

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



### FEATURES

- High volume product suitable for commercial applications
- Pure tin solder contacts on Ni barrier layer provides compatibility with lead (Pb)-free and lead containing soldering processes
- Metal glaze on high quality ceramic
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

STANDARD ELECTRICAL SPECIFICATIONS								
MODEL	CASE SIZE INCH	CASE SIZE METRIC	POWER RATING $P_{70}$ W	LIMITING ELEMENT VOLTAGE $U_{max. AC_{RMS}/DC}$ V	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE $\Omega$	SERIES
CRCW0201	0201	RR 0603M	0.05	30	$\pm 200$	$\pm 0.5$	10.0 to 10M	E24; E96
					-200 / +400		1.0 to 9.76	
					$\pm 100$	$\pm 1$	47.0 to 1M	E24; E96
					$\pm 200$		10.0 to 10M	
					-200 / +400	$\pm 5$	1.0 to 9.76	E24
					$\pm 200$		10.0 to 10M	
-200 / +400	1.0 to 9.1							
Zero-Ohm-Resistor: $R_{max.} = 50 \text{ m}\Omega$ , $I_{max.}$ at $70 \text{ }^\circ\text{C} = 1.0 \text{ A}$								

### 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.
- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material.

TECHNICAL SPECIFICATIONS		
PARAMETER	UNIT	CRCW0201
Rated Dissipation at $70 \text{ }^\circ\text{C}$ <sup>(1)</sup>	W	0.05
Operating Voltage $U_{max. AC_{RMS}/DC}$	V	30
Insulation Voltage $U_{ins}$ (1 min)	V	50
Insulation Resistance	$\Omega$	$> 10^9$
Operating Temperature Range	$^\circ\text{C}$	-55 to +155
Weight	mg	0.17

### 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  $155 \text{ }^\circ\text{C}$  is not exceeded.

PART NUMBER AND PRODUCT DESCRIPTION															
PART NUMBER: CRCW02011K00FNE D															
C	R	C	W	0	2	0	1	1	K	0	0	F	K	E	D
MODEL CRCW0201		VALUE R = decimal K = thousand M = million 0000 = jumper			TOLERANCE D = ± 0.5 % F = ± 1.0 % J = ± 5.0 % Z = jumper			TCR K = ± 100 ppm/K N = ± 200 ppm/K X = -200 ppm/K / +400 ppm/K 0 = jumper			PACKAGING ED EE EI				
PRODUCT DESCRIPTION: CRCW0201 100 1K0 1 % ET7 e3															
CRCW0201	100	562R	1 %	ET7	e3										
MODEL CRCW0201	TCR ± 200 ppm/K ± 100 ppm/K - 200/+ 400 ppm/K	RESISTANCE VALUE 1R0 = 1 Ω 10R = 10 Ω 1K0 = 1 kΩ 10K = 10 kΩ 1M0 = 1 MΩ 0R0 = jumper	TOLERANCE VALUE ± 0.5 % ± 1 % ± 5 %	PACKAGING ET7 EF4 ET2	LEAD (Pb)-FREE e3 = pure tin termination finish										

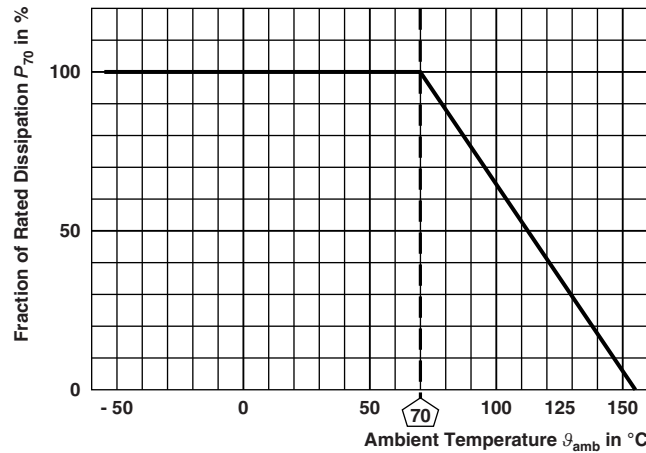
PACKAGING						
MODEL	CODE	QUANTITY	CARRIER TAPE	WIDTH	PITCH	REEL DIAMETER
CRCW0201	ED = ET7	10 000	Paper tape acc. to IEC 60068-3 Type I	8 mm	2 mm	180 mm/7"
	EI = ET2	20 000				254 mm/10"
	EE = EF4	50 000				330 mm/13"

**DIMENSIONS** in millimeters


SIZE		DIMENSIONS					SOLDER PAD DIMENSIONS		
INCH	METRIC	L	W	H	T1	T2	a	b	l
0201	0603	0.6 ± 0.05	0.3 ± 0.05	0.23 ± 0.05	0.15 ± 0.05	0.10 ± 0.05	0.28	0.43	0.23

**Note**

- No marking for 0201 size.

**DERATING**


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>CRCW0201 e3</b>	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	58 (Td)	Solderability	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
4.8.4.2	-	Temperature coefficient	(20 / -55 / 20) °C and (20 / 125 / 20) °C	$\pm 100$ ppm/K, $\pm 200$ ppm/K, -200 ppm/K / +400 ppm/K
4.32	21 (Uu <sub>3</sub> )	Shear (adhesion)	9 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 $\pm (0.5\% R + 0.05 \Omega)$
4.19	14 (Na)	Rapid change of temperature	30 min. at -55 °C; 30 min. at 125 °C	
			5 cycles	$\pm (0.5\% R + 0.05 \Omega)$
			1000 cycles	$\pm (1\% R + 0.05 \Omega)$
4.23	-	Climatic sequence:	-	$\pm (2\% R + 0.1 \Omega)$
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 ( $\Delta R$ )
			Stability for product types: <b>CRCW0201 e3</b>	1 $\Omega$ to 10 M $\Omega$
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	$\pm (2 \% R + 0.1 \Omega)$
			70 °C; 8000 h	$\pm (4 \% R + 0.1 \Omega)$
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 $\pm$ 5) °C; (10 $\pm$ 1) s	$\pm (1 \% R + 0.05 \Omega)$
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) °C; (93 $\pm$ 3) % RH; 56 days	$\pm (2 \% R + 0.1 \Omega)$
4.25.3	-	Endurance at upper category temperature	155 °C, 1000 h	$\pm (2 \% R + 0.1 \Omega)$
4.29	45 (XA)	Component solvent resistance	Isopropyl alcohol; 50 °C; method 2	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	$\pm (0.5 \% R + 0.05 \Omega)$

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-x, environmental test procedures

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



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