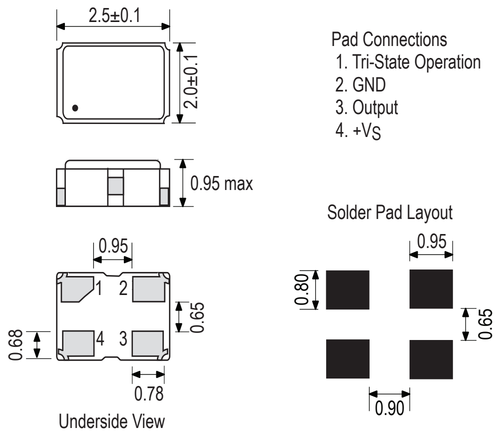
Environmental

- Drop: 100cm drop (3 times) onto hard wooden board
- Vibration: 10Hz-36Hz, 1.5mm amplitude, 36Hz-55Hz, 4G sweep time 1min/oct, 2hrs in 3 mutually perpendicular planes

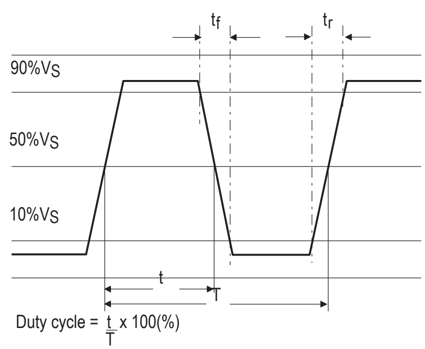
Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Output Waveform



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stablity*
- Operating Temperature Range*
- Supply Voltage

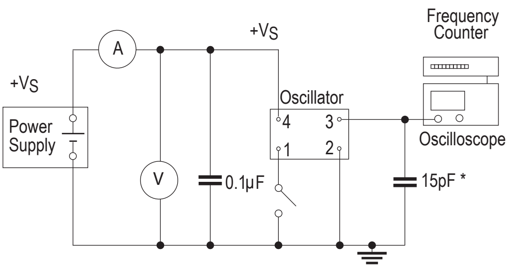
Example

- 10.0MHz CFPS-56
  CMOS ±50ppm -20 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
0.75 to <20.0MHz	±30ppm ±50ppm ±100ppm	1.8V ±5%	3mA	10ns	10ns	45/55%	CFPS-53
20.0 to <40.0MHz			4mA				
40.0 to 50.0MHz			5mA				
0.75 to <20.0MHz		2.5V ±5%	4.5mA			40/60%	CFPS-54
20.0 to <40.0MHz			8mA				
40.0 to 50.0MHz			10mA				
0.75 to <20.0MHz		3.0V ±5%	5.5mA			45/55%	CFPS-55
20.0 to <40.0MHz			6.5mA				
40.0 to 50.0MHz			7.5mA				
0.75 to <20.0MHz		3.3V ±10%	6mA				CFPS-56
20.0 to <40.0MHz			7mA				
40.0 to 50.0MHz			13mA				
Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices							
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



* Inclusive of jigging & equipment capacitance

CFPS-67, -68, -69 SMD CLOCK OSCILLATORS

ISSUE 5; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Low supply current crystal oscillators
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Please see our CFPS-9 and CFPS-37 packages for standard 5 x 3.2 oscillators
- Stock parts listed at the beginning of this chapter

Frequency Range

- 1.8MHz to 50MHz

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 2.5V CFPS-67
- 2.8V CFPS-68
- 3.3V CFPS-69

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage and output load variations over the operating temperature range) Note: ±25ppm is not available over –40 to 85°C

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Standby Operation

- Logic ‘1’ (>70% V_S) to pad 1 enables oscillator output
- Logic ‘0’ (<30% V_S) to pad 1 disables oscillator output; when the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current: 1µA max

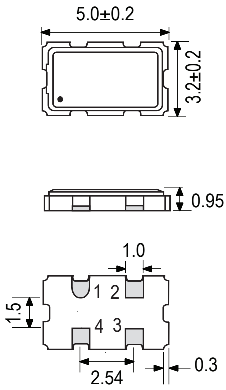
Environmental

- Shock: MIL-STD-202F, Method 213B: 1000G, 0.5ms, 1/2 sine wave
- Vibration: MIL-STD-202F, Method 204D, Test Condition D: 20G (10Hz-2000Hz), 4hrs in 3 mutually perpendicular planes (total 12hrs)

Packaging

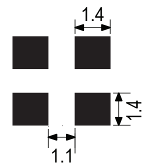
- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Pad Connections
1. Standby Operation
2. GND
3. Output
4. $+V_S$

Solder Pad Layout



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stablity*
- Operating Temperature Range*
- Supply Voltage

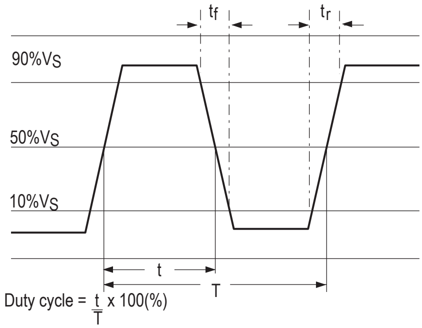
Example

- 20.0MHz CFPS-69
  CMOS ±50ppm –10 to 70C 3.3V

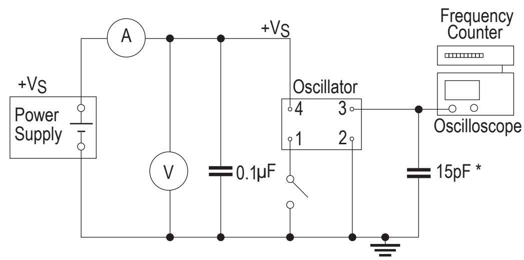
Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.8 to <32.0MHz	±25ppm ±50ppm ±100ppm	2.5V±5%	3.5mA	12ns	12ns	45/55%	CFPS-67
32.0 to 50.0MHz			4.5mA				
1.8 to <32.0MHz		2.8V±5%	4.0mA				CFPS-68
32.0 to 50.0MHz			5.0mA				
1.8 to <32.0MHz		3.3V±5%	4.5mA				CFPS-69
32.0 to 50.0MHz			6.0mA				
Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices							
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Test Circuit



* Inclusive of jigging and equipment capacitance

CFPS-74 SMD CLOCK OSCILLATORS

ISSUE 7; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Specifically designed and approved for use with Zarlink chipsets for Stratum 4 applications
- ±20ppm all causes over 15years crystal oscillators
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Please see our CFPS-73 for a standard 7 x 5 oscillators

Frequency Range (Developed Frequencies)

- 12.80, 19.440, 20.0, 20.480, 27.0, 40.0, 44.23220, 44.621770, 64.0, 77.760MHz

Output Compatibility & Load

- HCMOS
- Drive Capability: 15pF

Frequency Stability

- ±20ppm all causes over 15 years inclusive of frequency tolerance, supply voltage variation, load variation and ageing

Operating Temperature Range

- 0 to 70°C

Storage Temperature Range

- –55 to 125°C

Tri-State Operation

- Logic ‘1’ to pad 1 enables oscillator output, 2.5V min
- Logic ‘0’ to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state, 0.5V max
- No connection to pad 1 enables oscillator output

Packaging

- Loose in bulk pack, 10pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

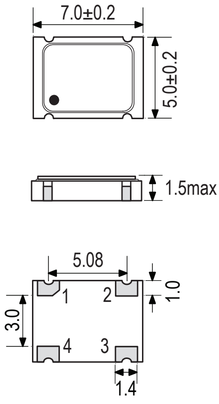
Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability
- Operating Temperature Range
- Supply Voltage

Example

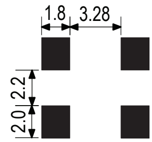
- 20.0MHz CFPS-74
  HCMOS ±20ppm All causes 15yrs 0 to 70C 3.3V

Outline (mm)

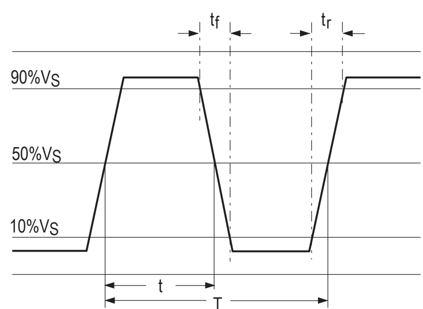


Pad Connections
1. N/C or Tri-State Operation
2. GND
3. Output
4. +V_S

Solder Pad Layout

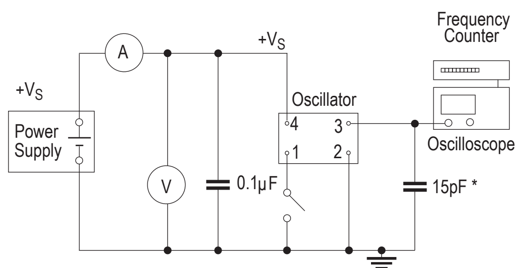


Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



* Inclusive of jigging and equipment capacitance

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
* See Developed Spot Frequencies	±20ppm	3.3V±1%	40mA	6ns	6ns	45/55%	CFPS-74
* Note: Frequencies between 1.0MHz and 100.0MHz will be considered. Please contact our sales offices							
Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices							

CFPS-102, -103, -104 SMD CLOCK OSCILLATORS

ISSUE 3; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Suitable for real time clock applications
- 32.768kHz output crystal oscillators
- Ceramic package with a seam sealed metal lid, hermetically sealed

Frequency Range

- 32.768kHz

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 1.8V CFPS-102
- 2.5V CFPS-103
- 3.3V CFPS-104

Frequency Stabilities

- ±20ppm, ±25ppm, ±50ppm (inclusive of tolerance and operating temperature range)

Operating Temperature Ranges

- –10 to 70°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Tri-State Operation

- Logic ‘1’ (>70% V_S) to pad 1 enables oscillator output
- Logic ‘0’ (<30% V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Ageing

- ±3ppm max per year

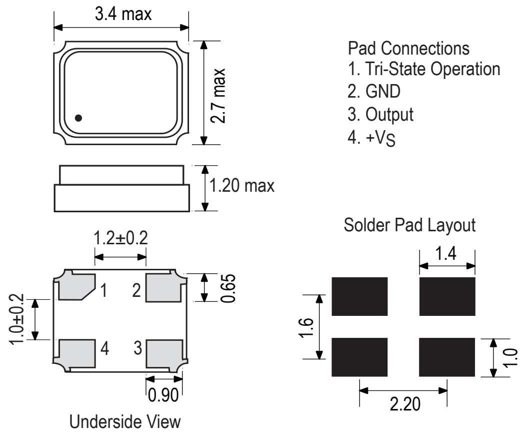
Environmental

- Shock: MIL-STD-883F, Method 2002.4: 1500G, 0.5ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: MIL-STD-883F, Method 2007.3: 20G (20Hz-2000Hz), 1.52mm amplitude, 20mins in 3 mutually perpendicular planes (total 4hrs)

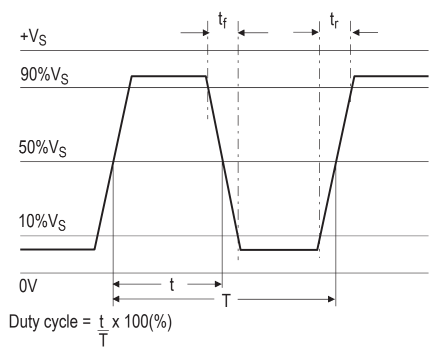
Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Output Waveform



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stablity*
- Operating Temperature Range*
- Supply Voltage

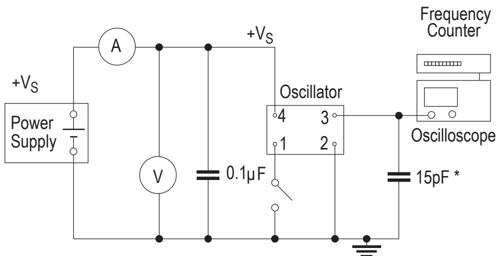
Example

- 32.768kHz CFPS-104
  CMOS ±50ppm –10 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
32.768kHz	±20ppm ±25ppm ±50ppm	1.8V±5%	1.5mA	50ns	50ns	40/60%	CFPS-102
		2.5V±5%	2.5mA				CFPS-103
		3.3V±5%	3.5mA				CFPS-104
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



* Inclusive of jigging and equipment capacitance

CFPS-107, -108, -109 SMD CLOCK OSCILLATORS

ISSUE 3; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Suitable for real time clock applications
- 32.768kHz output crystal oscillators
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Stock parts listed at the beginning of this chapter

Frequency Range

- 32.768kHz

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 1.8V CFPS-107
- 2.5V CFPS-108
- 3.3V CFPS-109

Frequency Stabilities

- ±20ppm, ±25ppm, ±50ppm, ±100ppm (inclusive of tolerance and operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Tri-State Operation

- Logic ‘1’ to pad 1 enables oscillator output
- Logic ‘0’ to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Ageing

- ±3ppm max per year

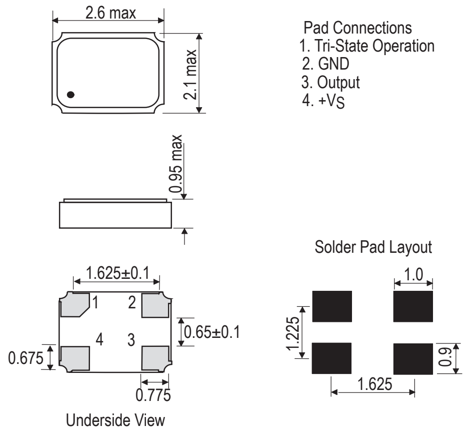
Environmental

- Shock: MIL-STD-883F, Method 2002.4: 1500G, 0.5ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: MIL-STD-883F, Method 2007.3: 20G (20Hz-2000Hz), 1.52mm amplitude

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

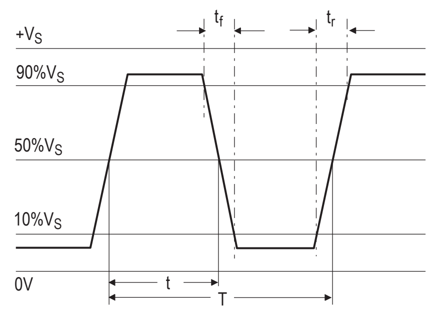
Example

- 32.768kHz CFPS-109
  CMOS ±50ppm 0 to 70C 3.3V

Electrical Specifications - maximum limiting values

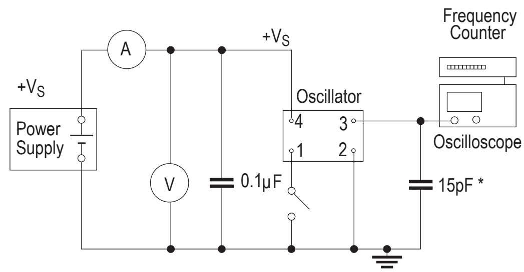
Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
32.768kHz	±20ppm ±25ppm ±50ppm ±100ppm	1.8V±5%	1.5mA	50ns	50ns	40/60%	CFPS-107
		2.5V±5%	2.5mA				CFPS-108
		3.3V±5%	3.5mA				CFPS-109
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



* Inclusive of jigging and equipment capacitance

CFPS-112, -113, -114, -115 SMD CLOCK OSCILLATORS

ISSUE 4; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Low phase noise crystal oscillator
- Ceramic package with a seam sealed metal lid, hermetically sealed
- For standard 2.5 x 2 package oscillators please see our CFPS-53, CFPS-54, CFPS-55 and CFPS-56 series

Frequency Range

- 26 to 44MHz

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 1.8V CFPS-112
- 2.5V CFPS-113
- 3.0V CFPS-114
- 3.3V CFPS-115

Frequency Stabilities

- ±30ppm, ±50ppm, ±100ppm (inclusive of supply voltage and output load variations over the operating temperature range)

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 100°C

Tri-State Operation

- Logic ‘1’ (>80%V_S) to pad 1 enables oscillator output
- Logic ‘0’ (<20% V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Phase Noise - Examples:

	dBc/Hz				
Frequency	**10Hz**	**100Hz**	**1kHz**	**10kHz**	**100kHz**
27MHz	–75	–111	–146	–155	–157
40MHz	–80	–116	–145	–157	–159

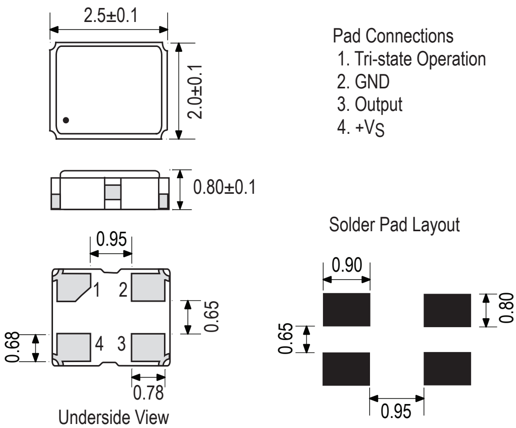
Environmental

- Drop: 100cm drop (3 times) onto hard wooden board
- Vibration: 10Hz-36Hz, 1.5mm amplitude, 36Hz-55Hz, 4G sweep time 1min/oct, 2hrs in 3 mutually perpendicular planes

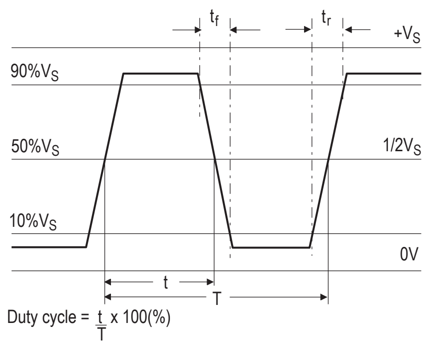
Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Output Waveform



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

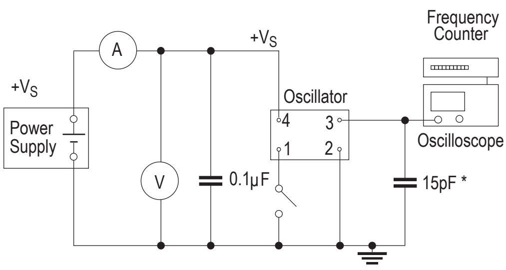
Example

- 30.0MHz CFPS-115
  CMOS ±50ppm –20 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
26.0 to 44.0MHz	±30ppm ±50ppm ±100ppm	1.8V±5%	3.0mA	10ns	10ns	45/55%	CFPS-112
		2.5V±5%	5.5mA			40/60%	CFPS-113
		3.0V±5%	6.5mA			45/55%	CFPS-114
		3.3V±5%	7.0mA				CFPS-115
Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices							
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



* Inclusive of jigging and equipment capacitance

CFPS-302, 303 CLOCK OSCILLATORS

ISSUE 6; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Not recommended for new designs

Description

- Standard 8pin DIL 3.3V supply crystal oscillators
- Available with or without a standby function
- Crystal oscillator in an 8pin DIL package hermetically sealed
- Fast Make capability: CFPP-303 series programmable oscillators are the nearest equivalent fast make model

Frequency Range

- 500kHz to 125MHz

Output Compatibility & Load

- HCMOS/LSTTL
- Drive Capability 15pF max or 10LSTTL
- No Standby Operation (CFPS-302)
- Standby Operation (CFPS-303)

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (over operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Standby Operation (CFPS-303)

- No connection or Logic ‘1’ to pin 1 enables oscillator output
- Logic ‘0’ to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- Maximum ‘pull-down’ resistance required to disable output = 20kΩ
- Standby Current: 50µA typical

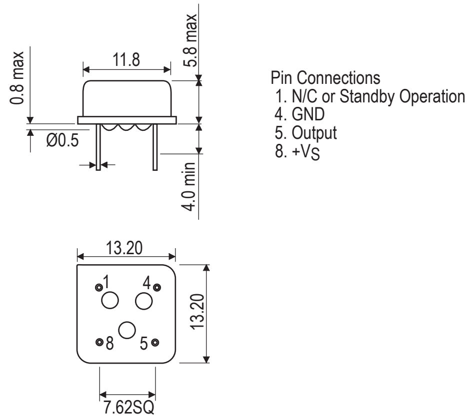
Environmental

- Terminal Strength: 0.91kg max force perpendicular to top and bottom
- Hermetic Seal: Not to exceed 1x10^{-8} mBar litres of Helium leakage
- Solderability: MIL-STD-202E, Method 208C
- Vibration: 0.76mm displacement, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane
- Rapid Change of Temperature over Operating Temperature Range: 10 cycles
- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes

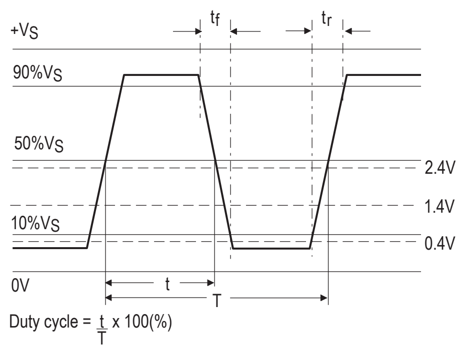
Packaging

- Bulk

Outline (mm)



Output Waveform



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

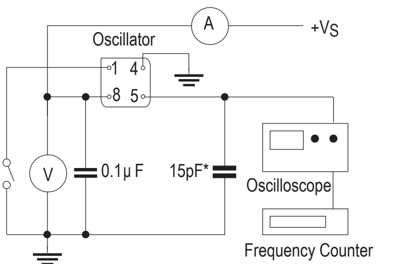
Example

- 20.0MHz CFPS-303
  HCMOS ±50ppm 0 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
500.0kHz to <20.0MHz	±25ppm ±50ppm ±100ppm	3.3V±0.33V	10mA	10ns	10ns	40/60%	CFPS-302, 303
20.0MHz to <25.0MHz			20mA				
25.0MHz to 40.0MHz				6ns	6ns		
>40.0MHz to <70.0MHz			25mA				
70.0MHz to <125.0MHz			30mA	3ns	3ns		
Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices							
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



*Inclusive of jigging and equipment capacitance

Note: Pin 1 = No connection on non standby option models

CFPS-306, -307 CLOCK OSCILLATORS

ISSUE 6; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Not recommended for new designs

Description

- Standard 14pin DIL 3.3V supply crystal oscillators
- Available with or without a standby function
- Crystal oscillator in a 14pin DIL package hermetically sealed
- Fast Make capability: CFPP-307 series programmable oscillators are the nearest equivalent fast make model

Frequency Range

- 500kHz to 125MHz

Output Compatibility & Load

- HCMOS/LSTTL
- Drive Capability: 15pF max or 10LSTTL
- No Standby Operation (CFPS-306)
- Standby Operation (CFPS-307)

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (over operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Standby Operation (CFPS-307)

- No connection or Logic ‘1’ to pin enables oscillator output
- Logic ‘0’ to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- Maximum ‘pull-down’ resistance required to disable output = 20kΩ
- Standby Current: 50µA typical

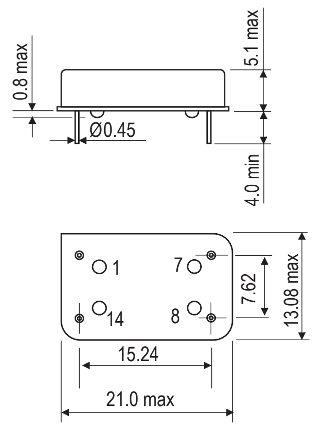
Environmental

- Terminal Strength: 0.91kg max force perpendicular to top and bottom
- Hermetic Seal: Not to exceed 1 x 10^{-8} mBar litres of Helium leakage
- Solderability: MIL-STD-202E, Method 208C
- Vibration: 0.76mm displacement, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane
- Rapid Change of Temperature over Operating Temperature Range: 10 cycles
- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes

Packaging

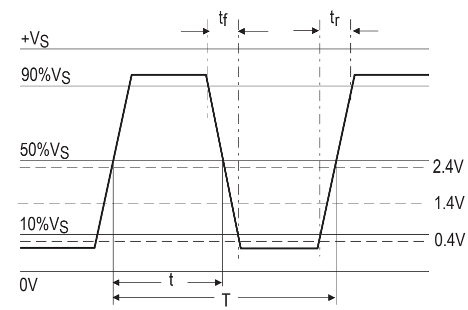
- Bulk

Outline (mm)



Pin connections
1. N/C or Stanby Operation
7. GND
8. Output
14. $+V_S$

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

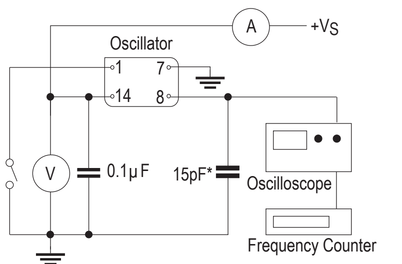
Example

- 20.0MHz CFPS-307
  HCMOS ±50ppm 0 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
500.0kHz to <20.0MHz	±25ppm ±50ppm ±100ppm	3.3V±0.33V	10mA	10ns	10ns	40/60%	CFPS-306, 307
20.0MHz to <25.0MHz			20mA				
25.0MHz to 40.0MHz				6ns	6ns		
>40.0MHz to <70.0MHz			25mA				
70.0MHz to <125.0MHz			30mA	3ns	3ns		
Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices							
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



*Inclusive of jigging and equipment capacitance

Note: Pin 1 = No connection on non standby option models

CXO3M SMD CLOCK OSCILLATORS

ISSUE 9; 1 NOVEMBER 2010

Description

Statek's surface-mount 3.3V CXO3M oscillators consist of a Statek miniature quartz crystal and a CMOS/TTL compatible hybrid circuit in a low-profile ceramic package with an extremely small footprint

Features

- Designed for surface mount applications using infrared, vapor phase, or epoxy mount techniques
- 3.3V operation
- CMOS and TTL compatible
- Low power consumption
- Optional Output Enable/Disable with Tri-State
- Low EMI emission
- High shock resistance
- Full military testing available
- Hermetically sealed ceramic package

Applications

Military & Aerospace

- Smart Munitions
- Cockpit Systems
- Navigation

Industrial, Computer & Communications

- Industrial Controls
- Instrumentation
- Microprocessor Clocks

Medical

- Infusion Pumps

Terminations

- SM1 = Gold Plated (RoHS Compliant)
- SM3 = Solder Dipped (non RoHS Compliant)
- SM5 = Solder Dipped (RoHS Compliant)

Frequency Range

- 200kHz to 220MHz

Output Compatiblity & Load

- CMOS/TTL
- Drive Compatiblity 15pF max

Supply Voltage

- 3.3V±10%

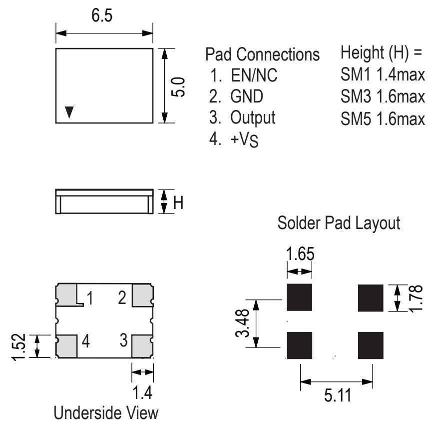
Frequency Tolerance

- ±100ppm

Frequency Stability

- ±50ppm
- ±100ppm
- Does not include calibration tolerance

Outline (mm) typ



Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C
- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

Pad 1 Function

Tri-State Option (TS option)

- Pad 1 normally high (internal pull-up resistor)
- Pad 1 logic '0', pad 3 high impedance
- Pad 1 logic '1', pad 3 output

Enable/Disable Option (EN option)

- Internal oscillator stops, low current
- Pad 1 logic '0', pad 3 high impedance
- Pad 1 logic '1', pad 3 output

No Connection Option (NC option)

- Pad 1 not connected internally

Ageing

- ±10ppm max in 1st year

Environmental

- Shock: 3000G, 0.3ms, 1/2 sine wave
- Vibration: MIL-STD-202G, Method 204D, Test Condition D: 20G (10Hz-2000Hz), swept sine wave

Packaging

- Tray pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see page 372)

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (typ)	Rise Time (t_r)	Fall Time (t_f)	Duty Cycle	Model Number
200.0kHz to 220.0MHz	±50ppm ±100ppm	3.3V	2mA @ 10MHz	6ns	6ns	40/60%	CXO3M
			4mA @ 24MHz				
			6mA @ 30MHz				
			8mA @ 40MHz				
			10mA @ 50MHz				
Note: For other frequency/specification combinations, please contact our sales offices							

Ordering Information (*minimum required)

- Frequency*
- Model*
- Termination Variant*
- Output Compatiblity
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pad 1 Function*

Example

- 40.0MHz CXO3M SM1
  CMOS ±100ppm ±50ppm –55 to 125C 3.3V NC

CXO3M(W) SMD CLOCK OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010

Description

For those applications requiring a 32.768kHz oscillator with high frequency stability over temperature or fast start-up, Statek offers the AT-crystal based 32.768kHz CXO3M(W) oscillator. A frequency stability of ±20 ppm over –40°C to +85°C is possible, compared to hundreds of parts-per-million for tuning-fork based 32.768kHz oscillators. Whereas tuning-fork based oscillators start in hundreds of milliseconds, Statek's 32.768kHz CXO3M(W) oscillators start in 0.8ms (typically)

Features

- High frequency stability over temperature
- Fast start-up
- High shock resistance
- Surface mount
- CMOS and TTL compatible
- Optional Output Enable/Disable with Tri-State
- Low EMI emission
- Hermetically sealed ceramic package
- Full military testing available

Applications

Miltary & Aerospace

- Aircraft landing gear
- Avionics
- Smart Munitions

Termination Variants

- SM1 = Gold Plated (RoHS Compliant)
- SM3 = Solder Dipped (non RoHS Compliant)
- SM5 = Solder Dipped (RoHS Compliant)

Frequency Range

- 32.768kHz

Output Compatiblity & Load

- CMOS/TTL
- Drive Compatiblity 15pF max

Supply Voltage

- 3.3V±10%

Frequency Tolerance

- ±100ppm

Frequency Stability

- ±10ppm, ±20ppm, ±30ppm, ±50ppm, ±100ppm
- Does not include Calibration tolerance

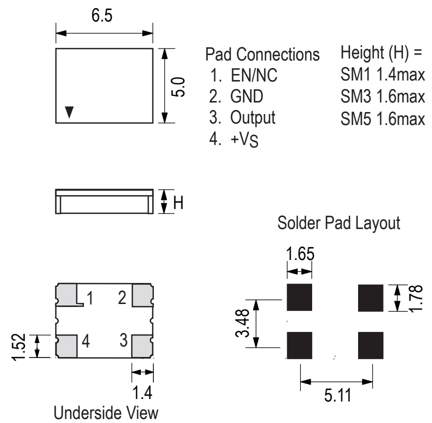
Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C
- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

Outline (mm) typ



Pad 1 Function

Enable/Disable Option (EN option)

- Internal oscillator stops, low current
- Pad 1 logic '0', pad 3 high impedance
- Pad 1 logic '1', pad 3 output

No Connection Option (NC option)

- Pad 1 not connected internally

Ageing

- ±10ppm max in 1st year

Environmetal

- Shock: 3000G, 0.3ms, 1/2 sine wave
- Vibration: MIL-STD-202G, Method 204D, Test Condition D: 20G (10Hz-2000Hz), swept sine wave

Packaging

- Tray pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see page 372)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Termination Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pad 1 Function

Example

- 32.768kHz CXO3M(W) SM1
  CMOS/TTL ±100ppm ±50ppm –10 to 70 3.3V NC

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (typ)	Rise Time (t_r)	Fall Time (t_f)	Duty Cycle	Model Number
32.768kHz	±10ppm ±20ppm ±30ppm ±50ppm ±100ppm	3.3V±10%	500µA	1µs	1µs	45/55%	CXO3M (W)
Note: For other frequency/specification combinations, please contact our sales offices							

CXOM SMD CLOCK OSCILLATORS

ISSUE 9; 1 NOVEMBER 2010

Description

Statek's surface-mount CXOM oscillators consist of a Statek miniature quartz crystal and a CMOS/TTL compatible hybrid circuit in a low-profile ceramic package with an extremely small footprint

Features

- Designed for surface mount applications using infrared, vapor phase, or epoxy mount techniques
- CMOS and TTL compatible
- Low power consumption
- Optional Output Enable/Disable with Tri-State
- Low EMI emission
- High shock resistance
- Full military testing available
- Hermetically sealed ceramic package

Applications

Military & Aerospace

- Smart Munitions
- Cockpit Systems
- Navigation

Industrial, Computer & Communications

- Industrial Controls
- Instrumentation
- Microprocessor Clocks

Medical

- Infusion Pumps

Termination Variants

- SM1 = Gold Plates (RoHS Compliant)
- SM3 = Solder Dipped (non RoHS Compliant)
- SM5 = Solder Dipped (RoHS Compliant)

Frequency Range

- 300kHz to 120MHz

Output Compatiblity & Load

- CMOS/TTL
- Drive Compatiblity 15pF max

Supply Voltage

- 5V±10%

Frequency Tolerance

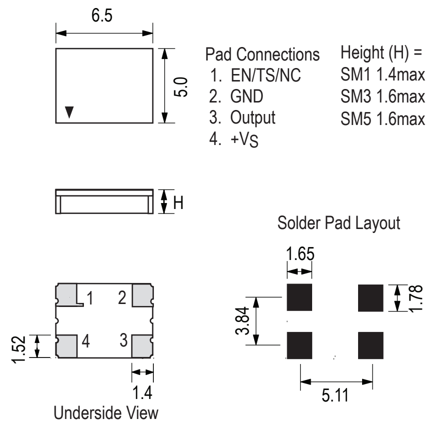
- ±100ppm

Frequency Stability

- ±50ppm
- ±100ppm
- Does not include calibration tolerance

CLOCK OSCILLATORS

Outline (mm) typ



Operating Temperature Range

- –10 to 70°C
- –40 to 85°C
- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

Pad 1 Function

Tri-State Operation (TS option)

- Pad 1 normally high (internal pull-up resistor)
- Pad 1 logic '0', pad 3 high impedance
- Pad 1 logic '1', pad 3 output

Enable/Disable Option (EN option)

- Internal oscillator stops, low current
  Pad 1 logic '0', pad 3 high impedance
  Pad 1 logic '1', pad 3 output

No Connection Option (NC option)

- Pad 1 not connected internally

Packaging

- Tray pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see page 372)

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (typ)	Rise Time (t_r)	Fall Time (t_f)	Duty Cycle	Model Number
300.0kHz to 120.0MHz	±50ppm ±100ppm	5.0V	4mA @ 10MHz	6ns	6ns	40/60%	CXOM
			8mA @ 24MHz				
			10mA @ 30MHz				
			12mA @ 40MHz				
			14mA @ 50MHz				
Note: For other frequency/specification combinations, please contact our sales offices							

Ordering Information (*minimum required)

- Frequency*
- Model*
- Termination Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pad 1 Function*

Example

- 40.0MHz CXOM SM1
  CMOS ±100ppm ±100ppm –10 to 70C 5V TS

CXOQ SMD CLOCK OSCILLATORS

ISSUE 1: 1 NOVEMBER 2010

Description

Statek's ultra miniature and ultra low profile CXOQ oscillators consist of a CMOS/TTL compatible hybrid circuit and a state-of-the-art, miniature, fundamental-mode crystal

Features

- Designed for surface mount applications
- CMOS and TTL compatible
- Low power consumption
- Full military testing available
- Optional Output Enable/Disable with Tri-State
- Low EMI emission
- Hermetically sealed ceramic package

Applications

- Fiber Channel
- WLAN
- Sonet/SDM
- PC Card
- Bluetooth
- DSL
- General Clock

Termination Variants

- SM1 = Gold Plated (RoHS Compliant)
- SM3 = Solder Dipped (non RoHS Compliant)
- SM5 = Solder Dipped (RoHS Compliant)

Frequency Range

- 400kHz to 100MHz

Output Compatiblity & Load

- CMOS/TTL
- Drive Compatiblity 15pF max

Supply Voltage

- 1.8 to 3.3V ±10%

Frequency Tolerance

- ±30ppm to ±100ppm

Frequency Stabiliies

- ±50ppm, ±100ppm
- Does not include Calibration tolerance

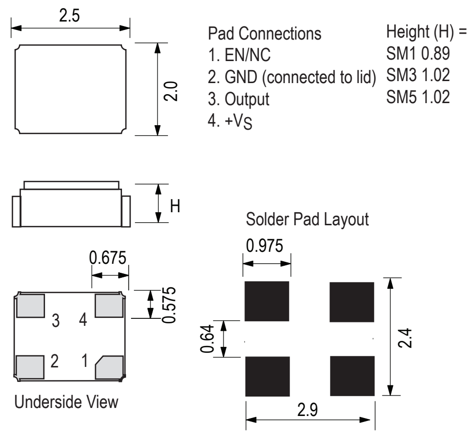
Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C
- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

Outline (mm) typ



Pad 1 Function

Enable/Disable Option (EN option)

- Internal oscillator stops, low current
- Pad 1 logic '0', pad 3 high impedance
- Pad 1 logic '1', pad 3 output

No Connection Option (NC option)

- Pad 1 not connected internally

Ageing

- ±5ppm max in 1st year

Environmental Specification

- Shock: 5000g 0.3ms 1/2 Sine
- Vibration: MIL-STD-202G, Method 204D, Condition D. 20g 10-2000Hz swept Sine

Packaging

- Tray pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see page 372)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Supply Voltage*
- Termination Variant*
- Output Compatiblity
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Pad 1 Function*

Example

- 40.0MHz CXOQ 3.3V SM1
  CMOS ±50ppm ±100ppm –55 to 125C NC

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (typ @ 50MHz)	Rise Time (t_r)	Fall Time (t_f)	Duty Cycle	Model Number
400.0kHz to 100.0MHz	±50ppm ±100ppm	1.8V±10%	3mA	10ns	10ns	45/55%	CXOQ 1.8V
400.0kHz to 100.0MHz	±50ppm ±100ppm	2.5V±10%	-	10ns	10ns	45/55%	CXOQ 2.5V
400.0kHz to 100.0MHz	±50ppm ±100ppm	3.0V±10%	-	10ns	10ns	45/55%	CXOQ 3.0V
400.0kHz to 100.0MHz	±50ppm ±100ppm	3.3V±10%	6mA	10ns	10ns	45/55%	CXOQ 3.3V
Note: For other frequency/specification combinations, please contact our sales offices							

CXOX SMD CLOCK OSCILLATORS

ISSUE 2: 1 NOVEMBER 2010

Description

Statek's ultra miniature and ultra low profile CXOX/CXOXHG oscillators consist of a CMOS/TTL compatible hybrid circuit and a state-of-the-art, miniature, fundamental-mode crystal

Features

- Designed for surface mount applications
- CMOS and TTL compatible
- Low power consumption
- Full military testing available
- High shock resistance (HG version)
- Optional Output Enable/Disable with Tri-State
- Low EMI emission
- Hermetically sealed ceramic package

Applications

Military & Aerospace

- Long range missiles
- Projectile electronics
- Smart munitions
- Communications
- Navigation
- GPS

Industrial, Computer & Communications

- Miniature clock oscillator
- Handheld instrumentation
- PDA
- Transponder/Animal migration

Medical

- Test & diagnostic equipment
- Handheld devices

Termination Variants

- SM1 = Gold Plated (RoHS Compliant)
- SM3 = Solder Dipped (non RoHS Compliant)
- SM5 = Solder Dipped (RoHS Compliant)

Frequency Range

- 1MHz to 160MHz

Output Compatiblity & Load

- CMOS/TTL
- Drive Compatiblity 15pF max

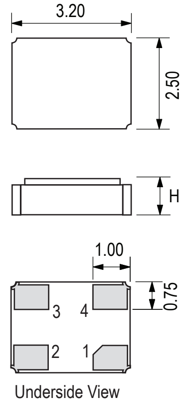
Supply Voltage

- 1.8 to 5.0V ±10%

Frequency Tolerance

- ±100ppm

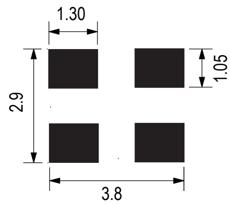
Outline (mm) typ



Pad Connections
1. NC/EN
2. Ground
3. Output
4. +V_S

Height (H) =
SM1 1.00
SM3 1.12
SM5 1.12

Solder Pad Layout



Frequency Stability

- ±50ppm, ±100ppm
- Does not include Calibration tolerance

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C
- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

Pad 1 Function

Enable/Disable Option (EN option)

- Internal oscillator stops, low current
- Pad 1 logic '0', pad 3 high impedance
- Pad 1 logic '1', pad 3 output

No Connection Option (NC option)

- Pad 1 not connected internally

Ageing

- ±10ppm max in 1st year

Packaging

- Tray pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see page 372)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Supply Voltage*
- Termination Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Pad 1 Function*

Example

- 40.0MHz CXOX 3.3V SM1
  CMOS ±100ppm ±100ppm –40 to 80C NC

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (typ)	Rise Time (t_r)	Fall Time (t_f)	Duty Cycle	Model Number
1.0MHz to 160.0MHz	±50ppm ±100ppm	1.8V±10%	1.5mA @ 24MHz 2mA @ 32MHz 3mA @ 50MHz 12mA @ 130MHz	6ns	6ns	40/60%	CXOX 1.8V
		3.3V±10%	3mA @ 24MHz 5mA @ 32MHz 6 @ 50MHz 23 @ 130MHz				CXOX 3.3V
		5.0V±10%	8 @ 24MHz 10 @ 32MHz 13 @ 50MHz 39 @ 130MHz				CXOX 5.0V
Note: For other frequency/specification combinations, please contact our sales offices							

HFXO SMD CLOCK OSCILLATORS

ISSUE 2: 1 NOVEMBER 2010

Description

Statek's high-frequency, surface-mount HFXO oscillators, available in tight tolerances, consist of a Statek miniature quartz crystal and a CMOS/TTL compatible hybrid circuit in a ceramic package. Each crystal is pre-qualified before assembly into the oscillator through electrical tests and characterization over temperature

Features

- Tight tolerance
- High shock resistance
- CMOS and TTL compatible
- Low power consumption
- Optional Output Enable/Disable with Tri-State
- Low EMI emission
- Full military testing available
- Low Jitter

Applications

Military & Aerospace

- Smart Munitions
- Cockpit Systems
- Navigation

Industrial, Computer & Communications

- Industrial Controls
- Instrumentation
- Down-hole Drilling

Termination Variants

- SM1 = Gold Plated (RoHS Compliant)
- SM3 = Solder Dipped (non RoHS Compliant)
- SM5 = Solder Dipped (RoHS Compliant)

Frequency Range

- 218.75kHz to 200MHz

Output Compatiblity & Load

- CMOS/TTL
- Drive Compatiblity 15pF max

Supply Voltages

- 1.8 to 5.0V ±10%

Frequency Tolerance

- ±10ppm, ±20ppm, ±50ppm

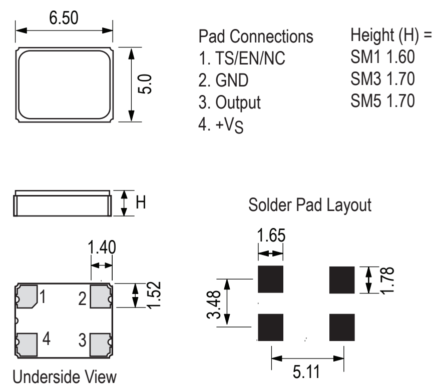
Frequency Stabilities

- ±10ppm, ±20ppm, ±40ppm
- Does not include Calibration tolerance

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C
- –55 to 125°C

Outline (mm) typ



Storage Temparature Range

- –55 to 125°C

Pad 1 Function

Tri-State Option (TS option)

- Pad 1 normally high (internal pull-up resistor)
- Pad 1 logic '0', pad 3 high impedance
- Pad 1 logic '1', pad 3 output

Enable/Disable Option (EN option)

- Internal oscillator stops, low current
- Pad 1 logic '0', pad 3 high impedance
- Pad 1 logic '1', pad 3 output

No Connection Option (NC option)

- Pad 1 not connected internally

Ageing

- ±10ppm max in 1st year

Environmental

- Shock: 0.5ms, 1/2 sine wave, please select: 5000G, 10000G, 20000G, 30000G, 50000G or 75000G
- Vibration: 20G (10Hz-2000Hz), swept sine

Packaging

- Tray pack

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Rise Time (t_r)	Fall Time (t_f)	Duty Cycle	Model Number
218.75kHz to 200.0MHz	±10ppm ±20ppm ±40ppm	1.8V	10ns	10ns	45/55%	HFXO
		3.0V				
		3.3V				
		5.0V				
Note: For other frequency/specification combinations, please contact our sales offices						

CLOCK OSCILLATORS

Ordering Information (*minimum required)

- Frequency*
- Model*
- Termination Variant*
- Output Compatiblity
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Pad 1 Function*
- Shock Requirement*

Example

- 40.0MHz HFXO SM1
  CMOS/TTL ±10ppm ±20ppm –10 to 70C NC 5000G

IQXO-10 SMD CLOCK OSCILLATORS

ISSUE 1; 3 MARCH 2011 - RoHS 2002/95/EC

Description

- Please note: This document is intended to illustrate the general capability and versatility of IQD's design. For specific enquiries please contact one of IQD's sales offices where we can tailor a unique specification to meet your needs.
- Low phase noise optimised design
- HCMOS or LVPECL available
- Enable / disable function available

Frequency Range

- 2 to 800MHz
- 2MHz to 125MHz (HCMOS)
- 60MHz to 800MHz (LVPECL)

Output Compatibility

- HCMOS or LVPECL

Supply Voltage

- 3.3V or 5.0V

Frequency Stabilities Vs Operating Temperature Range

- 0 to 70°C ±10ppm
- –40 to 85°C ±20ppm

Enable/Disable Operation

- HCMOS
  Logic '1' or no connection to pad 1 enables oscillator output
  Logic '0' to pad 1 disables oscillator output
- LVPECL
  Logic '1' to pad 2 disables oscillator output
  Logic '0' or no connection to pad 2 enables oscillator output

Duty Cycle

- 40/60% (45/55% available)

Phase Noise (typ @ 100MHz HCMOS)

- –75dBc/Hz @10Hz
- –105dBc/Hz @100Hz
- –135dBc/Hz @1kHz
- –150dBc/Hz @10kHz
- –155dBc/Hz @100kHz

Ageing (15 years)

- ±10ppm max

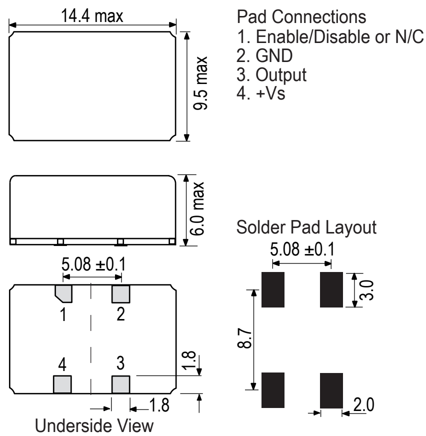
Storage Temperature Range

- –55 to 105°C

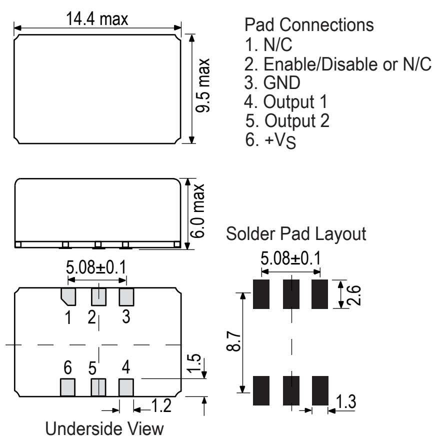
Environmental

- Enviromental testing taken from IEC 60068
- Please contact our sales offices for full details

Outline (mm) HCMOS



Outline (mm) LVPECL



Packaging

- Tape and reel in accordance with EIA-481-D, 600pcs per reel (please see Application Notes)

Minimum Enquiry Information

- Frequency
- Model
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Supply Voltage
- Duty Cycle

NOTES

IQXO-22, -23 CLOCK OSCILLATORS

ISSUE 20; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Not recommended for new designs

Description

- Standard 8pin DIL 5.0V supply crystal oscillator
- Available with or without a standby function
- Crystal oscillator in an 8pin DIL package hermetically sealed
- For parts that meet tougher environmental specifications please see our IQXO-35 and IQXO-36 range
- For parts that meet tough environmental specifications and military temperature range please see our IQXO-85 and IQXO-87
- For individually screened parts that meet tough environmental specifications and military temperature range please see our IQXO-86 and IQXO-88
- Fast Make capability: CFPP-23 series programmable oscillators are the nearest equivalent fast make model

Frequency Range

- 500kHz to 160MHz

Output Compatibility & Load

- HCMOS/TTL
- Drive Capability: 50pF max or 10TTL (<70.0MHz) 30pF max (70.0 to 160.0MHz)
- No Standby Operation (IQXO-22)
- Standby Operation (IQXO-23)

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (over operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

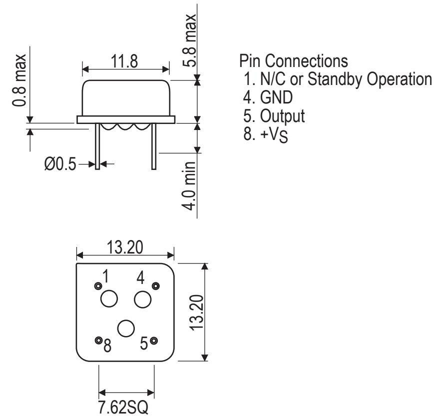
Standby Operation (IQXO-23)

- No connection or Logic ‘1’ to pin 1 enables oscillator output
- Logic ‘0’ to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- Maximum ‘pull-down’ resistance required to disable output = 20kΩ
- Standby Current: 50µA typical

Environmental

- Terminal Strength: 0.91kg max force perpendicular to top and bottom
- Hermetic Seal: Not to exceed $1x10^{-8}$ mBar litres of Helium leakage
- Solderability: MIL-STD-202E, Method 208C
- Vibration: 0.76mm displacement, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane

Outline (mm)



- Rapid Change of Temperature over Operating Temperature Range: 10 cycles
- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes

Packaging

- Bulk

Order Information Required

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

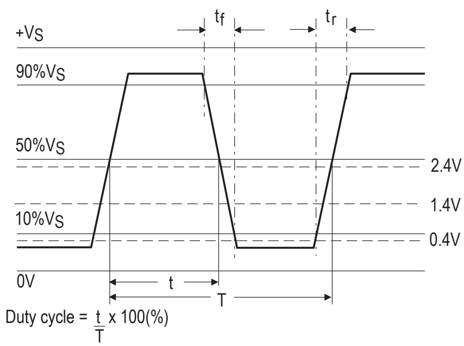
Example

- 20.0MHz IQXO-22
  HCMOS ±50ppm 0 to 70C 5.0V

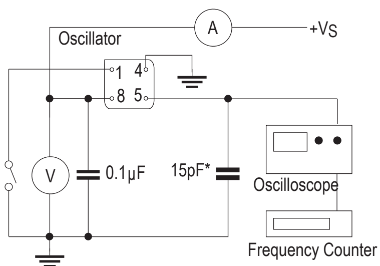
Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
500.0kHz to <5.0MHz	±25ppm ±50ppm ±100ppm	5V±0.25V	20mA	15ns	15ns	45/55%	IQXO-22, -23
5.0MHz to <16.0MHz				10ns	10ns		
16.0MHz to <30.0MHz			30mA				
30.0MHz to <50.0MHz			40mA	8ns	8ns		
50.0MHz to <70.0MHz			50mA	6ns	6ns	40/60%	
70.0MHz to 160.0MHz			70mA	5ns	5ns		
Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices							
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Test Circuit



*Inclusive of jigging and equipment capacitance

Note: Pin 1 = No connection on non standby option models

IQXO-35, -36 CLOCK OSCILLATORS

ISSUE 10; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Designed to meet tough environmental specifications
- 8pin DIL 5.0V supply crystal oscillator
- Available with or without a standby function
- Crystal oscillator in an 8pin DIL package hermetically sealed
- For standard parts in this package please see our IQXO-22 and IQXO-23
- For parts that meet tough environmental specifications and military temperature range please see our IQXO-85 and IQXO-87
- For individually screened parts that meet tough environmental specifications and military temperature range please see our IQXO-86 and IQXO-88

Package Outline

- 8-pin DIL

Frequency Range

- 500kHz to 70MHz

Output Compatibility & Load

- HCMOS/TTL
- Drive Capability: 50pF max or 10TTL
- No Standby Operation (IQXO-35)
- Standby Operation (IQXO-36)

Frequency Tolerance (Optional)

- ±5ppm, ±10ppm, ±25ppm

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (over operating temperature range)

Operating Temperature Range

- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

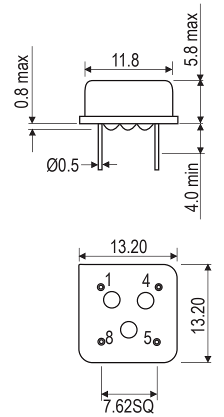
Standby Operation (IQXO-36)

- No connection or Logic ‘1’ to pin 1 enables oscillator output
- Logic ‘0’ to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- Maximum ‘pull-down’ resistance required to disable output = 20kΩ
- Standby Current: 50µA typ

Environmental

- Acceleration: 490m/s^2 for 1 minute in the ‘Y1’ plane
- Bump: 4000 bumps at 390m/s^2 in each of the three mutually perpendicular planes
- Hermetic Seal: Not to exceed 1 x 10^{-8} mBar litres of Helium leakage

Outline (mm)



Pin Connections
1. N/C or Standby Operation
4. GND
5. Output
8. $+V_S$

- Humidity: Steady State: in accordance with Test Ca of IEC 60068-2-3, for 56 days at 40°C at a relative humidity of 93%, cyclic: in accordance with Test Db variant of IEC 60068-2-30, at severity (b), 55°C for six cycles
- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes
- Solderability: IEC 60068 Test TA
- Rapid Change of Temperature over Operating Temperature Range: 10 cycles
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-2000Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

Packaging

- Bulk

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Tolerance
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

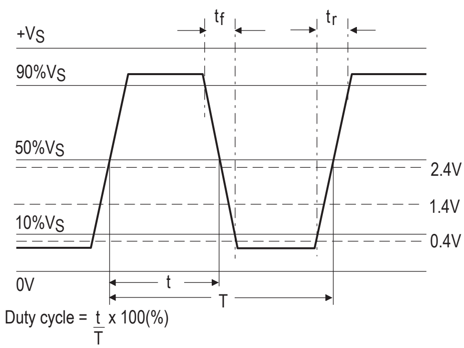
Example

- 20.0MHz IQXO-35
  HCMOS ±10ppm ±50ppm –40 to 85C 5.0V

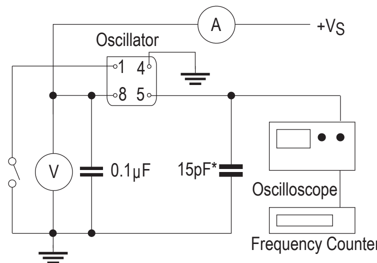
Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
500.0kHz to <5.0MHz	±25ppm ±50ppm ±100ppm	5V±0.25V	20mA	15ns	15ns	45/55%	IQXO-35, -36
5.0MHz to <16.0MHz				10ns	10ns		
16.0MHz to <30.0MHz			30mA				
30.0MHz to <50.0MHz			40mA	8ns	8ns		
50.0MHz to 70.0MHz			50mA	6ns	6ns	40/60%	
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Test Circuit



*Inclusive of jigging and equipment capacitance

Note: Pin 1 = No connection on non standby option models

IQXO-62, -63 SMD CLOCK OSCILLATORS

ISSUE 8; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 6 x 3.5 crystal oscillator
- Ceramic package with a seam sealed metal lid, hermetically sealed

Frequency Range

- 1.8 to 50MHz

Output Compatibility & Load

- HCMOS (5.0V) (IQXO-62) 50pF/10TTL max
- HCMOS (3.3V) (IQXO-63) 15pF max

Frequency Stabilities

- ±50ppm, ±100ppm (inclusive of supply voltage and output load)
  Note: ±50ppm is not available over –40 to 85°C

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Storage Temperature Range

- –40 to 85°C

Standby Operation

- Logic '1' (IQXO-62 2.2V min, IQXO-63 70%V_S min) to pad 1 enables oscillator output
- Logic '0' (IQXO-62 0.8V max, IQXO-63 30%V_S max) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max (IQXO-63)

Environmental

- Shock: MIL-STD-202F, Method 213B: 1000G, 0.5ms, 1/2 sine wave
- Vibration: MIL-STD-202F, Method 204D, Test Condition D: 20G (10Hz-2000Hz), 4hrs in 3 mutually perpendicular planes (total 12hrs)

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

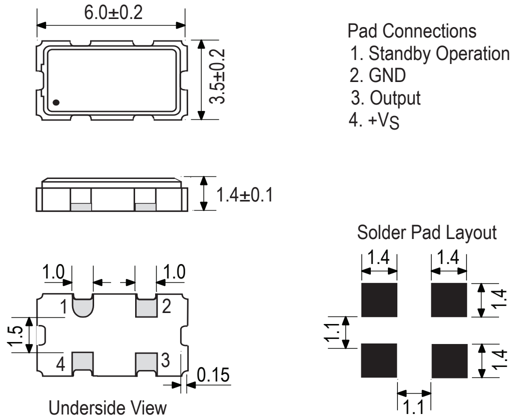
Ordering Information (*minimum required)

- Frequency*
- Model Number*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

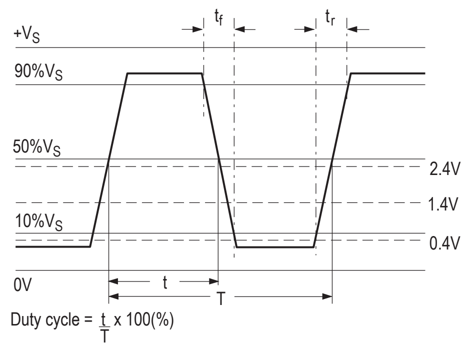
Example

- 10.0MHz IQXO-63
  HCMOS ±50ppm –10 to 70C 3.3V

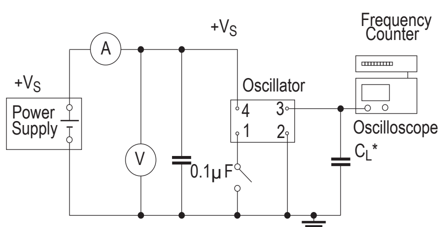
Outline (mm)



Output Waveform



Test Circuit



* Inclusive of jigging and equipment capacitance
Note: C_L = 50pF for model IQXO-62 and 15pF for model IQXO-63

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.8 to 32.0MHz	±50ppm ±100ppm	3.3V±0.3V	15mA	7ns	7ns	40/60%	IQXO-63
		5.0V±0.5V	27mA				IQXO-62
> 32.0 to 50.0MHz		3.3V±0.3V	20mA				IQXO-63
		5.0V±0.5V	45mA				IQXO-62
Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices							
Note: For other frequency/specification combinations, please contact our sales offices							

IQXO-85, -86, -87, -88 MILITARY CLOCK OSCILLATORS

ISSUE 9; 1 NOVEMBER 2010

Description

- Meets military temperature range and tough environmental specifications
- Available with or without 100% screening
- 8pin DIL 5.0V supply crystal oscillator
- Available with or without a standby function
- Crystal oscillator in an 8pin DIL package hermetically sealed
- For standard parts in this package please see our IQXO-22 and IQXO-23
- For parts that meet tough environmental specifications please see our IQXO-35 and IQXO-36

Frequency Range

- 250kHz to 72MHz

Output Compatibility & Load

- HCMOS/TTL
- Drive Capability: 50pF or 10TTL
- No Standby Operation (IQXO-85, -86)
- Standby Operation (IQXO-87, -88)

Frequency Tolerance (Optional)

- ±10ppm, ±25ppm

Frequency Stabilities

- ±50ppm, ±100ppm (inclusive of supply voltage variations over the operating temperature range)

Operating Temperature Range

- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

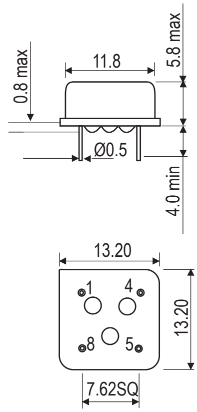
Standby Operation (IQXO-87, -88)

- No connection or Logic ‘1’ to pin 1 enables oscillator output
- Logic ‘0’ to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- Standby Current: 50µA typical

Environmental

- Bump: 4000 bumps at 391m/s^2 in each of the three mutually perpendicular planes
- Hermetic Seal: Not to exceed 1 x 10^{-8} mBar litres of Helium leakage
- Humidity: Steady State: in accordance with Test Ca of IEC 60068-2-3, for 56 days at 40°C at a relative humidity of 93%, cyclic: in accordance with Test Db variant 1 of IEC 60068-2-30, at severity (b), 55°C for six cycles
- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes
- Solderability: IEC 60068, Test TA
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-2000Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

Outline (mm)



Pin connections
1. N/C or Standby Operation
4. GND
5. Output
8. +V$_S$

Screening on each device (IQXO-86, -88)

- Acceleration: 49000m/s^2 for 1 minute in the ‘Y1’ plane
- High Temperature Storage: 24hrs at 150°C
- Rapid Change of Temperature over Operating Temperature Range: 10 cycles
- Dynamic burn-in for 168hrs at 125°C
- Check all parameters & assess

Packaging

- Bulk

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Tolerance
- Frequency Stability*
- Operating Temperature Range

Example

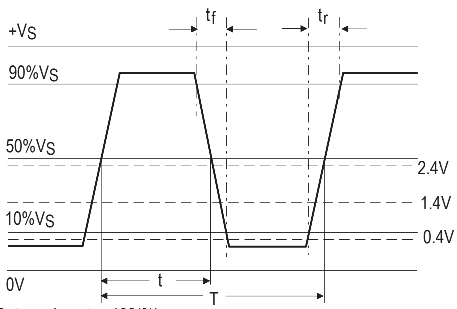
- 20.0MHz IQXO-85
  HCMOS ±10ppm ±50ppm –55 to 125C 5.0V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
250.0kHz to <8.0MHz	±50ppm ±100ppm	5V±0.5V	5mA	10ns	10ns	45/55%	IQXO-85, -86, -87, -88
8.0MHz to <23.0MHz			10mA	5ns	5ns	40/60%	
23.0MHz to <48.0MHz			50mA				
48.0MHz to 72.0MHz			65mA	3ns	3ns		
Note: For other frequency/specification combinations, please contact our sales offices							

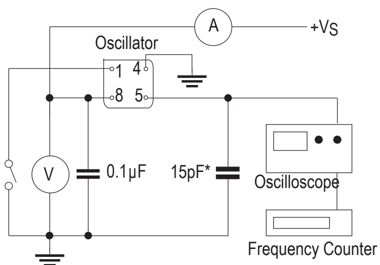
CLOCK OSCILLATORS

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



*Inclusive of jigging and equipment capacitance

Note: Pin 1 = No connection on non standby option models

CLOCK OSCILLATORS

IQXO-149 CLOCK OSCILLATORS

ISSUE 16; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Not recommended for new designs

Description

- Standard 14pin DIL 5.0V supply crystal oscillator with standby function
- Crystal oscillator in a 14pin DIL package hermetically sealed
- For a none tristate version of this package please see our IQXO-350
- For parts that meet tougher environmental specifications please see our IQXO-366
- For parts that meet tough environmental specifications and military temperature range please see our IQXO-627
- For individually screened parts that meet tough environmental specifications and military temperature range please see our IQXO-628
- For tight stabilities over temperature please see our IQXO-415
- Fast Make capability: CFPP-149 series programmable oscillators are the nearest equivalent fast make model

Frequency Range

- 500kHz to 160MHz

Output Compatibility & Load

- HCMOS/TTL
- Drive Capability: 50pF max or 10TTL (<70.0MHz)
  30pF max (70.0 to 160.0MHz)

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (over operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

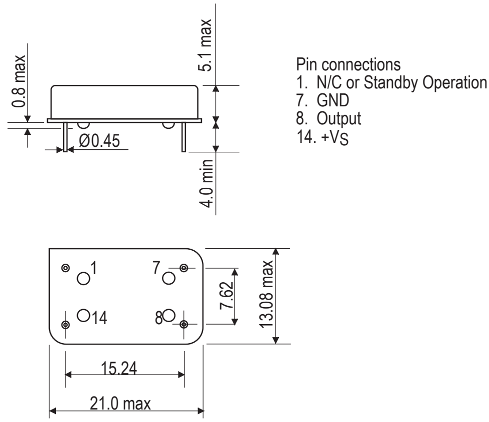
Standby Operation

- No connection or Logic ‘1’ to pin 1 enables oscillator output
- Logic ‘0’ to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- Maximum ‘pull-down’ resistance required to disable output = 20kΩ
- Standby Current: 50µA typical

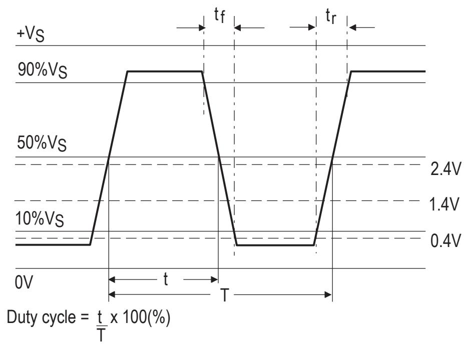
Environmental

- Terminal Strength: 0.91kg max force perpendicular to top and bottom
- Hermetic Seal: Not to exceed 1x10^{-8} mBar litres of Helium leakage
- Solderability: MIL-STD-202E, Method 208C
- Vibration: 0.76mm displacement, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane
- Rapid Change of Temperature over Operating Temperature Range: 10 cycles

Outline (mm)



Output Waveform



- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes

Packaging

- Bulk

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

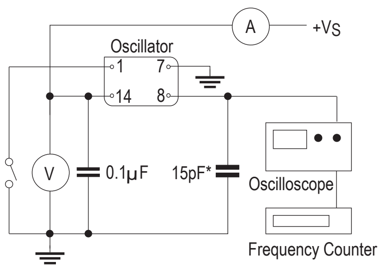
Example

- 20.0MHz IQXO-149
  HCMOS ±50ppm 0 to 70C 5.0V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
500.0kHz to <5.0MHz	±25ppm ±50ppm ±100ppm	5V±0.25V	20mA	15ns	15ns	45/55%	IQXO-149
5.0MHz to <16.0MHz				10ns	10ns		
16.0MHz to <30.0MHz			30mA				
30.0MHz to <50.0MHz			40mA	8ns	8ns		
50.0MHz to <70.0MHz			50mA	6ns	6ns	40/60%	
70.0MHz to 160.0MHz			70mA	5ns	5ns		
Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices							
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



*Inclusive of jigging and equipment capacitance

Note: Pin 1 = No connection on non standby option models

IQXO-331, -336 CLOCK OSCILLATORS

CLOCK OSCILLATORS

ISSUE 10; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- ACMOS/TTL compatible output
- 14pin DIL 5.0V supply crystal oscillators
- Available with or without a tristate function
- Crystal oscillator in a 14pin DIL package hermetically sealed

Frequency Range

- 70MHz to 150MHz

Output Compatibility & Load

- ACMOS/TTL
- Drive Capability: 50pF max (70.0 to 110.0MHz)
  15pF max (>110.0 to 150.0MHz)
  10TTL
- Non tri-state (IQXO-336)
- Tri-state (IQXO-331)

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (over operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Tri-State Operation (IQXO-331)

- No connection or Logic ‘1’ to pin 1 enables oscillator output
- Logic ‘0’ to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- Maximum ‘pull-down’ resistance required to disable output = 20kΩ

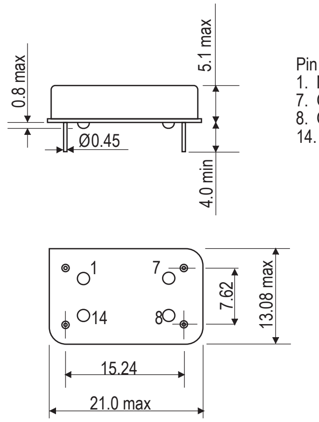
Environmental

- Terminal Strength: 0.91kg max force perpendicular to top and bottom
- Hermetic Seal: Not to exceed 1 x 10^{-8} mBar litres of Helium leakage
- Solderability: MIL-STD-202E, Method 208C
- Vibration: 0.76mm displacement, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane
- Rapid Change of Temperature over Operating Temperature Range: 10 cycles
- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes

Packaging

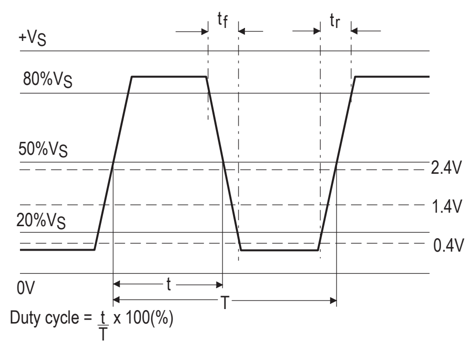
- Bulk

Outline (mm)



Pin connections
1. N/C or Standby Operation
7. GND
8. Output
14. $+V_S$

Output Waveform



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

Example

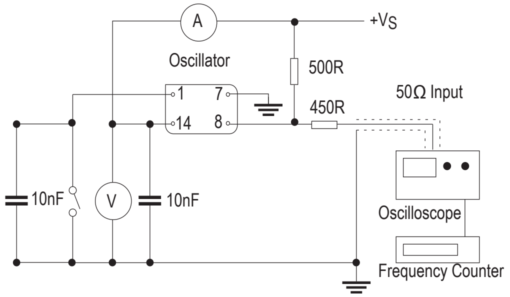
- 100.0MHz IQXO-331
  ACMOS ±50ppm 0 to 70C 5.0V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (20-80%)	Fall Time (tf) (80-20%)	Duty Cycle	Model Number
70.0MHz to <90.0MHz	±25ppm ±50ppm ±100ppm	5V±0.25V	45mA	3ns	3ns	40/60%	IQXO-331, -336
90.0MHz to <115.0MHz			60mA				
115.0MHz to 150.0MHz			65mA				
Note: For other frequency/specification combinations, please contact our sales offices							

CLOCK OSCILLATORS

Test Circuit



Note: Pin 1 = No connection on non tri-state models

IQXO-350 CLOCK OSCILLATORS

ISSUE 20; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Not recommended for new designs

Description

- Standard 14pin DIL 5.0V supply crystal oscillators with no standby function
- Crystal oscillator in a 14pin DIL package hermetically sealed
- For a version of this package with a standby function please see our IQXO-149
- For parts that meet tougher environmental specifications please see our IQXO-365
- For parts that meet tough environmental specifications and military temperature range please see our IQXO-625
- For individually screened parts that meet tough environmental specifications and military temperature range please see our IQXO-626
- For tight stabilities over temperature please see our IQXO-415

Frequency Range

- 1kHz to 160MHz

Output Compatibility & Load

- HCMOS/TTL
- Drive Capability: 50pF max or 10TTL (100kHz to <70MHz)
  30pF max (70 to 160MHz)
  15pF max (1 to < 100kHz)

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (over operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

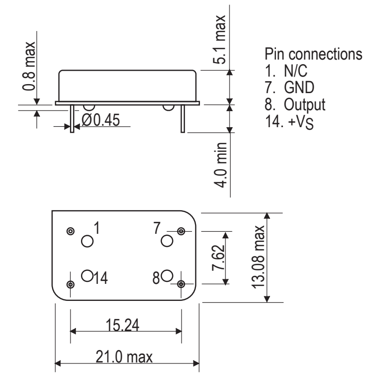
Environmental

- Terminal Strength: 0.91kg max force perpendicular to top and bottom
- Hermetic Seal: Not to exceed 1 x 10^{-8} mBar litres of Helium leakage
- Solderability: MIL-STD-202E, Method 208C
- Vibration: 0.76mm displacement, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane
- Rapid Change of Temperature over Operating Temperature Range: 10 cycles
- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes

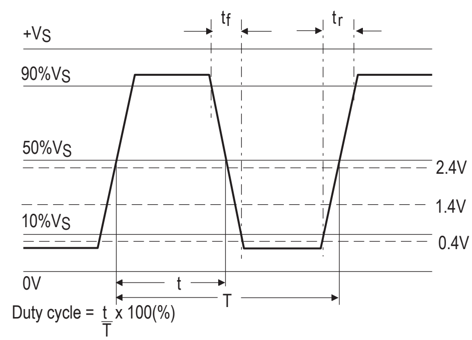
Packaging

- Bulk

Outline (mm)



Output Waveform



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

Example

- 20.0MHz IQXO-350
  HCMOS ±50ppm 0 to 70C 5.0V

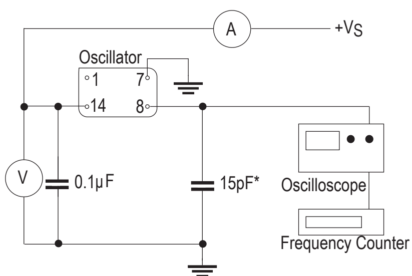
Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.0kHz to <100.0kHz	±25ppm ±50ppm ±100ppm	5V±0.25V	10mA	10ns	10ns	45/55%	IQXO-350
100.0kHz to <250.0kHz				15ns	15ns		
250.0kHz to <5.0MHz			30mA				
5.0MHz to <16.0MHz			15mA	10ns	10ns		
16.0MHz to <30.0MHz			30mA				
30.0MHz to <50.0MHz			40mA	8ns	8ns		
50.0MHz to <70.0MHz			50mA	6ns	6ns	40/60%	
70.0MHz to 160.0MHz			70mA	5ns	5ns		

Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices

Note: For other frequency/specification combinations, please contact our sales offices

Test Circuit



*Inclusive of jigging and equipment capacitance

IQXO-365, -366 CLOCK OSCILLATORS

ISSUE 10; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Designed to meet tough environmental specifications
- 14pin DIL 5.0V supply crystal oscillators
- Available with or without a standby function
- Crystal oscillator in a 14pin DIL package hermetically sealed
- For standard parts in this package please see our IQXO-149 and IQXO-350
- For parts that meet tough environmental specifications and military temperature range please see our IQXO-625 and IQXO-627
- For individually screened parts that meet tough environmental specifications and military temperature range please see our IQXO-626 and IQXO-628
- For tight stabilities over temperature please see our IQXO-415

Frequency Range

- 500kHz to 70MHz

Output Compatibility & Load

- HCMOS/TTL
- Drive Capability: 50pF max or 10TTL
- No Standby Operation (IQXO-365)
- Standby Operation (IQXO-366)

Frequency Tolerance (Optional)

- ±5ppm, ±10ppm, ±25ppm

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (over operating temperature range)

Operating Temperature Range

- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

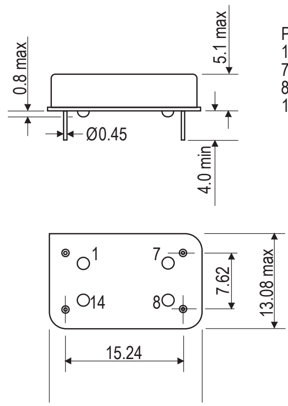
Standby Operation (IQXO-366)

- No connection or Logic ‘1’ to pin 1 enables oscillator output
- Logic ‘0’ to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- Maximum ‘pull-down’ resistance required to disable output = 20kΩ
- Standby Current: 50µA typical

Environmental

- Acceleration: 490m/s^2 for 1 minute in the ‘Y1’ plane
- Bump: 4000 bumps at 390m/s^2 in each of the three mutually perpendicular planes
- Hermetic Seal: Not to exceed 1 x 10^{-8} mBar litres of Helium leakage

Outline (mm)



Pin connections
1. N/C or Standby Operation
7. GND
8. Output
14. +V_S

- Humidity: Steady State: in accordance with Test Ca of IEC 60068-2-3, for 56 days at 40°C at a relative humidity of 93%, cyclic: in accordance with Test Db variant of IEC 60068-2-30, at severity (b), 55°C for six cycles
- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes
- Solderability: IEC 60068, Test TA
- Rapid Change of Temperature over Operating Temperature Range: 10 cycles
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-2000Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

Packaging

- Bulk

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Tolerance
- Frequency Stability*
- Operating Temperature Range
- Supply Voltage

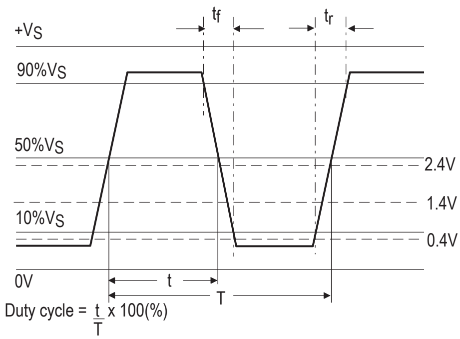
Example

- 20.0MHz IQXO-365
  HCMOS ±10ppm ±50ppm -40 to 85C 5.0V

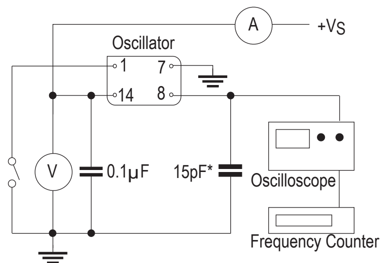
Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
500.0kHz to <5.0MHz	±25ppm ±50ppm ±100ppm	5V±0.25V	20mA	15ns	15ns	45/55%	IQXO-365, -366
5.0MHz to <16.0MHz				10ns	10ns		
16.0MHz to <30.0MHz			30mA				
30.0MHz to <50.0MHz			40mA	8ns	8ns		
50.0MHz to 70.0MHz			50mA	6ns	6ns	40/60%	
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Test Circuit



*Inclusive of jigging and equipment capacitance

Note: Pin 1 = no connection on standby option models

IQXO-415 CLOCK OSCILLATORS

ISSUE 9; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Not recommended for new designs

CLOCK OSCILLATORS

Description

- Designed to meet tight stabilities over temperature
- 14pin DIL 5.0V supply crystal oscillators
- Crystal oscillator in a 14pin DIL package hermetically sealed
- For standard parts in this package please see our IQXO-149
- For parts that meet tough environmental specifications and military temperature range please see our IQXO-627
- For individually screened parts that meet tough environmental specifications and military temperature range please see our IQXO-628

Frequency Range

- 250kHz to 80MHz

Output Compatibility & Load

- HCMOS/TTL
- Drive Capability: 50pF max or 10TTL

Frequency Tolerance (Optional)

- ±5ppm or ±10ppm

Frequency Stabilities

- ±15ppm, ±25ppm, ±50ppm (over operating temperature range)

Frequency Stability Inclusive of:

- Frequency Tolerance (as above)
- Voltage Variation: < ±0.5ppm
- Load Variation: < ±0.5ppm (< 60.0MHz)
- Load Variation: < ±1.0ppm (≥ 60.0MHz)
- Ageing for 5 years: < ±5ppm

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

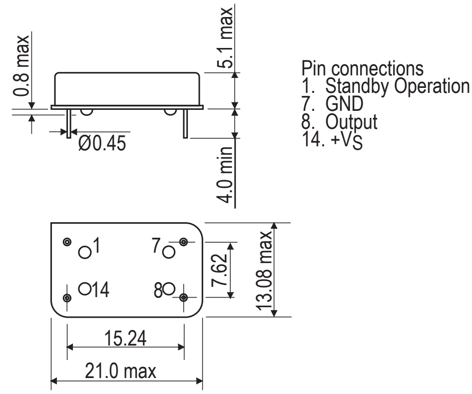
Standby Operation

- No connection or Logic ‘1’ to pin 1 enables oscillator output
- Logic ‘0’ to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- Standby Current: 50µA typical

Environmental

- Acceleration: 490m/s^2 for 1 minute in the ‘Y1’ plane
- Bump: 4000 bumps at 390m/s^2 in each of the three mutually perpendicular planes
- Hermetic Seal: Not to exceed 1 x 10^{-8} mBar litres of Helium leakage
- Humidity: Steady State: in accordance with Test Ca of IEC 60068-2-3, for 56 days at 40°C at a relative humidity of 93%, cyclic: in accordance with Test Db variant 1 of IEC 60068-2-30, at severity (b), 55°C for six cycles

Outline (mm)



- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes
- Solderability: IEC 60068, Test TA
- Thermal Shock: 10 cycles from –55 to 125°C
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-2000Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

Packaging

- Bulk

Minimum Order Information Required

- Frequency*
- Model*
- Output
- Frequency Tolerance
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

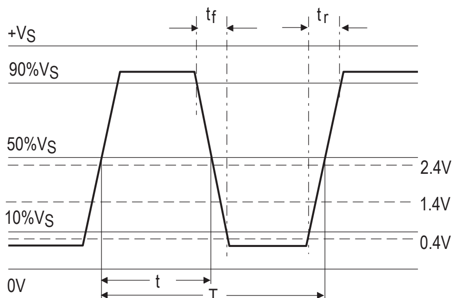
Example

- 20.0MHz IQXO-415
  HCMOS ±10ppm ±50ppm 0 to 70C 5.0V

Electrical Specifications - maximum limiting values

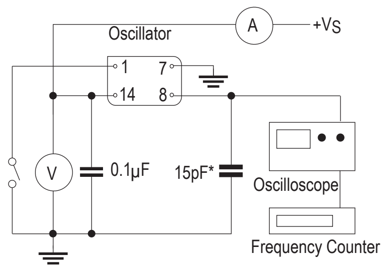
Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
250.0kHz to <8.0MHz	±15ppm ±25ppm ±50ppm	5V±0.5V	5mA	10ns	10ns	45/55%	IQXO-415
8.0MHz to <23.0MHz			10mA	5ns	5ns		
23.0MHz to 80.0MHz			65mA	3ns	3ns		
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



*Inclusive of jigging and equipment capacitance

Note: Pin 1 = No connection on standby option models

IQXO-540, -541, -542 SMD CLOCK OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Holder Style

- Standard 2 by 1.6 crystal oscillators
- Ceramic package with a seam sealed metal lid, hermetically sealed

Frequency Range

- 1 to 80MHz

Output Compatiblity & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 3.3V IQXO-540
- 2.5V IQXO-541
- 1.8V IQXO-542

Frequency Stabilities

- ±30ppm, ±50ppm, ±100ppm (inclusive of tolerance, supply voltage and load variations over the operating temperature range)
  Note: ±30ppm not available over –40 to 85°C

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –40 to 85°C

Standby Operation

- Logic ‘1’ (≥70%V_S) to pad 1 enables oscillator output
- Logic ‘0’ (≤30%V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Curent: 10µA max (pad 1 at logic ‘0’)

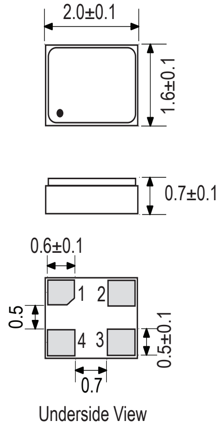
Environmental

- Impact: Weight of 10G dropped to centre of part from a height of 6mm
- Vibration: IEC 60068-2-6: 1.5mm amplitude, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane (total 6hrs)

Packaging

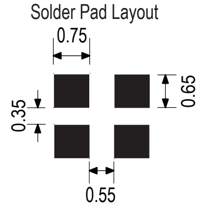
- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 3kpcs per reel (please see Application Notes)

Outline (mm)

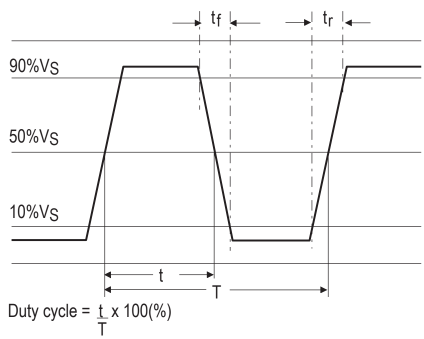


Pad Connections
1. Standby Operation
2. GND
3. Output
4. +V_S

Solder Pad Layout



Output Waveform



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

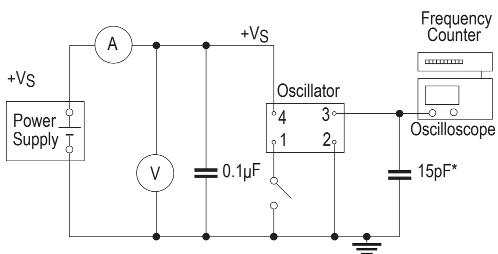
Example

- 10.0MHz IQXO-540
  CMOS ±50ppm –20 to 70C 3.3V

Electrical Specifications – maximum limiting values

Frequency Range	Frequency Stablity	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model
1.0 to <20.0MHz	±30ppm ±50ppm ±100ppm	3.3V±10%	4mA	5ns	5ns	45/55%	IQXO-540
20.0 to <40MHz			7mA				
40.0 to <60.0MHz			10mA				
60.0 to 80.0MHz			15mA				
1.0 to <20.0MHz		2.5V±10%	4mA				IQXO-541
20.0 to <40.0MHz			6mA				
40.0 to <60.0MHz			7mA				
60.0 to 80.0MHz			10mA				
1.0 to <20.0MHz		1.8V±10%	3mA				IQXO-542
20.0 to <40.0MHz			5mA				
40.0 to <60.0MHz			6mA				
60.0 to 80.0MHz			8mA				
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



* Inclusive of jigging and equipment capacitance

IQXO-620, -621 SMD CLOCK OSCILLATORS

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- LVPECL output using a high frequency fundamental crystal to give very low jitter
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Replacement for the CFPS-34 and CFPS-59 packages
- For higher frequencies please see our IQXO-690

Frequency Range

- 15 to 160MHz

Output Compatibility & Load

- LVPECL
- Output Load 50Ω terminated to Vs-2.0V

Supply Voltages

- 3.3V IQXO-620
- 2.5V IQXO-621

Frequency Stabilities

- ±25ppm, ±30ppm, ±50ppm, ±100ppm (inclusive of tolerance and stability over the operating temperature range)

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Standby Operation

- Logic '1' (70% V_S min) to pad 1 enables oscillator output
- Logic '0' (30% V_S max) to pad 1 disables oscillator output; the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current 10μA max

Output Voltages (IQXO-620)

- "0" Level (V_{OL}), +1.680V max
- "1" Level (V_{OH}), +2.275V min

Output Voltages (IQXO-621)

- "0" Level (V_{OL}), +1.095V max
- "1" Level (V_{OH}), +1.475V min

Phase Jitter (12kHz to 20MHz)

- 1ps rms max

Ageing

- ±3ppm max per year at 25°C

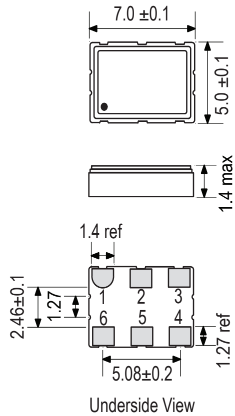
Storage Temperature Range

- –55 to 125°C

Environmental

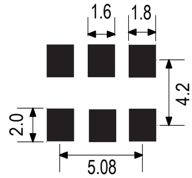
- Shock: MIL-STD-202, Method 213, Condition E: 1000G, 0.5ms 1/2 sine wave
- Vibration: MIL-STD-883, Method 2007, Condtion A: 20G

Outline (mm)

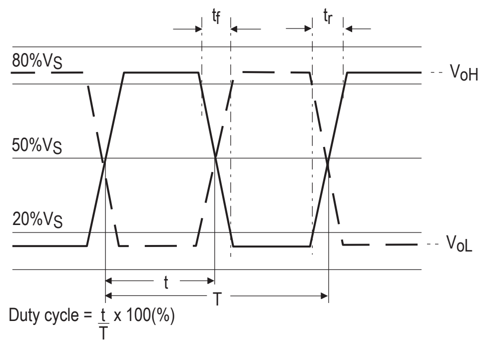


Pad Connections
1. Standby Operation
2. N/C
3. GND
4. Output 1
5. Output 2
6. $+V_S$
Note: a 0.01μF or 0.1μF capacitor is recommended between GND & $+V_S$

Solder Pad Layout



Output Waveform



Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

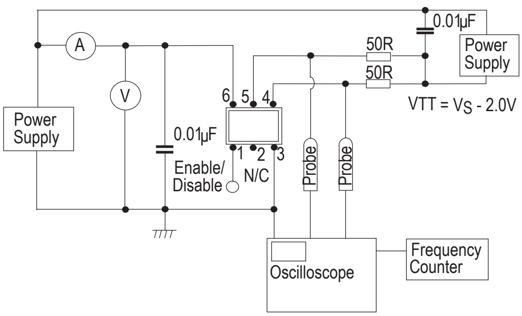
Example

- 100.0MHz IQXO-620
  LVPECL ±50ppm –10 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
15.0 to <100.0MHz	±25ppm ±30ppm ±50ppm ±100ppm	3.3V±5%	70mA	1.0ns	1.0ns	45/55%	IQXO-620
100.0 to 160.0MHz				0.5ns	0.5ns		
15.0 to <100.0MHz		2.5V±5%		1.0ns	1.0ns		IQXO-621
100.0 to 160.0MHz				0.5ns	0.5ns		
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



IQXO-625, -626, -627, -628 MILITARY CLOCK OSCILLATORS

ISSUE 9; 1 NOVEMBER 2010

Description

- Meets military temperature range and tough environmental specifications
- 14pin DIL 5.0V supply crystal oscillators
- Available with or without 100% screening
- Available with or without a standby function
- Crystal oscillator in a 14pin DIL package hermetically sealed
- Gold plated base and leads
- For standard parts in this package please see our IQXO-149 and IQXO-350
- For parts that meet tough environmental specifications please see our IQXO-365 and IQXO-366
- For tight stabilities over temperature please see our IQXO-415

Frequency Range

- 250kHz to 72MHz

Output Compatibility & Load

- HCMOS/TTL
- Drive Capability: 50pF max or 10TTL
- Non tri-state (IQXO-625, -626)
- Tri-state (IQXO-627, -628)

Frequency Tolerance (Optional)

- ±10ppm, ±25ppm

Frequency Stabilities

- ±50ppm, ±100ppm (inclusive of supply voltage variations over the operating temperature range)

Operating Temperature Range

- –55 to 125°C

Storage Temperature Range

- –55 to 125°C

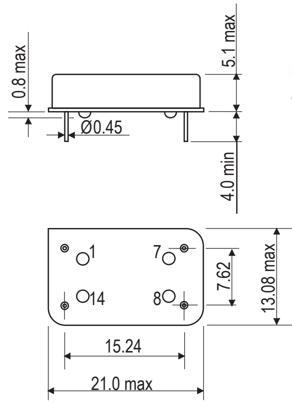
Standby Operation (IQXO-627, -628)

- No connection or Logic ‘1’ to pin 1 enables oscillator output
- Logic ‘0’ to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- Standby Current: 50µA typical

Environmental

- Bump: 4000 bumps at 391m/s^2 in each of the three mutually perpendicular planes
- Hermetic Seal: Not to exceed 1 x 10^{-8} mBar litres of Helium leakage
- Humidity: Steady State: in accordance with Test Ca of IEC 60068-2-3, for 56 days at 40°C at a relative humidity of 93%, cyclic: in accordance with Test Db variant 1 of IEC 60068-2-30, at severity (b), 55°C for six cycles
- Shock: 981m/s^2, 6ms, 3 times in each of 3 mutually perpendicular planes

Outline (mm)



Pin connections
1. Standby Operation
7. GND
8. Output
14. $+V_S$

- Solderability: IEC 60068, Test TA
- Vibration: 10Hz-60Hz, 0.75mm amplitude, 60Hz-2000Hz, 98.1m/s^2, 30mins in 3 mutually perpendicular planes

Screening on each Device (IQXO-626, -628)

- Acceleration: 49000m/s^2 for 1 minute in the ‘Y1’ plane
- High Temperature Storage: 24hrs at 150°C
- Rapid Change of Temperature over Operating Temperature Range: 10 cycles
- Dynamic burn-in for 168hrs at 125°C
- Check all parameters & assess

Packaging

- Bulk

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Tolerance
- Frequency Stability*
- Operating Temperature Range
- Supply Voltage

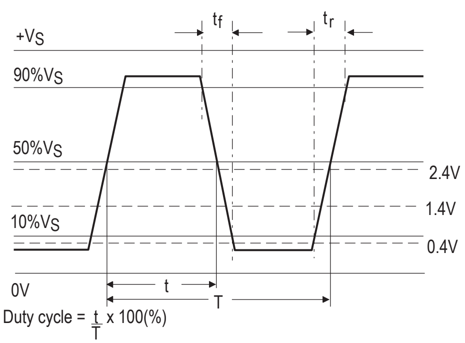
Example

- 20.0MHz IQXO-625
  HCMOS ±10ppm ±50ppm –55 to 125C 5.0V

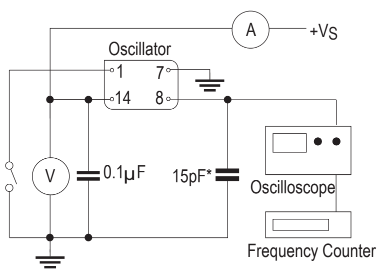
Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
250.0kHz to <8.0MHz	±50ppm ±100ppm	5V±0.5V	5mA	10ns	10ns	45/55%	IQXO-625, -626, -627, -628
8.0MHz to <23.0MHz			10mA	5ns	5ns	40/60%	
23.0MHz to <48.0MHz			50mA				
48.0MHz to 72.0MHz			65mA	3ns	3ns		
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Test Circuit



*Inclusive of jigging and equipment capacitance

Note: Pin 1 = no connection on non standby option models

IQXO-640, -641, -642 SMD CLOCK OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 1.6 x 1.2 crystal oscillators
- Ceramic package with a seam sealed metal lid, hermetically sealed

Frequency Range

- 1 to 80MHz

Output Compatiblity & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 3.3V IQXO-640
- 2.5V IQXO-641
- 1.8V IQXO-642

Frequency Stabilities

- ±30ppm, ±50ppm, ±100ppm (inclusive of tolerance, supply voltage and load variations over the operating temperature range)
  Note: ±30ppm not avaible over –40 to 85°C

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –40 to 85°C

Standby Operation

- Logic ‘1’ (≥70%V_S) to pad 1 enables oscillator output
- Logic ‘0’ (≤30%V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Curent: 10µA max (pad 1 at logic ‘0’)

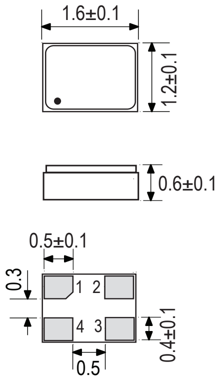
Environmental

- Shock: IEC 60068-2-27: 1000G, 1ms, 3 times in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6: 1.5mm amplitude, 10Hz-55Hz, 1min in 3 mutually perpendicular planes, duration 2hrs each plane (total 6hrs)

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481, 3kpcs per reel (please see Application Notes)

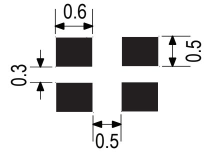
Outline (mm)



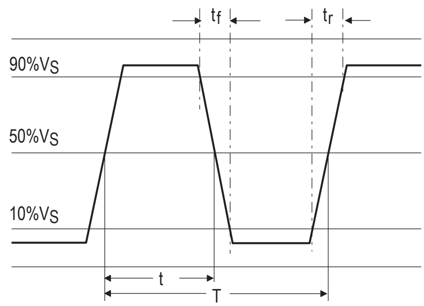
Underside View

Pad Connections
1. Standby Operation
2. GND & Lid
3. Output
4. +V_S

Solder Pad Layout



Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

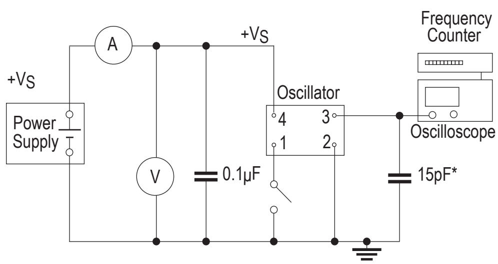
Example

- 10.0MHz IQXO-640
  CMOS ±50ppm –20 to 70C 3.3V

Electrical Specifications – maximum limiting values

Frequency Range	Frequency Stablity	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model
1.0 to 20.0MHz	±30ppm ±50ppm ±100ppm	3.3V±10%	4mA	5ns	5ns	45/55%	IQXO-640
>20.0 to 40.0MHz			6mA				
>40.0 to 60.0MHz			8mA				
>60.0 to 80.0MHz			10mA				
1.0 to 20.0MHz		2.5V±10%	3mA				IQXO-641
>20.0 to 40.0MHz			5mA				
>40.0 to 60.0MHz			7mA				
>60.0 to 80.0MHz			9mA				
1.0 to 20.0MHz		1.8V±10%	3mA				IQXO-642
>20.0 to 40.0MHz			4mA				
>40.0 to 60.0MHz			5mA				
>60.0 to 80.0MHz			7mA				
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



* Inclusive of jigging and equipment capacitance

IQXO-660, -661 SMD CLOCK OSCILLATORS

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- LVDS output using a high frequency fundamental crystal to give very low jitter
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Replacement for the CFPS-60 and CFPS-61 packages
- For higher frequencies please see our IQXO-710

Frequency Range

- 15 to 160MHz

Output Compatibility & Load

- LVDS
- Differential Output Voltage (VOD) 0.33V typ
- Offset Voltage (VOS) 1.25V typ
- Output Load 100Ω

Supply Voltages

- 3.3V IQXO-660
- 2.5V IQXO-661

Frequency Stabilities

- ±25ppm, ±30ppm, ±50ppm, ±100ppm (inclusive of tolerance and stability over the operating temperature range)

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Standby Operation

- Logic '1' (70% V_S min) to pad 1 enables oscillator output
- Logic '0' (30% V_S max) to pad 1 disables oscillator output; the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current 10µA max

Phase Jitter (12kHz to 20MHz)

- 1ps rms max

Ageing

- ±3ppm max per year at 25°C

Storage Temperature Range

- –55 to 125°C

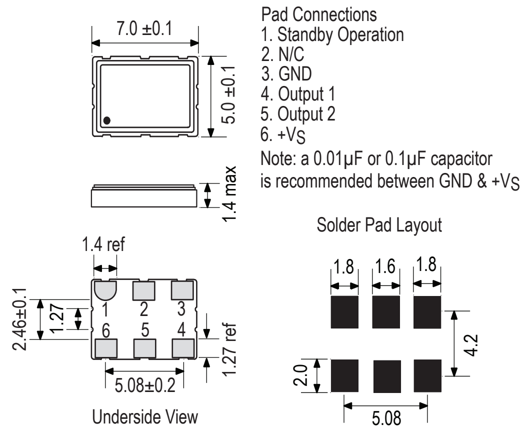
Environmental

- Shock: MIL-STD-202, Method 213, Condition E: 1000G 0.5ms 1/2 sine wave
- Vibration:MIL-STD-883, Method 2007: 20G

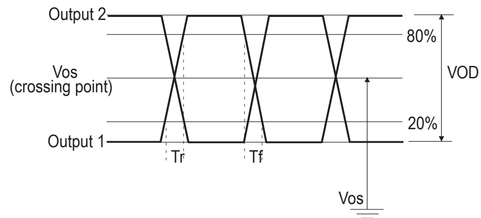
Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline mm



Output Waveform



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

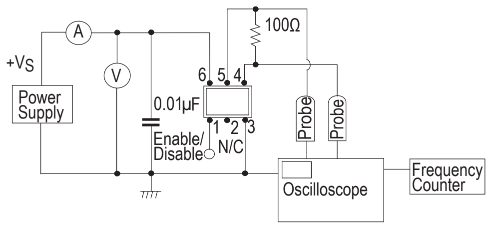
Example

- 100.0MHz IQXO-660
  LVDS ±50ppm –10 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
15.0 to <100.0MHz	±25ppm ±30ppm ±50ppm ±100ppm	3.3V±5%	50mA	1.0ns	1.0ns	45/55%	IQXO-660
100.0 to 160.0MHz				0.5ns	0.5ns		
15.0 to <100.0MHz		2.5V±5%		1.0ns	1.0ns		IQXO-661
100.0 to 160.0MHz				0.5ns	0.5ns		
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



IQXO-690 SMD CLOCK OSCILLATORS

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- LVPECL output using PLL technology to give a very wide frequency range
- Ceramic package with a seam sealed metal lid, hermetically sealed
- For a very low jitter version of this package please see our IQXO-620
- MEMS capability: IQMS-900 series oscillators are the nearest equivalent MEMS model

Frequency Range

- 160MHz to 622.08MHz

Output Compatibility & Load

- LVPECL
- Output Load 50Ω terminated to Vs-2.0V

Frequency Stabilities

- ±25ppm, ±30ppm, ±50ppm, ±100ppm (inclusive of tolerance and stability over the operating temperature range)

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Tri-State Operation

- Logic ‘1’ to pad 1 (≥70%V_S) disables oscillator outputs; oscillator outputs go to the high impedance state
- Logic ‘0’ to pad 1 (≤30%V_S) enables oscillator outputs
- No connection to pad 1 enables oscillator outputs

Phase Jitter (12kHz to 20MHz)

- 5ps rms max

Ageing

- ±3ppm max per year at 25°C

Storage Temperature Range

- –55 to 125°C

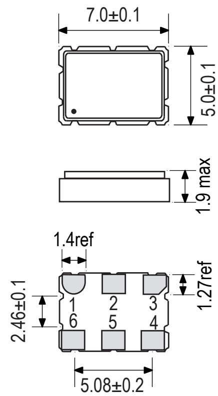
Environmental

- Shock: MIL-STD-202, Method 213, Condition E
- Vibration: MIL-STD-883, Method 2007, Condition A

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)

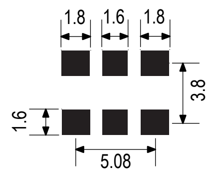


Underside View

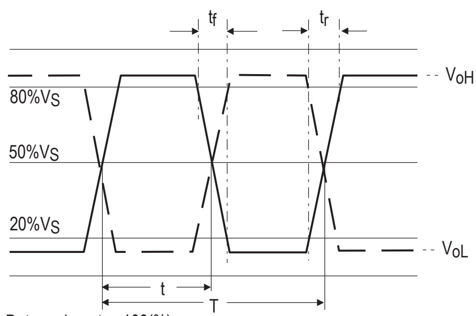
Pad Connections
1. Tri-state Operation
2. N/C
3. GND
4. Output 1
5. Output 2
6. +V_S

Note: a 0.01μF or 0.1μF decoupling capacitor is recommended between GND and +Vs

Solder Pad Layout



Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

Example

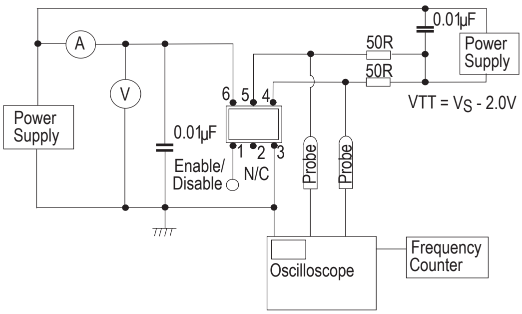
- 200.0MHz IQXO-690
  LVPECL ±50ppm –10 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
160.0 to 622.08MHz	±25ppm ±30ppm ±50ppm ±100ppm	3.3V±5%	100mA	0.7ns	0.7ns	45/55%	IQXO-690
Note: For other frequency/specification combinations, please contact our sales offices							

CLOCK OSCILLATORS

Test Circuit



IQXO-710 SMD CLOCK OSCILLATORS

ISSUE 5; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- LVDS output using PLL technology to give a very wide frequency range
- Ceramic package with a seam sealed metal lid, hermetically sealed
- For a very low jitter version of this package please see our IQXO-660
- MEMS capability: IQMS-940 series oscillators are the nearest equivalent MEMS model

Frequency Range

- 160MHz to 622.08MHz

Output Compatibility & Load

- LVDS
- Differential Output Voltage (VOD) 0.33V typ
- Offset Voltage (VOS) 1.25V typ
- Output Load 100Ω

Frequency Stabilities

- ±25ppm, ±30ppm, ±50ppm, ±100ppm (inclusive of tolerance and stability over the operating temperature range)

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Tri-State Operation

- Logic ‘1’ to pad 1 (≥70%V_S) disables oscillator outputs; oscillator outputs go to the high impedance state
- Logic ‘0’ to pad 1 (≤30%V_S) enables oscillator outputs
- No connection to pad 1 enables oscillator outputs

Phase Jitter (12kHz to 20MHz)

- 5ps rms max

Ageing

- ±3ppm max per year at 25°C

Storage Temperature Range

- –55 to 125°C

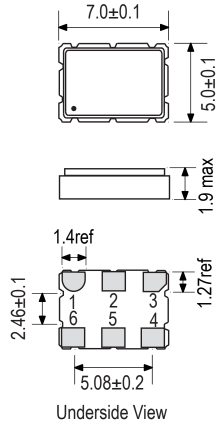
Environmental

- Shock: MIL-STD-202, Method 213, Condition E
- Vibration: MIL-STD-883, Method 2007, Condition A

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

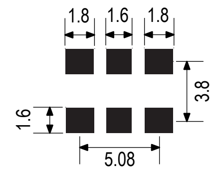
Outline (mm)



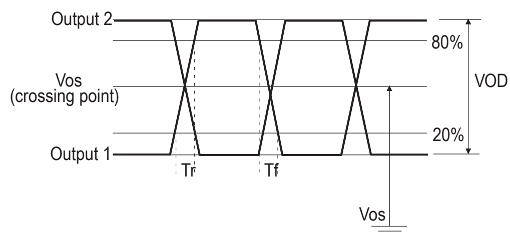
Pad Connections
1. Tri-state Operation
2. N/C
3. GND
4. Output 1
5. Output 2
6. +V_S

Note: a 0.01μF or 0.1μF decoupling capacitor is recommended between GND and +V_S

Solder Pad Layout



Output Waveform



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

Example

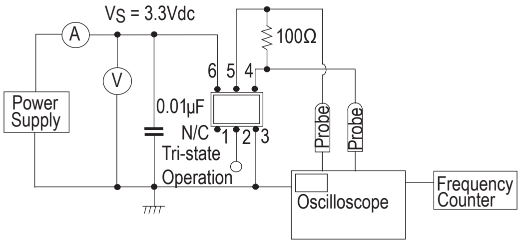
- 200.0MHz IQXO-710
  LVDS ±50ppm –10 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (20% to 80% Vp-p)	Fall Time (t_f) (80% to 20% Vp-p)	Duty Cycle (crossing point 0V)	Model Number
160.0 to 622.08MHz	±25ppm ±30ppm ±50ppm ±100ppm	3.3V±5%	70mA	0.7ns	0.7ns	45/55%	IQXO-710
Note: For other frequency/specification combinations, please contact our sales offices							

CLOCK OSCILLATORS

Test Circuit



IQXO-730, -731, -753, -757 SMD CLOCK OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Alternative to the IQXO-53, IQXO-57, CFPS-130 and CFPS-131
- Can withstand reflow profiles up to 250degC
- 'J' leaded plastic package oscillators
- Available in 3.3V and 5.0V supply
- Available with or without tristate
- Fast Make capability: CFPP-57 and CFPP-131 series programmable oscillators are the nearest equivalent fast make model

Model Equivalence Table vs Solder Reflow Temperature

250°C	230°C	Supply Voltage	Function
IQXO-730	CFPS-130	3.3V	Non tristate
IQXO-731	CFPS-131	3.3V	Tristate
IQXO-753	IQXO-53	5.0V	Non tristate
IQXO-757	IQXO-57	5.0V	Tristate

Frequency Range

- 1 to 70MHz

Output Compatibility & Load

- HCMOS
- Drive Capability 15pF max
- Tri-state (IQXO-731, -757)
- Non tri-state (IQXO-730, -753)

Standard Frequency Stabilities

- ±50ppm, ±100ppm (inclusive of supply voltage variations over the operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –50 to 125°C

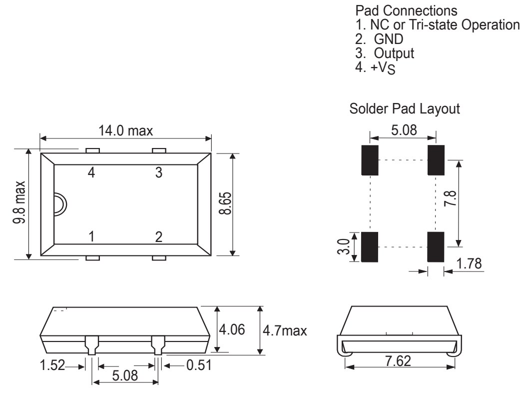
Tri-state Operation

- Logic '1' to pad 1 enables oscillator output,
- Logic '0' to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- When oscillator is enabled, maximum transition time = 100ns

Packaging

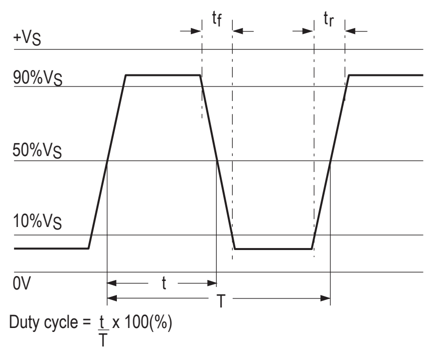
- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)

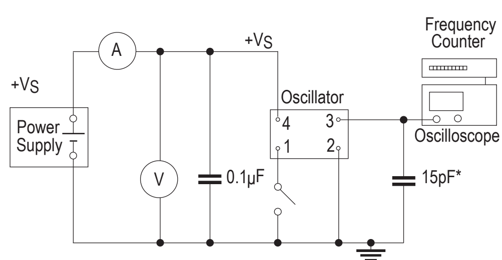


Note: Pad 1 = No connection on non tri-state models

Output Waveform



Test Circuit



* Inclusive of jigging and equipment capacitance

lectrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.0 to 27.0MHz	±50ppm ±100ppm	3.3V ±0.3V	10mA	5ns	5ns	40/60%	IQXO-730, -731
>27.0 to 50.0MHz			18mA				
>50.0 to 70.0MHz			30mA				
1.0 to 40.0MHz	±50ppm ±100ppm	5.0V ±0.5V	20mA	5ns	5ns	40/60%	IQXO-753, -757
>40.0 to 50.0MHz			30mA				
>50.0 to 70.0MHz			45mA				
Please note that the rise and fall times listed are the maximum values we specify to cover various frequency breaks. In practice the actual values are generally lower depending upon the spot frequency chosen. For typical values please contact our sales offices							
Note: For other frequency/specification combinations, please contact our sales offices							

IQXS-10, -11 SMD SPREAD SPECTRUM CLOCK OSCILLATORS

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Low EMI Spread Spectrum output crystal oscillator
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Alternative to the CFSS-3

Frequency Range

- 1 to 200MHz IQXS-10
- 1 to 166MHz IQXS-11

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 3.3V IQXS-10
- 2.5V IQXS-11

Frequency Stabilities (averaged frequency)

- ±25ppm, ±30ppm, ±50ppm, ±100ppm (inclusive of tolerance and stability over the operating temperature range)

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Standby Operation

- Logic ‘1’ to pad 1 enables oscillator output
- Logic ‘0’ to pad 1 disables oscillator output, the oscillator output goes to a high impedance state
- No connection to pad 1 enables oscillator outputs
- Standby Current: 10μA max

Modulation Ratios

- Centre Spread ±0.125%, ±0.25%, ±0.5%, ±1%, ±2%
- Down Spread -0.25%, -0.5%, -1%, -2%, -4%

Internal Modulation Frequency

- 30kHz to 40kHz

Jitter (cycle to cycle 1-σ)

- 100ps max

Ageing

- ±3ppm max per year at 25°C

Storage Temperature Range

- –55 to 125°C

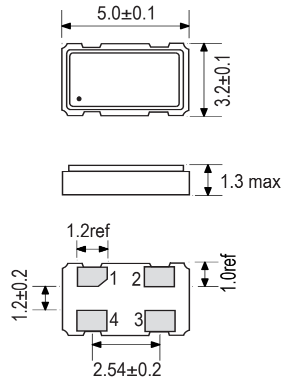
Environmental

- Shock: 1500G, 0.5ms, 3 times in each X, Y & Z axis, 3 cycles
- Vibration: 20 to 2000Hz (amplitude 1.52mm), 20G, X, Y & Z axis (20mins each axis, 4 cycles, total 4 hours)

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

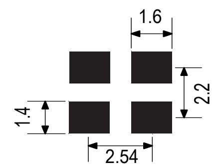
Outline (mm)



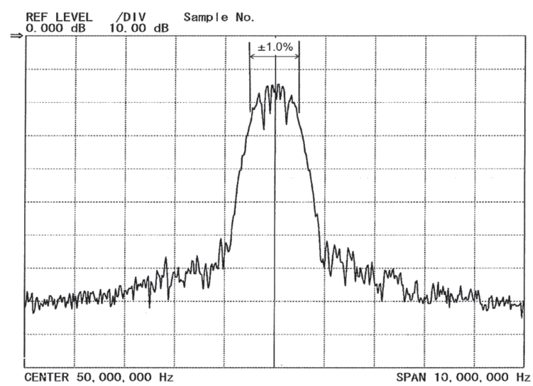
Underside View

Pad Connections
1. Standby Operation
2. GND
3. Output
4. +V_S

Solder Pad Layout



Example Output Spectrum (Center Spread ±1%)



Ordering Information (*minimum required)

- Frequency*
- Model*
- Modulation Ratio*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

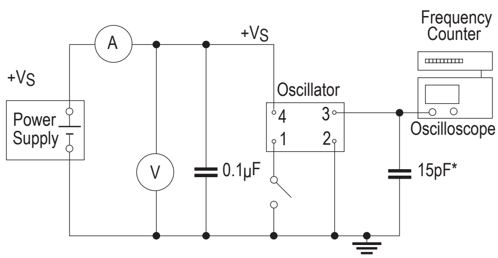
Example

- 20.0MHz IQXS-10 ±1%
  CMOS ±50ppm -10 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.0 to <50.0MHz	±25ppm ±30ppm ±50ppm ±100ppm	3.3V±10%	20mA	10ns	10ns	40/60%	IQXS-10
50.0 to <100.0MHz			30mA	5ns	5ns		
100.0 to <150.0MHz			35mA	4ns	4ns		
150.0 to 200MHz			40mA	3ns	3ns		
1.0 to <50.0MHz		2.5V±5%	20mA	10ns	10ns		IQXS-11
50.0 to <100.0MHz			30mA	5ns	5ns		
100.0 to <150.0MHz				4ns	4ns		
150.0 to 166MHz			35mA	3ns	3ns		
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



* Inclusive of jigging and equipment capacitance

IQXS-30, -31 SMD SPREAD SPECTRUM CLOCK OSCILLATORS

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description
- Low EMI Spread Spectrum output crystal oscillator
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Alternative to the CFSS-2

Frequency Range
- 1 to 200MHz IQXS-30
- 1 to 166MHz IQXS-31

Output Compatibility & Load
- CMOS
- Drive Capability 15pF max

Supply Voltages
- 3.3V IQXS-30
- 2.5V IQXS-31

Frequency Stabilities (averaged frequency)
- ±25ppm, ±30ppm, ±50ppm, ±100ppm (inclusive of tolerance and stability over the operating temperature range)

Operating Temperature Ranges
- –10 to 70°C
- –40 to 85°C

Standby Operation
- Logic ‘1’ to pad 1 enables oscillator output
- Logic ‘0’ to pad 1 disables oscillator output, the oscillator output goes to a high impedance state.
- No connection to pad 1 enables oscillator outputs
- Standby Current: 10µA max

Modulation Ratios
- Centre Spread ±0.125%, ±0.25%, ±0.5%, ±1%, ±2%
- Down Spread -0.25%, -0.5%, -1%, -2%, -4%

Internal Modulation Frequency
- 30kHz to 40kHz

Jitter (cycle to cycle 1-σ)
- 100ps max

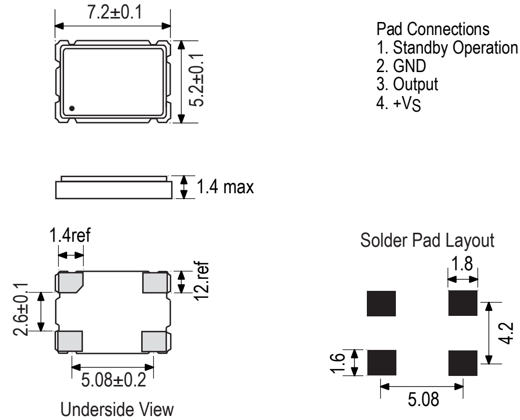
Ageing
- ±3ppm max per year at 25°C

Storage Temperature Range
- –55 to 125°C

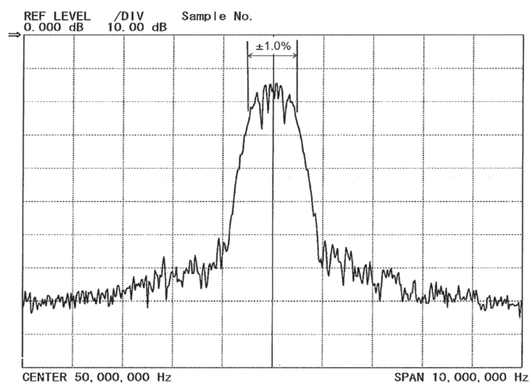
Environmental
- Shock: 1500G, 0.5ms, 3 times in each X, Y & Z axis, 3 cycles
- Vibration: 20 to 2000Hz (amplitude 1.52mm), 20G, X, Y & Z axis (20mins each axis, 4 cycles, total 4 hours)

Packaging
- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Example Output Spectrum (Center Spread ±1%)



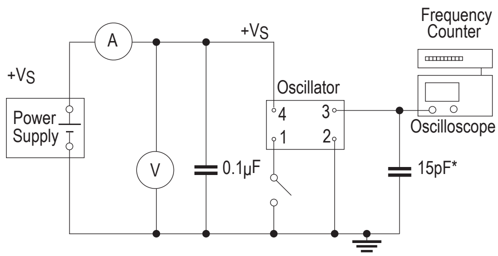
Ordering Information (*minimum required)
- Frequency*
- Model*
- Modulation Ratio*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage

Example
- 20.0MHz IQXS-30 ±1%
  CMOS ±50ppm -10 to 70C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.0 to <50.0MHz	±25ppm ±30ppm ±50ppm ±100ppm	3.3V±10%	20mA	10ns	10ns	40/60%	IQXS-30
50.0 to <100.0MHz			30mA	5ns	5ns		
100.0 to <150.0MHz			35mA	4ns	4ns		
150.0 to 200MHz			40mA	3ns	3ns		
1.0 to <50.0MHz		2.5V±5%	20mA	10ns	10ns		IQXS-31
50.0 to <100.0MHz			30mA	5ns	5ns		
100.0 to <150.0MHz				4ns	4ns		
150.0 to 166MHz			35mA	3ns	3ns		
Note: For other frequency/specification combinations, please contact our sales offices							

Test Circuit



* Inclusive of jigging and equipment capacitance

LFXO SMD CLOCK OSCILLATORS

ISSUE 2: 1 NOVEMBER 2010

Description

Statek's 32.768kHz surface mount LFXO oscillators, designed especially for applications requiring a fast start-up and high precision, consist of a Statek miniature AT quartz crystal and a CMOS/TTL compatible hybrid circuit in a ceramic package. Each crystal is pre-qualified before assembly into the oscillator through electrical tests and characterization over temperature

Features

- High precision (±10ppm)
- Fast start-up (0.8ms typ)
- High shock resistance
- Tight frequency-temperature stability
- Low acceleration sensitivity (HG version)
- CMOS output
- Optional Output Enable/Disable with Tri-State
- Low EMI emission
- Full military testing per MIL-PRF-55310
- Low Jitter

Applications

Military & Aerospace

- Smart Munitions
- Cockpit Systems
- Navigation

Industrial, Computer & Communications

- Industrial Controls
- Instrumentation
- Down-hole Drilling

Termination Variants

- SM1 = Gold Plated (RoHS Compliant)
- SM3 = Solder Dipped (non RoHS Compliant)
- SM5 = Solder Dipped (RoHS Compliant)

Frequency Range

- 32.768kHz

Output Compatiblity & Load

- CMOS/TTL
- Drive Compatiblity 15pF max

Supply Voltage

- 3.3V ±10%

Frequency Tolerance

- ±10ppm

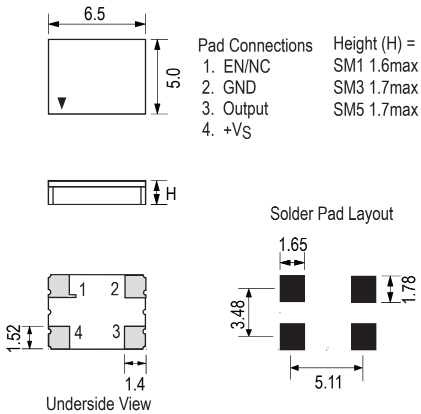
Frequency Stabilities

- ±10ppm, ±20ppm, ±30ppm, ±50ppm, ±100ppm
- Does not include Calibration tolerance

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C
- –55 to 125°C

Outline (mm) typ



Pad 1 Function

Enable/Disable Option (EN option)

- Internal oscillator stops, low current
- Pad 1 logic '0', pad 3 high impedance
- Pad 1 logic '1', pad 3 output

No Connection Option (NC option)

- Pad 1 not connected internally

Ageing

- ±3ppm max in 1st year

Storage Temperature Range

–55 to 125°C

Environmental

- Shock: 5000G, 0.3ms, 1/2 sinewave
- Vibration: MIL-STD-202G, Method 204D, Test Condition D: 20G (10Hz-2000Hz), swept sine wave

Packaging

- Tray pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see page 372)

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (typ)	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
32.768kHz	±10ppm ±20ppm ±30ppm ±50ppm ±100ppm	3.3V ±10%	500µA	1µs	1µs	45/55%	LFXO
Note: For other frequency/specification combinations, please contact our sales offices							

CLOCK OSCILLATORS

Ordering Information (*minimum required)

- Frequency*
- Model*
- Termination Variant*
- Output Compatiblity
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pad 1 Function*

Example

- 32.768kHz LFXO SM1
  CMOS/TTL ±10ppm ±30ppm –10 to 70C 3.3V NC

QC6100 SERIES MILITARY OSCILLATOR CAPABILITY

ISSUE 7; 1 NOVEMBER 2010

Manufactured and tested in accordance with BS9625

Available in 14pin DIL package or 40pin LCC package

For customers requiring oscillators manufactured and tested to BS specification, we are able to offer the following:

QC6107 series of DIL oscillator (manufactured in accordance with BS9625 F0014)

- Frequency Range: 1.50kHz to 32.0MHz (HCMOS)
- Package Styles: DIL (4 pins/14 pins)
- Stabilities: down to ±25ppm
- Operating Temperature Ranges: -40 to 85°C or –55 to 125°C

QC6108 series of DIL oscillator (manufactured in accordance with BS9625 F0014)

- Frequency Range: 375.0kHz to 32.0MHz (TTL)
- Package Styles: DIL (4 pins/14 pins)
- Stabilities: down to ±25ppm
- Operating Temperature Ranges: –40 to 85°C or –55 to 125°C

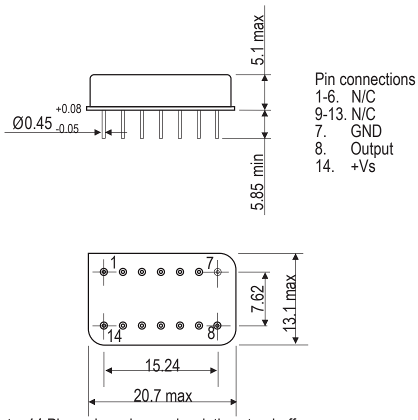
QC6111 series of 40 pin leadless chip carrier (LCC) oscillator (manufactured in accordance with BS9625 F0016)

- Frequency Range: 375.0kHz to 30.0MHz (HCMOS)
- Package Style: 40 pin leadless chip carrier oscillator (LCC)
- Stabilities: down to ±35ppm
- Operating Temperature Ranges: –40 to 85°C or –55 to 125°C

QC6112 series of 40 pin leadless chip carrier (LCC) oscillator (manufactured in accordance with BS9625 F0016)

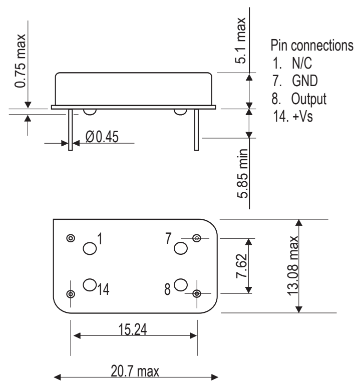
- Frequency Range: 375.0kHz to 30.0MHz (TTL)
- Package Style: 40 pin leadless chip carrier oscillator (LCC)
- Stabilities: down to ±35ppm
- Operating Temperature Ranges: –40 to 85°C or –55 to 125°C

Outline (mm) - QC6107/2 & QC6108/2

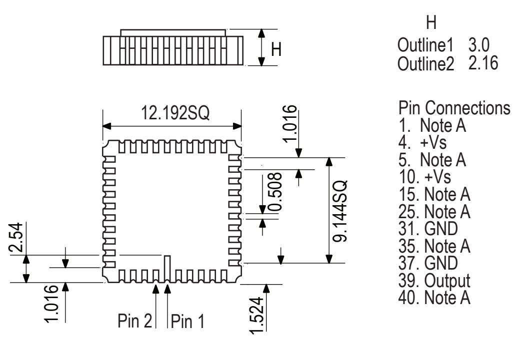


Note: 14 Pin package has no insulating stand-off

Outline (mm) - QC6107/1 & QC6108/1



Outline (mm) - QC6111 & QC6112



A - Internally connected. No external electrical connections permissable
B - All other pins may have external electrical connections

FAST MAKE OSCILLATORS - SELECTION TABLE

Model Number	Supply Voltage	Output Compatibility	Package (mm)	Frequency Range	Frequency Stability (Tightest*)	Operating Temperature Range (Widest*)	Page
Specifying Fast Make Oscillators							194
Surface Mount Models							
CFPP-53	1.8V	CMOS	2.5 x 2	1 to 133MHz	±20ppm	–40 to 85°C	202
CFPP-41	1.8V	CMOS	3.2 x 2.5	1 to 75MHz	±20ppm	–40 to 85°C	200
CFPP-54	2.5V	CMOS	2.5 x 2	1 to 166MHz	±20ppm	–40 to 85°C	202
CFPP-40	2.5V	CMOS	3.2 x 2.5	1 to 90MHz	±20ppm	–40 to 85°C	200
CFPP-56	3.3V	CMOS	2.5 x 2	1 to 200MHz	±20ppm	–40 to 85°C	202
CFPP-39	3.3V	CMOS	3.2 x 2.5	1 to 110MHz	±20ppm	–40 to 85°C	200
CFPP-9	3.3V	CMOS	5 x 3.2	1 to 150MHz	±25ppm	–40 to 85°C	196
CFPP-73	3.3V	CMOS	7 x 5	1 to 150MHz	±25ppm	–40 to 85°C	206
CFPP-131	3.3V	CMOS	14 x 9	1 to 150MHz	±25ppm	–40 to 85°C	204
CFPP-620	3.3V	LVPECL	7 x 5	200 to 700MHz	±25ppm	–40 to 85°C	210
IQXP-10	3.3V	LVPECL	7 x 5	1 to 200MHz	±25ppm	–40 to 85°C	212
CFPP-12	5.0V	CMOS	5 x 3.2	1 to 150MHz	±25ppm	–40 to 85°C	196
CFPP-72	5.0V	CMOS	7 x 5	1 to 150MHz	±25ppm	–40 to 85°C	206
CFPP-57	5.0V	CMOS	14 x 9	1 to 150MHz	±25ppm	–40 to 85°C	204
Leaded Models							
CFPP-303	3.3V	CMOS	8-pin DIL	1 to 150MHz	±25ppm	–40 to 85°C	198
CFPP-307	3.3V	CMOS	14-pin DIL	1 to 150MHz	±25ppm	–40 to 85°C	208
CFPP-23	5.0V	CMOS	8-pin DIL	1 to 150MHz	±25ppm	–40 to 85°C	198
CFPP-149	5.0V	CMOS	14-pin DIL	1 to 150MHz	±25ppm	–40 to 85°C	208
* Tighter stability and wider temperature ranges are available. Please contact our sales offices							

SPECIFYING FAST MAKE OSCILLATORS

FAST MAKE OSCILLATORS

IQD's range of fast make oscillators are one time only factory programmable parts. As such they are available at much shorter lead times than standard fixed frequency oscillators.

This can be particularly useful for developing a circuit design when a small volume of oscillators is often needed in a short time to prove a PCB design. Additionally these parts can be a good solution for customers who need uncommon frequencies in small volumes where the development costs of a fixed frequency oscillator can be prohibitive.

A typical surface mount fast make oscillator specification reads like this:

20.0MHz CFPP-72
CMOS ±50ppm –40 to 85C 5.0V

The data in the example above is translated in the following order

- Frequency
- Model
- Output Compatibility
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Supply Voltage

Frequency

Frequency is normally specified in kilohertz (kHz) up to 999.999kHz and in megahertz (MHz) from 1.0MHz. All our computer-generated transaction documents follow this standard convention automatically.

The frequency should be described to seven significant figures. If seven significant figures are not used, we assume that any figure that might follow those given may be taken as zero. Thus a frequency given as 16.6MHz will be taken as 16.60, not 16.66667.

Model number

The model number incorporates information which describes holder style, supply voltage and output compatibility.

Frequency Stability

The frequency stability of a surface mount oscillator includes the initial adjustment tolerance at room temperature and the variation over operating temperature range. This value is specified as 'parts per million' (ppm) and is available in various ranges as for example: ±20ppm, ±25ppm, ±50ppm & ±100ppm.

Operating Temperature Ranges

- 0 to 70°C
- –10 to 60°C
- –20 to 70°C
- –30 to 75°C
- –40 to 85°C

Although in general oscillators will continue to operate outside their normal temperature range with a degradation in frequency stability, damage can result if the temperatures reached are excessive.

Additional Text Code

If the product is non-standard, the letter 'T' and/or 'E' will appear at the end of the product specification. This refers to additional text on the quotation/sales order to identify the special requirements.

Packaging Codes

Tape and Reel packaging is available as an option on many of the products outlined in the this chapter.

Unless individual data sheets state Tape and Reel packaging, items will be Bulk packed. Please note: only complete reels are sold.

- Bulk = Bulk packed
- Reel = Tape and Reel packed

Outline Drawings

Dimensions on the oscillator outline drawings are shown only as a guide. Precise dimensions of oscillator holders are available upon request. All dimensions are shown in mm and are nominal unless otherwise stated.

Delivery Options

Express delivery options are available for some of the fast make range, e.g. a 48 hour fast make service is available. Please contact our sales offices for details.

Marking

Where space is limited some or all of the information will be omitted/truncated at IQD's discretion. Full product description will be found on the individual batch packaging.

Ordering Information

- See individual data sheets

NOTES

CFPP-9, -12 FAST MAKE OSCILLATORS

ISSUE 10; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- PLL based, one time only factory programmable for a fast lead time
- Crystal oscillator in a hermetically sealed ceramic package with a metal lid
- See CFPS-9 and CFPS-12 for standard crystal oscillator alternative
- See IQMS-510 series for MEMS oscillator alternative

Frequency Range

- 1 to 150MHz

Output Compatibility & Load

- Tri-state CMOS (5.0V) (CFPP-12)

Maximum Capacitive Load	
CMOS ≤ 66.0MHz	50pF
CMOS > 66.0 to 150.0MHz	25pF

- Tri-state CMOS (3.3V) (CFPP-9)

Maximum Capacitive Load	
CMOS ≤ 40.0MHz	30pF
CMOS > 40.0 to 133.0MHz	15pF

Supply Voltages

- 3.3V CFPP-9
- 5.0V CFPP-12

Standard Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage and output load variations over the operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

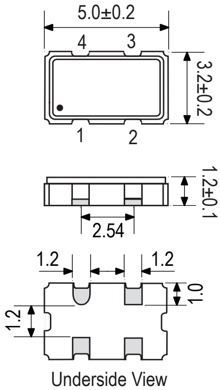
Tri-State Operation

- Logic ‘1’ to pad 1 enables oscillator output
- Logic ‘0’ to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Packaging

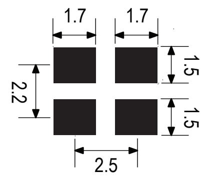
- Loose in bulk pack, 1pc per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Pad Connections
1. N/C or Tri-State
2. GND
3. Output
4. $+V_S$

Solder Pad Layout



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatibility
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

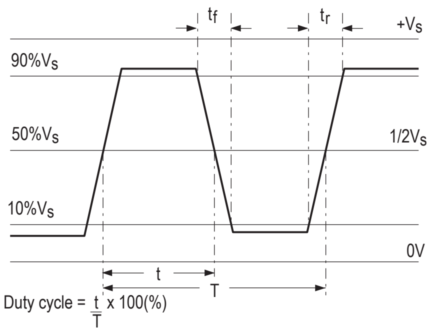
- 20.00MHz CFPP-9
  CMOS ±50ppm –40 to 85C 3.3V

Electrical Specifications - maximum limiting values

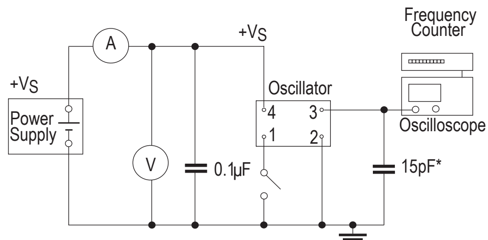
Frequency Range	Frequency Stability	Supply Voltage	Supply Current (unloaded)	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.0 to 40.0MHz	±25ppm ±50ppm ±100ppm	5.0V ±0.5V	45mA	4ns	4ns	45/55%	CFPP-12
		3.3V ±0.3V	25mA				CFPP-9
>40.0 to 66.0MHz		5.0V ±0.5V	45mA				CFPP-12
		3.3V ±0.3V	25mA			40/60%	CFPP-9
>66.0MHz to 100.0MHz		5.0V ±0.5V	45mA				CFPP-12
		3.3V ±0.3V	25mA				CFPP-9
>100.0 to 133.0MHz		5.0V ±0.5V	45mA				CFPP-12
		3.3V ±0.3V					CFPP-9
>133.0 to 150.0MHz		5.0V ±0.5V	60mA				CFPP-12
Note: For other frequency/specification combinations, please contact our sales offices							

Jitter $_{pk-pk}$ (typical)		Jitter $_{pk-pk}$ (max)	
1.0 to 33.0MHz	>33.0MHz	1.0 to 33.0MHz	>33.0MHz
100ps	75ps	250ps	175ps

Output Waveform



Test Circuit



* Inclusive of jigging and equipment capacitance

CFPP-23, -303 FAST MAKE OSCILLATORS

ISSUE 11; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- PLL based, one time only factory programmable for a fast lead time
- Crystal oscillator in an 8-pin DIL package hermetically sealed
- See CFPS-23 and CFPS-303 for standard crystal oscillator alternative

Frequency Range

- 1 to 150MHz

Output Compatibility & Load

- Tri-state CMOS (5.0V) (CFPP-23)

Maximum Capacitive Load	
CMOS ≤ 66.0MHz	50pF
CMOS > 66.0 to 150.0MHz	25pF

- Tri-state CMOS (3.3V) (CFPP-303)

Maximum Capacitive Load	
CMOS ≤ 40.0MHz	30pF
CMOS > 40.0 to 133.0MHz	15pF

Supply Voltage

- 5.0V CFPP-23
- 3.3V CFPP-303

Standard Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage & output load variations over the operating temperature range)

Operating Temperature Range

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Tri-state Operation

- Logic ‘1’ to pin 1 enables oscillator output
- Logic ‘0’ to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pin 1 enables oscillator output

Packaging

- Loose in bulk pack, 1pc per box

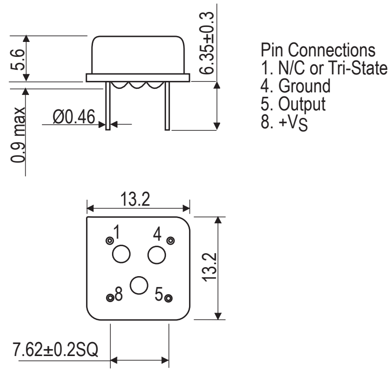
Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatibility
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

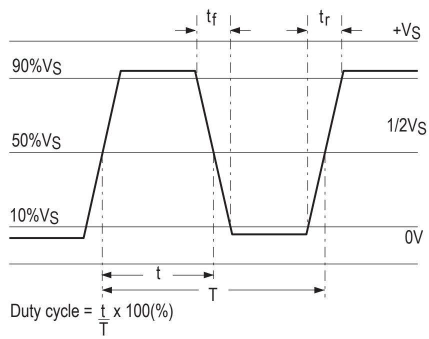
Example

- 20.00MHz CFPP-23
  CMOS ±50ppm –40 to 85C 5.0V

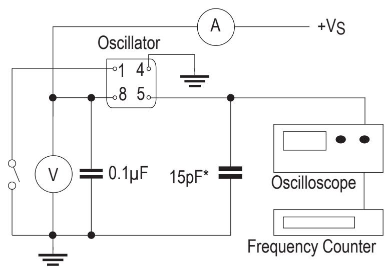
Outline (mm)



Output Waveform



Test Circuit



*Inclusive of jigging and equipment capacitance

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (unloaded)	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.0 to 40.0MHz	±25ppm ±50ppm ±100ppm	5.0V ±0.5V	45mA	4ns	4ns	45/55%	CFPP-23
		3.3V ±0.3V	25mA				CFPP-303
>40.0 to 66.0MHz		5.0V ±0.5V	45mA				CFPP-23
		3.3V ±0.3V	25mA			40/60%	CFPP-303
>66.0MHz to 100.0MHz		5.0V ±0.5V	45mA				CFPP-23
		3.3V ±0.3V	25mA				CFPP-303
>100.0 to 133.0MHz		5.0V ±0.5V	45mA				CFPP-23
		3.3V ±0.3V					CFPP-303
>133.0 to 150.0MHz		5.0V ±0.5V	60mA				CFPP-23
Note: For other frequency/specification combinations, please contact our sales offices							

Jitter $_{pk-pk}$ (typical)		Jitter $_{pk-pk}$ (max)	
1.0 to 33.0MHz	>33.0MHz	1.0 to 33.0MHz	>33.0MHz
100ps	75ps	250ps	175ps

CFPP-39, -40, -41 FAST MAKE OSCILLATORS

ISSUE 10; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description
- PLL based, one time only factory programmable for a fast lead time
- Crystal oscillator in a hermetically sealed ceramic package with a metal lid
- See CFPS-39, -40 and -41 for standard crystal oscillator alternative
- See IQMS-520 series for MEMS oscillator alternative

Frequency Range
- 1.0 to 110MHz CFPP-39
- 1.0 to 90MHz CFPP-40
- 1.0 to 75MHz CFPP-41

Output Compatibility & Load
- Tri-state CMOS
- Drive Capability 15pF max

Supply Voltage
- 3.3V CFPP-39
- 2.5V CFPP-40
- 1.8V CFPP-41

Frequency Stabilities
- ±20ppm, ±25ppm, ±50ppm, ±100ppm (inclusive of tolerance, supply voltage & output load variations over the operating temperature range)
  Note: ±20ppm not available over –20 to 70°C or –40 to 85°C
  Also ±25ppm not available over –40 to 85 °C

Operating Temperature Ranges
- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range
- –55 to 125°C

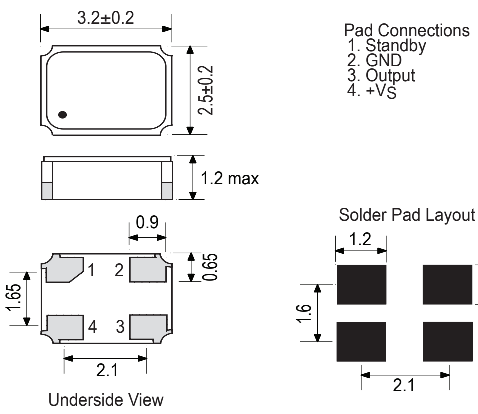
Standby Operation
- Logic ‘1’ (>70%Vs) to pad 1 enables oscillator output
- Logic ‘0’ (<30%Vs) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current: 10μA max

Period Jitter
- 150ps max

Start Up Time
- 8ms max

Packaging
- Loose in bulk pack, 1pc per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Ordering Information (*minimum required)
- Frequency*
- Model*
- Output Compatibility
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

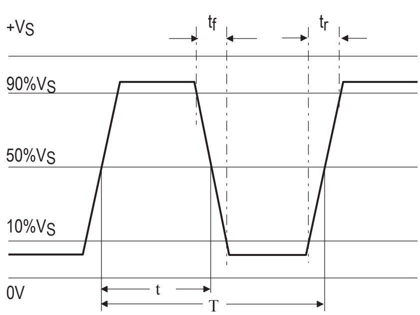
Example
- 20.00MHz CFPP-39
  CMOS ±50ppm –40 to 85C 3.3V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.0 to <20.0MHz	±20ppm ±25ppm ±50ppm ±100ppm	3.3V ±10%	10mA	5ns	5ns	45/55%	CFPP-39
		2.5V ±10%	8mA				CFPP-40
		1.8V ±10%	6mA				CFPP-41
20.0 to <40.0MHz		3.3V ±10%	15mA				CFPP-39
		2.5V ±10%	10mA				CFPP-40
		1.8V ±10%	7mA				CFPP-41
40.0 to <75.0MHz		3.3V ±10%	15mA				CFPP-39
		2.5V ±10%	10mA				CFPP-40
		1.8V ±10%	10mA				CFPP-41
75.0 to <90.0MHz		3.3V ±10%	20mA				CFPP-39
		2.5V ±10%	15mA				CFPP-40
90.0 to 110.0MHz		3.3V ±10%	25mA				CFPP-39
Note: For other frequency/specification combinations, please contact our sales offices							

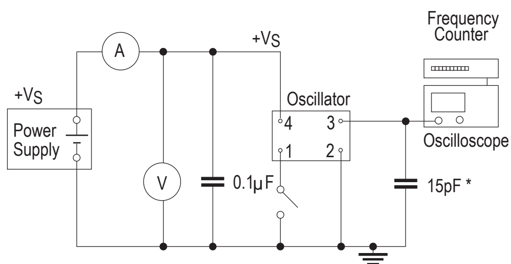
FAST MAKE OSCILLATORS

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



* Inclusive of jigging and equipment capacitance

CFPP-53, -54, -56 FAST MAKE OSCILLATORS

ISSUE 6; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- PLL based, one time only factory programmable for a fast lead time
- Crystal oscillator in a hermetically sealed ceramic package with a metal lid
- See CFPS-53, -54 and -56 for standard crystal oscillator alternative
- See IQMS-530 series for MEMS oscillator alternative

Frequency Range

- 1.0 to 133MHz CFPP-53
- 1.0 to 166MHz CFPP-54
- 1.0 to 200MHz CFPP-56

Output Compatibility & Load

- Tri-state CMOS
- Drive Capability 15pF max

Supply Voltage

- 1.8V CFPP-53
- 2.5V CFPP-54
- 3.3V CFPP-56

Frequency Stabilities

- ±20ppm, ±25ppm, ±50ppm, ±100ppm (inclusive of tolerance, supply voltage & output load variations over the operating temperature range)
  Note: ±20ppm not available over –20 to 70°C or –40 to 85°C
  Also ±25ppm not available over –40 to 85°C

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Standby Operation

- Logic ‘1’ (>70%V_S) to pad 1 enables oscillator output
- Logic ‘0’ (<30%V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Stand-by current: 15µA max

Start Up Time

- 2ms max

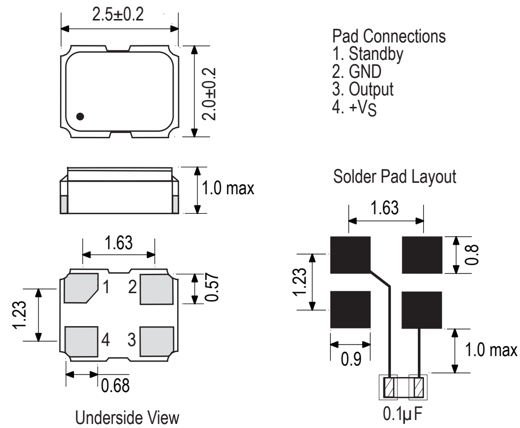
Period Jitter

- 200ps max

Packaging

- Loose in bulk pack, 1pc per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatibility
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

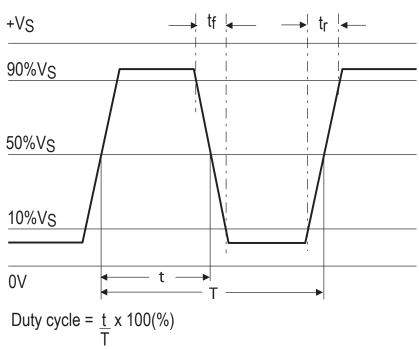
Example

- 20.00MHz CFPP-56
  CMOS ±50ppm –40 to 85C 3.3V

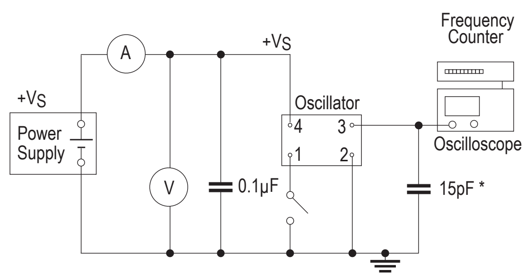
Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.0 to <10.0MHz	±20ppm ±25ppm ±50ppm ±100ppm	1.8V ±10%	6mA	5ns	5ns	45/55%	CFPP-53
		2.5V ±10%	8mA	4ns	4ns		CFPP-54
		3.3V ±10%	10mA	3ns	3ns		CFPP-56
10.0 to <30.0MHz		1.8V ±10%	6mA	4ns	4ns		CFPP-53
		2.5V ±10%	8mA	3ns	3ns		CFPP-54
		3.3V ±10%	10mA	2ns	2ns		CFPP-56
30.0 to <75.0MHz		1.8V ±10%	8mA	4ns	4ns		CFPP-53
		2.5V ±10%	10mA	3ns	3ns		CFPP-54
		3.3V ±10%	15mA	2ns	2ns		CFPP-56
75.0 to <133.0MHz		1.8V ±10%	12mA	4ns	4ns		CFPP-53
		2.5V ±10%	15mA	3ns	3ns		CFPP-54
		3.3V ±10%	20mA	2ns	2ns		CFPP-56
133.0 to <166.0MHz		2.5V ±10%	15mA	3ns	3ns		CFPP-54
		3.3V ±10%	22mA	2ns	2ns		CFPP-56
166.0 to 200.0MHz			25mA				
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Test Circuit



* Inclusive of jigging and equipment capacitance

CFPP-57, -131 FAST MAKE OSCILLATORS

ISSUE 9; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- PLL based, one time only factory programmable for a fast lead time
- Crystal oscillator in a plastic encapsulated 'J' leaded SMD package
- See IQXO-757 and IQXO-731 for standard crystal oscillator alternative

Frequency Range

- 1 to 150MHz

Output Compatibility & Load

- Tri-state CMOS (5.0V) (CFPP-57)

Maximum Capacitive Load	
CMOS ≤ 66.0MHz	50pF
CMOS > 66.0 to 150.0MHz	25pF

- Tri-state CMOS (3.3V) (CFPP-131)

Maximum Capacitive Load	
CMOS ≤ 40.0MHz	30pF
CMOS > 40.0 to 133.0MHz	15pF

Supply Voltage

- 5.0V CFPP-57
- 3.3V CFPP-131

Standard Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage & output load variations over the operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

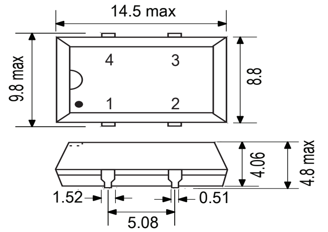
Tri-State Operation

- Logic '1' to pad 1 enables oscillator output
- Logic '0' to pad 1 disables oscillator output; when disabled the oscillator output goes to the higher impedance state
- No connection to pad 1 enables oscillator output

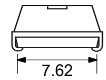
Packaging

- Loose in bulk pack, 1pc per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

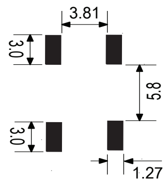
Outline (mm)



Pad Connections
1. N/C or Tri-State
2. GND
3. Output
4. +V_S



Solder Pad Layout



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatibility
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

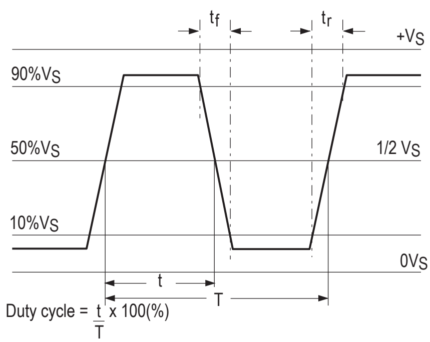
- 20.00MHz CFPP-57
  CMOS ±50ppm –40 to 85C 5.0V

Electrical Specifications - maximum limiting values

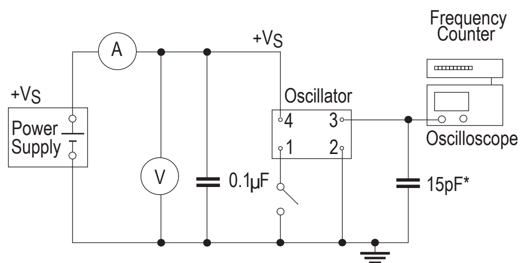
Frequency Range	Frequency Stability	Supply Voltage	Supply Current (unloaded)	Rise Time (tr) (10-90%)	Fall Time (tf) (90-10%)	Duty Cycle	Model Number
1.0 to 40.0MHz	±25ppm ±50ppm ±100ppm	5.0V ±0.5V	45mA	4ns	4ns	45/55%	CFPP-57
		3.3V ±0.3V	25mA				CFPP-131
>40.0 to 66.0MHz		5.0V ±0.5V	45mA				CFPP-57
		3.3V ±0.3V	25mA			40/60%	CFPP-131
>66.0MHz to 100.0MHz		5.0V ±0.5V	45mA				CFPP-57
		3.3V ±0.3V	25mA				CFPP-131
>100.0 to 133.0MHz		5.0V ±0.5V	45mA				CFPP-57
		3.3V ±0.3V					CFPP-131
>133.0 to 150.0MHz		5.0V ±0.5V	60mA				CFPP-57
Note: For other frequency/specification combinations, please contact our sales offices							

Jitter $_{pk-pk}$ (typical)		Jitter $_{pk-pk}$ (max)	
1.0 to 33.0MHz	>33.0MHz	1.0 to 33.0MHz	>33.0MHz
100ps	75ps	250ps	175ps

Output Waveform



Test Circuit



* Inclusive of jigging and equipment capacitance

CFPP-72, -73 FAST MAKE OSCILLATORS

ISSUE 11; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- PLL based, one time only factory programmable for a fast lead time
- Crystal oscillator in a hermetically sealed ceramic package with a metal lid
- See CFPS-72 and CFPS-73 for standard crystal oscillator alternative
- See IQMS-500 series for MEMS oscillator alternative

Frequency Range

- 1 to 150MHz

Output Compatibility & Load

- Tri-state CMOS (5.0V) (CFPP-72)

Maximum Capacitive Load	
CMOS ≤ 66.0MHz	50pF
CMOS > 66.0 to 150.0MHz	25pF

- Tri-state CMOS (3.3V) (CFPP-73)

Maximum Capacitive Load	
CMOS ≤ 40.0MHz	30pF
CMOS > 40.0 to 133.0MHz	15pF

Supply Voltage

- 5.0V CFPP-72
- 3.3V CFPP-73

Standard Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage & output load variations over the operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

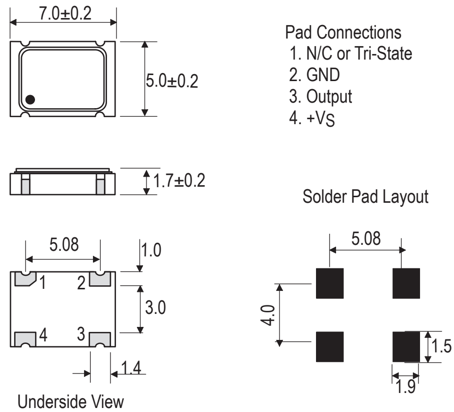
Tri-state Operation

- Logic ‘1’ to pad 1 enables oscillator output
- Logic ‘0’ to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Packaging

- Loose in bulk pack, 1pc per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatibility
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

- 20.00MHz CFPP-72
  CMOS ±50ppm –40 to 85C 5.0V

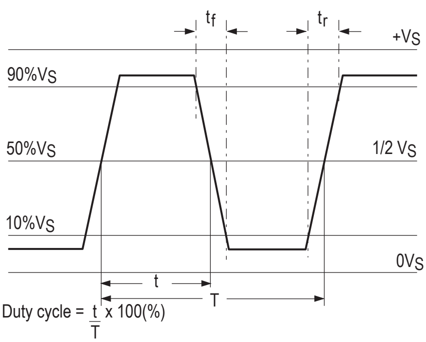
FAST MAKE OSCILLATORS

Electrical Specifications - maximum limiting values

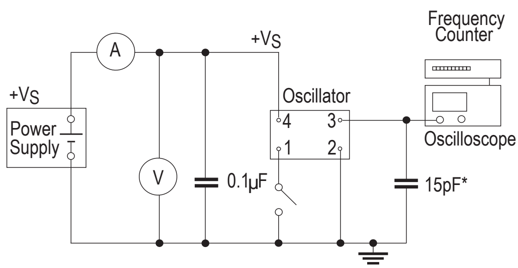
Frequency Range	Frequency Stability	Supply Voltage	Supply Current (unloaded)	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.0 to 40.0MHz	±25ppm ±50ppm ±100ppm	5.0V ±0.5V	45mA	4ns	4ns	45/55%	CFPP-72
		3.3V ±0.3V	25mA				CFPP-73
>40.0 to 66.0MHz		5.0V ±0.5V	45mA				CFPP-72
		3.3V ±0.3V	25mA			40/60%	CFPP-73
>66.0MHz to 100.0MHz		5.0V ±0.5V	45mA				CFPP-72
		3.3V ±0.3V	25mA				CFPP-73
>100.0 to 133.0MHz		5.0V ±0.5V	45mA				CFPP-72
		3.3V ±0.3V					CFPP-73
>133.0 to 150.0MHz		5.0V ±0.5V	60mA				CFPP-72
Note: For other frequency/specification combinations, please contact our sales offices							

Jitter $_{pk-pk}$ (typical)		Jitter $_{pk-pk}$ (max)	
1.0 to 33.0MHz	>33.0MHz	1.0 to 33.0MHz	>33.0MHz
100ps	75ps	250ps	175ps

Output Waveform



Test Circuit



* Inclusive of jigging and equipment capacitance

CFPP-149, -307 FAST MAKE OSCILLATORS

ISSUE 9; 17 JANUARY 2011 - RoHS 2002/95/EC

Description

- PLL based, one time only factory programmable for a fast lead time
- Crystal oscillator in an 8pin DIL package hermetically sealed
- See IQXO-149 and CFPS-307 for standard crystal oscillator alternative

Frequency Range

- 1 to 150MHz

Output Compatibility & Load

- Tri-state CMOS (5.0V) (CFPP-149)

Maximum Capacitive Load for:	
CMOS ≤ 66.0MHz	50pF
CMOS > 66.0 to 150.0MHz	25pF

- Tri-state CMOS (3.3V) (CFPP-307)

Maximum Capacitive Load for:	
CMOS ≤ 40.0MHz	30pF
CMOS > 40.0 to 133.0MHz	15pF

Supply Voltage

- 5.0V CFPP-149
- 3.3V CFPP-307

Standard Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage & output load variations over the operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Tri-state Operation

- Logic '1' to pin 1 enables oscillator output
- Logic '0' to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pin 1 enables oscillator output

Packaging

- Loose in bulk pack, 1pc per box

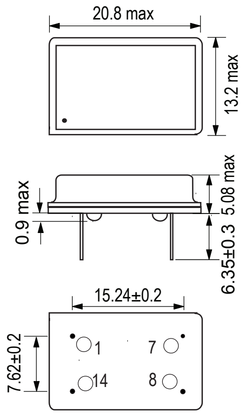
Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatibility
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

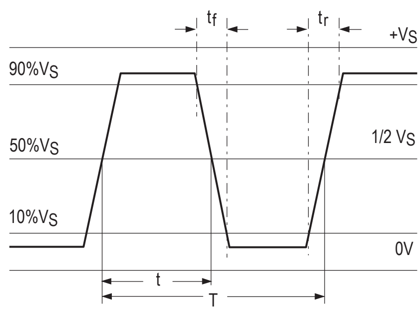
- 20.00MHz CFPP-149
  CMOS ±50ppm –40 to 85C 5.0V

Outline (mm)



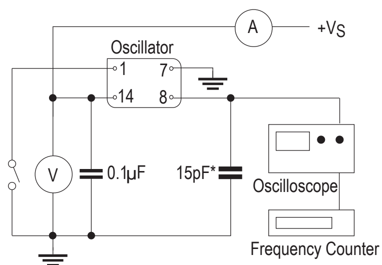
Pin Connections
1. N/C or Tri-State
7. GND
8. Output
14.+V_S

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



*Inclusive of jigging and equipment capacitance

FAST MAKE OSCILLATORS

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (unloaded)	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.0 to 40.0MHz	±25ppm ±50ppm ±100ppm	5.0V ±0.5V	45mA	4ns	4ns	45/55%	CFPP-149
		3.3V ±0.3V	25mA				CFPP-307
>40.0 to 66.0MHz		5.0V ±0.5V	45mA				CFPP-149
		3.3V ±0.3V	25mA			40/60%	CFPP-307
>66.0MHz to 100.0MHz		5.0V ±0.5V	45mA				CFPP-149
		3.3V ±0.3V	25mA				CFPP-307
>100.0 to 133.0MHz		5.0V ±0.5V	45mA				CFPP-149
		3.3V ±0.3V					CFPP-307
>133.0 to 150.0MHz		5.0V ±0.5V	60mA				CFPP-149
Note: For other frequency/specification combinations, please contact our sales offices							

Jitter $_{pk-pk}$ (typical)		Jitter $_{pk-pk}$ (max)	
1.0 to 33.0MHz	>33.0MHz	1.0 to 33.0MHz	>33.0MHz
100ps	75ps	250ps	175ps

CFPP-620 FAST MAKE OSCILLATORS

ISSUE 5; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- PLL based, one time only factory programmable for a fast lead time
- Crystal oscillator in a hermetically sealed ceramic package with a metal lid
- See IQXO-690 for standard crystal oscillator alternative
- See IQMS-900 series for MEMS oscillator alternative

Frequency Range

- 200 to 700MHz

Output Compatibility & Load

- LVPECL
- Output Load 50Ω terminated to V_S - 2.0V
- Output Voltage V_{OH} (V_S - 1.025V)
  Output Voltage V_{OL} (V_S - 1.62V)

Supply Voltage

- 3.3V

Standard Frequency Stability

- ±25ppm

Operating Temperature Range

- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Tri-state Operation (CMOS)

- Logic ‘1’ to pad 1 enables oscillator output
- Logic ‘0’ to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables the oscillator output

Period Jitter

- 10ps rms typ

Ageing

- ±5ppm max in 1st year @ 25°C, V_S = 3.3V

Packaging

- Loose in bulk pack, 1pc per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

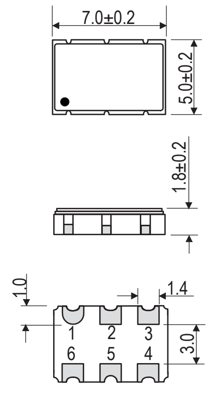
Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatibility
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

- 20.00MHz CFPP-620
  LVPECL ±25ppm –40 to 85C 3.3V

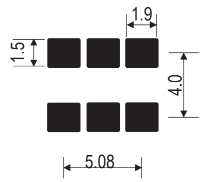
Outline (mm)



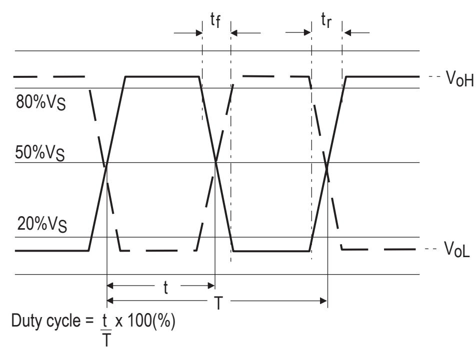
Underside View

Pad Connections
1. Tri-State (CMOS)
2. Do Not Connect
3. GND
4. LVPECL +
5. LVPECL -
6. +V_S

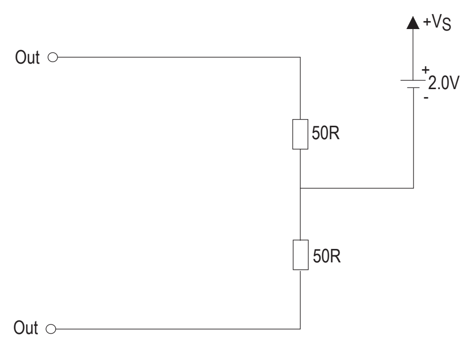
Solder Pad Layout



Output Waveform



Test Circuit



Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
200.0 to 700.0MHz	±25ppm	3.3V ±5%	130mA	1.5ns	1.5ns	45/55%	CFPP-620
Note: For other frequency/specification combinations, please contact our sales offices							

IQXP-10 FAST MAKE OSCILLATORS

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- PLL based, one time only factory programmable for a fast lead time
- Crystal oscillator in a hermetically sealed ceramic package with a metal lid
- See IQXO-690 for standard crystal oscillator alternative
- See IQMS-900 series for MEMS oscillator alternative

Frequency Range

- 1 to 200MHz

Output Compatibility & Load

- LVPECL
- Output Load 50Ω terminated to Vs - 2.0V
- Output Voltge V_{OH} (V_S - 1.025V)
- Output Voltge V_{OL} (V_S - 1.62V)

Supply Voltage

- 3.3V

Standard Frequency Stability

- ±25ppm

Operating Temperature Range

- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Tri-state Operation

- Logic ‘1’ to pin 1 enables oscillator output
- Logic ‘0’ to pin 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pin 1 enables oscillator output

Period Jitter

- 10ps rms max

Ageing

- ±5ppm max in 1st year @ 25°C

Packaging

- Loose in bulk pack, 1pc per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

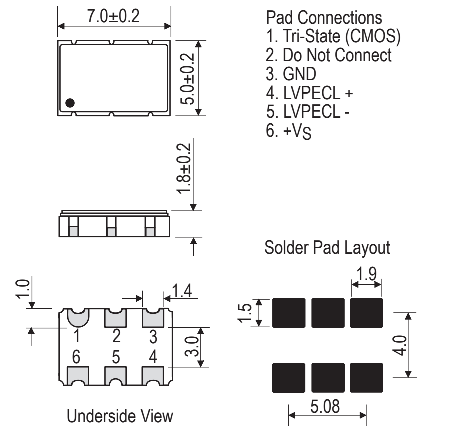
Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatibility
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

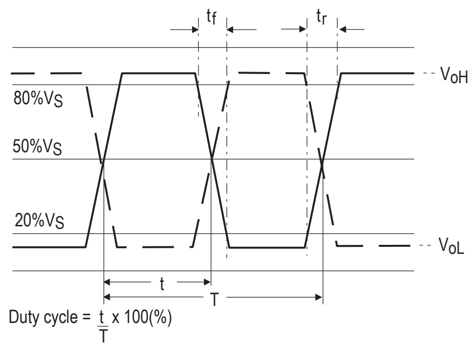
Example

- 100.0MHz IQXP-10
  LVPECL ±25ppm –40 to 85C 3.3V

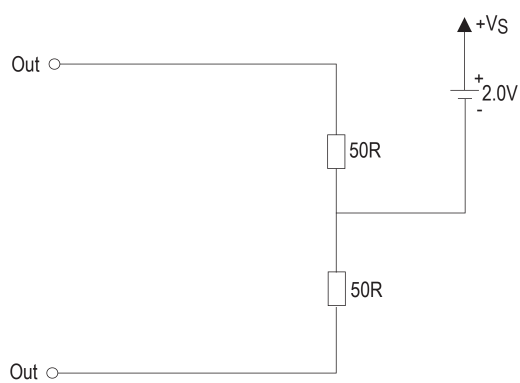
Outline (mm)



Output Waveform



Test Circuit



Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
1.0 to 200.0MHz	±25ppm	3.3V ±0.3V	100mA	1.5ns	1.5ns	45/55%	IQXP-10
Note: For other frequency/specification combinations, please contact our sales offices							

NOTES

FAST MAKE OSCILLATORS

MEMS OSCILLATORS - SELECTION TABLE

Model Number	Device Type	Supply Voltage	Output Compatibility	Package (mm)	Frequency Range	Frequency Stability (Tightest*)	Operating Temperature Range (Widest*)	Stock Items	Page
Specifying MEMS Oscillators									216
Stock MEMS Oscillators									218
IQMS-533	Oscillator	1.8V	CMOS	2.5 x 2	1 to 110MHz	±20ppm	–40 to 85°C		226
IQMS-523	Oscillator	1.8V	CMOS	3.2 x 2.5	1 to 110MHz	±20ppm	–40 to 85°C		224
IQMS-513	Oscillator	1.8V	CMOS	5 x 3.2	1 to 110MHz	±20ppm	–40 to 85°C		222
IQMS-503	Oscillator	1.8V	CMOS	7 x 5	1 to 110MHz	±20ppm	–40 to 85°C		220
IQMS-532	Oscillator	2.5V	CMOS	2.5 x 2	1 to 110MHz	±20ppm	–40 to 85°C		226
IQMS-522	Oscillator	2.5V	CMOS	3.2 x 2.5	1 to 110MHz	±20ppm	–40 to 85°C		224
IQMS-512	Oscillator	2.5V	CMOS	5 x 3.2	1 to 110MHz	±20ppm	–40 to 85°C		222
IQMS-502	Oscillator	2.5V	CMOS	7 x 5	1 to 110MHz	±20ppm	–40 to 85°C		220
IQMS-952	Oscillator	2.5V	LVDS	5 x 3.2	1 to 800MHz**	±10ppm	–40 to 85°C	✓	234
IQMS-942	Oscillator	2.5V	LVDS	7 x 5	1 to 800MHz**	±10ppm	–40 to 85°C		232
IQMS-912	Oscillator	2.5V	LVPECL	5 x 3.2	1 to 800MHz**	±10ppm	–40 to 85°C	✓	230
IQMS-902	Oscillator	2.5V	LVPECL	7 x 5	1 to 800MHz**	±10ppm	–40 to 85°C		228
IQMS-531	Oscillator	2.8V	CMOS	2.5 x 2	1 to 110MHz	±20ppm	–40 to 85°C		226
IQMS-521	Oscillator	2.8V	CMOS	3.2 x 2.5	1 to 110MHz	±20ppm	–40 to 85°C		224
IQMS-511	Oscillator	2.8V	CMOS	5 x 3.2	1 to 110MHz	±20ppm	–40 to 85°C		222
IQMS-501	Oscillator	2.8V	CMOS	7 x 5	1 to 110MHz	±20ppm	–40 to 85°C		220
IQMS-530	Oscillator	3.3V	CMOS	2.5 x 2	1 to 110MHz	±20ppm	–40 to 85°C		226
IQMS-520	Oscillator	3.3V	CMOS	3.2 x 2.5	1 to 110MHz	±20ppm	–40 to 85°C		224
IQMS-510	Oscillator	3.3V	CMOS	5 x 3.2	1 to 110MHz	±20ppm	–40 to 85°C		222
IQMS-500	Oscillator	3.3V	CMOS	7 x 5	1 to 110MHz	±20ppm	–40 to 85°C		220
IQMS-950	Oscillator	3.3V	LVDS	5 x 3.2	1 to 800MHz**	±10ppm	–40 to 85°C	✓	234
IQMS-940	Oscillator	3.3V	LVDS	7 x 5	1 to 800MHz**	±10ppm	–40 to 85°C		232
IQMS-910	Oscillator	3.3V	LVPECL	5 x 3.2	1 to 800MHz**	±10ppm	–40 to 85°C	✓	230
IQMS-900	Oscillator	3.3V	LVPECL	7 x 5	1 to 800MHz**	±10ppm	–40 to 85°C		228
IQMV-633	Voltage Control Oscillator	1.8V	CMOS	2.5 x 2	1 to 110MHz	±20ppm	–40 to 85°C		242
IQMV-623	Voltage Control Oscillator	1.8V	CMOS	3.2 x 2.5	1 to 110MHz	±20ppm	–40 to 85°C		240
IQMV-613	Voltage Control Oscillator	1.8V	CMOS	5 x 3.2	1 to 110MHz	±20ppm	–40 to 85°C		238
IQMV-603	Voltage Control Oscillator	1.8V	CMOS	7 x 5	1 to 110MHz	±20ppm	–40 to 85°C		236
IQMV-632	Voltage Control Oscillator	2.5V	CMOS	2.5 x 2	1 to 110MHz	±20ppm	–40 to 85°C		242
IQMV-622	Voltage Control Oscillator	2.5V	CMOS	3.2 x 2.5	1 to 110MHz	±20ppm	–40 to 85°C		240
IQMV-612	Voltage Control Oscillator	2.5V	CMOS	5 x 3.2	1 to 110MHz	±20ppm	–40 to 85°C		238
IQMV-602	Voltage Control Oscillator	2.5V	CMOS	7 x 5	1 to 110MHz	±20ppm	–40 to 85°C		236
IQMV-631	Voltage Control Oscillator	2.8V	CMOS	2.5 x 2	1 to 110MHz	±20ppm	–40 to 85°C		242
IQMV-621	Voltage Control Oscillator	2.8V	CMOS	3.2 x 2.5	1 to 110MHz	±20ppm	–40 to 85°C		240
IQMV-611	Voltage Control Oscillator	2.8V	CMOS	5 x 3.2	1 to 110MHz	±20ppm	–40 to 85°C		238
IQMV-601	Voltage Control Oscillator	2.8V	CMOS	7 x 5	1 to 110MHz	±20ppm	–40 to 85°C		236
IQMV-630	Voltage Control Oscillator	3.3V	CMOS	2.5 x 2	1 to 110MHz	±20ppm	–40 to 85°C		242
IQMV-620	Voltage Control Oscillator	3.3V	CMOS	3.2 x 2.5	1 to 110MHz	±20ppm	–40 to 85°C		240
IQMV-610	Voltage Control Oscillator	3.3V	CMOS	5 x 3.2	1 to 110MHz	±20ppm	–40 to 85°C		238
IQMV-600	Voltage Control Oscillator	3.3V	CMOS	7 x 5	1 to 110MHz	±20ppm	–40 to 85°C		236
* Tighter stability and wider temperature ranges may be available. Please contact our sales offices									
** 220 to 800MHz, please contact our sales offices									

SPECIFYING MEMS OSCILLATORS

Introduction

Micro Electro Mechanical Systems or MEMS as it is commonly known is the latest technology to be used in the Frequency Products market as an alternative to quartz based devices.

MEMS devices use a “silicon-beam” rather than quartz as the frequency control element which provides advantages such as small package size and good environmental performance for shock and vibration.

IQD’s series of MEMS devices use an internal MEMS resonator and a factory programmable oscillator circuit to provide the output frequency required by the customer.

Our range of devices include clock oscillators (IQMS series) and voltage controlled devices (IQMV series) in 4 package sizes and 4 supply voltage options.

The IQMS-500 and IQMV-600 series of oscillators provide enhanced performance including low jitter, low frequency stability and for the IQMV series, a choice of pullability options.

The electrical parameters are given on the specification to facilitate the correct circuit design. Further guidance can be found in the Application Notes chapter of this book. Our Application Support team can also provide assistance if required; please contact one of our sales offices for this support.

The limits given in the following specifications are indicative of the standard MEMS oscillator design, in the event that a specification is needed which is outside the standard MEMS oscillator designs offered please contact our Sales team.

Fast Make Capability

Due to the fact that MEMS oscillators are programmable, we are able to offer a fast make capability for this range of devices.

Specification

A typical MEMS specification reads like this:

40.0MHz IQMS-500
CMOS ±50ppm –20 to 70C 3.3V TS

The data in the example above is translated in the following order

- Frequency
- Model
- Output Compatiblity
- Frequency Stability
- Operating Temperature Range
- Supply Voltage
- Tri-State/Standby Option

Frequency

Frequency is normally specified in kilohertz (kHz) up to 999.999kHz and in megahertz (MHz) from 1.0MHz. All our computer-generated transaction documents follow this standard convention automatically.

The MEMS oscillator frequency should be specified to seven significant figures. If seven significant figures are not used, we assume that any figure that might follow those given may be taken as zero. Thus a frequency given as 16.6MHz will be taken as 16.60, not 16.6666.

Model Number

The model number incorporates information which describes supply voltage, output compatibility and holder style.

Output Compatiblity

As defined by the chosen model MEMS devices are available with either standard CMOS, LVDS or LVPECL outputs.

Frequency Stability

The frequency stability of a MEMS oscillator includes the initial adjustment tolerance at room temperature and the tolerance over operating temperature range. This value is specified as ‘parts per million’ (ppm) and is available in the ranges as shown below.

- ±10ppm
- ±15ppm
- ±20ppm
- ±25ppm
- ±30ppm
- ±50ppm
- ±100ppm

Operating Temperature Ranges

- 0 to 70°C
- –20 to 70°C
- –40 to 85°C

Although in general MEMS oscillators will continue to operate outside their normal temperature range with a degradation in frequency stability, damage can result if the temperatures reached are excessive.

Frequency Pullability (IQMV-600)

As standard the centre trim voltage is +0.875V. The pullability is specified as the change in frequency when the trim voltage is varied from 0V to +1.85V. This value is specified in ‘parts per million’ (ppm). Please see individual data sheets for further details.

Tri-State/Standby

The IQMS series of MEMS has the option of specifying either Tri-State (code TS) or Standby (code ST) as a function of the output signal. When in tri-state mode the output goes to the high impedance state while in standby mode the internal oscillator stops and the output signal goes to a low level. So TS will give fast start up time while ST will give low standby power consumption.

Additional Text Code

If the product is non-standard, the letter ‘T’ and/or ‘E’ will appear at the end of the product specification. This refers to additional text on the quotation/sales order to identify the non-standard requirements.

Packaging

Tape and Reel packaging is available as an option on many of the products outlined in this chapter.

Unless individual data sheets state Tape and Reel packaging, items will be Bulk packed. Please note: only complete reels are sold.

- Bulk = Bulk packed
- Reel = Tape and Reel packed

Outline Drawings

Dimensions on the MEMS oscillators drawings are shown only as a guide. Precise dimensions of the MEMS oscillators holders are available upon request. All dimensions are shown in mm and are nominal unless otherwise stated.

Ordering Information

- See individual data sheets

STOCK MEMS OSCILLATORS

IQMS-910 (5 x 3.2mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
212.50MHz	LVPECL 20ppm -40+85C 3.3V TS	LFMEMS001033	✓	
250.0MHz	LVPECL 20ppm -40+85C 3.3V TS	LFMEMS001037	✓	
297.0MHz	LVPECL 50ppm -20+70C 3.3V TS	LFMEMS001041	✓	
300.0MHz	LVPECL 20ppm -40+85C 3.3V TS	LFMEMS001042	✓	
312.50MHz	LVPECL 25ppm -40+85C 3.3V TS	LFMEMS001046	✓	
500.0MHz	LVPECL 20ppm -40+85C 3.3V TS	LFMEMS001049	✓	
600.0MHz	LVPECL 20ppm -40+85C 3.3V TS	LFMEMS001053	✓	
625.0MHz	LVPECL 20ppm -40+85C 3.3V TS	LFMEMS001057	✓	
644.53130MHz	LVPECL 25ppm -40+85C 3.3V TS	LFMEMS001059	✓	

IQMS-912 (5 x 3.2mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
212.50MHz	LVPECL 20ppm -40+85C 2.5V TS	LFMEMS001034	✓	
250.0MHz	LVPECL 20ppm -40+85C 2.5V TS	LFMEMS001038	✓	
300.0MHz	LVPECL 20ppm -40+85C 2.5V TS	LFMEMS001043	✓	
500.0MHz	LVPECL 20ppm -40+85C 2.5V TS	LFMEMS001050	✓	
600.0MHz	LVPECL 20ppm -40+85C 2.5V TS	LFMEMS001054	✓	
625.0MHz	LVPECL 20ppm -40+85C 2.5V TS	LFMEMS001058	✓	

IQMS-950 (5 x 3.2mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
212.50MHz	LVDS 20ppm -40+85C 3.3V TS	LFMEMS001035	✓	
250.0MHz	LVDS 20ppm -40+85C 3.3V TS	LFMEMS001039	✓	
300.0MHz	LVDS 20ppm -40+85C 3.3V TS	LFMEMS001044	✓	
425.0MHz	LVDS 50ppm -20+70C 3.3V TS	LFMEMS001048	✓	
500.0MHz	LVDS 20ppm -40+85C 3.3V TS	LFMEMS001051	✓	
600.0MHz	LVDS 20ppm -40+85C 3.3V TS	LFMEMS001055	✓	

IQMS-952 (5 x 3.2mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
212.50MHz	LVDS 20ppm -40+85C 2.5V TS	LFMEMS001036	✓	
250.0MHz	LVDS 20ppm -40+85C 2.5V TS	LFMEMS001040	✓	
300.0MHz	LVDS 20ppm -40+85C 2.5V TS	LFMEMS001045	✓	
322.26560MHz	LVDS 50ppm -40+85C 2.5V TS	LFMEMS001047	✓	
500.0MHz	LVDS 20ppm -40+85C 2.5V TS	LFMEMS001052	✓	
600.0MHz	LVDS 20ppm -40+85C 2.5V TS	LFMEMS001056	✓	

NOTES

MEMS OSCILLATORS

IQMS-500, -501, -502, -503 SERIES MEMS OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- MEMS alternative to the CFPS-73, CFPS-32 and CFPS-31
- Low jitter MEMS oscillator with CMOS output in a plastic package
- Factory programmable for a fast lead time

Frequency Range

- 1 to 110MHz

Output Compatibility & Load

- Tri-state / Standby CMOS
- Drive Capability 15pF max

Supply Voltages

- 3.3V IQMS-500
- 2.8V IQMS-501
- 2.5V IQMS-502
- 1.8V IQMS-503

Frequency Stabilities

- ±20ppm, ±25ppm, ±30ppm, ±50ppm, ±100ppm over the operating temperature range (inclusive of supply voltage variation, load variation, ageing, shock and vibration). Note: ±20ppm not available over –40 to 85°C

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –65 to 125°C

Tri-State Operation (TS option)

- Logic ‘1’ (≥70%V_S) to pad 1 enables oscillator output
- Logic ‘0’ (≤30%V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Standby (ST option)

- Logic ‘1’ (≥70%VS) to pad 1 enables oscillator output
- Logic ‘0’ (≤30%V_S) to pad 1 oscillator output is low level; oscillation stops (output weakly pulled down)
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max

RMS Period Jitter @ 75MHz

- 6.5ps max (IQMS-503)
- 4ps max (IQMS-500, 501, 502)

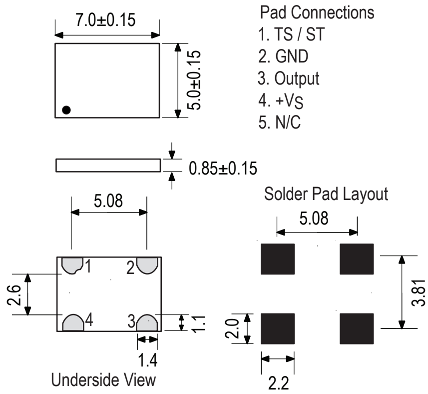
Start-Up Time

- 10ms max

Ageing

- ±1ppm typ in 1st year @ 25°C

Outline (mm)



Environmental

- Shock: MIL-STD-883F, Method 2002
- Vibration: MIL-STD-883F, Method 2007
- Temperature Cycle: JESD22, Method A104
- Solderability: MIL-STD-883F, Method 2003
- MSL level 1

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatiblity
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- TS/ST Option*

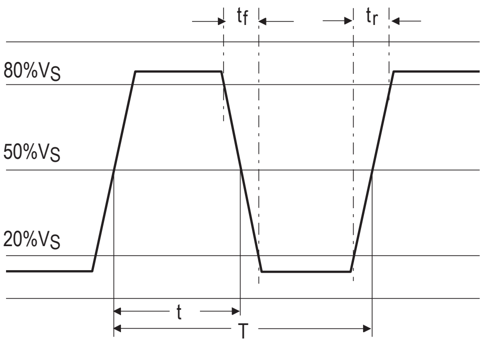
Example

- 40.00MHz IQMS-500
  CMOS ±50ppm –20 to 70C 3.3V TS

Electrical Specification - maximum limiting values

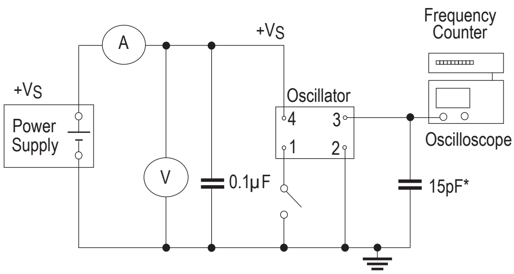
Frequency Range	Frequency Stability	Supply Voltage	Supply Current (no load @ 20MHz)	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
1.0 to 70.0MHz	±20ppm ±25ppm ±30ppm ±50ppm ±100ppm	3.3V±10%	7.5mA	2ns	2ns	45/55%	IQMS-500
>70.0 to 110.0MHz						40/60%	
1.0 to 70.0MHz		2.8V±10%				45/55%	IQMS-501
>70.0 to 110.0MHz						40/60%	
1.0 to 70.0MHz		2.5V±10%				45/55%	IQMS-502
>70.0 to 110.0MHz						40/60%	
1.0 to 70.0MHz		1.8V±5%	6.7mA	2.5ns	2.5ns	45/55%	IQMS-503
>70.0 to 110.0MHz						40/60%	
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



*Inclusive of jigging and equipment capacitance

IQMS-510, -511, -512, -513 SERIES MEMS OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- MEMS alternative to the CFPS-9 and CFPS-37
- Low jitter MEMS oscillator with CMOS output in a plastic package
- Factory programmable for a fast lead time

Frequency Range

- 1 to 110MHz

Output Compatibility & Load

- Tri-state / Standby CMOS
- Drive Capability 15pF max

Supply Voltages

- 3.3V IQMS-510
- 2.8V IQMS-511
- 2.5V IQMS-512
- 1.8V IQMS-513

Frequency Stabilities

- ±20ppm, ±25ppm, ±30ppm, ±50ppm, ±100ppm over the operating temperature range (inclusive of supply voltage variation, load variation, ageing, shock and vibration)
  Note: ±20ppm not avaible over –40 to 85°C

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –65 to 125°C

Tri-State Operation (TS option)

- Logic ‘1’ (≥70%V_S) to pad 1 enables oscillator output
- Logic ‘0’ (≤30%V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Standby (ST option)

- Logic ‘1’ (≥70%V_S) to pad 1 enables oscillator output
- Logic ‘0’ (≤30%V_S) to pad 1 oscillator output is low level; oscillation stops (output weakly pulled down)
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max

RMS Period Jitter @ 75MHz

- 6ps max (IQMS-513)
- 4ps max (IQMS-510, 511, 512)

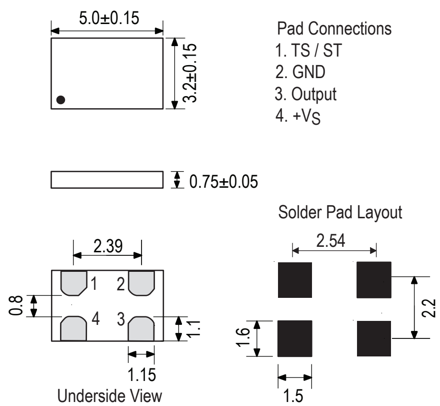
Start-Up Time

- 10ms max

Ageing

- ±1ppm typ in 1st year @ 25°C

Outline (mm)



Environmental

- Shock: MIL-STD-883F, Method 2002
- Vibration: MIL-STD-883F, Method 2007
- Temperature Cycle: JESD22, Method A104
- Solderability: MIL-STD-883F, Method 2003
- MSL level 1

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatiblity
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- TS/ST Option*

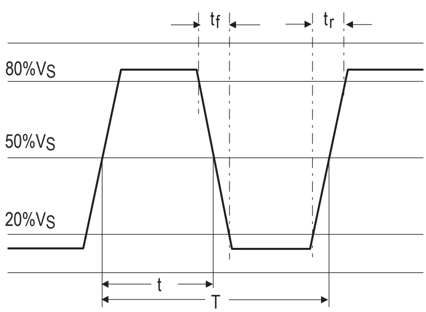
Example

- 40.00MHz IQMS-510
  CMOS ±50ppm –20 to 70C 3.3V TS

Electrical Specification - maximum limiting values

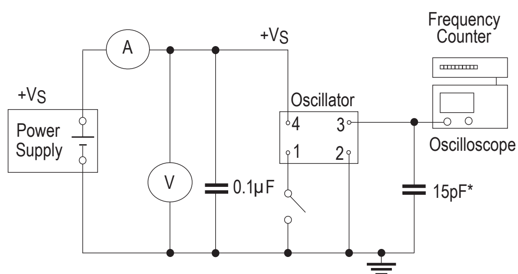
Frequency Range	Frequency Stability	Supply Voltage	Supply Current (no load @ 20MHz)	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
1.0 to 70.0MHz	±20ppm ±25ppm ±30ppm ±50ppm ±100ppm	3.3V±10%	7.5mA	2ns	2ns	45/55%	IQMS-510
>70.0 to 110.0MHz						40/60%	
1.0 to 70.0MHz		2.8V±10%				45/55%	IQMS-511
>70.0 to 110.0MHz						40/60%	
1.0 to 70.0MHz		2.5V±10%				45/55%	IQMS-512
>70.0 to 110.0MHz						40/60%	
1.0 to 70.0MHz		1.8V±5%	6.7mA	2.5ns	2.5ns	45/55%	IQMS-513
>70.0 to 110.0MHz						40/60%	
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



*Inclusive of jigging and equipment capacitance

IQMS-520, -521, -522, -523 SERIES MEMS OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- MEMS alternative to the CFPS-39, CFPS-40 and CFPS-41
- Low jitter MEMS oscillator with CMOS output in a plastic package
- Factory programmable for a fast lead time

Frequency Range

- 1 to 110MHz

Output Compatibility & Load

- Tri-state / Standby CMOS
- Drive Capability 15pF max

Supply Voltages

- 3.3V IQMS-520
- 2.8V IQMS-521
- 2.5V IQMS-522
- 1.8V IQMS-523

Frequency Stabilities

- ±20ppm, ±25ppm, ±30ppm, ±50ppm, ±100ppm over the operating temperature range (inclusive of supply voltage variation, load variation, ageing, shock and vibration)
  Note: ±20ppm not available over –40 to 85°C

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –65 to 125°C

Tri-State Operation (TS option)

- Logic ‘1’ (≥70%V_S) to pad 1 enables oscillator output
- Logic ‘0’ (≤30%V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Standby (ST option)

- Logic ‘1’ (≤70%V_S) to pad 1 enables oscillator output
- Logic ‘0’ (≤30%V_S) to pad 1 oscillator output is low level; oscillation stops (output weakly pulled down)
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max

RMS Period Jitter @ 75MHz

- 6ps max (IQMS-523)
- 4ps max (IQMS-520, 521, 522)

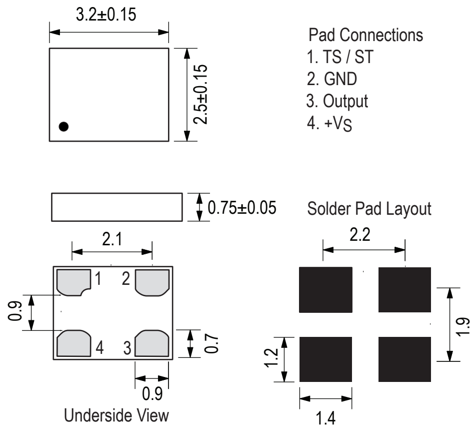
Start-Up Time

- 10ms max

Ageing

- ±1ppm typ in 1st year @ 25°C

Outline (mm)



Environmental

- Shock: MIL-STD-883F, Method 2002
- Vibration: MIL-STD-883F, Method 2007
- Temperature Cycle: JESD22, Method A104
- Solderability: MIL-STD-883F, Method 2003
- MSL level 1

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatiblity
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- TS/ST Option*

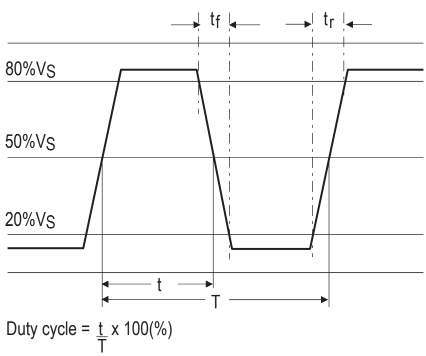
Example

- 40.00MHz IQMS-520
  CMOS ±50ppm –20 to 70C 3.3V TS

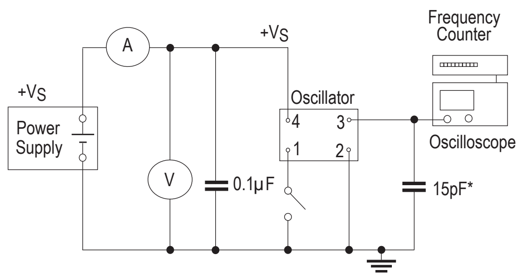
Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (no load @ 20MHz)	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
1.0 to 70.0MHz	±20ppm ±25ppm ±30ppm ±50ppm ±100ppm	3.3V±10%	7.5mA	2ns	2ns	45/55%	IQMS-520
>70.0 to 110.0MHz						40/60%	
1.0 to 70.0MHz		2.8V±10%				45/55%	IQMS-521
>70.0 to 110.0MHz						40/60%	
1.0 to 70.0MHz		2.5V±10%				45/55%	IQMS-522
>70.0 to 110.0MHz						40/60%	
1.0 to 70.0MHz		1.8V±5%	6.7mA	2.5ns	2.5ns	45/55%	IQMS-523
>70.0 to 110.0MHz						40/60%	
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Test Circuit



*Inclusive of jigging and equipment capacitance

MEMS OSCILLATORS

IQMS-530, -531, -532, -533 SERIES MEMS OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- MEMS alternative to the CFPS-56, CFPS-54 and CFPS-53
- Low jitter MEMS oscillator with CMOS output in a plastic package
- Factory programmable for a fast lead time

Frequency Range

- 1 to 110MHz

Output Compatibility & Load

- Tri-state / Standby CMOS
- Drive Capability 15pF max

Supply Voltages

- 3.3V IQMS-530
- 2.8V IQMS-531
- 2.5V IQMS-532
- 1.8V IQMS-533

Frequency Stabilities

- ±20ppm, ±25ppm, ±30ppm, ±50ppm, ±100ppm over the operating temperature range (inclusive of supply voltage variation, load variation, ageing, shock and vibration)
  Note: ±20ppm not available over –40 to 85°C

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –65 to 125°C

Tri-State Operation (TS option)

- Logic '1' (≥70%V_S) to pad 1 enables oscillator output
- Logic '0' (≤30%V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Standby (ST option)

- Logic '1' (≥70%V_S) to pad 1 enables oscillator output
- Logic '0' (≤30%V_S) to pad 1 oscillator output is low level; oscillation stops (output weakly pulled down)
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max

RMS Period Jitter @ 75MHz

- 6ps max (IQMS-533)
- 4ps max (IQMS-530, 531, 532)

Start-Up Time

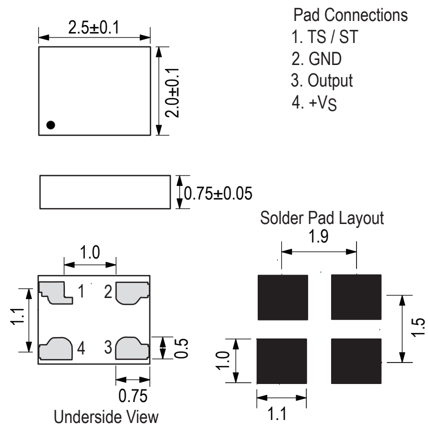
- 10ms max

Ageing

- ±1ppm typ in 1st year @ 25°C

MEMS OSCILLATORS

Outline (mm)



Environmental

- Shock: MIL-STD-883F, Method 2002
- Vibration: MIL-STD-883F, Method 2007
- Temperature Cycle: JESD22, Method A104
- Solderability: MIL-STD-883F, Method 2003
- MSL level 1

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatiblity
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- TS/ST Option*

Example

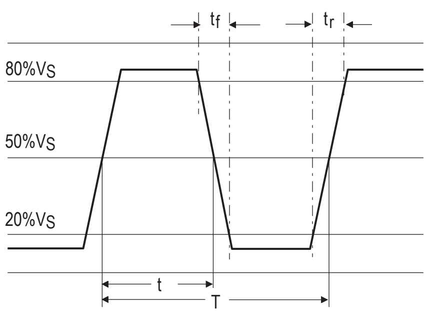
- 40.00MHz IQMS-530
  CMOS ±50ppm –20 to 70C 3.3V TS

Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (no load @ 20MHz)	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
1.0 to 70.0MHz	±20ppm ±25ppm ±30ppm ±50ppm ±100ppm	3.3V±10%	7.5mA	2ns	2ns	45/55%	IQMS-530
>70.0 to 110.0MHz						40/60%	
1.0 to 70.0MHz		2.8V±10%				45/55%	IQMS-531
>70.0 to 110.0MHz						40/60%	
1.0 to 70.0MHz		2.5V±10%				45/55%	IQMS-532
>70.0 to 110.0MHz						40/60%	
1.0 to 70.0MHz		1.8V±5%	6.7mA	2.5ns	2.5ns	45/55%	IQMS-533
>70.0 to 110.0MHz						40/60%	

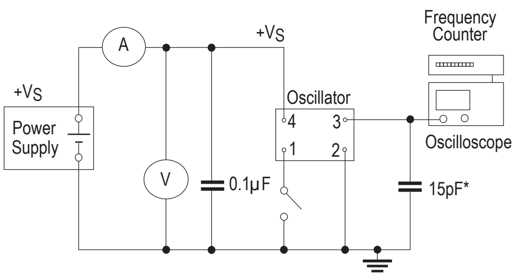
Note: For other frequency/specification combinations, please contact our sales offices

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



*Inclusive of jigging and equipment capacitance

MEMS OSCILLATORS

IQMS-900, -902 SERIES MEMS OSCILLATORS

ISSUE 3; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- MEMS alternative to the IQXO-690
- LVPECL output low jitter MEMS oscillator in a plastic package
- Factory programmable for a fast lead time

Frequency Ranges

- 1 to 220MHz
- 220 to 800MHz (contact IQD sales offices)

Output Compatibility & Load

- LVPECL
- Output load 50Ω terminated to V_S - 2.0V
- Output Level 0.8V pk-pk typical

Supply Voltages

- 3.3V IQMS-900
- 2.5V IQMS-902

Frequency Stabilities

- ±10ppm, ±15ppm ±20ppm, ±25ppm, ±50ppm over the operating temperature range (inclusive of tolerance, supply voltage variation, load variation)
  Note: ±10ppm only available over 0 to 70°C

Operating Temperature Ranges

- 0 to 70°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –65 to 150°C

Tri-state Operation (TS option)

- Logic ‘1’ to pad 1 (≥70%V_S) enables oscillator output
- Logic ‘0’ to pad 1 (≤30%V_S) disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Standby (ST option)

- Logic ‘1’ to pad 1 (≥70%V_S) enables oscillator output
- Logic ‘0’ to pad 1 (≤30%V_S) disables oscillator output; when disabled the oscillator output goes to the high impedance state, oscillation stops
- No connection to pad 1 enables oscillator output
- Standby Current: 25µA typcial @3.3V
  15µA typcial @2.5V

RMS Period Jitter @ 200MHz

- 1.3ps typical

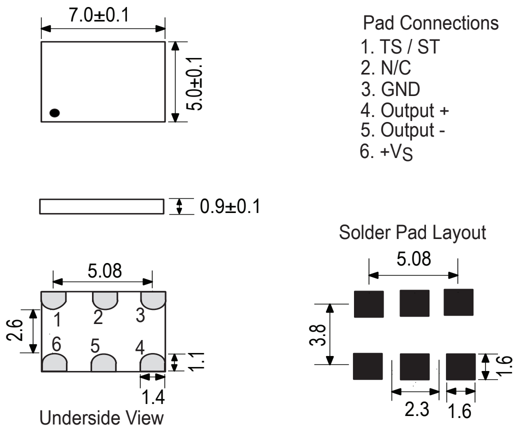
RMS Phase Jitter @ 200MHz, BW 1MHz to 20MHz

- 0.7ps typical

Ageing

- ±1ppm typ in 1st year at 25°C

Outline (mm)



Environmental

- Shock: MIL-STD-883F, Method 2002
- Vibration: MIL-STD-883F, Method 2007
- Temperature Cycle: MIL-STD-883F, Method 1010
- Solderability: MIL-STD-883F, Method 2003
- MSL level 1

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatiblity
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- TS/ST Option*

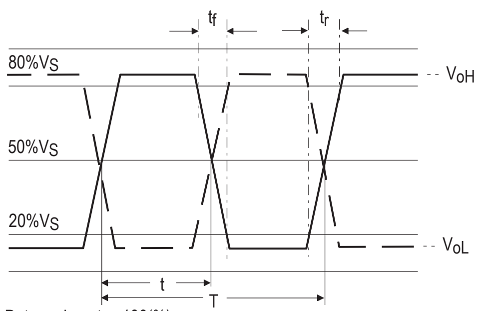
Example

- 40.00MHz IQMS-900
  LVPECL ±25ppm –40 to 85C 3.3V ST

Electrical Specifications - maximum limiting values

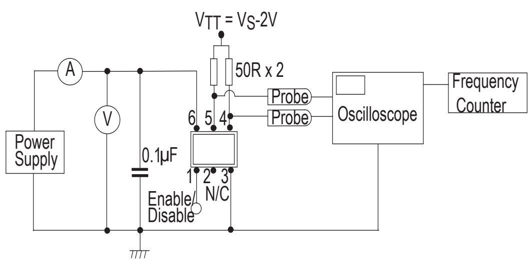
Frequency Range	Frequency Stability	Supply Voltage	Supply Current (no load)	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
1.0 to 220.0MHz	±10ppm ±15ppm ±20ppm ±25ppm ±50ppm	3.3V±10%	74mA	300ps	300ps	45/55%	IQMS-900
		2.5V±10%	71mA				IQMS-902
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



MEMS OSCILLATORS

IQMS-910, -912 SERIES MEMS OSCILLATORS

ISSUE 3; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- LVPECL output low jitter MEMS oscillator in a plastic package
- Factory programmable for a fast lead time
- Stock parts listed at the beginning of this chapter

Frequency Ranges

- 1 to 220MHz
- 220 to 800MHz (contact IQD sales offices)

Output Compatibility & Load

- LVPECL
- Output load 50Ω terminated to V_S - 2.0V
- Output Level 0.8V pk-pk typical

Supply Voltages

- 3.3V IQMS-910
- 2.5V IQMS-912

Frequency Stabilities

- ±10ppm, ±15ppm ±20ppm, ±25ppm, ±50ppm over the operating temperature range (inclusive of tolerance, supply voltage variation, load variation)
  Note: ±10ppm only available over 0 to 70°C

Operating Temperature Ranges

- 0 to 70°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –65 to 150°C

Tri-state Operation (TS option)

- Logic '1' to pad 1 (≥70%V_S) enables oscillator output
- Logic '0' to pad 1 (≤30%V_S) disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Standby (ST option)

- Logic '1' to pad 1 (≥70%V_S) enables oscillator output
- Logic '0' to pad 1 (≤30%V_S) disables oscillator output; when disabled the oscillator output goes to the high impedance state, oscillation stops
- No connection to pad 1 enables oscillator output
- Standby Current: 25µA typcial @3.3V
  15µA typcial @2.5V

RMS Period Jitter @ 200MHz

- 1.3ps typical

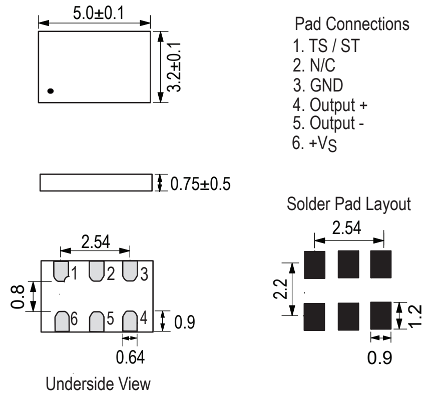
RMS Phase Jitter @ 200MHz, BW 1MHz to 20MHz

- 0.7ps typical

Ageing

- ±1ppm typ in 1st year at 25°C

Outline (mm)



Environmental

- Shock: MIL-STD-883F, Method 2002
- Vibration: MIL-STD-883F, Method 2007
- Temperature Cycle: MIL-STD-883F, Method 1010
- Solderability: MIL-STD-883F, Method 2003
- MSL level 1

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- TS/ST Option

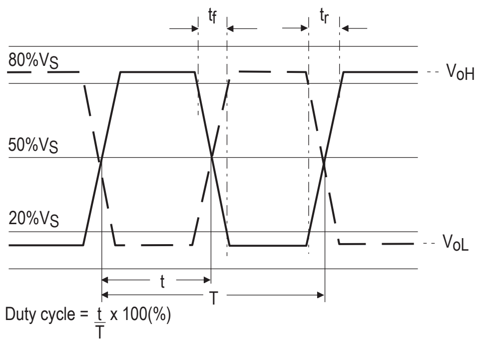
Example

- 40.00MHz IQMS-910
  LVPECL ±25ppm –40 to 85C 3.3V ST

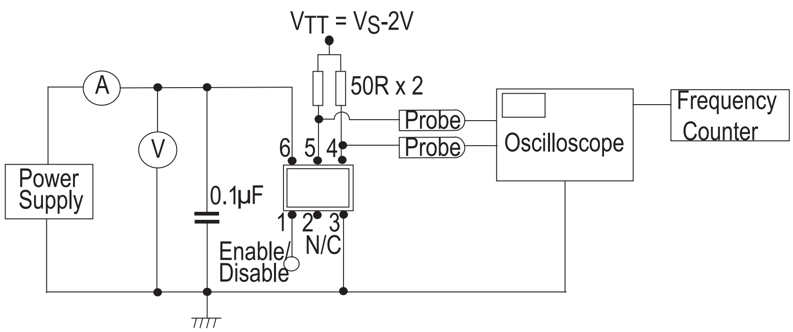
Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (no load)	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
1.0 to 220.0MHz	±10ppm ±15ppm ±20ppm ±25ppm ±50ppm	3.3V±10%	74mA	300ps	300ps	45/55%	IQMS-910
		2.5V±10%	71mA				IQMS-912
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Test Circuit



IQMS-940, -942 SERIES MEMS OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- MEMS alternative to the IQXO-710
- LVDS output MEMS oscillator in a plastic package
- Factory programmable for a fast lead time

Frequency Ranges

- 1 to 220MHz
- 220 to 800MHz (contact IQD sales offices)

Output Compatibility & Load

- LVDS
- Differential Output Voltage (V_{OD}) 0.25V min, 0.35V typical
- Offset Voltage (Vos) 1.2V typical
- Output Load 100Ω

Supply Voltages

- 3.3V IQMS-940
- 2.5V IQMS-942

Frequency Stabilities

- ±10ppm, ±15ppm ±20ppm, ±25ppm, ±50ppm over the operating temperature range (inclusive of tolerance, supply voltage variation, load variation)
  Note: ±10ppm only available over 0 to 70°C

Operating Temperature Ranges

- 0 to 70°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –65 to 150°C

Tri-State Operation (TS option)

- Logic ‘1’ to pad 1 (≥70%V_S) enables oscillator output
- Logic ‘0’ to pad 1 (≤30%V_S) disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Standby (ST option)

- Logic ‘1’ to pad 1 (≥70%V_S) enables oscillator output
- Logic ‘0’ to pad 1 (≤30%V_S) disables oscillator output; when disabled the oscillator output goes to the high impedance state, oscillation stops
- No connection to pad 1 enables oscillator output
- Standby Current: 25µA typcial @3.3V
  15µA typcial @2.5V

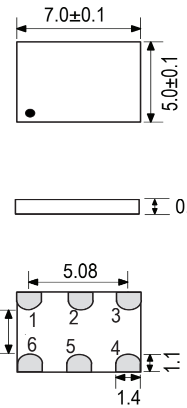
RMS Period Jitter @ 200MHz

- 1.8ps typical at 3.3V
- 2.4ps typical at 2.5V

RMS Phase Jitter @ 200MHz, BW 1MHz to 20MHz

- 0.7ps typical

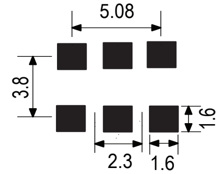
Outline (mm)



Underside View

Pad Connections
1. TS / ST
2. N/C
3. GND
4. Output +
5. Output -
6. +V_S

Solder Pad Layout



Ageing

- ±1ppm typ in 1st year at 25°C

Environmental

- Shock: MIL-STD-883F, Method 2002
- Vibration: MIL-STD-883F, Method 2007
- Temperature Cycle: MIL-STD-883F, Method 1010
- Solderability: MIL-STD-883F, Method 2003
- MSL level 1

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- TS/ST Option*

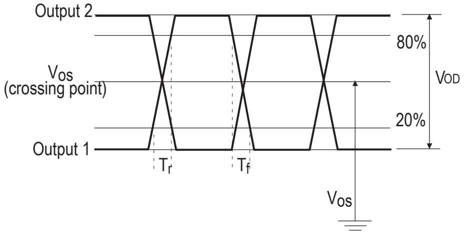
Example

- 40.00MHz IQMS-940
  LVDS ±25ppm –40 to 85C 3.3V ST

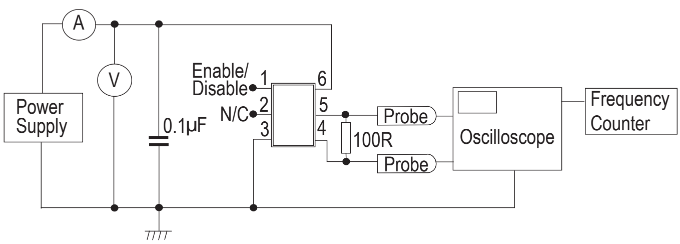
Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (no load)	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
1.0 to 220.0MHz	±10ppm ±15ppm ±20ppm ±25ppm ±50ppm	3.3V±10%	79mA	325ps	325ps	45/55%	IQMS-940
		2.5V±10%	76mA				IQMS-942
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Test Circuit



MEMS OSCILLATORS

IQMS-950, -952 SERIES MEMS OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- LVDS output MEMS oscillator in a plastic package
- Factory programmable for a fast lead time
- Stock parts listed at the beginning of this chapter

Frequency Ranges

- 1 to 220MHz
- 220 to 800MHz (contact IQD sales offices)

Output Compatibility & Load

- LVDS
- Differential Output Voltage (V_{OD}) 0.25V min, 0.35V typical
- Offset Voltage (Vos) 1.2V typical
- Output Load 100Ω

Supply Voltages

- 3.3V IQMS-950
- 2.5V IQMS-952

Frequency Stabilities

- ±10ppm, ±15ppm ±20ppm, ±25ppm, ±50ppm over the operating temperature range (inclusive of tolerance, supply voltage variation, load variation)
  Note: ±10ppm only avaible over 0 to 70°C

Operating Temperature Ranges

- 0 to 70°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –65 to 150°C

Tri-State Operation (TS option)

- Logic ‘1’ to pad 1 (≥70%V_S) enables oscillator output
- Logic ‘0’ to pad 1 (≤30%V_S) disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Standby (ST option)

- Logic ‘1’ to pad 1 (≥70%V_S) enables oscillator output
- Logic ‘0’ to pad 1 (≤30%V_S) disables oscillator output; when disabled the oscillator output goes to the high impedance state, oscillation stops
- No connection to pad 1 enables oscillator output
- Standby Current: 25μA typcial @3.3V
  15μA typcial @2.5V

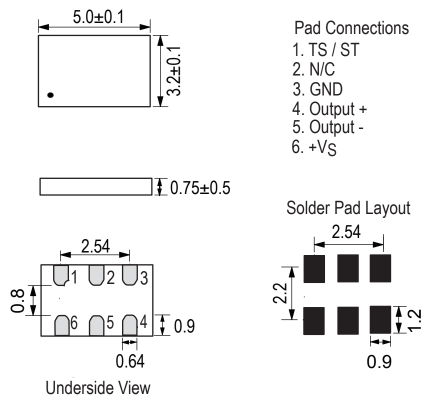
RMS Period Jitter @ 200MHz

- 1.8ps typical at 3.3V
- 2.4ps typical at 2.5V

RMS Phase Jitter @ 200MHz, BW 1MHz to 20MHz

- 0.7ps typical

Outline (mm)



Ageing

- ±1ppm typ in 1st year at 25°C

Environmental

- Shock: MIL-STD-883F, Method 2002
- Vibration: MIL-STD-883F, Method 2007
- Temperature Cycle: MIL-STD-883F, Method 1010
- Solderability: MIL-STD-883F, Method 2003
- MSL level 1

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- TS/ST Option*

Example

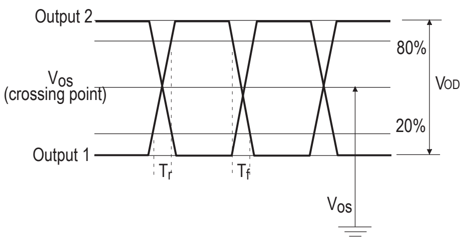
- 40.00MHz IQMS-950
  LVDS ±25ppm –40 to 85C 3.3V ST

MEMS OSCILLATORS

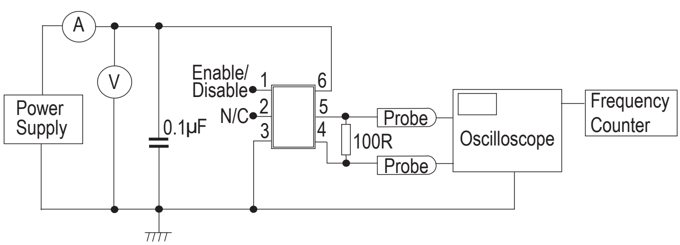
Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (no load)	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
1.0 to 220.0MHz	±10ppm ±15ppm ±20ppm ±25ppm ±50ppm	3.3V±10%	79mA	325ps	325ps	45/55%	IQMS-950
		2.5V±10%	76mA				IQMS-952
Note: For other frequency/specification combinations, please contact our sales offices							

Output Waveform



Test Circuit



IQMV-600, -601, -602, -603 SERIES MEMS OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Voltage Controlled MEMS Oscillator with Low jitter a CMOS output in a plastic package
- Factory programmable for a fast lead time

Frequency Range

- 1 to 110MHz

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 3.3V IQMV-600
- 2.8V IQMV-601
- 2.5V IQMV-602
- 1.8V IQMV-603

Frequency Stabilities

- ±20ppm, ±25ppm, ±30ppm, ±50ppm over the operating temperature range (inclusive of supply voltage variation and load variation)
  Note: ±20ppm not avaible over –40 to 85°C

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –65 to 150°C

Pullability Options

- ±60ppm min
- ±120ppm min

Voltage Control (pad 1)

- 0V to +1.85V (for all supply voltage devices)
- Frequency @ 25°C is ref to 0.875V

Linearity

- 0.25% max, positive slope

RMS Period Jitter @ 75MHz

- 4ps rms max (2.5V, 2.8V & 3.3V devices)
- 6ps rms max (1.8V devices)

Phase Jitter (BW 900kHz to 7.5MHz) @75MHz

- 0.6ps rms typical (2.5V, 2.8V & 3.3V devices)
- 0.8ps rms typical (1.8V devices)

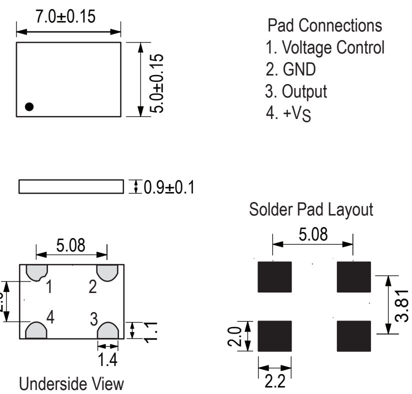
Start-Up Time

- 10ms max

Environmental

- Shock: based on MIL-STD-883F, Method 2002, 50kG
- Vibration: MIL-STD-883F, Method 2007, 70G
- MSL level 1

Outline (mm)



Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatiblity
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pullability*

Example

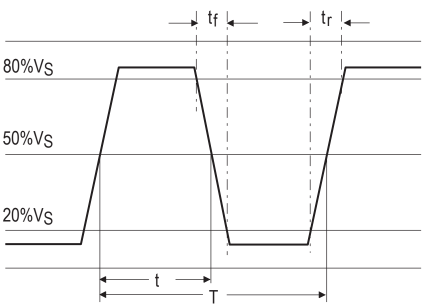
- 40.00MHz IQMV-600
  CMOS ±50ppm –20 to 70C 3.3V ±60ppm min

Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Pullability min	Supply Current (no load @ 20MHz)	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model
1.0 to 75.0MHz	±20ppm ±25ppm ±30ppm ±50ppm	3.3V±10%	±60ppm ±120ppm	7.5mA	2ns	2ns	45/55%	IQMV-600
>75.0 to 110.0MHz							40/60%	
1.0 to 75.0MHz		2.8V±10%					45/55%	IQMV-601
>75.0 to 110.0MHz							40/60%	
1.0 to 75.0MHz		2.5V±10%					45/55%	IQMV-602
>75.0 to 110.0MHz							40/60%	
1.0 to 75.0MHz		1.8V±5%		6.7mA	2.5ns	2.5ns	45/55%	IQMV-603
>75.0 to 110.0MHz							40/60%	

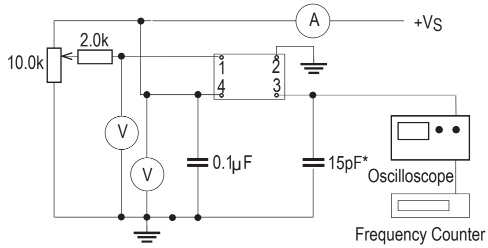
Note: For other frequency/specification combinations, please contact our sales offices

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



*Inclusive of jigging and equipment capacitance

MEMS OSCILLATORS

IQMV-610, -611, -612, -613 SERIES MEMS OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Voltage Controlled MEMS Oscillator with Low jitter a CMOS output in a plastic package
- Factory programmable for a fast lead time

Frequency Range

- 1 to 110MHz

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 3.3V IQMV-610
- 2.8V IQMV-611
- 2.5V IQMV-612
- 1.8V IQMV-613

Frequency Stabilities

- ±20ppm, ±25ppm, ±30ppm, ±50ppm over the operating temperature range (inclusive of supply voltage variation and load variation)
  Note: ±20ppm not avavible over –40 to 85°C

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –65 to 150°C

Pullability Options

- ±60ppm min
- ±120ppm min

Voltage Control (pad 1)

- 0V to +1.85V (for all supply voltage devices)
- Frequency @ 25°C is ref to 0.875V

Linearity

- 0.25% max, positive slope

RMS Period Jitter @ 75MHz

- 4ps rms max (2.5V, 2.8V & 3.3V devices)
- 6ps rms max (1.8V devices)

Phase Jitter (BW 900kHz to 7.5MHz) @75MHz

- 0.6ps rms typical (2.5V, 2.8V & 3.3V devices)
- 0.8ps rms typical (1.8V devices)

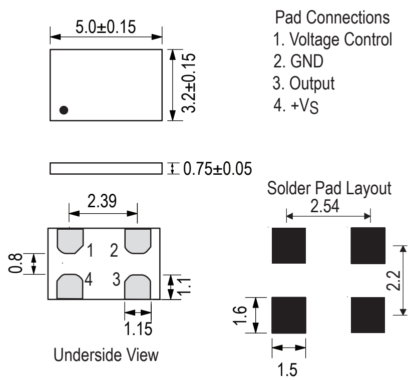
Start-Up Time

- 10ms max

Environmental

- Shock: based on MIL-STD-883F, Method 2002, 50kG
- Vibration: MIL-STD-883F, Method 2007, 70G
- MSL level 1

Outline (mm)



Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatiblity
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pullability*

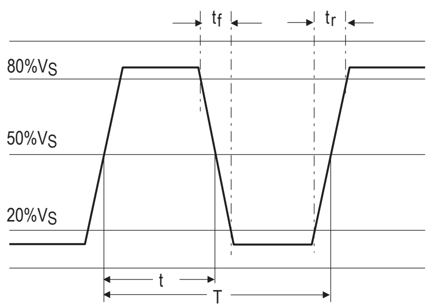
Example

- 40.00MHz IQMV-610
  CMOS ±50ppm –20 to 70C 3.3V ±60ppm min

Electrical Specification - maximum limiting values

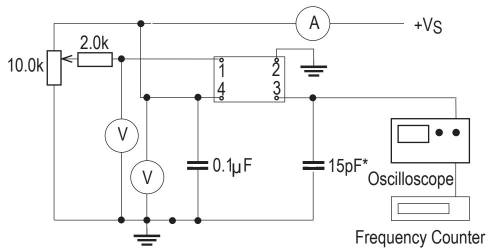
Frequency Range	Frequency Stability	Supply Voltage	Pullability min	Supply Current (no load @ 20MHz)	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model
1.0 to 75.0MHz	±20ppm ±25ppm ±30ppm ±50ppm	3.3V±10%	±60ppm ±120ppm	7.5mA	2ns	2ns	45/55%	IQMV-610
>75.0 to 110.0MHz							40/60%	
1.0 to 75.0MHz		2.8V±10%					45/55%	IQMV-611
>75.0 to 110.0MHz							40/60%	
1.0 to 75.0MHz		2.5V±10%					45/55%	IQMV-612
>75.0 to 110.0MHz							40/60%	
1.0 to 75.0MHz		1.8V±5%		6.7mA	2.5ns	2.5ns	45/55%	IQMV-613
>75.0 to 110.0MHz							40/60%	
Note: For other frequency/specification combinations, please contact our sales offices								

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



*Inclusive of jigging and equipment capacitance

IQMV-620, -621, -622, -623 SERIES MEMS OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Voltage Controlled MEMS Oscillator with Low jitter a CMOS output in a plastic package
- Factory programmable for a fast lead time

Frequency Range

- 1 to 110MHz

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 3.3V IQMV-620
- 2.8V IQMV-621
- 2.5V IQMV-622
- 1.8V IQMV-623

Frequency Stabilities

- ±20ppm, ±25ppm, ±30ppm, ±50ppm over the operating temperature range (inclusive of supply voltage variation and load variation)
  Note: ±20ppm not available over –40 to 85°C

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –65 to 150°C

Pullability Options

- ±60ppm min
- ±120ppm min

Voltage Control (pad 1)

- 0V to +1.85V (for all supply voltage devices)
- Frequency @ 25°C is ref to 0.875V

Linearity

- 0.25% max, positive slope

RMS Period Jitter @ 75MHz

- 4ps rms max (2.5V, 2.8V & 3.3V devices)
- 6ps rms max (1.8V devices)

Phase Jitter (BW 900kHz to 7.5MHz) @75MHz

- 0.6ps rms typical (2.5V, 2.8V & 3.3V devices)
- 0.8ps rms typical (1.8V devices)

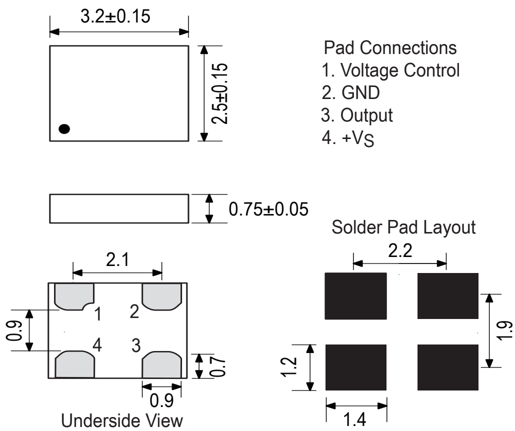
Start-Up Time

- 10ms max

Environmental

- Shock: based on MIL-STD-883F, Method 2002, 50kG
- Vibration: MIL-STD-883F, Method 2007, 70G
- MSL level 1

Outline (mm)



Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatiblity
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pullability*

Example

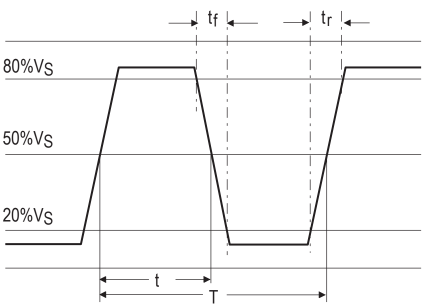
- 40.00MHz IQMV-620
  CMOS ±50ppm –20 to 70C 3.3V ±60ppm min

Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Pullability min	Supply Current (no load @ 20MHz)	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model
1.0 to 75.0MHz	±20ppm ±25ppm ±30ppm ±50ppm	3.3V±10%	±60ppm ±120ppm	7.5mA	2ns	2ns	45/55%	IQMV-620
>75.0 to 110.0MHz							40/60%	
1.0 to 75.0MHz		2.8V±10%					45/55%	IQMV-621
>75.0 to 110.0MHz							40/60%	
1.0 to 75.0MHz		2.5V±10%					45/55%	IQMV-622
>75.0 to 110.0MHz							40/60%	
1.0 to 75.0MHz		1.8V±5%		6.7mA	2.5ns	2.5ns	45/55%	IQMV-623
>75.0 to 110.0MHz							40/60%	

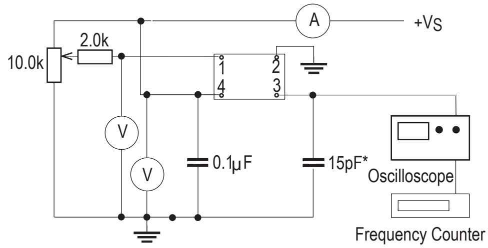
Note: For other frequency/specification combinations, please contact our sales offices

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



*Inclusive of jigging and equipment capacitance

MEMS OSCILLATORS

IQMV-630, -631, -632, -633 SERIES MEMS OSCILLATORS

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Voltage Controlled MEMS Oscillator with Low jitter a CMOS output in a plastic package
- Factory programmable for a fast lead time

Frequency Range

- 1 to 110MHz

Output Compatibility & Load

- CMOS
- Drive Capability 15pF max

Supply Voltages

- 3.3V IQMV-630
- 2.8V IQMV-631
- 2.5V IQMV-632
- 1.8V IQMV-633

Frequency Stabilities

- ±20ppm, ±25ppm, ±30ppm, ±50ppm over the operating temperature range (inclusive of supply voltage variation and load variation)
  Note: ±20ppm not available over –40 to 85°C

Operating Temperature Ranges

- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –65 to 150°C

Pullability Options

- ±60ppm min
- ±120ppm min

Voltage Control (pad 1)

- 0V to +1.85V (for all supply voltage devices)
- Frequency @ 25°C is ref to 0.875V

Linearity

- 0.25% max, positive slope

RMS Period Jitter @ 75MHz

- 4ps rms max (2.5V, 2.8V & 3.3V devices)
- 6ps rms max (1.8V devices)

Phase Jitter (BW 900kHz to 7.5MHz) @75MHz

- 0.6ps rms typical (2.5V, 2.8V & 3.3V devices)
- 0.8ps rms typical (1.8V devices)

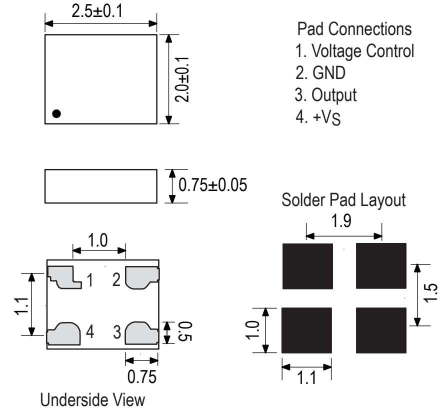
Start-Up Time

- 10ms max

Environmental

- Shock: based on MIL-STD-883F, Method 2002, 50kG
- Vibration: MIL-STD-883F, Method 2007, 70G
- MSL level 1

Outline (mm)



Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatiblity
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pullability*

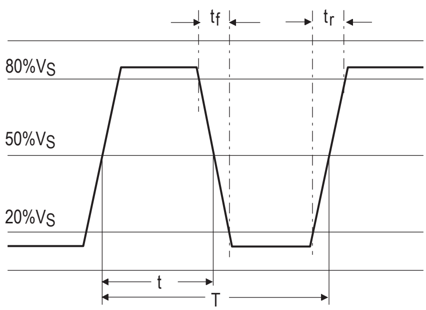
Example

- 40.00MHz IQMV-630
  CMOS ±50ppm –20 to 70C 3.3V ±60ppm min

Electrical Specification - maximum limiting values

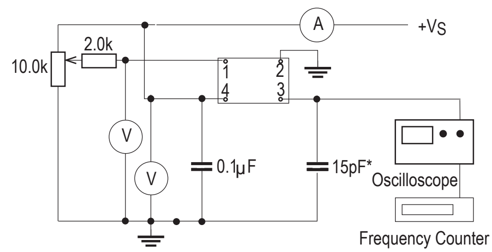
Frequency Range	Frequency Stability	Supply Voltage	Pullability min	Supply Current (no load @ 20MHz)	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model
1.0 to 75.0MHz	±20ppm ±25ppm ±30ppm ±50ppm	3.3V±10%	±60ppm ±120ppm	7.5mA	2ns	2ns	45/55%	IQMV-630
>75.0 to 110.0MHz							40/60%	
1.0 to 75.0MHz		2.8V±10%					45/55%	IQMV-631
>75.0 to 110.0MHz							40/60%	
1.0 to 75.0MHz		2.5V±10%					45/55%	IQMV-632
>75.0 to 110.0MHz							40/60%	
1.0 to 75.0MHz		1.8V±5%		6.7mA	2.5ns	2.5ns	45/55%	IQMV-633
>75.0 to 110.0MHz							40/60%	
Note: For other frequency/specification combinations, please contact our sales offices								

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



*Inclusive of jigging and equipment capacitance

NOTES

AUTOMOTIVE QUARTZ CRYSTALS & OSCILLATORS SELECTION TABLE

Model	Package (mm)	Frequency Range	Frequency Tolerance (Tightest*)	Frequency Stability (Tightest*)	Temperature Range (Widest*)	Load Capacitance (Standard)	Page
Specifying Automotive Quartz Crystals & Oscillators							246
Surface Mount Crystals							
IQXC-180 AUTO	3.2 x 2.5	16 to 32MHz	±10ppm	±15ppm	–40 to 125°C	8pF	263
IQXC-201 AUTO	4 x 2.5	12 to 32MHz	±10ppm	±15ppm	–40 to 125°C	8pF	264
IQXC-104 AUTO	5 x 3.2	12 to 32MHz	±10ppm	±15ppm	–40 to 125°C	8pF	262
IQXC-228 AUTO	6 x 3.5	10 to 70MHz	±10ppm	±15ppm	-40 to 125°C	8pF	266
12SMX AUTO	7 x 5	6 to 80MHz	±10ppm	±15ppm	–40 to 125°C	8pF	250
85SMX AUTO	8 x 3.8	32.768kHz	±20ppm	–0.034/°C2	–40 to 85°C	12.5pF	252
IQXC-13 AUTO	8 x 4.5	6 to 80MHz	±10ppm	±15ppm	–40 to 125°C	8pF	260
HC49/4HSMX AUTO	11.3 x 4.7	3.01 to 100MHz	±10ppm	±15ppm	–40 to 125°C	16pF	258
Leaded Crystals							
HC49 AUTO	HC49	1.8432 to 200MHz	±10ppm	±15ppm	–40 to 85°C	16pF	254
HC49/4H AUTO	HC49/4H	3.01 to 100MHz	±10ppm	±15ppm	–40 to 125°C	16pF	256
Surface Mount Oscillators							
Model	**Package (mm)**	**Frequency Range**	**Supply Voltage**	**Frequency Stability (Tightest*)**	**Temperature Range (Widest*)**	**Output**	**Page**
IQXO-581 AUTO	5 x 3.2	1.5 to 160MHz	3.3V	±50ppm	–40 to 85°C	HCMOS	268
IQXO-580 AUTO	5 x 3.2	1.5 to 160MHz	5.0V	±50ppm	–40 to 85°C	HCMOS	268
* Tighter tolerance, stability and wider temperautre ranges are available. Please contact our sales offices							

AUTOMOTIVE

SPECIFYING AUTOMOTIVE QUARTZ CRYSTALS

AUTOMOTIVE

A range of products from our TS16949 approved automotive production site, all these parts are qualified to AEC-Q200 and are available with PPAP if required.

A typical automotive quartz crystal specification reads like this:

10.0MHz HC49/4HSMX AUTO
50/50/–40 to 85C/20/ FUND TE

The data in the example above is translated in the following order

- Frequency
- Model & Variant
- Frequency Tolerance @ 25°C
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Load Capacitance
- Overtone
- Additional Text Code (for non-standard product)

Frequency

Frequency is normally specified in kilohertz (kHz) up to 999.999kHz and in megahertz (MHz) from 1.0MHz. All our computer-generated transaction documents follow this standard convention automatically.

The frequency should be described to seven significant figures. If seven significant figures are not used, we assume that any figure that might follow those given may be taken as zero. Thus a frequency given as 16.6MHz will be taken as 16.60, not 16.66667.

Some specifiers extend the use of kHz to all crystals operating in fundamental mode, reserving MHz for overtones. To minimise the possibility of misunderstanding it is best to use the standard method and specify fundamental or overtone mode separately.

Please contact our sales offices for details of developed frequencies.

Model

Before manufacture of the crystal can start, the holder style must be defined. Each holder style covers a frequency range which is defined in the relevant specification.

For leaded versions, the holder information should also cover any mechanical variant required such as a top wire or cropped leads. The following variants for example may be available, either singly or in some cases, in combination:

- 3 lead base
- Top wire
- Insulating sleeve
- Taped and reeled
- Fitted insulator
- Cropped leads
- Formed leads

Frequency Tolerance

The cost of manufacture depends partly on the accuracy required at reference temperature (which in the case of the AT-cut crystal, is usually 25°C).

Where high initial accuracy is important the additional manufacturing cost should be weighed against the cost of including a frequency trimming facility within the oscillator.

Frequency Stability

Frequency stability is normally specified as a frequency tolerance over a defined operating temperature range with respect to the frequency at reference temperature. The temperature ranges are defined for each crystal in the relevant data sheet. However the majority of crystals will continue to operate quite satisfactorily outside the temperature range for which they are specified, but with a possible degradation in the value of frequency stability. Under normal conditions this will not damage the crystal.

A crystal designed for operation over a restricted operating temperature range, (such as from 0 to 50°C) generally has a better frequency stability over that range than one designed for operation over a wide operating temperature range. Therefore it is important not to over specify the temperature range, as doing so will result in inferior performance for the same or greater cost; or greater cost for the same or inferior performance.

Generalised frequency vs temperature curves for the AT-cut crystal types are illustrated where appropriate. These indicate that, without compensation, a crystal specified for operation over a wide frequency range will probably have an inferior performance over a narrower range than one whose design was optimised for the narrower range. The angle of cut of the quartz blank from its quartz stone determines which curve will be followed; the chosen angle being subject to its own tolerance. Thus, since manufacturing cost is tolerance-dependent it is wise not to specify a wider operating temperature range than is actually needed unless some sacrifice of stability, or an increase in cost, can be accepted.

Standard Frequency Tolerances and Stabilitie

- ±10ppm
- ±20ppm
- ±50ppm
- ±15ppm
- ±30ppm
- ±100ppm

Operating Temperature Ranges

The standard operating temperature ranges for a crystal are:

- –40 to 85°C
- –55 to 125°C

Circuit condition

The characters ‘SR’ are used to denote calibration of the crystal at series resonance. If it is to be calibrated at load resonance the characters represent the circuit load capacitance in pF.

Additional Text Code

If the product is non-standard, the letter ‘T’ and/or ‘E’ will appear at the end of the product specification. This refers to additional text on the quotation/sales order to identify the special requirements.

Packaging Codes

Tray packaging is available as an option for some products outlined in the individual data sheets.

Unless individual data sheets state packaging, surface mount products will be Tape and Reel packed, and leaded products will be Bulk packed. Please note: only complete reels are sold.

- Bulk = Bulk packed
- Reel = Tape and Reel packed

Outline Drawings

Dimensions on the crystal outline drawings are shown only as a guide. Precise dimensions of crystal holders are available from our Factory upon request. All dimensions are shown in mm and are nominal unless otherwise stated.

Marking

Where possible the frequency of operation will be marked in full on the crystal. On the smaller types the full frequency may not fit in the available space and will therefore be truncated. Please refer to the despatch packaging for the relevant crystal to see the frequency in full.

Ordering Information

- See individual data sheets

SPECIFYING AUTOMOTIVE CLOCK OSCILLATORS

A typical surface mount automotive clock oscillator specification reads like this:

10.0MHz IQXO-580
HCMOS ±50ppm –40 to 85C 3.3V

The data in the example above is translated in the following order

- Frequency
- Model
- Output
- Frequency Stability
- Operating Temperature Range
- Supply Voltage

Frequency

Frequency is normally specified in kilohertz (kHz) up to 999.999kHz and in megahertz (MHz) from 1.0MHz. All our computer-generated transaction documents follow this standard convention automatically.

The clock oscillator frequency should be specified to seven significant figures. If seven significant figures are not used, we assume that any figure that might follow those given may be taken as zero. Thus a frequency given as 16.6MHz will be taken as 16.60, not 16.6666.

Please contact our sales offices for details of developed frequencies.

Model Number

The model number incorporates information which describes output compatibility and holder style.

Frequency Stability

The frequency stability of a surface mount oscillator includes the initial adjustment tolerance at room temperature, the tolerance over operating temperature range and the effect of supply voltage variation. This value is specified as 'parts per million' (ppm) and is available in various ranges as shown below.

- ±50ppm
- ±100ppm

Operating Temperature Range

- –40 to 85°C

Although in general clock oscillators will continue to operate outside their normal temperature range with a degradation in frequency stability, damage can result if the temperatures reached are excessive.

Packaging Code

Tape and Reel packaging is available as an option on many of the products outlined in this chapter.

Unless individual data sheets state Tape and Reel packaging, items will be Bulk packed. Please note: only complete reels are sold.

- Bulk = Bulk packed
- Reel = Tape and Reel packed

Additional Text Code

If the product is non-standard, the letter 'T' and/or 'E' will appear at the end of the product specification. This refers to additional text on the quotation/sales order to identify the non-standard requirements.

Outline Drawings

Dimensions on the clock oscillators drawings are shown only as a guide. Precise dimensions of the clock oscillators holders are available upon request. All dimensions are shown in mm and are nominal unless otherwise stated.

Marking

Where space is limited some or all of the information will be omitted/truncated at IQD's discretion. Full product description will be found on the individual batch packaging.

Ordering Information

- See individual data sheets

NOTES

AUTOMOTIVE

12SMX AUTO

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Ceramic package with a hermetically seam sealed metal lid suitable for automotive applications. Qualified to AEC-Q200 and available with TS16949 release.

General Specifications

- Load Capacitance (C_L): 8pF standard
- Drive Level: 50µW standard
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances

- ±10ppm to ±50ppm

Standard Frequency Stabilities

- ±15ppm to ±100ppm

Operating Temperature Ranges

- –40 to 85°C
- –40 to 125°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

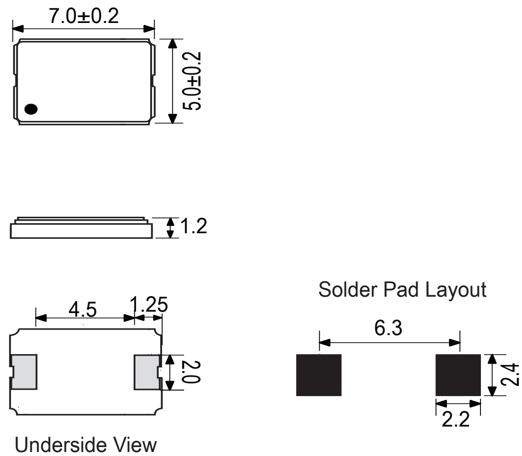
Ordering Information (*minimum required)

- Frequency*
- Model*
- Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

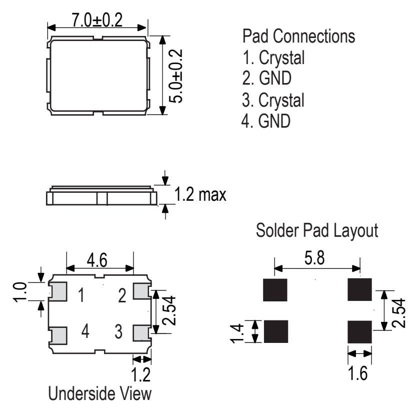
Example

- 10.00MHz 12SMX AUTO - B
  50/100/–40 to 125C/8 FUND

Outline (mm) 12SMX AUTO - A



Outline (mm) 12SMX AUTO- B



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
6.0 to 8.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	150Ω	Fundamental AT cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>8.0 to 9.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	100Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>9.0 to 11.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	60Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>11.0 to 40.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	40Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
26.0 to 80.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	100Ω	3rd Overtone AT cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
Note. For any other frequencies / specifications please contact our sales offices						

85SMX AUTO

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Plastic encapsulated surface mount crystal suitable for non safety-critical automotive applications. Qualified to AEC-Q200 and available with TS16949 release.

General Specifications

- Load Capacitance (C_L): 12.5pF standard
- Drive Level: 0.2μW max
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 2.5pF max

Standard Frequency Tolerance

- ±20ppm

Frequency Stability Coefficient

- –0.034ppm/°C^2 (±0.006ppm/°C^2)

Operable Temperature Range

- –40 to 85°C

Storage Temperature Range

- –40 to 105°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

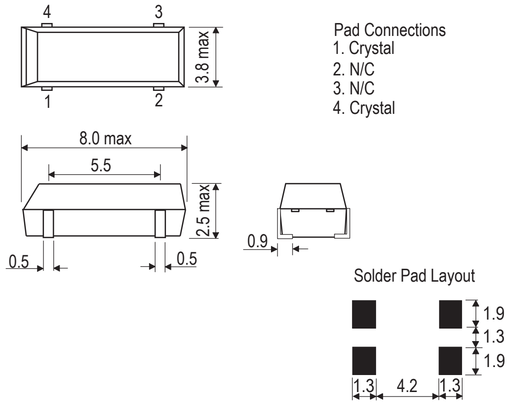
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*

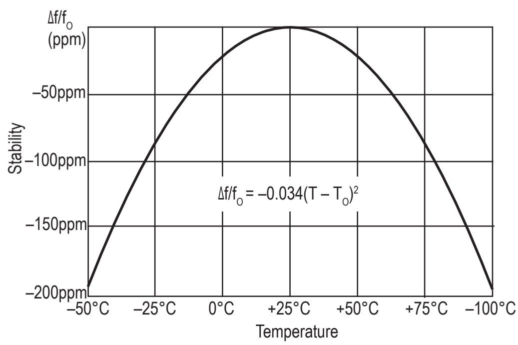
Example

- 32.768kHz 85SMX AUTO
  20/-/-/12.5

Outline (mm) 85SMX AUTO



Typical Frequency Stability Characteristics



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C	Operating Temperature Range	Typical Frequency Stability Coefficient	ESR Max	Vibration Mode
32.768kHz	±20ppm	–40 to 85°C	-0.034ppm/°C^2	50kΩ	Fundamental

NOTES

HC49 AUTO

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Resistance welded, hermetically sealed metal package sealed in an inert atmosphere with glass to metal seals securing the lead wires and suitable for automotive applications. Qualified to AEC-Q200 and available with TS16949 release.
- Holders suffixed '-3L' have a centre third wire which grounds the case.

General Specifications

- Load Capacitance (C_L): 16pF standard
- Drive Level: 50µW standard
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances

- ±10ppm to ±30ppm

Standard Frequency Stabilities

- ±15ppm to ±50ppm

Operating Temperature Range

- –40 to 85°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel to EIA-468-C, 1kpcs per reel (please see Application Notes)

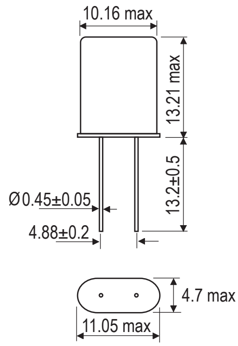
Ordering Information (*minimum required)

- Frequency*
- Model*
- Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

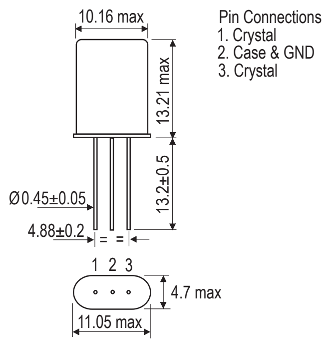
Example

- 10.00MHz HC49 AUTO
  10/50/–40 to 85C/16 FUND

Outline (mm) Standard 2-Lead Device HC49 AUTO



Outline (mm) 3-Lead Device HC49 AUTO - 3L



AUTOMOTIVE

Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
1.8432 to 3.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	550Ω	Fundamental AT cut
>3.0 to 4.0MHz					150Ω	
>4.0 to 6.0MHz					80Ω	
>6.0 to 11.0MHz					50Ω	
>11.0 to 50.0MHz					35Ω	
20.0 to 100.0MHz					40Ω	3rd Overtone AT cut
60.0 to 120.0MHz					100Ω	5th Overtone AT cut
120.0 to 200.0MHz					150Ω	7th Overtone AT cut
Note. For any other frequencies / specifications please contact our sales offices						

HC49/4H AUTO

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Resistance welded, hermetically sealed metal package sealed in an inert atmosphere with glass to metal seals securing the lead wires and suitable for automotive applications. Qualified to AEC-Q200 and available with TS16949 release.
- Variant '-3L' have a centre third wire which grounds the case.
- Variant 'Gull-Wing' have a metal jacket for surface mounting.

General Specifications

- Load Capacitance (C_L): 16pF standard
- Drive Level: 50µW standard
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances

- ±10ppm to ±50ppm

Standard Frequency Stabilities

- ±15ppm to ±100ppm

Operating Temperature Ranges

- –40 to 85°C
- –40 to 125°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-468-C, 1kpcs per reel (please see Application Notes)

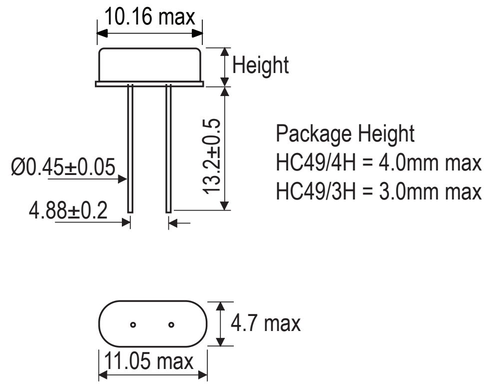
Ordering Information (*minimum required)

- Frequency*
- Model*
- Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

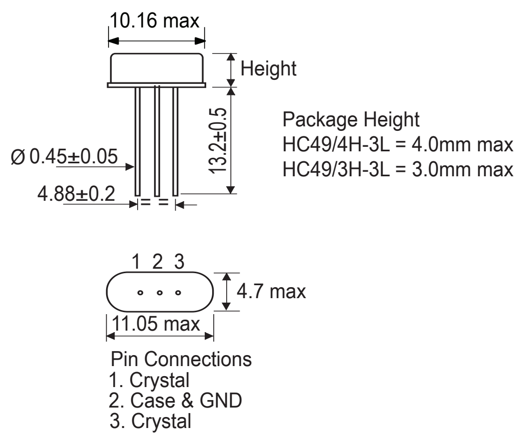
Example

- 10.00MHz HC49/4H AUTO
  50/100/–40 to 125C/16 FUND

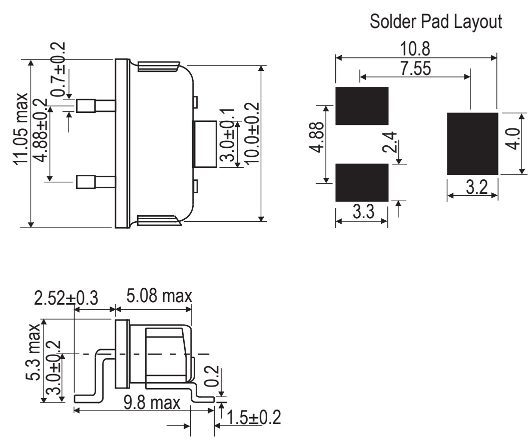
Outline (mm) Standard 2-Lead Device HC49/4H AUTO



Outline (mm) 3-Lead Device HC49/4H AUTO - 3L



Outline (mm) Gull-Wing Device HC49/4H AUTO - Gull-Wing



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
3.01 to 4.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	300Ω	Fundamental AT cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>4.0 to 5.5MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	130Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>5.5 to 8.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	80Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>8.0 to 40.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	50Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
26.0 to 100.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	100Ω	3rd Overtone AT cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
Note. For any other frequencies / specifications please contact our sales offices						

HC49/4HSMX AUTO

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Resistance welded, hermetically sealed metal package sealed in an inert atmosphere with glass to metal seals securing the lead wires. The lead wires are formed into a gull wing and mounted on a plastic former and is suitable for automotive applications. Qualified to AEC-Q200 and available with TS16949 release.

General Specifications

- Load Capacitance (C_L): 16pF standard
- Drive Level: 50μW standard
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances

- ±10ppm to ±50ppm

Standard Frequency Stabilities

- ±15ppm to ±100ppm

Operating Temperature Ranges

- –40 to 85°C
- –40 to 125°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

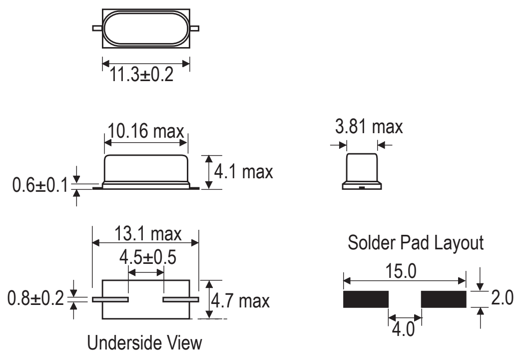
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.00MHz HC49/4HSMX AUTO
  50/100/–40 to 125C/16 FUND

Outline (mm)



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
3.01 to 4.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	300Ω	Fundamental AT cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>4.0 to 5.5MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	130Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>5.5 to 8.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	80Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>8.0 to 40.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	60Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
26.0 to 100.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	100Ω	3rd Overtone AT cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
Note. For any other frequencies / specifications please contact our sales offices						

IQXC-13 AUTO

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Ceramic package with a hermetically seam sealed metal lid suitable for automotive applications. Qualified to AEC-Q200 and available with TS16949 release.

General Specifications

- Load Capacitance (C_L): 8pF standard
- Drive Level: 50µW standard
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances

- ±10ppm to ±50ppm

Standard Frequency Stabilities

- ±15ppm to ±100ppm

Operating Temperature Ranges

- –40 to 85°C
- –40 to 125°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

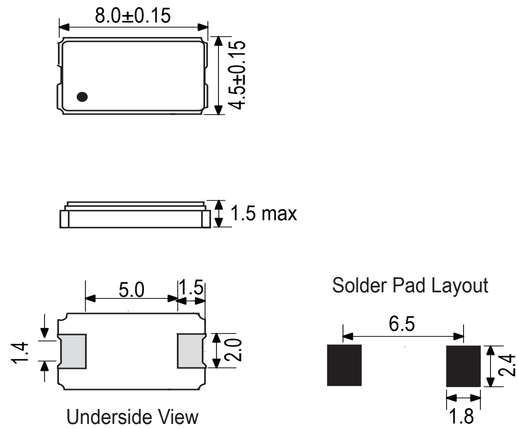
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone*

Example

- 10.00MHz IQXC-13 AUTO - A
  50/50/–40 to 125C/8 FUND

Outline (mm) IQXC-13 AUTO - A



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
6.0 to 11.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	300Ω	Fundamental AT cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>11.0 to 14.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	100Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>14.0 to 20.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	70Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>20.0 to 48.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	50Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
30.0 to 80.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	150Ω	3rd Overtone AT cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
Note. For any other frequencies / specifications please contact our sales offices						

IQXC-104 AUTO

ISSUE 3; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Hermetically sealed ceramic package with a seam sealed metal lid suitable for automotive applications. Qualified to AEC-Q200 and available with TS16949 release.

General Specifications

- Load Capacitance (C_L): 8pF standard
- Drive Level: 50µW standard
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances

- ±10ppm to ±50ppm

Standard Frequency Stabilities

- ±15ppm to ±100ppm

Operating Temperature Ranges

- –40 to 85°C
- –40 to 125°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

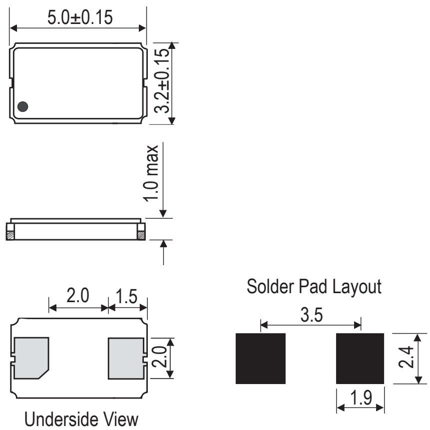
Ordering Information (*minimum required)

- Frequency*
- Model*
- Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

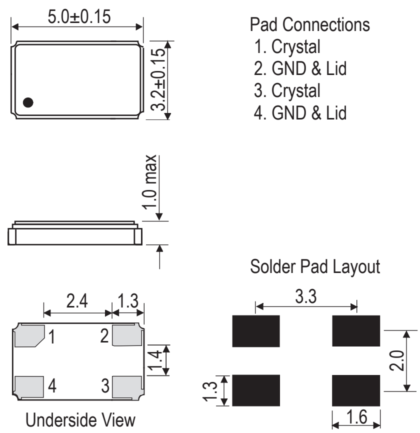
Example

- 20.00MHz IQXC-104 AUTO - B
  50/50/–40 to 125C/8 FUND

Outline (mm) IQXC-104 AUTO - A



Outline (mm) IQXC-104 AUTO - B



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
12.0 to <20.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	150Ω	Fundamental AT cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
20.0 to 32.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	100Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
Note. For any other frequencies / specifications please contact our sales offices						

IQXC-180 AUTO

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Ceramic package with a hermetically seam sealed metal lid suitable for automotive applications. Qualified to AEC-Q200 and available with TS16949 release.

General Specifications

- Load Capacitance (C_L): 8pF standard
- Drive Level: 50µW standard
- Ageing: ±5ppm max per year @ 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances

- ±10ppm to ±50ppm

Standard Frequency Stabilities

- ±15ppm to ±100ppm

Operating Temperature Ranges

- –40 to 85°C
- –40 to 125°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

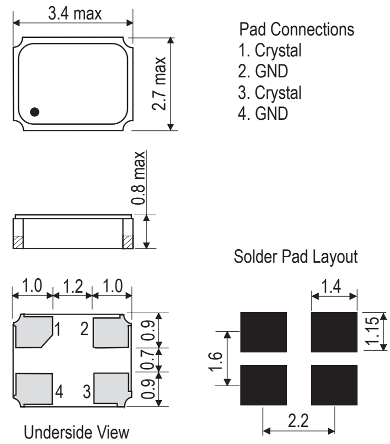
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

Example

- 20.00MHz IQXC-180 AUTO - B
  50/50/–40 to 125C/8 FUND

Outline (mm) IQXC-180 AUTO - B



AUTOMOTIVE

Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
16.0 to 26.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	100Ω	Fundamental AT Cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>26.0 to 32.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	50Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
Note. For any other frequencies / specification combinations, please contact our sales offices						

IQXC-201 AUTO

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Ceramic package with a hermetically seam sealed metal lid suitable for automotive aplications. Qualified to AEC-Q200 and available with TS16949 release.

General Specifications

- Load Capacitance (C_L): 8pF standard
- Drive Level: 50μW standard
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 5pF max

Standard Frequency Tolerances

- ±10ppm to ±50ppm

Standard Frequency Stabilities

- ±15ppm to ±100ppm

Operating Temperature Ranges

- –40 to 85°C
- –40 to 125°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

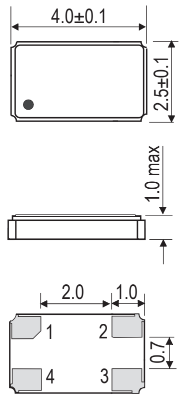
Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

Example

- 20.00MHz IQXC-201 AUTO - B
  50/50/–40 to 125C/8 FUND

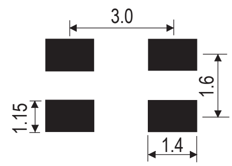
Outline (mm) IQXC-201 AUTO - B



Underside View

Pad Connections
1. Crystal
2. GND
3. Crystal
4. GND

Solder Pad Layout



Electrical Specifications – maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
12.0 to 20.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	80Ω	Fundamental AT Cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>20.0 to 32.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	50Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
Note. For any other frequencies / specification combinations, please contact our sales offices						

NOTES

AUTOMOTIVE

IQXC-228 AUTO

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Ceramic package with a hermetically seam sealed metal lid suitable for automotive applications. Qualified to AEC-Q200 and available with TS16949 release.

General Specifications

- Load Capacitance (C_L): 8pF standard
- Drive Level: 50μW standard
- Ageing: ±5ppm max per year at 25°C
- Shunt Capacitance (C_0): 7pF max

Standard Frequency Tolerances

- ±10ppm to ±50ppm

Standard Frequency Stabilities

- ±15ppm to ±100ppm

Operating Temperature Ranges

- –40 to 85°C
- –40 to 125°C

Storage Temperature Range

- –40 to 150°C

Environmental

- Qualified to AEC-Q200

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

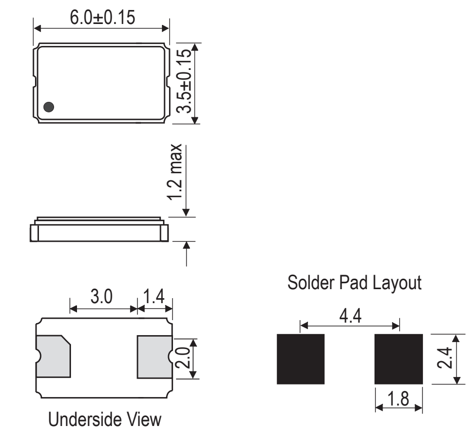
Ordering Information (*minimum required)

- Frequency*
- Model*
- Variant*
- Frequency Tolerance (@25°C)*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Load Capacitance*
- Overtone

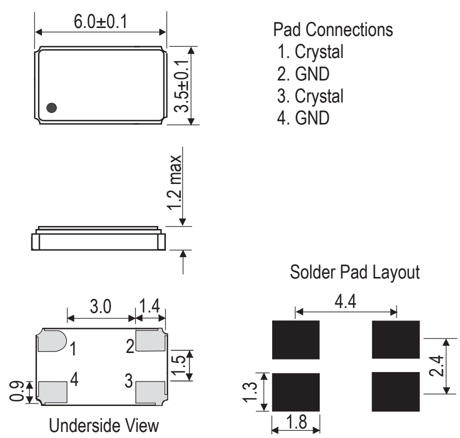
Example

- 10.00MHz IQXC-228 AUTO - B
  50/100/–40 to 125C/8 FUND

Outline (mm) IQXC-228 AUTO - A



Outline (mm) IQXC-228 AUTO - B



Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Operating Temperature Range	Frequency Stability Available Over Operating Temperature Range		ESR Max	Vibration Mode
			Minimum	Maximum		
10.0 to 11.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	80Ω	Fundamental AT cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>11.0 to 12.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	50Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
>12.0 to 40.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	40Ω	
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
40.0 to 70.0MHz	±10ppm to ±30ppm	–40 to 85°C	±15ppm	±50ppm	70Ω	3rd Overtone AT cut
	±20ppm to ±50ppm	–40 to 125°C	±50ppm	±100ppm		
Note. For any other frequencies / specifications please contact our sales offices						

IQXO-580, -581 AUTO

ISSUE 0.2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

3.3V or 5V surface mount oscillators in a ceramic package, with a hermetically sealed metal lid suitable for automotive applications. Qualified to AEC-Q200 and available with TS16949 release.

Package Outline

- 5 x 3.2mm

Frequency Range

- 1.5 to 160MHz

Output Compatibility & Load

- Tri-state HCMOS
- Drive Capability

Maximum Compatibility Load	
1.5 to 50.0MHz	50pF max
>50.0MHz to 80.0MHz	30pF max
>80.0MHz to 160.0MHz	15pF max

Supply Voltages

- 5.0V IQXO-580 AUTO
- 3.3V IQXO-581 AUTO

Frequency Stabilities

- ±50ppm, ±100ppm (inclusive of supply voltage and output load variations over the operating temperature range)

Operating Temperature Range

- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

Tri-state Operation

- Logic ‘1’ to pad 1 enables oscillator output
- Logic ‘0’ to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output

Ageing

- ±5ppm max per year

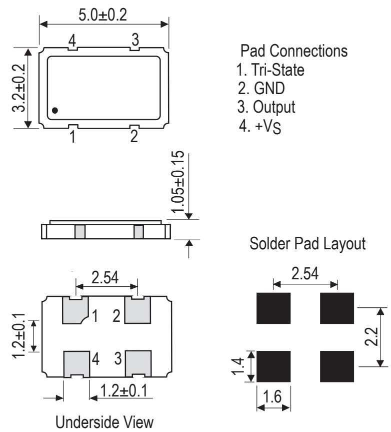
Environmental

- Qualified to AEC-Q200

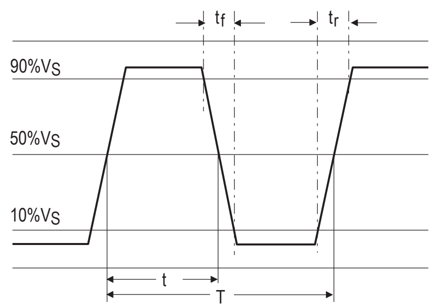
Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm) IQXO-580, -581 AUTO



Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output Compatability
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

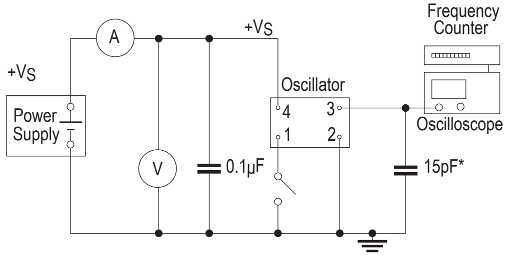
Example

- 10.00MHz IQXO-580 AUTO
  HCMOS ±100ppm –40 to 85C 5.0V

Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.5 to 70.0MHz	±50ppm ±100ppm	5.0V±10%	30mA	12ns	12ns	40/60%	IQXO-580 AUTO
		3.3V±10%					IQXO-581 AUTO
>70.0MHz to 160.0MHz		5.0V±10%	50mA				IQXO-580 AUTO
		3.3V±10%					IQXO-581 AUTO
Note. For any other frequencies / specifications please contact our sales offices							

Test Circuit



* Inclusive of jigging and equipment capacitance

NOTES

AUTOMOTIVE

VCXOs - SELECTION TABLE

Model Number	Supply Voltage	Output Compatiblity	Package (mm)	Frequency Range	Pullability*	Operating Temperature Range (Widest*)	Stock Items	Page
Specifying VCXOs								272
Stock VCXOs								273
Surface Mount VCXOs								
IQXV-22	2.8V	HCMOS	5 x 3.2	1.25 to 80MHz	±100ppm min	–40 to 85°C		286
CFPV-115	3.3V	HCMOS	3.2 x 2.5	6 to 54MHz	±50ppm min APR	–40 to 85°C		282
IQXV-21	3.3V	HCMOS	5 x 3.2	1.25 to 80MHz	±100ppm min	–40 to 85°C		286
CFPV-42	3.3V	HCMOS	7 x 5	1 to 80MHz	±50ppm min	–40 to 85°C		276
CFPV-44	3.3V	HCMOS	7 x 5	1 to 80MHz	±100ppm min	–40 to 85°C		276
CFPV-45	3.3V	HCMOS	7 x 5	1.5 to 80MHz	±100ppm min APR	0 to 70°C	✓	278
IQXV-110	3.3V	HCMOS	14.4 x 9.5	2 to 125MHz	±50ppm min	–40 to 85°C		289
CFPV-32	3.3V	LVPECL	7 x 5	50 to 700MHz	±80ppm min	–40 to 85°C		274
CFPV-55	3.3V	LVPECL	7 x 5	12 to 700MHz	±150ppm min	–40 to 85°C		280
IQXV-100	3.3V	LVPECL	14.4 x 9.5	60 to 800MHz	±50ppm min	–40 to 85°C		288
IQXV-130	3.3V	LVPECL	20 x 9.5	100 to 800MHz	±90ppm min	–40 to 85°C		291
IQXV-20	5.0V	HCMOS	5 x 3.2	1.25 to 80MHz	±100ppm min	–40 to 85°C		286
CFPV-41	5.0V	HCMOS	7 x 5	1 to 80MHz	±50ppm min	–40 to 85°C		276
CFPV-43	5.0V	HCMOS	7 x 5	1 to 80MHz	±100ppm min	–40 to 85°C		276
CFPV-46	5.0V	HCMOS	7 x 5	1.5 to 51.84MHz	±100ppm min APR	0 to 70°C		278
IQXV-110	5.0V	HCMOS	14.4 x 9.5	2 to 125MHz	±50ppm min	–40 to 85°C		289
Leaded VCXOs								
IQXV-120	3.3V	HCMOS	14-pin DIL	2 to 125MHz	±50ppm min	–40 to 85°C		290
IQXV-120	5.0V	HCMOS	14-pin DIL	2 to 125MHz	±50ppm min	–40 to 85°C		290
IQVCXO-161	5.0V	HCMOS/TTL	14-pin DIL	1 to 90MHz	±100ppm min	–40 to 85°C		284
* Wider temperautre ranges and alternative pullabilities are available. Please contact our sales offices								

VCXOs

SPECIFYING VCXOs

Voltage Controlled Crystal Oscillators give a stable clock output waveform which can be changed via an analogue voltage input. The technology makes use of the pullability of the crystal, its change in frequency due to change in load capacitance. The voltage input is used to vary the load capacitance of the crystal circuit within the oscillator, this gives a very controllable change in output frequency which can be used to tune the device to match the exact frequency required while the circuit is active. IQD uses the code VCXO to denote our voltage controlled quartz crystal oscillator part numbers.

The electrical parameters are given on the specification to facilitate the correct circuit design. Further guidance can be found in the Application Notes chapter of this book. Our Application Support team can also provide assistance if required; please contact one of our sales officess for this support.

The limits given in the following specifications are indicative of the standard VCXO oscillator design, in the event that a specification is needed which is outside the standard VCXO oscillator designs offered please contact our Sales team.

A typical VCXO specification reads like this:

- 20.0MHz CFPV-43
  HCMOS ±50ppm –10 to 70C 5.0V ±100ppm min

The data in the example above is translated in the following order

- Frequency
- Model
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Supply Voltage
- Pullability

VCXOs

Frequency

Frequency is normally specified in kilohertz (kHz) up to 999.999kHz and in megahertz (MHz) from 1.0MHz. All our computer-generated transaction documents follow this standard convention automatically.

The VCXO frequency should be described to seven significant figures. If seven significant figures are not used, we assume that any figure that might follow those given may be taken as zero. Thus a frequency given as 16.6MHz will be taken as 16.60, not 16.66667.

Model Number

The model number incorporates information which describes holder style, output compatibility and supply voltage.

Frequency Stability

The frequency stability of a VCXO includes the initial adjustment tolerance at room temperature (with the control pin set to centre trim voltage: e.g. 2.5V) and the stability over the operating temperature range. This value is specified as ‘parts per million’ (ppm) and is available in ranges of for example; ±25ppm, ±50ppm and ±100ppm.

Frequency Pullability

The pullability is specified as the change in output frequency when the voltage control input is varied. This value is specified in ‘parts per million’ (ppm) and is available in various ranges, please see individual models for details. Large pullability figures give a greater tuneable range, while smaller pullability figures give greater control. The pullability may be specified as either relative pulling or APR (absolute pulling range).

Relative pulling defines the actual ppm change which will be seen on the output when the voltage control line is varied from one extreme to the other and all other factors are held constant. Since no allowance is made for frequency shift due to other factors, this ppm change may not always be attainable when referenced to the nominal frequency.

APR defines the pulling which will always be available to the customer when referenced to the nominal frequency. An allowance is made for the shift in frequency due to factors such as temperature, ageing, supply voltage variations etc, these are subtracted from the relative pulling to give the Absolute Pullability Range.

Operating Temperature Range

Standard operating temperature ranges for VCXO’s are:

- 0 to 70°C
- –10 to 70°C
- –40 to 85°C

Although in general oscillators will continue to operate outside their normal temperature range with a degradation in frequency stability, damage can result if the temperatures reached are excessive.

For other temperature ranges please contact our sales offices.

Additional Text Code

If the product is non-standard, the letter ‘T’ and/or ‘E’ will appear at the end of the product specification. This refers to additional text on the quotation/sales order to identify the non-standard requirements.

Packaging

Tape and Reel packaging is available as an option on many of the products outlined in this chapter.

Unless individual data sheets state Tape and Reel packaging, items will be Bulk packed. Please note: only complete reels are sold.

- Bulk = Bulk packed
- Reel = Tape and Reel packed

Outline Drawings

Dimensions on the oscillator outline drawings are shown only as a guide. Precise dimensions of oscillator holders are available upon request. All dimensions are shown in mm and are nominal unless otherwise stated.

Marking

Where space is limited some or all of the information will be omitted/truncated at IQD’s discretion. Full product description will be found on the individual batch packaging.

Ordering Information

- See individual data sheets

STOCK VCXOs

CFPV-45

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
10.0MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO021640	✓	
12.3520MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO026155	✓	
16.3840MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO021634	✓	
19.440MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO023978	✓	
20.0MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO026156	✓	
24.88320MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO026157	✓	
25.0MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO025545	✓	
25.920MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO026158	✓	
27.0MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO000381	✓	✓
30.720MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO026159	✓	
32.0MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO026160	✓	
32.7680MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO021914	✓	
33.330MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO026161	✓	
35.3280MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO022532	✓	
40.0MHz	HCMOS ±100ppm 0 to 70C 3.3V ±100ppm APR	LFVCXO025892	✓	

CFPV-32 SMD VCXO

ISSUE 5; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- LVPECL output Voltage Controlled Crystal Oscillator
- Using PPL technology to give a very wide frequency range
- Pulling range of ±80ppm min
- Ceramic package with a seam sealed metal lid, hermetically sealed
- For a wider pulling range please see our CFPV-55

Frequency Range

- 50 to 700MHz

Output Compatibility & Load

- Tri-state LVPECL
- Output load 50Ω terminated to +1.3V

Frequency Stabilities

- ±25ppm, ±50ppm
  Note: ±25ppm not available over –40 to 85°C

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Tri-state Operation

- Logic ‘1’ to pad 1 disables oscillator output; when disabled the oscillator goes to the high impedance state (>V_S-1.10V)
- Logic ‘0’ to pad 1 enables oscillator output (<V_S-1.60V)
- No connection to pad 1 enables oscillator output

Output Voltage

- ‘0’ Level V_{OL} +1.7V max
- ‘1’ Level V_{OH} +2.2V min

Voltage Control (pad 1)

- +1.65V ±1.5V (positive sense)

Pullability

- ±80ppm min

Input Impedance (voltage control, pad 1)

- 60kΩ min

Phase Noise (max)

- –37dBc/Hz @ 10Hz
- –75dBc/Hz @ 100Hz
- –105dBc/Hz @ 1kHz
- –107dBc/Hz @ 10kHz
- –145dBc/Hz @ 100kHz
- –145dBc/Hz @ 1MHz

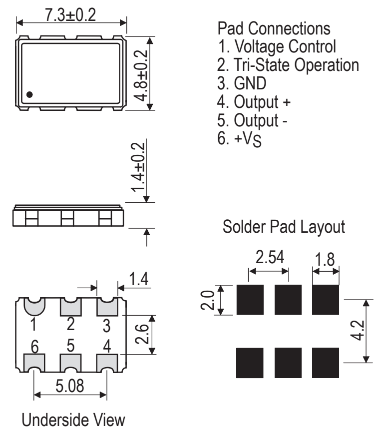
Phase Jitter

- 1ps rms max (12kHz - 20MHz)

Storage Temperature Range

- –40 to 85°C

Outline (mm)



Environmental

- Shock: MIL-STD-202F, Method 213B
  (1000G, 0.5ms, 1/2 sine)
- Vibration: MIL-STD-202F, Method 204D, Test Condition D 20G, frequency range 10-2000Hz, 4 hrs in X, Y & Z axes (total 12hrs)

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage
- Pullability

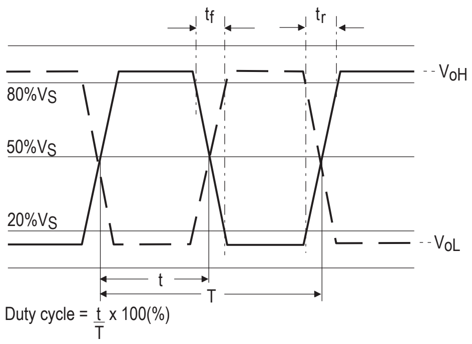
Example

- 200.0MHz CFPV-32
  LVPECL ±50ppm –40 to 85C 3.3V ±80ppm min

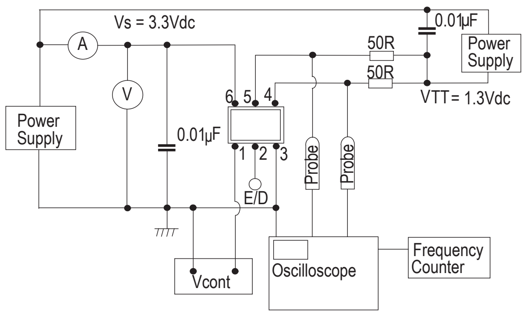
Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Pullability	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
50.0 to 700.0MHz	±25ppm ±50ppm	3.3V±5%	120mA	±80ppm min	0.5ns	0.5ns	40/60%	CFPV-32
Note: For other frequency / specification combinations, please contact our sales offices								

Output Waveform



Test Circuit



VCXOs

CFPV-41, -42, -43, -44 SMD VCXOs

ISSUE 7; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 7 x 5mm Voltage Controlled Crystal Oscillators
- Available in 5.0V or 3.3V supply
- Available with either ±50ppm min or ±100ppm min pulling
- Ceramic package with a seam sealed metal lid, hermetically sealed
- For pulling of ±100ppm min APR please see our CFPV-45 and CFPV-46

Frequency Range

- 1 to 80MHz

Output Compatibility & Load

- Tri-state HCMOS
- Load 15pF max

Supply Voltages

- 5.0V CFPV-41, -43
- 3.3V CFPV-42, -44

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage and output load variations over the operating temperature range)

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Tri-State Operation

- Logic ‘1’ (>70%V_S) to pad 2 enables oscillator output
- Logic ‘0’ (<30%V_S) to pad 2 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection pad 2 enables oscillator output

Start-Up Time

- 10ms max

Voltage Control (pad 1)

- 2.5V±2.0V   (CFPV-41, -43)
- 1.65V±1.5V (CFPV-42, -44)

Pullability

- ±50ppm min (CFPV-41, -42)
- ±100ppm min (CFPV-43, -44)

Linearity

- Positive <±10%

Modulation Bandwidth

- >20kHz

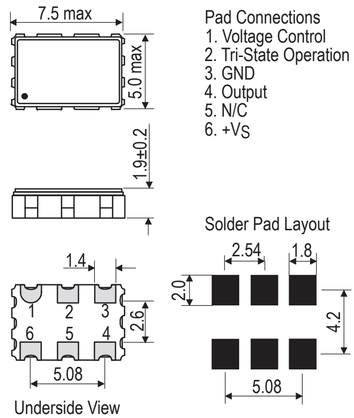
Phase Jitter

- <20MHz 1ps rms (12kHz - 1MHz)

Storage Temperature Range

- –40 to 85°C

Outline (mm)



Environmental

- Shock: MIL-STD-202F, Method 213B (1000G, 0.5ms, 1/2 sine)
- Vibration: sinewave, frequency range 10-55Hz, amplitude 1.52mm, 2 hrs in X, Y, Z axes (total 6 hrs)

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pullability*

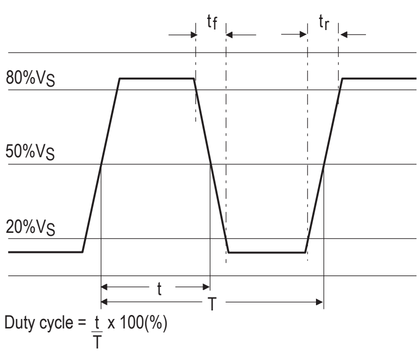
Example

- 20.0MHz CFPV-43
  HCMOS ±50ppm –40 to 85C 5.0V ±100ppm min

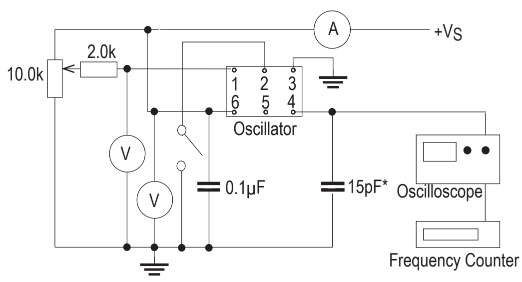
Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Pullability	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
1.0 to 18.0MHz	±25ppm ±50ppm ±100ppm	5.0V±0.25V	20mA	±50ppm min	5ns	5ns	40/60%	CFPV-41
				±100ppm min				CFPV-43
		3.3V±0.3V	15mA	±50ppm min				CFPV-42
				±100ppm min				CFPV-44
> 18.0 to 30.0MHz		5.0V±0.25V	30mA	±50ppm min				CFPV-41
				±100ppm min				CFPV-43
		3.3V±0.3V	15mA	±50ppm min				CFPV-42
				±100ppm min				CFPV-44
> 30.0 to 36.0MHz		5.0V±0.25V	30mA	±50ppm min				CFPV-41
				±100ppm min				CFPV-43
		3.3V±0.3V	25mA	±50ppm min				CFPV-42
				±100ppm min				CFPV-44
> 36.0 to 52.0MHz		5.0V±0.25V	40mA	±50ppm min				CFPV-41
				±100ppm min				CFPV-43
		3.3V±0.3V	25mA	±50ppm min				CFPV-42
				±100ppm min				CFPV-44
> 52.0 to 80.0MHz	±50ppm ±100ppm	5.0V±0.25V	50mA	±50ppm min				CFPV-41
				±100ppm min				CFPV-43
		3.3V±0.3V	35mA	±50ppm min				CFPV-42
				±100ppm min				CFPV-44
Some combinations of specification may not be available, please check with our sales offices								
Note: For other frequency / specification combinations, please contact our sales offices								

Output Waveform



Test Circuit



*Inclusive of jigging and equipment capacitance

CFPV-45, -46 SMD VCXOs

ISSUE 7; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 7 x 5mm Voltage Controlled Crystal Oscillators
- Pulling of ±100ppm min APR
- Available in 5.0V or 3.3V supply
- Ceramic package with a seam sealed metal lid, hermetically sealed
- Stock parts listed at the beginning of this chapter

Frequency Ranges

- 1.5 to 80MHz (CFPV-45)
- 1.5 to 51.84MHz (CFPV-46)

Output Compatibility & Load

- Tri-state HCMOS
- Drive Capability: 15pF max

Supply Voltages

- 3.3V CFPV-45
- 5.0V CFPV-46

Frequency Stabilities

- ±100ppm (inclusive of frequency tolerance, ageing, shock and vibration)

Operating Temperature Range

- 0 to 70°C

Operable Temperature Range

- –40 to 85°C

Tri-state Operation

- Logic ‘1’ (>2.5V) to pad 2 enables oscillator output
- Logic ‘0’ (<0.5V) to pad 2 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection pad 2 enables oscillator output

Voltage Control (pad 1)

- 1.65V±1.65V (CFPV-45)
- 2.5V±2.0V (CFPV-46)

Pullability

- ±100ppm min APR

Linearity

- Positive < ±10%

Input Impedance (voltage control, pad 1)

- 50kΩ min

Modulation Bandwidth

- >10kHz (@-3dB, Vc=2.5V)

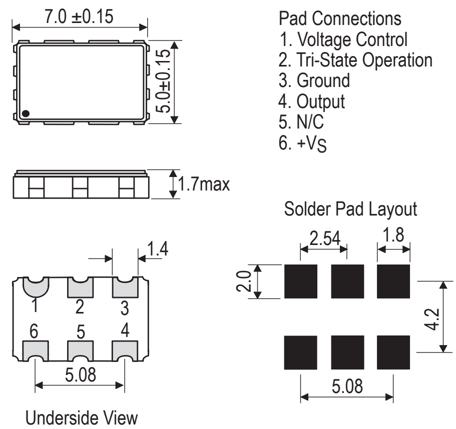
Phase Jitter

- 20ps max @ 1sigma

Storage Temperature Range

- –55 to 125°C

Outline (mm)



Environmental

- Shock: MIL-STD-202, Method 213, Cond. E
- Vibration: MIL-STD-883, Method 2007, Cond. A

Packaging

- Loose in bulk pack, 100pcs per bag
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Supply Voltage
- Pullability

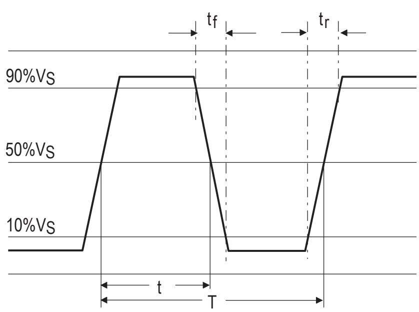
Example

- 20.0MHz CFPV-45
  HCMOS ±100ppm 0 to 70C 3.3V ±100ppm min

Electrical Specification - maximum limiting values

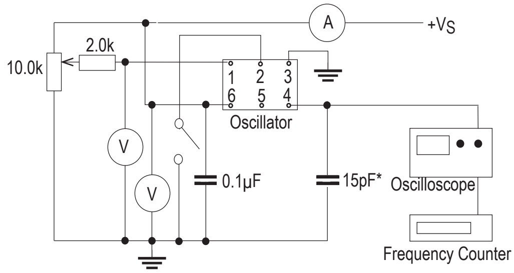
Frequency Range	Supply Voltage	Supply Current	Pullability APR	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.5 to 80.0MHz	3.3V±0.3V	50mA	±100ppm min	10ns	10ns	40/60%	CFPV-45
1.5 to 51.84MHz	5.0V±0.25V	60mA					CFPV-46
APR - Absolute Pulling Range The APR is the minimum pulling from nominal after an allowance is made for frequency shift due to temperature, ageing, supply voltage and load variation plus environmental effects.							
For operation over –40 to 85°C, please discuss your requirements with our sales offices							
Note: For other frequency / specification combinations, please contact our sales offices							

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



*Inclusive of jigging and equipment capacitance

CFPV-55 SMD VCXO

ISSUE 5; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- LVPECL output Voltage Controlled Crystal Oscillator
- Using PPL technology to give a very wide frequency range
- Wide pulling range of ±150ppm min
- Ceramic package with a seam sealed metal lid, hermetically sealed
- For more a controllable smaller pulling range please see our CFPV-32

Frequency Range

- 12 to 700MHz

Output Compatibility & Load

- Tri-state LVPECL
- Output Load 50Ω terminated to +1.3V

Frequency Stabilities

- ±25ppm, ±50ppm (inclusive of supply voltage and output load variations over the operating temperature range)
  Note: ±25ppm not avavilble over -40 to 85°C

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Tri-state Operation

- Logic ‘1’ (>V_S-1.10V) to pad 1 disables oscillator output; when disabled the oscillator goes to the high impedance state
- Logic ‘0’ (<V_S-1.60V) to pad 1 enables oscillator output
- No connection to pad 1 enables oscillator output

Voltage Control (pad 1)

- +1.65V ±1.5V (positive sense)

Pullability

- ±150ppm min

Input Impedance (voltage control, pad 1)

- 60kΩ min

Phase Noise (max)

- –45dBc/Hz @ 10Hz
- –65dBc/Hz @ 100Hz
- –95dBc/Hz @ 1kHz
- –120dBc/Hz @ 10kHz
- –117dBc/Hz @ 100kHz
- –115dBc/Hz @ 1MHz
- –135dBc/Hz @ 10MHz

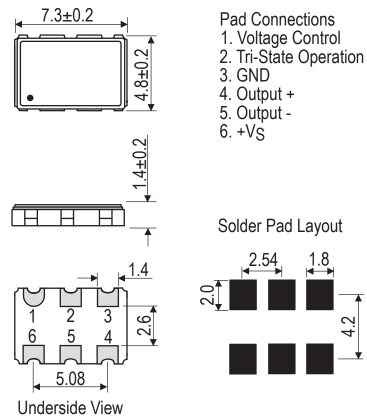
Phase Jitter

- 5ps rms max (12kHz - 20MHz)

Storage Temperature Range

- –40 to 85°C

Outline (mm)



Environmental

- Shock: MIL-STD-202F, Method 213B (1000G, 0.5ms, 1/2 sine)
- Vibration: MIL-STD-202F, Method 204D, Test Condition D 20G, frequency range 10-2000Hz, 4 hrs in X, Y & Z axes (total 12hrs)

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pullability

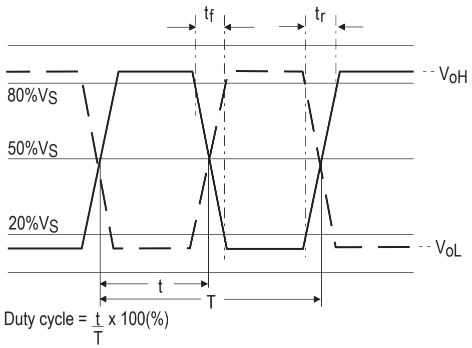
Example

- 100.0MHz CFPV-55
  LVPECL ±50ppm -10 to 70C 3.3V ±150ppm min

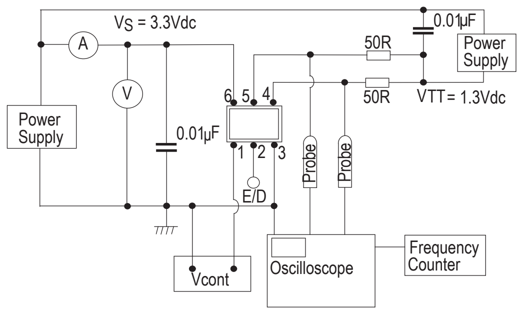
Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Pullability	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
12.0 to < 100.0MHz	±25ppm ±50ppm	3.3V±5%	120mA	±150ppm min	1ns	1ns	40/60%	CFPV-55
100.0 to 700.0MHz					0.5ns	0.5ns		
Note: For other frequency / specification combinations, please contact our sales offices								

Output Waveform



Test Circuit



CFPV-115 SMD VCXO

ISSUE 3; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 3.2 x 2.5mm Voltage Controlled Crystal Oscillator
- Ceramic package with a seam sealed metal lid, hermetically sealed

Frequency Range

- 6 to 54MHz

Output Compatibility & Load

- HCMOS
- Load 15pF max

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of supply voltage and output load variations over the operating temperature range)

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Start-Up Time

- 10ms max

Voltage Control (pad 1)

- 1.65V±1.65V

Pullability

- ±50ppm min APR

Linearity

- Positive <±10%

Input Impedance (voltage control, pad 1)

- 1MΩ min

Modulation Bandwidth

- >20kHz

Phase Noise (typical @ 21.25MHz)

- –60dBc/Hz @ 10Hz
- –90dBc/Hz @ 100Hz
- –125dBc/Hz @ 1kHz
- –145dBc/Hz @ 10kHz
- –150dBc/Hz @ 100kHz

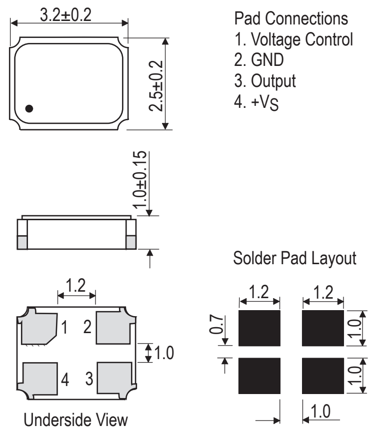
Storage Temperature Range

- –40 to 85°C

Environmental

- Shock: MIL-STD-202F, Method 213B (1000G, 0.5ms, 1/2 sine)
- Vibration: MIL-STD-202F, Method 204D, Test condition D 20G, frequency range 10-2000Hz, 4 hrs in X, Y & Z axes (total 12 hrs)

Outline (mm)



Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pullability

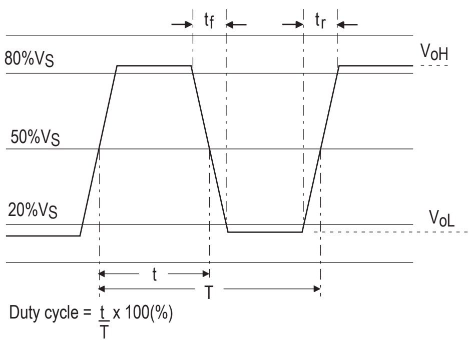
Example

- 10.0MHz CFPV-115
  HCMOS ±50ppm –40 to 85C 3.3V ±50ppm min

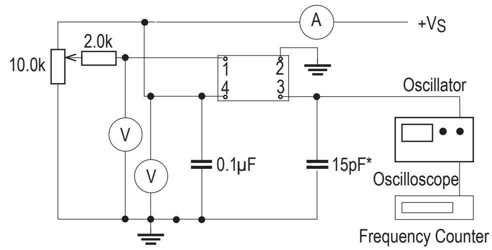
Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Pullability APR	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
6.0 to 30.0MHz	±25ppm ±50ppm ±100ppm	3.3V±5%	15mA	±50ppm min	5ns	5ns	40/60%	CFPV-115
>30.0 to 54.0MHz			25mA					
APR - Absolute Pulling Range The APR is the minimum pulling from nominal after an allowance is made for frequency shift due to temperature, ageing, supply voltage and load variation plus environmental effects.								
Note: For other frequency / specification combinations, please contact our sales offices								

Output Waveform



Test Circuit



*Inclusive of jigging and equipment capacitance

IQVCXO-161 LEADED VCXO

ISSUE 10; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 14pin DIL package Voltage Controlled Crystal Oscillator
- Crystal oscillator in a 14pin DIL package hermetically sealed

Frequency Range

- 1 to 90MHz

Output Compatibility & Load

- HCMOS/TTL
- Drive Capability: 15pF/10TTL max

Frequency Stabilities

- ±25ppm, ±50ppm @ Vc = 2.5V (inclusive of supply voltage and output load variations over the operating temperature range)

Operating Temperature Ranges

- 0 to 70°C
- –20 to 70°C
- –40 to 85°C (available 30 to 90MHz only)

Voltage Control (pin 1)

- 2.5V ±2.0V

Pullability

- ±100ppm min

Modulation Bandwidth

- >15kHz

Storage Temperature Range

- –40 to 85°C

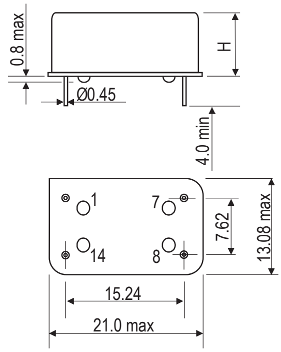
Environmental

- Terminal Strength: 0.91kg max. force perpendicular to top and bottom
- Hermetic Seal: not to exceed 1 x 10^{-8} mBar litres of Helium leakage
- Solderability: MIL-STD-202E, Method 208C
- Vibration: 10 to 55Hz 0.76mm displacement, sweep 60 seconds, duration 2 hours
- Rapid Change of Temperature over Operating Temperature Range: 10 cycles
- Shock: 981m/s^2 for 6ms, three shocks in each direction along the three mutually perpendicular planes

Packaging

- Loose in bulk pack, 25pcs per tube

Outline (mm)

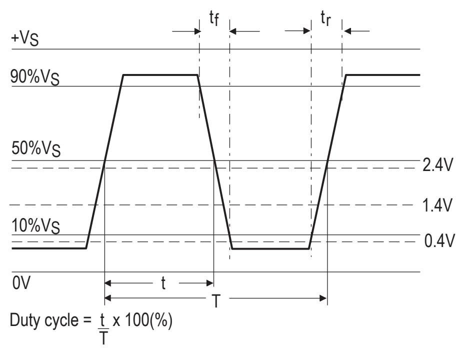


Underside View

Pin Connections
1. Voltage Control
7. GND
8. Output
14. +V_S

Frequency Range	Height (H)
1.0 to < 30.0MHz	5.1 max
30.0 to 90.0MHz	8.0 max

Output Waveform



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pullability

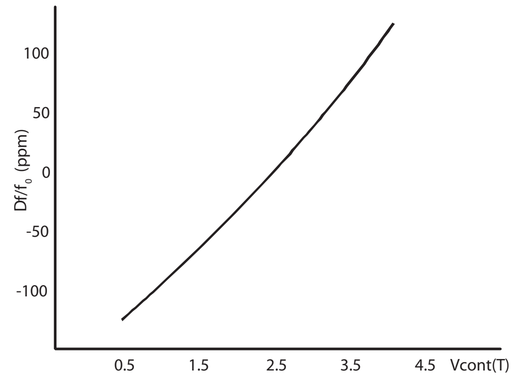
Example

- 20.0MHz IQVCXO-161
  HCMOS ±50ppm 0 to 70C 5.0V ±100ppm min

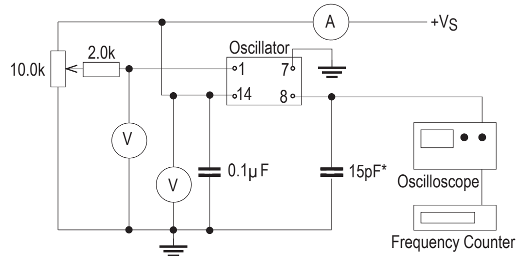
Electrical Specification - maximum limiting value

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Pullability	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
1.0 to < 24.0MHz	±25ppm ±50ppm	5.0 ±0.25V	15mA	±100ppm min	10ns	10ns	40/60%	IQVCXO-161
24.0 to < 30.0MHz			40mA					
30.0 to 90.0MHz			30mA		5ns	5ns		
Note: For other frequency / specification combinations, please contact our sales offices								

Typical Voltage Control Curve @25°C & 20.0MHz



Test Circuit



*Inclusive of jigging and equipment capacitance

IQXV-20, -21, -22 SMD VCXOs

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Standard 5 x 3.2mm Voltage Controlled Crystal Oscillator
- Available in 5.0V, 3.3V and 2.8V supply
- Ceramic package with a seam sealed metal lid, hermetically sealed

Frequency Range

- 1.25 to 80MHz
- For >80MHz to 125MHz please contact sales offices

Output Compatibility & Load

- HCMOS
- Drive Capability: 15pF max

Supply Voltages

- 5.0V IQXV-20
- 3.3V IQXV-21
- 2.8V IQXV-22

Frequency Stabilities

- ±25ppm, ±50ppm, ±100ppm (inclusive of frequency tolerance, stability over temperature range and supply voltage variation)

Operating Temperature Ranges

- –10 to 70°C
- –40 to 85°C

Storage Temperature Range

- –40 to 85°C

Tri-State operation

- Logic ‘1’ (>70%Vs) to pad 2 enables oscillator output
- Logic ‘0’ (<30%Vs) to pad 2 disables oscillator output; when disabled the oscillator ouput goes to the high impedance state.
- No connection to pad 2 enables oscillator output

Voltage Control (pad 1)

- 2.5V ±2.0V IQXV-20
- 1.65V ±1.5V IQXV-21
- 1.4V ±1.4V IQXV-22

Pullability

- ±100ppm min

Linearity

- Positive < ±10%

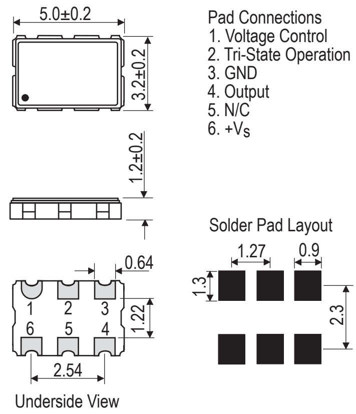
Input Impedance (voltage control, pad 1)

- 100kΩ typ.

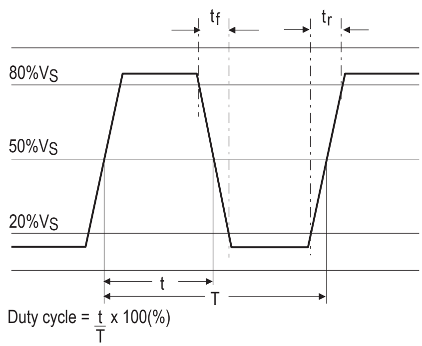
Modulation Bandwidth

- 20kHz min

Outline (mm)



Output Waveform



Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage
- Pullability*

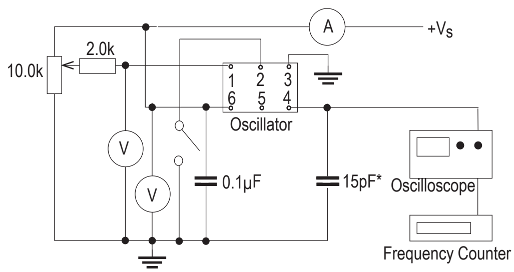
Example

- 10.0MHz IQXV-20
  HCMOS ±50ppm –10 to 70C 5.0V ±100ppm min

Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current	Pullability	Rise Time (t_r) (20-80%)	Fall Time (t_f) (80-20%)	Duty Cycle	Model Number
1.25 to 30.0MHz	±25ppm ±50ppm ±100ppm	5.0V±5%	15mA	±100ppm min	5ns	5ns	40/60%	IQXV-20
>30.0 to 52.0MHz			25mA					
>52.0 to 80.0MHz			35mA					
1.25 to 30.0MHz		3.3V±5%	15mA					IQXV-21
>30.0 to 52.0MHz			25mA					
>52.0 to 80.0MHz			35mA					
1.25 to 30.0MHz		2.8V±5%	15mA					IQXV-22
>30.0 to 52.0MHz			25mA					
>52.0 to 80.0MHz			35mA					
Note: For other frequency / specification combinations, please contact our sales offices								

Test Circuit



*Inclusive of jigging and equipment capacitance

IQXV-100 SMD VCXO

ISSUE 1; 28 FEBRUARY 2011 - RoHS 2002/95/EC

Description

- Please note: This document is intended to illustrate the general capability and versatility of IQD’s design. For specific enquiries please contact one of IQD’s sales offices where we can tailor a unique specification to meet your needs.
- Low phase noise optimised design
- Wide pulling ranges available
- Best linearity
- Complementary output
- Enable / disable function

Frequency Range

- 60 to 800MHz

Nominal Frequency (fo) reference:

- Temperature = 25°C ±3°C
- Control voltage = 1.65V

Output Compatibility & Load

- LVPECL, 50Ω terminated to Vs - 2V

Frequency Stabilities Vs Operating Temperature Range

- 0 to 70°C   ±10ppm
- –40 to 85°C   ±20ppm

Enable/Disable Operation

- Logic ‘0’ or no connection to pad 2 enables oscillator output
- Logic ‘1’ to pad 2 disables oscillator output

Ageing (15 years)

- ±10ppm max

Supply Voltage

- 3.3V±5%

Duty Cycle

- 45/55% max

Pullability Range Options

- ±50ppm to ±250ppm

Voltage Control (pad 1)

- Control Voltage: 1.65V ±1.65V

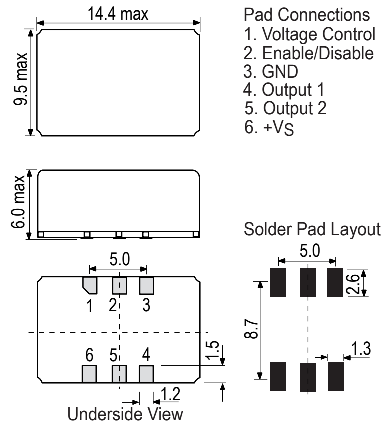
Linearity Options

- 2% to 10% available

Phase Noise (typical @ 122.88MHz)

- –70dBc/Hz@10Hz
- –100dBc/Hz@100Hz
- –125dBc/Hz@1kHz
- –145dBc/Hz@10kHz
- –150dBc/Hz@100kHz

Outline (mm)



Storage Temperature Range

- –55 to 105°C

Enviromental

- Testing taken from IEC 60068
- Please contact our sales offices for full details

Packaging

- Bulk pack supplied in tube or box packaging
- Tape and reel in accordance with EIA-481-D, 600pcs per reel (please see Application Notes)

Minimum Enquiry Information

- Frequency
- Model
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Pullability
- Linearity

IQXV-110 SMD VCXO

ISSUE 1; 28 FEBRUARY 2011 - RoHS 2002/95/EC

Description

- Please note: This document is intended to illustrate the general capability and versatility of IQD's design. For specific enquiries please contact one of IQD's sales offices where we can tailor a unique specification to meet your needs.
- Low phase noise optimised design
- Wide pulling ranges available
- Best linearity

Frequency Range

- 2 to 125MHz

Nominal Frequency (fo) reference:

- Temperature = 25°C ±3°C
- Control voltage = 1.65V

Frequency Stabilities Vs Operating Temperature Range

- 0 to 70°C ±10ppm
- –40 to 85°C ±20ppm

Ageing (15 years)

- ±10ppm max

Supply Voltage Options

- 3.3V or 5.0V

Output Compatibility

- HCMOS

Duty Cycle

- 40/60% max (45/55% max available)

Storage Temperature Range

- –55 to 105°C

Pullability Range Options

- ±50ppm to ±250ppm

Voltage Control (pad 1)

- 1.65V ±1.65V

Linearity Options

- 2% to 10% available

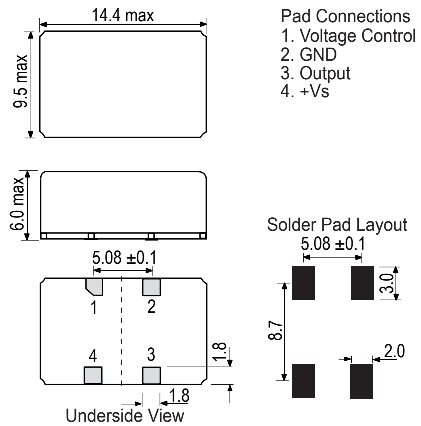
Phase Noise (typical @ 61.44MHz)

- –75dBc/Hz@10Hz
- –105dBc/Hz@100Hz
- –130dBc/Hz@1kHz
- –145dBc/Hz@10kHz
- –155dBc/Hz@100kHz

Input Impeadance

- 50kΩ min

Outline (mm)



Enviromental

- Testing taken from IEC 60068
- Please contact our sales offices for full details

Packaging

- Bulk pack supplied in tube or box packaging
- Tape and reel in accordance with EIA-481-D, 600pcs per reel (please see Application Notes)

Minimum Enquiry Information

- Frequency
- Model
- Supply Voltage
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Pullability
- Linearity
- Duty Cycle

VCXOs

IQXV-120 VCXO

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Description

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- Low phase noise optimised design
- Wide pulling ranges available
- Best linearity

Frequency Range

- 2 to 125MHz

Nominal Frequency (fo) reference:

- Temperature = 25°C ±3°C
- Control voltage = 1.65V

Frequency Stabilities Vs Operating Temperature Range

- 0 to 70°C ±10ppm
- –40 to 85°C ±20ppm

Ageing (15 years)

- ±10ppm max

Supply Voltage Options

- 3.3V or 5.0V

Output Compatibility

- HCMOS

Duty Cycle

- 40/60% max (45/55% max available)

Pullability Range Options

- ±50ppm to ±250ppm

Voltage Control (pin 1)

- 1.65V ±1.65V

Linearity Options

- 2% to 10% available

Phase Noise (typical)

- –95dBc/Hz@100Hz
- –125dBc/Hz@1kHz
- –145dBc/Hz@10kHz
- –150dBc/Hz@100kHz

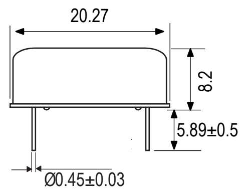
Storage Temperature Range

- –55 to 105°C

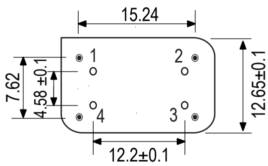
Input Impedance

- 50kΩ min

Outline (mm)



Pin Connection
1. Voltage Control
2. GND
3. Output
4. $+V_S$



Underside View

Enviromental

- Testing taken from IEC 60068
- Please contact our sales offices for full details

Packaging

- Bulk pack supplied in tube or box packaging, 120pcs

Minimum Enquiry Information

- Frequency
- Model
- Supply Voltage
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Pullability
- Linearity
- Duty Cycle

VCXOs

IQXV-130 SMD VCXO

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Description

- Please note: This document is intended to illustrate the general capability and versatility of IQD's design. For specific enquiries please contact one of IQD's sales offices where we can tailor a unique specification to meet your needs.
- Two independent oscillators in one enclosure
- Especially for RX / TX applications
- Wide pulling ranges available
- Large temperature range available
- Phase noise optimized

Frequency Range

- 100 to 800MHz

Developed Frequency Pairs:

- 155.52MHz and 166.628571MHz
- 622.08MHz and 669.32658MHz
- 622.08MHz and 624.694MHz

Nominal Frequency (fo) reference:

- Temperature = 25°C ±3°C
- Control voltage = 1.65V

Frequency Stabilities Vs Operating Temperature Range

- 0 to 70°C ±20ppm
- –40 to 85°C ±30ppm

Enable/Disable Operation

- Logic '0' or no connection to pad 6 enables oscillator output
- Logic '1' to pad 6 disables oscillator output

Ageing (15 years)

- ±10ppm max

Supply Voltage

- 3.3V±5%

Output Compatibility

- LVPECL

Duty Cycle

- 45/55% max

Pullability Range Options

- ±90ppm to ±200ppm

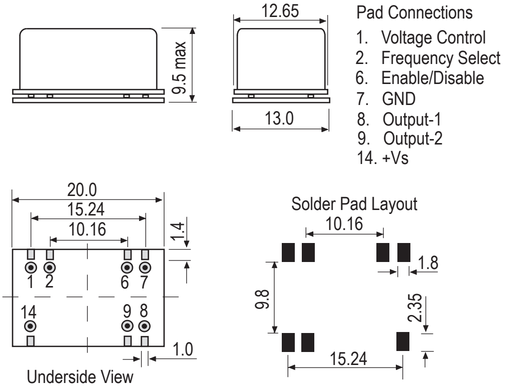
Voltage Control (pad 1)

- 1.65V ±1.65V

Linearity Options

- 2% to 10% available

Outline (mm)



Phase Noise (typical @ 155.520 / 166.628MHz)

- –100dBc/Hz@100Hz
- –130dBc/Hz@1kHz
- –140dBc/Hz@10kHz

Frequency Select Function

- Logic '0' to pad 2, low frequency selected
- Logic '1' to pad 2, high frequency selected

Storage Temperature Range

- –55 to 105°C

Input Impeadance

- 50kΩ min

Enviromental

- Testing taken from IEC 60068
- Please contact our sales offices for full details

Packaging

- Bulk pack supplied in tube or box packaging
- Tape and reel in accordance with EIA-481-D, 250pcs per reel (please see Application Notes)

Minimum Enquiry Information

- Frequencies
- Model
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Pullability
- Linearity

NOTES

TCXOs & TCVCXOs SELECTION TABLE

Model Number	Supply Voltage	Output Compatibility	Package (mm)	Frequency Range	Frequency Stability (Tightest*)	Operating Temperature Range (Widest*)	Applications	Approvals	Stock Items	Page
Specifying TCXOs and TCVCXOs										295
Stock TCXOs and TCVCXOs										296
Surface Mount Models										
CFPT-77	1.8V	Clipped Sine	2.5 x 2	13 to 38.4MHz	±0.5ppm	–30 to 85°C			✓	300
IQXT-73	1.8V	HCMOS	2.5 x 2	4 to 54MHz	±2.5ppm	–30 to 75°C				338
IQXT-63	1.8V	HCMOS	3.2 x 2.5	4 to 54MHz	±2.5ppm	–30 to 75°C				336
IQXT-43	1.8V	HCMOS	5 x 3.2	4 to 54MHz	±2.5ppm	–30 to 75°C				332
IQXT-33	1.8V	HCMOS	7 x 5	4 to 54MHz	±2.5ppm	–30 to 75°C				330
IQXT-53	2.5V	Clipped Sine	3.2 x 2.5	8 to 44MHz	±2.5ppm	–30 to 75°C				334
IQXT-83	2.5V	Clipped Sine	3.2 x 2.5	8 to 44MHz	±2.5ppm	–30 to 75°C				340
IQXT-72	2.5V	HCMOS	2.5 x 2	4 to 54MHz	±2.5ppm	–30 to 75°C				338
IQXT-62	2.5V	HCMOS	3.2 x 2.5	4 to 54MHz	±2.5ppm	–30 to 75°C				336
IQXT-42	2.5V	HCMOS	5 x 3.2	4 to 54MHz	±2.5ppm	–30 to 75°C				332
IQXT-32	2.5V	HCMOS	7 x 5	4 to 54MHz	±2.5ppm	–30 to 75°C				330
IQXT-52	2.8V	Clipped Sine	3.2 x 2.5	8 to 44.0MHz	±2.5ppm	–30 to 75°C				334
IQXT-82	2.8V	Clipped Sine	3.2 x 2.5	8 to 44.0MHz	±2.5ppm	–30 to 75°C				340
IQXT-71	2.8V	HCMOS	2.5 x 2	4 to 54MHz	±2.5ppm	–30 to 75°C				338
IQXT-61	2.8V	HCMOS	3.2 x 2.5	4 to 54MHz	±2.5ppm	–30 to 75°C				336
IQXT-41	2.8V	HCMOS	5 x 3.2	4 to 54MHz	±2.5pm	–30 to 75°C				332
IQXT-31	2.8V	HCMOS	7 x 5	4 to 54MHz	±2.5ppm	–30 to 75°C				330
CFPT-101	3.0V	Clipped Sine	11.4 x 9.6	9.6 to 40MHz	±2.5ppm	–30 to 75°C				304
CFPT-102	3.0V	Clipped Sine	11.4 x 9.6	9.6 to 40MHz	±2.5ppm	–30 to 75°C				304
CFPT-103	3.0V	Clipped Sine	11.4 x 9.6	9.6 to 40MHz	±2.5ppm	–30 to 75°C				304
CFPT-69	3.0V	Clipped Sine	2.5 x 2	13 to 38.4MHz	±0.5ppm	–30 to 85°C			✓	300
CFPT-75	3.0V	Clipped Sine	3.2 x 2.5	13 to 38.4MHz	±0.5ppm	–30 to 85°C			✓	302
IQXT-51	3.0V	Clipped Sine	3.2 x 2.5	8 to 44MHz	±2.5ppm	–30 to 75°C				334
IQXT-81	3.0V	Clipped Sine	3.2 x 2.5	8 to 44MHz	±2.5ppm	–30 to 75°C				340
CFPT-9302	3.0V	Clipped Sine	5 x 3.2	12 to 52MHz	±0.2ppm	–40 to 85°C				322
CFPT-127	3.0V	Clipped Sine	5 x 3.2	16.32 to 33.6MHz	±0.5ppm	–40 to 85°C	GPS		✓	312
CFPT-141	3.0V	Clipped Sine	5 x 3.2	10 to 30MHz	±1.5ppm	–40 to 85°C			✓	314
CFPT-123	3.0V	Clipped Sine	7 x 5	10 to 26MHz	±1.5ppm	–40 to 85°C			✓	306
IQXT-50	3.3V	Clipped Sine	3.2 x 2.5	8 to 44MHz	±2.5ppm	–30 to 75°C				334
IQXT-80	3.3V	Clipped Sine	3.2 x 2.5	8 to 44MHz	±2.5ppm	–30 to 75°C				340
CFPT-9008	3.3V	Clipped Sine	7 x 5	10 to 40MHz	±0.3ppm	–40 to 85°C				318
IQXT-70	3.3V	HCMOS	2.5 x 2	4 to 54MHz	±2.5ppm	–30 to 75°C				338
IQXT-60	3.3V	HCMOS	3.2 x 2.5	4 to 54MHz	±2.5ppm	–30 to 75°C				336
CFPT-9301	3.3V	HCMOS	5 x 3.2	1.5 to 52MHz	±0.2ppm	–40 to 85°C	Mobile			322
IQXT-40	3.3V	HCMOS	5 x 3.2	4 to 54MHz	±2.5ppm	–30 to 75°C				332
CFPT-37	3.3V	HCMOS	7 x 5	10 to 40MHz	±0.9ppm	–20 to 70°C				298
CFPT-125	3.3V	HCMOS	7 x 5	10 to 40MHz	±0.9ppm	–20 to 70°C			✓	308
CFPT-126	3.3V	HCMOS	7 x 5	10 to 40MHz	±0.5ppm	–40 to 85°C			✓	310
CFPT-9006	3.3V	HCMOS	7 x 5	1.25 to 40MHz	±0.3ppm	–40 to 85°C	Mobile			318
E2747	3.3V	HCMOS	7 x 5	12.8MHz	±0.28ppm	–20 to 70°C	Stratum 3	Semtech		324
E2791	3.3V	HCMOS	7 x 5	20MHz	±0.28ppm	–20 to 70°C	GR-1244 & GR-253 Stratum 3	Zarlink		325
E2799	3.3V	HCMOS	7 x 5	12.8MHz	±4.6ppm	–40 to 85°C	SONET	Semtech		326

Model Number	Supply Voltage	Output Compatibility	Package (mm)	Frequency Range	Frequency Stability (Tightest*)	Operating Temperature Range (Widest*)	Applications	Approvals	Stock Items	Page
E3179	3.3V	HCMOS	7 x 5	20MHz	±0.28ppm	–5 to 80°C	GR-1244 & GR-253 Stratum 3	Zarlink		327
E3198	3.3V	HCMOS	7 x 5	12.8MHz	±0.28ppm	–40 to 85°C	Stratum 3	Semtech		328
E3199	3.3V	HCMOS	7 x 5	20MHz	±0.28ppm	–40 to 85°C	GR-1244 & GR-253 Stratum 3	Zarlink		329
IQXT-30	3.3V	HCMOS	7 x 5	4 to 54MHz	±2.5ppm	-30 to 75°C				330
IQXT-100	3.3V	HCMOS, Sinewave	19.9 x 13	2 to 120MHz	±1ppm	–40 to 85°C				342
IQXT-110	3.3V	HCMOS, Sinewave	25.4 x 12.8	2 to 80MHz	±1ppm	–40 to 85°C				343
CFPT-9007	3.3V	Sine	7 x 5	10 to 40MHz	±0.3ppm	–40 to 85°C	Mobile			318
CFPT-9005	5.0V	Clipped Sine	7 x 5	10 to 40MHz	±0.3ppm	–40 to 85°C	Mobile			318
CFPT-9001	5.0V	HCMOS	7 x 5	1.25 to 40MHz	±0.3ppm	–40 to 85°C	Mobile			318
IQXT-100	5.0V	HCMOS, Sinewave	19.9 x 13	2 to 120MHz	±1ppm	–40 to 85°C				342
IQXT-110	5.0V	HCMOS, Sinewave	25.4 x 12.8	2 to 80MHz	±1ppm	–40 to 85°C				343
CFPT-9003	5.0V	Sine	7 x 5	10 to 40MHz	±0.3ppm	–40 to 85°C	Mobile			318
Leaded Models										
CFPT-5301	3.3V	HCMOS, ACMOS, Sinewave, Clipped Sine	14-pin DIL	1.255 to 40MHz	±0.3ppm	–55 to 95°C				316
IQXT-120	3.3V	HCMOS, Sinewave	14-pin DIL	2 to 125MHz	±1ppm	–40 to 85°C				344
IQXT-130	3.3V	HCMOS, Sinewave	20.2sq	2 to 105MHz	±1ppm	–40 to 85°C				345
IQXT-140	3.3V	HCMOS, Sinewave	36 x 27	2 to 150MHz	±1ppm	–40 to 85°C				346
CFPT-5302	5.0V	HCMOS, ACMOS, Sinewave, Clipped Sine	14-pin DIL	1.255 to 40MHz	±0.3ppm	–55 to 95°C				316
IQXT-120	5.0V	HCMOS, Sinewave	14-pin DIL	2 to 125MHz	±1ppm	–40 to 85°C				344
IQXT-130	5.0V	HCMOS, Sinewave	20.2sq	2 to 105MHz	±1ppm	–40 to 85°C				345
IQXT-140	5.0V	HCMOS, Sinewave	36 x 27	2 to 150MHz	±1ppm	–40 to 85°C				346
IQXT-140	12.0V	HCMOS, Sinewave	36 x 27	2 to 150MHz	±1ppm	–40 to 85°C				346

SPECIFYING TCXOs & TCVCXOs

Temperature Compensated Crystal Oscillators give much tighter frequency stabilities than standard clock oscillators. The frequency over temperature change of the quartz crystal is internally monitored and compensated for using a similar process to that used inside a VCXO. As a result the frequency change seen on the output is significantly reduced. Some temperature compensated voltage controlled crystal oscillators also give a further fine tuning function to allow the customer to make changes to the output frequency while the circuit is active.

IQD uses the code TCXO to denote our temperature compensated quartz crystal oscillator part numbers and the code TVXO to denote our temperature compensated quartz crystal oscillators with additional voltage control function within our part numbers.

The electrical parameters are given on the specification to facilitate the correct circuit design. Further guidance can be found in the Application Notes chapter of this book. Our Application Support team can also provide assistance if required; please contact one of our sales offices for this support.

The limits given in the following specifications are indicative of the standard TCXO/TVXO oscillator design, in the event that a specification is needed which is outside the standard TCXO/TVXO oscillator designs offered please contact our Sales team.

A typical TCXO specification reads like this:

13.0MHz CFPT-123
Clipped Sine ±2.5ppm –30 to 80C 3.0V ±5ppm min

The data in the example above is translated in the following order

- Frequency
- Model
- Output
- Frequency Stability
- Operating Temperature Range
- Supply Voltage
- Frequency Adjustment

The following notes define each element of the specification.

Frequency

Frequency is normally specified in kilohertz (kHz) up to 999.999kHz and in megahertz (MHz) from 1.0MHz. All our computer-generated transaction documents follow this standard convention automatically.

The frequency should be specified to seven significant figures. If seven significant figures are not used, we assume that any figure that might follow those given may be taken as zero. Thus a frequency given as 16.6MHz will be taken as 16.60, not 16.6666.

Model

The model incorporates information which describes output compatibility, holder style and supply voltge.

Frequency Stability

The frequency stability is the frequency change over the operating temperature range.

In tight tolerance applications it may be necessary to apply a frequency offset at 25°C in order to centralise the frequency/temperature characteristic to the nominal frequency. If applicable this will be stated in the individual data sheet.

The following are common frequency stabilities:

- ±0.3ppm
- ±0.5ppm
- ±0.9ppm
- ±1.0ppm
- ±1.5ppm
- ±2.0ppm
- ±2.5ppm
- ±5.0ppm

Operating Temperature Ranges

Although in general these devices will continue to operate outside their normal temperature range with a degradation in frequency stability, damage can result if the temperatures reached are excessive.

The following are common operating temperature ranges:

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –25 to 75°C
- –30 to 75°C
- –30 to 85°C
- –40 to 85°C

Frequency Adjustment

In order to meet their specification over their full operating temperature range, close tolerance devices are often adjusted to have a frequency offset at room temperature, therefore adjustment of the mechanical trimmers of such devices should not be attempted unless facilities exist to measure their frequency over their full operating temperature range.

Additional Text Code

If the product is non-standard, the letter ‘E’ and/or ‘T’ will appear at the end of the product specification. This refers to additional text on the quotation/sales order to identify the non-standard requirements.

Packaging

Tape and Reel packaging is available as an option on many of the products outlined in this chapter.

- Bulk = Bulk packed
- Reel = Tape and Reel packed

Outline Drawings

Dimensions on the drawings are shown only as a guide. Precise dimensions of the holders are available upon request. All dimensions are shown in mm and are nominal unless otherwise stated.

Marking

Where space is limited some information may be omitted or truncated at IQD’s discretion. Full product description will be found on the individual batch packaging.

Ordering Information

- See individual data sheets

STOCK SMD TCXOs & TCVCXOs

CFPT-69 Clipped Sine (2.5 x 2mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
13.0MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027625	✓	
13.0MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027632	✓	
16.3680MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027633	✓	
16.3680MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027626	✓	
16.3690MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027627	✓	
16.3690MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027634	✓	
19.20MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027628	✓	
19.20MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027635	✓	
26.0MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027636	✓	
27.4560MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027630	✓	
27.4560MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027637	✓	
38.40MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027638	✓	
38.40MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027631	✓	

CFPT-75 Clipped Sine (3.2 x 2.5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
13.0MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027639	✓	
13.0MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027646	✓	
16.3680MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027647	✓	
16.3680MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027640	✓	
16.3690MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027641	✓	
16.3690MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027648	✓	
19.20MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027649	✓	
19.20MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027642	✓	
26.0MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027643	✓	
26.0MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027725	✓	
27.4560MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027651	✓	
27.4560MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027644	✓	
38.40MHz	Clipped Sine ±0.5ppm -30 to 85C 3V	LFTCXO027645	✓	
38.40MHz	Clipped Sine ±2ppm -30 to 85C 3V	LFTCXO027652	✓	

CFPT-77 Clipped Sine (2.5 x 2mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
13.0MHz	Clipped Sine ±2ppm -30 to 85C 1.8V	LFTCXO027660	✓	
13.0MHz	Clipped Sine ±0.5ppm -30 to 85C 1.8V	LFTCXO027653	✓	
16.3680MHz	Clipped Sine ±0.5ppm -30 to 85C 1.8V	LFTCXO027654	✓	
16.3680MHz	Clipped Sine ±2ppm -30 to 85C 1.8V	LFTCXO027661	✓	
16.3690MHz	Clipped Sine ±2ppm -30 to 85C 1.8V	LFTCXO027662	✓	
16.3690MHz	Clipped Sine ±0.5ppm -30 to 85C 1.8V	LFTCXO027655	✓	
19.20MHz	Clipped Sine ±2ppm -30 to 85C 1.8V	LFTCXO027663	✓	
19.20MHz	Clipped Sine ±0.5ppm -30 to 85C 1.8V	LFTCXO027656	✓	
26.0MHz	Clipped Sine ±0.5ppm -30 to 85C 1.8V	LFTCXO027657	✓	
26.0MHz	Clipped Sine ±2ppm -30 to 85C 1.8V	LFTCXO027664	✓	
27.4560MHz	Clipped Sine ±0.5ppm -30 to 85C 1.8V	LFTCXO027658	✓	
27.4560MHz	Clipped Sine ±2ppm -30 to 85C 1.8V	LFTCXO027665	✓	
38.40MHz	Clipped Sine ±2ppm -30 to 85C 1.8V	LFTCXO027666	✓	
38.40MHz	Clipped Sine ±0.5ppm -30 to 85C 1.8V	LFTCXO027659	✓	

CFPT-123 Clipped Sine (7 x 5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
10.0MHz	Clipped Sine ±2.5ppm -30 to 80C 3V ±5ppm min	LFTVXO009984	✓	
12.80MHz	Clipped Sine ±2.5ppm -30 to 80C 3V ±5ppm min	LFTVXO009983	✓	
13.0MHz	Clipped Sine ±2.5ppm -30 to 80C 3V ±5ppm min	LFTVXO009982	✓	
14.40MHz	Clipped Sine ±2.5ppm -30 to 80C 3V ±5ppm min	LFTVXO009981	✓	

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
15.360MHz	Clipped Sine ±2.5ppm -30 to 80C 3V ±5ppm min	LFTVXO009980	✓	
19.20MHz	Clipped Sine ±2.5ppm -30 to 80C 3V ±5ppm min	LFTVXO009979	✓	
19.440MHz	Clipped Sine ±2.5ppm -30 to 80C 3V ±5ppm min	LFTVXO009978	✓	
19.680MHz	Clipped Sine ±2.5ppm -30 to 80C 3V ±5ppm min	LFTVXO009977	✓	
20.0MHz	Clipped Sine ±2.5ppm -30 to 80C 3V ±5ppm min	LFTVXO009976	✓	
26.0MHz	Clipped Sine ±2.5ppm -30 to 80C 3V ±5ppm min	LFTVXO009975	✓	

CFPT-125 HCMOS (7 x 5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
10.0MHz	HCMOS ±0.9ppm -20 to 70C 3.3V ±5ppm min	LFTVXO009900	✓	
12.80MHz	HCMOS ±0.9ppm -20 to 70C 3.3V ±5ppm min	LFTVXO009901	✓	
13.0MHz	HCMOS ±0.9ppm -20 to 70C 3.3V ±5ppm min	LFTVXO009902	✓	
16.3840MHz	HCMOS ±0.9ppm -20 to 70C 3.3V ±5ppm min	LFTVXO009905	✓	
19.440MHz	HCMOS ±0.9ppm -20 to 70C 3.3V ±5ppm min	LFTVXO009906	✓	
20.0MHz	HCMOS ±0.9ppm -20 to 70C 3.3V ±5ppm min	LFTVXO009907	✓	
32.7680MHz	HCMOS ±0.9ppm -20 to 70C 3.3V ±5ppm min	LFTVXO009909	✓	
40.0MHz	HCMOS ±0.9ppm -20 to 70C 3.3V ±5ppm min	LFTVXO009910	✓	

CFPT-126 HCMOS (7 x 5mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
10.0MHz	HCMOS ±0.5ppm -40 to 85C 3.3V ±5ppm min	LFTVXO009912	✓	
12.80MHz	HCMOS ±0.5ppm -40 to 85C 3.3V ±5ppm min	LFTVXO009913	✓	
13.0MHz	HCMOS ±0.5ppm -40 to 85C 3.3V ±5ppm min	LFTVXO009914	✓	

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
16.3840MHz	HCMOS ±0.5ppm -40 to 85C 3.3V ±5ppm min	LFTVXO009915	✓	
19.440MHz	HCMOS ±0.5ppm -40 to 85C 3.3V ±5ppm min	LFTVXO009916	✓	
20.0MHz	HCMOS ±0.5ppm -40 to 85C 3.3V ±5ppm min	LFTVXO009917	✓	
26.0MHz	HCMOS ±0.5ppm -40 to 85C 3.3V ±5ppm min	LFTVXO009918	✓	
32.7680MHz	HCMOS ±0.5ppm -40 to 85C 3.3V ±5ppm min	LFTVXO009919	✓	
40.0MHz	HCMOS ±0.5ppm -40 to 85C 3.3V ±5ppm min	LFTVXO009920	✓	

CFPT-127 (5 x 3mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
16.320MHz	Clipped Sine ±0.5ppm -40 to 85C 3.0V	LFTCXO007005	✓	
16.80MHz	Clipped Sine ±0.5ppm -40 to 85C 3.0V	LFTCXO007006	✓	
19.20MHz	Clipped Sine ±0.5ppm -40 to 85C 3.0V	LFTCXO007007	✓	
24.5535MHz	Clipped Sine ±0.5ppm -40 to 85C 3.0V	LFTCXO007008	✓	
26.0MHz	Clipped Sine ±0.5ppm -40 to 85C 3.0V	LFTCXO007009	✓	
33.60MHz	Clipped Sine ±0.5ppm -40 to 85C 3.0V	LFTCXO007010	✓	

CFPT-141 Clipped Sine (5 x 3mm)

Frequency	Specification	Part Number	Packaging	
			Bulk	Reel
12.80MHz	Clipped Sine ±2.5ppm -30 to 85C 3V ±3ppm min to ±7ppm max	LFTVXO022775	✓	
19.20MHz	Clipped Sine ±2.5ppm -30 to 85C 3V ±3ppm min to ±7ppm max	LFTVXO018792	✓	
20.0MHz	Clipped Sine ±2.5ppm -30 to 85C 3V ±3ppm min to ±7ppm max	LFTVXO022175	✓	
26.0MHz	Clipped Sine ±2.5ppm -30 to 85C 3V ±3ppm min to ±7ppm max	LFTVXO022776	✓	

CFPT-37 SMD TCXO

ISSUE 6; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Fixed frequency, surface mount, temperature compensated crystal oscillator (TCXO) providing a high degree of frequency stability over a wide temperature range in a hermetically sealed ceramic package

Standard Frequencies

- 10, 12.8, 13, 14.4, 16.32,16.384, 19.44, 20, 26, 32.768, 40MHz (other frequencies may be available, please contact our sales offices)

Output Compatibility & Load

- HCMOS
- Load: 15pF nom

Supply Voltage

- 3.3V±5%

Supply Current

- 3mA @20MHz typ

Frequency Tolerance

- ±1.0ppm

Frequency Stability

- ±0.9ppm

Supply Voltage Variation

- <30MHz ±0.3ppm
- 30MHz to <40MHz ±0.4ppm
- 40MHz ±0.5ppm

Load Variation

- ±0.2ppm @ 15pF ±10%

After Reflow

- ±1.0ppm

Ageing

- ±1ppm typ in 1st year @25°C

Operating Temperature Range

- –20 to 70°C

Duty Cycle

- 45/55%

Rise & Fall Time

- 8ns max

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: IEC 60068-2-27, Test Ea: 980m/s^2 acceleration for 6ms, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6, Test Fc, Procedure B4: 10Hz-60Hz 1.5mm displacement, 60-2000Hz at 98.1m/s^2, 30mins in 3 mutually perpendicular planes at 1 oct/min
- Solderability: MIL-STD-202, Method 208, Category 3

Manufacturing Information

- Soldering: Suitable for Convection Reflow soldering. Peak temperature 260°C for 10sec max
- Washing: Able to withstand aqueous washing

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 500pcs per reel (please see Application Notes)

Ordering Information (*minimum required)

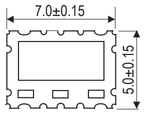
- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Supply Voltage

Example

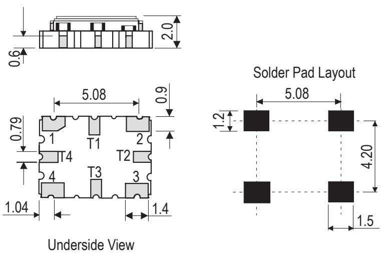
- 40.0MHz CFPT-37
  HCMOS ±0.9ppm –20 to 70C 3.3V

TCXOs

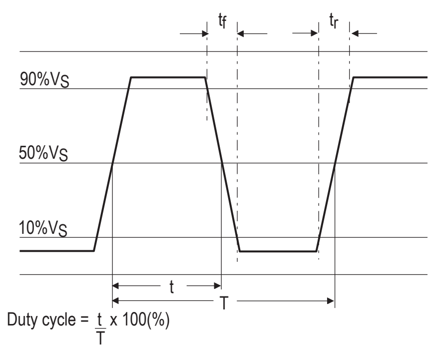
Outline (mm)



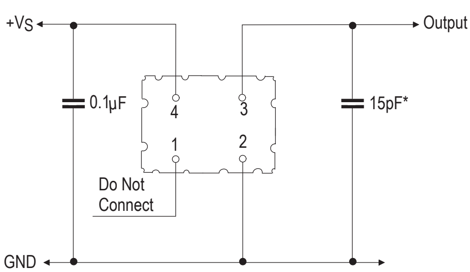
Pad Connections
1.N/C
2.GND
3.Output
4.+V_S
T1, T2, T3, T4 N/C



Output Waveform



Test Circuit



* Inclusive of probe and jig capacitance

TCXOs

CFPT-69, -77 SMD TCXOs

ISSUE 2; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated crystal oscillator (TCXO) in a miniature ceramic package

Standard Frequencies

- 13.0, 16.368, 16.369, 19.2, 26.0, 27.456, 38.4MHz

Output Compatibility & Load

- Clipped Sine 0.8$_{pk-pk}$ minimum, 10kΩ // 10pF ±10%

Supply Voltages

- 3.0V±5% CFPT-69
- 1.8V±5% CFPT-77

Frequency Tolerance

- ±2.0ppm @25°C ±2°C

Frequency Stability

- See table

Supply Voltage Variation

- ±0.2ppm max

Load Variation

- ±0.1ppm max

Ageing

- ±1ppm max per year @25°C ±2°C

Operating Temperature Range

- –30 to 85°C

Phase Noise (typical)

- –80dBc/Hz @ 10Hz
- –105dBc/Hz @ 100Hz
- –130dBc/Hz @ 1kHz
- –145dBc/Hz @ 10kHz

Harmonics

- -5dBc max

Storage Temperature Range

- –40 to 85°C

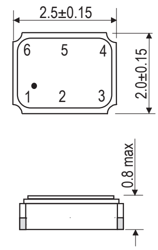
Environmental

- Drop: 150cm drop (6 directions x 3 times) onto hard wooden board
- Vibration: 1.5mm amplitude, 10Hz-55Hz-10Hz, sweep rate 1min in 3 mutually perpendicular planes, duration 2hrs each plane

Manufacturing Information

- MSL 1
- Soldering: Suitable for Convection Reflow soldering. Peak temperature 260°C for 10sec max
- Washing: Not recommended

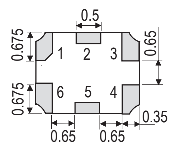
Outline (mm)



Pad Connections
1. GND
2. N/C
3. GND
4. Output
5. N/C
6. +V$_S$

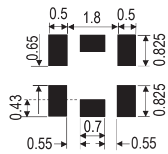
Note 1: a capacitor of 0.01μF between +Vs and GND is recommended.

Note 2: a DC bias cut capacitor of 0.01μF at the output is recommended.

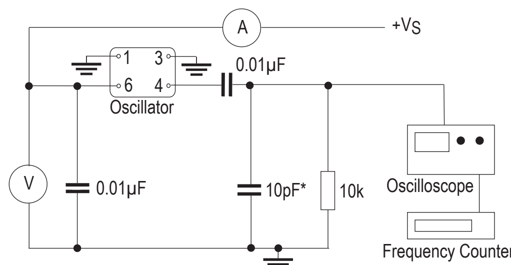


Underside View

Solder Pad Layout



Test Circuit



* Inclusive of jigging and equipment capacitance

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

- 13.0MHz CFPT-77
  Clipped Sine ±2ppm –30 to 85C 1.8V

TCXOs

Electrical Specification - maximum limiting values

Frequencies	Frequency Tolerance @ 25°C	Supply Voltage	Supply Current	Output Waveform	Output	Model Number
13.0, 16.368, 16.369, 19.2, 26.0, 27.456, 38.4MHz	±2.0ppm	3.0V±5%	2mA	Clipped Sine	$0.8V_{pk-pk}$ min	CFPT-69
		1.8V±5%				CFPT-77
Note: For other frequency/specification combinations, please contact our sales offices						

Frequency Stabilities over Operating Temperature Range

Operating Temperature Range	Frequency Stabilities v Operating Temperature Range	
	±0.5ppm	±2.0ppm
–30 to 85°C	✓	✓
Note: Other frequencies may be available, please contact our sales offices		

TCXOs

CFPT-75 SMD TCXO

ISSUE 3; 16 DECEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated crystal oscillator (TCXO) in a miniature ceramic package

Standard Frequencies

- 13.0, 16.368, 16.369, 19.2, 26.0, 27.456, 38.4MHz

Output Compatibility & Load

- Clipped Sine 0.6$V_{pk\text{-}pk}$ minimum, 10kΩ // 10pF ±10%

Frequency Tolerance

- ±2.0ppm

Frequency Stability

- See table

Supply Voltage

- 3.0V±5%

Supply Voltage Variation

- ±0.3ppm max (±5% change)

Load Variation

- ±0.2ppm max (±10% change)

Ageing

- ±1ppm max per year @25°C ±2°C

Operating Temperature Range

- –30 to 85°C

Phase Noise (@ 13MHz ref 25°C ±2°C)

- –85dBc/Hz @ 10Hz
- –110dBc/Hz @ 100Hz
- –130dBc/Hz @ 1kHz
- –140dBc/Hz @ 10kHz

Harmonics

- -8dBc max

Storage Temperature Range

- –40 to 85°C

Environmental

- Drop: 150cm drop (6 directions x 3 times) onto hard wooden board
- Vibration: 1.5mm amplitude, 10Hz-55Hz-10Hz, sweep rate 1min in 3 mutually perpendicular planes, duration 2hrs each plane

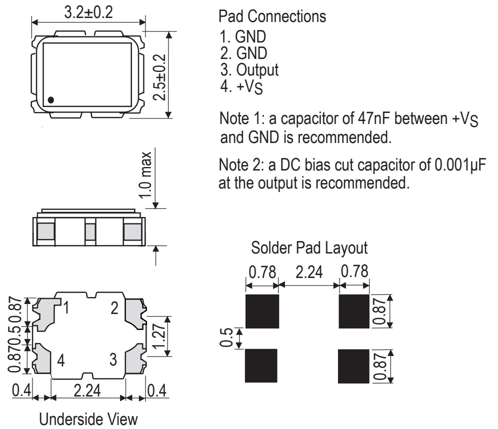
Manufacturing Information

- MSL 3
- Soldering: Suitable for Convection Reflow soldering. Peak temperature 260°C for 10 secs max
- Washing: Not recommended

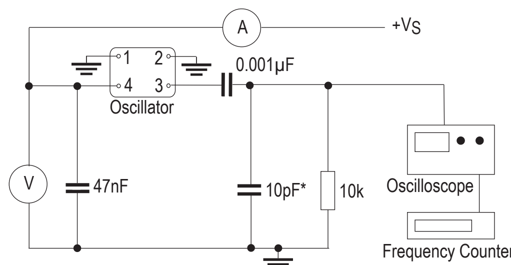
Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Test Circuit



* Inclusive of jigging and equipment capacitance

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

- 13.0MHz CFPT-75
  Clipped Sine ±2ppm –30 to 85C 3.0V

Electrical Specification - maximum limiting values

Frequencies	Frequency Tolerance @ 25°C ±2°C	Supply Voltage	Supply Current	Output Waveform	Output	Model Number
13.0, 16.368, 16.369, 19.2, 26.0, 27.456, 38.4MHz	±2.0ppm	3.0V±5%	2mA	Clipped Sine	0.6$V_{pk\text{-}pk}$ min	CFPT-75
Note: For other frequencies / specifications combinatins, please contact our sales offices						

Frequency Stabilities over Operating Temperature Range

Operating Temperature Range	Frequency Stabilities v Operating Temperature Range	
	±0.5ppm	±2.0ppm
–30 to 85°C	✓	✓
Note: Other frequencies may be available, please contact our sales offices		

TCXOs

CFPT-101, -102, -103 SMD TCXO/TCVCXOs

ISSUE 8; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Not recommended for new designs

Description

- Surface mount temperature compensated voltage controlled crystal oscillators (TCVCXOs) providing a high degree of frequency stability over a wide temperature range

Frequency Range

- 9.6MHz to 56MHz

Output Capability & Load

- Clipped Sine 0.7V_{pk-pk} minimum
- 10kΩ // 10pF

Frequency Stability

- See table

Supply Voltage Variation

- ±5% ±1.0ppm max

Load Variation

- (10kΩ\\10pF) ±10% ±0.3ppm max

After Reflow

- ±1.5ppm max

Ageing

- ±1ppm max in 1st year @25°C

Voltage Control

- 1.5V±1.0V applied to pad 1 (CFPT-102, -103)

Frequency Adjustment (trimmer)

- ±3ppm minimum internal trimmer adjustment (CFPT-101, -103)

Storage Temperature Range

- –40 to 85°C

Environmental

- Drop: 75cm drop (10 times) onto concrete
- Vibration: 2.0mm amplitude, 10Hz-55Hz, in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

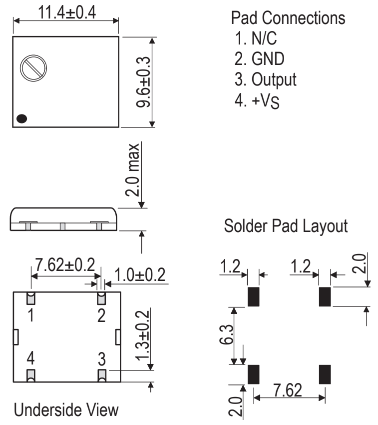
Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

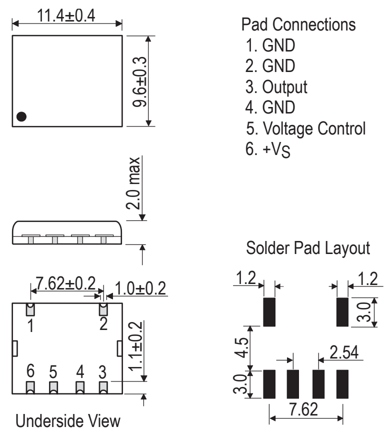
Example

- 13.0MHz CFPT-101
  Clipped Sine ±2.5ppm –30 to 75C 3.0V

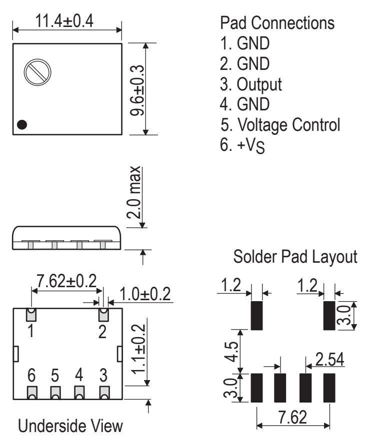
Outline (mm) - CFPT-101



Outline (mm) - CFPT-102



Outline (mm) - CFPT-103



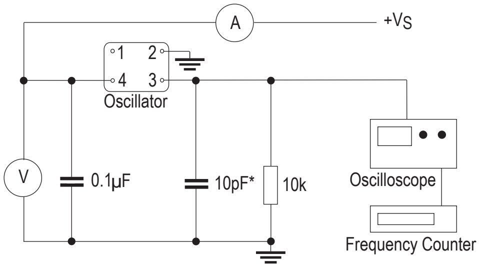
Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C ±2°C	Supply Voltage	Supply Current	Frequency Adjustment	Output Waveform	Output	Model Number
9.6 to 56.0MHz	±0.5ppm	3.0V±5%	5mA	–	Clipped Sine	0.7V_{pk-pk} min	CFPT-101
	±2.0ppm			±8.0ppm to ±14.0pm max / 1.5V ±1.0V			CFPT-102
	±0.5ppm			±5.0ppm to ±10.0pm max / 1.5V ±1.0V			CFPT-103
Note: For other frequencies / specifications combinatins, please contact our sales offices							

Frequency Stabilities over Operating Temperature Range

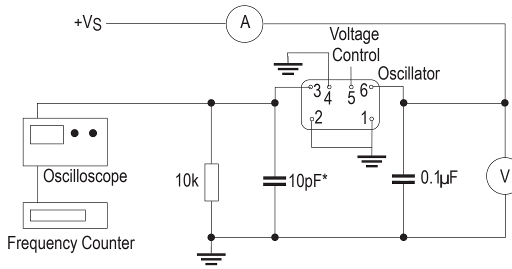
Operating Temperature Ranges	Frequency Stabilities v Operating Temperature Range	
	±2.5ppm	±5.0ppm
–20 to 70°C	✓	✓
–25 to 75°C	✓	✓
–30 to 75°C	Standard*	✓
*Note: ±2.5ppm over -30 to 75°C is the standard frequency stability vs operating temperature range		

Test Circuit - CFPT-101



*Inclusive of jigging and equipment capacitance

Test Circuit - CFPT-102 & 103



*Inclusive of jigging and equipment capacitance

TCXOs

CFPT-123 SMD TCVCXO

ISSUE 7; 17 JANUARY 2011 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated voltage controlled crystal oscillator (TCVCXO) in a hermetically sealed ceramic package

Standard Frequencies

- 10, 12.8, 13, 14.4, 15.36, 19.2, 19.44, 19.68, 20, 26MHz

Output Compatiblity & Load

- Clipped Sine 0.8V_{pk-pk} minimum
- 10kΩ // 10pF ±10%

Frequency Tolerance

- ±0.5ppm max

Frequency Stability

- See table

Supply Voltage Variation

- ±0.2ppm (5% change)

Load Variation

- ±0.2ppm (10% change)

Ageing

- ±1ppm typ in 1st year @ 25°C

Voltage Control

- 1.5V±1.0V applied to pad 1
  (frequency movement is positive sense)

Frequency Adjustment

- ±5ppm min

Input Impedance

- 1.0MΩ min

Phase Noise (typical @ 10MHz)

- –90dBc/Hz @ 10Hz
- –110dBc/Hz @ 100Hz
- –140dBc/Hz @ 1kHz
- –145dBc/Hz @ 10kHz

Storage Temperature Range

- –55 to 125°C

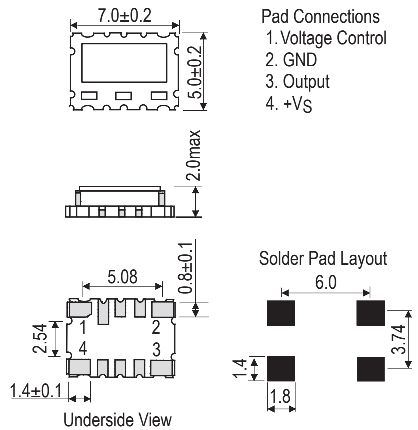
Environmental

- Shock: MIL-STD-883D, Method 2002.3, Test Condition B: 1500G, 0.5ms, 1/2 sine wave, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: MIL-STD-883D, Method 2005.2, Test Condition B: 20G (20Hz-2000Hz), 1.5mm amplitude, in 3 mutually perpendicular planes, 4hrs in each plane

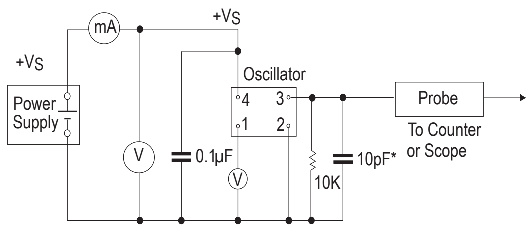
Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Test Circuit



* Inclusive of jigging and equipment capacitance

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

- 13.0MHz CFPT-123
  Clipped Sine ±2.5ppm –30 to 80C 3.0V

Electrical Specification - maximum limiting values

Frequency Range	Supply Voltage	Supply Current	Frequency Adjustment	Output Waveform	Output	Model Number
10.0 to 26.0MHz	3.0V±0.3V	2.5mA	±5.0ppm min. / 1.5V±1.0V	Clipped Sine	0.8V_{pk-pk} min	CFPT-123
Note: For other frequencies / specifications combinatins, please contact our sales offices						

Frequency Stabilities over Operating Temperature Range

Operating Temperature Ranges	Frequency Stabilities v Operating Temperature Range			
	±1.5ppm	±2.0ppm	±2.5ppm	±5.0ppm
0 to 50°C	✓	✓	✓	✓
–10 to 60°C	✓	✓	✓	✓
–20 to 70°C	–	✓	✓	✓
–30 to 80°C	–	✓	Standard*	✓
–30 to 85°C	–	–	✓	✓
–40 to 85°C	–	–	✓	✓
* Note: ±2.5ppm over -30 to 80°C is the standard frequency stability vs operating temperature range				

TCXOs

CFPT-125 SMD TCVCXO

ISSUE 10; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated voltage controlled oscillator (TCVCXO) providing a high degree of frequency stability over a wide temperature range in a hermetically sealed ceramic package

Standard Frequencies

- 10, 12.8, 13, 14.4, 16.32,16.384, 19.44, 20, 26, 32.768 40MHz (other frequencies may be available, please contact our sales offices)

Output Compatibility & Load

- HCMOS
- 15pF nom

Supply Voltage

- 3.3V±5%

Supply Current

- 3mA @ 20MHz typical

Frequency Stability

- ±0.9ppm

Supply Voltage Variation

- <30MHz ±0.3ppm
- 30MHz to <40MHz ±0.4ppm
- 40MHz ±0.5ppm

Load Variation

- ±0.2ppm (@15pF ±10%)

After Reflow

- ±1.0ppm

Ageing

- ±1ppm typ in 1st year @ 25°C

Operating Temperature Range

- –20 to 70°C

Control Voltage

- 1.65V±1V

Frequency Adjustment

- ±5ppm min

Duty Cycle

- 45/55%

Rise & Fall Time

- 8ns max

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: IEC 60068-2-27, Test Ea: 980m/s^2 acceleration for 6ms, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6, Test Fc, Procedure B4: 10Hz-60Hz 1.5mm displacement, 60-2000Hz at 98.1m/s^2, 30mins in 3 mutually perpendicular planes at 1 oct/min
- Solderability: MIL-STD-202, Method 208, Category 3

Manufacturing Information

- Soldering: Suitable for Convection Reflow soldering. Peak temperature 260°C for 10sec max
- Washing: Able to withstand aqueous washing

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

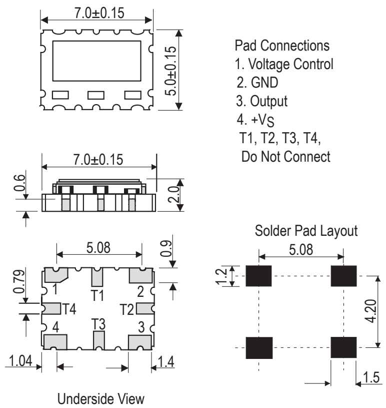
Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Supply Voltage
- Frequency Adjustment

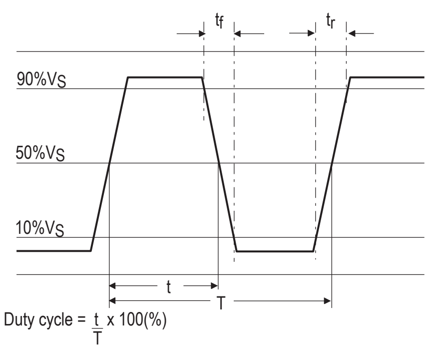
Example

- 10.0MHz CFPT-125
  HCMOS ±0.9ppm –20 to 70C 3.3V ±5ppm min

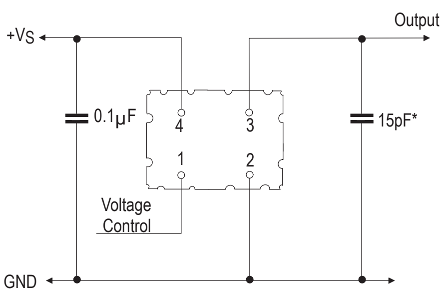
Outline (mm)



Output Waveform



Test Circuit



* Inclusive of probe and jig capacitance

TCXOs

CFPT-126 SMD TCVCXO

ISSUE 5; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated voltage controlled oscillator (TCVCXO) providing a high degree of frequency stability over a wide temperature range in a hermeticaly sealed ceramic package

Standard Frequencies

- 10, 12.8, 13, 16.384, 19.44, 20, 26, 32.768, 40MHz (other frequencies may be available, please contact our sales offices)

Output Compatibility & Load

- HCMOS
- 15pF nom

Supply Voltage

- 3.3V±5%

Supply Current

- 3mA @ 20MHz typical

Frequency Stability

- ±0.5ppm

Supply Voltage Variation

- <30MHz ±0.3ppm
- 30MHz to 40MHz ±0.4ppm

Load Variation

- ±0.2ppm (@15pF ±10%)

After Reflow

- ±1.0ppm

Ageing

- ±1ppm typ in 1st year @ 25°C

Operating Temperature Range

- –40 to 85°C

Control Voltage

- 1.65V±1V

Frequency Adjustment

- ±5ppm min

Duty Cycle

- 45/55%

Rise & Fall Time

- 8ns max

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: IEC 60068-2-27, Test Ea: 980m/s^2 acceleration for 6ms, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6, Test Fc, Procedure B4: 10Hz-60Hz 1.5mm displacement, 60-2000Hz at 98.1m/s^2, 30mins in 3 mutually perpendicular planes at 1 oct/min
- Solderability: MIL-STD-202, Method 208, Category 3

Manufacturing Information

- Soldering: Suitable for Convection Reflow soldering. Peak temperature 260°C, 60sec max above 220°C
- Washing: Able to withstand aqueous washing

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

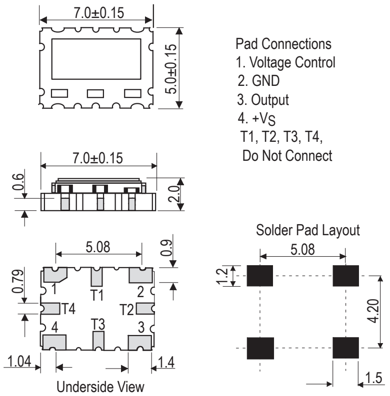
- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

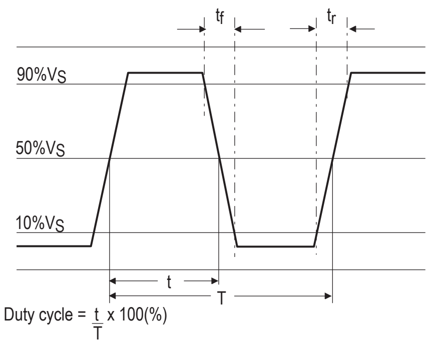
- 13.0MHz CFPT-126
  HCMOS ±0.5ppm –40 to 85C 3.3V

TCXOs

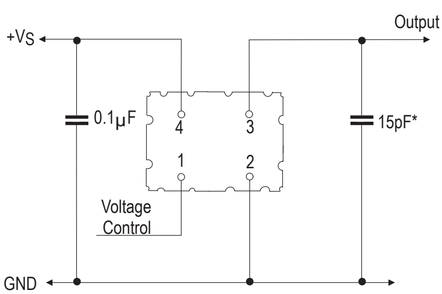
Outline (mm)



Output Waveform



Test Circuit



* Inclusive of probe and jig capacitance

TCXOs

CFPT-127 SMD TCXO

ISSUE 5; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated crystal oscillator (TCXO) providing a high degree of frequency stability over a wide temperature in a hermetically sealed ceramic package and is suitable for GPS applications

Standard Frequencies

- 16.32, 16.8, 19.2, 24.5535, 26, 33.6MHz (other frequencies may be available, please contact our sales offices)

Output Compatibility & Load

- Clipped Sinewave DC-Coupled, 0.8 V_{pk-pk} min
- 10kΩ // 10pF

Supply Voltage

- 3V±10%

Supply Current

- 2mA @ 20MHz typical

Frequency Stability

- ±0.5ppm

Supply Voltage Variation

- ±0.2ppm

Load Variation

- ±0.2ppm (10kΩ // 10pF)

After Reflow

- ±1.0ppm

Ageing

- ±1ppm typ in 1st year @ 25°C

Operating Temperature Range

- –40 to 85°C

Storage Temperature Range

- –55 to 125°C

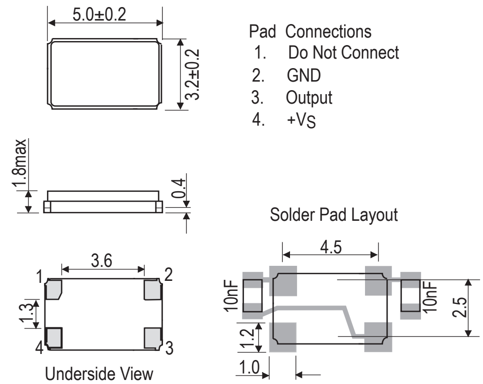
Environmental

- Shock: IEC 60068-2-27, Test Ea: 980m/s^2 acceleration for 6ms, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6, Test Fc, Procedure B4: 10Hz-60Hz 1.5mm displacement, 60-2000Hz at 98.1m/s^2, 30mins in 3 mutually perpendicular planes at 1 oct/min
- Solderability: MIL-STD-202, Method 208, Category 3

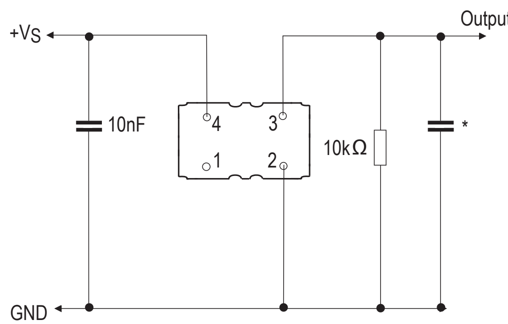
Manufacturing Information

- Soldering: Suitable for Convection Reflow soldering. Peak temperature 260°C for 10sec max
- Washing: Able to withstand aqueous washing

Outline (mm)



Test Circuit



*10k Ω // 10pF (Clipped Sinewave), inclusive of probe and jig capacitance.

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

- 26.0MHz CFPT-127
  Clipped Sine ±0.5ppm –40 to 85C 3V

TCXOs

NOTES

TCXOs

CFPT-141 SMD TCVCXO

ISSUE 8; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated voltage controlled crystal oscillator (TCVCXO) providing a high degree of frequency stability over a wide temperature range in a hermeticaly sealed ceramic package and is particularly suited to applications where space is at a premium

Standard Frequencies

- 12.8, 13, 19.2, 20, 26MHz

Output Compatibility & Load

- Clipped Sine, $0.8V_{pk\text{-}pk}$ min
- 10kΩ // 10pF ±10%

Frequency Tolerance

- ±0.5ppm max

Frequency Stability

- See table

Supply Voltage Variation

- ±0.2ppm (5% change)

Load Variation

- ±0.2ppm max (10% change)

Ageing

- ±1ppm typical in 1st year @ 25°C

Voltage Control

- 1.5V±1.0V applied to pad 1

Frequency Adjustment

- ±3ppm min to ±7ppm max (positive sense)

Input Impedance

- 1.0MΩ min

Phase Noise (typical @ 13MHz)

- –80dBc/Hz @ 10Hz
- –105dBc/Hz @ 100Hz
- –130dBc/Hz @ 1kHz
- –140dBc/Hz @ 10kHz

Storage Temperature Range

- –55 to 125°C

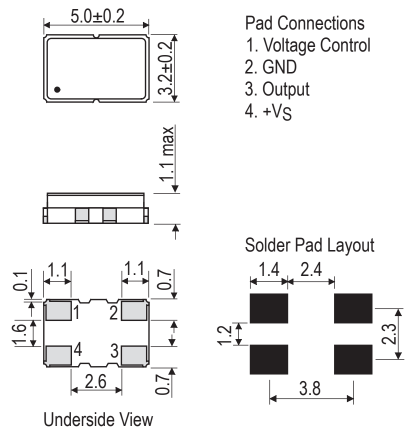
Environmental

- Shock: MIL-STD-883D, Method 2002.3, Test Condition B: 1500G, 0.5ms, 1/2 sine wave, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: MIL-STD-883D, Method 2005.2, Test Condition B: 20G (20Hz-2000Hz), 1.5mm amplitude, in 3 mutually perpendicular planes, 4hrs in each plane

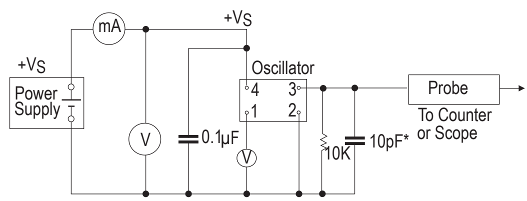
Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Outline (mm)



Test Circuit



* Inclusive of jigging and equipment capacitance

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

- 13.0MHz CFPT-141
  Clipped Sine ±2.5ppm -30 to 85C 3V

Electrical Specification - maximum limiting values

Frequency Range	Supply Voltage	Supply Current	Frequency Adjustment	Output Waveform	Output	Model Number
10.0 to 30.0MHz	3.0V±0.15V	2mA	±3ppm min/±7ppm max.	Clipped Sine	0.8 $V_{pk\text{-}pk}$ min	CFPT-141
Note. Other frequencies / specification combinatios, please contact our sales offices						

Frequency Stabilities over Operating Temperature Range

Operating Temperature Ranges	Frequency Stabilities v Operating Temperature Range			
	±1.5ppm	±2.0ppm	±2.5ppm	±5ppm
0 to 50°C	✓	✓	✓	✓
–10 to 60°C	✓	✓	✓	✓
–20 to 70°C	–	✓	✓	✓
–30 to 85°C	–	–	Standard*	✓
–40 to 85°C	–	–	✓	✓
* Note: ±2.5ppm over -30 to 85°C is the standard frequency stability vs operating temperature range				

CFPT-5301, -5302 LEADED TCXOs

ISSUE 6; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Ultra high stabilitie 14-pin DIL hermetically sealed TCXO with wide operating temperature range. Manufactured for us by Rakon, its wide frequency range and operating temperature range, coupled with high stability and linear frequency pulling make it the ideal reference oscilator. Its ability to function down to supply voltage of 2.4V and low power consumption makes it suitable for a wide range of applications

Standard Frequency

- 3.2, 4.096, 5, 6.4, 8.192, 9.6, 10, 12.8, 13, 14.4, 14.85, 16.384, 16.8, 19.2, 19.44, 19.8, 20, 32.768, 38.88, 40MHz (other frequencies in the range 1.25MHz to 40MHz may be available, please contact our sales offices)

Output Compatibility & Load (standard)

- HCMOS 15pF max

Output Compatibility & Load (options)

- ACMOS 50pF max
- Sinewave >1.0V_{pk-pk}, 10kΩ // 10pF load
- Clipped Sinewave >0.8V_{pk-pk}, 10kΩ // 10pF load

Sinewave and Clipped Sinewave signals are superimposed on a DC offset, to remove this offset insert an external coupling capacitor in series with the output

Supply Voltages

- 3.3V or 5.0V

Non-standard supply voltages in the range 2.4V to 6.0V are available on request, please contact our sales offices

Supply Current

- HCMOS
  1+Frequency(MHz)*Supply(V)*{Load(pF)+15}*10^{-3}mA
  e.g. 20MHz, 5V, 15pF ≈ 4mA
- Sinewave: <8mA
- Clipped Sinewave
  1+Frequency(MHz)*1.2*{Load(pF)+30}*10^{-3}mA

Frequency Stability

- Temperature: see table
- Supply Voltage Variation ±10% < ±0.2ppm*
- Load co-efficient 15pF ±5pF < ±0.2ppm*
  *Dependent on frequency and output type

Frequency Adjustment Option A (standard):

- Control Voltage 1.5V±1.0V, applied to pin 1
- >±5ppm*, frequency <20MHz
- >±7ppm, frequency >20MHz
- Linearity <3% (Positive)
- Input resistance >100kΩ
- Modulation Bandwidth>2kHz

Frequency Adjustment Option B:

- >±5ppm* (>±7ppm if frequency >20MHz) by means of an external 100kΩ potentiometer connected as a variable resistor from pin 1 to GND

Frequency Adjustment Option C:

- No frequency adjustment, initial calibration @25°C <±1.0ppm

*Higher adjustment range up to ±50ppm and non-standard control voltage ranges are available on request. This may not be compatible with all stability options. Please contact our sales offices

Ageing

- ±1ppm maximum in 1st year, frequency <20MHz
- ±3ppm maximum for 10 years, frequency <20MHz
- ±2ppm maximum in 1st year, frequency ≥20MHz
- ±5ppm maximum for 10 years, frequency ≥20MHz

Storage Temperature Range

- –55 to 95°C

Environmental

- Bump: IEC 60068-2-29, Test Eb: 4000 ±10 bumps at 390m/s^2 in each of 3 mutually perpendicular planes
- Shock: IEC 60068-2-27, Test Ea: 980m/s^2 acceleration for 6ms, 3 shocks in each of 3 mutually perpendicular planes
- Solderability: IEC 60068-2-20, Test T, Method 1 (solder bath): Temperature 235°C
- Vibration: IEC 60068-2-6, Test Fc, Procedure B4: 10Hz-60Hz 1.5mm displacement, 60-2000Hz at 98.1m/s^2, 30mins in 3 mutually perpendicular planes at 1 oct/min
- Damp Heat (steady state): IEC 60068-2-3, Test Ca: Duration 56 days
- Robustness of Termination: IEC 60068-2-21, Test Ua (tensile): Force 1kg
- Sealing: IEC 60068-2-17, Test Qc (gross) and Test Qk (fine)
- Immersion in Solvents: IEC 60068-2-45, Test Xa

Packaging

- Loose in bulk pack, 10pcs per pack

Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Adjustment Option
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

- 10.0MHz CFPT-5301 A
  HCMOS ±1.5ppm –30 to 75C 3.3V

Phase Noise (typical figures)

Frequency	Frequency offset from carrier: 10Hz	Frequency offset from carrier: 100Hz	Frequency offset from carrier: 1kHz	Frequency offset from carrier: 10kHz	Frequency offset from carrier: 100kHz
10.0MHz	–95dBc/Hz	–120dBc/Hz	–135dBc/Hz	–140dBc/Hz	–145dBc/Hz
20.0MHz	–85dBc/Hz	–110dBc/Hz	–125dBc/Hz	–135dBc/Hz	–140dBc/Hz
40.0MHz	–75dBc/Hz	–100dBc/Hz	–120dBc/Hz	–130dBc/Hz	–135dBc/Hz

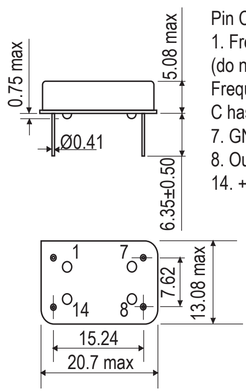
Electrical Specification - maximum limiting values

Frequency Range	Supply Voltage	Output	Output Levels	Rise Time (t_r)	Fall Time (t_f)	Duty Cycle	Model Number
1.255 to 40.0MHz	3.3V±10%	HCMOS	V_{OH} ≥90% V_S V_{OL} ≤10% V_S	8ns	8ns	45/55%	CFPT-5301
	5.0V±10%			7ns	7ns		CFPT-5302

Frequency Stabilities over Operating Temperature Range

Operating Temperature Ranges	Frequency Stabilities v Operating Temperature Range				
	±0.3ppm	±0.5ppm	±0.8ppm	±1.0ppm	±1.5ppm
0 to 70°C	✓*	✓	✓	✓	✓
–20 to 70°C	✓*	✓	✓	✓	✓
–30 to 75°C	–	✓*	✓	✓	✓
–40 to 85°C	–	✓*	✓	✓	✓
–55 to 95°C	–	–	–	✓*	✓*
Note: *Stability/Temperature combinations may not be available for all frequencies, please contact our sales offices					

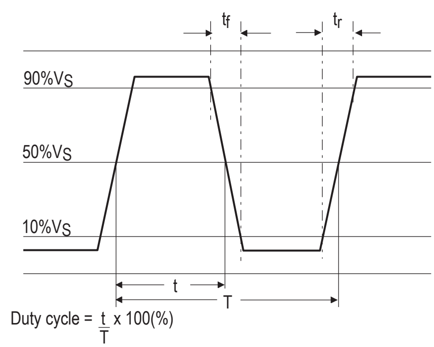
Outline (mm)



Underside View

Pin Connections
1. Frequency Adjust (do not connect if Frequency Adjust option C has been selected)
7. GND
8. Output
14. +V_S

Output Waveform



TCXOs

CFPT-9001, -9003, -9005, -9006, -9007, 9008 SMD TCXO/TCVCXOs

ISSUE 13; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Sub 1ppm performance TCXO manufactured for us by Rakon utilising their Pluto™ ASIC technology, a single chip oscillator and analogue compensation circuit operating over an extended temperature range. Its ability to function down to a supply voltage of 2.4V and low power consumption make it particularly suitable for mobile applications

Standard Frequencies

- 3.2, 5, 6.4, 8.192, 9.6, 12.688375, 10, 12.8, 13, 14.4, 14.85, 16.384, 16.367, 16.8, 19.2, 19.44, 19.8, 20, 24.5535, 32.768, 38.88, 40MHz

Output Compatibility & Load

- HCMOS 15pF
- ACMOS 15pF max
  (available on request, contact sales offices)
- Sinewave 10kΩ // 10pF, AC-coupled
- Clipped sinewave 10kΩ // 10pF, AC-coupled

Supply Voltage

- Standard 3.3V, 5.0V (see table)
- Supply voltages in the range 2.4 to 6.0V available to order, please contact our sales offices

Supply Current

- HCMOS
  1+Frequency(MHz)*Supply(V)*{Load(pF)+15}*10^{-3} mA
  e.g. 20MHz, 5V, 15pF ≈ 4mA
- Sinewave <8mA
- Clipped Sinewave
  1+Frequency(MHz)*1.2*{Load(pF)+30}*10^{-3}mA

Frequency Stability

- Temperature: see table
- Typical Supply Voltage Variation ±10% < ±0.2ppm*
- Typical Load Coefficient 15pF ±5pF < ±0.2ppm*
  *Dependent on frequency and output type

Tri-State Operation

- Logic '1' (>60%V_S) to pad 8 enables output
- Logic '0' (<20%V_S) to pad 8 disables output
  When at logic '0', the output stage is disabled for all output options, but the oscillator and compensation circuit are still active (current consumption <1mA)

Reference Voltage, Vref

- Optional reference voltage output on pad 1, suitable for potentiometer supply or DAC reference.
  1. No output (standard option)
  2. 2.2V, for Min. V_S>2.4V
  3. 2.7V, for Min. V_S>3.0V
  4. 4.2V, for Min. V_S>4.5V
  Maximum load current (mA) = Vref/10

For manual frequency adjustment connect an external 50kΩ potentiometer between pad 1 (Reference Voltage) and pad 4 (GND) with wiper connected to pad 10 (Voltage Control). Please specify reference voltage as part of the ordering code

Frequency Adjustment

- Three options with external Voltage Control applied to pad 10:
  A. Ageing adjustment:
  >±5ppm, frequency <20MHz
  >±7ppm, frequency >20MHz
  B. No frequency adjustment initial calibration @ 25°C < ±1.0ppm
  C. High Pulling ±10ppm to ±50ppm can be available depending on frequency and stability options. Please consult our sales office.
- Linearity: <1%
- Slope: Positive
- Input resistance: >100kΩ
- Modulation bandwidth: >2kHz
- Standard voltage control ranges:
  Without reference voltage - V_S=5.0V 2.5V±1V
  Without reference voltage - V_S=3.3V 1.65V±1V
  With reference voltage - Vc=0V to Vref

Ageing

- ±1ppm maximum in 1st year, frequency <20MHz
- ±3ppm maximum for 10 years (including the first year), frequency <20MHz
- ±2ppm maximum in 1st year, frequency ≥20MHz
- ±5ppm maximum for 10 years (includng the first year), frequency ≥20MHz

After Reflow

- ±1ppm max

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: IEC 60068-2-27, Test Ea: 1500G acceleration for 6ms, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6, Test Fc, procedure B4: 10Hz-60Hz, 1.5mm displacemnt, 60-2000Hz at 98.1m/s^2, 30mins in 3 mutually perpendicular planes at 1 octave.min
- Solderabiltiy: MIL-STD-202, Method 208, Category 3

Packaging

- Loose in bulk pack, 10pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

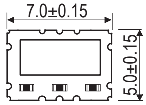
Ordering Information (*minimum required)

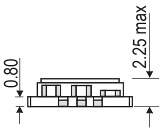
- Frequency*
- Model*
- Reference Voltage + Frequency Adjustment Options*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

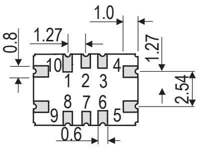
- 10.0MHz CFPT-9001-1A
  HCMOS ±1.0ppm -20 to 70C 5.0V

Outline (mm)



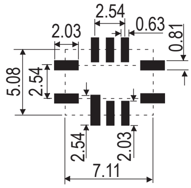


Pad Connections
1.V ref
2.N/C
3.Do not connect
4.GND
5.Output
6.N/C
7.N/C
8.Tri-state Control *
9. $+V_S$
10.Do not connect
* Leave unconnected if not required

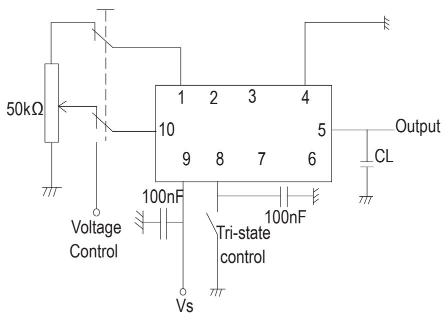


Underside View

Solder Pad Layout



Test Circuit



Phase Noise (typical figures)

Frequency	Frequency offset from carrier: 10Hz	Frequency offset from carrier: 100Hz	Frequency offset from carrier: 1kHz	Frequency offset from carrier: 10kHz	Frequency offset from carrier: 100kHz
13.0MHz	–95dBc/Hz	–120dBc/Hz	–135dBc/Hz	–140dBc/Hz	–145dBc/Hz

Electrical Specification - limiting values

Frequency Range	Supply Voltage	Output Voltage	Output Levels	Rise Time (t_r)	Fall Time (t_f)	Duty Cycle	Model Number
1.25 to 40.0MHz	3.3V±10%	HCMOS 15pF	V_{OH} > 90% V_S V_{OL} < 10% V_S	8ns	8ns	45/55%	CFPT-9006
1.25 to 40.0MHz	5.0V±10%	HCMOS 15pF	V_{OH} > 90% V_S V_{OL} < 10% V_S	7ns	7ns	45/55%	CFPT-9001
10.0 to 40.0MHz	3.3V±10%	Sine 10kΩ//10pF	< 20MHz > 1 V_{pk-pk} > 20MHz > 0.5V_{pk-pk}	–		–	CFPT-9007
10.0 to 40.0MHz	5.0V±10%	Sine 10kΩ//10pF	< 20MHz > 1 V_{pk-pk} > 20MHz > 0.5V_{pk-pk}	–		–	CFPT-9003
10.0 to 40.0MHz	3.3V±10%	Clipped Sinewave 10kΩ//10pF	V_{pk-pk} > 0.8V	–		–	CFPT-9008
10.0 to 40.0MHz	5.0V±10%	Clipped Sinewave 10kΩ//10pF	V_{pk-pk} > 0.8V	–		–	CFPT-9005

Frequency Stabilities over Operating Temperature Range

Operating Temperature Ranges	Frequency Stabilities v Operating Temperature Range					
	±0.3ppm	±0.5ppm	±1.0ppm	±1.5ppm	±2.0ppm	±2.5ppm
0 to 50°C	✓	✓	✓	✓	✓	✓
0 to 70°C	✓*	✓	✓	✓	✓	✓
–20 to 70°C	✓*	✓	✓	✓	✓	✓
–30 to 75°C	✓*	✓*	✓	✓	✓	✓
–40 to 85°C	✓*	✓*	✓	✓	✓	✓

* Stability/Temperature Range combinations may not be available for all frequencies, please contact our sales offices

NOTES

TCXOs

CFPT-9301, -9302 SMD TCVCXOs

ISSUE 7; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated voltage controlled crystal oscillators for medium to high volume applications where small size and high performance are prerequisites. Manufactured for us by Rakon utilising their Pluto™ ASIC technology and capable of sub 0.3ppm performance over an extended temperature range. Its ability to function down to a supply voltage of 2.4V and low power consumption makes it particularly suitable for mobile applications

Standard Frequencies

- 10 (HCMOS only), 12.688375, 12.8, 13, 14.4, 16, 16.367, 16.384, 16.8, 19.2, 19.44, 20, 24, 24.5535, 26, 32.768, 33.6, 36, 38.88, 40MHz

Frequency Range

- 1.5 to 52MHz

Output Compatibility & Load (standard)

- HCMOS 15pF max
- Clipped sinewave 10kΩ // 10pF, DC-coupled

Supply Voltage

- Standard 3.0V, 3.3V (see table)
- Supply voltages in the range 2.4 to 6.0V available to order, please contact our sales offices

Supply Current (typically)

- HCMOS
  1+Frequency(MHz)*Supply(V)*{Load(pF)+15}*10^{-3}mA
  e.g. 20MHz, 3.3V, 15pF ≈ 3mA
- Clipped Sinewave
  1+Frequency(MHz)*1.2*{Load(pF)+30}*10^{-3} mA
  e.g. 20MHz, 10pF ≈ 2mA

Frequency Stability

- Temperature: see table
- Supply Voltage Variation, ±5%

  HCMOS, <20MHz ±0.1ppm typ

  HCMOS, 20-<35MHz ±0.3ppm typ

  HCMOS, 35-52MHz ±0.5ppm typ

  Clipped Sinewave ±0.05ppm typ

- Load Coefficient

  15pF ±5pF (HCMOS)

  <20MHz ±0.2ppm typ

  20-<35MHz ±0.3ppm typ

  35-52MHz ±0.5ppm typ

  10kΩ // 10pF ± 10% ±0.05ppm typ

Ageing

- ±1ppm maximum in 1st year, frequency ≤20MHz
- ±3ppm maximum for 10 years (including the first year), frequency ≤20MHz
- ±2ppm maximum in 1st year, frequency >20MHz
- ±5ppm maximum for 10 years (includng the first year), frequency >20MHz

Frequency Adjustment - option A (standard)

Ageing adjustment by means of external Control Voltage applied to pad 1

- Range (frequency ≤ 20MHz) ≥ ±5ppm
- Range (frequency > 20MHz) ≥ ±7ppm
- Linearity ≤2%
- Slope Positive
- Input resistance ≥100kΩ
- Modulation bandwidth ≥2kHz
- Standard control voltage range 1.5V±1V

Frequency Adjustment - option B

No frequency adjustment

- Initial calibration ≤ ±1.0ppm

Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: IEC 60068-2-27, Test Ea: 1500G acceleration for 0.5ms, 3 shocks in each of 3 mutually perpendicular planes
- IEC 60068-2-6 test Fc. 10-60Hz 1.5mm displacement, 60-2000Hz at 20G, 4 hours in each of three mutually perpendicular axes at 1 oct/min

Non Standard Requirements

- Non standard requirements may be available upon request, please contact our sales offices

Packaging

- Loose in bulk pack, 10pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Frequency Adjustment Option*
- Output
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage

Example

- 20.0MHz CFPT-9301 A
HCMOS ±1.0ppm –20 to 70C 3.3V

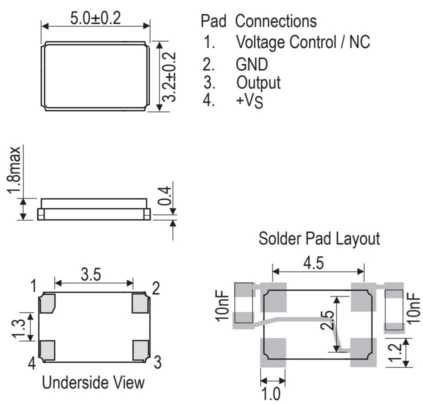
Electrical Specification - maximum limiting values

Frequency Range	Supply Voltage	Output Waveform	Output Levels	Rise Time (t_r)	Fall Time(t_f)	Duty Cycle	Model Number
1.5 to 52.0MHz	3.3V±10%*	HCMOS 15pF	$V_{OH} \geq 90\% V_S$ $V_{OL} \leq 10\% V_S$	8ns	8ns	45/55%	CFPT-9301
12.0 to 52.0MHz	3.0V±10%*	Clipped Sine 10kΩ//10pF	$V_{pk\text{-}pk} \geq 0.8V$	–	–	–	CFPT-9302
*Parts will operate correctly with ±10% supply voltage variation but supply coefficient is measured with ±5% variation							

Frequency Stabilities over Operating Temperature Range

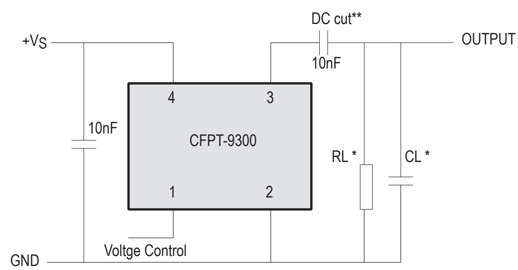
Operating Temperature Ranges	Frequency Stabilities v Operating Temperature Range				
	±0.2ppm	±0.3ppm	±0.5ppm	±1.0ppm	±2.0ppm
–20 to 70°C	✓**	✓**	✓	✓	✓
–40 to 85°C	–	✓**	✓**	✓	✓
**Stability/Temperature Range combinations may not be available for all frequencies, please contact our sales offices					

Outline (mm)



Low profile option: 1.4mm max height

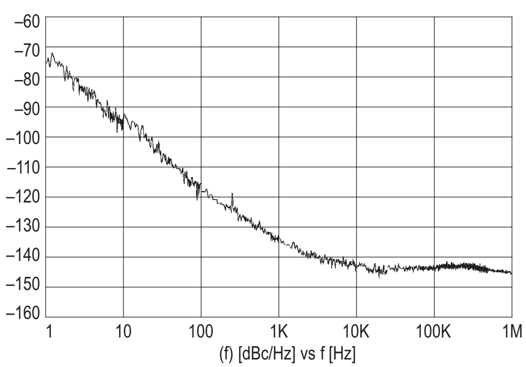
Test Circuit



* Load 15pF (HCMOS) or 10kΩ // 10pF (clipped sinewave), inclusive of probe and jig capacitance

** DC cut capacitor required for AC coupled clipped sinewave

Typical Phase Noise at 14.4MHz



E2747 SMD TCXO STRATUM 3

ISSUE 7; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Semtech approved TCXO for Stratum 3 applications, manufactured for us by Rakon utilising their Pluto™ ASIC technology

Nominal Frequency, Fo

- 12.8MHz

Output Compatibility & Load

- HCMOS
- 15pF max
- V_{OL}: ≤10% V_S
- V_{OH}: ≥90% V_S
- Duty Cycle @ 50%: 45% to 55%
- Rise Time, 10% to 90%: ≤9ns
- Fall Time, 90% to 10%: ≤9ns

Supply Voltage

- 3.3V±5%

Input Current

- ≤4mA

Holdover Stability [±(Fmax-Fmin)/2Fo]

- Temperature, –20 to 70°C: <±0.28ppm
- Temperature, –20 to 70°C, inclusive of Supply Voltage, 3.3V ±5% and Ageing, 24 hours: <±0.32ppm

Free-Run Accuracy, incl.

- Calibration @25°C, Temperature –20 to 70°C, Supply Voltage 3.3V ±5%, Load 15pF ±5%, Reflow Soldering and Ageing 20 years: <±4.6ppm ref. to Fo

Phase Noise (max)

- –90dBc/Hz @ 10Hz
- –115dBc/Hz @ 100Hz
- –127dBc/Hz @ 1kHz
- –137dBc/Hz @ 10kHz
- –143dBc/Hz @ 100kHz

Tri-State Operation

- Logic ‘1’ (> 60%V_S) to pad 8 enables output
- Logic ‘0’ (< 20%V_S) to pad 8 disables output
- When at logic ‘0’ the output stage is disabled for all output options, but the oscillator and compensation circuit are still active (Current consumption <1mA)

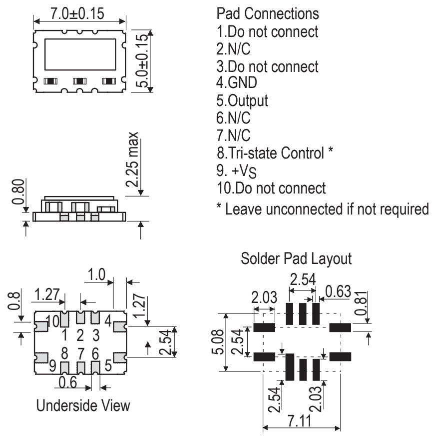
Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: IEC 60068-2-27, Test Ea: 980m/s^2 acceleration for 6ms, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6, Test Fc, Procedure B4: 10Hz-60Hz 1.5mm displacement, 60-2000Hz at 98.1m/s^2, 30mins in 3 mutually perpendicular planes at 1 oct/min
- Solderability: MIL-STD-202, Method 208, Category 3
- Resistance to Soldering Heat: 260°C/10sec exposure

Outline (mm)



Packaging

- Loose in bulk pack, 10pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*

Example

- 12.8MHz E2747LF

E2791 SMD TCXO GR-1244 & GR-253 STRATUM 3

ISSUE 7; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Zarlink approved TCXO for GR-1244 & GR-253 Stratum 3 applications, manufactured for us by Rakon utilising their Pluto™ ASIC technology

Nominal Frequency, Fo

- 20.0MHz

Output Compatibility & Load

- HCMOS
- 15pF max
- V_{OL}: ≤10%V_S
- V_{OH}: ≥90%V_S
- Duty Cycle @ 50%: 45/55%
- Rise Time, 10% to 90%: ≤9ns
- Fall Time, 90% to 10%: ≤9ns

Supply Voltage

- 3.3V ±5%

Input Current

- ≤6mA

Holdover Stability [±(Fmax-Fmin)/2Fo]

- Temperature, –20 to 70°C: <±0.28ppm
- Temperature, –20 to 70°C, inclusive of Supply Voltage, 3.3V ± 5% and Ageing, 24 hours: < ±0.32ppm

Free-Run Accuracy, incl,

- Calibration @25°C, Temperature –20 to 70°C, Supply Voltage 3.3V ±5%, Load 15pF ±5%, Reflow Soldering and Ageing 20 years: < ±4.6ppm ref. to Fo

Phase Noise (max)

- –85dBc/Hz @ 10Hz
- –110dBc/Hz @ 100Hz
- –125dBc/Hz @ 1kHz
- –135dBc/Hz @ 10kHz

Tri-State Operation

- Logic ‘1’ (>60%V_S) to pad 8 enables output
- Logic ‘0’ (<20%V_S) to pad 8 disables output
- When at logic ‘0’ the output stage is disabled for all output options, but the oscillator and compensation circuit are still active (Current consumption < 1mA)

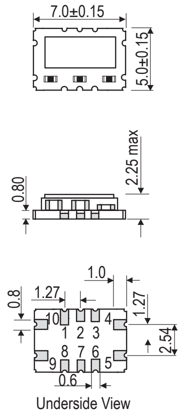
Storage Temperature Range

- –55 to 125°C

Environmental

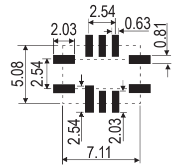
- Shock: IEC 60068-2-27, Test Ea: 980m/s^2 acceleration for 6ms, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6, Test Fc, Procedure B4: 10Hz-60Hz 1.5mm displacement, 60-2000Hz at 98.1m/s^2, 30mins in 3 mutually perpendicular planes at 1 oct/min
- Solderability: MIL-STD-202, Method 208, Category 3

Outline (mm)



Pad Connections
1.Do not connect
2.N/C
3.Do not connect
4.GND
5.Output
6.N/C
7.N/C
8.Tri-state Control *
9. +V_S
10.Do not connect
* Leave unconnected if not required

Solder Pad Layout



Packaging

- Loose in bulk pack, 10pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*

Example

- 20.0MHz E2791LF

E2799 SMD TCXO SONET

ISSUE 7; 1 NOVEMBER 2010

Description

- SEMTECH approved surface mount TCXO designed for use in SONET applications, manufactured for us by Rakon utilising their Pluto™ ASIC technology

Nominal Frequency, Fo

- 12.8MHz

Output Compatiblity & Load

- HCMOS
- Load: 15pF max
- V_{OL}: ≤10% V_S
- V_{OH}: ≤90% V_S
- Duty Cycle @ 50%: 45% to 55%
- Rise Time, 10% to 90%: ≤9ns
- Fall Time, 90% to 10%: ≤9ns

Supply Voltage

- 3.3V±5%

Input Current

- ≤4mA

Holdover Stability [±(Fmax-Fmin)/2Fo]

- Temperature, –40 to 85°C, inclusive of Supply Voltage, 3.3V ±5% and Ageing, 24 hours: ≤ ±4.6ppm

Free-Run Accuracy, incl.

- Calibration @25°C, Temperature –40 to 85°C, Supply Voltage 3.3V ±5% Load 15pF ±5%, Reflow Soldering and Ageing 20 years: ≤ ±20ppm ref. to Fo

Phase Noise (max)

- –90dBc/Hz @ 10Hz
- –115dBc/Hz @ 100Hz
- –127dBc/Hz @ 1kHz
- –137dBc/Hz @ 10kHz
- –143dBc/Hz @ 100kHz

Tri-state Operation

- Logic ‘1’ (>60%V_S) to pad 8 enables output
- Logic ‘0’ (<20%V_S) to pad 8 disables output
- When at logic ‘0’ the output stage is disabled for all output options, but the oscillator and compensation circuit are still active (Current consumption ≤1mA)

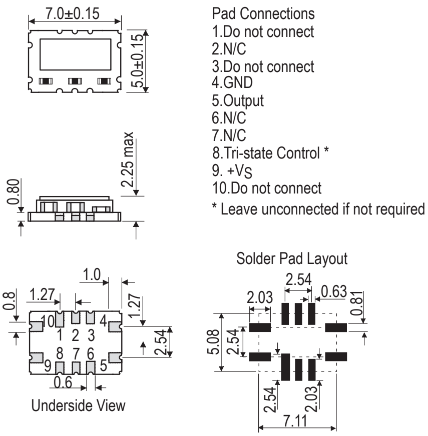
Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: IEC 60068-2-27, Test Ea: 980m/s^2 acceleration for 6ms, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6, Test Fc, Procedure B4: 10Hz-60Hz 1.5mm displacement, 60-2000Hz at 98.1m/s^2, 30mins in 3 mutually perpendicular planes at 1 oct/min
- Solderability: MIL-STD-202, Method 208, Category 3
- Resistance to Soldering Heat: 260°C/10sec exposure

Outline (mm)



Packaging

- Loose in bulk pack, 10pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*

Example

- 12.8MHz E2799LF

E3179 SMD TCXO GR-1244 & GR-253 STRATUM 3

ISSUE 5; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Zarlink approved TCXO for GR-1244 & GR-253 Stratum 3 applications, manufactured for us by Rakon utilising their Pluto™ ASIC technology

Nominal Frequency, Fo

- 20.0MHz

Output Compatiblity & Load

- HCMOS
- Load: 15pF max
- V_{OL}: <10% V_S
- V_{OH}: >90% V_S
- Duty Cycle @ 50%: 45% to 55%
- Rise Time, 10% to 90%: ≤9ns
- Fall Time, 90% to 10%: ≤9ns

Supply Voltage

- 3.3V±5%

Input Current

- ≤6mA

Holdover Stability [±(Fmax-Fmin) /2.Fo]

- Temperature, –5 to 80°C <±0.28ppm
- Temperature, –5 to 80°C, inclusive of Supply Voltage, 3.3V ±5% and Ageing, 24 hours: < ±0.32ppm

Free-Run Accuracy, incl,

- Calibration @25°C, Temperature –5 to 80°C, Supply Voltage 3.3V ±5%, Load 15pF ±5%, Reflow Soldering and Ageing 20 years: < ±4.6ppm ref. to Fo

Phase Noise (max)

- –85dBc/Hz @ 10Hz
- –110dBc/Hz @ 100Hz
- –125dBc/Hz @ 1kHz
- –135dBc/Hz @ 10kHz

Tri-State Operation

- Logic ‘1’ (>60%V_S) to pad 8 enables output
- Logic ‘0’ (<20%V_S) to pad 8 disables output
- When at logic ‘0’ the output stage is disabled for all output options, but the oscillator and compensation circuit are still active (Current consumption ≤1mA)

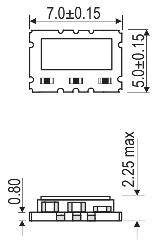
Storage Temperature Range

- –55 to 125°C

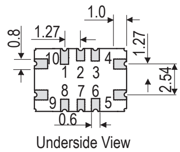
Environmental

- Shock: IEC 60068-2-27, Test Ea: 980m/s^2 acceleration for 6ms, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6, Test Fc, Procedure B4: 10Hz-60Hz 1.5mm displacement, 60-2000Hz at 98.1m/s^2, 30mins in 3 mutually perpendicular planes at 1 oct/min

-Outline (mm)

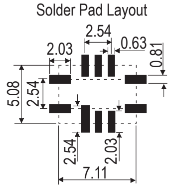


Pad Connections
1.Do not connect
2.N/C
3.Do not connect
4.GND
5.Output
6.N/C
7.N/C
8.Tri-state Control *
9. $+V_S$
10.Do not connect
* Leave unconnected if not required



Underside View

Solder Pad Layout



Manufacturing Information

- Soldering: Suitable for Convection Reflow soldering. Peak temperature 260°C, 60sec max above 220°C

Packaging

- Loose in bulk pack, 10pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*

Example

- 20.0MHz E3179LF

TCXOs

E3198 SMD TCXO STRATUM 3

ISSUE 5; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Semtech approved TCXO for Stratum 3 applications, manufactured for us by Rakon utilising their Pluto™ ASIC technology

Nominal Frequency, Fo

- 12.8MHz

Output Compatibility & Load

- HCMOS
- 15pF max
- V_{OL}: ≤10% V_S
- V_{OH}: ≥90% V_S
- Duty Cycle @ 50%: 45/55%
- Rise Time, 10% to 90%: ≤9ns
- Fall Time, 90% to 10%: ≤9ns

Supply Voltage

- 3.3V±5%

Input Current

- ≤4mA

Holdover Stability [±(Fmax-Fmin)/2Fo]

- Temperature, –40 to 85°C: ≤±0.28ppm
- Temperature, –40 to 85°C, inclusive of Supply Voltage, 3.3V ±5% and Ageing, 24 hours: ≤±0.32ppm

Free-Run Accuracy, incl.

- Calibration @25°C, Temperature –40 to 85°C, Supply Voltage 3.3V ±5% Load 15pF ±5%, Reflow Soldering and Ageing 20 years: ≤ ±4.6ppm ref. to Fo

Phase Noise (max)

- –90dBc/Hz @ 10Hz
- –115dBc/Hz @ 100Hz
- –127dBc/Hz @ 1kHz
- –137dBc/Hz @ 10kHz
- –143dBc/Hz @ 100kHz

Tri-state Operation

- Logic ‘1’ (≥60%V_S) to pad 8 enables output
- Logic ‘0’ (≤20%V_S) to pad 8 disables output
- When at logic ‘0’ the output stage is disabled for all output options, but the oscillator and compensation circuit are still active (Current consumption ≤1mA)

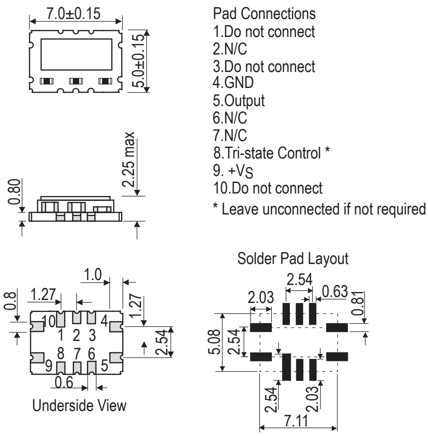
Storage Temperature Range

- –55 to 125°C

Environmental

- Shock: IEC 60068-2-27, Test Ea: 980m/s^2 acceleration for 6ms, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6, Test Fc, Procedure B4: 10Hz-60Hz 1.5mm displacement, 60-2000Hz at 98.1m/s^2, 30mins in 3 mutually perpendicular planes at 1 oct/min
- Solderability: MIL-STD-202, Method 208, Category 3
- Resistance to Soldering Heat: 260°C/10sec exposure

Outline (mm)



Packaging

- Loose in bulk pack, 10pcs per pack
- Tape and reel in accordance with EIA-481-D, 1Kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*

Example

- 12.8MHz E3198LF

E3199 SMD TCXO STRATUM 3

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Zarlink approved TCXO for GR-1244 & GR-253 Stratum 3 applications, manufactured for us by Rakon utilising their Pluto™ ASIC technology

Nominal Frequency, Fo

- 20.0MHz

Output Compatibility & Load

- HCMOS
- 15pF max
- V_{OL}: ≤10% V_S
- V_{OH}: ≥90% V_S
- Duty Cycle @ 50%: 45/55%
- Rise Time, 10% to 90%: ≤8ns
- Fall Time, 90% to 10%: ≤8ns

Supply Voltage

- 3.3V±5%

Input Current

- ≤6mA

Holdover Stability [±(Fmax-Fmin)/2Fo]

- Temperature, –40 to 85°C: ≤±0.28ppm
- Temperature, –40 to 85°C, inclusive of Supply Voltage, 3.3V ±5% and Ageing, 24 hours: ≤±0.32ppm

Free-Run Accuracy, incl.

- Calibration @25°C, Temperature –40 to 85°C, Supply Voltage 3.3V ±5% Load 15pF ±5%, Reflow Soldering and Ageing 20 years: ≤ ±4.6ppm ref. to Fo

Phase Noise (max)

- –85dBc/Hz @ 10Hz
- –110dBc/Hz @ 100Hz
- –125dBc/Hz @ 1kHz
- –130dBc/Hz @ 10kHz

Tri-state Operation

- Logic ‘1’ (≥60%V_S) to pad 8 enables output
- Logic ‘0’ (≤20%V_S) to pad 8 disables output
- When at logic ‘0’ the output stage is disabled for all output options, but the oscillator and compensation circuit are still active (Current consumption ≤1mA)

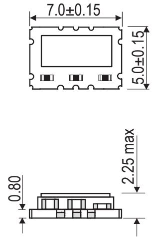
Storage Temperature Range

- –55 to 125°C

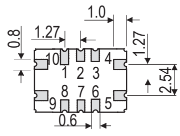
Environmental

- Shock: IEC 60068-2-27, Test Ea: 980m/s^2 acceleration for 6ms, 3 shocks in each of 3 mutually perpendicular planes
- Vibration: IEC 60068-2-6, Test Fc, Procedure B4: 10Hz-60Hz 1.5mm displacement, 60-2000Hz at 98.1m/s^2, 30mins in 3 mutually perpendicular planes at 1 oct/min
- Solderability: MIL-STD-202, Method 208, Category 3

Outline (mm)

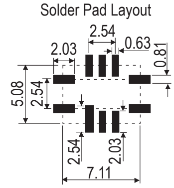


Pad Connections
1.Do not connect
2.N/C
3.Do not connect
4.GND
5.Output
6.N/C
7.N/C
8.Tri-state Control *
9. +V_S
10.Do not connect
* Leave unconnected if not required



Underside View

Solder Pad Layout



Manufacturing Information

- Soldering: Suitable for Convection Reflow soldering. Peak temperature 260°C, 60sec max above 220°C

Packaging

- Loose in bulk pack, 10pcs per pack
- Tape and reel in accordance with EIA-481-D, 1Kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*

Example

- 20.0MHz E3199LF

IQXT-30, -31, -32, -33 SMD TCXOs

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated crystal oscillator (TCXO) in a miniature ceramic package with a HCMOS output

Frequency Range

- 4 to 54MHz

Output Compatibility & Load

- HCMOS
- 15pF max

Supply Voltages

- 3.3V IQXT-30
- 2.8V IQXT-31
- 2.5V IQXT-32
- 1.8V IQXT-33

Frequency Tolerance

- ±0.5ppm

Frequency Stability

- ±2.5ppm

Supply Voltage Variation (±5%)

- ±0.2ppm max

Load Variation (±10%)

- ±0.2ppm max

Ageing

- ±1ppm max per year @ 25°C

Operating Temperature Range

- –30 to 75°C

Standby Operation

- Logic ‘1’ (≥70%Vs) to pad 1 enables oscillator output
- Logic ‘0’ (≤30%Vs) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max

Jitter (Period RMS 1σ)

- 3ps typ

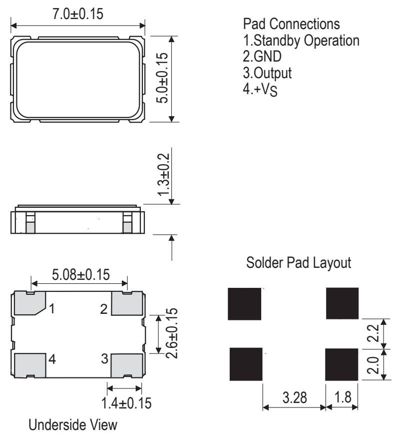
Phase Noise (typical)

- –145dBc/Hz typ @10kHz

Storage Temperature Range

- –40 to 125°C

Outline (mm)



Environmental

- Drop: 150cm drop (5 times) onto concrete
- Vibration: 1.5mm amplitude (10Hz-36Hz), 4G (36Hz-200Hz), sweep time 1 oct/min, in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Supply Voltage

Example

- 10.0MHz IQXT-30
  HCMOS ±2.5ppm –30 to 75C 3.3V

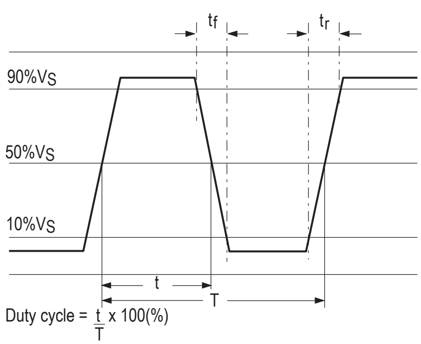
Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (ref*)	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
4.0 to 10.0MHz	±2.5ppm	1.8V±5%	3.1mA	5ns	5ns	45/55%	IQXT-33
		2.5V±5%					IQXT-32
		2.8V±5%	3.4mA				IQXT-31
		3.3V±5%	4.0mA				IQXT-30
>10.0 to 20.0MHz		1.8V±5%	3.7mA				IQXT-33
		2.5V±5%					IQXT-32
		2.8V±5%	4.1mA				IQXT-31
		3.3V±5%	4.8mA				IQXT-30
>20.0 to 30.0MHz		1.8V±5%	4.2mA				IQXT-33
		2.5V±5%					IQXT-32
		2.8V±5%	4.7mA				IQXT-31
		3.3V±5%	5.5mA				IQXT-30
>30.0 to 40.0MHz		1.8V±5%	4.6mA				IQXT-33
		2.5V±5%					IQXT-32
		2.8V±5%	5.2mA				IQXT-31
		3.3V±5%	6.0mA				IQXT-30
>40.0 to 54.0MHz		1.8V±5%	5.5mA				IQXT-33
		2.5V±5%					IQXT-32
		2.8V±5%	6.0mA				IQXT-31
		3.3V±5%	7.0mA				IQXT-30
* Note: Supply current may exceed the above specifications for some frequencies. Final specification shall be confirmed by samples products.							
Note: For other frequency/specification combinations, please contact our sales offices							

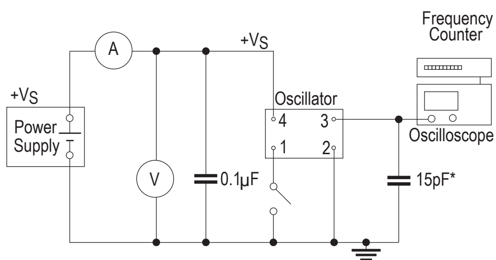
Frrequency Stability over Operating Temperature Range

Operating Temperature Range	Frequency Stability v Operating Temperature Range
	±2.5ppm
–30 to 75°C	✓
Other specifications may be available, please contact our sales offices	

Output Waveform



Test Circuit



* Inclusive of jigging and equipment capacitance

IQXT-40, -41, -42, -43 SMD TCXOs

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated crystal oscillator (TCXO) in a miniature ceramic package with a CMOS output

Frequency Range

- 4 to 54MHz

Output Compatibility & Load

- HCMOS
- 15pF max

Supply Voltages

- 3.3V IQXT-40
- 2.8V IQXT-41
- 2.5V IQXT-42
- 1.8V IQXT-43

Frequency Tolerance

- ±0.5ppm

Frequency Stability

- ±2.5ppm

Supply Voltage Variation (±5%)

- ±0.2ppm max

Load Variation (±10%)

- ±0.2ppm max

Ageing

- ±1ppm max per year @ 25°C

Operating Temperature Range

- –30 to 75°C

Standby Operation

- Logic ‘1’ (≥70%Vs) to pad 1 enables oscillator output
- Logic ‘0’ (≤30%Vs) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max

Jitter (Period RMS 1σ)

- 3ps typ

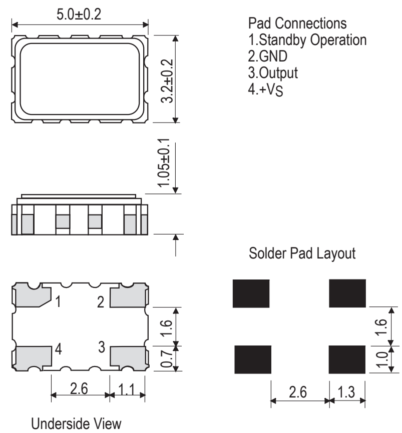
Phase Noise (typical @ 40MHz) IQXT-40

- –61dBc/Hz @ 10Hz
- –98dBc/Hz @ 100Hz
- –131dBc/Hz @ 1kHz
- –152dBc/Hz @ 10kHz
- –162dBc/Hz @ 100kHz

Storage Temperature Range

- –40 to 125°C

Outline (mm)



Environmental

- Drop: 150cm drop (5 times) onto concrete
- Vibration: 1.5mm amplitude (10Hz-36Hz), 4G (36Hz-200Hz), sweep time 1 oct/min, in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Supply Voltage

Example

- 10.0MHz IQXT-40
  HCMOS ±2.5ppm –30 to 75C 3.3V

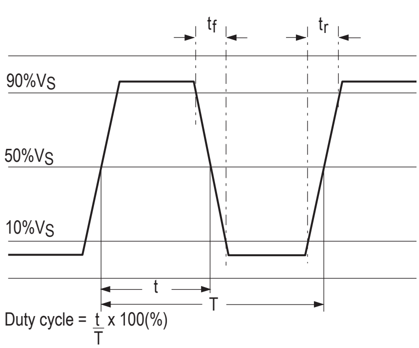
Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (ref*)	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
4.0 to 10.0MHz	±2.5ppm	1.8V±5%	3.1mA	5ns	5ns	45/55%	IQXT-43
		2.5V±5%					IQXT-42
		2.8V±5%	3.4mA				IQXT-41
		3.3V±5%	4.0mA				IQXT-40
>10.0 to 20.0MHz		1.8V±5%	3.7mA				IQXT-43
		2.5V±5%					IQXT-42
		2.8V±5%	4.1mA				IQXT-41
		3.3V±5%	4.8mA				IQXT-40
>20.0 to 30.0MHz		1.8V±5%	4.2mA				IQXT-43
		2.5V±5%					IQXT-42
		2.8V±5%	4.7mA				IQXT-41
		3.3V±5%	5.5mA				IQXT-40
>30.0 to 40.0MHz		1.8V±5%	4.6mA				IQXT-43
		2.5V±5%					IQXT-42
		2.8V±5%	5.2mA				IQXT-41
		3.3V±5%	6.0mA				IQXT-40
>40.0 to 54.0MHz		1.8V±5%	5.5mA				IQXT-43
		2.5V±5%					IQXT-42
		2.8V±5%	6.0mA				IQXT-41
		3.3V±5%	7.0mA				IQXT-40
* Note: Supply current may exceed the above specifications for some frequencies. Final specification shall be confirmed by samples products.							
Note: For other frequency/specification combinations, please contact our sales offices							

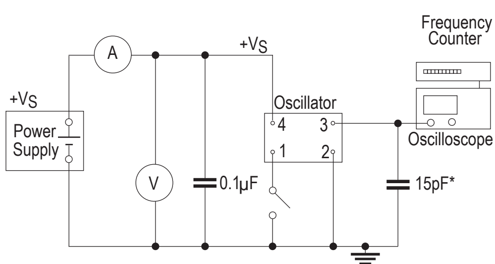
Frrequency Stability over Operating Temperature Range

Operating Temperature Range	Frequency Stability v Operating Temperature Range
	±2.5ppm
–30 to 75°C	✓
Other specifications may be available, please contact our sales offices	

Output Waveform



Test Circuit



* Inclusive of jigging and equipment capacitance

IQXT-50, -51, -52, -53 SMD TCXOs

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated voltage controlled crystal oscillators (TCVCXO) providing a high degree of frequency stability over a wide temperature range in a small package size

Frequency Range

- 8 to 45MHz

Output Compatibility & Load

- Clipped Sine 0.8V_{pk-pk} minimum (DC coupled)
- Output load: 10kΩ // 10pF ±10%

Supply Voltages

- 3.3V IQXT-50
- 3.0V IQXT-51
- 2.8V IQXT-52
- 2.5V IQXT-53

Frequency Tolerance

- ±0.5ppm

Frequency Stability

- ±2.5ppm

Supply Voltage Variation (±5%)

- ±0.2ppm max

Load Variation (±10%)

- ±0.2ppm max

Ageing

- ±1ppm max in 1st year @ 25°C

Frequency Adjustment

- Voltage control 1.5V±1.0V applied to pad 1
- Pulling ±8ppm min
- Linearity - positive

Phase Noise (typcial @ 16.367617MHz)

- –58dBc/Hz @ 1Hz
- –94dBc/Hz @ 10Hz
- –121dBc/Hz @ 100Hz
- –141dBc/Hz @ 1kHz
- –153dBc/Hz @ 10kHz
- –155dBc/Hz @ 100kHz

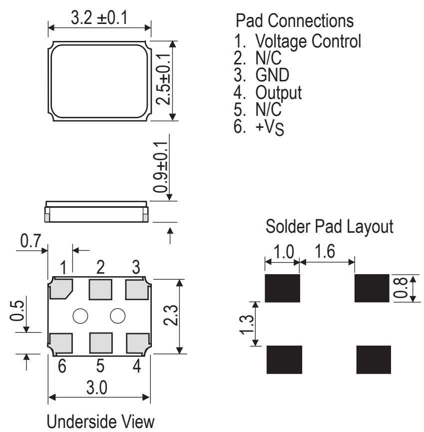
Storage Temperature Range

- –40 to 85°C

Environmental

- Drop: 150cm drop (5 times) onto concrete
- Vibration: 1.5mm amplitude (10Hz-36Hz), 4G (36Hz-200Hz), sweep time 1 oct/min, in 3 mutually perpendicular planes, duration 2hrs each plane

Outline (mm)



Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Supply Voltage

Example

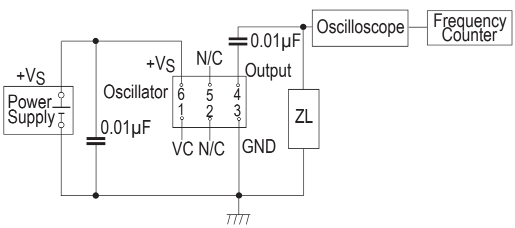
- 20.0MHz IQXT-50
  Clipped Sine ±2.5ppm –30 to 70C 3.3V

Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C	Frequency Stability	Supply Voltage	Supply Current	Voltage Control	Output Waveform	Output	Model Number
8.0 to <20.0MHz	±0.5ppm	±2.5ppm	3.3V±5%	1.5mA	±8.0ppm min / 1.5V ±1.0V	Clipped Sine	$0.8V_{pk-pk}$ min	IQXT-50
20.0 to <32.0MHz				2.0mA				
32.0 to 45.0MHz				2.5mA				
8.0 to <20.0MHz			3.0V ±5%	1.5mA				IQXT-51
20.0 to <32.0MHz				2.0mA				
32.0 to 45.0MHz				2.5mA				
8.0 to <20.0MHz			2.8V ±5%	1.5mA				IQXT-52
20.0 to <32.0MHz				2.0mA				
32.0 to 45.0MHz				2.5mA				
8.0 to <20.0MHz			2.5V ±5%	1.5mA				IQXT-53
20.0 to <32.0MHz				2.0mA				
32.0 to 45.0MHz				2.5mA				
Note: For other frequency/specification combinations, please contact our sales offices								

Operating Temperature Range	Frequency Stability v Operating Temperature Range
	±2.5ppm
–30 to 75°C	✓
Other specifications may be available, please contact our sales offices	

Test Circuit



TCXOs

IQXT-60, -61, -62, -63 SMD TCXOs

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated crystal oscillator (TCXO) in a miniature ceramic package with a HCMOS output

Frequency Range

- 4 to 54MHz

Output Compatibility & Load

- HCMOS
- 15pF max

Supply Voltages

- 3.3V IQXT-60
- 2.8V IQXT-61
- 2.5V IQXT-62
- 1.8V IQXT-63

Frequency Tolerance

- ±0.5ppm

Frequency Stability

- ±2.5ppm

Supply Voltage Variation (±5%)

- ±0.2ppm max

Load Variation (±10%)

- ±0.2ppm max

Ageing

- ±1ppm max per year @ 25°C

Operating Temperature Range

- –30 to 75°C

Standby Operation

- Logic '1' (≥70%V_S) to pad 1 enables oscillator output
- Logic '0' (≤30%V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max

Jitter (Period RMS 1σ)

- 3ps typ

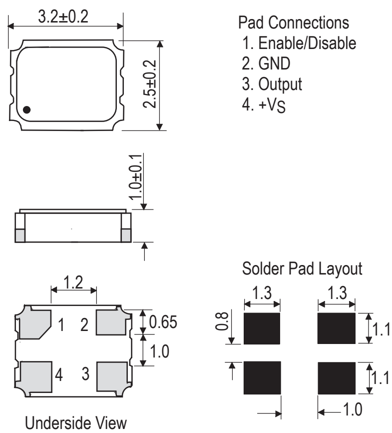
Phase Noise (typical)

- –63dBc/Hz @ 10Hz
- –99dBc/Hz @ 100Hz
- –133dBc/Hz @ 1kHz
- –155dBc/Hz @ 10kHz
- –161dBc/Hz @ 100kHz

Storage Temperature Range

- –40 to 125°C

Outline (mm)



Environmental

- Drop: 150cm drop (5 times) onto concrete
- Vibration: 1.5mm amplitude (10Hz-36Hz), 4G (36Hz-200Hz), sweep time 1 oct/min, in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Supply Voltage

Example

- 10.0MHz IQXT-60
  HCMOS ±2.5ppm –30 to 75C 3.3V

TCXOs

Electrical Specification - maximum limiting values

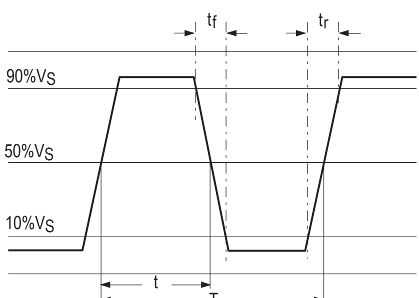
Frequency Range	Frequency Stability	Supply Voltage	Supply Current (ref*)	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
4 to <10.0MHz	±2.5ppm	1.8V±5%	3.1mA	5ns	5ns	45/55%	IQXT-63
		2.5V±5%					IQXT-62
		2.8V±5%	3.4mA				IQXT-61
		3.3V±5%	4.0mA				IQXT-60
10 to <20.0MHz		1.8V±5%	3.7mA				IQXT-63
		2.5V±5%					IQXT-62
		2.8V±5%	4.1mA				IQXT-61
		3.3V±5%	4.8mA				IQXT-60
20 to <30.0MHz		1.8V±5%	4.2mA				IQXT-63
		2.5V±5%					IQXT-62
		2.8V±5%	4.7mA				IQXT-61
		3.3V±5%	5.5mA				IQXT-60
30 to <40.0MHz		1.8V±5%	4.6mA				IQXT-63
		2.5V±5%					IQXT-62
		2.8V±5%	5.2mA				IQXT-61
		3.3V±5%	6.0mA				IQXT-60
40 to 54.0MHz		1.8V±5%	5.5mA				IQXT-63
		2.5V±5%					IQXT-62
		2.8V±5%	6.0mA				IQXT-61
		3.3V±5%	7.0mA				IQXT-60
* Note: supply current may exceed the above specifications for some frequencies. Final specification shall be confirmed by samples products.							
Note: For other frequency/specification combinations, please contact our sales offices							

Frequency Stability over Operating Temperature Range

Operating Temperature Range	Frequency Stability v Operating Temperature Range
	±2.5ppm
–30 to 75°C	✓
Other specifications may be available, please contact our sales offices	

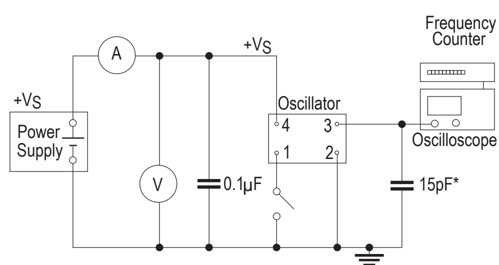
TCXOs

Output Waveform



Duty cycle = $\frac{t}{T}$ x 100(%)

Test Circuit



* Inclusive of jigging and equipment capacitance

IQXT-70, -71, -72, -73 SMD TCXOs

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated crystal oscillator (TCXO) in a miniature ceramic package with a HCMOS output

Frequency Range

- 4 to 54MHz

Output Compatibility & Load

- HCMOS
- 15pF max

Supply Voltages

- 3.3V IQXT-70
- 2.8V IQXT-71
- 2.5V IQXT-72
- 1.8V IQXT-73

Frequency Tolerance

- ±0.5ppm

Frequency Stability

- ±2.5ppm

Supply Voltage Variation (±5%)

- ±0.2ppm max

Load Variation (±10%)

- ±0.2ppm max

Ageing

- ±1ppm max per year @ 25°C

Operating Temperature Range

- –30 to 75°C

Standby Operation

- Logic ‘1’ (≥70%V_S) to pad 1 enables oscillator output
- Logic ‘0’ (≤30%V_S) to pad 1 disables oscillator output; when disabled the oscillator output goes to the high impedance state
- No connection to pad 1 enables oscillator output
- Standby Current: 10µA max

Jitter (Period RMS 1σ)

- 3ps typ

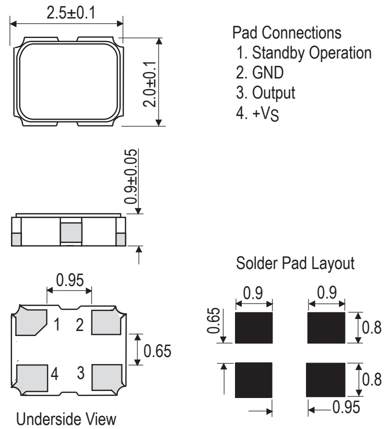
Phase Noise (typical @ 40MHz) IQXT-70

- –63dBc/Hz @ 10Hz
- –100dBc/Hz @ 100Hz
- –133dBc/Hz @ 1kHz
- –155dBc/Hz @ 10kHz
- –162dBc/Hz @ 100kHz

Storage Temperature Range

- –40 to 125°C

Outline (mm)



Environmental

- Drop: 150cm drop (5 times) onto concrete
- Vibration: 1.5mm amplitude (10Hz-36Hz), 4G (36Hz-200Hz), sweep time 1 oct/min, in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481-D, 1kpcs per reel (please see Application Notes)

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Supply Voltage

Example

- 20.0MHz IQXT-70
  HCMOS ±2.5ppm –30 to 75C 3.3V

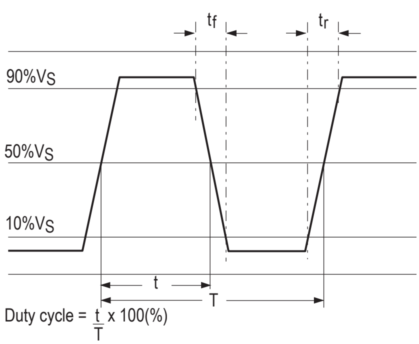
Electrical Specification - maximum limiting values

Frequency Range	Frequency Stability	Supply Voltage	Supply Current (ref*)	Rise Time (t_r) (10-90%)	Fall Time (t_f) (90-10%)	Duty Cycle	Model Number
4 to <10.0MHz	±2.5ppm	1.8V±5%	3.1mA	5ns	5ns	45/55%	IQXT-73
		2.5V±5%					IQXT-72
		2.8V±5%	3.4mA				IQXT-71
		3.3V±5%	4.0mA				IQXT-70
10 to <20.0MHz		1.8V±5%	3.7mA				IQXT-73
		2.5V±5%					IQXT-72
		2.8V±5%	4.1mA				IQXT-71
		3.3V±5%	4.8mA				IQXT-70
20 to <30.0MHz		1.8V±5%	4.2mA				IQXT-73
		2.5V±5%					IQXT-72
		2.8V±5%	4.7mA				IQXT-71
		3.3V±5%	5.5mA				IQXT-70
30 to <40.0MHz		1.8V±5%	4.6mA				IQXT-73
		2.5V±5%					IQXT-72
		2.8V±5%	5.2mA				IQXT-71
		3.3V±5%	6.0mA				IQXT-70
40 to 54.0MHz		1.8V±5%	5.5mA				IQXT-73
		2.5V±5%					IQXT-72
		2.8V±5%	6.0mA				IQXT-71
		3.3V±5%	7.0mA				IQXT-70
* Note: supply current may exceed the above specifications for some frequencies. Final specification shall be confirmed by samples products.							
Note: For other frequency/specification combinations, please contact our sales offices							

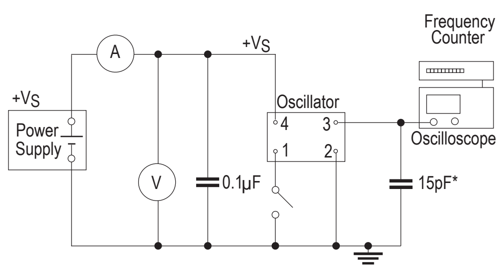
Frrequency Stability over Operating Temperature Range

Operating Temperature Range	Frequency Stability v Operating Temperature Range
	±2.5ppm
–30 to 75°C	✓
Other specifications may be available, please contact our sales offices	

Output Waveform



Test Circuit



* Inclusive of jigging and equipment capacitance

IQXT-80, -81, -82, -83 SMD TCXOs

ISSUE 1; 1 NOVEMBER 2010 - RoHS 2002/95/EC

Description

- Surface mount temperature compensated crystal oscillators (TCXO) providing a high degree of frequency stability over a wide temperature range in a small package size

Frequency Range

- 8 to 45MHz

Output Compatibility & Load

- Clipped Sine 0.8V $_{\text{pk-pk}}$ minimum (DC coupled)
- Output load: 10kΩ // 10pF ±10%

Supply Voltages

- 3.3V IQXT-80
- 3.0V IQXT-81
- 2.8V IQXT-82
- 2.5V IQXT-83

Frequency Tolerance

- ±0.5ppm

Frequency Stabilities

- ±2.5ppm

Supply Voltage Variation (±5%)

- ±0.2ppm max

Load Variation (±10%)

- ±0.2ppm max

Ageing

- ±1ppm max in 1st year @ 25°C

Phase Noise (typical)

- –135dBc/Hz @ 1kHz

Storage Temperature Range

- –40 to 85°C

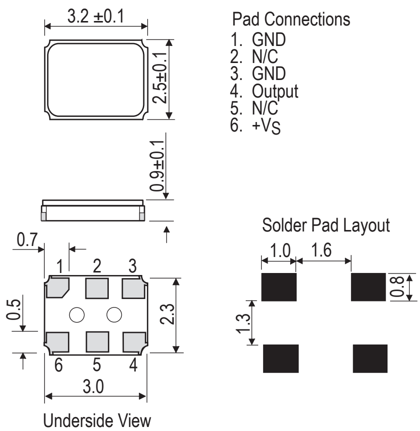
Environmental

- Drop: 150cm drop (5 times) onto concrete
- Vibration: 1.5mm amplitude (10Hz-36Hz), 4G (36Hz-200Hz), sweep time 1 oct/min, in 3 mutually perpendicular planes, duration 2hrs each plane

Packaging

- Loose in bulk pack, 100pcs per pack
- Tape and reel in accordance with EIA-481, 1kpcs per reel (please see Application Notes)

Outline (mm)



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Supply Voltage

Example

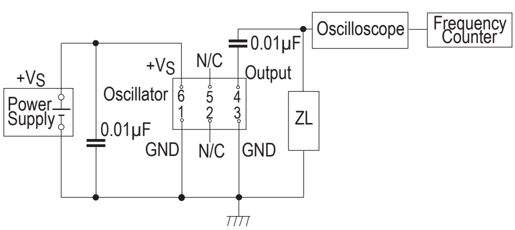
- 20.0MHz IQXT-80
  Clipped Sine ±2.5ppm –30 to 70C 3.3V

Electrical Specification - maximum limiting values

Frequency Range	Frequency Tolerance @25°C	Frequency Stability	Supply Voltage	Supply Current	Output Waveform	Output	Model Number
8.0 to <20.0MHz	±0.5ppm	±2.5ppm	3.3V±5%	1.5mA	Clipped Sine	0.8V_{pk-pk} min	IQXT-80
20.0 to <32.0MHz				2.0mA			
32.0 to 45.0MHz				2.5mA			
8.0 to <20.0MHz			3.0V±5%	1.5mA			IQXT-81
20.0 to <32.0MHz				2.0mA			
32.0 to 45.0MHz				2.5mA			
8.0 to <20.0MHz			2.8V 5%	1.5mA			IQXT-82
20.0 to <32.0MHz				2.0mA			
32.0 to 45.0MHz				2.5mA			
8.0 to <20.0MHz			2.5V ±5%	1.5mA			IQXT-83
20.0 to <32.0MHz				2.0mA			
30.0 to 45.0MHz				2.5mA			
Note: For other frequency/specification combinations, please contact our sales offices							

Operating Temperature Range	Frequency Stability v Operating Temperature Range
	±2.5ppm
–30 to 75°C	✓
Other specifications may be available, please contact our sales offices	

Test Circuit



IQXT-100 SMD TCXO

ISSUE 1; 23 FEBRUARY 2011 - RoHS 2002/95/EC

Description

- Please note: This document is intended to illustrate the general capability and versatility of IQD's design. For specific enquiries please contact one of IQD's sales offices where we can tailor a unique specification to meet your needs.
- Low phase noise optimised design
- High stability
- Low ageing
- Tuning range also available

Frequency Range

- 2 to 120MHz

Developed Frequencies

- 9.60, 10.0, 12.0, 16.3840, 18.0, 20.0, 26.50, 30.0, 32.7680, 41.250, 55.0, 61.440, 80.0, 100.0, 103.7030, 115.0MHz
- For other frequency/specification combinations, please contact our sales offices

Output Compatibility & Load

- HCMOS or Sinewave

Supply Voltages

- 3.3V or 5.0V

Frequency Stability Vs Operating Tamperature Ranges

- 0 to 70°C ±1ppm
- –40 to 85°C ±2ppm

Ageing (typical @ 100MHz)

- ±1ppm in the first year, ±5ppm after 15years

Frequency Adjustment Range

- ±5ppm to ±15ppm

Phase Noise (typical @ 80MHz)

- –100dBc/Hz @ 100Hz
- –125dBc/Hz @ 1kHz
- –140dBc/Hz @ 10kHz
- –145dBc/Hz @ 100kHz

Storage Temperature Range

- –55 to 105°C

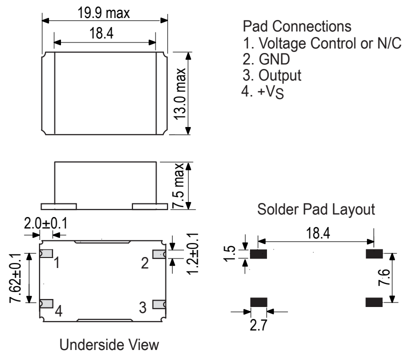
Environmental

- Enviromental testing taken from IEC 60068
- Please contact our sales offices for full details

Packaging

- Bulk pack supplied in tube, box or bag packaging
- Tape and reel in accordance with EIA-481, 250pcs per reel (please see Application Notes)

Outline (mm)



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage*
- Frequency Adjustment*

Example

- 20.0MHz IQXT-100
  HCMOS ±2ppm –40 to 85C 3.3V

TCXOs

IQXT-110 SMD TCXO

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Description

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- Low phase noise optimised design
- High stability
- Low ageing
- Tuning range also available

Frequency Range

- 2 to 80MHz

Developed Frequencies

- 12.80, 50.0MHz
- For other frequency/specification combinations, please contact our sales offices

Output Compatibility & Load

- HCMOS or Sinewave

Supply Voltages

- 3.3V or 5.0V

Frequency Stability Vs Operating Tamperature Ranges

- –10 to 85°C ±1ppm
- –40 to 85°C ±2ppm

Ageing (typical @ 50MHz)

- ±0.8ppm in the first year, ±3.5ppm after 15years

Frequency Adjustment Range

- ±5ppm to ±15ppm

Phase Noise (typical @ 50MHz)

- –105dBc/Hz @ 100Hz
- –130dBc/Hz @ 1kHz
- –145dBc/Hz @ 10kHz
- –150dBc/Hz @ 100kHz

Storage Temperature Range

- –55 to 105°C

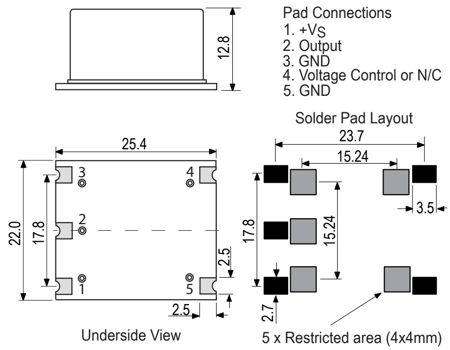
Environmental

- Environmental testing taken from IEC 60068
- Please contact our sales offices for full details

Packaging

- Bulk packed supplied in tube, box or bag packaging
- Tape and reel in accordance with EIA-481, 75pcs per reel (please see Application Notes)

Outline (mm)



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage*
- Frequency Adjustment*

Example

- 20.0MHz IQXT-110
  HCMOS ±2ppm –40 to 85C 3.3V

TCXOs

IQXT-120 TCXO

ISSUE 1; 23 FEBRUARY 2011 - RoHS 2002/95/EC

Description

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- Low phase noise optimised design
- High stability
- Low ageing
- Tuning range also available

Frequency Range

- 2 to 125MHz

Developed Frequencies

- 8.0, 10.0, 12.80, 16.3840, 19.440, 20.0, 34.3680, 40.0, 80.0, 100.0, 122.880MHz
- For other frequency/specification combinations, please contact our sales offices

Output Compatibility & Load

- HCMOS or Sinewave

Supply Voltages

- 3.3V or 5.0V

Frequency Stability Vs Operating Tamperature Ranges

- 0 to 70°C ±1ppm
- –40 to 85°C ±2ppm

Ageing (typical @ 100MHz)

- ±1ppm in the first year, ±5ppm after 15years

Frequency Adjustment Range

- ±5ppm to ±15ppm

Phase Noise (typical @ 100MHz)

- –100dBc/Hz @ 100Hz
- –120dBc/Hz @ 1kHz
- –140dBc/Hz @ 10kHz
- –145dBc/Hz @ 100kHz

Storage Temperature Range

- –55 to 105°C

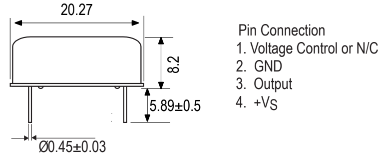
Environmental

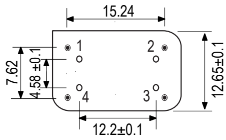
- Environmental testing taken from IEC 60068
- Please contact our sales offices for full details

Packaging

- Bulk packed supplied in tube or box packaging

Outline (mm)





Underside View

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage*
- Frequency Adjustment*

Example

- 20.0MHz IQXT-120
  HCMOS ±2ppm –40 to 85C 3.3V

IQXT-130 TCXO

ISSUE 1; 23 FEBRUARY 2011 - RoHS 2002/95/EC

Description

- Please note: This document is intended to illustrate the general capability and versatility of IQD's design. For specific enquiries please contact one of IQD's sales offices where we can tailor a unique specification to meet your needs.
- Low phase noise optimised design
- High stability
- Low ageing
- Tuning range also available

Frequency Range

- 2 to 105MHz

Developed Frequencies

- 2.0480, 8.0, 10.0, 12.80, 19.440, 20.0, 24.5760, 30.0, 38.880, 51.840, 97.280MHz
- For other frequency/specification combinations, please contact our sales offices

Output Compatibility & Load

- HCMOS or Sinewave

Supply Voltages

- 3.3V or 5.0V

Frequency Stability Vs Operating Tamperature Ranges

- 0 to 70°C ±1ppm
- –40 to 85°C ±2ppm

Ageing (typical @ 10MHz)

- ±0.8ppm in the first year, ±3.5ppm after 15years

Frequency Adjustment Range

- ±5ppm to ±15ppm

Phase Noise (typical @ 30MHz)

- –110dBc/Hz @ 100Hz
- –130dBc/Hz @ 1kHz
- –145dBc/Hz @ 10kHz
- –150dBc/Hz @ 100kHz

Storage Temperature Range

- –55 to 105°C

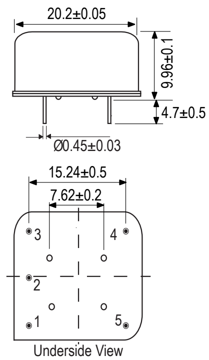
Environmental

- Environmental testing taken from IEC 60068
- Please contact our sales offices for full details

Packaging

- Bulk packed supplied in tube or box packaging

Outline (mm)



Pin Connections
1. $+V_S$
2. Output
3. GND
4. Voltage Control or N/C
5. GND

Ordering Information (*minimum required)

- Frequency*
- Model*
- Output*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage*
- Frequency Adjustment*

Example

- 20.0MHz IQXT-130
  HCMOS ±2ppm –40 to 85C 3.3V

TCXOs

IQXT-140 TCXO

ISSUE 1; 23 FEBRUARY 2011 - RoHS 2002/95/EC

Description

- Please note: This document is intended to illustrate the general capability and versatility of IQD's design. For specific enquiries please contact one of IQD's sales offices where we can tailor a unique specification to meet your needs.
- Low phase noise optimised design
- High stability
- Low ageing
- Tuning range also available

Frequency Range

- 2 to 150MHz

Developed Frequencies

- 6.40, 8.1920, 10.0, 12.80, 16.3840, 19.440, 24.0, 26.0, 27.0, 28.0, 32.7680, 56.0, 80.0, 100.0, 143.0MHz
- For other frequency/specification combinations, please contact our sales offices

Output Compatibility & Load

- HCMOS up to 120MHz or Sinewave up to 150MHz

Supply Voltages

- 3.3V, 5.0V or 12.0V

Frequency Stability Vs Operating Tamperature Ranges

- 0 to 70°C ±1ppm
- –40 to 85°C ±2ppm

Ageing (typical @ 143MHz)

- ±1ppm in the first year, ±5ppm after 15years

Frequency Adjustment Range

- ±5ppm to ±15ppm

Phase Noise (typical @ 10MHz)

- –115dBc/Hz @ 100Hz
- –135dBc/Hz @ 1kHz
- –140dBc/Hz @ 10kHz
- –145dBc/Hz @ 100kHz

Storage Temperature Range

- –55 to 105°C

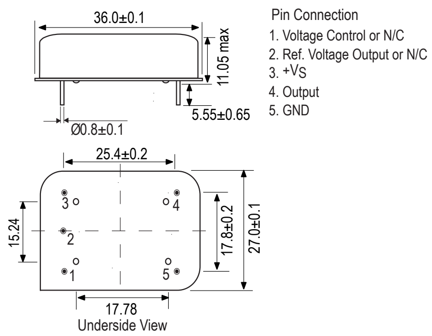
Environmental

- Environmental testing taken from IEC 60068
- Please contact our sales offices for full details

Packaging

- Bulk packed supplied in tube or box packaging

Outline (mm)



Ordering Information (*minimum required)

- Frequency*
- Model*
- Output*
- Frequency Stability (over operating temperature range)*
- Operating Temperature Range*
- Supply Voltage*
- Frequency Adjustment*

Example

- 20.0MHz IQXT-140
  HCMOS ±2ppm –40 to 85C 3.3V

TCXOs

NOTES

TCXOs

NOTES

TCXOs

OCXOs - SELECTION TABLE

Model Number	Supply Voltage	Output Compatibility	Package (mm)	Frequency Range	Frequency Stability (Tightest)	Operating Temperature Range (Widest)	Applications	Approvals	Page
Specifying OCXOs									350
OCXO Enquiry Form									351
SMD Packages									
IQOV-80	3.3V	HCMOS, Sinewave	25.4 x 22	10 to 40MHz	±10ppb	–40 to 75°C			359
IQOV-80	5.0V	HCMOS, Sinewave	25.4 x 22	10 to 40MHz	±10ppb	–40 to 75°C			359
IQOV-80	12.0V	HCMOS, Sinewave	25.4 x 22	10 to 40MHz	±10ppb	–40 to 75°C			359
Leaded Packages									
IQOV-13	3.3V	Sine	14-pin DIL	10 to 100MHz	±100ppb	–40 to 85°C			352
IQOV-11	3.3V	ACMOS	14-pin DIL	10 to 100MHz	±100ppb	–40 to 85°C			352
IQOV-50	3.3V	HCMOS	20.20sq	4 to 80MHz	±50ppb	0 to 60°C			356
IQOV-60	3.3V	HCMOS, Sinewave	25.6sq	4 to 20MHz	±5ppb	0 to 70°C			357
IQOV-70	3.3V	HCMOS, Sinewave	36 x 27	4 to 80MHz	±10ppb	–20 to 70°C			358
IQOV-10	5.0V	ACMOS	14-pin DIL	10 to 100MHz	±100ppb	–40 to 85°C			352
IQOV-22	5.0V	CMOS	26.162sq x 13.46	10 to 100MHz	±5ppb	–40 to 85°C			354
IQOV-50	5.0V	HCMOS	20.20sq	4 to 80MHz	±50ppb	0 to 60°C			356
IQOV-60	5.0V	HCMOS, Sinewave	25.6sq	4 to 20MHz	±5ppb	0 to 70°C			357
IQOV-70	5.0V	HCMOS, Sinewave	36 x 27	4 to 80MHz	±10ppb	–20 to 70°C			358
IQOV-12	5.0V	Sine	14-pin DIL	10 to 100MHz	±100ppb	–40 to 85°C			352
IQOV-26	5.0V	Sine	26.162sq x 13.46	10 to 100MHz	±5ppb	–40 to 85°C			354
IQOV-21	12.0V	CMOS	26.162sq x 13.46	10 to 100MHz	±5ppb	–40 to 85°C			354
IQOV-70	12.0V	HCMOS, Sinewave	36 x 27	4 to 80MHz	±10ppb	–20 to 70°C			358
IQOV-25	12.0V	Sine	26.162sq x 13.46	10 to 100MHz	±5ppb	–40 to 85°C			354
IQOV-20	15.0V	CMOS	26.162sq x 13.46	10 to 100MHz	±5ppb	–40 to 85°C			354
IQOV-24	15.0V	Sine	26.162sq x 13.46	10 to 100MHz	±5ppb	–40 to 85°C			354

SPECIFYING OCXOS

Oven Controlled Crystal Oscillators offer frequency stabilities even tighter than those offered by a TCXO. The frequency drift of the quartz crystal due to temperature shift is reduced by heating the crystal in an oven and so holding the temperature of the quartz at a fixed point. Traditionally this technology meant physically large devices with heavy power consumptions, however technology is constantly developing and IQD are proud to offer some of the smallest OCXOs in the world. IQD uses the code OCXO to denote our oven controlled quartz crystal oscillator part numbers.

The electrical parameters are given on the specification to facilitate the correct circuit design. Further guidance can be found in the Application Notes chapter of this book. Our Application Support team can also provide assistance if required; please contact one of our sales offices for this support.

The limits given in the following specifications are indicative of the standard OCXO oscillator design, in the event that a specification is needed which is outside the standard OCXO oscillator designs offered please contact our Sales team.

The following notes define each element of an OCXO specification.

Frequency

Frequency is normally specified in kilohertz (kHz) up to 999.999kHz and in megahertz (MHz) from 1.0MHz. All our computer-generated transaction documents follow this standard convention automatically.

The OCXO frequency should be described to seven significant figures. If seven significant figures are not used, we assume that any figure that might follow those given may be taken as zero. Thus a frequency given as 16.6MHz will be taken as 16.60, not 16.66667.

Input Supply Voltage

Various DC input supply options are available to suit a wide range of applications, eg: +5V, +9V, +12V, +15V, +24V. Miniaturized generation OCXOs also include the input supply option of +3.3V.

Output Compatibility

Various output options are available, e.g. Sinewave, HCMOS, TTL and LVCMOS (3.3V supply).

Long Term Stability (Ageing)

Defined as long term stability in OCXOs, the initial ageing is monitored by the manufacturer at final test until the 'ageing' rate achieves the agreed rate of change. Ageing rate will normally be specified per day, per month or per year. Very stable OCXOs can have an annual frequency change of a few parts per billion (parts in 10^{-9}). More typical products will achieve annual drift of a few parts in 10^{-8}.

Operating Temperature Stability

In the past, only AT-cut crystals were employed in ovened oscillators and were selected such that their upper turnover temperature, where their temperature coefficient is zero, was at or close to the nominal oven temperature.

However for very high stability, so-called 'doubly-rotated' crystal cuts are now used. The SC (stress-compensated) cut in particular is used because it is much less sensitive to mounting stress and thermal gradients than an AT-cut crystal. This type of crystal has a family of static f-t curves like the AT, except shifted upwards in temperature by about 70°C. The optimum oven temperature is therefore normally at the crystal's lower turnover where the slope of its characteristic is low over a relatively wide range. For the most stable OCXOs the crystal is operated on an overtone mode of oscillation to achieve the highest Q factor and stability.

Despite the temperature control applied to the crystal there will still be some variation in frequency with ambient temperature change, usually over one year this is outweighed by the ageing. Typical operating temperature ranges are between –20 to 60°C and –20 to 75°C with resulting variations in frequency in the range of 10^{-11} up to 10^{-8}. Because crystals age more rapidly at high temperatures, it is desirable that the oven temperature be as low as possible. It must however, be a few degrees higher than the maximum ambient temperature or temperature control would become impossible. Take care therefore not to specify too high an operating temperature for the unit unless it is really needed.

Phase Noise

Phase noise is expressed in units of dBc/Hz at a specified offset from the carrier or centre frequency. Other things being equal, the dominating factor which governs the phase noise characteristic of an oscillator is the Q of the crystal and this is one of the reasons why operation on a high overtone is often chosen in preference to the fundamental mode. A very high performance oscillator may exhibit a phase noise in one sideband of –160dBc/Hz at 1kHz offset from its carrier with –150dBc/Hz being a typical performance.

Package Size

There are several standard package size options available for OCXO products and normally one of those should be selected. A fully customised device can be designed if essential but please remember that utilising existing packages will reduce lead time and cost. Even so, if an application requires a non-standard package, we will discuss and advise the most efficient approach.

Warm Up Time

An OCXO will typically take 10 to 15 minutes to warm up and stabilise from the initial power up. During warm up there will be a significant frequency change of several parts per million followed by a very small drift over an hour or so. Consideration should be given to decide whether warm up time is a critical factor to the application. Faster warm up time involves more power consumption but fast warm up products can be provided to meet special needs.

Warm Up Power

At first switch on, the oven will take maximum current and therefore consume the most power as the oven commences to warm up. Again this initial surge of power can be critical in some applications and must be taken into consideration. Once the oven has achieved temperature, the current consumption will dramatically reduce e.g. from 6W to less than half that amount.

Note: The external ambient temperature determines the amount of power the oven takes. The colder the outer ambient temperature the higher the current consumption will be to maintain the constant internal temperature.

Package Mounting

There are various methods available for mounting the device. Large devices have mounting screws for security/reliability in addition to connection pins. With lighter and smaller devices PCB, pins are sufficient.

Frequency Adjust

Some means of frequency adjustment is provided to enable re-calibration of frequency after ageing has occurred. If an external control voltage is used to adjust the frequency care should be taken that it is sufficiently stable for the performance required from the oscillator.

OCXO ENQUIRY FORM

Please download from the IQD website, complete the form and email it to us at: info@iqdfrequencyproducts.com

X = Minimum Specification Information Required for OCXO pricing					
Frequency			X		MHz
Output Waveform			X		
Output Level/Load			X		
Rise/Fall Time (Square Wave)					ns
Duty Cycle (Square Wave)					%
Supply Voltage			X		Vdc
Supply Power	During warm-up				watts
	Stabilized at 25°C				watts
Warm-Up @ 25°C to within ≤±1x10^{-7}					minutes
Operating Temperature Range					°C
Harmonics/Sub-Harmonics					dBc
Phase Noise	10Hz				dBc/Hz
	100Hz				dBc/Hz
	1kHz				dBc/Hz
	10kHz				dBc/Hz
Short Term Stability					
Frequency	vs. Input Voltage Change				ppm
Stability	vs. Load Change				ppm
	vs. Operating Temperature		X		ppm
Ageing	After 7 days power on		X		per day
	After 30 days power on		X		per month
	After 30 days on power on		X		per year
Frequency Adjust	Electrical	Range	X		
		Linearity			%
		Slope	X		Positive/Negative
	Control Voltage Range		X		Vdc
Package Size			X		
Mounting Style			X		
Connections					
Marking					
Additional Notes					
Name					
Job Title					
Company Name					
Address					
Postcode/Zipcode					
Telephone				E-mail:	
Fax				www.	

IQOV-10, -11, -12, 13 OCXOS

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Description

- A series of precision Oven Controlled Crystal Oscillators (OCXOs) which are suitable for Stratum 3 applications

Package Outline

- 14 pin DIL

Frequency Range

- 10 to 100.0MHz

Output Compatibility & Load

- ACMOS (IQOV-10, -11)
- Sine, 0dBm min into 50Ω (IQOV-12, -13)

Supply Voltages

- 5.0V (IQOV-10, -12)
- 3.3V (IQOV-11, -13)

Frequency Stabilities

- ±100ppb, ±200ppb, ±300ppb

Operating Temperature Ranges

- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 85°C

Power Consumption

- Warm up: ≤3W for 5 minutes
- Idle @ 25°C: ≤1W (calm air)

Warm Up Time @25°C (typical)

- Within normal parameters after 10 minutes

Frequency Stability Vs Supply Voltage Change (5%)

- ±3ppb max

Phase Noise @ 10MHz (typical)

- –95dBc/Hz @ 10Hz
- –125dBc/Hz @ 100Hz
- –140dBc/Hz @ 1kHz
- –150dBc/Hz @ 10kHz
- –155dBc/Hz @ 100kHz

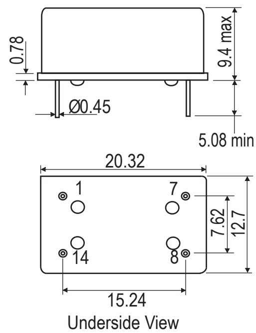
Harmonics

- –20dBc (IQOV-12, -13)

Ageing

- ±2ppb max per day after 30 days (10MHz typical) @ 25°C
-

Outline (mm)



Pin Connections
1. Voltage Control
7. GND
8. Output
14. $+V_S$

Environmental

- Shock: MIL-STD-202, Method 213, Test Condition C
- Vibration: MIL-STD-202, Method 204, Test Condition A

Packaging

- Bulk

Ordering Information (*minimum required)

- Frequency*
- Model Number*
- Output*
- Supply Voltage

Example

- 10.0MHz IQOV-10
  ACMOS 5.0V

OCXOs

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stabilites	Operating Temperature Range	Supply Voltage	Frequency Adjustment from 0V to +Vs	Duty Cycle	Model Number
10.0 to 100.0MHz	±100ppb	–10 to 60°C	5.0V ±5%	±5000ppb typical (positive slope)	40/60%	IQOV-10
			3.3V ±5%			IQOV-11
	±200ppb	–20 to 70°C	5.0V ±5%			IQOV-10
			3.3V ±5%			IQOV-11
	±300ppb	–40 to 85°C	5.0V ±5%			IQOV-10
			3.3V ±5%			IQOV-11
	±100ppb	–10 to 60°C	5.0V ±5%		n/a	IQOV-12
			3.3V ±5%			IQOV-13
	±200ppb	–20 to 70°C	5.0V ±5%			IQOV-12
			3.3V ±5%			IQOV-13
	±300ppb	–40 to 85°C	5.0V ±5%			IQOV-12
			3.3V ±5%			IQOV-13

IQOV-20, -21, -22, -24, -25, -26 OCXOS

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Description

- A series of precision Oven Controlled Crystal Oscilaltors (OCXOs) which are suitable for Stratum 3E applications

Frequency Range

- 10 to 100.0MHz

Output Compatibility & Load

- CMOS, 15pF (IQOV-20, -21, -22)
- Sine, +7dBm ±2dBm min into 50Ω (IQOV-24, -25, -26)

Supply Voltages

- 15.0V (IQOV-20, -24)
- 12.0V (IQOV-21, -25)
- 5.0V (IQOV-22, -26)

Frequency Stabilities

- ±5ppb, ±8ppb, ±10ppb, ±20ppb

Operating Temperature Ranges

- 0 to 50°C
- –10 to 60°C
- –20 to 70°C
- –40 to 85°C

Storage Temperature Range

- –55 to 85°C

Power Consumption

- Warm up: ≤5W for 5 minutes
- Idle @ 25°C : ≤2W (calm air)

Warm Up Time @ 25°C (typical)

- Within normal parameters after 10 minutes

Frequency Stability vs Supply Voltage Change (±5%)

- ±1ppb max

Phase Noise @ 10MHz (typical)

- -125dBc/Hz @ 10Hz
- -145dBc/Hz @ 100Hz
- -155dBc/Hz @ 1kHz
- -160dBc/Hz @ 10kHz
- -160dBc/Hz @ 100kHz

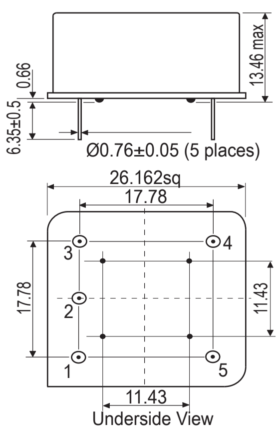
Harmonics

- –20dBc (IQOV-24, -25, -26)

Ageing

- ±0.5ppb max per day after 30 days (10MHz typical) @ 25°C

Outline (mm)



Pin Connection
1. EFC
2. N/C
3. +V_S
4. Output
5. GND & Case

Environmental

- Shock: MIL-STD-202, Method 213, Test Condition C
- Vibration: MIL-STD-202, Method 204, Test Condition A

Packaging

- Bulk

Ordering Information (*minimum required)

- Frequency*
- Model Number*
- Output
- Frequency Stability*
- Operating temperature Range*
- Supply Voltage

Example

- 10.0MHz IQOV-22
  CMOS ±10ppb –20 to 70°C 5.0V

Electrical Specifications - maximum limiting values

Frequency Range	Frequency Stabilites	Operating Temperature Range	Supply Voltage	Frequency Adjustment from 0V to +Vs	Duty Cycle	Model Number
10.0 to 100.0MHz	±5ppb	0 to 50°C	5.0V ±5%	±2000ppb typical (positive slope)	40/60%	IQOV-22
	±8ppb	–10 to 60°C				
	±10ppb	–20 to 70°C				
	±20ppb	–40 to 85°C				
	±5ppb	0 to 50°C	12.0V ±5%			IQOV-21
	±8ppb	–10 to 60°C				
	±10ppb	–20 to 70°C				
	±20ppb	–40 to 85°C				
	±5ppb	0 to 50°C	15.0V ±5%			IQOV-20
	±8ppb	–10 to 60°C				
	±10ppb	–20 to 70°C				
	±20ppb	–40 to 85°C				
	±5ppb	0 to 50°C	5.0V ±5%		n/a	IQOV-26
	±8ppb	–10 to 60°C				
	±10ppb	–20 to 70°C				
	±20ppb	–40 to 85°C				
	±5ppb	0 to 50°C	12.0V ±5%			IQOV-25
	±8ppb	–10 to 60°C				
	±10ppb	–20 to 70°C				
	±20ppb	–40 to 85°C				
	±5ppb	0 to 50°C	15.0V ±5%			IQOV-24
	±8ppb	–10 to 60°C				
	±10ppb	–20 to 70°C				
	±20ppb	–40 to 85°C				

IQOV-50 OCXO

ISSUE 1; 10 FEBRUARY 2011 - RoHS 2002/95/EC

Description

- Please note: This document is intended to illustrate the general capability and versatility of IQD's design. For specific enquiries please contact one of IQD's sales offices where we can tailor a unique specification to meet your needs.
- Hermetically sealed oven controlled crystal oscillator (OCXO)
- Reference voltage available
- Low phase noise and low jitter optimised design

Frequency Range

- 4.0 to 80.0MHz

Developed Frequencies

- 10.0, 12.0, 12.2880, 16.3840, 19.20, 20.0, 32.7680, 38.40 38.880MHz
- For other frequency/specification combinations, please contact our sales offices

Output Compatibility & Load

- HCMOS, 15pF

Supply Voltage

- 3.3V & 5.0V

Frequency Stability verses Operating Temperature Ranges

- 0 to 60°C ±50ppb
- –30 to 75°C ±100ppb

Current Consumption:

- 3.3V @25°C steady state, 300mA max
- 3.3V Warm up, 800mA max
- 5.0V @25°C steady state, 200mA max
- 5.0V Warm up, 500mA max

Storage Temperature

- –55 to 105°C

Frequency Tuning Range

- ±5000ppb to ±15000ppb

Phase Noise @ 10.0MHz

- –80dBc/Hz @ 1Hz
- –110dBc/Hz @ 10Hz
- –130dBc/Hz @ 100Hz
- –135dBc/Hz @ 1kHz
- –148dBc/Hz @ 10kHz

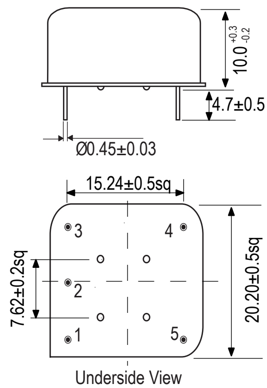
Ageing (typ @ 10.0MHz after 30days continuous operation)

- After first year, ±500ppb
- After 10 years, ±2000ppb

Environmental

- Testing taken from IEC 60068
- Please contact our sales offices for full details

Outline (mm)



Pin Connection
1. $+V_S$
2. Output
3. GND
4. Voltage Control or NC
5. Ref. Voltage Output or NC

Packaging

- Bulk

Ordering Information (*minimum required)

- Frequency*
- Model Number*
- Output
- Frequency Stability*
- Operating Temperature Range*
- Supply Voltage*
- Frequency Adjustement*

Example

- 10.0MHz IQOV-50
  HCMOS ±10ppb -30+75°C 5.0V

OCXOs

IQOV-60 OCXO

ISSUE 1; 10 MARCH 2011 - RoHS 2002/95/EC

Description

- Please note: This document is intended to illustrate the general capability and versatility of IQD's design. For specific enquiries please contact one of IQD's sales offices where we can tailor a unique specification to meet your needs.
- Hermetically sealed oven controlled crystal oscillator
- Optional reference voltage
- Low phase noise and low jitter optimised design
- SC-Cut crystal design

Frequency Range

- 4.0 to 20.0MHz

Developed Frequencies

- 10, 13, 16.384MHz
- For other frequency/specification combinations, please contact our sales offices

Output Compatibility Options

- HCMOS or Sinewave

Supply Voltage Options

- 3.3V or 5.0V

Frequency Stability Vs Operating Temperature Ranges

- 0 to 70°C ±5ppb
- –40 to 70°C ±10ppb

Storage Temperature

- –55 to 105°C

Current Consumption

- 5.0V @25°C steady state, 200mA max
- 5.0V Warm up, 500mA max
- 3.3V @25°C steady state, 300mA max
- 3.3V Warm up, 800mA max

Phase Noise (typical @ 10MHz)

- –90dBc/Hz @ 1Hz
- –120dBc/Hz @ 10Hz
- –140dBc/Hz @ 100Hz
- –145dBc/Hz @ 1kHz
- –150dBc/Hz @ 10kHz
- –150dBc/Hz @ 100kHz

Ageing (typ @ 10MHz after 30 days continuous operation)

- ±50ppb in the 1st year, ±300ppb after 10 years

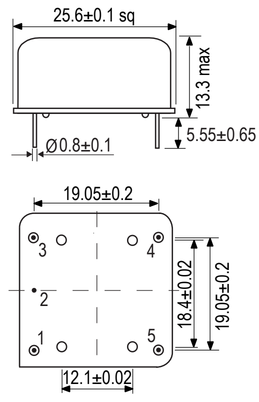
Frequency Adjustment Range Options

- ±500ppb to ±1500ppb

Ref. Voltage Output

- Customer specified value

Outline (mm)



Underside View

Pin Connection
1. Output
2. GND
3. Voltage Control
4. Ref. Voltage Output or N/C
5. $+V_S$

Environmental

- Testing taken from IEC 60068
- Please contact our sales offices for full details

Packaging

- Bulk

Minimum Enquiry Information

- Frequency
- Model
- Supply Voltage
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Frequency Adjustment
- Ref. Voltage Output

IQOV-70 OCXO

ISSUE 1; 10 MARCH 2011 - RoHS 2002/95/EC

Description

- Please note: This document is intended to illustrate the general capability and versatility of IQD's design. For specific enquiries please contact one of IQD's sales offices where we can tailor a unique specification to meet your needs.
- Hermetically sealed oven controlled crystal oscillator
- Optional reference voltage
- Low phase noise and low jitter optimised design
- SC-CUT crystal design
- Optional oven alarm

Frequency Range

- 4.0 to 80.0MHz

Developed Frequencies

- 10, 12.8, 13, 16.384, 20, 32.768, 38.4, 38.88MHz
- For other frequency/specification combinations, please contact our sales offices

Output Compatibility Options

- HCMOS or Sinewave

Supply Voltage Options

- 3.3V, 5.0V or 12.0V

Frequency Stability Vs Operating Temperature Ranges

- –20 to 70°C ±10ppb
- –40 to 75°C ±20ppb

Storage Temperature

- –55 to 105°C

Current Consumption

- 12.0V @ 25°C steady state, 200mA max
- 12.0V Warm up, 400mA max
- 5.0V @ 25°C steady state, 300mA max
- 5.0V Warm up, 600mA max
- 3.3V @ 25°C steady state, 400mA max
- 3.3V Warm up, 800mA max

Phase Noise (typical @ 10MHz)

- –95dBc/Hz @ 1Hz
- –120dBc/Hz @ 10Hz
- –140dBc/Hz @ 100Hz
- –145dBc/Hz @ 1kHz
- –150dBc/Hz @ 10kHz
- –150dBc/Hz @ 100kHz

Frequency Adjustment Range Options

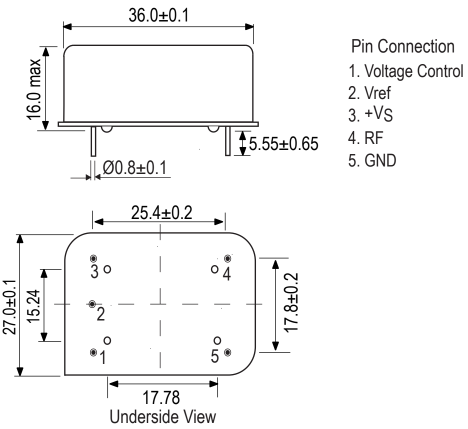
- ±1000ppb to ±2000ppb

Oven Alarm (optional)

- Shows if device is in warm-up or heated mode

  eg. Logic '0' = warm-up, Logic '1' = heated and ready

Outline (mm)



Ref. Voltage Output

- Customer specified value

Environmental

- Testing taken from IEC 60068
- Please contact our sales offices for full details

Packaging

- Bulk

Minimum Enquiry Information

- Frequency
- Model
- Supply Voltage
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Frequency Adjustment
- Oven Alarm
- Ref. Voltage Output

IQOV-80 OCXO

ISSUE 1; 10 MARCH 2011 - RoHS 2002/95/EC

Description

- Please note: This document is intended to illustrate the general capability and versatility of IQD's design. For specific enquiries please contact one of IQD's sales offices where we can tailor a unique specification to meet your needs.
- Hermetically sealed oven controlled crystal oscillator
- Small SMD case style
- Optional reference voltage
- Low phase noise and low jitter optimised design
- AT-Cut and SC-CUT crystal designs
- Optional oven alarm

Frequency Range

- 10.0 to 40.0MHz

Developed Frequencies

- 10, 13, 16.384, 32.768, 38.4MHz
- For other frequency/specification combinations, please contact our sales offices

Output Compatibility Options

- HCMOS or Sinewave

Supply Voltage Options

- 3.3V, 5.0V or 12.0V

Frequency Stability Vs Operating Temperature Range

- –40 to 75°C ±10ppb

Storage Temperature

- –55 to 105°C

Current Consumption:

- 12.0V @ 25°C steady state, 180mA max
- 12.0V Warm up, 350mA max
- 5.0V @ 25°C steady state, 200mA max
- 5.0V Warm up, 500mA max
- 3.3V @ 25°C steady state, 350mA max
- 3.3V Warm up, 800mA max

Phase Noise (typical @ 10.0MHz)

- –90dBc/Hz @ 1Hz
- –120dBc/Hz @ 10Hz
- –140dBc/Hz @ 100Hz
- –145dBc/Hz @ 1kHz
- –150dBc/Hz @ 10kHz

–150dBc/Hz @ 100kHz

Frequency Adjustment Range Options

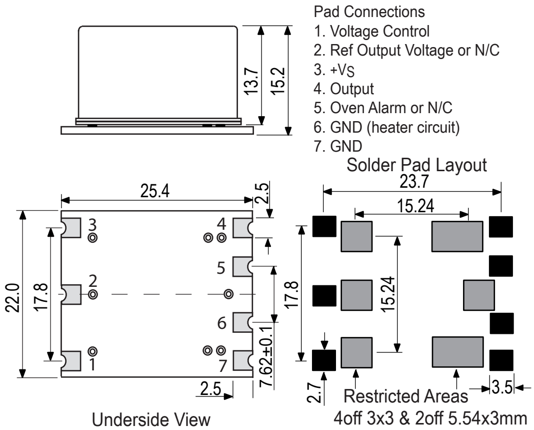
- ±1000ppb to ±2000ppb

Oven Alarm (optional)

- Shows if device is in warm-up or heated mode

  eg. Logic '0' = warm-up, Logic '1' = heated and ready

Outline (mm)



Ref. Voltage Output

- Customer specified value

Environmental

- Testing taken from IEC 60068
- Please contact our sales offices for full details

Packaging

- Tape and reel in accordance with EIA-481-D (please see Application Notes)
- Bulk

Minimum Enquiry Information

- Frequency
- Model
- Supply Voltage
- Output
- Frequency Stability (over operating temperature range)
- Operating Temperature Range
- Frequency Adjustment
- Oven Alarm
- Ref. Voltage Output
-

NOTES

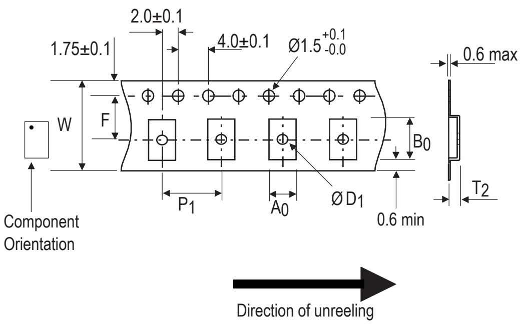
OCXOs

APPLICATION NOTES - CONTENTS

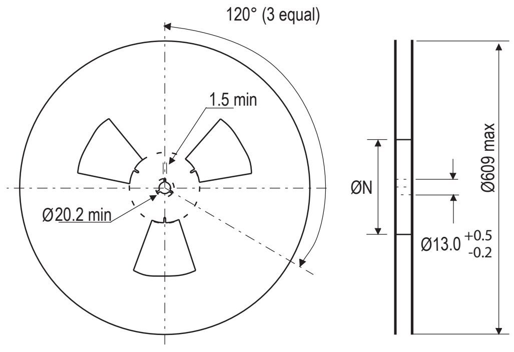
APPLICATION NOTES

TAPE AND REEL DETAILS - SMD

Tape (mm)



Reel (mm)



Cut outs are shown for indication only

Generic Package Size	Generic Tape Width	W (max)	F	B_0 (typ)	P_1 (typ)	A_0 (typ)	D_1 (min)	N (min)	T_2 (max)
1.6 x1.2	8	8.3	3.5±0.05	1.7	2	1.9	-	50	2.5
2 x 1.6	8	8.3	3.5±0.05	2.2	2	2.4	-	50	2.5
2.5 x 2	8	8.3	3.5±0.05	2.5	4	3.0	1	50	2.5
3.2 x 2.5	8	8.3	3.5±0.05	3.0	4	3.7	1	50	2.5
5 x 3.2	12	12.3	5.5±0.05	4.3	8	5.5	1.5	50	6.5
6 x 3.5	12	12.3	5.5±0.05	4.0	8	6.5	1.5	50	6.5
7 x 5	16	16.3	7.5±0.1	6.0	8	8.0	1.5	50	16.3
14 x 9.8	24	24.3	11.5±0.1	10.8	12	15.0	1.5	60	24.3

Leader and Trailer

- There shall be a leader of 400mm minimum of cover tape, which includes at least 100mm of carrier tape with empty compartments sealed by the cover tape. All of the leader may consist of the carrier tape with empty compartments sealed by cover tape.
- There shall be a trailer of 160mm minimum of empty carrier tape sealed with cover tape. The entire carrier tape shall release from the reel hub as the last portion of the tape unwinds from the reel without damage to the carrier tape and the remaining components in the cavities.

Bend Radius

- The tape shall pass around a bend with radius 30mm without damage.

Camber

- Not more than 1mm lateral movement across 250mm length of tape.

References

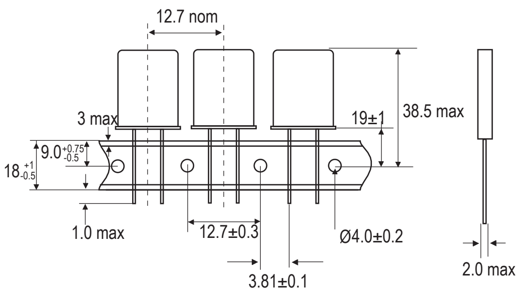
- All dimensions based on international stanrdard EIA-481-D.

Statek Product

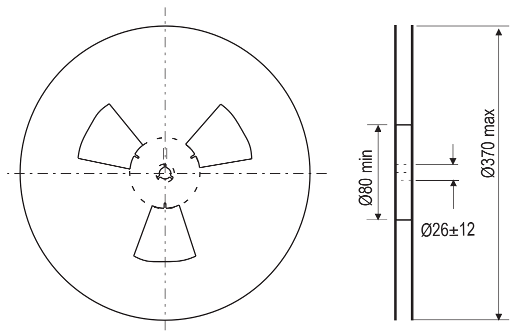
- For specific details on Statek's tape and reel specifications, please refer to the technical information on the IQD Statek website at www.iqdstatek.com/app-notes/

TAPE AND REEL DETAILS - LEADED

Tape (mm)



Reel (mm)



Cut outs are shown for indication only

Hold Down Tape

- The hold down tape shall not protude beyond the carier tape.
- The components shall be held sufficiently in the tape so that their position remains within the permitted tolerances.

References

- All dimensions are based on international standard EIA-481-C.

APPLICATION NOTES

QUARTZ CRYSTALS

The importance of quartz crystal resonators in electronics results from their extremely high Q, relatively small size and excellent temperature stability.

A quartz crystal resonator uses the piezoelectric properties of quartz. The direct piezoelectric effect refers to the electric polarization of certain materials brought about by the application of mechanical stress. The converse effect refers to the deformation produced in the same materials by the application of an electric field. In a quartz crystal resonator, a thin slice of quartz, cut at an appropriate orientation with respect to the crystallographic axes, is placed between two electrodes. An alternating voltage applied to these electrodes causes the quartz to vibrate in sympathy. The accompanying changes in the electric polarization constitute an electric displacement current through the resonator.

When the frequency of the applied voltage approaches one of the mechanical resonance frequencies of the quartz slice, the amplitude of the vibrations becomes very large. The accompanying displacement current also increases, so that the effective impedance of the device decreases in magnitude. The rapid change in impedance as the frequency varies in the neighbourhood of resonance is the key factor in the application of quartz crystal resonators as frequency control elements in crystal oscillators.

Electrically, a quartz crystal can be represented by the equivalent circuit of Figure 1, where the series combination R1, L1 and C1 represent the contributions to the impedance from the piezoelectric effect, and C0 represents the shunt capacitance between the electrodes along with any stray holder capacitances. The inductance L1 is a function of the mass of the quartz while the capacitance C1 is associated with its stiffness. The resistance R1 results from the loss in the quartz and in the mounting arrangement. The parameters of the equivalent circuit can be measured to accuracies of the order of 1%.

A reactance-frequency plot of the equivalent circuit is given in Figure 2. There are many related formulae for crystal performance; the first of these is for fs. This is the frequency at which the crystal is series resonant and is given by:

$$Fs = \frac{1}{2\pi\sqrt{L_1 C_1}}$$

where fs is in Hz, L1 in henries and C1 in farads.

Fig. 1 - Equivalent Circuit of a Crystal

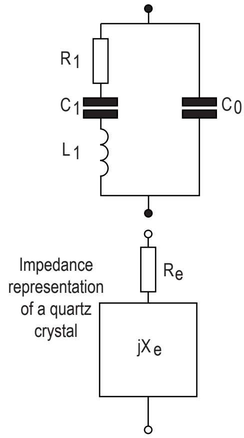
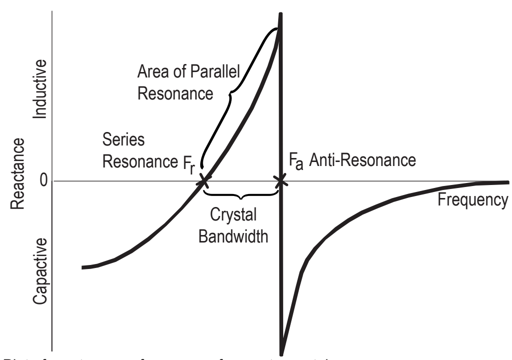


Fig. 2 - Reactive vs Frequency



Plot of reactance vs frequency of a quartz crystal

Typical Crystal Parameter Values

Parameter	200kHz	2MHz	30MHz	90MHz
	Fundamental		Third Overtone	Fifth Overtone
R1	2kΩ	100Ω	20Ω	40Ω
L1	27H	520mH	11mH	6mH
C1	0.024pF	0.012pF	0.0026pF	0.0005pF
C0	9pF	4pF	6pF	4pF
Q	$18x10^3$	$18x10^3$	$18x10^3$	$18x10^3$

Calibration tolerance

Calibration tolerance is the maximum allowable deviation in frequency of a crystal at a specific temperature, the reference temperature (usually 25°C).

Frequency stability

Crystals suffer instability from several causes. Temperature variation and a physical change of mass which results in the long-term drift we call ageing are probably those which concern us most.

The effects of temperature variation are minimized by an appropriate choice of crystal cut and (for close tolerance requirements) by including a temperature dependent reactance in the crystal's circuit, or by holding it at a constant temperature in small oven. AT-cut crystals are the most widely used today because their family of frequency-temperature curves readily provides good performance at low cost for all but the most demanding applications.

Uncompensated AT-cut crystals can be specified with tolerances down to ±5ppm from –10°C to 60°C, with larger tolerances required for wider temperature ranges as illustrated in Figure 3, showing a typical family of AT-cut frequency-temperature curves. These curves may be represented by cubic equations and are strongly dependent on the angle of cut of the quartz blank. The points of zero temperature coefficient are called the upper and lower turning points. One turning point can be placed where desired by selecting the angle of cut; the other is then fixed, since both are symmetrical about a point in the 20°–30°C range. The slope between the turning points becomes smaller as they move together. Crystals designed for use in an oven are cut so that the upper turning point coincides with the oven operating temperature.

Figure 4 shows the frequency temperature curves from several low-frequency cuts. The J-cut is used below 10kHz, while an XY-cut may be used from 3kHz to 85kHz. An NT-cut may be used in the 10kHz range. A DT-cut is applicable from 100kHz to about 800kHz and a CT-cut from 300 kHz to 900kHz.

Load capacitance

Crystals can be calibrated by their manufacturer at either fr, where they appear resistive (or fs which is very close to fr), or for resonance with a capacitive load, where of course they must appear inductive. The latter condition is called load resonance and represented in general terms by the symbol fL; more specifically, the symbol f30 would, for example, represent the frequency at which the crystal is at resonance with a 30pF capacitative load.

The point on the crystal's reactance curve at which calibration is needed is determined by the circuit configuration. As a general rule, a non-inverting maintaining amplifier in an oscillator requires calibration at fr and an inverting amplifier needs calibration at some value of 'load capacitance', CL. The latter arrangement relies upon the inductive crystal, together with the load capacitance with which it is at resonance, to provide a further 180° of phase shift.

The most common exception to the rule is when a small capacitor, a varicap diode for example, is placed in series with the crystal in the non-inverting amplifier circuit to provide a degree of frequency adjustment. In such a case the crystal must be calibrated for resonance with the mean value of that capacitance.

Fig. 3 - AT Cut Frequency vs Temperature Curve

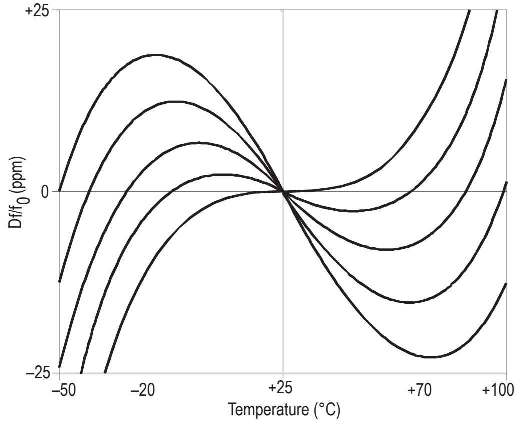
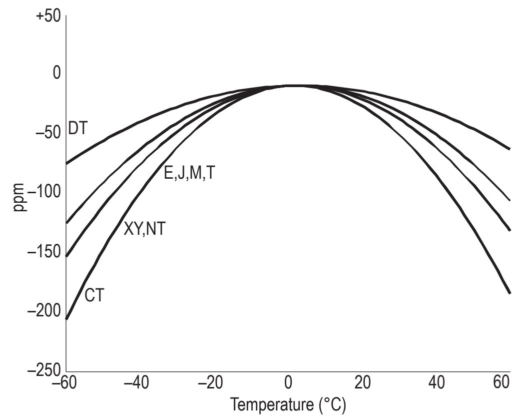


Fig. 4 - Low Frequency Crystal



APPLICATION NOTES

Pullability

The pullability of a crystal is a measure of its frequency change for a given change of load capacitance. This is often expressed as the difference between its series resonance frequency (f_r) and its load resonance frequency (f_L). This offset can be calculated in parts per million using fractional load resonance frequency offset (D_L), the actual frequency change from f_r to f_L for a given value of C_L.

$$D_L = \frac{C_1 \times 10^6}{2\left(C_0 \times C_L\right)}\, ppm$$

where C_1, C_0 and C_L are all expressed in the same units.

Figure 5 shows a typical curve for the effect of frequency change with respect to change in load capacitance.

Alternatively, it is common to express a crystal's pullability as a trim sensitivity in ppm per pF change of load capacitance. This is given in ppm/pF by:

$$\frac{D_L}{C_L} = \frac{-C_1 \times 10^6}{2\left(C_0 \times C_L\right)^2}\, ppm / pF$$

where C_1, C_0 and C_L are in pF, and is shown graphically in Figure 6 for various values of (C_0 + C_L).

Typical Values

Frequency	Vibration Mode	C1 (fF)	C0 (pF)
1.0 to 1.999MHz	Fundamental	5 to 8	3
2.0 to 3.999MHz		6 to 12	
4.0 to 6.4999MHz		8 to 20	5
6.5 to 30.0MHz		16 to 25	6
21.0 to 90MHz	3rd Overtone	1.0 to 2.5	
60.0 to 150MHz	5th Overtone	<0.70	
85.0 to 210MHz	7th Overtone	<0.40	

Fig. 5 - Frequency/Load Capacitance

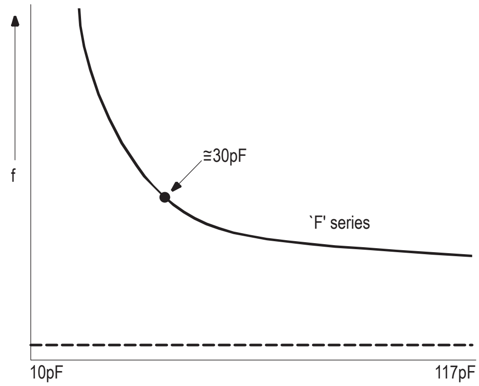
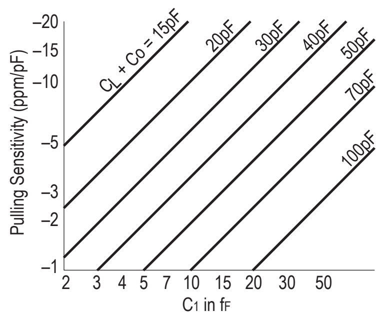


Fig. 6 - Typical Crystal Pulling Sensitivity



CRYSTAL OSCILLATOR CIRCUITS

An oscillator circuit requires that two conditions be satisfied: that it contains an amplifier having sufficient gain to overcome the loss due to its feedback network, and that the phase shift around the whole loop is zero at the wanted frequency. It must be ensured also that the loop gain at other frequencies where the phase shift might be zero, is less than that at the wanted frequency. For example a crystal oscillator which is intended to operate at the crystal's third overtone frequency could do so otherwise at its fundamental.

When power is first applied to an oscillator the signal amplitude builds up until it is limited by the non-linearity of its maintaining amplifier or, by an external level-control circuit. In the former case, the limiting method employed by all but high-precision oscillators, the output waveform is therefore dependent upon the type of amplifier and its method of limiting, and the point of signal extraction. Any point in the circuit can be chosen to extract the signal as long as impedance levels are borne in mind. It is important that any loading be as light as possible in order to maintain a high circuit Q and, thereby, good short-term stability and low phase noise.

The Circuit Condition

Some of the circuits to be illustrated require crystal calibration at series resonance, while others require load resonance calibration with a stated load capacitance value. The appropriate circuit condition must be stated when ordering crystals or, while they will oscillate, they will not do so at precisely the desired and marked frequency.

Below 150.0kHz

The relatively high equivalent series resistance of crystals in this frequency range demands a high amplifier gain. This can be provided as shown in Fig. 7 by employing two cascaded common emitter bipolar stages. Component values are indicated for frequencies down to 50kHz.

The diodes D1 and D2 in the collector circuit of TR1 limit the crystal drive level to avoid damage and the tuned circuit in the collector of TR2 adds some selectivity. The crystal should be calibrated at load resonance with the mid value of the trimmer capacitor C2. Series-resonance calibration is recommended only if precise frequency trimming is not required as only a limited pulling range is afforded by adjustment of L1.

150.0 to 550.0kHz

DT and CT are the usual cuts for conventional crystals in this frequency range, for which a suitable circuit for those calibrated at series resonance is shown in Fig. 8. These cuts have a strong mode at about twice the wanted frequency which should not cause a problem.

L1, which must be initially adjusted for oscillation near the crystal frequency with the crystal shorted, may be used as a fine frequency trimmer. Series resonance crystal calibration should be specified but parallel resonant crystals may be used if C1 is replaced by a capacitor whose value is equal to the crystal load capacitance.

0.95 to 21.0MHz

The circuit shown in Fig. 9 is designed for use with high stability AT-cut fundamental mode crystals calibrated at load resonance. Specify 30pF load capacitance 950kHz to 10MHz and 20pF for 10 to 21MHz.

Fig. 7

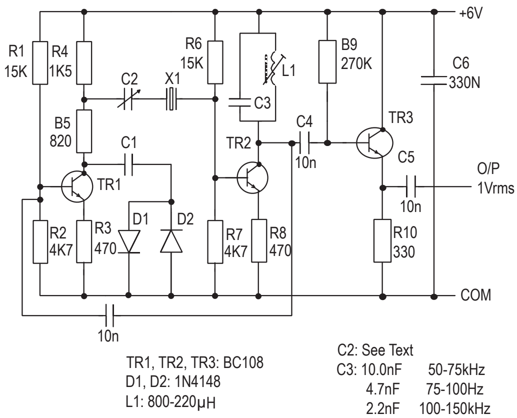


Fig. 8

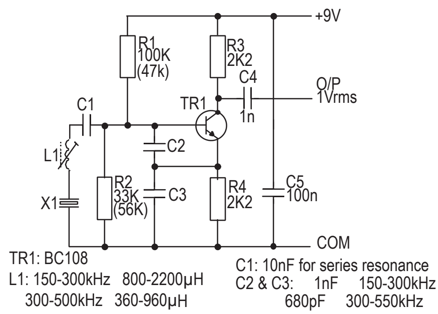
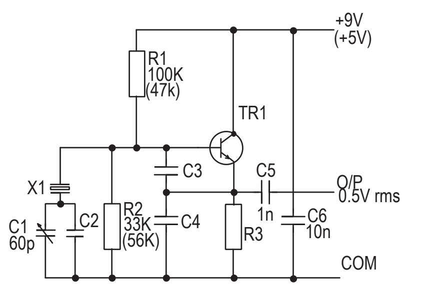


Fig. 9



TR1: BC 108

f(MHz)	R3	C2(pF)	C3(pF)	C4(pF)
0.95-3	3K3	not used	220	220
3-6	3K3	33	150	150
6-10	2K2	33	150	150
10-18	1K2	not used	100	100
18-21	680	not used	68	33

APPLICATION NOTES

15.0 to 105.0MHz

Figs. 10 and 11 give circuits suitable for operation with 15 to 63MHz third and 50 to 105MHz fifth overtone series resonant crystals respectively. A small positive frequency offset, +20ppm, will allow a wide trimming range.

When ordering an overtone crystal, reference must not be made to its fundamental frequency since it is not an exact sub-multiple of the overtone frequency. Overtone crystals are produced and calibrated specifically for operation at their marked frequencies.

By including a tuned circuit at twice or three times the crystal frequency in the collector TR1 of these circuits, it is possible to extract, from the collector, harmonics of the crystal frequency. Such an approach offers an easy and economical solution to VHF crystal oscillator design.

Above 105.0MHz

The low reactance of stray circuit capacitances at these high frequencies can make a reliable oscillator design difficult to achieve. To help prevent oscillation not controlled by the crystal, the static capacitance Co of the crystal is often tuned out with a small parallel inductance - L2 in Fig. 12. L1 in the circuit is tuned for maximum output but it can also serve a fine frequency trimmer. Alternatively, the frequency can be trimmed by inserting variable reactance in series with the crystal.

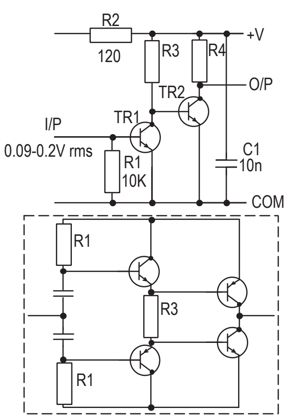
At these frequencies, it may be necessary to obtain correlation of the oscillator frequency with crystal frequency as measured by the crystal manufacturer. If high accuracy is required therefore, it is important to experiment with a sample crystal on which the manufacturer's precise frequency reading is known. Any discrepancy between the crystal and oscillator frequencies can then be remedied by calling for an offset calibration tolerance for further crystal supplies.

TTL Clock Oscillators

Many circuits have appeared over the years that use TTL inverters and gates as the active elements. Often, such designs are prone to oscillate at unwanted frequencies or, for a variety of reasons, do not operate properly. Even certain integrated circuits which have been designed specifically for the purpose can be troublesome. As a general rule, extensive testing should be done on these circuits to make sure that the design is not marginal and will not result in belated problems.

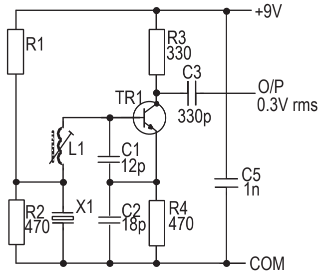
Figs. 14 to 15 illustrate some possible arrangements for use with the 7400, 7402, 7404 etc. Unused inputs of NAND gates should

Fig. 10



TR1: 2N 3906
R3: TTL: 3K3
CMOS: 15k
TR2: 2N 2369A
R4: TTL: 1k
CMOS:2K7
R2: See text

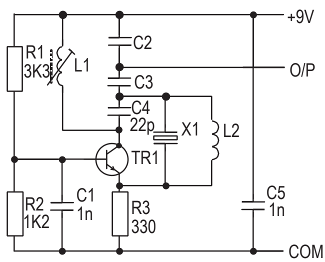
Fig. 11



TR1: BF 180
L1: 0.3μH-1.5μH

R1: 2K7 50-80MHz
1K2 80-105MHz

Fig. 12

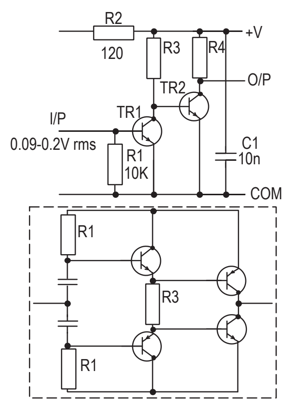


TR1: BF 180

$\frac{C2.C3}{C2+C3} = 10pF$ Adjust the ratio to suit following circuit

$L1 = \frac{1}{w^2.7pF}$ $L2 = \frac{1}{w^2.C_o}$

Fig. 13



TR1: 2N 3906
R3: TTL: 3K3
CMOS: 15k
TR2: 2N 2369A
R4: TTL: 1k
CMOS:2K7
R2: See text

be connected to the positive supply and those of NOR types, to earth. The approximate frequency ranges shown apply only to standard TTL ICs; although with higher value bias resistors in Figs. 14 and 15, the low power families can be used to advantage. In these two circuits, the value of C1 and C2 if found to be necessary, should be determined experimentally. For the frequency range 4 to 14MHz, the circuit of Fig. 16 will give good results.

TTL gate circuits cannot be fully recommended if the highest stability is required. Random phase shift within the IC will cause jitter and the relatively high crystal drive level does not make for good long-term stability.

A conventional discrete component oscillator such as one already described, followed by a buffer amplifier provides a better way of obtaining a stable design. A suitable buffer is shown in Fig. 13 in which the resistor R2 decouples the supply to the oscillator. The insert shows a complimentary version of the buffer amplifier which can be used for a faster rise time when feeding capacitive loads. For operation of the circuits of Figs. 8 and 9 from a 5V supply, the values for R1 and R2 shown in brackets should be used. In order to reduce the output to a level suitable for the logic buffer, reduce R3 in Fig. 7; and increase C3 and C4 in Fig. 9. For the latter circuit, crystals calibrated for 30pF load capacitance can now be specified for use up to about 15MHz.

CMOS Clock Oscillators

Fig. 17 shows the circuit of a typical CMOS inverter oscillator in which the crystal is connected in a pi-network and operates at load resonance. Again, only one gate input is connected to the crystal; unused inputs are tied to the appropriate supply rail. Simple formulae for calculating the values of Ca, Cb and R are given which will result in a reliable 4000UB-series design for use up to about 3Mz. However, the actual values used may differ slightly owing to variations in the stray capacitances of individual layouts. If frequency trimming is required, a trimmer capacitor can be fitted in parallel with Cb and the fixed capacitor reduced accordingly.

If connections to the sources of each FET in the inverter are available, as in a 4007, the resistor value calculated for R may be inserted at these points, the single series resistor being no longer used.

Fig. 14

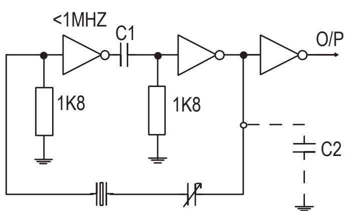


Fig. 15

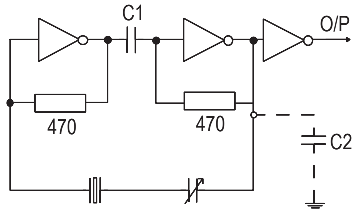
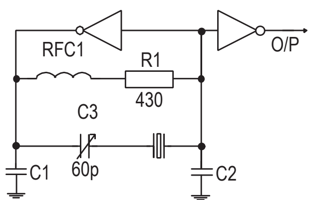
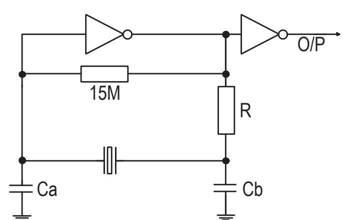


Fig. 16



f1(MHz)	C1 (pF)	C2 (pF)	RFC1 (µH)
4.0 - 6.0	330	220	100
6.0 - 9.0	330	180	68
9.0 - 11.5	220	150	39
11.5 - 14.0	330	120	22

Fig. 17



This arrangement, which is illustrated in Fig. 18 gives better stability than the standard configuration due to negative feedback.

For operation above 3MHz, the resistor R is omitted and the crystal connected directly between the inverter input and output. The two pi-network capacitors will now have the same value and their series combination plus inverter capacitances and strays will be equal to CL. Low values of CL, for example 12pF, and/or a high supply voltage may be necessary for reliable operation.

If preferred, a discrete component oscillator together with the logic buffer of Fig. 14 can be used. The power consumption however will be considerably greater than that of a CMOS inverter oscillator.

Frequencies 20.0 to 200.0MHz

The schematic of this VHF overtone oscillator is shown in Figs. 19 & 20. The crystal operates at its overtone and is tapped into the capacitive side of the LC tank circuit. The circuit has no parasitic effects of any kind.

There are no 2.6V zener diodes available, so four signal diodes are cascaded in series for base biasing. The emitter's output resistance that drives the crystal is 25Ω. The crystal load impedance is mostly capacitive and is one or two times the impedance of C2 (35Ω), depending on the value of C. The crystals internal series resistance R1 is between 30 and 40Ω.

The circuit works very well and the absence of parasitics is a big help. By tuning C, the oscillation frequency can be set either at or slightly above (2ppm) the series resonance. Figs. 21 & 22 show typical values for 50MHz and 100MHz operation.

Integrated Circuits as Oscillators

A large number of integrated circuits are available for use as an oscillator or include a crystal oscillator. Many existing IC's require only the attachment of an external crystal while some require other components as well. There are three main types of oscillator, the first provides a single bipolar or field effect transistor to which the external crystal and feedback network can be attached. For this class of circuit the designs shown for transistor oscillators are directly applicable and the frequency stability is generally good.

The second class of circuit, often using MS technology, provides a gate, which can be used as a crystal oscillator. The frequency stability is generally equivalent to that of oscillators using discrete gates of the same type.

Fig. 18

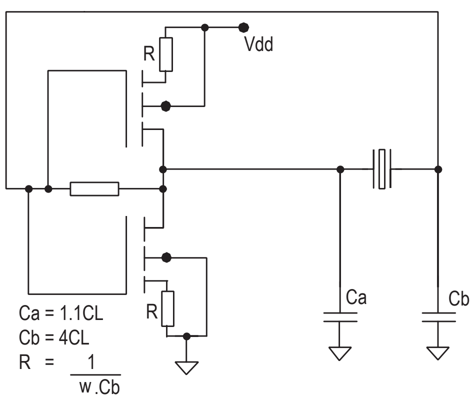


Fig. 19

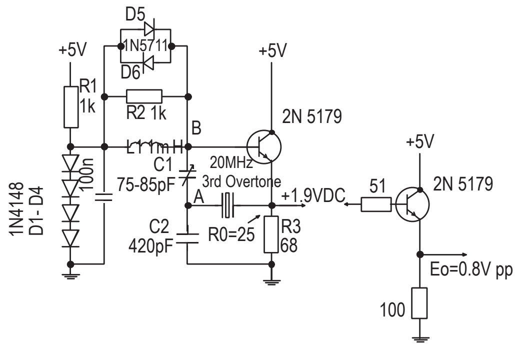


Fig. 20

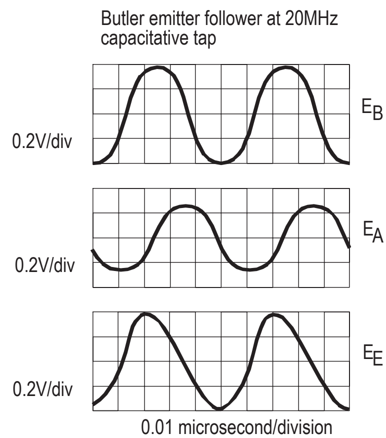
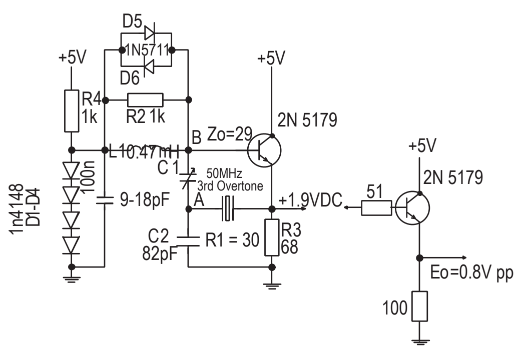


Fig. 21



The third class of circuit is designed with a multi-stage amplifier on the chip and the external crystal either closes the feedback path from the amplifier output to its input or it serves as a frequency-selective by-pass at some point in the amplifier. Many of these circuits are used as clock drivers for microprocessors, as frequency synthesisers, modems, TV circuits, phase-locked loops and the like. As might be expected, the frequency stability varies greatly with the design and while some are good, others are very poor indeed.

While it is desirable in the design of integrated circuit oscillators to use a set of analytical tools, the detailed equations for oscillation are generally too complex to be useful. Two approaches are presented here based on the terminal parameters of the integrated circuit. In those circuits where the crystal acts as a frequency-selective by-pass in the amplifier which is internally cross-coupled, it may be convenient to think of the circuit as a negative-resistive element in series with an inductance and a series compensating capacitor C in series with the crystal. For on frequency operation with a series resonant crystal, C should be resonant with Lo at the nominal frequency of the crystal. The resistance Rn is a negative value and must be larger in magnitude than the equivalent resistance of the crystal for oscillation to take place.

It is possible to determine the magnitude of Rn in several ways. Perhaps the most obvious is to place a crystal between the appropriate terminals of the IC and add series resistance until oscillation will no longer occur. The magnitude of the negative resistance is then given by the sum of the crystal resistance and the additional series resistance. The magnitude of the oscillator inductance can be found by noting the difference between the frequency of oscillation and the series resonant frequency of the crystal (without C or the series resistance) and calculating.

It can also be found experimentally by selecting C to obtain the series resonant frequency of the crystal. Then:

$$L_0 = \frac{1}{(2\pi fs)^2 C}$$

Since the equivalent inductance will in general vary as a function of frequency it should be computed near the nominal frequency of the crystal used.

It is desirable to minimise the equivalent inductance of an oscillator for several reasons. First the equivalent inductance of an oscillator will change with temperature and supply voltage, causing the oscillator frequency to drift. Secondly, it may result in free-running oscillations through C_0 of the crystal.

The equivalent inductance is a result of phase shift in the amplifier and can be minimised in the design by using as few stages as possible and by increasing bandwidth of the amplifier. The negative resistance will of course be a function of the gain of the amplifier and the impedance level where the crystal is placed.

Test data on several IC's of the cross-coupled type shows a wide variation in the equivalent inductance, from approximately 1-2µH to greater than 250µH over the frequency range from 1 to 20MHz. Therefore, while some IC's operate with the crystal near series resonance, others operate as much as 1% low in frequency.

Frequencies 1 to 20MHz

The schematic circuit for this series resonant oscillator at 1MHz is shown in Fig. 23. The circuit waveforms are shown in Fig. 24. This circuit has outstanding performance and works very nicely off a 5V supply. Waveforms at the crystal are very good. The frequency changes very little when power supply voltage

Fig. 22

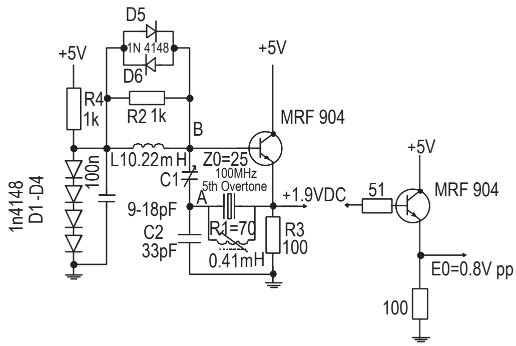


Fig. 23

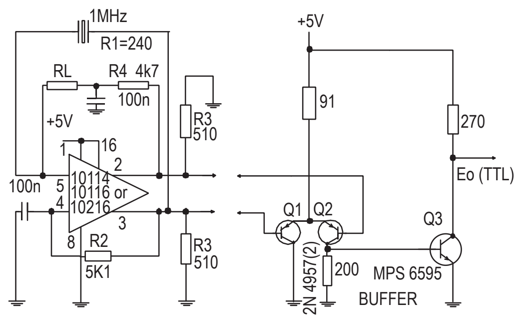
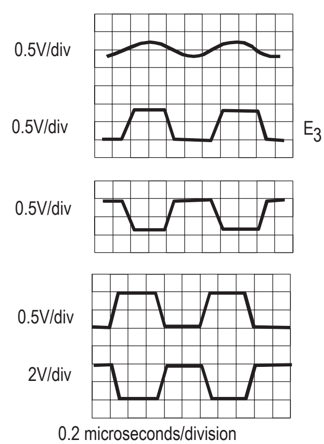


Fig. 24



or temperature are changed. The low ECL drive voltage keeps crystal dissipation low and the low ECL drive resistance RL, which gives very good frequency stability. The ECL receiver format is well adapted to high frequency oscillator circuits. At high frequencies crystals are low impedance devices and ECL circuits can drive low impedance loads down to 50Ω easily. Input resistances of ECL circuits are high and they are also linear over the ECL voltage range. As shown in Fig.24 the crystals square wave drive waveform at Pin 3 has a definite slope during transition between binary states, indicating the ECL unit is operating as a linear amplifier during the transition interval.

Fig.25 shows the circuit at 20MHz. The crystals internal series resistance R1 is 7Ω; the crystals load resistance RL is 10Ω. At 20MHz the ECL receiver has to be able to drive a 17Ω load (R1+RL=12Ω), a very low value. The receivers output resistance is controlled by the ECL emitters output current, which is in turn controlled by the emitters pull down resistor R3. R3=510Ω works well at 1MHz but has to be decreased to 100W at 20MHz to get the ECL output resistance down low enough to provide a reasonable drive waveform to the crystal.

There are three ECL receivers in one DIP. One of the two unused ones could be used as a no-cost buffer between the oscillator and the two transistor buffer, but the circuit will oscillate spuriously when the crystal is removed. Because of this the ECL receiver should not be used as a buffer.

Frequencies up to 500kHz (CMOS)

Each inverter in Fig.26 has negative feedback round it to ensure that it is biased in the middle of its linear region, so that oscillation will always start when power is applied. The feedback resistor round the first inverter is divided into two series resistors and the centre point is bypassed to ground. RL is used as the crystals load resistor and is set equal to or somewhat less than the crystals internal series resistance R1. Figs. 27 & 28 shows good waveform at the crystal. The spikes on the crystal sine wave output appear to be due to sharp edges of the crystals square wave drive feeding through on the crystals shunt terminal capacitance C_O.

The overall performance of this oscillator is average with on/off times of 2.45µsec to 2.55µsecs. This is due to its frequency sensitivity to power supply voltage changes being higher than it should be. This high sensitivity to power supply voltage changes seems to be characteristic of most CMOS IC's.

Fig. 25

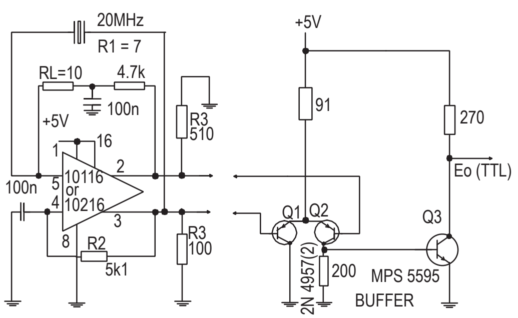


Fig. 26

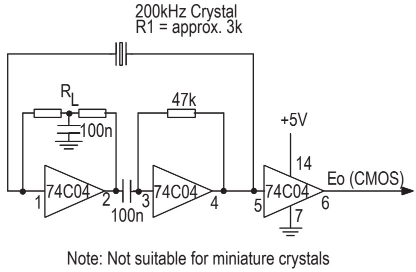


Fig. 27

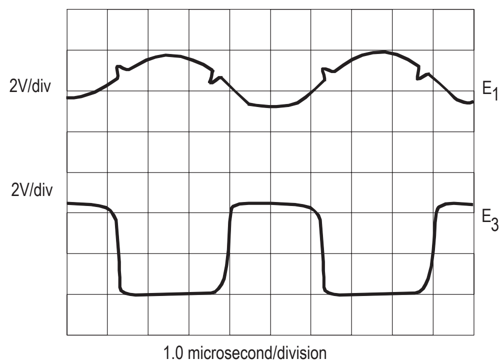
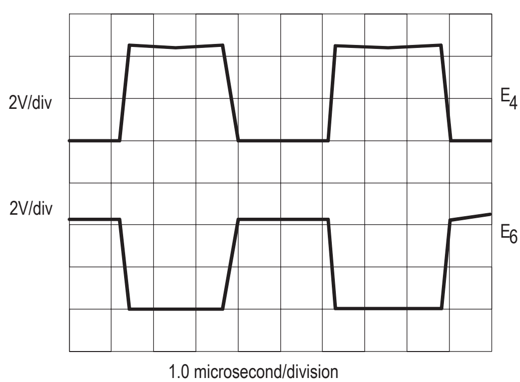


Fig. 28



TIMEKEEPING WITH QUARTZ CRYSTALS

Since its introduction the 32.768kHz miniature watch crystal has become the most popular time keeping reference ever. This application note is intended to give some guidance as to the use of quartz crystals in time keeping applications.

In almost all circumstances designers will want to use simple logic gate oscillators for this application for the sake of convenience and cost. The criteria normally applied to this type of design are that it should be accurate, low in cost and low in power consumption. Using a watch crystal and CMOS logic all these criteria can be met.

In a CMOS oscillator circuit, power consumption rises with frequency and so it makes sense to reduce the operation frequency to a minimum; this is the reason for choosing 32.768kHz. The second way of reducing power consumption in a CMOS circuit is to reduce the size of any loads being driven. It is partly for this reason that watch crystals are designed to operate with typically a 12.5pF load, instead of the more usual 20 or 30pF. It also has to do with: (a) the type of CMOS employed runs out of steam at the low voltages used in watches unless a low crystal load capacitance is used; (b) to keep the crystal drive level low while maintaining adequate inverter input voltage, and (c) to allow the use of a very tiny trimmer capacitor while still providing the necessary trimming range.

The basic requirements of a CMOS inverter oscillator can be met with a single gate and a handful of other components to provide bias and feedback. Fig. 29 shows a typical circuit of this type. The load capacitance seen by the quartz crystal is the series combination of C_{out} and C_{in} together with any circuit strays including the logic gate input and output pin capacitances. The component values used in Fig. 29 work well and give good correlation with measured test results obtained from a Saunders 140 crystal impedance meter. The apparent load capacitance presented to the crystal is:

$$\frac{C_{out} \times C_{in}}{C_{out} + C_{in}}$$

C_{out} = Gate output capacitor C_{in} = Gate input capacitor

This gives a figure of 6.9pF load. This is well below the required figure of 12.5pF, however both the input and output pins of the logic gate present an appreciable load. These additional values need to be added to the 6.9pF. These loads will typically be in the order of 3pF to 4pF per pin but can be up to 10pF and will also depend on the logic family used. These extra loads together with any stray capacitances in circuit should add up to approximately 12.5pF.

If a trimmable oscillator is needed, the 22pF output capacitor can be replaced by a fixed 10pF capacitor in parallel with a 2pF to 22pF trimmer. For best results NPO, COG or similar low-temperature-coefficient dielectric capacitors should be used for best stability.

A frequently expressed requirement for oscillators such as this is close tolerance, often indeed in layouts in which no provision will be made for a trimmer. Apart from the effect of capacitor tolerances, it must be appreciated that because their values are low, the somewhat variable impedances attributable to the IC will result in a somewhat uncertain phase shift, hence oscillation frequency. A trimmer is recommended strongly, therefore, if

Fig. 29

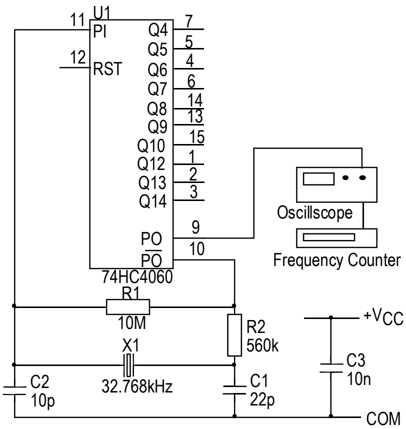
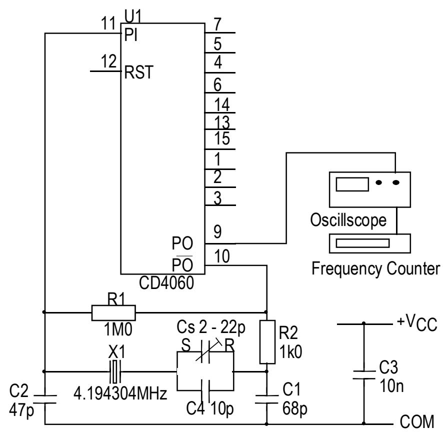


Fig. 30

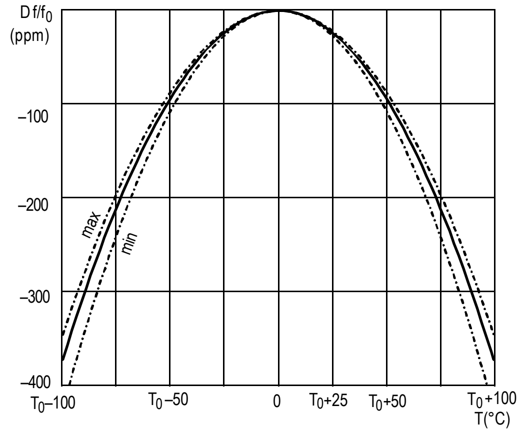


precision better than, say, ±50ppm is needed, regardless of the actual crystal tolerance.

The other important effect is that due to temperature variation. Watch crystals and other similar types below 1MHz have a parabolic frequency-temperature characteristic with a design turnover temperature of 25°C (see Figure 31). The tolerance of the turnover temperature and the parabolic curvature constant, typically ±3°C and 0.038ppm/°C^2 respectively, mean that close tolerances can be maintained over only a limited temperature range. This is of little consequence in a watch, of course, since in use it is kept close to the crystal's turnover temperature, but it could render the choice of this type of crystal less cost effective than an AT-cut unit if an operating temperature range wider than 0 to 50°C is desired.

A similar circuit for 4.194304MHz (32.768kHz x 27) AT-cut crystals is illustrated in Figure 30. C3 and C4 are intended to facilitate precise frequency trimming of crystals calibrated at the standard clock crystal load of 12pF. If trimming is not required, either replace those capacitors with a 18pF or 22pF fixed unit (choose the value which results in oscillation closest to nominal frequency), or omit them altogether and specify the crystals for calibration at 30pF load.

Fig. 31



JITTER IN CRYSTAL OSCILLATORS

Measuring and specifying jitter

Measuring and specifying jitter using a phase noise plot for a crystal oscillator that contains only random jitter sources has several advantages over conventional time domain methods using high-speed digital sampling oscilloscopes (DSO's).

Disadvantages of DSOs

The jitter performance of the oscillator is often much better than the combined jitter uncertainty of the DSO's internal sampling oscillator, the DSO's trigger point uncertainty and some questionable software techniques.

The measurement bandwidth is unknown with a DSO. For example Belcore specifications define any 'jitter' below 10Hz as wander, not jitter.

The DSO can only give a total jitter figure. It cannot split the jitter content into particular areas of interest.

Advantages of the Phase Noise Plot

There is only a ±2dB absolute uncertainty using the HP phase noise measurement system. What you measure is only phase noise (jitter), not measurement induced errors.

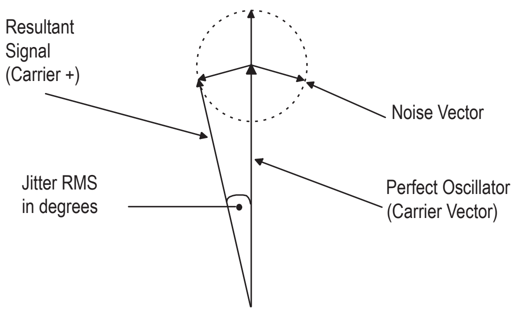
The measurement bandwidth is specified as part of the measurement.

The contribution to the overall jitter figure can be specified for any particular band of frequencies.

Converting Phase Noise to Jitter

The measured phase noise plot is broken down into areas of constant slope (see Figure 32, the idealized phase noise plot).

These areas are integrated and summed to give an equivalent single sideband at the maximum frequency of integration. Now think of the oscillator as a perfect source with this noise vector rotating about its end:

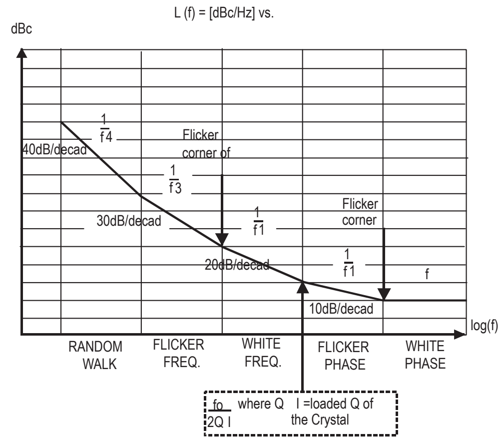


Jitter RMS in degrees is then calculated as the maximum angle between the resulting vector and the carrier vector. To convert to time express as a fraction of 360 degrees and multiply by the period of the carrier frequency.

Jitter RMS in pico secs = angle/360 x T

Using the Gaussian distribution as defined in Figure 33 and the appropriate mathematical manipulation, the RMS jitter can be converted to peak-peak jitter for a specified sampling time (say) or an expected bit error rate (BER) for a given sample size etc. Figure 34 is an example of a typical phase noise plot converted to time jitter.

Fig. 32 - Idealised Phase Noise Plot



WHITE PHASE

Thermal noise (Johnson noise) i.e. kT buffer amplifier, resistor noise and Shott noise

FLICKER PHASE

Pink Noise (equal power per decade frequency) i.e. predominately buffer amplifier flicker noise

WHITE FREQ.

Carrier noise i.e. Crystal RLC noise

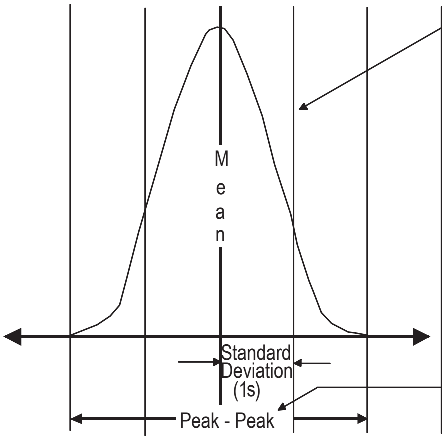
FLICKER FREQ.

Intermodulation of *White Freq* (Carrier noise) and *Flicker Phase* (transistor noise) particularly within the oscillator loop

RANDOM WALK

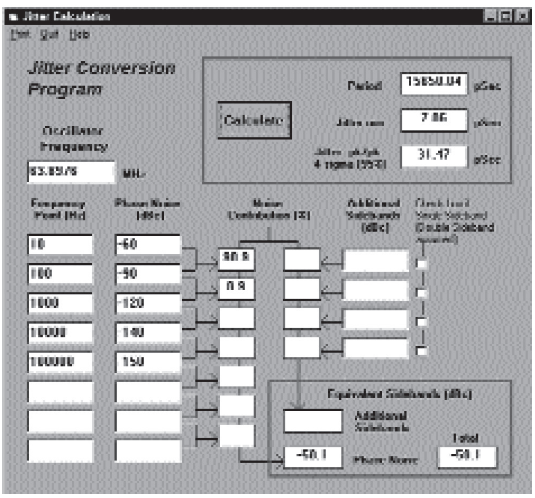
Intrinsic noise sources within the Quartz and electrode structures. Possible external effects caused by environmental changes i.e. mechanical shock, vibration, temperature changes etc.

Fig. 33 - Gaussian Distribution of Random (non-deterministic) Jitter



This conversion of a real 63.8976 MHz non-multiplied oscillator shows 99% of the contribution to the total jitter is generated by the close in phase noise between 10Hz and 100Hz. It would make no sense, therefore, for the specification to demand –150dBc at 1kHz as this would make absolutely no difference to the overall jitter performance.

Fig. 34 - Typical Phase Noise to Jitter Conversion Screen



Standard deviation (1s) is defined as the area under the curve that contains 34.13% of all [measurements] to one side of the mean.

Therefore:

±1s contains 68.26% of all measurements...

±2s contains 95.40% of all measurements...

±3s contains 99.73% of all measurements...

±4s contains 99.99366% of all measurements...

±6s contains (100-1.973x10-7)% of all measurements...

±7s contains (100-1x10-12)% of all measurements...

±8s contains (100-1.244x10-13)% of all measurements...

±10s contains (100-1.973x10-21)% of all measurements…

Note: Peak-Peak (measured in the time domain) is dependent on the sample size. Larger samples of the same distribution will most likely yield a larger peak-peak measurement. Thus, peak-peak must be discussed in context of the number of samples and, ideally, a specified bandwidth.

SOLDERING GUIDELINES

In July 2006 the European Union (EU) directive “Restriction of Hazardous Substances” (RoHS) was implemented which defined specific substances that must be eliminated from electronic components. The six hazardous substances are: lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardents. The main issue affecting manufacture of electronic components and associated assemblies is the restriction of lead in solder.

Reflow Soldering

The solder industry has worked on the composition and development of RoHS compliant solders based on for example alloys of Sn/Ag/Cu and various types are available with different melting points and characteristics. In general RoHS compliant solders require a higher maximum reflow temperature compared with traditional lead based solders.

As such the market place has moved towards a common maximum sldering temperature for RoHS compliant components of up to 260°C, even though in many instances this temperature may never be reached and better results may be obtained by using lower temperatures of for example 245°C maximum.

Due to the varied nature and product mix of PCB assemblies and the component types used, we recommend that customers experiment with device samples from IQD and develop their own soldering profles to suit their specific product needs. The JEDEC standard J-STD-020 has suggestions on reflow profiles for both solders with lead and for RoHS compliant solders.

Almost all the frequency product types supplied by IQD are RoHS compliant as standard and as such the majority of SMD devices can be reflow soldered at up to 260°C maximum.

For individual device details concerning soldering temperature levels, please visit our website at :- http://www.iqdfrequencyproducts.com/about/accreditations/rohs/media/pdf/rohs-status-fcp-v5.pdf

Note: current IQD part numbers have the prefix “LF” to denote RoHS compliance. Part numbers that are supplied as non RoHS compliant will be prefixed with “F1”.

NOTES

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