

Thin Film Products Components

Thin film surface mount resistors

Current sensing surface mount resistors

Thick film surface mount resistors

Power choke coils

High frequency surface mount components

Sample kits



Using Susumu's products means being "eco-friendly"

- The thin film process uses the least amount of resistive material among all the resistor producing processes.
- Compared to other resistor-producing processes, the thin film process employs fewer sintering and curing processes and as well as using a lower temperature. Therefore, it utilizes less power and has a smaller carbon footprint.
- Susumu's thin film products are small without losing functionality. They contribute to conserving the earth's resources.
- Because Susumu uses environmentally low impact processes and products, you can be assured that by using Susumu products, you are contributing to environmental protection.



Susumu's products are made of "thin film" and are "eco-friendly"

Susumu's products are all RoHS compliant and totally lead-free even within the RoHS exempted areas where lead can be utilized. Some of Susumu's products are halogen-free as well.

■ The logos below are used for labeling products throughout this catalogue. _____



■ About REACH _____

○ REACH was established by the European Chemical Agency (ECHA) in 2007 in order to manage the risk that chemicals pose to health and the environment. REACH stands for

Registration, **E**valuation, and **A**uthorization of **C**hemicals.

38 Substances listed in SHVC.(Updated on Jun 2010)

Typical composition of RG/RM products

Materials	Weight (Wt%)						RoHS restricted material composition					
	RG1005	RG1608	RG2012	RG3216	RM2012	RM3216	Heavy metal				PBB	PBDE
							Cadmium	Lead	Mercury	Hexavalent Chromium		
Substrate	83.2	87	87.6	89.5	87.8	92.86	<1ppm	<1ppm	<5ppm	<1ppm	Not detected	Not detected
Resistive material	0.02	0.02	0.02	0.02	0.02	0.02	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected
Inner electrode	0.65	0.13	0.11	0.15	0.15	0.1	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected
Intermediate electrode	8.33	5.82	5.58	4.83	5.87	2.96	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected
Outer electrode	5.45	3.81	3.66	3.16	3.84	1.94	Not detected	Not detected	Not detected	Not detected	Not detected	Not detected
Protective coating	A						Not detected	Not detected	Not detected	Not detected	Not detected	Not detected
	B	2.35	2.88	2.67	2.06	1.95	<2ppm	<2ppm	<2ppm	<2ppm	<5ppm	<5ppm
	C						<5ppm	<10ppm	<1ppm	<6ppm	Not detected	Not detected
Marking ink	—	0.34	0.36	0.28	0.37	0.25	<2ppm	7ppm	<2ppm	<2ppm	<2ppm	Not detected
Product weight	0.72mg	2.07mg	4.12mg	8.26mg	4.11mg	7.96mg						

Some of our products' life span is quite long, therefore contributes to the efficient use of resources.

Examples: RG series, **P.07** RM series **P.09**

- In addition to our reliable precision RR series, we also offer the RG series which has a life span that is 8 times longer than that of the RR series. Under normal temperature and humidity, the RG series is expected to drift less than 0.1% after 116 years.

Comparison of RR vs. RG

Resistor type	Series name	Criteria	Years
Metal thin film chip resistor	RG series	0.1% drift	over 116 years
	RR series		14 years

Test conditions: 85°C , 85% RH, 10% of rated power, 90min. on; 30min. off

The use of thin film technology enabled Susumu to make smaller products resulting in the conservation of resources.

Examples: RL series Comparison with our conventional products, unit: mm

Power	Conventional size	RL	Area ratio
0.1W	1.6×0.8	1.0×0.5	about 1/2.5
1W	6.4×3.2	3.7×2.0	about 1/4
2W	11.5×7.0	7.5×2.0	about 1/5

Examples: RG series Comparison with our conventional products, unit: mm

Power	Conventional size	RGH	Area ratio
1/8W	1.6×0.8	1.0×0.5	about 1/4
1/4W	3.2×1.6	2.0×1.25	about 1/2

Together, the Susumu group companies are striving to manufacture environmentally friendly products in order to maintain the earth's sustainability.

Susumu group's ISO 14001 certification status

Company	Facility	Certification date	Certification body	Certification #
Susumu Co. Ltd	Obama factory	2000.12.15	JQA	EM1184
	headquarters, all sales offices			
Yokohama Denshi Seiko	Niigata factory	2001.03.09	JQA	EM1388
Cyntec	Hsin-Chu (Taiwan)	2002.08.26	UL	A11463
	Suzhou (China)	2002.08.26	UL	A11463

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In order for customers to choose the best parts for their requirements, the following pages contain tables that provide an outline for each product series. For details, please refer to the specification pages or contact our sales office. All RoHS compliant products(with Sn termination) withstand threesoldering cycles at 260 °C or 10 seconds at 260°C, have an MSL of 1, meet J-STD-020C, and compatible with SnPb soldering process.	
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Product group	New series name	Old series name	Rated power (W)							Resistance tolerance (%)							Environmental compliance					Specification pages
			1/32	1/20	1/16	1/10	1/8	1/6	1/4	±0.02	±0.05	±0.1	±0.25	±0.5	±1.0	±20	EU-RoHS	REACH SVHC 15	CHINA RoHS	Pb free	Hologen free	
Thin film surface mount resistors	Metal film chip resistors (ultra precision)																					
	RGseries	RGseries	●		●	●	●		●	●	●	●	●			●	●	●	●	●	07-08	
	RGseries	RGHseries					●	●			●		●			●	●	●	●	●		
	Metal film chip resistor networks																					
	RMseries	—		●	●	●					●	●	●				●	●	●	●	09-10	
	Metal film chip resistors (precision)																					
	RRseries	—		●	●	●	●		●			●		●	●		●	●	●	●	11	
	Metal film trimmable chip resistors																					
RTseries	—		●	●	●										●	●	●	●	●	12		

Product group	New series name	Old series name	Rated power (W)													Resistance tolerance (%)				Environmental compliance					Specification pages	
			1/8	1/6	1/5	1/4	1/3	1/2	2/3	3/4	1	2	3	4	5	±0.5	±1.0	±2.0	±5.0	EU-RoHS	REACH SVHC 15	CHINA RoHS	Pb free	Hologen free		
Current sensing surface mount resistors	Low resistance chip resistors (long-side terminal)																									
	PRLseries	—					●		●		●	●				●	●	●	●	●	●	●※1	●※1	●	13-14	
	RLseries	—								●	●						●	●		●	●	●※1	●※1	●		
	Low resistance chip resistors (short-side terminal)																									
	RLseries	RLseries	●	●	●	●	●	●			●					●	●	●	●	●	●	●※1	●※1	●※2	15-16	
	RLseries	RPseries				●	●										●	●	●	●	●	●※1	●※1	●		
	Metal plate low resistance chip resistors																									
	RLseries	—						●			●	●					●	●	●	●		●		●	●	17
	Metal foil surface mount low resistance chip resistors (long/short side terminal)																									
	KRLseries	—					●	●	●		●	●	●	●	●		●	●	●	●	●	●	●	●	●	18
Thick film low resistance chip resistors																										
RLTseries	—					●		●		●	●					●	●	●	●	●	●	●	●	●	19	

※1 : This product is RoHS compliant but not completely lead-free. Plated nickel contains 10s of ppm level lead.

※2 : All but the RL0510 are halogen-free. We are working on eliminating halogen from the RL1005 series.

Product group	New series name	Old series name	Rated power (W)					Resistance tolerance (%)				Environmental compliance					Specification pages
			1/32W	1/20W	1/16W	31mW/element	63mW/element	±0.5	±1.0	±2.0	±5.0	EU-RoHS	REACH SVHC 15	CHINA RoHS	Pb free	Hologen free	
Thick film surface mount resistors	Thick film chip resistors																
	PFR・GFR series	—	●	●	●		●	●	●	●	●	●		●	●	20	
	Ultra small chip array resistors																
	RSseries	—				●	●				●	●	●		●	●	21

Product group	New series name	Old series name	Inductance (μH)							Rated current (A)						Environmental compliance					Specification pages
			0.1 ~ 0.49	0.5 ~ 0.99	1.0 ~ 2.9	3.0 ~ 4.9	5.0 ~ 9.9	10 ~	0.45 ~ 0.9	1.0 ~ 4.9	5.0 ~ 9.9	10 ~ 19.9	20.0 ~ 34.9	35.0 ~	EU-RoHS	REACH SVHC 15	CHINA RoHS	Pb free	Hologen free		
Power choke coils	Power choke coils																				
	PCMB・PSMC series	—	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	22		
	Small power choke coils																				
	PCMB・PS series	—	●	●	●	●	●	●	●	●	●	●			●	●	●	●	23		

Product group	New series name	Old series name	Inductance		Inductance tolerance			Environmental compliance					Specification pages
			1.0~8.2	10~18	±0.1nH	±0.2nH	±2.0%	EU-RoHS	REACH SVHC 15	CHINA RoHS	Pb free	Hologen free	
High frequency surface mount components	Precision thin film chip inductors												
	HPLseries	—	●	●	●	●	●	●	●	●	●	24	

Product group	New series name	Old series name	Attenuation (dB)																		Attenuation tolerance (dB)						Environmental compliance					Specification pages	
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	20	± 0.3	± 0.4	± 0.5	± 0.7	± 0.8	± 1.0	± 2.5	EU-RoHS	REACH SVHC 15	CHINA RoHS	Pb free		Hologen free
High frequency surface mount components	Precision chip attenuators																																
	PAT·RAT series	—	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	25	
	Temperature-compensated chip attenuators																																
	P*Vseries	—	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	26	

Product group	Product name	Rated power (W)							Resistance tolerance (%)					Specification pages
		1/32	1/20	1/16	1/10	1/8	1/6	1/4	±0.02	±0.05	±0.1	±0.25	±0.5	
Sample kits	Thin film surface mount resistors/metal film chip resistors													
	RR0816PD-KIT			●									●	27
	RR1220PD-KIT				●								●	
	RG1005PD-KIT	●		●		●							●	
	RG1608PD-KIT			●		●	●						●	
	RG2012PD-KIT				●	●		●					●	

Product group	Product name	Rated power (W)				Resistance tolerance(%)	Specification pages
		1/3	1/2	1.0	2.0	± 1.0	
Sample kits	Current sensing surface mount resistors/low resistance chip resistors						
	RL1220-KIT	●				●	27
	RL3720W-KIT			●		●	

Product group	Product name	Inductance (nH)		Inductance tolerance		Specification pages
		1.0~18		$\pm 0.1\text{nH}$	$\pm 2.0\%$	
Sample kits	HPL1005-KIT	●		1.0 - 9.1nH	10 - 18nH	27

Thin film surface mount resistors

Current sensing surface mount resistors

Thick film surface mount resistors

Power choke coils

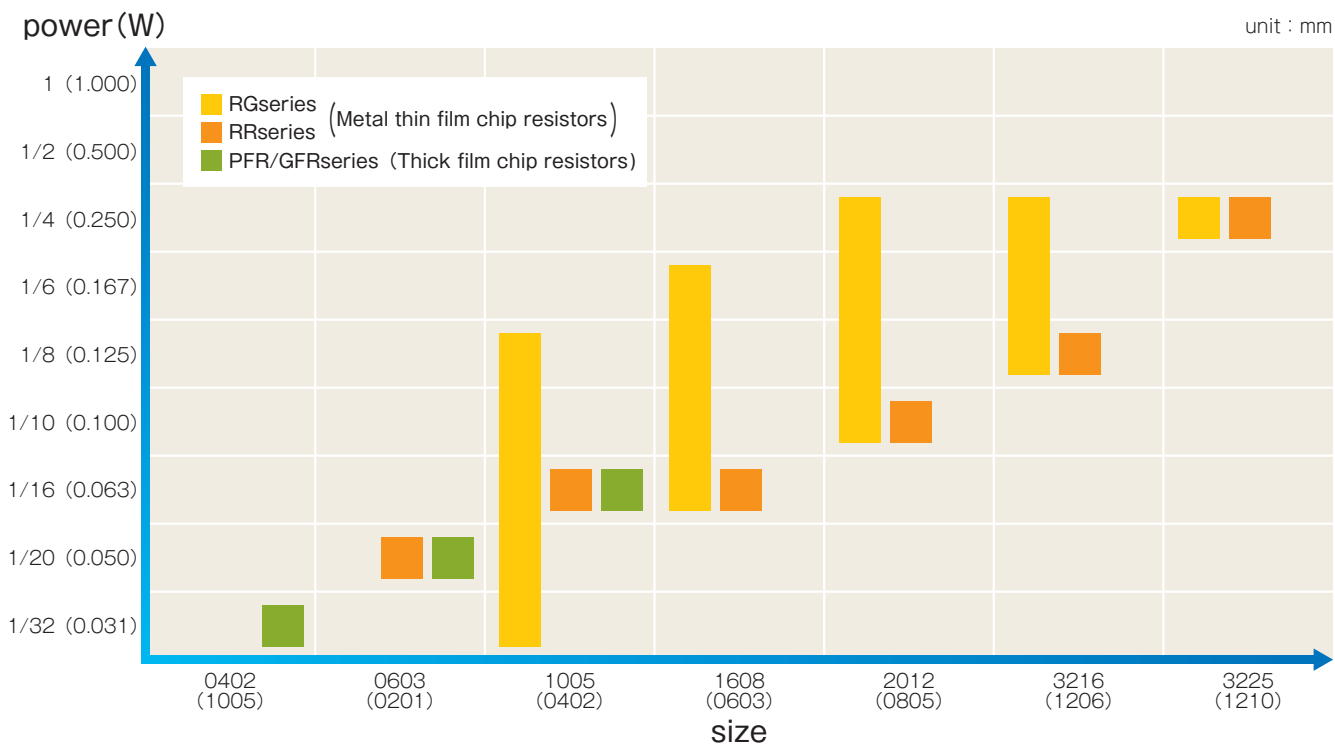
High frequency surface mount components

Sample kits

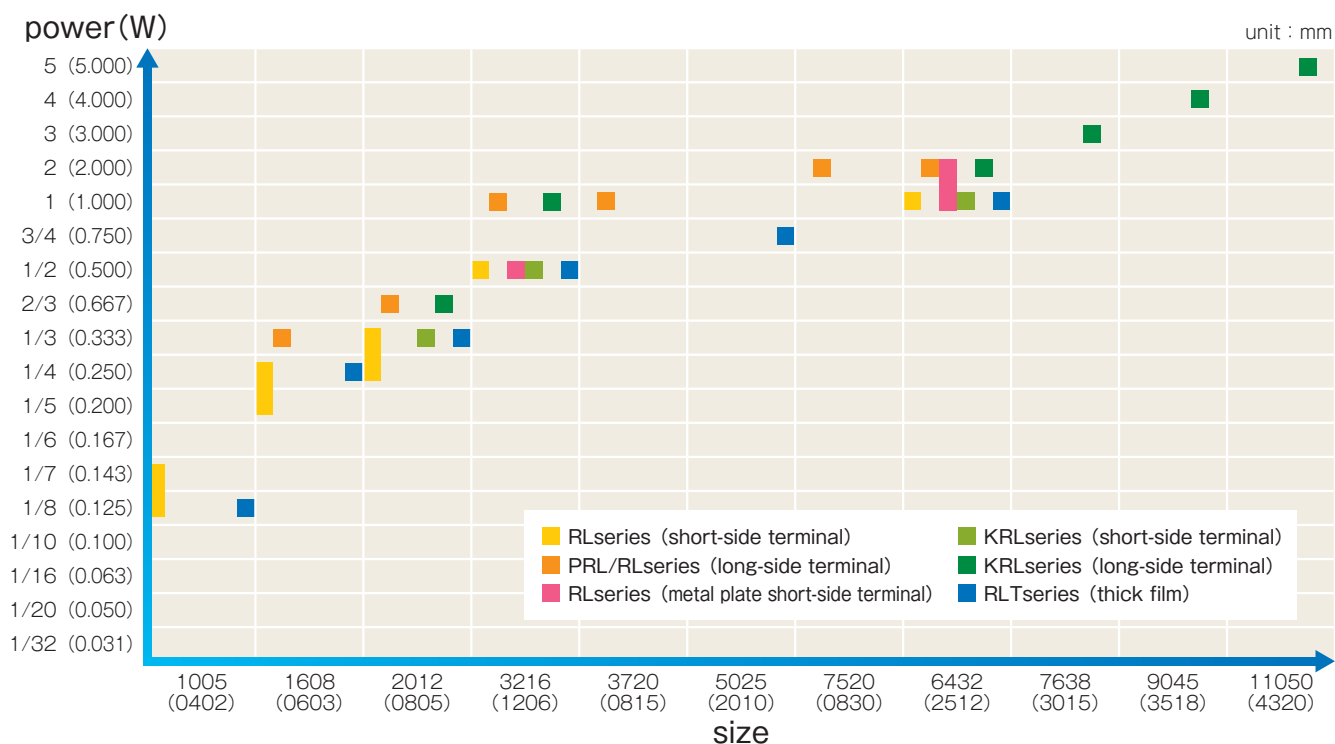
Selection guide

We offer a variety of features among metal thin film chip resistors, thick film chip resistors, and current sensing surface mount resistors. In order to help customers choose the correct series of components, the following charts show the relationship of each component size to its rated power.

Metal thin film chip resistors; thick film chip resistors



Current sensing surface mount resistors



E series resistance values (IEC designated series of resistance values)

series	Values														
E-6	1.0	1.5		2.2		3.3		4.7		6.8					
E-12	1.0	1.2	1.5	1.8	2.2	2.7	3.3	3.9	4.7	5.6	6.8	8.2			
E-24	1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2	2.4	2.7	3.0	3.3	3.6	3.9
	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1						
E-96	1.00	1.02	1.05	1.07	1.10	1.13	1.15	1.15	1.21	1.24	1.27	1.3	1.33	1.37	1.40
	1.43	1.47	1.50	1.54	1.58	1.62	1.65	1.69	1.74	1.78	1.82	1.87	1.91	1.96	2.00
	2.05	2.10	2.12	2.21	2.26	2.32	2.37	2.43	2.49	2.55	2.61	2.67	2.74	2.80	2.87
	2.94	3.01	3.09	3.16	3.24	3.32	3.40	3.48	3.57	3.65	3.74	3.83	3.92	4.02	4.12
	4.22	4.32	4.42	4.53	4.64	4.75	4.87	4.99	5.11	5.23	5.36	5.49	5.62	5.76	5.90
	6.04	6.19	6.34	6.49	6.65	6.81	6.98	7.15	7.32	7.50	7.68	7.87	8.06	8.25	8.45
	8.66	8.87	9.09	9.31	9.53	9.76									

Three-letter codes for resistance value (Codes for E96 series preferred numbers)

For RR0816 series and RG1608 series, Susumu uses special 3 letter codes to designate E96 values. (*uses E24)

code	E96 value	code	E96 value	code	E96 value	code	E96 value	code	E96 value	code	E96 value	code	E96 value	code	E96 value
01	100*	13	133	25	178	37	237	49	316	61	422	73	562	85	750*
02	102	14	137	26	182	38	243	50	324	62	432	74	576	86	768
03	105	15	140	27	187	39	249	51	332	63	442	75	590	87	787
04	107	16	143	28	191	40	255	52	340	64	453	76	604	88	806
05	110	17	147	29	196	41	261	53	348	65	464	77	619	89	825
06	113	18	150*	30	200*	42	267	54	357	66	475	78	634	90	845
07	115	19	154	31	205	43	274	55	365	67	487	79	649	91	866
08	118	20	158	32	210	44	280	56	374	68	499	80	665	92	887
09	121	21	162	33	215	45	287	57	383	69	511	81	681	93	909
10	124	22	165	34	221	46	294	58	392	70	523	82	698	94	931
11	127	23	169	35	226	47	301	59	402	71	536	83	715	95	953
12	130*	24	174	36	232	48	309	60	412	72	549	84	732	96	976

code for power of 10

code	power
A	10 ⁰
H	10 ¹
C	10 ²
D	10 ³
E	10 ⁴
F	10 ⁵
R	10 ⁻¹
S	10 ⁻²

(example) 1780Ω : 178 × 10¹ → 25H

Disclaimer and handling care of our products

Disclaimer

1. The contents of this catalogue are only for reference purposes and its contents may be changed without prior notification. Official specifications will be submitted to each customer. For ordering, please contact our sales representatives.
2. The products listed in this catalogue are for general purpose electronic equipment. Please consult with us if you require specific qualities or reliability as in nuclear or aerospace applications.
3. When you incorporate our products in your design, please utilize them within their specified operating conditions such as rated power and recommended operating temperature. We cannot guarantee our products and cannot take responsibility for the failure of our products if they are used under improper conditions or outside of the parameters of our specified conditions.
4. No part of this publication may be reproduced by any means without the permission of Susumu Co. Ltd.

Handling and care

< Consideration during mounting >

- (1) Before, during and after mounting, take care not to damage the protective coating of the products. Damage to the protective coating may result in weakening the humidity tolerance.
- (2) When using a soldering iron, the heat should be applied to the land pattern not directly to the component. The tip of the soldering iron should not touch the resistors directly.
- (3) Flux residue can cause corrosion and electro-migration resulting in the deterioration of humidity tolerance. If you utilize highly activated flux, such as flux containing chlorine, please consult with us prior to usage.
- (4) Ionized foreign material contamination or residue can also cause corrosion and electro-migration resulting in the deterioration of humidity tolerance. Do not touch the components with bare hands prior to or after mounting.
- (5) If the soldering operation takes place at very high temperatures and for a prolonged period of time, the terminal may dissolve into the solder.
- (6) When mounted components are embedded into resin or polymer, the resin/polymer selection must consider heat tolerance, humidity tolerance, mechanical properties, and chemical or ion composition.

< Operating environment; condition >

- (1) If these components are utilized for unusual conditions, the reliability and characteristics should be verified in advance. Such conditions include:
 - ① Exposure of the component to water, salt water, oils, acids, alkaline, or solvents
 - ② Exposure of the component to direct sunlight, outdoor weather conditions, or heavy dust
 - ③ Exposure to frost
 - ④ Possible exposure to corrosive air or gas such as a marine atmosphere, HCl, Cl₂, H₂S, NH₃, and NO
- (2) Usage under high temperatures and high humidity
- (5) When components are used under high temperature conditions, assess the potential temperatures surrounding the components considering the other heat-producing neighboring components, and regulate your power usage following the specified derating curve.
- (6) If the components are used under high humidity conditions or at temperatures below the dew point, the products can experience positive resistance drift or even an open circuit.
- (3) Use our products under the rated power when the pulse current or voltage is applied. The peak voltage of the pulse should remain under the rated voltage.



Metal thin film chip resistors (Ultra-precision)

■ RG series (This series now includes the former RGH series.)

Features

- Ultimate chip resistors: the result of all of our thin film technology expertise including inorganic passivation
- Resistance drift: less than $\pm 0.1\%$ after 10000 hour accelerated reliability test
- $\pm 0.02\%$ of resistance tolerance and $\pm 5\text{ppm}/^\circ\text{C}$ of temperature coefficient of resistance
- Excellent tolerance to power surges

Applications

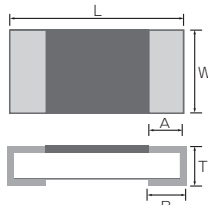
- Any applications that require precision resistors such as automotive electronics, industrial test and measurement equipment, and consumer electronics

Specifications

* Standard stock item: E-24 series with TCR P, Q, and R grades, as well as tolerance D and B grades. Other E-24 grades and E-96 series are made to order

unit : mm

Dimensions



Dimension (inch)	RG1005 (0402) OLD:RGH1005 included	RG1608 (0603) OLD:RGH1608 included	RG2012 (0805) OLD:RGH2012 included	RG3216 (1206)
L	1.0 ± 0.05	1.6 ± 0.2	2.0 ± 0.2	3.2 ± 0.2
W	0.5 ± 0.05	0.8 ± 0.2	1.25 ± 0.2	1.6 ± 0.2
A	0.2 ± 0.10	0.3 ± 0.2	0.4 ± 0.2	0.5 ± 0.25
B	0.25 ± 0.05	0.3 ± 0.2	0.4 ± 0.2	0.5 ± 0.2
T	0.35 ± 0.05	0.4 ± 0.1	0.4 ± 0.1	0.4 ± 0.1

NOTE Obsolete : RGH1005 (0402) RGH:1608-2C (0603) RGH2012 (0805)
Alternative P/N : RG1005 (0402) RG1608(0603) RG2012 (0805)

Electrical characteristics

Series name		RG1005				RG1608					
Rated power*1	High power application	1/8W (OLD : RGH1005-2B)				1/6W (OLD : RGH1608-2C)					
	Regular power application	1/16W				1/10W					
	High precision	1/32W				1/16W					
E series offered		E-24, E-96									
Resistance range (Ω)		10 ~ 46.4	47 ~ 97.6	100 ~ 2.94k	3k ~ 100k	10 ~ 46.4	47 ~ 97.6	100 ~ 4.99k	5.1k ~ 270k	274 ~ 332k	340 ~ 360k
Resistance tolerance (%)	±0.02% (P)	—	—	○	—	—	—	○	—	—	—
	±0.05% (W)	—	○	○	○	—	○	○	○	—	—
	±0.1% (B)	—	○	○	○	—	○	○	○	○	—
	±0.25% (C)	—	○	○	○	—	○	○	○	○	—
	±0.5% (D)	○	○	○	○	○	○	○	○	○	○
Temperature coefficient of resistance (ppm/°C)	±5 (V)	—	—	○	—	—	—	○	—	—	—
	±10 (N)	—	○	○	○	—	○	○	○	—	—
	±25 (P)	—	○	○	○	—	○	○	○	○	○
	±50 (Q)	—	—	—	—	○	—	—	—	—	—
	±100 (R)	○	—	—	—	—	—	—	—	—	—
Maximum voltage		25V				75V					
Operating temperature		-55℃~155℃				-55℃~155℃					
Packaging	5,000pcs	CodeT5				CodeT5					
	10,000pcs	CodeT10				—					

Series name		RG2012					RG3216			
Rated power*1	High power application	1/4W(OLD : RGH2012-2E)					—			
	Regular power application	1/8W					1/4W			
	High precision	1/10W					1/8W			
E series offered		E-24, E-96								
Resistance range(Ω)		10 ~ 46.4	47 ~ 97.6	100 ~ 10k	10.2k ~ 475k	487k ~ 1M	10 ~ 46.4	47 ~ 97.6	100 ~ 33.2k	34k ~ 1M
Resistance tolerance (%)	±0.02% (P)	—	—	○	—	—	—	—	○	—
	±0.05% (W)	—	—	○	○	—	—	○	○	○
	±0.1% (B)	—	○	○	○	○	—	○	○	○
	±0.25% (C)	—	○	○	○	○	—	○	○	○
	±0.5% (D)	○	○	○	○	○	○	○	○	○
Temperature coefficient of resistance (ppm/°C)	±5 (V)	—	—	○	—	—	—	—	○	—
	±10 (N)	—	○	○	○	—	—	○	○	○
	±25 (P)	—	○	○	○	○	—	○	○	○
	±50 (Q)	○	—	—	—	—	○	—	—	—
	Maximum voltage		100V					150V		
Operating temperature		-55℃ ~ 155℃					-55℃ ~ 155℃			
Packaging	5,000pcs	CodeT5					CodeT5			

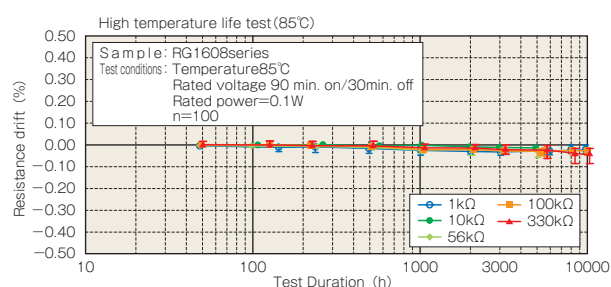
*1 Depending on customer's reliability requirements, power rating between high power and regular power can be selected.
· Contact us for RG3225 with 1/2W rated power.

Reliability characteristics

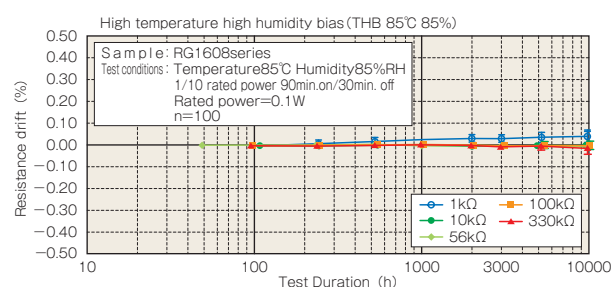
Item	Test Method	Specification: drift limits for each power rating						(Typical)
		Low		Regular		High		
		≤47Ω	≥47Ω	≤47Ω	≥47Ω	≤47Ω	≥47Ω	
Short time Overload	Applied voltage : 2.5Xrated voltage or 2 X Maximum operating voltage which ever is less test duration: 5 seconds	±0.1%	±0.05%	±0.1%	±0.05%	—	±0.1%	±(0.01%)
Load Life	Test Temperature : 85℃ Applied voltage: rated voltage Test period : repeat 1000 cycle as follow : 90 min./30 min. off cycled	±0.25%	±0.1%	±0.5%	±0.25%	—	±0.5%	±(0.01%)
Moisture load life	Test condition : 85℃ 85% RH Applied power: 1/10 rated Power Test period : repeat 1000 cycle as follow : 90 min./30 min. off cycled	±0.25%	±0.1%	±0.5%	±0.25%	—	±0.5%	±(0.05%)
Temperature Cycle	Repeat 1000 cycle as follow : —55℃ (30 min.)/Room Temp.(2 min.) / +125℃ (30min.)/Room Temp.(2min.)	±0.25%	±0.1%	±0.25%	±0.1%	—	±0.1%	±(0.01%)
High temperature Exposure	+155℃ for 1000 hours with no load	±0.25%	±0.1%	±0.25%	±0.1%	—	±0.1%	±(0.01%)

10000 hour reliability test data

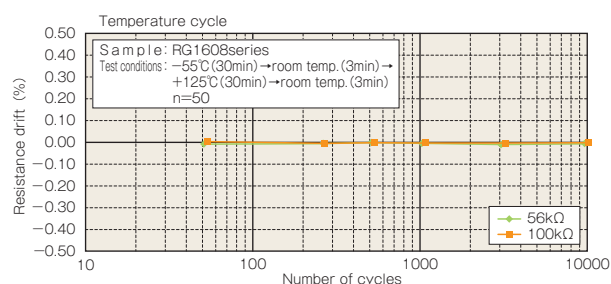
Life test



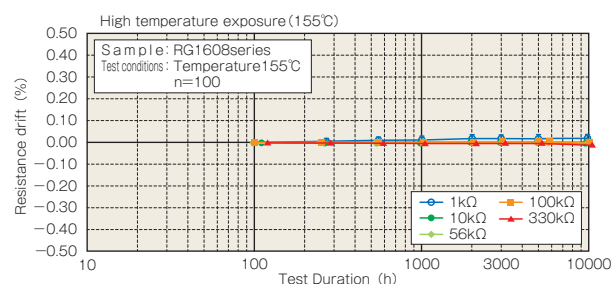
High temperature high humidity bias test



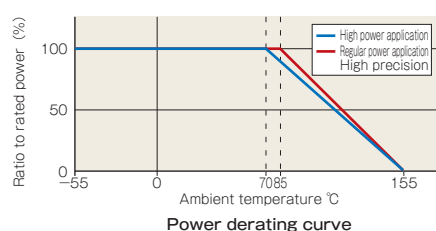
Temperature cycle test



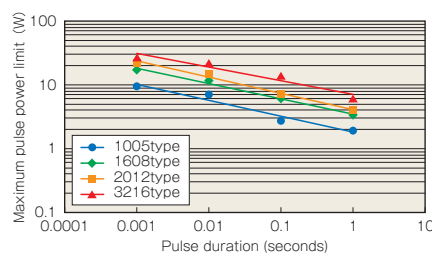
High temperature exposure test



Power derating characteristics



Maximum pulse power limit



Test procedure

Voltage pulse is applied to the test samples mounted on the test board.

After each pulse, resistance drift is measured. Pulse voltage is increased until the drift exceeds $\pm 0.5\%$. The power at that voltage is defined as the maximum pulse power.

Part numbering system

(New name) **RG 1608**

N-102-B-T5

Packaging: T5 (5000pcs) T10 (10000pcs)

Resistance tolerance

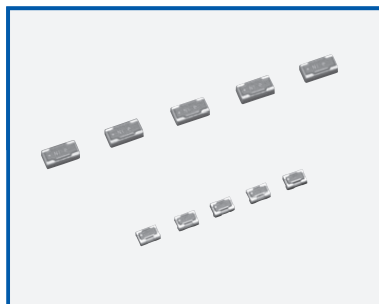
Resistance value
(E-24:3digit, E-96:4digit, RG3216:all 4 digit)

Temperature coefficient of resistance
Power (2B:1/8W, 2C:1/6W, 2E:1/4W)

Size

Series code

(Old name) **RGH 1608 2C-N-102-B-T5**



Metal thin film resistor networks

■ RM series

Features

- Ultra accuracy: relative resistance tolerance $\pm 0.01\%$, relative TCR $\pm 1\text{ppm}/^\circ\text{C}$
- Ultra reliability: 10,000 hours of $85^\circ\text{C}/85\text{RH}$ test or 10,000 of 155°C high temperature exposure test causes less than $\pm 0.1\%$ resistance drift

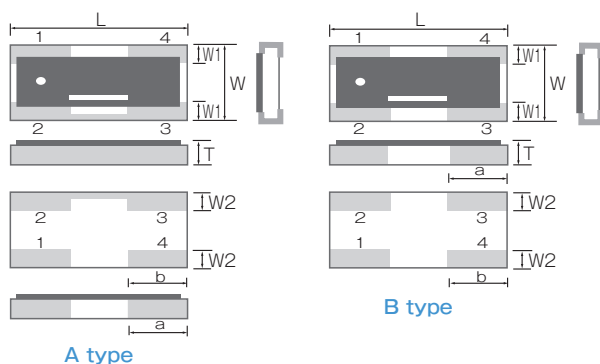
Applications

- Applications that require a precise relative resistance ratio such as voltage dividers, and gain-setting circuits for amplifiers.

Specifications

* All products are made to order.

Dimensions



unit : mm

Dimension (inch)	RM2012 (0805)	RM3216 (1206)
L	2.0 ± 0.2	3.2 ± 0.2
W	1.25 ± 0.2	1.6 ± 0.2
W1	0.4 ± 0.2	0.4 ± 0.25
W2	0.35 ± 0.2	0.4 ± 0.2
a	0.5 ± 0.2	1.0 ± 0.25
b	0.6 ± 0.2	1.0 ± 0.2
T	0.4 ± 0.1	0.4 ± 0.1

Electrical characteristics

Series name	RM2012		RM3216	
Rated power	High power application		0.05W/Element, 0.1W/Package	
Resistance range (Ω)	100 ~ < 300		300 ~ 100k Ω	
Resistance tolerance (%)	± 0.05 (W)	—	—	—
	± 0.1 (B)	○	○	○
	± 0.5 (D)	○	○	○
Relative resistance tolerance (%)	± 0.01 (L)	Resistance ratio=1		Resistance ratio=1
	± 0.02 (P)	Resistance ratio ≤ 10		Resistance ratio ≤ 10
	± 0.05 (W)	Resistance ratio ≤ 100		Resistance ratio ≤ 100
Temperature coefficient of resistance (ppm/ $^\circ\text{C}$)	± 10 (N)	—	—	—
	± 25 (P)	○	○	○
Relative TCR (ppm/ $^\circ\text{C}$)	± 1 (X)	Resistance ratio=1		Resistance ratio=1
	± 2 (W)	1<Resistance ratio ≤ 3		1<Resistance ratio ≤ 3
	± 5 (V)	Resistance ratio>3		Resistance ratio>3
Maximum voltage /element	25V		50V	
Operating temperature	$-55^\circ\text{C} \sim 155^\circ\text{C}$		$-55^\circ\text{C} \sim 155^\circ\text{C}$	
Packaging	1,000pcs	Code10	Code10	Code10
	5,000pcs	Code50	Code50	Code50

* Relative resistance tolerance is defined as the ratio of the actual R2/R1 against the specified R2/R1 as expressed:

$$\left[\frac{\text{actual R2/R1}}{\text{specified R2/R1}} - 1 \right] \times 100$$

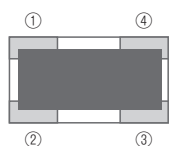
* Relative TCR is defined as : (TCR of R2)-(TCR of R1)

Standard resistance value pairings

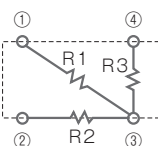
Ratio	R1 (Ω)	R2 (Ω)	Ratio	R1 (Ω)	R2 (Ω)	Ratio	R1 (Ω)	R2 (Ω)	Ratio	R1 (Ω)	R2 (Ω)	Ratio	R1 (Ω)	R2 (Ω)	Ratio	R1 (Ω)	R2 (Ω)
1 : 1	1k	1k	1 : 3	1k	3k	1 : 5	1k	5k	1 : 9	1k	9k	1 : 20	1k	20k	1 : 50	1K	50k
	10k	10k		10k	30k		2k	10k		10k	90k		2k	40k		2K	100k
	100k	100k		100k	300k		10k	50k		1k	10k		5k	100k		1K	100k
1 : 2	1k	2k	1 : 4	1k	4k	1 : 6	1k	6k	1 : 10	2k	20k	1 : 25	1k	25k	1 : 100	2K	200k
	10k	20k		10k	40k		10k	60k		10k	100k		2k	50k			
	100k	200k															

Standard circuits

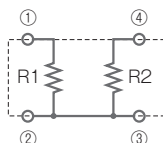
2012/3216Size



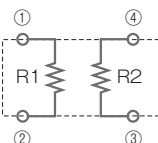
Outside appearance



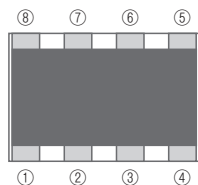
Circuit diagram : 3 element type



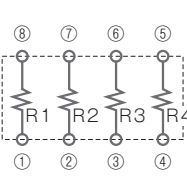
Circuit diagram : A type



Circuit diagram : B type

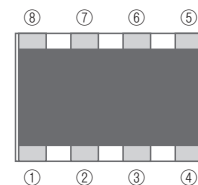
3216Size 4 element type
(array, network with different resistance values)

Outside appearance

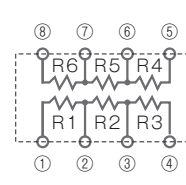


Circuit diagram

3216Size 6 element type



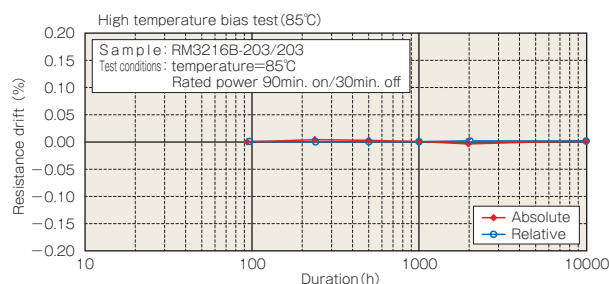
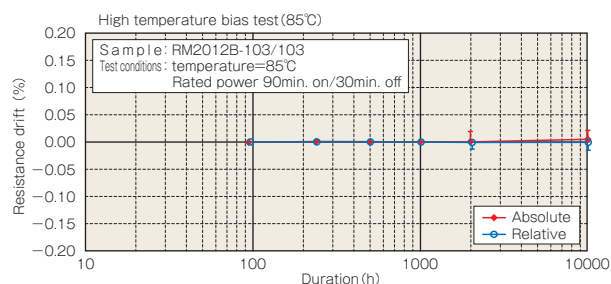
Outside appearance



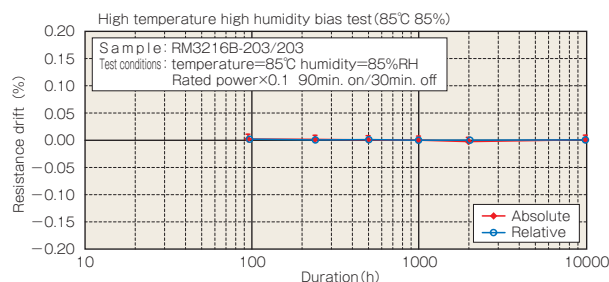
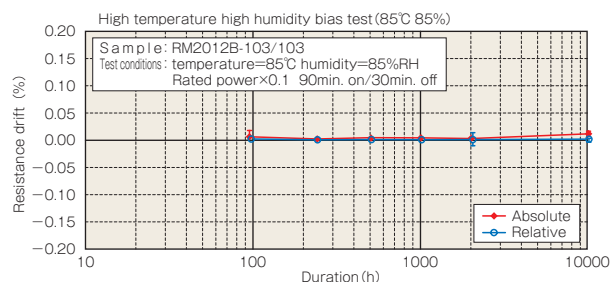
Circuit diagram

10000 hour reliability test data

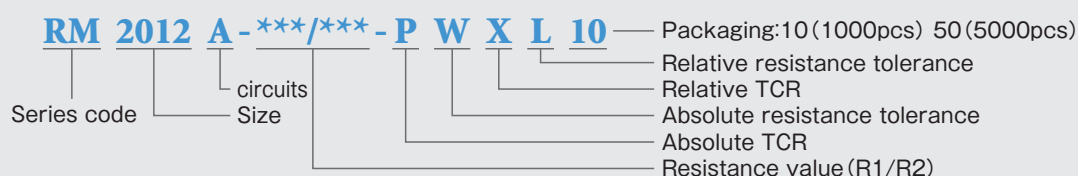
Life test



High temperature high humidity bias test



Part numbering system



Please contact us for specific custom requirements for resistance values, resistance ratios, number of elements, circuitry and any others.



Metal thin film chip resistors (precision)

■ RR series

Features

- Excellent characteristics in resistance tolerance, temperature coefficient of resistance, current noise, and linearity

Applications

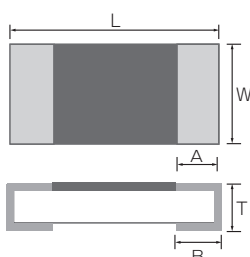
- Any electronics applications that require accuracy and reliability such as automotive electronics, industrial test and measurement, consumer electronics and many others.

Specifications

* Stocked items: E-24 series (TCR P and Q, resistance tolerance D), other E-24 and E-96 series are made to order.

▣ Dimensions

unit : mm



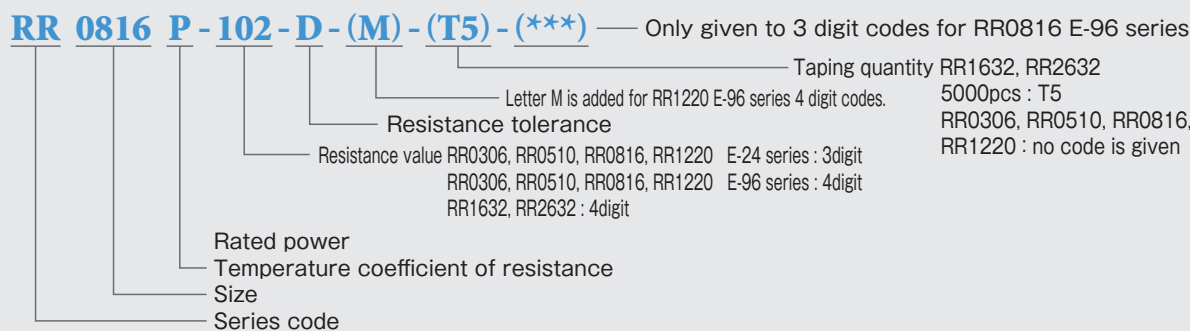
Dimension (inch)	RR0306 (0201)	RR0510 (0402)	RR0816 (0603)	RR1220 (0805)	RR1632 (1206)	RR2632 (1210)
L	0.60±0.05	1.00±0.05	1.60±0.20	2.00±0.20	3.20±0.20	3.20±0.20
W	0.30±0.05	0.50±0.05	0.80±0.20	1.25±0.20	1.60±0.20	2.60±0.20
A	0.12±0.05	0.20±0.10	0.30±0.20	0.40±0.20	0.50±0.20	0.50±0.20
B	0.12±0.05	0.25±0.05	0.30±0.20	0.40±0.20	0.45±0.20	0.45±0.20
T	0.23±0.03	0.35±0.05	0.40±0.10	0.40±0.10	0.40±0.10	0.40±0.10

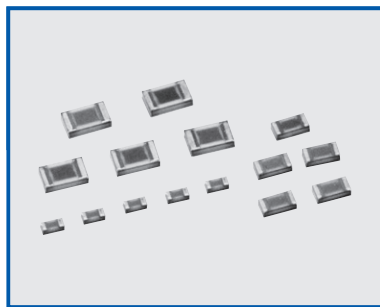
▣ Electrical characteristics

Series name		RR0306		RR0510		RR0816		RR1220		RR1632			RR2632		
power		1/20W		1/16W		1/16W		1/10W		1/8W			1/4W		
E series offered		E-24		E-24, E-96											
Resistance range (Ω)		10~30	33~22k	10~91	100~100k	10~91	100~360k	10~91	100~1M	10~47	51~1M	100~200k	10~47	51~1M	100~200k
Resistance tolerance (%)	±0.1% (B)	—	—	—	—	—	—	—	—	—	—	○	—	—	○
	±0.5% (D)	—	○	○	○	○	○	○	○	○	○	—	○	○	—
	±1.0% (F)	○	—	—	—	—	—	—	—	—	—	—	—	—	—
Temperature coefficient of resistance (ppm/°C)	±5 (V)	—	—	—	—	—	—	—	—	—	—	○	—	—	○
	±10 (N)	—	—	—	—	—	—	—	—	—	—	○	—	—	○
	±25 (P)	—	○	—	○	—	○	—	○	—	○	○	—	○	○
	±50 (Q)	—	—	—	—	○	—	○	—	○	—	—	○	○	—
	±100 (R)	○	—	○	—	—	—	—	—	—	—	—	—	—	—
Maximum voltage		15V		25V		75V		100V		150V			200V		
Operating temperature		-55°C ~ 125°C													
Packaging	5,000pcs	○	—	—	—	○	—	—	○	—	○	—	—	○	—
	10,000pcs	—	—	○	—	—	—	—	—	—	—	—	—	—	—

Contact us for the jumper resistor in RR0816 size (part number: RL0816-JMP)

Part numbering system





Metal thin film trimmable chip resistors

RT series

Features

- Patented trimming method (patent# 1921853) allows high trimming accuracy, excellent reliability after trimming and short trimming time
- Small sizes down to 0.6mm x 0.3mm

Applications

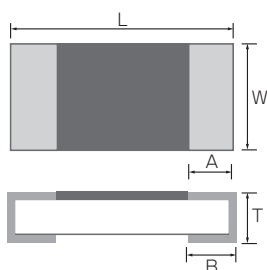
- Sensor circuits that require high precision such as automotive electronics
- PA modules in mobile phones
- Devices that require strong vibration tolerance such as microphones

Specifications

* All made to order.

Dimensions

unit : mm



Dimension (inch)	RT0306 (0201)	RT0510 (0402)	RT0816 (0603)	RT1220 (0805)
L	0.60±0.05	1.00±0.07	1.60±0.20	2.00±0.20
W	0.30±0.03	0.50±0.07	0.80±0.20	1.25±0.20
A	0.12±0.05	0.20±0.10	0.30±0.20	0.40±0.20
B	0.15±0.05	0.25±0.20	0.30±0.20	0.40±0.20
T	0.25±0.03	0.35±0.05	0.40±0.10	0.40±0.10

Electrical characteristics

Series name		RT0306			RT0510			RT0816					RT1220							
power		1/20W			1/16W			1/16W					1/10W							
Initial resistance value (Ω)		150	330	1.5k	100	270	1.5k	100	330	1.0k	3.3k	10k	33	100	330	1.0k	3.3k	10k	33k	100k
Targeted resistance value (Ω)		1.0k	1.9k	10k	820	2.1k	10k	2.7k	8.0k	8.8k	37k	40k	4.7k	8.2k	15k	15k	100k	120k	120k	220k
Initial value tolerance (%)		±20% (M)			±20% (M)			±20% (M)					±20% (M)							
Temperature coefficient of resistance (ppm/℃)	±25 (P)	○	○	—	○	○	—	○	○	○	—	—	—	○	○	○	—	—	—	—
	±50 (Q)	—	—	—	—	—	—	—	—	—	—	—	○	—	—	—	—	—	—	—
	±100 (R)	—	—	○	—	—	○	—	—	—	○	○	—	—	—	—	○	○	○	○
Maximum voltage		15V			25V			75V					100V							
Operating temperature		-55℃~125℃			-55℃~125℃			-55℃~125℃					-55℃~125℃							
Packaging	5,000pcs	—			—			○					○							
	10,000pcs	—			○			—					—							
	15,000pcs	○			—			—					—							

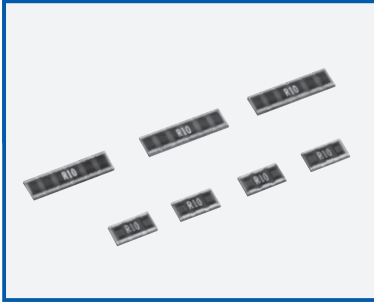
Part numbering system

RT 0816 P - 102 - M

Resistance tolerance
Resistance value
Temperature coefficient of resistance
Size
Series code

Low resistance chip resistors (long side terminal type)

■ This series includes (some of) former PRL/RL series



Features

- The distinctive structure that encourages heat dissipation and radiation limits the rise of the surface temperature, allows the realization of smaller sizes, and reduces influence of heat on surrounding components. Low ESL contributes to less noise. This product also withstands temperature cycles very well.

Applications

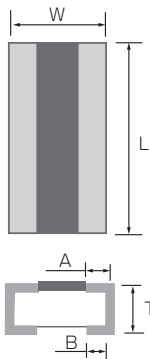
- PCs, power sources, inverters, automotive electronics, adaptors and industrial machining equipment.

Specifications

* All made to order.

Dimensions

unit : mm



Dimension (mm)	PRL0816 (0603)	PRL1220 (0805)	PRL1632 (1206)	PRL3264 (2512)	RL3720W (0815)	RL7520W (0830)
L	1.6±0.2	2.0±0.2	3.2±0.2	6.4±0.2	3.75±0.30	7.50±0.30
W	0.8±0.2	1.25±0.2	1.6±0.2	3.2±0.2	2.00±0.20	2.00±0.20
A	—	—	—	—	0.40±0.20	0.40±0.20
B	0.2±0.1	0.35±0.15	0.45±0.15	0.9±0.15	0.40±0.20	0.40±0.20
T	0.4±0.1	0.5±0.1	0.5±0.1	0.5±0.1	0.5±0.2	0.5±0.2

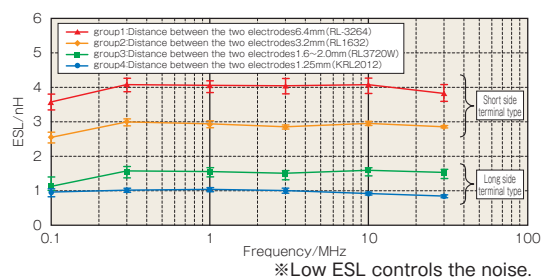
NOTE Obsolete: RL3720, RL3720W, RL7520W
Alternative P/N: PRL3720, PRL3720W, PRL7520W

Electrical characteristics

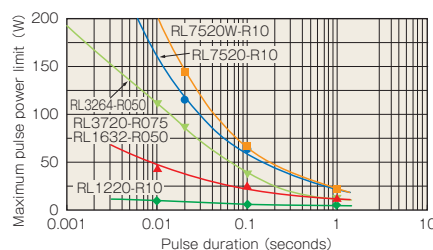
Series name		PRL0816		PRL1220			PRL1632		PRL3264			
Power		1/3W		2/3W			1W		2W			
E series offered		E-24		E-24 1mΩstep (7m~10mΩ)			E-24 1mΩstep (5m~10mΩ)		E-24 1mΩstep (3m~10mΩ)			
Initial resistance value (Ω)		0.01 ~ 0.039	0.043 ~ 0.1	0.007 ~ 0.009	0.01 ~ 0.043	0.047 ~ 0.1	0.005 ~ 0.009	0.01~0.1	0.003 ~ 0.004	0.005 ~ 0.009	0.010 ~ 0.043	0.047~0.1
Resistance tolerance (%)	±0.5% (D)	—	○	—	—	○	—	○	—	—	—	○
	±1.0% (F)	○	○	—	○	○	○	○	—	—	○	○
	±2.0% (G)	—	—	○	○	○	○	○	—	○	○	○
	±5.0% (J)	—	—	—	—	—	—	—	○	—	—	—
Temperature coefficient of resistance (ppm/°C)		15mΩ or less 0~350ppm/°C		7m~9mΩ 0~350ppm/°C			9mΩ or less 0~350ppm/°C					
		18m~27mΩ 0~200ppm/°C		10m~18mΩ 0~200ppm/°C			10m~18mΩ 0~200ppm/°C					
		33m~68mΩ ±100ppm/°C		20m~51mΩ ±100ppm/°C			20m~51mΩ ±100ppm/°C					
		75m~100mΩ ±50ppm/°C		56m~100mΩ ±50ppm/°C			56m~100mΩ ±50ppm/°C					
Maximum voltage		$\sqrt{P \cdot R}$										
Operating temperature		-55°C ~ 125°C										
Packaging	5,000pcs	○										

Series name	RL3720W				RL7520W			
power	1W				2W			
E series offered	E-24 1mΩstep (1m~10mΩ)				E-24 1mΩstep (1m~10mΩ)			
Initial resistance value (Ω)	0.001 ~ 0.004	0.005 ~ 0.009	0.010 ~ 0.091	0.1 ~ 1.0	0.001 ~ 0.004	0.005 ~ 0.009	0.010 ~ 0.091	0.1 ~ 0.47
Resistance tolerance (%)	±1.0% (F)	—	—	—	—	—	—	—
	±2.0% (G)	—	—	—	—	—	—	—
	±5.0% (J)	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	—
Temperature coefficient of resistance (ppm/°C)	0~+50 (Q)	—	—	—	—	—	—	—
	0~+100 (R)	—	—	—	—	—	—	—
	0~+200 (S)	—	—	—	—	—	—	—
	0~+350 (T)	—	—	—	—	—	—	—
	0~+420 (T)	—	—	—	—	—	—	—
	0~+800 (T)	—	—	—	—	—	—	—
Maximum voltage	$\sqrt{P \cdot R}$							
Operating temperature	-55°C ~ 125°C							
Packaging	4,000pcs							

ESL



Resistance to power pulse



Test procedure

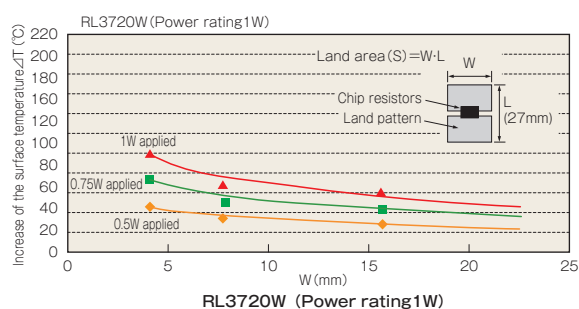
Voltage pulse is applied to the test samples mounted on the test board.

After each pulse, resistance drift is measured. Pulse voltage is increased until the drift exceeds $\pm 0.5\%$. The power at that voltage is defined as the maximum pulse power.

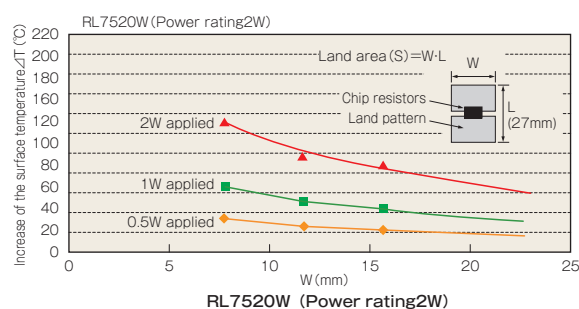
Surface temperature data

The high power type land pattern and surface temperature

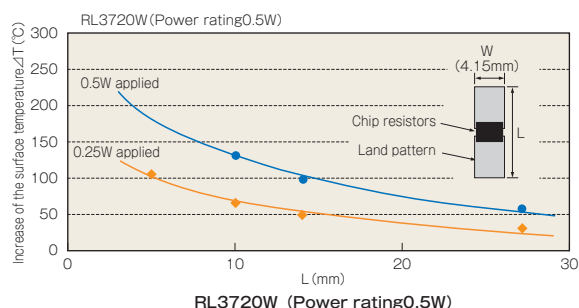
These high-power low resistance chip resistors are designed to dissipate heat efficiently through the land patterns on circuit boards. The actual temperature of the surface of the resistor is dependent upon the dimensions and the shape of the land patterns.



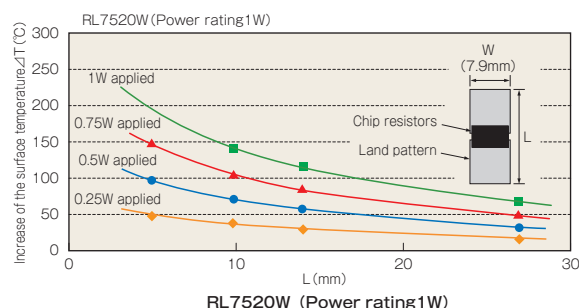
RL3720W (Power rating 1W)



RL7520W (Power rating 2W)

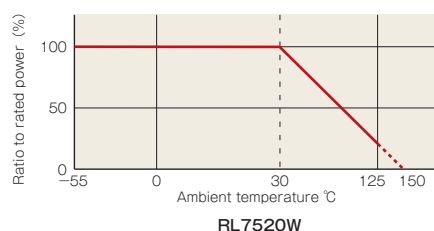
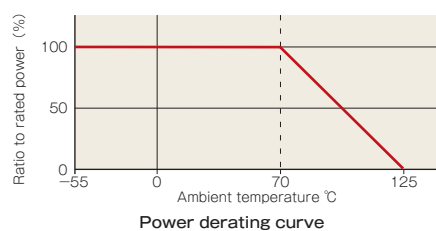


RL3720W (Power rating 0.5W)



RL7520W (Power rating 1W)

Power derating characteristics



RL7520W

Part numbering system

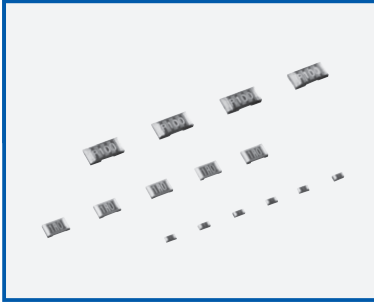
PRL 1220 T-R10-F-(T5)

Packaging: T5 (5000pcs)
Resistance tolerance
Resistance value
Temperature coefficient of resistance
Size
Series code

RL 3720W T-R10-F

Low resistance chip resistors (short side terminal)

■ This series includes (some of) former RP and RPH series



* 1 : Except for RL0510、RL1632、RL3264

Features

- The distinctive structure that encourages heat dissipation and radiation limits the rise of the surface temperature, allows the realization of smaller sizes, and reduces the influence of heat on surrounding components.

Applications

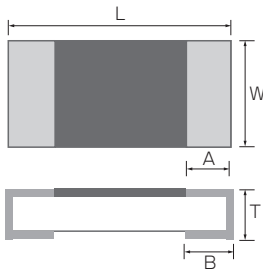
- PCs, power sources, mobile phones, automotive electronics, adaptor and industrial machining equipment.

Specifications

* All made to order.

Dimensions

unit : mm



Dimension (inch)	RL0510 (0402) (OLD:RP1005 included)		RL0816 (0603) (OLD:RP1608,RPH1608 included)		RL1220 (0805) (OLD:RP2012 included)		RL1632 (1206)	RL3264 (2512)
	R≤0.2Ω	R>0.2Ω	R≤0.082Ω	R>0.091Ω	R≤0.068Ω	R>0.075Ω		
L	1.00±0.05		1.60±0.20		2.00±0.20		3.2±0.20	6.4±0.20
W	0.50±0.05		0.80±0.20		1.25±0.20		1.6±0.20	3.2±0.20
A	0.15±0.10		0.20±0.15		0.40±0.20		—	—
B	0.25±0.10	0.15±0.10	0.25±0.20	0.20±0.15	0.40±0.20		1.00±0.15	2.00±0.15
T	0.35±0.15/-0.10	0.35±0.10	0.45±0.15/-0.10	0.45±0.10	0.5±0.20	0.4±0.10	0.5±0.15	0.5±0.15

NOTE Obsolete: RP1005, RP1608, RPH1608, RP2012
Alternative P/N:RL0510, RL0816, RL1220

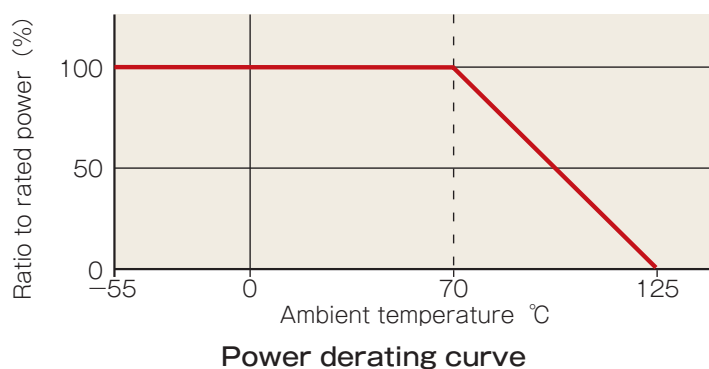
Electrical characteristics

Series name	RL0510 (OLD : RP1005 included)			RL0816 (OLD:RP1608,RPH1608 included)			RL1220 (OLD:RP2012 included)			
Power	1/8W	1/6W (OLD : RP1005 included)		1/4W (OLD : RPH1608)	1/5W (OLD : RP1608)		1/4W		1/3W (OLD : RP2012)	
E series offered	E-24									
Resistance range (Ω)	R<0.05~0.1	0.1~4.7	5.1~47	R<0.01~0.1	0.1~6.8	7.5~68	0.01~0.039	0.043~0.091	0.1~10	11~100
Resistance tolerance (%)	±1.0 (F)	○	○	○	○	○	○	○	○	○
	±2.0 (G)	○	○	○	—	○	○	○	○	○
	±5.0 (J)	—	—	○	○	○	○	○	○	○
Temperature coefficient of resistance (ppm/°C)	0~+100(R)	—	—	—	○	—	—	—	○	—
	0~+200(S)	—	○	○	○	○	—	○	○	○
	0~+350(T)	○	—	—	○	—	○	○	—	—
Maximum voltage	$\sqrt{P \cdot R}$									
Operating temperature	-55~125°C									
Packaging	5,000pcs	—					○			
	10,000pcs	○					—			

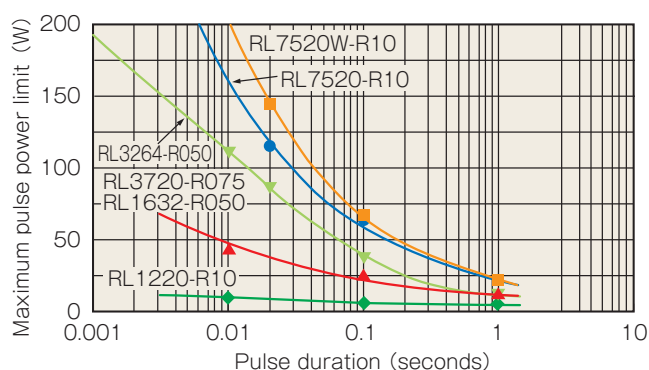
Series name	RL1632						
Power	1/ 2W						
E series offered	E-24						
Resistance range (Ω)	0.01~0.016	0.018~0.024	0.027~0.03	0.033~0.051	0.056~0.47	0.51~4.7	
Resistance tolerance (%)	±0.5 (D)	—	—	—	—	○	
	±1.0 (F)	—	—	○	○	○	
	±2.0 (G)	○	○	○	○	—	
Temperature coefficient of resistance (ppm/°C)	0~+100(R)	—	—	—	○	○	
	0~+200(S)	—	—	—	○	—	
	0~+350(T)	—	○	○	—	—	
	0~+500(T)	○	—	—	—	—	
Maximum voltage	$\sqrt{P \cdot R}$						
Operating temperature	-55~125°C						
Packaging	5,000pcs	○					

Series name		RL3264				
Power		1W				
E series offered		Standard stock item : E-24series E-12series				
Resistance range (Ω)		0.01 ~ 0.015	0.018 ~ 0.022	0.027	0.033 ~ 0.047	0.056 ~ 0.47
Resistance tolerance (%)	±0.1 (B)	—	—	—	—	—
	±0.5 (D)	—	—	—	—	—
	±1.0 (F)	—	—	○	○	○
	±2.0 (G)	○	○	○	○	○
	±5.0 (J)	—	—	—	—	—
Temperature coefficient of resistance (ppm/°C)	0 ~ +100 (R)	—	—	—	—	○
	0 ~ +200 (S)	—	—	—	○	—
	0 ~ +350 (T)	—	○	○	—	—
	0 ~ +500 (T)	○	—	—	—	—
Maximum voltage		$\sqrt{P \cdot R}$				
Operating temperature		-55 ~ 125°C				
Packaging	5,000pcs	○				

Power derating characteristics



Resistance to power pulse

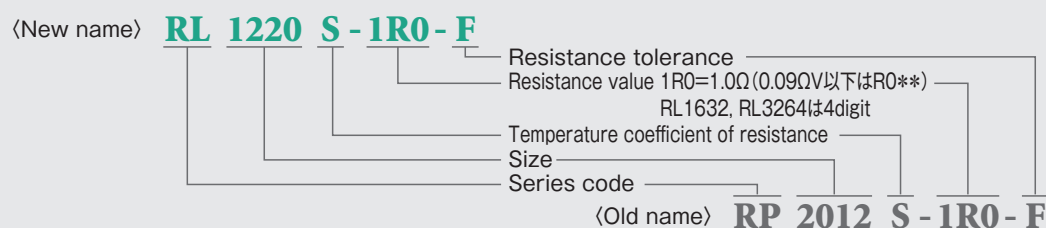


Test procedure

Voltage pulse is applied to the test samples mounted on the test board.

After each pulse, resistance drift is measured. Pulse voltage is increased until the drift exceeds +/-0.5%. The power at that voltage is defined as the maximum pulse power.

Part numbering system



Metal plate low resistance chip resistors

RL series

Features

- Operating temperature: stable up to 170°C
- Resistance tolerance: +/-1%, TCR +/-50ppm/°C
- Protective outer coating is halogen free in consideration of the environment.

Applications

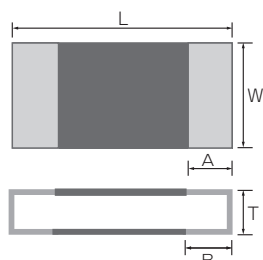
- Power sources, servers, etc.

Specifications

* All made to order.

Dimensions

unit : mm



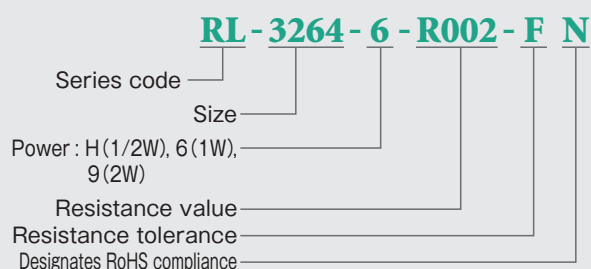
Dimension (inch)	RL1632H (1206)	RL3264-6 (2512)	RL3264-6C (2512)	RL3264-9V (2512)	RL3264-6W, -9C (2512)
L	3.20±0.33(1-4mΩ) 3.20±0.20(5-150mΩ)	6.35±0.25	6.35±0.25	6.35±0.25	6.35±0.25
W	1.60±0.33(1-4mΩ) 1.60±0.20(5-150mΩ)	3.20±0.20	3.20±0.20	3.20±0.20	3.20±0.20
A	—	2.50±0.15(1mΩ) 1.90±0.15(2mΩ)	1.0±0.25(1mΩ)	2.21±0.25(1-4mΩ) 1.19±0.25(5-6mΩ) 0.76±0.25(7-11mΩ)	0.70 ± 0.20
B	1.25±0.20(1mΩ) 0.50±0.20(2-4mΩ) 0.50±0.15(5-150mΩ)	—	—	—	—
T	0.65±0.15(1-2mΩ) 0.50±0.15(3-4mΩ) 0.80±0.15(5-150mΩ)	0.70±0.15(1mΩ) 0.65±0.15(2mΩ)	1.05±0.15(3-5mΩ) 0.80±0.15(≥6mΩ)	1.30±0.25(1mΩ) 1.20±0.25(2-4mΩ) 1.00±0.25(5-11mΩ)	(1mΩ) 2.30 ± 0.15 (2mΩ) 1.45 ± 0.15 (5~20mΩ) 1.15 ± 0.25

Electrical characteristics

Series name	RL1632H				RL3264-6		RL3264-6C		RL3264-9V		
Power	1/2W				1W		1W		2W		
E series offered	1mΩ STEP				1mΩ STEP		1mΩ STEP	E-24	1mΩ STEP		
Resistance range (Ω)	1m	2m	3m~10m	11m~150m	1m	2m	3m~10m	11m~100m	1m~2m	3m~4m	5m~11m
Resistance tolerance (%)	±1.0(F)	—	○	○	—	—	○	○	○	○	○
	±2.0(G)	—	○	—	○	○	—	—	—	—	—
	±5.0(J)	○	○	○	○	○	○	○	○	○	○
Temperature coefficient of resistance (ppm/°C)	±50	—	—	○	—	—	○	○	—	—	○
	±100	—	—	○	—	○	—	—	—	—	—
	±150	—	○	—	—	—	—	—	—	○	—
	±200	—	—	—	○	—	—	—	—	—	—
	±275	○	—	—	—	—	—	—	○	—	—
Maximum voltage	$\sqrt{P \cdot R}$										
Operating temperature	-55 ~ 170°C										
Packaging	2,000pcs										

Series name	RL3264-6W		RL3264-9C	
Power	1W		2W	
E series offered	1mΩ STEP		1mΩ STEP	
Resistance range (Ω)	1m~2m	5m~20m	1m~2m	5m~20m
Resistance tolerance (%)	±1.0(F)	○	○	○
	±2.0(G)	○	○	○
	±5.0(J)	○	○	○
Temperature coefficient of resistance (ppm/°C)	±75			
Maximum voltage	$\sqrt{P \cdot R}$			
Operating temperature	-55 ~ 170°C			
Packaging	2,000pcs			

Part numbering system



Metal foil low resistance chip resistors (long-side and short-side terminals)

KRL series

Features

- The C type utilizes materials that withstand high temperatures and can be operated up to 170°C. The M type utilizes low emf materials that are stable up to 155°C. TCR is very stable for very low resistance: $\pm 150\text{ppm}/^\circ\text{C}$ for 1m Ω , $\pm 100\text{ppm}/^\circ\text{C}$ for 2m Ω , and $\pm 50\text{ppm}/^\circ\text{C}$ for 3m Ω . Face down mounting allows for accurate current measurement. Long and short side terminal types, as well as power ratings from 1/3W to 5W are offered to meet customers' specific requirements. The protective outer coating is halogen free in consideration of the environment.

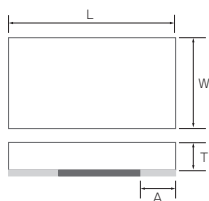
Applications

- PCs, hard drive discs, audio visual equipment.

Specifications

* All made to order.

Dimensions : Short side terminal

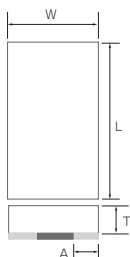


Dimensions (mm)	KRL1220	KRL1632	KRL3264
L	2.0 $\pm$ 0.20	3.2 $\pm$ 0.20	6.3 $\pm$ 0.20
W	1.25 $\pm$ 0.20	1.6 $\pm$ 0.20	3.1 $\pm$ 0.20
T	0.5 $\pm$ 0.20	0.5 $\pm$ 0.20	0.5 $\pm$ 0.20
A (5.0~7.0m Ω)	0.4 $\pm$ 0.20	1.10 $\pm$ 0.20	1.90 $\pm$ 0.20
A (8.0m Ω ~)		0.4 $\pm$ 0.20	1.0 $\pm$ 0.20

Electrical characteristics : Short side terminal

Series name	KRL1220	KRL1632	KRL3264
Power	1/3W	1/2W	1W
E series offered	E-12	1m Ω STEP	E-12
Resistance range (Ω)	10m~100m	5m~9m	10m~100m
Resistance tolerance (%)	± 1.0 (F)	—	± 2.0 (G)
Temperature coefficient of resistance (ppm/ $^\circ\text{C}$)	± 50	—	± 100
Operating temperature	C	—	—
Packaging	1,000pcs	—	—
	5,000pcs	—	—

Dimensions : Long side terminal



Dimensions (mm)	KRL2012	KRL3216	KRL6432	KRL7638	KRL9045	KRL11050
L	2.0 $\pm$ 0.20	3.2 $\pm$ 0.20	6.3 $\pm$ 0.20	7.6 $\pm$ 0.20	8.9 $\pm$ 0.20	11.0 $\pm$ 0.20
W	1.25 $\pm$ 0.20	1.6 $\pm$ 0.20	3.1 $\pm$ 0.20	3.8 $\pm$ 0.20	4.5 $\pm$ 0.20	5.0 $\pm$ 0.20
T	0.5 $\pm$ 0.20	0.5 $\pm$ 0.20	0.5 $\pm$ 0.20	0.5 $\pm$ 0.20	0.5 $\pm$ 0.20	0.5 $\pm$ 0.20
A (1m Ω)	0.55 $\pm$ 0.20	0.60 $\pm$ 0.20	1.20 $\pm$ 0.20	1.35 $\pm$ 0.20	1.60 $\pm$ 0.20	1.80 $\pm$ 0.20
A (2m Ω)	0.40 $\pm$ 0.20	0.40 $\pm$ 0.20	0.50 $\pm$ 0.20	0.60 $\pm$ 0.20	0.70 $\pm$ 0.20	0.80 $\pm$ 0.20
A (3m Ω ~)	0.30 $\pm$ 0.20	0.30 $\pm$ 0.20				

Electrical characteristics : Long side terminal

Series name	KRL2012	KRL3216	KRL6432	KRL7638	KRL9045	KRL11050
Power	2/3W	1W	2W	3W	4W	5W
E series offered	1m Ω STEP	1m Ω STEP	1m Ω STEP	1m Ω STEP	1m Ω STEP	1m Ω STEP
Resistance range (Ω)	1m 2m 3m~9m 10m~50m	1m 2m 3m~9m 10m~50m	1m 2m 3m~9m 10m~50m	1m 2m 3m~9m 10m~100m	1m 2m 3m~9m 10m~100m	1m 2m 3m~9m 10m~100m
Resistance tolerance (%)	± 1.0 (F)	—	± 2.0 (G)	—	± 5.0 (J)	—
Temperature coefficient of resistance (ppm/ $^\circ\text{C}$)	± 50	—	± 100	—	± 150	—
Operating temperature	C	—	M	—	—	—
Packaging	1,000pcs	—	—	—	—	—
	5,000pcs	—	—	—	—	—

· Contact us for ERL series with wrap round type of termination.

Part numbering system

KRL 6432 - C - R010 - F - T1

Packaging: T1 (1000pieces) T5 (5000pieces)

Resistance tolerance
Resistance value
Operating temperature: C (High temperature type) M (Low emf type)
Size
Series code

Thick film chip resistors

RLT series **NEW**

Features

- Offering a variety of sizes (0510-3264) and power ratings (1/8W-1W)
- Current sensing thick film chip resistors

Applications

- PCs, HDDs, mobile phones, power sources, motors, etc.

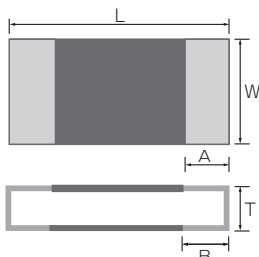


Specifications

* E-24 series are standard stock items. E-96 series are made to order.

unit : mm

Dimensions



Dimension (inch)	RLT 0510-2 (0402)	RLT 0816-3 (0603)	RLT 1220-F (0805)	RLT 1632-4 (1206)	RLT 2550-5 (2010)	RLT 3264-6 (2512)
L	1.00 ±0.10	1.60 ±0.15	2.00 ±0.20	3.20 ± 0.20	5.00 ± 0.15	6.30 ±0.15
W	0.50 ±0.10	0.80 ±0.15	1.25 ±0.20	1.60 ± 0.20	2.50 ± 0.15	3.20 ±0.15
T	0.35±0.15/ -0.10	0.45 ±0.10	0.50 ±0.10	0.60 ± 0.10	0.55 ± 0.15	0.55 ±0.15
A	0.25 ±0.10	0.30 ±0.20	0.40 ±0.20	0.50 ± 0.25	0.60 ± 0.20	0.60 ±0.20
B	0.30 ±0.10	0.30 ±0.20	0.40 ±0.20	0.50 ± 0.25	0.60 ± 0.20	0.60 ±0.20

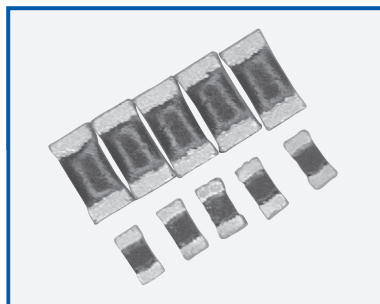
Electrical characteristics

Series name	RLT0510-2		RLT0816-3		RLT1220-F			RLT1632-4		RLT2550-5		RLT3264-6	
Rated power	1/8W		1/4W		1/3W			1/2W		3/4W		1W	
E series offered	E24	E24, E96	E24	E24, E96	E24	E24, E96	E24, E96	E24	E24, E96	E24	E24, E96	E24	E24, E96
Resistance range (Ω)	0.065~<0.60	0.60~<1.0	0.05~<0.1	0.1~<10	0.02~<0.05	0.05~<0.1	0.1~<10	0.05~<0.1	0.1~<10	0.05~<0.1	0.1~<10	0.05~<0.1	0.1~<10
Resistance tolerance (%)	±1.0% (F)	○	○	○	○	○	○	○	○	○	○	○	○
	±2.0% (G)	○	○	○	○	○	○	○	○	○	○	○	○
	±5.0% (J)	○	○	○	○	○	○	○	○	○	○	○	○
Temperature coefficient of resistance (ppm/°C)	0~150	—	—	—	—	—	—	—	—	—	○	—	○
	0~200	—	○	—	○	—	○	—	○	○	—	○	—
	0~250	—	—	—	—	—	—	○	—	—	—	—	—
	0~300	○	—	○	—	○	—	—	—	—	—	—	—
	0~800	—	—	—	—	○	—	—	—	—	—	—	—
Maximum voltage	$\sqrt{P \cdot R}$												
Operating temperature	-55°C ~ 125°C												
Packaging	2,000pcs	—	—	—	—	—	—	—	—	○	—	○	—
	5,000pcs	—	○	—	—	○	—	○	—	—	—	—	—
	10,000pcs	○	—	—	—	—	—	—	—	—	—	—	—

Part numbering system

RLT 3264-6-R002-F NH

- RLT: Pb free, halogen free
- 3264: Resistance value
- 6: Resistance tolerance
- R002: Size
- F: Power rating: 2(1/8W), 3(1/4W), F(1/3W), 4(1/2W), 6(1W), 9(2W)
- NH: Part code



Thick film chip resistors

■ PFR series and GFR series

Features

- TCR $\pm 100\text{ppm}/^{\circ}\text{C}$ is realized for resistors over $1\text{M}\Omega$
- The same terminal structure as thin film counterparts assures reliability
- In consideration of the environment, the glass passivation is Pb free and the resin passivation is halogen free.

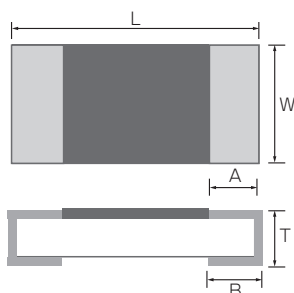


Specifications

*E-24 series are standard stock items. E-96 series are made to order.

unit : mm

Dimensions



Dimension (inch)	NEW PFR02 (01005)	PFR03 (0201)	PFR05, GFR05 (0402)
L	0.40 ± 0.02	0.60 ± 0.03	1.00 ± 0.05
W	0.20 ± 0.02	0.30 ± 0.03	0.50 ± 0.05
A	0.13 ± 0.02	0.10 ± 0.05	0.20 ± 0.10
B	0.10 ± 0.03	0.15 ± 0.05	0.25 ± 0.05
T	0.10 ± 0.03	0.23 ± 0.03	0.35 ± 0.05

Electrical characteristics

Series name		NEW PFR02				PFR03				PFR05				GFR05			
Power		1/32W				Jumper	1/20W				Jumper	1/16W				Jumper	1/16W
E series offered		E-24, E-96		E-24		—	E-24				—	E-24, E-96				—	E-24, E-96
Resistance range (Ω)		1~9.1	10~91	100~1.62M	100~10M	50m or less	3~9.1	10~91	100~1M	100~10M	50m or less	10~97.6	100~1M	1.02~10M	50m or less	10~10M	
Resistance tolerance (%)	±0.5% (D)	—	—	—	—	—	—	—	—	—	—	○	○	—	—	○	
	±1.0% (F)	—	○	○	—		—	○	○	—		○	○	○		○	
	±2.0% (G)	—	○	—	○		—	○	—	○		—	—	—		—	
	±5.0% (J)	○	○	—	○		○	—	—	○		—	—	—		—	
Temperature coefficient of resistance (ppm/℃)	±50	—	—	—	—	—	—	—	—	—	—	—	○	—	—	—	
	±100	—	—	—	—		—	—	—	—		○	—	○		—	
	±200	—	—	○	○		—	—	○	○		—	—	—		○	
	±250	—	○	—	—		—	○	—	—		—	—	—		—	
	+600~-200	○	—	—	—		○	—	—	—		—	—	—		—	
Maximum voltage		15V				1A	25V				1A	50V				1A	50V
Operating temperature		-55℃~125℃															
Packaging	10,000pcs	—				○				○				○			
	15,000pcs	—				○				—				—			
	20,000pcs	○				—				—				—			

Part numbering system

PFR05 R-102-D-(2)-(T15) — Packaging: Given to PFR03 15,000pcs/reel

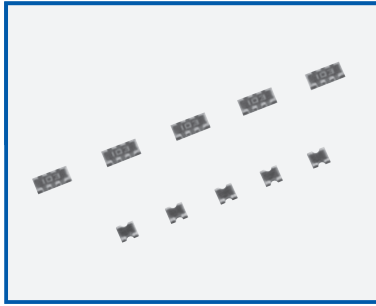
“1” for PbSn and “2” for Sn are given only to PFR05 and GFR05
Resistance tolerance: PFR03, GFR05 jumpers: X
Resistance value: 3digit (E-24), 4digit (E-96), 000 (jumper)
Temperature coefficient of resistance: RFR03: S, GFR05 jumper: J
Part code

Thick film surface mount resistors

PFR series and GFR series

Ultra-small chip resistor arrays

■ RS series



Features

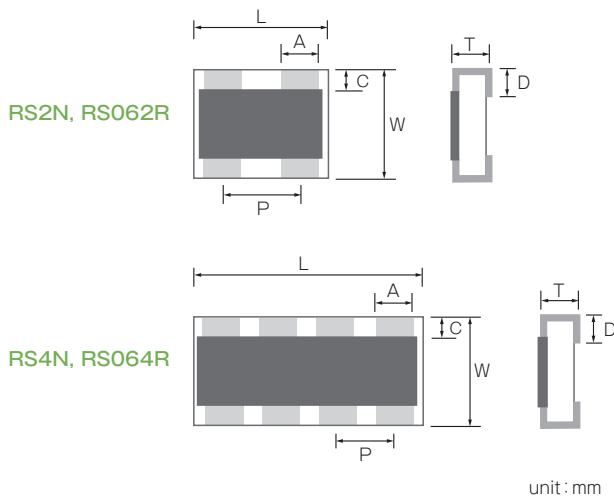
- Integrating 2 or 4 chip resistors (1.0 x 0.5 or 0.3 x 0.6 sizes) into one chip allowing significant space saving



Specifications

* All are stocked items.

Dimensions



unit : mm

Dimension (inch)	RS062R (0302)	RS2N (0404)	RS064R (0602)	RS4N (0804)
L	0.8±0.1	1.0±0.05	1.46±0.1	2.0±0.1
W	0.6±0.1	1.0±0.05	0.6±0.1	1.0±0.1
T	0.35±0.1	0.4±0.1	0.35±0.1	0.4±0.1
A	0.30±0.1	0.33±0.1	0.2±0.1	0.35±0.1
P	0.5 Typ	0.65 Typ	0.4 Typ	0.5 Typ
C	0.15±0.1	0.15±0.1	0.15±0.07	0.22±0.1
D	0.15±0.1	0.25±0.05/-0.1	0.2±0.05	0.35max.

Equivalent circuits



Electrical characteristics

Series name	RS062R	RS2N		RS064R		RS4N	
Power	31mW/element	—	63mW/element	—	32mW/element	—	63mW/element
Resistance range (Ω)	10 ~ 1M	Jumper	10 ~ 1M	Jumper	10 ~ 1M	Jumper	10 ~ 1M
Resistance tolerance (code)	±5.0% (J)	—	±5.0% (J)	—	±5.0% (J)	—	±5.0% (J)
Temperature coefficient of resistance	±200ppm/°C	—	±250ppm/°C	—	±200ppm/°C	—	±250ppm/°C
Maximum Voltage	12.5V	1A	25V	1A	12.5V	1A	25V
Resistance value series	E-24	—	E-24	—	E-24	—	E-24
Packaging	10,000pcs/reel						

· Contact us for parts that do not contain Pb in the glass coating.

Part numbering system

RS064R - 1001 - J - 2 N(H)

N:RoHS compliant parts (given only for RS062R and RS064)
H:Given only to RS062R and RS064
Terminal structure (2=flat)
Resistance tolerance (J=±5%, X=Jumper)
Resistance value (00R0=Jumper, 1001=1kΩ)
Part code



Power choke coils

PCMB series, PCMC series

NEW

Features

- Low profile (3.0 mm max) and small size (7.3mm x6.6mm)
- Occupying small board spaces
- Low loss and high saturating current.

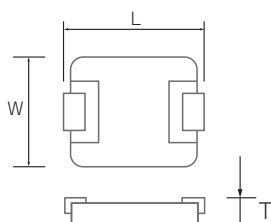
Applications

- PCs, servers, power sources, mobile devices, flat screen TVs etc.

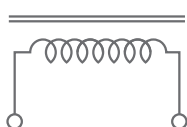
Specifications

*All made to order.

Dimensions • Electrical characteristics



Equivalent circuits



Series name	Size L×W×T (mm)	LO Inductance (uH)	DC resistance (mΩ)		Rated current(A)	Saturating current(A)	Packaging
			Typical	Max	Typical	Typical	
PCMB065T-XXXMS	6.6×7.05×4.8	0.2	0.9	1.2	32	50	1,000 pcs/reel
		0.22	1.2	1.4	30	50	
		0.36	3.2	3.5	21	25	
		0.40	3.2	3.5	20	23	
		0.47	3.5	3.9	20	23	
		0.56	3.4	3.6	20	18	
		0.68	3.9	4.2	18	16	
		0.82	4.6	4.9	16.5	17	
		1.0	5.6	6.5	13	15	
		1.2	6	7.5	11	12	
		1.5	6.7	7.5	11	12	
		2.2	11.2	12.5	8	12	
		3.3	19.9	20.9	7	8	
		4.7	23	25	6.5	7	
PCMB101E-XXXMS	10×10.85×1.3	0.68	15	16	7.5	16	1,000 pcs/reel
		0.82	16	18	6.0	14	
PCMB103T-XXXMS	10×11.15×2.8	1	18	21	5.5	12	
		0.36	1.3	1.6	23	28	
		0.47	2.1	2.5	23	26	
		0.56	2.4	3	22	24	
		0.68	2.9	3.4	21	23	
		1.0	5.3	6	13	18	
		1.5	6.5	7.5	13	20	
		2.2	8	9	13	16	
		3.3	14.5	16	9	14	
		4.7	20.5	22.5	7	13	
PCMB103E-XXXMS	10×11.15×3.3	8.2	35	45	5	8.5	
		10	50	55	5	7.5	
PCMB104T-XXXMS	10×11×3.8	1.0	2.7	3.0	20	27	
		0.15	0.5	0.65	40	75	
		0.19	0.7	0.8	38	60	
		0.22	0.9	1.0	35	60	
		0.36	1.05	1.2	30	50	
		0.39	1.1	1.2	31	45	
		0.41	1.1	1.3	30	60	
		0.47	1.6	1.8	26	40	
		0.56	1.6	1.8	25	33	
		0.68	2.4	2.7	22	39	
		0.88	2.7	3.0	20	38	
		1.0	3	3.3	18	28	
		1.5	3.8	4.2	16	32	
		1.8	4.5	5	15	15	
		2.0	5.2	5.8	14	14	
		2.2	6.0	7	12	18	
		3.3	10.8	11.8	10	16	
		4.7	17	20	8.5	15	
		5.6	20	23	7.5	14	
		6.8	22.5	25	6.5	9	
		10	27.5	30	7.5	8.5	

Series name	Size L×W×T (mm)	LO Inductance (uH)	DC resistance (mΩ)		Rated current(A)	Saturating current(A)	Packaging
			Typical	Max	Typical	Typical	
PCMB104T-XXXMS	10×11×3.8	15	40	45	6.25	7.0	1,000 pcs/reel
		22	60	66	5.0	5.5	
		33	85	92	4.4	5.0	
		47	130	145	3.3	3.5	
		68	178	195	2.3	3.0	
		1.0	2.7	3.2	22	34	
PCMB104E-XXXMS	10×11×4.3	2.2	5.8	7	14	16	1,000 pcs/reel
		3.3	11	13.2	11	14.5	
		4.7	13.2	15	10	13	
		5.6	16	18.5	8.5	10.5	
		6.8	21.5	24	7.5	9.5	
		0.22	1.1	1.3	38	65	
PCMC133E-XXXMF	12.6×13.45×3.3	0.33	1.3	1.5	36.5	62	500 pcs/reel
		0.39	1.1	1.3	38	65	
		0.47	1.7	2	32	55	
		0.56	1.8	2.2	29	51	
		0.62	1.8	2.2	29	51	
		0.68	2.3	2.5	28	49	
		1.0	3.3	3.5	24	40	
		1.5	5.1	5.5	19	35	
		2.2	7.2	8.0	16	29	
		3.3	10	12	12	27	
		0.15	0.55	0.70	45	110	
		0.36	0.77	1.1	41	75	
		0.47	1.1	1.3	38	65	
		0.5	1.2	1.5	36	55	
PCMC135T-XXXMF	12.6×13.45×4.8	0.56	1.2	1.5	36	55	500 pcs/reel
		0.62	1.5	1.7	34	54	
		0.68	1.5	1.7	34	54	
		0.82	1.8	2.1	31	53	
		1.0	2.1	2.5	29	50	
		1.2	2.6	3.0	25	49	
		1.5	3.4	4.1	23	48	
		2.2	4.6	5.5	20	32	
		3.3	7.7	9.2	15	32	
		4.7	12.8	15	12	27	
		6.3	15.4	18.5	11	21	
		6.8	15.4	18.5	11	21	
PIMB136T-XXXMS	12.6×13.45×6.0	15	25.0	29.0	6.0	9.0	
		18	30.0	35.0	5.0	8.0	
		22	34.0	39.5	5.0	7.5	
		27	49.0	56.0	4.0	6.5	

Rated current : the current that increases the temperature by 40°C
Saturating current : The current that reduces inductance by 20% (PCMC) or 30% (PCMB/PS/PST/PL)

※Contact us for details.

Part numbering system

PCMC 13 - *** M N(S,T)**

Part code

Size
(063T=6.6*7.3*3.0mm, 104T=10*11.5*4.0mm,
133E=12.6*13.8*3.5mm, 135T=12.6*13.8*5.0mm)

Inductance value (R56=0.56mH, R68=0.68mH)

Inductance tolerance M=±20%

Material : refer to the table for electrical characteristics

Power choke coils

PCMB series, PCMC series

Small choke coils

PCMB series, PS series

NEW

Features

- Low DCR and large current for small sizes
- High efficiency and low loss

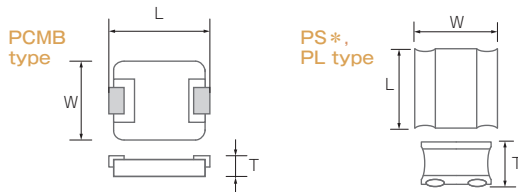
Applications

- PCs, servers, power sources, mobile devices, flat screen TVs etc.

Specifications

* All made to order.

Dimensions • Electrical characteristics



Series name	Size L×W×T (mm)	L Inductance (μH)	DC resistance (mΩ)		Rated current (A)		Saturating current (A)	Packaging
			Typical	Max	Typical	Typical		
PST 16081T-XXXMS (in development)	1.6×0.8×1.0	0.22	40	47	1.7	1.3	2,000 pcs/reel	
		0.47	68	81	1.3	0.95		
		1	96	113	1	0.65		
		1.5	186	218	0.8	0.5		
		2.2	244	287	0.65	0.43		
		3.3	415	487	0.5	0.33		
PST 20161T-XXXMS	2.0×1.6×1.0	4.7	477	561	0.45	0.27	2,000 pcs/reel	
		1	66	80	1.8	1.27		
		1.5	92	112	1.6	1.15		
		2.2	133	162	1.4	0.95		
		3.3	185	225	1.2	0.8		
		4.7	246	299	1	0.65		
PST 25201B-XXXMS	2.5×2.0×1.2	6.8	385	467	0.8	0.55	2,000 pcs/reel	
		10	430	522	0.7	0.45		
		22	1150	1395	0.5	0.29		
		0.47	25	29	3.7	3.9		
		1	37	43	2.6	2.7		
		1.5	63	72	2.2	2.3		
PL052B-XXXMS	4.95×4.95×1.2	2.2	80	90	1.85	2.15	1,000 pcs/reel	
		3.3	140	155	1.45	1.7		
		4.7	190	212	1.2	1.5		
		6	260	288	1.1	1.35		
		6.8	325	370	1	1.15		
		10	360	410	0.75	0.85		
PS073T-XXXMS	6.9×6.9×3.0	22	910	1050	0.5	0.56	1,000 pcs/reel	
		1.2	21	25	4.2	4.7		
		1.8	28	32	3.8	3.85		
		2.2	36	40	3.4	3.35		
		3.3	54	60	2.7	2.75		
		4.7	73	81	2.3	2.2		

Part numbering system

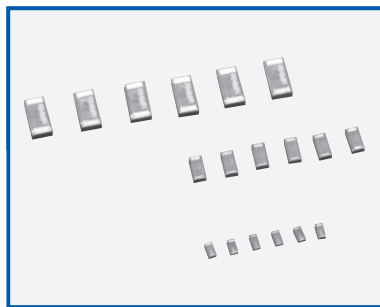
PS 031* - *** M (S)

Part code
Size : B (2.9mm*2.9mm*1.2mm),
T (2.9mm*2.9mm*1.0mm)
Inductance value
Resistance tolerance : ±20%
Material : refer to the table for electrical characteristics

Series name	Size L×W×T (mm)	L Inductance (μH)	DC resistance (mΩ)		Rated current (A)	Saturating current (A)	Packaging
			Typical	Max	Typical	Typical	
PCMB042T-XXXMS	4.15×4.0×1.8	0.1	3.5	4	12	22	2,000 pcs/reel
		0.22	6	6.6	9	12.5	
		0.47	12.5	14	7	9.5	
		1.0	24	27	4.5	7	
		1.5	38	46	4	6	
		2.2	52	58	3	5	
PCMB051H-XXXMS	5.4×5.2×1.6	3.3	74	87	2.5	4	2,000 pcs/reel
		4.7	80	85	3.5	4	
		6.8	110	120	2.7	3.4	
		10	140	155	2.5	3	
		0.68	11	12	8.5	14	
		1.0	13	14	7	11	
PCMB053T-XXXMS	4.7×4.85×2.8	1.2	15	16	6.5	11	2,000 pcs/reel
		1.5	18	20	6	10	
		2.2	29	35	5.5	9	
		3.3	32	38	5	7	
		0.1	2	2.5	18	45	
		0.33	5.2	6.8	12	22	
PCMB061H-XXXMS	6.6×7.05×1.6	0.47	7.3	8.4	11	18	2,000 pcs/reel
		0.68	10.8	12.7	9	17	
		1.0	14.5	17	7	14	
		2.0	28	32	6	11	
		2.2	31	35	6	13	
		3.3	56	60	3.5	10	
PCMB062D-XXXMS	6.6×6.95×2.2	4.7	68	70	3.5	5	1,000 pcs/reel
		6.8	101	110	2.8	2.5	
		10.0	130	138	2.5	2.5	
		0.1	1.5	1.7	30	70	
		0.2	2.2	2.8	25	50	
		0.22	2.9	3.2	21	34	
PCMB063T-XXXMS	6.6×6.95×2.8	0.47	4.9	5.5	15	22	1,000 pcs/reel
		0.56	5.9	6.5	13	20	
		0.81	8.3	9.5	11	14	
		1.0	11.2	13.5	9	16	
		1.5	17	20	9	15	
		2.2	23	28	7	14	
PCMB064T-XXXMS	6.6×6.95×3.8	3.3	31	39	5.5	13	500 pcs/reel
		4.7	41	50	5	10	
		6.8	57	70	4	6	
		10.0	92	101	3.1	2.5	
		0.1	1.5	1.7	32.5	60	
		0.2	2.4	3.0	24	41	

Rated current : the current that increases the temperature by 40°C
Saturating current : The current that reduces inductance by 20% (PCMC) or 30% (PCMB/PS/PST/PL)

* Contact us for details.



Precision thin film chip inductors

HPL series

Features

- Highly precise chip inductors: inductance tolerance $\pm 0.1\text{nH}$ for 0603 size
- High Q and high current
- Small temperature coefficient of inductance: 0 to $-200\text{ppm}/^\circ\text{C}$

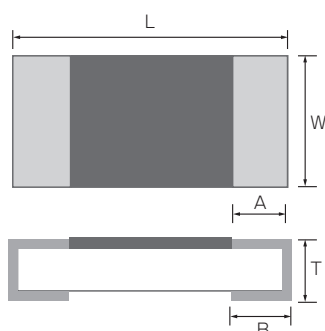
Applications

- Automotive electronics, high frequency circuitries such as wireless communication devices and base stations

Specifications

* All made to order.

Dimensions



unit : mm

Dimension (inch)	HPL0603 (0201)	HPL1005 (0402)
L	0.60 ± 0.05	1.00 ± 0.10
W	0.30 ± 0.05	0.50 ± 0.10
A	0.07 ± 0.05	0.15 ± 0.15
B	0.12 ± 0.05	0.25 ± 0.20
T	0.28 ± 0.05	0.40 ± 0.10

Electrical characteristics

Series name		HPL0603		HPL1005	
Inductance range		1.0 ~ 5.6	6.2 ~ 10	1.0 ~ 9.1	10 ~ 18
Inductance tolerance	$\pm 0.1\text{nH (E02)}$	○	—	○	—
	$\pm 0.2\text{nH}$	○	—	○	—
	$\pm 2\%$	—	○	—	○
Inductance value offered		E-24			
Q value	at 300MHz	—	—	20 ~ 15	15 ~ 13
	at 500MHz	10	10 ~ 8	—	—
	at 800MHz	17 ~ 14	16 ~ 14	35 ~ 25	25 ~ 20
	at 1.5GHz	25 ~ 18	20 ~ 18	50 ~ 30	30 ~ 25
Self-resonance frequency (GHz)		10 ~ 6.0	3.5	7.0 ~ 4.0	3.5
DC resistance (Ω) typ.		0.1 ~ 0.8	0.8 ~ 1.5	0.01 ~ 0.4	0.5 ~ 0.8
Rated current (A)		0.5 ~ 0.2	0.2 ~ 0.15	1.8 ~ 0.34	0.3 ~ 0.24
Operating temperature		$-40 \sim 125^\circ\text{C}$			
Packaging	10,000pcs	○		○	

· Measured at 500MHz in case of HPL0603, at 300MHz in case of HPL1005.

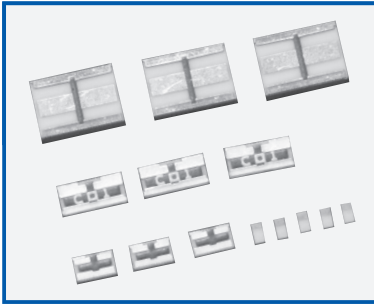
Part numbering system

HPL 1005 - 1N0 (-E02)

- Designates tighter inductance tolerance
- Inductance value (1N0=1.0nH)
- Size
- Part code

Precision chip attenuators

■ PAT series, RAT series



Features

- Excellent noise characteristics, small stray/parasitic inductance and capacitance
- Excellent high frequency characteristics
- PAT0510S are the smallest and lightest thin film chip attenuators.

Applications

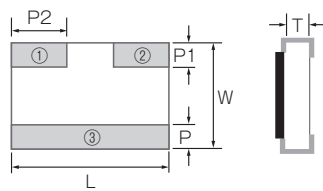
- Wireless communication devices, wireless communication modules, etc.

Specifications

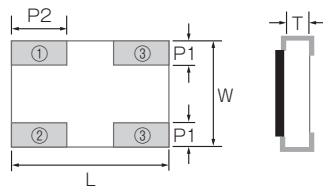
* All made to order.

Dimensions

PAT1608, PAT1220,
PAT1632



RAT1010X, PAT0510,
PAT3042S

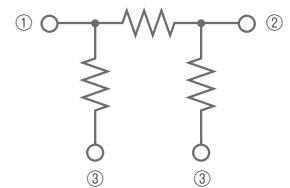


Back side

unit : mm

Dimension (inch)	RAT1010X (0404)	PAT0510S (0402)	PAT0816 (0603)	PAT1220 (0805)	PAT1632 (1206)	PAT3042S (1712)
L	1.00±0.05	1.00±0.05	1.60±0.10	2.00±0.10	3.20±0.20	4.20±0.20
W	1.00±0.05	0.50±0.05	0.80±0.10	1.25±0.10	1.60±0.20	3.00±0.20
P	0.25+0.05/-0.1	—	0.20±0.10	0.35±0.20	0.40±0.20	0.90±0.20
P1	0.25+0.05/-0.1	0.12±0.04	0.20±0.10	0.35±0.20	0.40±0.20	0.80±0.20
P2	0.33±0.10	0.27±0.05	0.50±0.10	0.60±0.20	1.00±0.20	0.50±0.20
T	0.42±0.05	0.34±0.05	0.40±0.10	0.40±0.10	0.40±0.10	0.80±0.15

Equivalent circuits



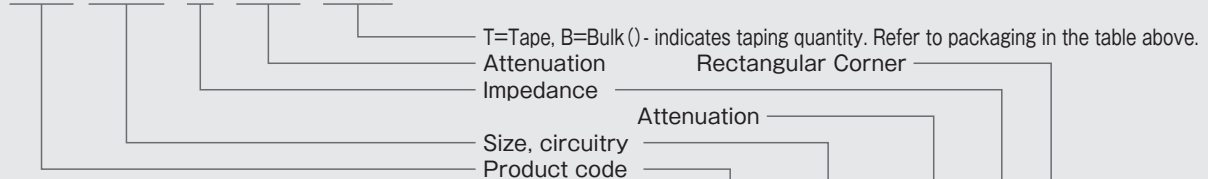
Electrical characteristics

Series name	RAT1010X					PAT0510S			PAT0816			PAT1220	PAT1632		PAT3042S	
Attenuation	1 ~ 5dB	6 ~ 9dB	10dB	11 ~ 16dB	20dB	0 ~ 3dB	4 ~ 7dB	8 ~ 10dB	0 ~ 3dB	4 ~ 7dB	8 ~ 10dB	0 ~ 10dB	0 ~ 10dB	16dB	0 ~ 10dB	16, 20dB
Attenuation tolerance	±0.3dB	±0.4dB	±0.75dB	±0.8dB	±2.5dB	±0.3dB	±0.5dB	±1.0dB	±0.3dB	±0.5dB	±0.7dB	±0.3dB	±0.3dB	±0.5dB	±0.3dB	±0.5dB
Impedance	50Ω (C)					50Ω (C)			50Ω (C)			50Ω (C)		50Ω (C), 75Ω (D)		
VSWR	<1.3					<1.3			<1.3 (~ 6GHz) , <1.5 (6 ~ 10GHz)			<1.3	<1.3		<1.2 (50Ω) , <1.3 (75Ω)	
Operating frequency	~ 2.5GHz		~ 3GHz			DC ~ 10GHz			DC ~ 10GHz			DC ~ 3GHz		~ 3GHz (50Ω) , ~ 2GHz (75Ω)		
Rated power	40mW					32mW			63mW			100mW	125mW		250mW	
Rated operating temperature	—					70℃										
Operating temperature	-55℃ ~ + 125℃															
Packaging	10,000pcs/reel (no code)					10,000pcs/reel (T10)			5,000pcs/reel (T)			100pcs/bag 1,000pcs/reel (T1), 5,000pcs/reel (T5)		50pcs/bag 2,000pcs/reel (T2)		

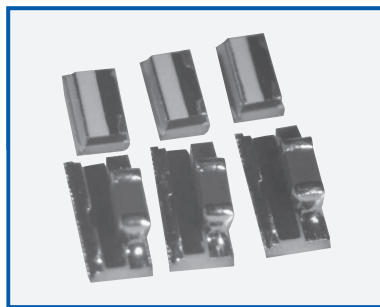
- Contact us for 1.0 x 0.5mm GBA type PAT0510.
- Contact us for high power attenuators up to 10W.

Part numbering system

PAT 1632 - C - 3dB - T (5)



RAT 1010X - 3dB - C - B



Temperature compensated chip attenuators

P * V series

Features

- For simplifying temperature drift compensation of GaAs high frequency amplifiers
- Excellent high frequency characteristics

Applications

- Base station and others



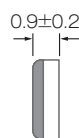
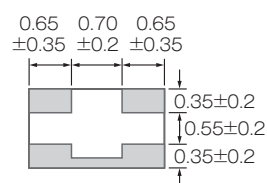
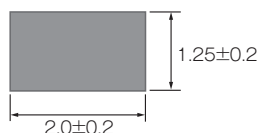
* Except for Chinese RoHS

Specifications

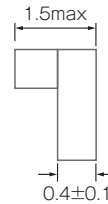
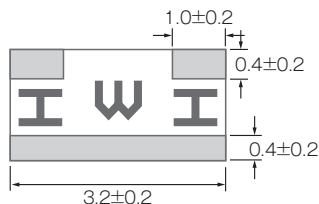
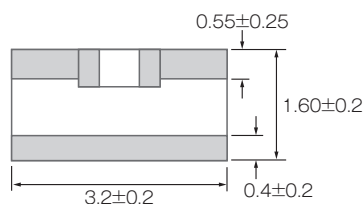
* All made to order.

Dimensions

PXV1220S



PBV1632S

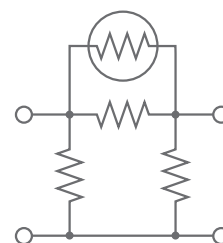


Front side

Back side

(unit:mm)

Equivalent circuits



Electrical characteristics

Series name	PXV1220S	PBV1632S
Attenuation	1, 2, 3, 4, 5, 6, 7, 8, 9, 10dB	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 16dB
Attenuation tolerance	±0.5dB (@25°C, no load)	
Impedance	50Ω	
VSWR	1.3max.	
Temperature coefficient of attenuation	ex : 6dB N1 ~ N8 (1 ~ 3dB : N1 ~ N9) N1 0.0119dB/dB*°C N2 0.0088dB/dB*°C N3 0.0062dB/dB*°C N4 0.0047dB/dB*°C N5 0.0041dB/dB*°C N6 0.0035dB/dB*°C N7 0.0026dB/dB*°C N8 0.0019dB/dB*°C	
Operating frequency	DC ~ 3GHz	
Rated power	63mW	100mW
Operating temperature	-40°C ~ +100°C	
Packaging	100pcs/bag 1,000pcs/reel	min.20pcs/bag 1,000pcs/reel

· Refer to the data book for details.

Part numbering system

PXV 1220S -06dB N1 -T

Packaging (T=Tape, B=Bulk)
 Temperature coefficient of attenuation
 Attenuation
 Size
 Product code

Not for shipment to or sale in the United States



Sample Kits

For development, testing and prototyping, sample kits are available for metal thin film chip resistors, low resistance chip resistors, and chip inductors. We encourage our customers to give them a try.

Electrical characteristics

Product name	Rated power (W)							Resistance tolerance (%)				
	1/32	1/20	1/16	1/10	1/8	1/6	1/4	±0.02	±0.05	±0.1	±0.25	±0.5
Surface mount thin film resistors/metal thin film chip resistors												
RR0816PD-KIT			●									●
RR1220PD-KIT				●								●
RG1005PD-KIT	●		●		●							●
RG1608PD-KIT			●		●	●						●
RG2012PD-KIT				●	●		●					●

Product name	Rated power (W)				Resistance tolerance (%)
	1/3	1/2	1.0	2.0	±1.0
Current sensing surface mount resistors/low resistance chip resistors					
RL1220-KIT	●				●
RL3720W-KIT			●		●

Product name	Inductance		Inductance tolerance	
	1.0 ~ 15	1.0 ~ 18	±0.1nH	±2.0%
HPL1005-KIT		●	1.0 - 9.1nH	10 - 18nH

Part numbering system



[illegible]

Overseas sales network and distributors

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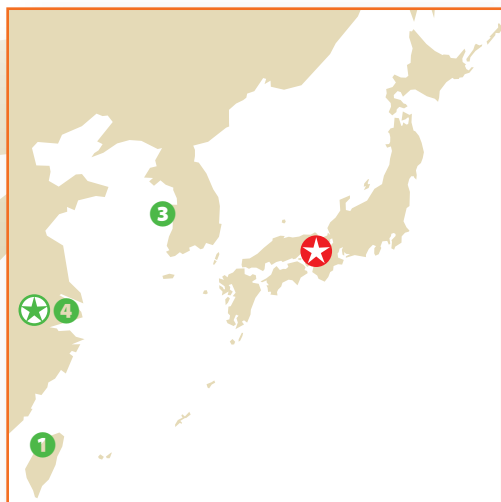
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