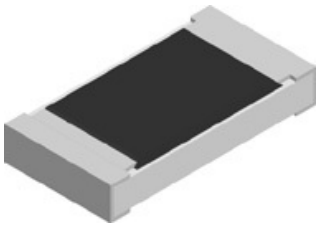
Lead (Pb)-free Thick Film, Rectangular Trimmable Chip Resistors



FEATURES

- Can be trimmed to the required value after insertion
- For applications in precision circuitry where relative tolerances can be compensated by trimming
- 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
- Compatible 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	LIMITING ELEMENT VOLTAGE MAX V≅	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE Ω	E-SERIES
	INCH	METRIC						
D10/CRCW0402-TR	0402	1005	0.063	50	± 100 ± 200	± 10 ± 15 ± 20 + 0/- 10 + 0/- 20 + 0/- 30	10R - 10M R47 - 10M	24
D11/CRCW0603-TR	0603	1608	0.10	75	± 100 ± 200		10R - 10M R47 - 10M	
D12/CRCW0805-TR	0805	2012	0.125	150	± 100 ± 200		10R - 10M R47 - 10M	
D25/CRCW1206-TR	1206	3216	0.25	200	± 100 ± 200		10R - 10M R47 - 10M	
CRCW1210-TR	1210	3225	0.33	200	± 100 ± 200		10R - 4M7	
CRCW2010-TR	2010	5025	0.50	400	± 100 ± 200		10R - 4M7	
CRCW2512-TR	2512	6332	1.0	500	± 100 ± 200		10R - 4M7	

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: No marking on device, on the label only
- Packaging: See appropriate catalog or web pages
- 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-TR	D11/ CRCW0603-TR	D12/ CRCW0805-TR	D25/ CRCW1206-TR	CRCW1210-TR	CRCW2010-TR	CRCW2512-TR
Rated Dissipation at 70 °C (3)	W	0.063	0.1	0.125	0.25	0.33	0.5	1.0
Limiting Element Voltage (2)	V≅	50	75	150	200	200	400	500
Insulation Voltage (1 min)	V_{peak}	> 75	> 100	> 200	> 300	> 300	> 300	> 300
Thermal Resistance (1)	K/W	≤ 870	≤ 550	≤ 440	≤ 220	≤ 140	≤ 88	≤ 65
Insulation Resistance	Ω	$> 10^9$						
Category Temperature Range	°C	- 55 to + 155						
Failure Rate	h^{-1}	0.3×10^{-9}						
Weight/1000 pcs	g	0.65	2	5.5	10	16	25.5	40.5

Notes

(1) For size 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) Rated voltage: $\sqrt{P \times R}$

(3) 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: CRCW040275R0KKEDTR[1)]

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

MODEL	VALUE	TOLERANCE	TCR	PACKAGING [2)]	SPECIAL
CRCW0402 **CRCW0603** **CRCW0805** **CRCW1206** **CRCW1210** **CRCW2010** **CRCW2512**	**R** = Decimal **K** = Thousand **M** = Million	**K** = ± 10 % **L** = ± 15 % **M** = ± 20 % **U** = + 0 %/- 10 % **V** = + 0 %/- 20 % **W** = + 0 %/- 30 %	**K** = ± 100 ppm/K **N** = ± 200 ppm/K	**EA** **EB** **EC** **ED** **EE** **EI** **EL** **EF** **EG** **EH**	up to 2 digits **TR** = Trimmable

PRODUCT DESCRIPTION: D10/CRCW0402-TR 100 75R 10 % ET7 e3

D10/CRCW0402-TR	100	75R	10 %	ET7	e3
MODEL	TCR	RESISTANCE VALUE	TOLERANCE	PACKAGING [2)]	LEAD (Pb)-FREE
D10/CRCW0402-TR D11/CRCW0603-TR D12/CRCW0805-TR D25/CRCW1206-TR CRCW1210-TR CRCW2010-TR CRCW2512-TR	± 100 ppm/K ± 200 ppm/K	49K9 = 49.9 kΩ 5R1 = 5.1 Ω	± 10 % ± 15 % ± 20 % + 0 %/- 10 % + 0 %/- 20 % + 0 %/- 30 %	ET1 ET5 ET6 ET7 EF4 E02 E67 E82 EG1 E20	e3 = Pure Tin Termination Finish

Notes

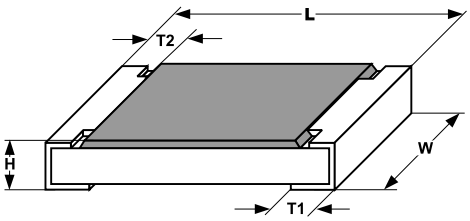
(1) Preferred way for ordering products is by use of the PART NUMBER

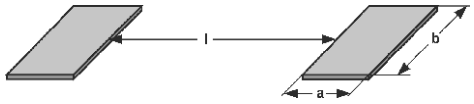
(2) Please refer to table PACKAGING, see next page

PACKAGING

MODEL	REEL							BULK		
	TAPE WIDTH	DIAMETER	PITCH	PIECES/ REEL	PACKAGING CODE				PIECES	PACKING CODE	
					PART NUMBER		PRODUCT DESC.			PART NUMBER	PRODUCT DESC.
					PAPER	BLISTER	PAPER	BLISTER			
D10/CRCW0402-TR	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 EF4		50 000	EY	E27
D11/CRCW0603-TR	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-TR	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-TR	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-TR	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				
CRCW2010-TR	12 mm	180 mm/7"	4 mm	4000		EF		E02			
CRCW2512-TR	12 mm	180 mm/7"	8 mm 4 mm	2000 4000		EG EH		E67 E82			

DIMENSIONS

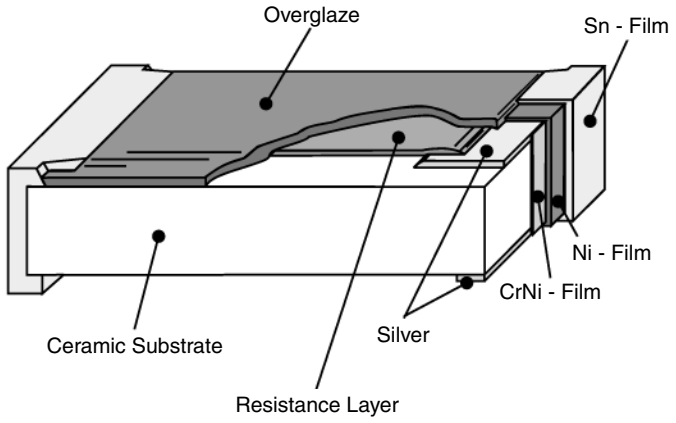




SIZE		DIMENSIONS [in millimeters]				
INCH	METRIC	L	W	H	T1	T2
0402	1005	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.25 ± 0.05	0.2 ± 0.1
0603	1608	$1.55^{+0.10}_{-0.05}$	0.85 ± 0.1	0.45 ± 0.05	0.3 ± 0.2	0.3 ± 0.2
0805	2012	$2.0^{+0.20}_{-0.10}$	1.25 ± 0.15	0.45 ± 0.05	$0.3^{+0.20}_{-0.10}$	0.3 ± 0.2
1206	3216	$3.2^{+0.10}_{-0.20}$	1.6 ± 0.15	$0.55^{+0.05}_{-0.10}$	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
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

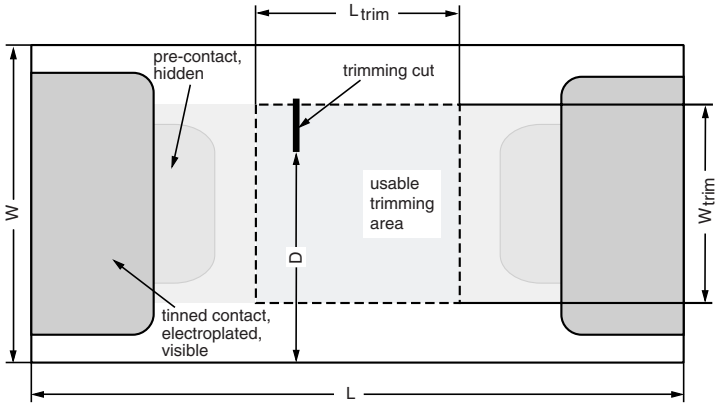
SIZE		SOLDER PAD DIMENSIONS [in millimeters]					
		REFLOW SOLDERING			WAVE SOLDERING		
INCH	METRIC	a	b	l	a	b	l
0402	1005	0.4	0.6	0.5			
0603	1608	0.5	0.9	1.0	0.9	0.9	1.0
0805	2012	0.7	1.3	1.2	0.9	1.3	1.3
1206	3216	0.9	1.7	2.0	1.1	1.7	2.3
1210	3225	0.9	2.5	2.0	1.1	2.5	2.2
2010	5025	1.0	2.5	3.9	1.2	2.5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

TRIMMING INSTRUCTIONS



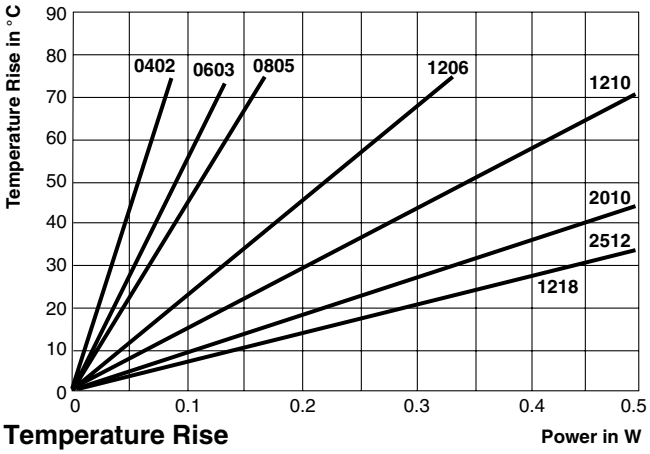
YAG-Laser:
Maximum trimming factor = 1.6 for an I-cut and 1.8 for a L-cut
Double cut: Distance between two cuts = 0.5 mm min
The laser-cut should be protected with epoxy resins

PERMISSIBLE TRIMMING AREA

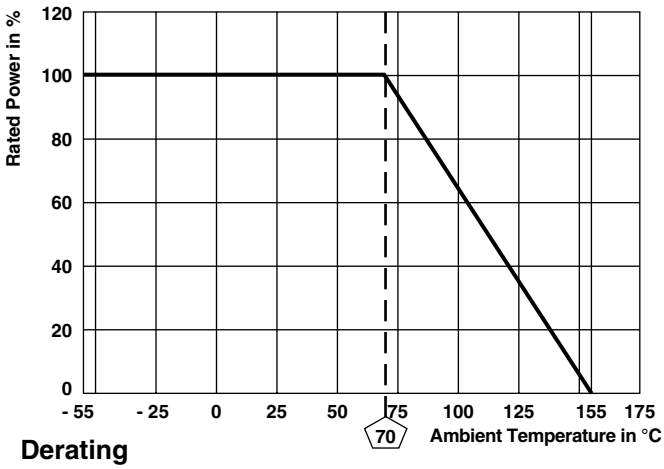


DIMENSIONS OF THE PERMISSIBLE TRIMMING AREA in millimeters					
MODEL	**L**	**W**	**L_{trim}**	**W_{trim}**	**D**
D10/CRCW0402-TR (1)	1.0	0.5	≤ 0.25	0.27	≥ 0.25
D11/CRCW0603-TR (1)	1.55	0.85	≤ 0.425	0.5	≥ 0.425
D12/CRCW0805-TR	2.0	1.25	≤ 0.625	0.85	≥ 0.625
D25/CRCW1206-TR	3.2	1.6	≤ 0.8	1.0	≥ 0.8
CRCW1210-TR	3.2	2.5	≤ 1.25	1.6	≥ 1.25
CRCW2010-TR	5.0	2.5	≤ 1.25	1.9	≥ 1.25
CRCW2512-TR	6.3	3.15	≤ 1.575	2.4	≥ 1.575

Note
(1) Single cut only



Temperature Rise



Derating

TEST PROCEDURES AND REQUIREMENTS

EN 60115-1			
TEST (clause)	**CONDITIONS OF TEST**	**REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R/R$) (1)**	
		STABILITY CLASS 1 OR BETTER	**STABILITY CLASS 2 OR BETTER**
	Stability for product types:	10R - 10M	R47 - 10M
	D../CRCW....-TR e3		
Resistance (4.5)	-	± 10; ± 15; ± 20; + 0/- 30 %	
Temperature coefficient (4.8.4.2)	20/- 55/20 °C and 20/125/20 °C	± 100 ppm/K	± 200 ppm/K
Overload (4.13)	$U = 2.5 \times (P_{70} \times R)^{1/2}$ $\leq 2 \times U_{max.}$; Duration: according the style	± (0.25 % R + 0.05 Ω)	± (0.5 % R + 0.05 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	± (0.25 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)
Rapid change of temperature (4.19)	30 min at LCT = - 55 °C; 30 min at UCT = 125 °C; 5 cycles	± (0.25 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)
Damp heat, steady state (4.24)	(40 ± 2) °C; 56 days; (93 ± 3) % RH	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 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	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 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	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)
Extended endurance (4.25.1.8)	Duration extended to 8000 h	± (2 % R + 0.1 Ω)	± (4 % R + 0.1 Ω)
Endurance at upper category temperature (4.25.3)	UCT = 125 °C; 1000 h	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)

Note

(1) Data is valid for non trimmed resistors only. Depending on the trimming process some properties can change

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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