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 ₇₀ W	LIMITING ELEMENT VOLTAGE U _{max.} 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 _{max.} = 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 _{max.} = 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:	$R_{\text{max.}} = 20 \text{ m}\Omega,$	$I_{\text{max.}} = 6.0 \text{ A}$					
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: thickfilmchip@vishay.com
Document Number: 20008
Revision: 18-Nov-10



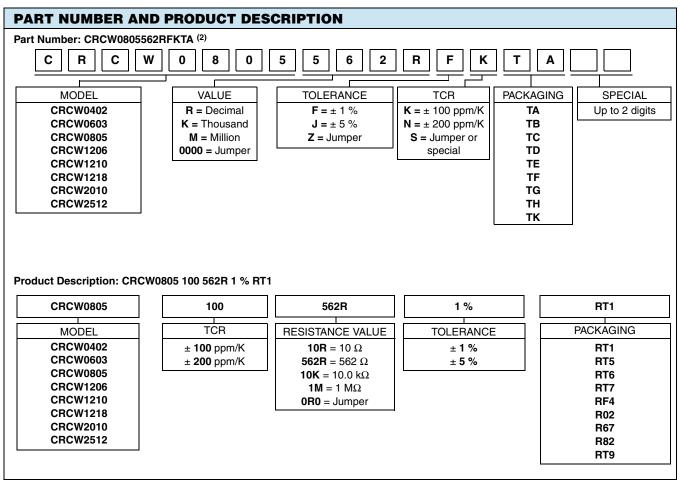


Lead (Pb)-Bearing Thick Film, Rectangular Chip Resistors

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 _{MAX.} AC/DC	٧	50	75	150	200	200	200	400	500	
Insulation voltage <i>U</i> _{INS.} (1 min)	٧	> 75	> 100	> 200	> 300	> 300	> 300	> 300	> 300	
Insulation resistance Ω > 10 ⁹				09						
Category temperature range			- 55 to + 155							
Failure rate	h-1		< 0.1 x 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 °C is not exceeded.



Note

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

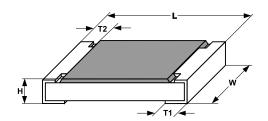
Vishay

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



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	160 11111/7				4000	TH	R82		

DIMENSIONS



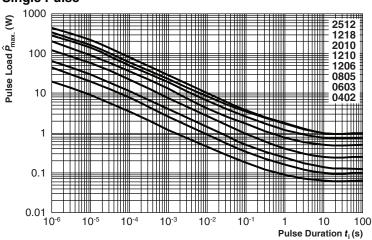


SIZE		DIMENSIONS in millimeters						SOLDER PAD DIMENSIONS in millimeters						
								W SOLD	ERING	WAVE SOLDERING				
INCH	METRIC	L	w	Н	T1	T2	а	b	I	а	b	I		
0402	1005	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.25 ± 0.05	0.2 ± 0.1	0.4	0.6	0.5					
0603	1608	1.55 + 0.10	0.85 ± 0.1	0.45 ± 0.05	0.3 ± 0.2	0.3 ± 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	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		



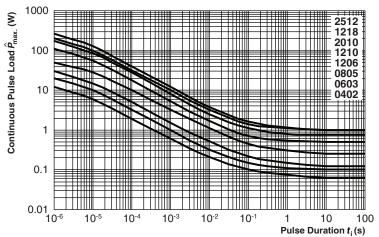
FUNCTIONAL PERFORMANCE

Single Pulse



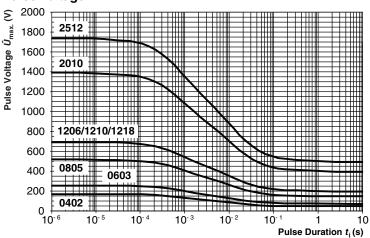
Maximum pulse load, single pulse; applicable if $\bar{P} \longrightarrow 0$ and n < 1000 and $\hat{U} \le \hat{U}_{max}$; for permissible resistance change equivalent to 8000 h operation

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

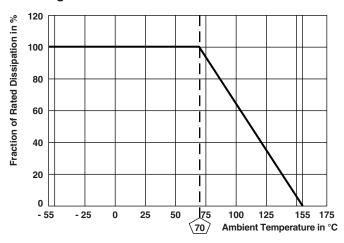
Pulse Voltage



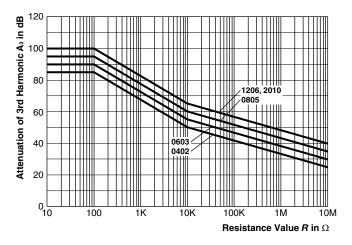
Maximum pulse voltage, single and continuous pulses; applicable if $\hat{P} \leq \hat{P}_{max}$; for permissible resistance change equivalent to 8000 h operation



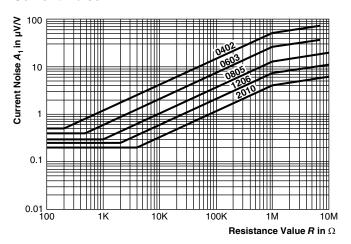
Derating



Non-Linearity



Current Noise





Vishay



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

TEST PROCEDURES AND REQUIREMENTS REQUIREMENTS PERMISSIBLE CHANGE ($\triangle R$) **PROCEDURE IEC** ΕN STABILITY CLASS 1 **STABILITY CLASS 2** 60082-2 **OR BETTER** OR BETTER 60115-1 **TEST TEST CLAUSE** Stability for product types: **METHOD** 1 Ω to 10 M Ω 1 Ω to 10 M Ω D/CRCW 4.5 Resistance ±1% ±5% $U = 1.4 \cdot U_{\text{ins}}$; 60 s 4.7 Voltage proof No flashover or breakdown $U = 2.5 \text{ x } \sqrt{P_{70} \text{ x } R} \le 2 \text{ x } U_{\text{max.}};$ $\pm (0.25 \% R + 0.05 \Omega)$ $\pm (0.5 \% R + 0.05 \Omega)$ 4.13 Short time overload duration: Acc. to style Solder bath method: Sn60Pb40: Good tinning (≥ 95 % 4.17.2 58 (Td) Solderability non-activated flux; covered); (235 ± 5) °C, (2 ± 0.2) s no visible damage (20/- 55/20) °C and 4.8.4.2 Temperature coefficient ± 100 ppm/K ± 200 ppm/K (20/125/20) °C RR 1608 and smaller: 9 N 4.32 21 (Uu₃₎ Shear (adhesion) No visible damage RR 2012 and larger: 45 N No visible damage, no open circuit in bent position 4.33 21 (Uu₁₎ Substrate bending Depth 2 mm; 3 times $\pm (0.25 \% R + 0.05 \Omega)$ 30 min. at - 55 °C; 30 min. at 125°C 4.19 14 (Na) Rapid change of temperature 5 cycles $\pm (0.25 \% R + 0.05 \Omega)$ $\pm~(0.5~\%~R+0.05~\Omega)$ 1000 cycles $\pm (1 \% R + 0.05 \Omega)$ $\pm (1 \% R + 0.05 \Omega)$ 4.23 Climatic sequence: 4.23.2 2 (Ba) Dry heat 125 °C; 16 h 55 °C; ≥ 90 % RH; 4.23.3 30 (Db) Damp heat, cyclic 24 h; 1 cycle 4.23.4 1 (Aa) Cold - 55 °C; 2 h $\pm (1 \% R + 0.05 \Omega)$ $\pm (2 \% R + 0.1 \Omega)$ 4.23.5 13 (M) Low air pressure 1 kPa; (25 ± 10) °C; 1 h 55 °C; ≥ 90 % RH; 4.23.6 30 (Db) Damp heat, cyclic 24 h; 5 cycles $U = \sqrt{P_{70} \times R}$ 4.23.7 DC load $\overline{U = \sqrt{(P_{70} \times R)}} \le U_{\text{max.}}$ 1.5 h on; 0.5 h off; 4.25.1 Endurance at 70 °C 70 °C; 1000 h $\pm (1 \% R + 0.05 \Omega)$ $\pm (2 \% R + 0.1 \Omega)$ 70 °C; 8000 h $\pm (2 \% R + 0.1 \Omega)$ $\pm (4 \% R + 0.1 \Omega)$ Solder bath method 4.18.2 58 (Td) Resistance to soldering heat $\pm (0.25 \% R + 0.05 \Omega)$ $\pm (0.5 \% R + 0.05 \Omega)$ (260 ± 5) °C; (10 ± 1) s IEC 60695-11-5; Flamability, needle flame test 4.35 No burning after 30 s 10 s (40 ± 2) °C; 4.24 78 (Cab) Damp heat, steady state $\pm (1 \% R + 0.05 \Omega)$ (93 ± 3) % RH; 56 days Endurance at upper 4.25.3 155 °C; 1000 h $\pm (1 \% R + 0.05 \Omega)$ $\pm (2 \% R + 0.1 \Omega)$ category temperature

Document Number: 20008 Revision: 18-Nov-10

45 (XA)

45 (XA)

4.40

4.29

4.30

Electrostatic discharge

(human body model)

Component solvent resistance

Solvent resistance of marking

IEC 61340-3-1;

3 pos. + 3 neg. discharges;

ESD test voltage acc. to size Isopropyl alcohol;

50 °C; method 2 Isopropyl alcohol;

50 °C; method 1, toothbrush

 $\pm (1 \% R + 0.05 \Omega)$

No visible damage

Marking legible,

no visible damage

D/CRCW

Vishay

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



TEST F	TEST PROCEDURES AND REQUIREMENTS										
			PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)							
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 Ω to 10 MΩ	1 Ω to 10 MΩ						
			D/CRCW	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 ² ; 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	± (1 % R + 0.05 Ω)							
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	$\pm (1 \% R + 0.05 \Omega)$							

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, 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

Vishay

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 and agree to fully indemnify and hold Vishay and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Vishay or its distributor was negligent regarding the design or manufacture of the part. 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.

Material Category Policy

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.