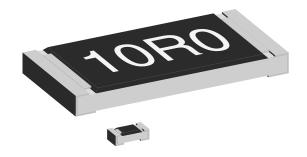


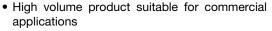
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# Lead (Pb)-free Thick Film, Rectangular Commodity Chip Resistors



#### **FEATURES**





- Stability ( $\Delta R/R \le 1$  % for 1000 h at 70 °C)
- Lead (Pb)-free solder contacts on Ni barrier layer
- COMPLIANT HALOGEN FREE

- · Metal glaze on ceramic
- Material categorization: for definitions of compliance please see <a href="https://www.vishay.com/doc?99912"><u>www.vishay.com/doc?99912</u></a>

STANDARD E	STANDARD ELECTRICAL SPECIFICATIONS										
MODEL	CASE SIZE INCH	CASE SIZE METRIC	POWER RATING  P <sub>70 °C</sub> W	LIMITING ELEMENT VOLTAGE MAX. V ≅	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE Ω	E-SERIES			
		RR 1005M	0.063	50	± 100	± 1	1R0 to 10M	E24; E96			
CRCW0402C	0402		0.003		± 200	± 5	1R0 to 10M	E24			
			Zero-Ohm-Resisto	or: R <sub>max.</sub> = 20	mΩ, $I_{\text{max.}}$ at 70 °C =	1.5 A					
	0603	RR 1608M	0.10	75	± 100	± 1	1R0 to 10M	E24; E96			
CRCW0603C					± 200	± 5	1R0 to 10M	E24			
			Zero-Ohm-Resistor: $R_{\text{max.}} = 20 \text{ m}\Omega$ , $I_{\text{max.}}$ at 70 °C = 2.0 A								
	0805	RR 2012M	0.125	150	± 100	± 1	1R0 to 10M	E24; E96			
CRCW0805C			0.125		± 200	± 5	1R0 to 10M	E24			
Zero-Ohm-Resistor: $R_{\text{max.}}$ = 20 m $\Omega$ , $I_{\text{max.}}$ at 70 °C = 2.5 A											
CRCW1206C	1206	RR 3216M	0.25	200	± 100	± 1	1R0 to 10M	E24; E96			
					± 200	± 5	1R0 to 10M	E24			
			Zero-Ohm-Resistor: $R_{\text{max.}} = 20 \text{ m}\Omega$ , $I_{\text{max.}}$ at 70 °C = 3.5 A								

#### **Notes**

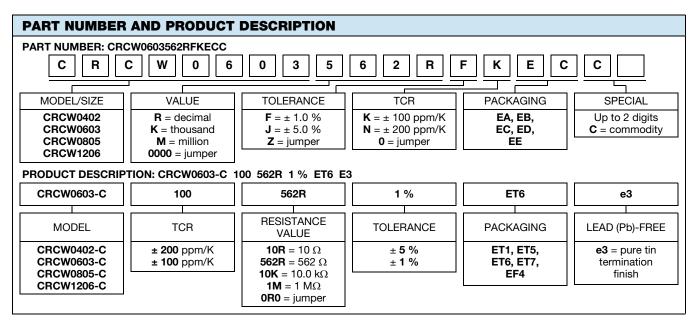
- These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over
  operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime
- · Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material

TECHNICAL SPECIFICATIONS								
PARAMETER	UNIT	CRCW0402C	CRCW0603C	CRCW0805C	CRCW1206C			
Rated dissipation at 70°C (1)	W	0.063	0.10	0.125	0.25			
Limiting element voltage U <sub>max.</sub> AC/DC	V	50 75		150	200			
Insulation voltage $U_{\text{ins.}}$ (1 min)	V	> 75	> 100	> 200	> 300			
Insulation resistance	Ω	> 10 <sup>9</sup>						
Category temperature range	°C	- 55 to + 155						
Failure rate	h <sup>-1</sup>	0.1 x 10 <sup>-9</sup>						
Weight/1000 pieces	g	0.65	2	5.5	10			

#### Note

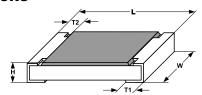
<sup>(1)</sup> The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature of 155 °C is not exceeded

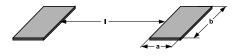




PACKAGING									
TYPE / SIZE	CODE	QUANTITY	PACKAGING STYLE	WIDTH	PITCH	PACKAGING DIMENSIONS			
CRCW0402C	ED = ET7	10 000		8 mm	2 mm	Ø 180 mm/7"			
ChCW0402C	EE = EF4	50 000				Ø 330 mm/13"			
	EA = ET1	5000	Paper tape acc. to IEC 60286-3, Type 1a		4 mm	Ø 180 mm/7"			
CRCW0603C	EB = ET5	10 000				Ø 254 mm/10"			
	EC = ET6	20 000				Ø 330 mm/13"			
	EA = ET1	5000				Ø 180 mm/7"			
CRCW0805C	EB = ET5	10 000				Ø 254 mm/10"			
	EC = ET6	20 000				Ø 330 mm/13"			
CRCW1206C	EA = ET1	5000			4 mm	Ø 180 mm/7"			
	EB = ET5	10 000				Ø 254 mm/10"			
	EC = ET6	20 000	1			Ø 330 mm/13"			

#### **DIMENSIONS**





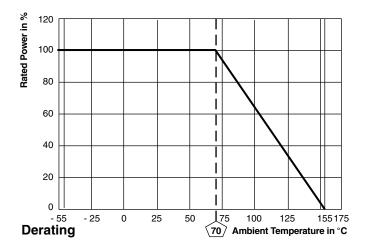
	SIZE	DINATINGIONIC (in millimentary)						SOLDER PAD DIMENSIONS (1) (in millimeters)					
	DIZE		DIMENSIONS (in millimeters)					REFLOW SOLDERING			WAVE SOLDERING		
INCH	METRIC	L	W	Н	T1	T2	а	b	I	а	b	I	
0402	1005	$1.0 \pm 0.10$	$0.5 \pm 0.05$	$0.30 \pm 0.05$	$0.25 \pm 0.10$	$0.2 \pm 0.1$	0.4	0.6	0.5				
0603	1608	1.60 ± 0.10	$0.80 \pm 0.10$	$0.45 \pm 0.10$	$0.3 \pm 0.2$	$0.3 \pm 0.2$	0.5	0.9	1.0	0.9	0.9	1.0	
0805	2012	$2.0 \pm 0.10$	1.25 ± 0.15	$0.50 \pm 0.10$	$0.35 \pm 0.15$	$0.35 \pm 0.2$	0.7	1.3	1.2	0.9	1.3	1.3	
1206	3216	3.05 ± 0.10	1.55 ± 0.10	0.55 + 0.10 - 0.05	0.35 ± 0.15	$0.45 \pm 0.2$	0.9	1.7	2.0	1.1	1.7	2.3	

#### Note

<sup>(1)</sup> The rated dissipation applies only if the permitted film temperature is not exceeded. Furthermore, a high level of ambient temperature or of power dissipation may raise the temperature of the solder joint, hence special solder alloys or board materials maybe required to maintain the reliability of the assembly. Specified power rating above 125 °C requires dedicated heat-sink pads, which depend on board materials. The given solder pad dimensions reflect the considerations for board design and assembly as outlined e.g. in standards IEC 61188-5-x, or in publication IPC-7351. They do not guarantee any supposed thermal properties, particularly as these are also strongly influenced by many other parameters. Still the given solder pad dimensions will be found adequate for most general applications



## **FUNCTIONAL PERFORMANCE**



TEST PR	OCEDURES	S AND REQUIF	REMENTS					
EN 60115-1	IEC 60068-2				REQUIREMENTS PERMISSIBLE CHANGE ( $\triangle R$ )			
CLAUSE	TEST METHOD	TEST	PRO	OCEDURE	STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER		
			Stability for prod	luct types:				
				CRCWC e3	1 Ω to 10 MΩ	1 Ω to 10 MΩ		
4.5	-	Resistance		-	± 1 %	± 5 %		
4.8.4.2	-	Temperature coefficient		5/20) °C and 125/20) °C	± 100 ppm/K	± 200 ppm/K		
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70}}$	$\overline{x\;R} \leq 2\;x\;U_{max.;}\;5\;s$	± (2 % R	+ 0.1 Ω)		
4.17.5	58 (Td)	d) Solderability	Pre-aging 4 h at 155 °C, dryheat	Solder bath method; Sn60Pb40 non activated flux; (235 ± 5) °C (2 ± 0.2) s	Good tinning (≥ 95 % covered) no visible damage			
4.17.5	36 (Tu)			Solder bath method; Sn96.5Ag3Cu0.5 non activated flux; (245 ± 5) °C (3 ± 0.3) s	Good tinning (≥ 95 % covered) no visible damage			
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 ± 5) °C; (10 ± 1) s		± (1% R + 0.05 Ω)			
4.19	14 (Na)	Rapid change of temperature	30 min. at - 55 °C; 30 min. at 125 °C; 5 cycles		± (0.25 % R + 0.05 Ω)	$\pm (0.5 \% R + 0.05 \Omega)$		
4.24	78 (Cab)	Damp heat, steady state	(40 ± 2) °C; 56 days; (93 ± 3) % RH		± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)		
4.36	-	Operation at low temperature	-55 °C, 1 h		± (1 % R + 0.05 Ω)			
4.05.4	-	Endurance at 70 °C	$U = \sqrt{P_{70} \times R} \le U_{\text{max.};}$ 1.5 h on; 0.5 h off;					
4.25.1			70 °C; 1000 h		± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)		
			70 °	C; 8000 h	± (2 % R + 0.1 Ω)	± (4 % R + 0.1 Ω)		
4.25.3	-	Endurance at upper category temperature	155 °C, 1000 h		± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)		



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## **APPLICABLE SPECIFICATIONS**

EN 60115-1 Generic specification
 EN 140400 Sectional specification
 EN 140401-802 Detail specification

• IEC 60068-2-X Variety of environmental test procedures

• IEC 60286-3 Packaging of SMD components



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