## Vishay



## Lead (Pb)-Bearing Thick Film, Rectangular Chip Resistors



#### **FEATURES**

HALOGEN FREE

- Stability  $\Delta R/R = 1$  % for 1000 h at 70 °C
- Lead (Pb)-bearing termination plating on Ni barrier layer
- Metal glaze on high quality ceramic
- Halogen-free according to IEC 61249-2-21 definiton
- AEC-Q200 qualified, rev. C compliant

STANDARD	ELEC	CTRICAL	SPECIFICATION	NS					
MODEL	INCH	SIZE METRIC	RATED DISSIPATION  P <sub>70</sub> W	LIMITING ELEMENT VOLTAGE U <sub>max.</sub> AC/DC	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE Ω	SERIES	
D10/CRCW0402	0402	RR 1005M	0.063	50	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24	
			Zero-Ohm-Resistor:	$R_{\text{max.}} = 20 \text{ m}\Omega,$	I <sub>max.</sub> = 1.5 A				
D11/CRCW0603	0603	RR 1608M	0.10	75	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24	
			Zero-Ohm-Resistor:	$R_{\text{max.}} = 20 \text{ m}\Omega,$	I <sub>max.</sub> = 2.0 A				
D12/CRCW0805	0805	0805	RR 2012M	0.125	150	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24
			Zero-Ohm-Resistor: $R_{\text{max.}} = 20 \text{ m}\Omega$ , $I_{\text{max.}} = 2.5 \text{ A}$						
D25/CRCW1206	1206	RR 3216M	0.25	200	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24	
			Zero-Ohm-Resistor:	$R_{\text{max.}} = 20 \text{ m}\Omega,$	$I_{\text{max.}} = 3.5 \text{ A}$				
CRCW1210	1210	RR 3225M	0.50	200	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24	
			Zero-Ohm-Resistor: $R_{\text{max.}} = 20 \text{ m}\Omega$ , $I_{\text{max.}} = 5.0 \text{ A}$						
CRCW1218	1218	RR 3246M	1.0	200	± 100 ± 200	± 1 ± 5	1R0 to 2M2	E24; E96 E24	
			Zero-Ohm-Resistor: $R_{\text{max.}} = 20 \text{ m}\Omega$ , $I_{\text{max.}} = 7.0 \text{ A}$						
CRCW2010	2010	RR 5025M	0.75	400	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24	
			Zero-Ohm-Resistor:	$R_{\text{max.}} = 20 \text{ m}\Omega,$	I <sub>max.</sub> = 6.0 A				
CRCW2512	2512	RR 6332M	1.0	500	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24	
				Zero-Ohm-Resistor:	$R_{\text{max.}} = 20 \text{ m}\Omega,$	$I_{\text{max.}} = 7.0 \text{ A}$			

#### 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 datasheet "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.

For technical questions, contact: <a href="mailto:thickfilmchip@vishay.com">thickfilmchip@vishay.com</a>
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Revision: 18-Nov-10

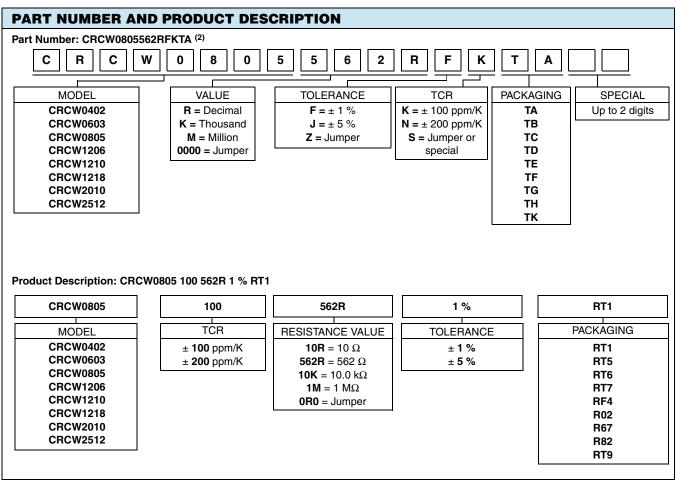




TECHNICAL SPECIFICATIONS									
PARAMETER	UNIT	D10/ CRCW0402	D11/ CRCW0603	D12/ CRCW0805	D25/ CRCW1206	CRCW1210	CRCW1218	CRCW2010	CRCW2512
Rated dissipation at 70 °C (1)	W	0.063	0.1	0.125	0.25	0.5	1.0	0.75	1.0
Limiting element voltage U <sub>MAX.</sub> AC/DC	٧	50	75	150	200	200	200	400	500
Insulation voltage <i>U</i> <sub>INS.</sub> (1 min)	٧	> 75	> 100	> 200	> 300	> 300	> 300	> 300	> 300
Insulation resistance	Ω	2 > 10 <sup>9</sup>							
Category temperature range °C - 55 to + 155									
Failure rate	h <sup>-1</sup>		< 0.1 x 10 <sup>-9</sup>						
Weight	mg	0.65	2	5.5	10	16	29.5	25.5	40.5

#### Note

<sup>(1)</sup> 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.



#### Note

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

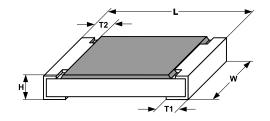
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PACKAGING									
MODEL	UNIT		PAPER TAP ACC. IEC 60286-3	_	BLISTER TAPE ACC. IEC 60286-3, TYPE II				
		QUANTITY	PART NUMBER	PRODUCT DESC.	QUANTITY	PART NUMBER	PRODUCT DESC.		
D10/CRCW0402	180 mm/7"	10 000	TD	RT7					
D10/ChCVV0402	330 mm/13"	50 000	TE	RF4					
	180 mm/7"	5000	TA	RT1					
D11/CRCW0603	285 mm/11.25"	10 000	ТВ	RT5					
	330 mm/13"	20 000	TC	RT6					
	180 mm/7"	5000	TA	RT1					
D12/CRCW0805	285 mm/11.25"	10 000	ТВ	RT5					
	330 mm/13"	20 000	TC	RT6					
	180 mm/7"	5000	TA	RT1					
D25/CRCW1206	285 mm/11.25"	10 000	ТВ	RT5					
	330 mm/13"	20 000	TC	RT6					
	180 mm/7"	5000	TA	RT1					
CRCW1210	285 mm/11.25"	10 000	ТВ	RT5					
	330 mm/13"	20 000	TC	RT6					
CRCW1218	180 mm/7"				4000	TK	RT9		
CRCW2010	180 mm/7"				4000	TF	R02		
CDCW0E10	180 mm/7"				2000	TG	R67		
CRCW2512	100 111111/7				4000	TH	R82		

### **DIMENSIONS**



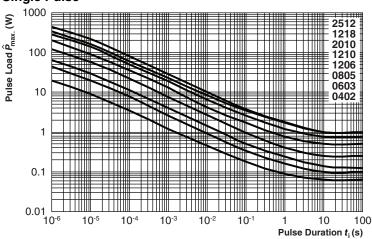


SIZE		DIMENSIONS in millimeters					SOLDER PAD DIMENSIONS in millimeters					
							REFLOW SOLDERING			WAVE SOLDERING		
INCH	METRIC	L	w	Н	T1	T2	а	b	I	а	b	I
0402	1005	1.0 ± 0.05	$0.5 \pm 0.05$	0.35 ± 0.05	0.25 ± 0.05	$0.2 \pm 0.1$	0.4	0.6	0.5			
0603	1608	1.55 + 0.10	0.85 ± 0.1	$0.45 \pm 0.05$	$0.3 \pm 0.2$	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	$0.55 \pm 0.05$	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	$0.55 \pm 0.05$	$0.45 \pm 0.2$	$0.4 \pm 0.2$	0.9	2.5	2.0	1.1	2.5	2.2
1218	3246	3.2 + 0.10 - 0.20	4.6 ± 0.15	$0.55 \pm 0.05$	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	$0.6 \pm 0.2$	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	$0.6 \pm 0.2$	1.0	3.2	5.2	1.2	3.2	5.2



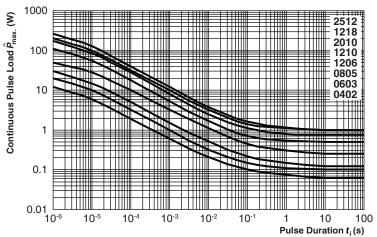
#### **FUNCTIONAL PERFORMANCE**

### Single Pulse



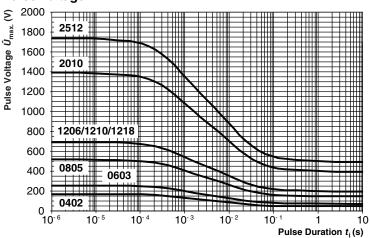
Maximum pulse load, single pulse; applicable if  $\bar{P} \longrightarrow 0$  and n < 1000 and  $\hat{U} \le \hat{U}_{max}$ ; for permissible resistance change equivalent to 8000 h operation

#### **Continuous Pulse**



Maximum pulse load, continuous pulses; applicable if  $\bar{P} \leq P$  ( $9_{amb}$ ) and  $\hat{U} \leq \hat{U}_{max}$ ; for permissible resistance change equivalent to 8000 h operation

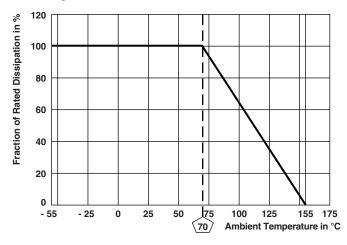
#### **Pulse Voltage**



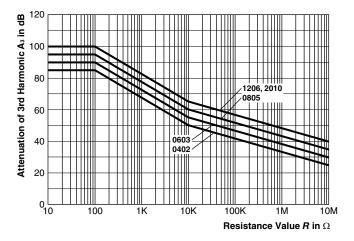
Maximum pulse voltage, single and continuous pulses; applicable if  $\hat{P} \leq \hat{P}_{max}$ ; for permissible resistance change equivalent to 8000 h operation



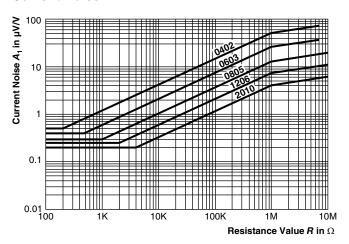
### **Derating**



### **Non-Linearity**



### **Current Noise**







TEST F	PROCED	URES AND REQUIREM	MENTS				
			PROGERIUM	REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )			
EN 60115-1	IEC 60082-2 TEST	TEST	PROCEDURE	STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER		
CLAUSE	METHOD		Stability for product types:	1.0 to 10 MO	1.04-10.00		
			D/CRCW	- 1 Ω to 10 MΩ	1 Ω to 10 MΩ		
4.5	-	Resistance	-	± 1 %	± 5 %		
4.7	-	Voltage proof	$U = 1.4 \cdot U_{\text{ins}}$ ; 60 s	No flashover	or breakdown		
4.13	-	Short time overload	$U = 2.5 \text{ x } \sqrt{P_{70} \text{ x } R} \le 2 \text{ x } U_{\text{max.}};$ duration: Acc. to style	$\pm (0.25 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$		
4.17.2	58 (Td)	Solderability	Solder bath method; Sn60Pb40; non-activated flux; $(235 \pm 5)$ °C, $(2 \pm 0.2)$ s	Good tinning (≥ 95 % covered); no visible damage			
4.8.4.2	-	Temperature coefficient	(20/- 55/20) °C and (20/125/20) °C	± 100 ppm/K	± 200 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	e damage		
4.33	21 (Uu <sub>1)</sub>	Substrate bending	Depth 2 mm; 3 times	no open circuit	e damage, in bent position $R+0.05~\Omega)$		
			30 min. at - 55 °C;				
4.19	14 (Na)	Rapid change of temperature	30 min. at 125°C 5 cycles 1000 cycles	$\pm$ (0.25 % $R$ + 0.05 Ω) $\pm$ (1 % $R$ + 0.05 Ω)	$\pm (0.5 \% R + 0.05 \Omega)$ $\pm (1 \% R + 0.05 \Omega)$		
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 % R + 0.05 Ω)	± (2 % R + 0.1 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; 70 °C; 1000 h 70 °C; 8000 h	± (1 % R + 0.05 Ω) ± (2 % R + 0.1 Ω)	± (2 % R + 0.1 Ω) ± (4 % R + 0.1 Ω)		
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 $\pm$ 5) °C; (10 $\pm$ 1) s	± (0.25 % R + 0.05 Ω)	± (0.5 % R + 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 % R + 0.05 Ω)			
4.25.3	-	Endurance at upper category temperature	155 °C; 1000 h	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)		
4.40	-	Electrostatic discharge (human body model)	IEC 61340-3-1; 3 pos. + 3 neg. discharges; ESD test voltage acc. to size	± (1 % <i>R</i> + 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			

### D/CRCW

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TEST F	TEST PROCEDURES AND REQUIREMENTS										
			PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )							
EN 60115-1	IEC 60082-2 TEST	TEST	PROCEDURE	STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER						
CLAUSE	METHOD		Stability for product types: 1 $\Omega$ to 10 $M\Omega$		1 Ω to 10 MΩ						
			D/CRCW	1 22 10 10 10122	1 22 10 10 10122						
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 <sup>2</sup> ; 10 sweeps per axis	$\pm (0.25 \% R + 0.05 \Omega)$	± (0.5 % R + 0.05 Ω)						
4.37	-	Periodic electric overload	$U = \sqrt{15 \times P_{70} \times R} \le 2 \times U_{\text{max.}};$ 0.1 s on; 2.5 s off; 1000 cycles	$\pm (1 \% R + 0.05 \Omega)$							
4.27	-	Single pulse high voltage overload, 10 μs/700 μs	$\hat{U} = 10 \text{ x } \sqrt{P_{70} \text{ x } R} \le 2 \text{ x } U_{\text{max.}};$ 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, environmental test procedures

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

www.vishay.com 124 For technical questions, contact: thickfilmchip@vishay.com



## **Legal Disclaimer Notice**

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Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.

Revision: 02-Oct-12 Document Number: 91000

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CRCW04028R20JNEE CRCW06036K80FKEE CRG1206F1K58 CRL0603-FW-R700ELF M55342K06B6E19RWL RC1005F1072CS

RC1005F471CS RC1005F4751CS RCP0603W100RGED ERJ-1GMF1R00C ERJ-1GMF1R20C ERJ-1GMF2R55C ERJ-1GMF8R66C

25121WF1003T4E 25.501.3653.0 290-1.0M-RC 292-1.0M-RC 292-2.2K-RC 292-4.7K-RC 25121WF4700T4E 292-470K-RC 302-1.0M-RC CPG1206F10KC CRCW02011R00FXED CRCW060315K0FKEE CRCW060320K5FKEE CRG0201F10K RCP2512B100RGWB

RCWP12061K00FKS2 3520510RJT 352075KJT M55342K11B9E53RUL RMC16-102JT RMC1JPTE TR0603MR-075K1L 5-2176094-4

35202K7JT WF06Q1000FTL ERJ-S14J4R7U CHP2512L4R30GNT WR12X1621FTL RCWP11001K00FKS3 LRC-LRF3W-01-R050-FTR1800 9-2176088-6 NRC06F1002TR20F CRCW02013M30FNED CRCW060343K0FKEE WR04X5360FTL RCA060345K3FKEA LTR100JZPF33R0