

## 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 $U_{max. AC_{RMS}/DC}$ 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			
					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			
					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			
					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 $U_{max. AC_{RMS}/DC}$	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.

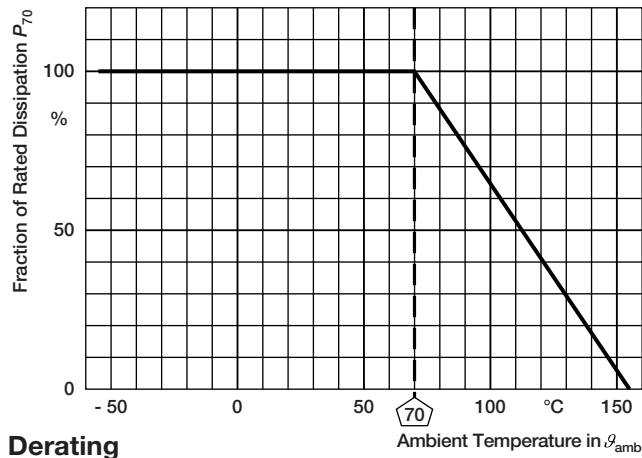


PART NUMBER AND PRODUCT DESCRIPTION														
PART NUMBER: RCG080510K0FKEA														
R	C	G	0	8	0	5	1	0	K	0	F	K	E	A
TYPE		VALUE			TOLERANCE			TCR		PACKAGING				
RCG0402 RCG0603 RCG0805 RCG1206		R = Decimal K = Thousand M = Million 0000 = 0 Ω Jumper			D = ± 0.5 % F = ± 1.0 % J = ± 5.0 % Z = Jumper			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	EB	EC	Paper tape acc. to IEC 60268-3 Type 1a	8 mm	4 mm	180 mm/7"
							285 mm/11.25"
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					
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			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.



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