

## Green Thick Film Chip Resistors



### FEATURES

- Green resistor - does not use RoHS exemptions
- Stability  $\Delta R/R = 1\%$  for 1000 h at 70 °C
- 2 mm pitch packaging option for 0603 size
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### STANDARD ELECTRICAL SPECIFICATIONS

TYPE	CASE SIZE IMPERIAL	CASE SIZE METRIC	POWER RATING $P_{70}$ W	LIMITING ELEMENT VOLTAGE $U_{max.}$ AC <sub>RMS</sub> /DC V	TEMPERATURE COEFFICIENT $\pm$ ppm/K	TOLERANCE $\pm$ %	RESISTANCE RANGE $\Omega$	SERIES
RCG0402	0402	RR1005M	0.063	50	100	0.5, 1	150 to 10M	E24; E96
					150		1.0 to 147	
					200	5	1.0 to 10M	E24
Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 1.5\text{ A}$								
RCG0603	0603	RR1608M	0.1	75	100	0.5, 1	1.0 to 10M	E24; E96
					200			5
					Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 2.0\text{ A}$			
RCG0805	0805	RR2012M	0.125	150	100	0.5, 1	1.0 to 10M	E24; E96
					200			5
					Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 2.5\text{ A}$			
RCG1206	1206	RR3216M	0.25	200	100	0.5, 1	1.0 to 10M	E24; E96
					200			5
					Zero-Ohm-Resistor: $R_{max.} = 20\text{ m}\Omega$ , $I_{max.} = 3.5\text{ A}$			

### Notes

- These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.
- Marking: See datasheet "Surface Mount Resistor Marking" (document number 20020).
- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material.

### TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	RCG0402	RCG0603	RCG0805	RCG1206
Rated dissipation $P_{70}$ <sup>(1)</sup>	W	0.063	0.1	0.125	0.25
Operating voltage $U_{max.}$ AC <sub>RMS</sub> /DC	V	50	75	150	200
Insulation voltage $U_{ins}$ (1 min)	V	75	100	200	300
Insulation resistance	$\Omega$	$> 10^9$			
Operating temperature range	°C	- 55 to + 155			
Mass	mg	0.65	2	5.5	10

### Note

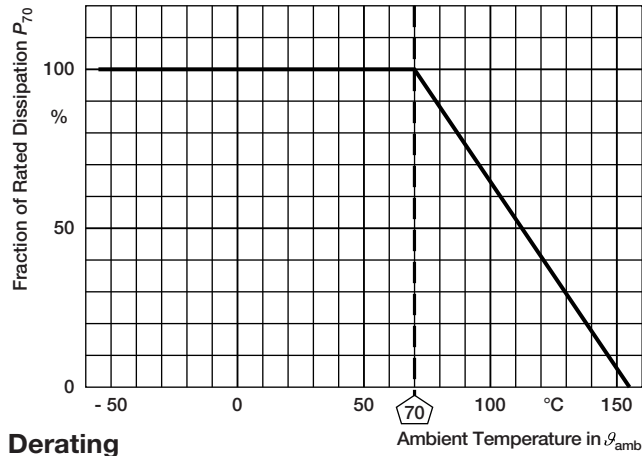
- <sup>(1)</sup> The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature of 155 °C is not exceeded.



PART NUMBER AND PRODUCT DESCRIPTION														
PART NUMBER: RCG080510K0FKEA														
R	C	G	0	8	0	5	1	0	K	0	F	K	E	A
TYPE		VALUE			TOLERANCE			TCR		PACKAGING				
RCG0402 RCG0603 RCG0805 RCG1206		R = Decimal K = Thousand M = Million 0000 = 0 Ω Jumper			D = ± 0.5 % F = ± 1.0 % J = ± 5.0 % Z = Jumper			K = ± 100 ppm/K L = ± 150 ppm/K N = ± 200 ppm/K 0 = Jumper		EA, EB, EC, ED, EE, EI, EL				
PRODUCT DESCRIPTION: RCG0805 100 10K 1 % EA														
RCG0805		100			10K			1 %		EA				
TYPE		TCR			RESISTANCE VALUE			TOLERANCE		PACKAGING				
RCG0402 RCG0603 RCG0805 RCG1206		± 100 ppm/K ± 150 ppm/K ± 200 ppm/K			10R = 10 Ω 10K = 10 kΩ 1M = 1 MΩ 0R0 = Jumper			± 0.5 % ± 1 % ± 5 %		EA, EB, EC, ED, EE, EI, EL				

PACKAGING							
TYPE	CODE	QUANTITY	CARRIER TAPE	WIDTH	PITCH	REEL DIAMETER	
RCG0402	ED	10 000	Paper tape acc. to IEC 60286-3 Type 1a	8 mm	2 mm	180 mm/7"	
	EE	50 000				330 mm/13"	
RCG0603	EI	5000	Paper tape acc. to IEC 60268-3 Type 1a	8 mm	2 mm	180 mm/7"	
	ED	10 000				180 mm/7"	
	EL	20 000				285 mm/11.25"	
	EE	50 000				330 mm/13"	
	EA	EA	5000	Paper tape acc. to IEC 60268-3 Type 1a	8 mm	4 mm	180 mm/7"
		EB	10 000				285 mm/11.25"
EC		20 000	330 mm/13"				
RCG0805	EA	5000	Paper tape acc. to IEC 60268-3 Type 1a	8 mm	4 mm	180 mm/7"	
	EB	10 000				285 mm/11.25"	
	EC	20 000				330 mm/13"	
RCG1206	EA	5000	Paper tape acc. to IEC 60268-3 Type 1a	8 mm	4 mm	180 mm/7"	
	EB	10 000				285 mm/11.25"	
	EC	20 000				330 mm/13"	

DIMENSIONS in millimeters												
SIZE		DIMENSIONS					SOLDER PAD DIMENSIONS					
IMPERIAL	METRIC	L	W	H	T1	T2	REFLOW SOLDERING			WAVE SOLDERING		
							a	b	l	a	b	l
0402	RR1005M	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.25 ± 0.05	0.2 ± 0.1	0.4	0.6	0.5			
0603	RR1608M	1.55 <sup>+0.10</sup> <sub>-0.05</sub>	0.85 ± 0.1	0.45 ± 0.05	0.3 ± 0.2	0.3 ± 0.2	0.5	0.9	1.0	0.9	0.9	1.0
0805	RR2012M	2.0 <sup>+0.20</sup> <sub>-0.10</sub>	1.25 ± 0.15	0.45 ± 0.05	0.3 <sup>+0.20</sup> <sub>-0.10</sub>	0.3 ± 0.2	0.7	1.3	1.2	0.9	1.3	1.3
1206	RR3216M	3.2 <sup>+0.10</sup> <sub>-0.20</sub>	1.6 ± 0.15	0.55 ± 0.05	0.45 ± 0.2	0.4 ± 0.2	0.9	1.7	2.0	1.1	1.7	2.3

**FUNCTIONAL PERFORMANCE**


GREEN REQUIREMENTS	
SUBSTANCES	CONCENTRATION LIMIT
Lead (Pb)	< 1000 ppm
Mercury (Hg)	< 1000 ppm
Cadmium (Cd)	< 100 ppm
Hexavalent Chromium	< 1000 ppm
Polybrominated Biphenyl (PBB)	< 1000 ppm
Polybrominated Diphenyl Ether (PBDE)	< 1000 ppm
Bromine (Br)	< 900 ppm
Chlorine (Cl)	< 900 ppm
Sum of Bromine and Chlorine	≤ 1500 ppm max.
Antimony (Sb)	< 900 ppm
Red Phosphorous	< 100 ppm

**Notes**

- No exemptions (e.g. Pb in glass) may be applied to any substances or application for the “Green” category
- All concentration levels are based on homogenous materials



TEST PROCEDURES AND REQUIREMENTS					
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )	
			Stability for product types:	<b>STABILITY CLASS 1 OR BETTER</b>	<b>STABILITY CLASS 2 OR BETTER</b>
			<b>RCG e3</b>	1 $\Omega$ to 10 M $\Omega$	1 $\Omega$ to 10 M $\Omega$
4.5	-	Resistance	-	$\pm 0.5\%$ , $\pm 1\%$	$\pm 5\%$
4.7	-	Voltage proof	$U = 1.4 \times U_{ins}$ ; 60 s	No flashover or breakdown	
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$ ; Duration acc. to style	$\pm (0.25\% R + 0.05 \Omega)$	$\pm (0.5\% R + 0.05 \Omega)$
4.17.2	58 (Td)	Solderability	Solder bath method; Sn96.5Ag3Cu0.5 non-activated flux; (245 $\pm$ 5) $^{\circ}$ C (3 $\pm$ 0.3) s	Good tinning ( $\geq 95\%$ covered) no visible damage	
4.8.4.2	-	Temperature coefficient	(20/- 55/20) $^{\circ}$ C and (20/125/20) $^{\circ}$ C	$\pm 100$ ppm/K, $\pm 150$ ppm/K	$\pm 200$ ppm/K
4.32	21 (Uu <sub>3</sub> )	Shear (adhesion)	RR 1608 and smaller: 9 N RR 2012 and larger: 45 N	No visible damage	
4.33	21 (Uu <sub>1</sub> )	Substrate bending	Depth 2 mm; 3 times	No visible damage, no open circuit in bent position	
				$\pm (0.25\% R + 0.05 \Omega)$	$\pm (0.5\% R + 0.05 \Omega)$
4.23	-	Climatic sequence:	-		
4.23.2	2 (Ba)	Dry heat	125 $^{\circ}$ C; 16 h		
4.23.3	30 (Db)	Damp heat, cyclic	55 $^{\circ}$ C; $\geq 90\%$ RH; 24 h; 1 cycle		
4.23.4	1 (Aa)	Cold	- 55 $^{\circ}$ C; 2 h	$\pm (1\% R + 0.05 \Omega)$	$\pm (2\% R + 0.1 \Omega)$
4.23.5	13 (M)	Low air pressure	1 kPa; (25 $\pm$ 10) $^{\circ}$ C; 1 h		
4.23.6	30 (Db)	Damp heat, cyclic	55 $^{\circ}$ C; $\geq 90\%$ RH; 24 h; 5 cycles		
4.23.7	-	DC load	$U = \sqrt{P_{70} \times R}$		
4.25.1	-	Endurance at 70 $^{\circ}$ C	$U = \sqrt{P_{70} \times R} \leq U_{max.}$ ; 1.5 h on; 0.5 h off; 70 $^{\circ}$ C; 1000 h	$\pm (1\% R + 0.05 \Omega)$	$\pm (2\% R + 0.1 \Omega)$
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 $\pm$ 5) $^{\circ}$ C; (10 $\pm$ 1) s	$\pm (0.25\% R + 0.05 \Omega)$	$\pm (0.5\% R + 0.05 \Omega)$
4.35	-	Flamability, needle flame test	IEC 60695-11-5; 10 s	No burning after 30 s	
4.24	78 (Cab)	Damp heat, steady state	(40 $\pm$ 2) $^{\circ}$ C; (93 $\pm$ 3) % RH; 56 days	$\pm (1\% R + 0.05 \Omega)$	$\pm (1\% R + 0.1 \Omega)$
4.25.3	-	Endurance at upper category temperature	155 $^{\circ}$ C, 1000 h	$\pm (1\% R + 0.05 \Omega)$	$\pm (2\% R + 0.1 \Omega)$
4.40	-	Electrostatic discharge (human body model)	IEC 61340-3-1; 3 pos. + 3 neg. discharges; ESD test voltage acc. to size	$\pm (1\% R + 0.05 \Omega)$	



TEST PROCEDURES AND REQUIREMENTS					
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )	
			Stability for product types:	<b>STABILITY CLASS 1 OR BETTER</b>	<b>STABILITY CLASS 2 OR BETTER</b>
			<b>RCG e3</b>	1 $\Omega$ to 10 M $\Omega$	1 $\Omega$ to 10 M $\Omega$
4.29	45 (XA)	Component solvent resistance	Isopropyl alcohol; 50 °C; method 2	No visible damage	
4.30	45 (XA)	Solvent resistance of marking	Isopropyl alcohol; 50 °C; method 1, toothbrush	Marking legible, no visible damage	
4.22	6 (Fc)	Vibration, endurance by sweeping	f = 10 Hz to 2000 Hz; x, y, z $\leq$ 1.5 mm; A $\leq$ 200 m/s <sup>2</sup> ; 10 sweeps per axis	$\pm$ (0.25 % R + 0.05 $\Omega$ )	$\pm$ (0.5 % R + 0.05 $\Omega$ )
4.37	-	Periodic electric overload	$U = \sqrt{15 \times P_{70} \times R}$ $\leq 2 \times U_{max.}$ ; 0.1 s on; 2.5 s off; 1000 cycles	$\pm$ (1 % R + 0.05 $\Omega$ )	
4.27	-	Single pulse high voltage overload, 10 $\mu$ s/700 $\mu$ s	$\dot{U} = 10 \times \sqrt{P_{70} \times R}$ $\leq 2 \times \dot{U}_{max.}$ ; 10 pulses	$\pm$ (1 % R + 0.05 $\Omega$ )	

All tests are carried out in accordance with the following specifications:

- EN 60115-1, generic specification
- EN 140400, sectional specification
- EN 140401-802, detail specification
- IEC 60068-2, environmental test procedures

Packaging of components is done in paper tapes according to IEC 60286-3.



## **Disclaimer**

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.