

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



FEATURES

- High volume product suitable for commercial applications
- Excellent stability ($\Delta R/R \leq 1\%$ for 1000 h at 70 °C)
- Lead (Pb)-free solder contacts on Ni barrier layer
- Metal glaze on ceramic
- Protective overglaze
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

STANDARD ELECTRICAL SPECIFICATIONS								
MODEL	CASE SIZE INCH	CASE SIZE METRIC	POWER RATING $P_{70\text{ }^\circ\text{C}}$ W	LIMITING ELEMENT VOLTAGE MAX. V \cong	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE Ω	E-SERIES
CRCW0402...C	0402	RR 1005M	0.063	50	± 100	± 1	1R0 to 10M	E24; E96
					± 200		1R0 to 9R76	
					± 200	± 5	1R0 to 10M	E24
Zero-Ohm-Resistor: $R_{\text{max.}} = 20\text{ m}\Omega$, $I_{\text{max.}}$ at 70 °C = 1.5 A								
CRCW0603...C	0603	RR 1608M	0.10	75	± 100	± 1	1R0 to 10M	E24; E96
					± 200		1R0 to 9R76	
					± 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								
CRCW0805...C	0805	RR 2012M	0.125	150	± 100	± 1	1R0 to 10M	E24; E96
					± 200		1R0 to 9R76	
					± 200	± 5	1R0 to 10M	E24
Zero-Ohm-Resistor: $R_{\text{max.}} = 20\text{ m}\Omega$, $I_{\text{max.}}$ at 70 °C = 2.5 A								
CRCW1206...C	1206	RR 3216M	0.25	200	± 100	± 1	1R0 to 10M	E24; E96
					± 200		1R0 to 9R76	
					± 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	CRCW0402...C	CRCW0603...C	CRCW0805...C	CRCW1206...C
Rated dissipation at 70°C ⁽¹⁾	W	0.063	0.10	0.125	0.25
Limiting element voltage $U_{\text{max. AC/DC}}$	V	50	75	150	200
Insulation voltage $U_{\text{ins.}}$ (1 min)	V	> 75	> 100	> 200	> 300
Insulation resistance	Ω	> 10^9			
Category temperature range	°C	- 55 to + 155			
Failure rate	h^{-1}	0.3×10^{-9}			
Weight/1000 pieces	g	0.65	2	5.5	10

Note

- ⁽¹⁾ 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: CRCW0603562RFKECC																	
C	R	C	W	0	6	0	3	5	6	2	R	F	K	E	C	C	
MODEL/SIZE	VALUE	TOLERANCE	TCR	PACKAGING	SPECIAL												
CRCW0402 CRCW0603 CRCW0805 CRCW1206	R = Decimal K = Thousand M = Million 0000 = Jumper	F = ± 1.0 % J = ± 5.0 % Z = Jumper	K = ± 100 ppm/K N = ± 200 ppm/K 0 = Jumper	EA, EB EC, ED EE, EI	Up to 2 digits C = Commodity												
PRODUCT DESCRIPTION: D11/CRCW0603-C 100 562R 1 % ET6 E3																	
D11/CRCW0603-C	100	562R	1 %	ET6	e3												
MODEL	TCR	RESISTANCE VALUE	TOLERANCE	PACKAGING	LEAD (Pb)-FREE												
D10/CRCW0402-C D11/CRCW0603-C D12/CRCW0805-C D25/CRCW1206-C	± 200 ppm/K ± 100 ppm/K	10R = 10 Ω 562R = 562 Ω 10K = 10.0 kΩ 1M = 1 MΩ 0R0 = Jumper	± 5 % ± 1 %	ET1, ET2 ET5, ET6 ET7, EF4	e3 = Pure tin termination finish												

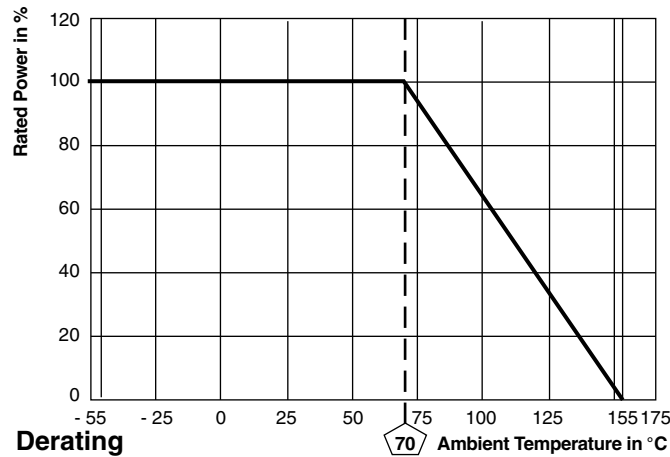
PACKAGING						
MODEL	REEL				PACKAGING CODE	
	TAPE WIDTH	DIAMETER	PITCH	PIECES/REEL	PART NUMBER	PRODUCT DESC.
					PAPER	PAPER
CRCW0402...C	8 mm	180 mm/7"	2 mm	10 000	ED	ET7
		254 mm/10"		20 000	EI	ET2
		330 mm/13"		50 000	EE	EF4
CRCW0603...C	8 mm	180 mm/7"	4 mm	5000	EA	ET1
		254 mm/10"		10 000	EB	ET5
		330 mm/13"		20 000	EC	ET6
CRCW0805...C	8 mm	180 mm/7"	4 mm	5000	EA	ET1
		254 mm/10"		10 000	EB	ET5
		330 mm/13"		20 000	EC	ET6
CRCW1206...C	8 mm	180 mm/7"	4 mm	5000	EA	ET1
		254 mm/10"		10 000	EB	ET5
		330 mm/13"		20 000	EC	ET6

DIMENSIONS


SIZE		DIMENSIONS (in millimeters)					SOLDER PAD DIMENSIONS ⁽¹⁾ (in millimeters)					
INCH	METRIC	L	W	H	T1	T2	REFLOW SOLDERING			WAVE SOLDERING		
							a	b	l	a	b	l
0402	1005	1.0 ± 0.10	0.5 ± 0.05	0.30 ± 0.05	0.25 ± 0.10	0.2 ± 0.1	0.4	0.6	0.5			
0603	1608	1.60 ± 0.10	0.80 ± 0.10	0.45 ± 0.10	0.3 ± 0.2	0.3 ± 0.2	0.5	0.9	1.0	0.9	0.9	1.0
0805	2012	2.0 ± 0.10	1.25 ± 0.15	0.50 ± 0.10	0.35 ± 0.15	0.35 ± 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 ± 0.2	0.9	1.7	2.0	1.1	1.7	2.3

Note

⁽¹⁾ The rated dissipation applies only if the permitted film temperature is not exceeded. Furthermore, a high level of ambient temperature or power dissipation may raise the temperature of the solder joint, hence special solder alloys or board materials may be 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 PROCEDURES AND REQUIREMENTS					
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)	
				STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER
			Stability for product types: CRCW...C e3	1 Ω to 10 M Ω	1 Ω to 10 M Ω
4.5	-	Resistance	-	$\pm 1\%$	$\pm 5\%$
4.8.4.2	-	Temperature coefficient	(20/- 55/20) °C and (20/125/20) °C	± 100 ppm/K, ± 200 ppm/K	± 200 ppm/K
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$; duration: Acc. to the style	$\pm (0.25\% R + 0.05 \Omega)$	$\pm (0.5\% R + 0.05 \Omega)$
4.17.5	58 (Td)	Solderability	Pre-aging 4 h at 155 °C, dryheat	Solder bath method; Sn60Pb40 non activated flux; (235 \pm 5) °C (2 \pm 0.2) s	Good tinning ($\geq 95\%$ covered) no visible damage
			Solder bath method; Sn96.5Ag3Cu0.5 non activated flux; (245 \pm 5) °C (3 \pm 0.3) s	Good tinning ($\geq 95\%$ covered) no visible damage	
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 \pm 5) °C; (10 \pm 1) s	$\pm (0.25\% R + 0.05 \Omega)$	$\pm (0.5\% R + 0.05 \Omega)$
4.19	14 (Na)	Rapid change of temperature	30 min. at - 55 °C; 30 min. at 125 °C; 5 cycles	$\pm (0.25\% R + 0.05 \Omega)$	$\pm (0.5\% R + 0.05 \Omega)$
4.24	78 (Cab)	Damp heat, steady state	(40 \pm 2) °C; 56 days; (93 \pm 3) % RH	$\pm (1\% R + 0.05 \Omega)$	$\pm (2\% R + 0.1 \Omega)$
4.23	-	Climatic sequence:	-	$\pm (1\% R + 0.05 \Omega)$	$\pm (2\% R + 0.1 \Omega)$
4.23.2	2 (Ba)	Dry heat	125 °C; 16 h		
4.23.3	30 (Db)	Damp heat, cyclic	55 °C; $\geq 90\%$ RH; 24 h; 1 cycle		
4.23.4	1 (Aa)	Cold	- 55 °C; 2 h		
4.23.5	13 (M)	Low air pressure	1 kPa; (25 \pm 10) °C; 1 h		
4.23.6	30 (Db)	Damp heat, cyclic	55 °C; $\geq 90\%$ RH; 24 h; 5 cycles		
4.23.7	-	DC load	$U = \sqrt{P_{70} \times R} \leq U_{max.}$		



TEST PROCEDURES AND REQUIREMENTS

EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)	
				STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER
			Stability for product types:		
			CRCW...C e3	1 Ω to 10 M Ω	1 Ω to 10 M Ω
4.25.1	-	Endurance at 70 °C	$U = \sqrt{P_{70} \times R} \leq U_{max.};$ 1.5 h on; 0.5 h off; 70 °C; 1000 h 70 °C; 8000 h	$\pm (1 \% R + 0.05 \Omega)$ $\pm (2 \% R + 0.1 \Omega)$	$\pm (2 \% R + 0.1 \Omega)$ $\pm (4 \% R + 0.1 \Omega)$
4.25.3	-	Endurance at 125 °C	125 °C, 1000 h	$\pm (1 \% R + 0.05 \Omega)$	$\pm (2 \% R + 0.1 \Omega)$

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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