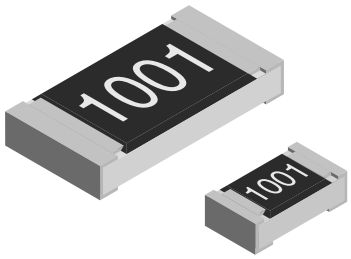
Lead (Pb)-Free Thick Film, Rectangular, Semi-Precision Chip Resistors



FEATURES

- Low temperature coefficient (25 ppm/K) and tight tolerances (± 0.25 %)
- Metal glaze on high quality ceramic
- Pure tin solder contacts on Ni Barrier layer provides compatibility with lead (Pb)-free and lead containing soldering processes
- Compliant to RoHS directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition
- AEC-Q200 qualified, rev. C compliant

RoHS COMPLIANT
HALOGEN FREE

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE		RATED DISSIPATION P_{70} W	LIMITING ELEMENT VOLTAGE $U_{max.}$ AC/DC	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE Ω	SERIES
	INCH	METRIC						
D10/CRCW0402-P	0402	RR 1005M	0.063	50	± 100	± 0.5	10R to 1M0	E24; E96
					± 50	± 0.25, ± 0.5, ± 1	100R to 1M0	
					± 25	± 0.5, ± 1	1K0 to 10K	
D11/CRCW0603-P	0603	RR 1608M	0.1	75	± 100	± 0.5	10R to 10M	E24; E96
					± 50	± 0.5, ± 1	100R to 10M	
						± 0.25	100R to 1M0	
					± 25	± 0.25, ± 0.5, ± 1	200R to 10K	
D12/CRCW0805-P	0805	RR 2012M	0.125	150	± 100	± 0.5	10R to 10M	E24; E96
					± 50	± 0.5, ± 1	100R to 10M	
						± 0.25	100R to 1M0	
					± 25	± 0.25, ± 0.5, ± 1	150R to 10K	
D25/CRCW1206-P	1206	RR 3216M	0.25	200	± 100	± 0.5	10R to 10M	E24; E96
					± 50	± 0.5, ± 1	100R to 10M	
						± 0.25	100R to 1M0	
					± 25	± 0.25, ± 0.5, ± 1	150R to 10K	
CRCW1210-P	1210	RR 3225M	0.5	200	± 100	± 0.5	100R to 1M0	E24; E96
					± 50	± 0.5, ± 1		
CRCW1218-P	1218	RR 3246M	1.0	200	± 100	± 0.5	100R to 2M2	E24; E96
					± 50	± 0.5, ± 1		
CRCW2010-P	2010	RR 5025M	0.75	400	± 100	± 0.5	10R to 10M	E24; E96
					± 50	± 0.5, ± 1	100R to 10M	
CRCW2512-P	2512	RR 6332M	1.0	500	± 100	± 0.5	10R to 10M	E24; E96
					± 50	± 0.5, ± 1	100R to 10M	

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 data sheet “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	D10/ CRCW0402-P	D11/ CRCW0603-P	D12/ CRCW0805-P	D25/ CRCW1206-P	CRCW1210-P	CRCW1218-P	CRCW2010-P	CRCW2512-P
Rated dissipation P_{70} (1)	W	0.063	0.1	0.125	0.25	0.5	1.0	0.75	1.0
Limiting element voltage $U_{max.}$ AC/DC	V	50	75	150	200	200	200	400	500
Insulation voltage U_{ins} (1 min)	V	> 75	> 100	> 200	> 300	> 300	> 300	> 300	> 300
Insulation resistance	Ω	> 10^9							
Category temperature range	°C	- 55 to + 155							
Failure rate	h^{-1}	< 0.1 x 10^{-9}							
Weight	mg	0.65	2	5.5	10	16	29.5	25.5	40.5

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-ciruit 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: CRCW040275R0DKEDP (2)

C	R	C	W	0	4	0	2	7	5	R	0	D	K	E	D	P	

MODEL	VALUE	TOLERANCE	TCR	PACKAGING	SPECIAL
CRCW0402 **CRCW0603** **CRCW0805** **CRCW1206** **CRCW1210** **CRCW1218** **CRCW2010** **CRCW2512**	**R** = Decimal **K** = Thousand **M** = Million	**C** = ± 0.25 % **D** = ± 0.5 % **F** = ± 1.0 %	**E** = ± 25 ppm/K **H** = ± 50 ppm/K **K** = ± 100 ppm/K	**EA, EB,** **EC, ED,** **EE, EI,** **EL, EK,** **EF, EG,** **EH, EY**	Up to 2 digits **P** = Precision

Product Description: D10/CRCW0402-P 100 75R 0.5 % ET7 e3

D10/CRCW0402-P	100	75R	0.5 %	ET7	e3
MODEL	TCR	RESISTANCE VALUE	TOLERANCE	PACKAGING	LEAD (Pb)-FREE
D10/CRCW0402-P **D11/CRCW0603-P** **D12/CRCW0805-P** **D25/CRCW1206-P** **CRCW1210-P** **CRCW1218-P** **CRCW2010-P** **CRCW2512-P**	± **25** ppm/K ± **50** ppm/K ± **100** ppm/K	**49K9** = 49.9 Ω **5R1** = 5.1 Ω	± **0.25 %** ± **0.5 %** ± **1 %**	**ET1, ET5,** **ET6, ET7,** **EF4, EG1,** **E20, ET0,** **E02, E67,** **E82, E27**	**e3** = Pure tin termination finish

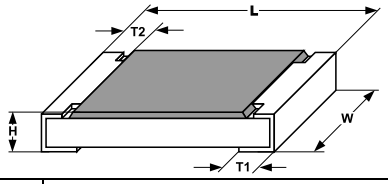
Note

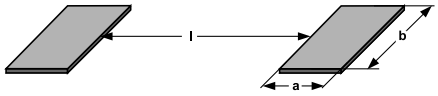
(2) Preferred way for ordering products is by use of the PART NUMBER.

PACKAGING

MODEL	UNIT	PAPER TAPE ACC. IEC 60286-3, TYPE I			BLISTER TAPE ACC. IEC 60286-3, TYPE II		
		QUANTITY	PART NUMBER	PRODUCT DESC.	QUANTITY	PART NUMBER	PRODUCT DESC.
D10/CRCW0402-P	180 mm/7"	10 000	ED	ET7			
	330 mm/13"	50 000	EE	EF4			
D11/CRCW0603-P	180 mm/7"	5000	EA	ET1			
	285 mm/11.25"	10 000	EB	ET5			
	330 mm/13"	20 000	EC	ET6			
D12/CRCW0805-P	180 mm/7"	5000	EA	ET1			
	285 mm/11.25"	10 000	EB	ET5			
	330 mm/13"	20 000	EC	ET6			
D25/CRCW1206-P	180 mm/7"	5000	EA	ET1			
	285 mm/11.25"	10 000	EB	ET5			
	330 mm/13"	20 000	EC	ET6			
CRCW1210-P	180 mm/7"	5000	EA	ET1			
	285 mm/11.25"	10 000	EB	ET5			
	330 mm/13"	20 000	EC	ET6			
CRCW1218-P	180 mm/7"				4000	EK	ET9
CRCW2010-P	180 mm/7"				4000	EF	E02
CRCW2512-P	180 mm/7"				2000	EG	E67
					4000	EH	E82

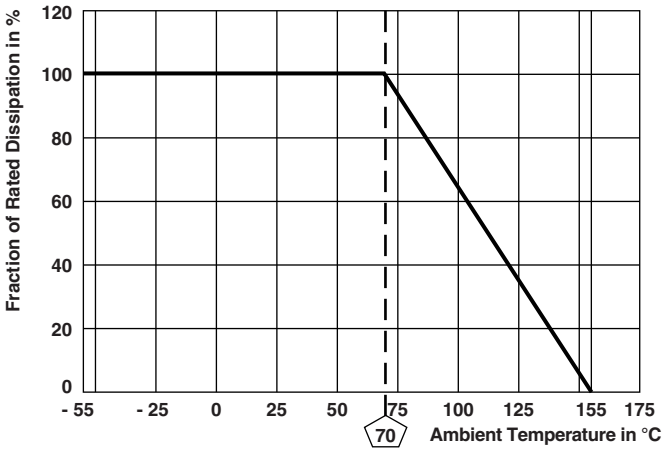
DIMENSIONS



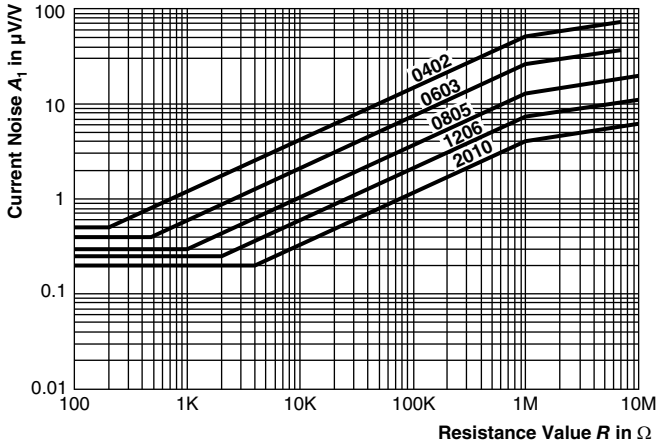


SIZE		DIMENSIONS in millimeters					SOLDER PAD DIMENSIONS in millimeters					
							REFLOW SOLDERING			WAVE SOLDERING		
INCH	METRIC	L	W	H	T1	T2	a	b	l	a	b	l
0402	1005	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.25 ± 0.05	0.2 ± 0.1	0.4	0.6	0.5			
0603	1608	1.55 $^{+0.10}_{-0.05}$	0.85 ± 0.1	0.45 ± 0.05	0.3 ± 0.2	0.3 ± 0.2	0.5	0.9	1.0	0.9	0.9	1.0
0805	2012	2.0 $^{+0.20}_{-0.10}$	1.25 ± 0.15	0.45 ± 0.05	0.3 $^{+0.20}_{-0.10}$	0.3 ± 0.2	0.7	1.3	1.2	0.9	1.3	1.3
1206	3216	3.2 $^{+0.10}_{-0.20}$	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
1210	3225	3.2 ± 0.2	2.5 ± 0.2	0.55 ± 0.05	0.45 ± 0.2	0.4 ± 0.2	0.9	2.5	2.0	1.1	2.5	2.2
1218	3246	3.2 $^{+0.10}_{-0.20}$	4.6 ± 0.15	0.55 ± 0.05	0.45 ± 0.2	0.4 ± 0.2	1.05	4.9	1.9	1.25	4.8	1.9
2010	5025	5.0 ± 0.15	2.5 ± 0.15	0.6 ± 0.1	0.6 ± 0.2	0.6 ± 0.2	1.0	2.5	3.9	1.2	2.5	3.9
2512	6332	6.3 ± 0.2	3.15 ± 0.15	0.6 ± 0.1	0.6 ± 0.2	0.6 ± 0.2	1.0	3.2	5.2	1.2	3.2	5.2

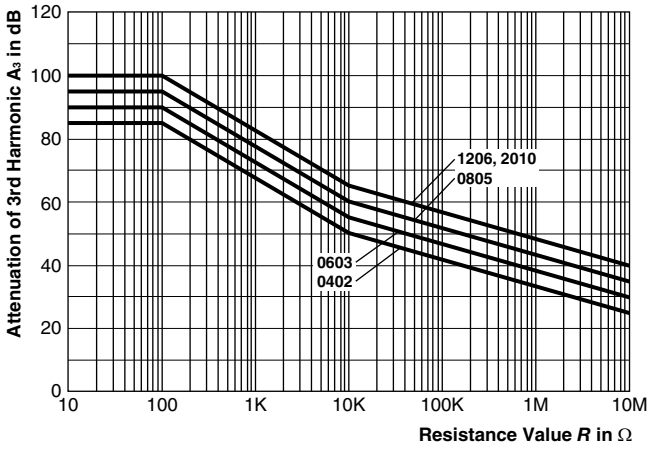
Derating



Current Noise



Non-Linearity



TEST PROCEDURES AND REQUIREMENTS

EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)
				SIZE 0402 to 2512
				STABILITY CLASS 1 OR BETTER
			Stability for product types:	
			D/CRCW-P e3	1 Ω to 10 MΩ
4.5	-	Resistance	-	± 1 %
4.7	-	Voltage proof	U = 1.4 x U_{ins}; 60 s	No flashover or breakdown
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R}$ ≤ 2 x $U_{max.}$; duration: Acc. to style	± (0.25 % R + 0.05 Ω)
4.17.2	58 (Td)	Solderability	Solder bath method; Sn60Pb40 non activated flux; (235 ± 5) °C (2 ± 0.2) s	Good tinning (≥ 95 % covered) no visible damage
			Solder bath method; Sn96.5Ag3Cu0.5 non-activated flux; (245 ± 5) °C (3 ± 0.3) s	Good tinning (≥ 95 % covered) no visible damage
4.8.4.2	-	Temperature coefficient	(20/- 55/20) °C and (20/125/20) °C	± 100 ppm/K
4.32	21 (Uu_3)	Shear (adhesion)	RR 1608 and smaller: 9 N RR 2012 and larger: 45 N	No visible damage
4.33	21 (Uu_1)	Substrate bending	Depth 2 mm; 3 times	No visible damage, no open circuit in bent position ± (0.25 % 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)
			1000 cycles	± (1 % R + 0.05 Ω)
4.23	-	Climatic sequence:	-	± (1 % R + 0.05 Ω)
4.23.2	2 (Ba)	Dry heat	125 °C; 16 h	
4.23.3	30 (Db)	Damp heat, cyclic	55 °C; ≥ 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 ± 10) °C; 1 h	
4.23.6	30 (Db)	Damp heat, cyclic	55 °C; ≥ 90 % RH; 24 h; 5 cycles	
4.23.7	-	DC load	$U = \sqrt{P_{70} \times R}$	
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	± (1 % R + 0.05 Ω)
			70 °C; 8000 h	± (2 % R + 0.05 Ω)
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 ± 5) °C; (10 ± 1) s	± (0.25 % R + 0.05 Ω)

TEST PROCEDURES AND REQUIREMENTS				
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)
				SIZE 0402 to 2512
				STABILITY CLASS 1 OR BETTER
			Stability for product types:	
			D/CRCW-P e3	1 Ω to 10 MΩ
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 ± 2) °C; (93 ± 3) % RH; 56 days	± (1 % R + 0.05 Ω)
4.25.3	-	Endurance at upper category temperature	155 °C, 1000 h	± (1 % R + 0.05 Ω)
4.40	-	Electrostatic discharge (human body model)	IEC 61340-3-1* 3 pos. + 3 neg. discharges; ESD voltage acc. to size	± (1 % R + 0.05 Ω)
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 ≤ 1.5 mm; A ≤ 200 m/s^2; 10 sweeps per axis	± (0.25 % R + 0.05 Ω)
4.37	-	Periodic electric overload	$U = \sqrt{15 \times P_{70} \times R}$ ≤ 2 x $U_{max.}$; 0.1 s on; 2.5 s off; 1000 cycles	± (1 % R + 0.05 Ω)
4.27	-	Single pulse high voltage overload, 10 µs/700 µs	$\hat{U} = 10 \times \sqrt{P_{70} \times R}$ ≤ 2 x $U_{max.}$; 10 pulses	± (1 % R + 0.05 Ω)

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 or blister tapes according to IEC 60286-3.

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