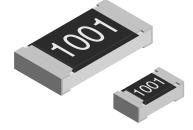
# D/CRCW-P e3



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



## FEATURES

• Low temperature coefficient (50 ppm/K) and tight tolerances (± 0.25 %)



- Pure tin plating provides compatibility with lead (Pb)-free and lead containing soldering processing
  RoHS
  COMPLIANT
  HALGEN
  FREE
- Metal glaze on high quality ceramic
- AEC-Q200 qualified
- Material categorization: For definitions of compliance please see <u>www.vishay.com/doc?99912</u>

STANDARD ELECTRICAL SPECIFICATIONS																
MODEL	CASE SIZE INCH	CASE SIZE METRIC	POWER RATING P <sub>70</sub> W	LIMITING ELEMENT VOLTAGE U <sub>max.</sub> AC <sub>RMS</sub> /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								
B10/0110004021	0402	1005	0.000	50	± 50	± 0.25, ± 0.5, ± 1	100R to 1M	224, 200								
					± 100	± 0.5, ± 0.25	1R to 10M									
D11/CRCW0603-P	0603	1608	0.1	75	± 50	± 0.25	100R to 1M	E24; E96								
					± 50	± 0.5, ± 1	100R to 10M									
	0805											± 100	± 0.5	10R to 10M		
D12/CRCW0805-P		2012	0.125	150	± 50	± 0.25	100R to 1M	E24; E96								
						± 0.5, ± 1	100R to 10M									
	1206												± 100	± 0.5	10R to 10M	
D25/CRCW1206-P		3216	0.25	200	± 50	± 0.25	100R to 1M	E24; E96								
						± 0.5, ± 1	100R to 10M									
CRCW1210-P	1210	3225	0.5	200	± 100	± 0.5	100R to 1M									
CRCW1210-P	1210	3225	0.5	200	± 50	± 0.5, ± 1	100R to 1M	E24; E96								
		0040	1.0	000	± 100	± 0.5	100R to 2M2									
CRCW1218-P	1218	3246	1.0	200	± 50	± 0.5, ± 1	100R to 2M2	E24; E96								
CRCW2010-P	0010	0010	0010	0010	0010	5005	0.75	400	± 100	± 0.5	10R to 10M					
	2010	0 5025	0.75	400	± 50	± 0.5, ± 1	100R to 10M	E24; E96								
	0510	6000	1.0	500	± 100	± 0.5	10R to 10M									
CRCW2512-P	2512 6332		1.0	500	± 50	± 0.5, ± 1	100R to 10M	E24; E96								

### 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.



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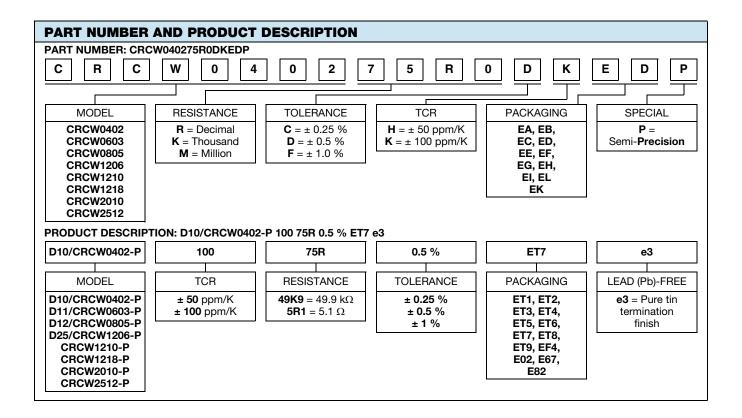
TECHNICAL SPECIFICATIONS	
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TECHNICAL SPECIFICATIONS									
PARAMETER	UNIT	D10/ CRCW0402-P	D11/ CRCW0603-P	D12/ CRCW0805-P	D25/ CRCW1206-P	CRCW1210-P	CRCW1218-P	CRCW2010-P	CRCW2512-I
Rated Dissipation at $P_{70}$ <sup>(1)</sup>	W	0.063	0.1	0.125	0.25	0.5	1.0	0.75	1.0
Operating Voltage U <sub>max.</sub> AC <sub>RMS</sub> /DC	V	50	75	150	200	200	200	400	500
Insulation Voltage U <sub>ins</sub> (1 min)	V	75	100	200	300	300	300	300	300
Insulation Resistance	Ω	> 10 <sup>9</sup>							
Operating Temperature Range	°C	- 55 to + 155							
Failure Rate	h⁻¹	< 0.1 x 10 <sup>-9</sup>							
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.



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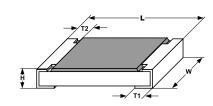


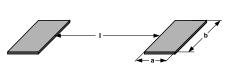
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PACKAGING								
MODEL	CODE	QUANTITY	CARRIER TAPE	WIDTH	PITCH	REEL DIAMETER		
D10/CRCW0402-P	ED = ET7	10 000		0	2 mm	180 mm/7"		
D10/CRC100402-P	EE = EF4	50 000		8 mm	2 mm	330 mm/13"		
	EI = ET2	5000	]			180 mm/7"		
	ED = ET3	10 000		8 mm	2 mm	180 mm/7"		
	EL = ET4	20 000		0 11111	2 11111	285 mm/11.25"		
D11/CRCW0603-P	EE = ET8	50 000				330 mm/13"		
	EA = ET1	5000				180 mm/7"		
	EB = ET5	10 000		8 mm	4 mm	285 mm/11.25"		
	EC = ET6	20 000	Paper tape acc. to IEC 60068-3			330 mm/13"		
	EA = ET1	5000	Type I	8 mm	4 mm	180 mm/7"		
D12/CRCW0805-P	EB = ET5	10 000				285 mm/11.25"		
	EC = ET6	20 000				330 mm/13"		
	EA = ET1	5000		8 mm	4 mm	180 mm/7"		
D25/CRCW1206-P	EB = ET5	10 000				285 mm/11.25"		
	EC = ET6	20 000				330 mm/13"		
	EA = ET1	5000			4 mm	180 mm/7"		
CRCW1210-P	EB = ET5	10 000		12 mm		285 mm/11.25"		
	EC = ET6	20 000				330 mm/13"		
CRCW1218-P	EK = ET9	4000		12 mm	4 mm	180 mm/7"		
CRCW2010-P	EF = E02	4000	Blister tape acc. to IEC 60068-3	12 mm	4 mm	180 mm/7"		
CRCW2512-P	EG = E67	2000	Type II	12 mm	8 mm	180 mm/7"		
	EH = E82	4000		12 11111	4 mm			

## **DIMENSIONS** in millimeters





	SIZE DIMENSIONS					SOLDER PAD DIMENSIONS						
			DIMENSIONS						ERING	WAVE SOLDERING		
INCH	METRIC	L	W	Н	T1	T2	а	b	I	а	b	I
0402	1005	$1.0 \pm 0.05$	$0.5 \pm 0.05$	$0.35\pm0.05$	$0.25\pm0.05$	0.2 ± 0.1	0.4	0.6	0.5			
0603	1608	1.55 <sup>+ 0.10</sup> - 0.05	0.85 ± 0.1	$0.45 \pm 0.05$	0.3 ± 0.2	0.3 ± 0.2	0.5	0.9	1.0	0.9	0.9	1.0
0805	2012	2.0 <sup>+ 0.20</sup> - 0.10	1.25 ± 0.15	$0.45 \pm 0.05$	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 <sup>+ 0.10</sup> - 0.20	1.6 ± 0.15	$0.55 \pm 0.05$	0.45 ± 0.2	$0.4 \pm 0.2$	0.9	1.7	2.0	1.1	1.7	2.3
1210	3225	$3.2 \pm 0.2$	$2.5 \pm 0.2$	$0.55\pm0.05$	$0.45 \pm 0.2$	$0.4 \pm 0.2$	0.9	2.5	2.0	1.1	2.5	2.2
1218	3246	3.2 <sup>+ 0.10</sup> - 0.20	4.6 ± 0.15	$0.55 \pm 0.05$	0.45 ± 0.2	$0.4 \pm 0.2$	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	$0.6 \pm 0.2$	1.0	2.5	3.9	1.2	2.5	3.9
2512	6332	$6.3 \pm 0.2$	$3.15\pm0.15$	0.6 ± 0.1	0.6 ± 0.2	$0.6 \pm 0.2$	1.0	3.2	5.2	1.2	3.2	5.2

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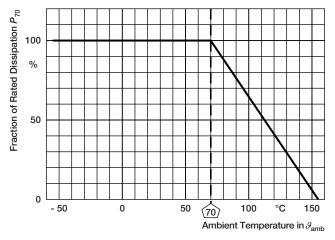
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### FUNCTIONAL PERFORMANCE



TEST PROCEDURES AND REQUIREMENTS								
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (\Delta R)				
			Stability for product types:	STABILITY CLASS 1 OR BETTER				
			D/CRCW-P e3	1 $\Omega$ to 10 M $\Omega$				
4.5	-	Resistance	-	± 0.25 %; ± 0.5 %; ± 1 %				
4.7	-	Voltage proof	<i>U</i> = 1.4 x <i>U</i> <sub>ins</sub> ; 60 s	No flashover or breakdown				
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R} \le 2 \times U_{\text{max.}};$ duration acc. to style	± (0.25 % <i>R</i> + 0.05 Ω)				
	59 (Ta)	Solderability	Solder bath method; Sn60Pb40 non-activated flux; $(235 \pm 5) \degree C$ $(2 \pm 0.2) s$	Good tinning (≥ 95 % covered) no visible damage				
4.17.2 58 (Td)		Solderability	Solder bath method; Sn96.5Ag3Cu0.5 non-activated flux; $(245 \pm 5) \ ^{\circ}C$ $(3 \pm 0.3) \ ^{\circ}S$	Good tinning (≥ 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 <sub>3</sub> )	Shear (adhesion)	RR 1608 and smaller: 9 N RR 2012 and larger: 45 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 $\pm$ (0.25 % $R$ + 0.05 $\Omega$ )				
4.19	14 (Na)	Rapid change of temperature	30 min at - 55 °C; 30 min at 125 °C 5 cycles 1000 cycles	$\pm$ (0.25 % R + 0.05 Ω) $\pm$ (1 % R + 0.05 Ω)				

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TEST PROCEDURES AND REQUIREMENTS									
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (∆R)					
		•	Stability for product types:	STABILITY CLASS 1 OR BETTER					
			D/CRCW-P e3	1 $\Omega$ to 10 M $\Omega$					
4.23	-	Climatic sequence:	-						
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	± (1 % <i>R</i> + 0.05 Ω)					
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	$U = \sqrt{P_{70} \times R} \le U_{\text{max.;}}$ 1.5 h on; 0.5 h off;						
4.23.1	-	Endurance at 70 C	70 °C; 1000 h	± (1 % <i>R</i> + 0.05 Ω)					
			70 °C; 8000 h	± (2 % <i>R</i> + 0.05 Ω)					
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 ± 5) °C; (10 ± 1) s	± (0.25 % <i>R</i> + 0.05 Ω)					
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 % <i>R</i> + 0.05 Ω)					
4.25.3	-	Endurance at upper category temperature	155 °C, 1000 h	± (1 % <i>R</i> + 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 % <i>R</i> + 0.05 Ω)					
4.29	45 (XA)	Component solvent resistance	lsopropyl alcohol; 50 °C; method 2	No visible damage					
4.30	45 (XA)	Solvent resistance of marking	lsopropyl alcohol; 50 °C; method 1, toothbrush	Marking legible, no visible damage					
4.22	6 (Fc)	Vibration, endurance by sweeping	$      f = 10 \ \text{Hz to } 2000 \ \text{Hz;} \\       x, y, z \le 1.5 \ \text{mm;} \\       A \le 200 \ \text{m/s}^2; \\       10 \ \text{sweeps per axis} $	± (0.25 % <i>R</i> + 0.05 Ω)					
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	± (1 % <i>R</i> + 0.05 Ω)					
4.27	-	Single pulse high voltage overload, 10 µs/700 µs	$\hat{U} = 10 \times \sqrt{P_{70} \times R}$ $\leq 2 \times U_{max.;}$ 10 pulses	± (1 % <i>R</i> + 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-x, variety of environmental test procedures

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

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