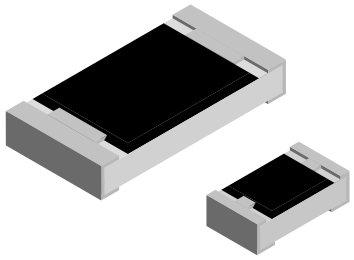
Lead (Pb)-free Thick Film, Rectangular, Low Value Chip Resistors



FEATURES

- Low resistance values (down to 0.1 Ω)
- Suitable for current sensors and shunts
- Metal glaze on high quality ceramic
- Protective overglaze
- Lead (Pb)-free solder contacts on Ni barrier layer
- Pure tin plating provides compatibility with lead (Pb)-free and lead containing soldering processes
- Compliant with "Restriction of the use of Hazardous Substances" (RoHS) directive 2002/95/EC (issue 2004)

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE		POWER RATING $P_{70\,°C}$ W	RATED VOLTAGE $V_{\cong}$	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE Ω	E-SERIES
	INCH	METRIC						
D10/CRCW0402-LR	0402	1005	0.063	$\sqrt{P \times R}$	± 600 ± 400	± 5	R22 - R43 R47 - R91	24
D11/CRCW0603-LR	0603	1608	0.1	$\sqrt{P \times R}$	± 400 ± 200	± 5	R10 - R43 R47 - R91	24
D12/CRCW0805-LR	0805	2012	0.125	$\sqrt{P \times R}$	± 300 ± 200	± 5	R10 - R43 R47 - R91	24
D25/CRCW1206-LR	1206	3216	0.25	$\sqrt{P \times R}$	± 300 ± 200	± 5	R10 - R43 R47 - R91	24
CRCW1210-LR	1210	3225	0.33	$\sqrt{P \times R}$	± 200	± 5	R10 - R91	24
CRCW1218-LR	1218	3246	1.0	$\sqrt{P \times R}$	± 200	± 5	R10 - R91	24
CRCW2010-LR	2010	5025	0.5	$\sqrt{P \times R}$	± 200	± 5	R10 - R91	24
CRCW2512-LR	2512	6332	1.0	$\sqrt{P \times R}$	± 200	± 5	R10 - R91	24

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 and packaging: See appropriate catalog or web page
- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material
- The resistance is measured from the top side

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	D10/ CRCW0402-LR	D11/ CRCW0603-LR	D12/ CRCW0805-LR	D25/ CRCW1206-LR	CRCW1210-LR	CRCW1218-LR	CRCW2010-LR	CRCW2512-LR
Rated Dissipation at 70 °C (2)	W	0.063	0.1	0.125	0.25	0.33	1.0	0.5	1.0
Rated Voltage	$V_{\cong}$	$\sqrt{P \times R}$							
Insulation Voltage (1 min)	V_{peak}	> 75	> 100	> 200	> 300	> 300	> 300	> 300	> 300
Thermal Resistance (1)	K/W	≤ 870	≤ 550	≤ 440	≤ 220	≤ 140	≤ 65	≤ 88	≤ 65
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	16	29.5	25.5	40.5

Notes

(1) For sizes 0402 until 1206 the measuring conditions are in acc. to EN 140401-802. For all other sizes the result depends on the solder pad dimensions.

(2) The power dissipation on the resistors 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: CRCW0402R470JNEDLR (1)

C	R	C	W	0	4	0	2	R	4	7	0	J	N	E	D	L	R

MODEL/SIZE	VALUE	TOLERANCE	TCR	PACKAGING (2)	SPECIAL
CRCW0402 **CRCW0603** **CRCW0805** **CRCW1206** **CRCW1210** **CRCW1218** **CRCW2010** **CRCW2512**	**R =** Decimal	**J =** ± 5 %	**N =** ± 200 ppm/K **M =** ± 300 ppm/K **Q =** ± 400 ppm/K **T =** ± 600 ppm/K	**EA, EB,** **EC, ED,** **EE, EF,** **EG, EH,** **EI, EK,** **EL, EY**	Up to 2 digits **LR** = Low Value

PRODUCT DESCRIPTION: D10/CRCW0402-LR 200 0R47 5 % ET7 e3

D10/CRCW0402-LR	200	0R47	5 %	ET7	e3
MODEL	TCR	RESISTANCE VALUE	TOLERANCE	PACKAGING (2)	LEAD (Pb)-FREE
D10/CRCW0402-LR D11/CRCW0603-LR D12/CRCW0805-LR D25/CRCW1206-LR CRCW1210-LR CRCW1218-LR CRCW2010-LR CRCW2512-LR	± 200 ppm/K ± 300 ppm/K ± 400 ppm/K ± 600 ppm/K	0R10 = 0.1 Ω 0R91 = 0.91 Ω	± 5 %	ET1, ET5, ET6, ET7, EF4, E02, E67, E82, EG1, ET9, E20, E27	e3 = Pure tin Termination finish

Notes

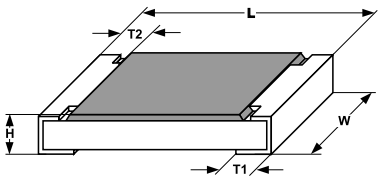
(1) Preferred way for ordering products is by use of the PART NUMBER

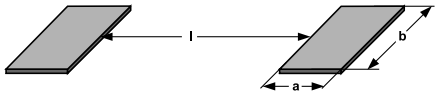
(2) Please refer to table PACKAGING, see below

PACKAGING

MODEL	REEL								BULK		
	TAPE WIDTH	DIAMETER	PITCH	PIECES/ REEL	PACKAGING CODE				PIECES	PACKAGING CODE	
					PART NUMBER		PRODUCT DESC.			PART NUMBER	PRODUCT DESC.
					PAPER	BLISTER	PAPER	BLISTER			
D10/ CRCW0402-LR	8 mm	180 mm/7" 285 mm/11.25" 330 mm/13"	2 mm 2 mm 2 mm	10 000 20 000 50 000	ED EC EE		ET7 ET6 ET4		50 000	EY	E27
D11/ CRCW0603-LR	8 mm	180 mm/7" 285 mm/11.25" 330 mm/13"	4 mm 4 mm 4 mm	5000 10 000 20 000	EA EB EC	EI EL	ET1 ET5 ET6	EG1 E20	25 000	EY	E27
D12/ CRCW0805-LR	8 mm	180 mm/7" 285 mm/11.25" 330 mm/13"	4 mm 4 mm 4 mm	5000 10 000 20 000	EA EB EC	EI EL	ET1 ET5 ET6	EG1 E20	10 000	EY	E27
D25/ CRCW1206-LR	8 mm	180 mm/7" 285 mm/11.25" 330 mm/13"	4 mm 4 mm 4 mm	5000 10 000 20 000	EA EB EC	EI EL	ET1 ET5 ET6	EG1 E20			
CRCW1210-LR	12 mm	180 mm/7" 285 mm/11.25" 330 mm/13"	4 mm 4 mm 4 mm	5000 10 000 20 000	EA EB EC		ET1 ET5 ET6				
CRCW1218	12 mm	180 mm/7"	4 mm	4000		EK		ET9			
CRCW2010	12 mm	180 mm/7"	4 mm	4000		EF		E02			
CRCW2512	12 mm	180 mm/7"	8 mm 4 mm	2000 4000		EG EH		E67 E82			

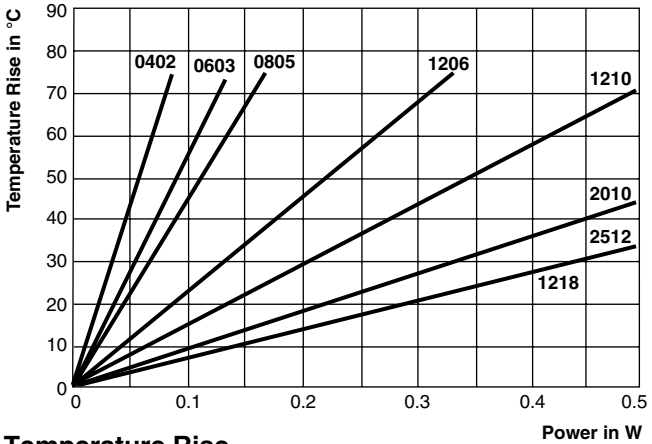
DIMENSIONS



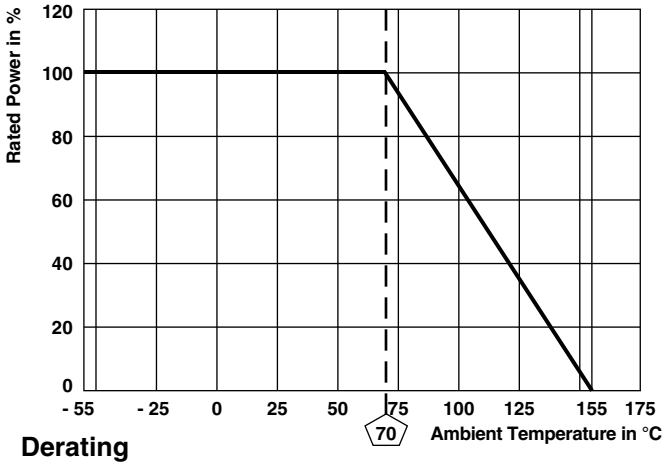


SIZE		DIMENSIONS [in millimeters]				
INCH	METRIC	L	W	H	T1	T2
0402	1005	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.25 ± 0.05	0.2 ± 0.1
0603	1608	$1.55^{+0.10}_{-0.05}$	0.85 ± 0.1	0.45 ± 0.05	0.3 ± 0.2	0.3 ± 0.2
0805	2012	$2.0^{+0.20}_{-0.10}$	1.25 ± 0.15	0.45 ± 0.05	$0.3^{+0.20}_{-0.10}$	0.3 ± 0.2
1206	3216	$3.2^{+0.10}_{-0.20}$	1.6 ± 0.15	0.55 ± 0.05	0.45 ± 0.2	0.4 ± 0.2
1210	3225	3.2 ± 0.2	2.5 ± 0.2	0.55 ± 0.05	0.45 ± 0.2	0.4 ± 0.2
1218	3246	$3.2^{+0.10}_{-0.20}$	4.6 ± 0.15	0.55 ± 0.05	0.45 ± 0.2	0.4 ± 0.2
2010	5025	5.0 ± 0.15	2.5 ± 0.15	0.6 ± 0.1	0.6 ± 0.2	0.6 ± 0.2
2512	6332	6.3 ± 0.2	3.15 ± 0.15	0.6 ± 0.1	0.6 ± 0.2	0.6 ± 0.2

SIZE		SOLDER PAD DIMENSIONS [in millimeters]					
		REFLOW SOLDERING			WAVE SOLDERING		
INCH	METRIC	a	b	l	a	b	l
0402	1005	0.4	0.6	0.5			
0603	1608	0.5	0.9	1.0	0.9	0.9	1.0
0805	2012	0.7	1.3	1.2	0.9	1.3	1.3
1206	3216	0.9	1.7	2.0	1.1	1.7	2.3
1210	3225	0.9	2.5	2.0	1.1	2.5	2.2
1218	3246	1.05	4.9	1.9	1.25	4.8	1.9
2010	5025	1.0	2.5	3.9	1.2	2.5	3.9
2512	6332	1.0	3.2	5.2	1.2	3.2	5.2



Temperature Rise



Derating

TEST PROCEDURES AND REQUIREMENTS

EN 60115-1		
TEST (clause)	**CONDITIONS OF TEST**	**REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R/R$) (1)**
		STABILITY CLASS 2 OR BETTER
	Stability for product types:	
	D../CRCW....-LR e3	0.1 Ω to 0.91 Ω
Resistance (4.5)	-	± 5 %
Temperature coefficient (4.8.4.2)	20/- 55/20 °C and 20/125/20 °C	± 200 ppm/K, ± 300 ppm/K, ± 400 ppm/K, ± 600 ppm/K
Overload (4.13)	$U = 2.5 \times (P_{70} \times R)^{1/2}$ $\leq 2 \times U_{max.}$; Duration: according the style	± (0.5 % R + 0.005 Ω)
Solderability (4.17.5)	Aging 4 h at 155 °C, dryheat solder bath method; 235 °C; 2 s visual examination	Good tinning (≥ 95 % covered) no visible damage
Resistance to soldering heat (4.18.2)	Solder bath method; (260 ± 5) °C; (10 ± 1) s	± (0.5 % R + 0.005 Ω)
Rapid change of temperature (4.19)	30 min at LCT = - 55 °C; 30 min at UCT = 125 °C; 5 cycles	± (0.5 % R + 0.005 Ω)
Damp heat, steady state (4.24)	(40 ± 2) °C; 56 days; (93 ± 3) % RH	± (2 % R + 0.01 Ω)
Climatic sequence (4.23)	16 h at UCT = 125 °C; 1 cycle at 55 °C; 2 h at LCT = - 55 °C; 1 h/1 kPa at 15 °C to 35 °C; 5 cycles at 55 °C $U = (P_{70} \times R)^{1/2}$ $U = U_{max.}$; whichever is less severe	± (2 % R + 0.01 Ω)
Endurance at 70 °C (4.25.1)	$U = (P_{70} \times R)^{1/2}$ $U = U_{max.}$; whichever is less severe 1.5 h ON; 0.5 h OFF; 70 °C; 1000 h	± (2 % R + 0.01 Ω)
Extended endurance (4.25.1.8)	Duration extended to 8000 h	± (4 % R + 0.01 Ω)
Endurance at upper category temperature (4.25.3)	UCT = 125 °C; 1000 h	± (2 % R + 0.01 Ω)

Note

(1) Values valid for measurements from the top side

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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