

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



FEATURES

- Low temperature coefficient (50 ppm/K) and tight tolerances ($\pm 0.25\%$)
- Pure tin plating provides compatibility with lead (Pb)-free and lead containing soldering processing
- Metal glaze on high quality ceramic
- AEC-Q200 qualified
- Material categorization: For definitions of compliance please see 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 Ω	SERIES
D10/CRCW0402-P	0402	1005	0.063	50	± 100	± 0.5	1R to 1M1	E24; E96
					± 50	$\pm 0.25, \pm 0.5, \pm 1$	100R to 1M	
D11/CRCW0603-P	0603	1608	0.1	75	± 100	$\pm 0.5, \pm 0.25$	1R to 10M	E24; E96
					± 50	± 0.25	100R to 1M	
D12/CRCW0805-P	0805	2012	0.125	150	± 100	± 0.5	10R to 10M	E24; E96
					± 50	± 0.25	100R to 1M	
D25/CRCW1206-P	1206	3216	0.25	200	± 100	± 0.5	10R to 10M	E24; E96
					± 50	± 0.25	100R to 1M	
CRCW1210-P	1210	3225	0.5	200	± 100	± 0.5	100R to 1M	E24; E96
					± 50	$\pm 0.5, \pm 1$	100R to 1M	
CRCW1218-P	1218	3246	1.0	200	± 100	± 0.5	100R to 2M2	E24; E96
					± 50	$\pm 0.5, \pm 1$	100R to 2M2	
CRCW2010-P	2010	5025	0.75	400	± 100	± 0.5	10R to 10M	E24; E96
					± 50	$\pm 0.5, \pm 1$	100R to 10M	
CRCW2512-P	2512	6332	1.0	500	± 100	± 0.5	10R to 10M	E24; E96
					± 50	$\pm 0.5, \pm 1$	100R to 10M	

Notes

- These resistors do not feature a limited lifetime when operated within the limits of rated dissipation, permissible operating voltage and permissible film temperature. However, the resistance typically increase due to the resistor's film temperature over operating time generally known as drift. The drift may exceed the stability requirements of an individual application circuit and thereby limits the functional time.
- Marking and packaging: See datasheet "Surface Mount Resistor Marking" (www.vishay.com/doc?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 at P_{70} ⁽¹⁾	W	0.063	0.1	0.125	0.25	0.5	1.0	0.75	1.0
Operating Voltage U_{max} , AC _{RMS} /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							
Operating Temperature Range	$^{\circ}\text{C}$	- 55 to + 155							
Failure Rate	h^{-1}	< 0.1×10^{-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-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature of 155 $^{\circ}\text{C}$ is not exceeded.

PART NUMBER AND PRODUCT DESCRIPTION																
PART NUMBER: CRCW040275R0DKEDP																
C	R	C	W	0	4	0	2	7	5	R	0	D	K	E	D	P
MODEL		RESISTANCE		TOLERANCE		TCR		PACKAGING		SPECIAL						
CRCW0402 CRCW0603 CRCW0805 CRCW1206 CRCW1210 CRCW1218 CRCW2010 CRCW2512		R = Decimal K = Thousand M = Million		C = $\pm 0.25\%$ D = $\pm 0.5\%$ F = $\pm 1.0\%$		H = ± 50 ppm/K K = ± 100 ppm/K		EA, EB, EC, ED, EE, EF, EG, EH, EI, EL EK		P = Semi-Precision						
PRODUCT DESCRIPTION: D10/CRCW0402-P 100 75R 0.5 % ET7 e3																
D10/CRCW0402-P		100		75R		0.5 %		ET7		e3						
MODEL		TCR		RESISTANCE		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		± 50 ppm/K ± 100 ppm/K		49K9 = 49.9 k Ω 5R1 = 5.1 Ω		$\pm 0.25\%$ $\pm 0.5\%$ $\pm 1\%$		ET1, ET2, ET3, ET4, ET5, ET6, ET7, ET8, ET9, EF4, E02, E67, E82		e3 = Pure tin termination finish						

PACKAGING						
MODEL	CODE	QUANTITY	CARRIER TAPE	WIDTH	PITCH	REEL DIAMETER
D10/CRCW0402-P	ED = ET7	10 000	Paper tape acc. to IEC 60068-3 Type I	8 mm	2 mm	180 mm/7"
	EE = EF4	50 000				330 mm/13"
D11/CRCW0603-P	EI = ET2	5000		8 mm	2 mm	180 mm/7"
	ED = ET3	10 000				180 mm/7"
	EL = ET4	20 000				285 mm/11.25"
	EE = ET8	50 000				330 mm/13"
	EA = ET1	5000				180 mm/7"
D12/CRCW0805-P	EB = ET5	10 000		8 mm	4 mm	285 mm/11.25"
	EC = ET6	20 000				330 mm/13"
	EA = ET1	5000				180 mm/7"
D25/CRCW1206-P	EB = ET5	10 000	8 mm	4 mm	285 mm/11.25"	
	EC = ET6	20 000			330 mm/13"	
	EA = ET1	5000			180 mm/7"	
CRCW1210-P	EB = ET5	10 000	12 mm	4 mm	285 mm/11.25"	
	EC = ET6	20 000			330 mm/13"	
	EA = ET1	5000			180 mm/7"	
CRCW1218-P	EK = ET9	4000	Blister tape acc. to IEC 60068-3 Type II	12 mm	4 mm	180 mm/7"
CRCW2010-P	EF = E02	4000		12 mm	4 mm	180 mm/7"
CRCW2512-P	EG = E67	2000		12 mm	8 mm	180 mm/7"
	EH = E82	4000	4 mm		180 mm/7"	

DIMENSIONS in millimeters												
SIZE		DIMENSIONS					SOLDER PAD DIMENSIONS					
INCH	METRIC	L	W	H	T1	T2	REFLOW SOLDERING			WAVE SOLDERING		
							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

FUNCTIONAL PERFORMANCE


TEST PROCEDURES AND REQUIREMENTS				
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)
			Stability for product types:	STABILITY CLASS 1 OR BETTER
			D/CRCW-P e3	1 Ω to 10 M Ω
4.5	-	Resistance	-	$\pm 0.25\%$; $\pm 0.5\%$; $\pm 1\%$
4.7	-	Voltage proof	$U = 1.4 \times U_{ins}$; 60 s	No flashover or breakdown
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$; duration acc. to style	$\pm (0.25\% R + 0.05 \Omega)$
4.17.2	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	± 50 ppm/K; ± 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 $\pm (0.25\% R + 0.05 \Omega)$
4.19	14 (Na)	Rapid change of temperature	30 min at - 55 °C; 30 min at 125 °C	$\pm (0.25\% R + 0.05 \Omega)$ $\pm (1\% R + 0.05 \Omega)$
			5 cycles 1000 cycles	

TEST PROCEDURES AND REQUIREMENTS				
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)
			Stability for product types:	STABILITY CLASS 1 OR BETTER
			D/CRCW-P e3	1 Ω to 10 M Ω
4.23	-	Climatic sequence:	-	$\pm (1 \% R + 0.05 \Omega)$
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	$U = \sqrt{P_{70} \times R}$	
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	$\pm (1 \% R + 0.05 \Omega)$ $\pm (2 \% R + 0.05 \Omega)$
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 \pm 5) °C; (10 \pm 1) s	$\pm (0.25 \% R + 0.05 \Omega)$
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	$\pm (1 \% R + 0.05 \Omega)$
4.25.3	-	Endurance at upper category temperature	155 °C, 1000 h	$\pm (1 \% R + 0.05 \Omega)$
4.40	-	Electrostatic discharge (human body model)	IEC 61340-3-1; 3 pos. + 3 neg. discharges; ESD voltage acc. to size	$\pm (1 \% R + 0.05 \Omega)$
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 \leq 1.5 mm; A \leq 200 m/s ² ; 10 sweeps per axis	$\pm (0.25 \% R + 0.05 \Omega)$
4.37	-	Periodic electric overload	$U = \sqrt{15 \times P_{70} \times R}$ $\leq 2 \times U_{max.}$; 0.1 s on; 2.5 s off; 1000 cycles	$\pm (1 \% R + 0.05 \Omega)$
4.27	-	Single pulse high voltage overload, 10 μ s/700 μ s	$\hat{U} = 10 \times \sqrt{P_{70} \times R}$ $\leq 2 \times U_{max.}$; 10 pulses	$\pm (1 \% R + 0.05 \Omega)$

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, variety of environmental test procedures

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



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.