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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 _{max.} = 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: thickfilmchip@vishay.com
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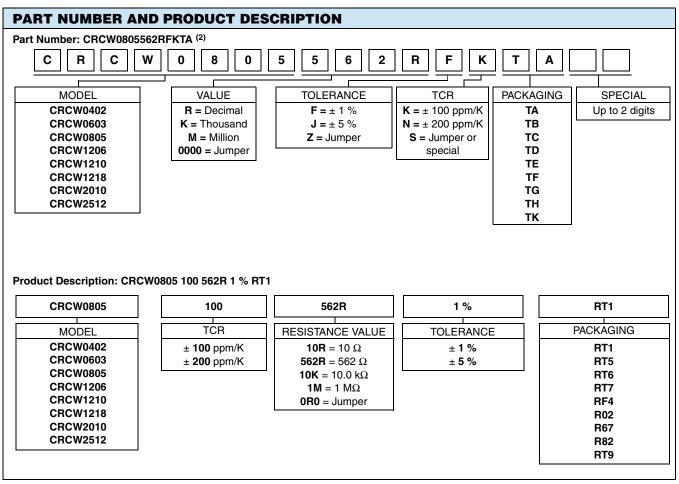


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TECHNICAL SPECIFICATIONS									
PARAMETER	UNIT	D10/ CRCW0402	D11/ CRCW0603	D12/ CRCW0805	D25/ CRCW1206	CRCW1210	CRCW1218	CRCW2010	CRCW2512
Rated dissipation at 70 °C (1)	W	0.063	0.1	0.125	0.25	0.5	1.0	0.75	1.0
Limiting element voltage U _{MAX.} AC/DC	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							
Category temperature range °C			- 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.

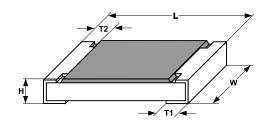
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PACKAGING									
MODEL	UNIT		PAPER TAP ACC. IEC 60286-3	_	BLISTER TAPE ACC. IEC 60286-3, TYPE II				
		QUANTITY	PART NUMBER	PRODUCT DESC.	QUANTITY	PART NUMBER	PRODUCT DESC.		
D10/CRCW0402	180 mm/7"	10 000	TD	RT7					
D10/ChCVV0402	330 mm/13"	50 000	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	180 11111/7				4000	TH	R82		

DIMENSIONS



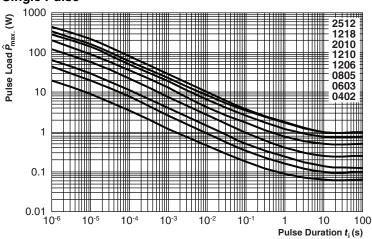


SIZE		DIMENSIONS in millimeters						SOLDER PAD DIMENSIONS in millimeters					
								REFLOW SOLDERING			WAVE SOLDERING		
INCH	METRIC	L	w	Н	T1	T2	а	b	I	а	b	I	
0402	1005	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.25 ± 0.05	0.2 ± 0.1	0.4	0.6	0.5				
0603	1608	1.55 + 0.10	0.85 ± 0.1	0.45 ± 0.05	0.3 ± 0.2	0.3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



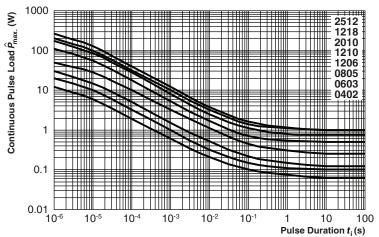
FUNCTIONAL PERFORMANCE

Single Pulse



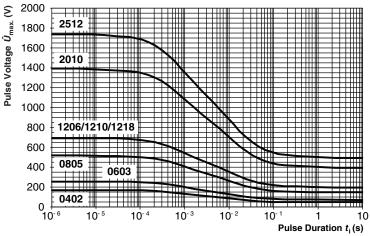
Maximum pulse load, single pulse; applicable if $\bar{P} \longrightarrow 0$ and n < 1000 and $\hat{U} \le \hat{U}_{max}$; for permissible resistance change equivalent to 8000 h operation

Continuous Pulse



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

Pulse Voltage

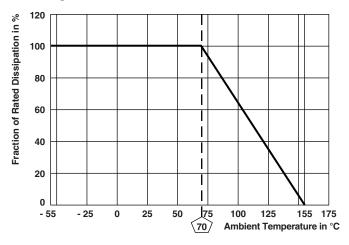


Maximum pulse voltage, single and continuous pulses; applicable if $\hat{P} \leq \hat{P}_{max}$; for permissible resistance change equivalent to 8000 h operation

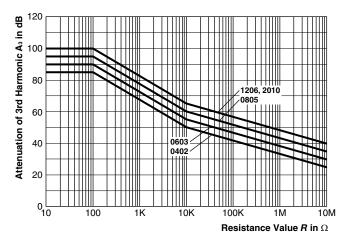
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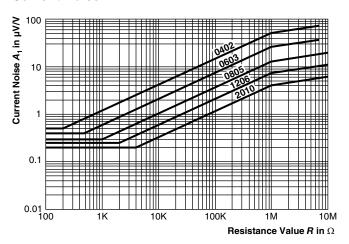
Derating



Non-Linearity



Current Noise







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TEST F	PROCED	URES AND REQUIREM	MENTS				
			PROGERIUM	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:	1.0 to 10 MO	1 O to 10 MO		
			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 ± 5) °C, (2 ± 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 ₃₎	Shear (adhesion)	RR 1608 and smaller: 9 N RR 2012 and larger: 45 N	No visible	e damage		
4.33	21 (Uu ₁₎	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 % R + 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 (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	± (1 % R + 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.

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