

## Pulse Proof Thick Film Chip Resistors



### FEATURES

- High pulse performance, up to 10 kW
- Stability  $\Delta R/R \leq 1\%$  for 1000 h at 70 °C
- AEC-Q200 qualified
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### STANDARD ELECTRICAL SPECIFICATIONS

TYPE	CASE SIZE IMPERIAL	CASE SIZE METRIC	POWER RATING $P_{70}$ W	LIMITING ELEMENT VOLTAGE $U_{max. AC_{RMS}/DC}$ V	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE $\Omega$	SERIES
D10/CRCW0402-IF	0402	RR1005M	0.063	50	$\pm 200$	$\pm 5$ $\pm 10$	1.0 to 100K	E24
D11/CRCW0603-IF	0603	RR1608M	0.10	75	$\pm 200$	$\pm 5$ $\pm 10$	1.0 to 100K	E24
D12/CRCW0805-IF	0805	RR2012M	0.125	150	$\pm 200$	$\pm 5$ $\pm 10$	1.0 to 100K	E24
D25/CRCW1206-IF	1206	RR3216M	0.25	200	$\pm 200$	$\pm 5$ $\pm 10$	1.0 to 100K	E24
CRCW1210-IF	1210	RR3225M	0.50	200	$\pm 200$	$\pm 5$ $\pm 10$	1.0 to 100K	E24
CRCW2010-IF	2010	RR5025M	0.75	400	$\pm 200$	$\pm 5$ $\pm 10$	1.0 to 100K	E24
CRCW2512-IF	2512	RR6332M	1.0	500	$\pm 200$	$\pm 5$ $\pm 10$	1.0 to 100K	E24

#### 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: See data sheet "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.

### TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	D10/ CRCW0402-IF	D11/ CRCW0603-IF	D12/ CRCW0805-IF	D25/ CRCW1206-IF	CRCW1210-IF	CRCW2010-IF	CRCW2512-IF
Rated dissipation $P_{70}$ <sup>(1)</sup>	W	0.063	0.1	0.125	0.25	0.5	0.75	1.0
Operating voltage $U_{max. AC_{RMS}/DC}$	V	50	75	150	200	200	400	500
Insulation voltage $U_{ins}$ (1 min)	V	75	100	200	300	300	300	300
Insulation resistance	$\Omega$	$> 10^9$						
Operating temperature range	°C	-55 to +155						
Failure rate	$h^{-1}$	$< 0.1 \times 10^{-9}$						
Mass	mg	0.65	2	5.5	10	16	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.



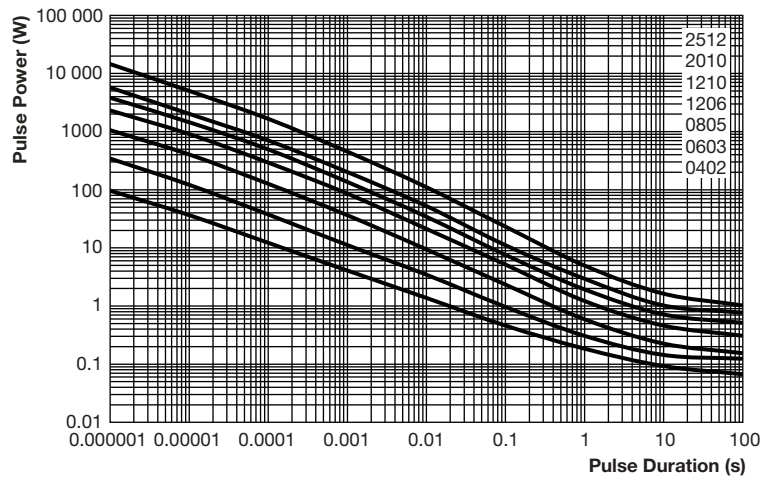
PART NUMBER AND PRODUCT DESCRIPTION																	
Part Number: CRCW08051R00JNEAIF																	
C	R	C	W	0	8	0	5	1	R	0	0	J	N	E	A	I	F
TYPE	VALUE	TOLERANCE	TCR	PACKAGING	SPECIAL												
CRCW0402 CRCW0603 CRCW0805 CRCW1206 CRCW1210 CRCW2010 CRCW2512	R = Decimal K = Thousand	J = ± 5 % K = ± 10 %	N = ± 200 ppm/K	EA, EB, EC, ED, EE, EF, EG, EH, EI, EL	Up to 2 digits IF = Pulse proof												
Product Description: D12/CRCW0805-IF 200 1R0 5 % ET1 e3																	
D12/CRCW0805-IF	200	1R0	5 %	ET1	e3												
TYPE	TCR	RESISTANCE VALUE	TOLERANCE	PACKAGING	LEAD (Pb)-FREE												
D10/CRCW0402-IF D11/CRCW0603-IF D12/CRCW0805-IF D25/CRCW1206-IF CRCW1210-IF CRCW2010-IF CRCW2512-IF	± 200 ppm/K	1R0 = 1 Ω 10K = 10 kΩ	± 5 % ± 10 %	ET1, ET2, ET3, ET4, ET5, ET6, ET7, ET8, ET9, EF4, E02, E67, E82	e3 = Pure tin termination finish												

PACKAGING						
TYPE	CODE	QUANTITY	CARRIER TAPE	WIDTH	PITCH	REEL DIAMETER
D10/CRCW0402-IF	ED = ET7	10 000	Paper tape acc. to IEC 60286-3 Type 1a	8 mm	2 mm	180 mm/7"
	EE = EF4	50 000				330 mm/13"
D11/CRCW0603-IF	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"
	EB = ET5	10 000				285 mm/11.25"
D12/CRCW0805-IF	EC = ET6	20 000		8 mm	4 mm	330 mm/13"
	EA = ET1	5000				180 mm/7"
	EB = ET5	10 000				285 mm/11.25"
D25/CRCW1206-IF	EC = ET6	20 000		8 mm	4 mm	330 mm/13"
	EA = ET1	5000				180 mm/7"
	EB = ET5	10 000				285 mm/11.25"
CRCW1210-IF	EC = ET6	20 000	8 mm	4 mm	330 mm/13"	
	EA = ET1	5000			180 mm/7"	
	EB = ET5	10 000			285 mm/11.25"	
CRCW2010-IF	EF = E02	4000	Pressed tape acc. to IEC 60286-3 Type 1b	12 mm	4 mm	180 mm/7"
CRCW2512-IF	EG = E67	2000		12 mm	8 mm	4 mm
	EH = E82	4000				

DIMENSIONS in millimeters												
SIZE		DIMENSIONS					RECOMMENDED SOLDER PAD DIMENSIONS					
							REFLOW SOLDERING			WAVE SOLDERING		
IMPERIAL	METRIC	L	W	H	T1	T2	a	b	l	a	b	l
0402	RR1005M	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	RR1608M	1.55 <sup>+0.10</sup> / <sub>-0.05</sub>	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	RR2012M	2.0 <sup>+0.20</sup> / <sub>-0.10</sub>	1.25 ± 0.15	0.45 ± 0.05	0.3 <sup>+0.20</sup> / <sub>-0.10</sub>	0.3 ± 0.2	0.7	1.3	1.2	0.9	1.3	1.3
1206	RR3216M	3.2 <sup>+0.10</sup> / <sub>-0.20</sub>	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	RR3225M	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
2010	RR5025M	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	RR6332M	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

Maximum pulse dissipation as a function of the pulse duration, single pulse

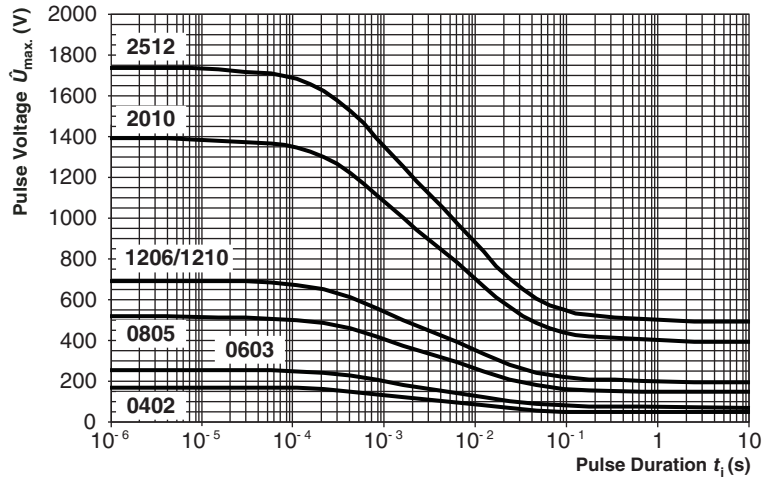


Maximum pulse load, single pulse; applicable if  $\bar{P} \rightarrow 0$  and  $n \leq 1000$  and  $\dot{U} \leq \dot{U}_{max}$ ; for permissible resistance change equivalent to 8000 h operation

**Maximum pulse dissipation as a function of the pulse duration,  
continuous pulse loading**



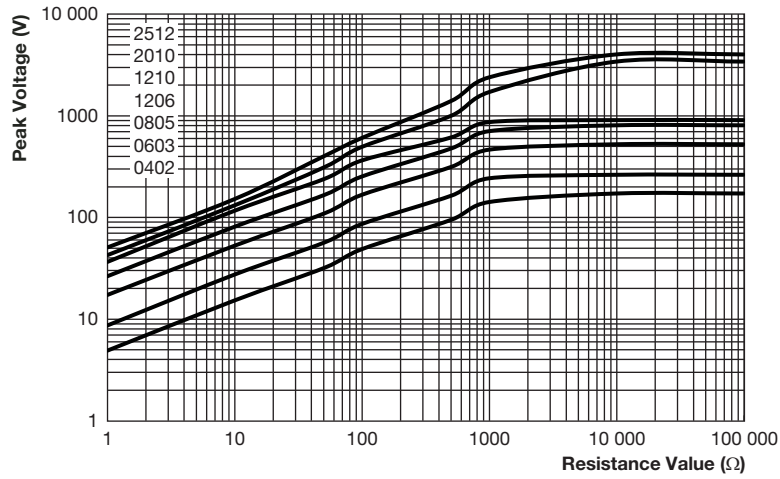
Maximum pulse load, continuous pulses; applicable if  $P \leq P(\vartheta_{amb})$  and  $\dot{U} \leq \dot{U}_{max}$ ; for permissible resistance change equivalent to 8000 h operation



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

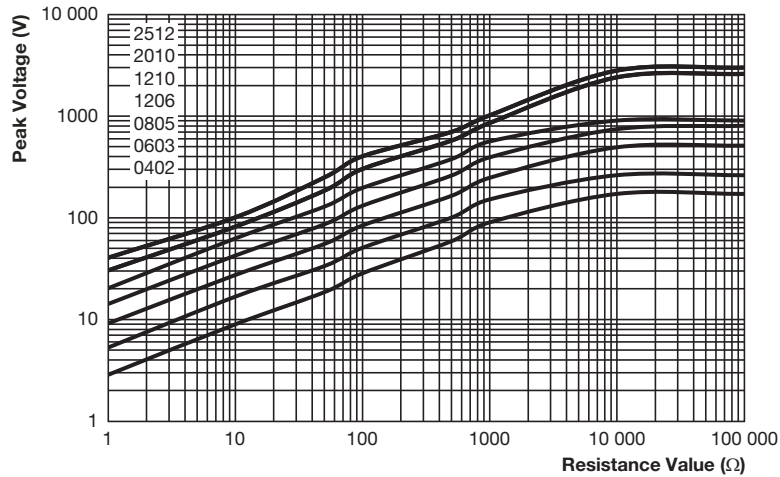


**Single-pulse high voltage overload test 1.2  $\mu$ s/50  $\mu$ s EN 140000 4.27**



Pulse load rating in accordance to EN 60115-1, 4.27; 1.2  $\mu$ s/50  $\mu$ s;  
5 pulses at 12 s intervals; for permissible resistance change 1 %

**Single-pulse high voltage overload test 10  $\mu$ s/700  $\mu$ s EN 140000 4.27**



Pulse load rating in accordance to EN 60115-1, 4.27; 10  $\mu$ s/700  $\mu$ s;  
10 pulses at 1 min intervals; for permissible resistance change 1 %

**Derating**


TEST PROCEDURES AND REQUIREMENTS				
EN 60115-1 CLAUSE	IEC 60082-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )
				STABILITY CLASS 1 OR BETTER
			Stability for product type:	
			<b>D/CRCW-IF e3</b>	1 $\Omega$ to 100 k $\Omega$
4.5	-	Resistance	-	$\pm 5\%$ ; $\pm 10\%$
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	$\pm 200$ ppm/K
4.19	14 (Na)	Rapid change of temperature	30 min. at - 55 °C; 30 min. at 125°C	
			5 cycles 1000 cycles	$\pm (0.25\% R + 0.05 \Omega)$ $\pm (1\% R + 0.05 \Omega)$

<b>TEST PROCEDURES AND REQUIREMENTS</b>				
EN 60115-1 CLAUSE	IEC 60082-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )
			STABILITY CLASS 1 OR BETTER	
			Stability for product type: <b>D/CRCW-IF e3</b>	
				1 $\Omega$ to 100 k $\Omega$
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; $\geq 90$ % RH; 24 h; 1 cycle	
4.23.4	1 (Aa)	Cold	- 55 °C; 2 h	$\pm (1 \% R + 0.05 \Omega)$
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	$\pm (1 \% R + 0.05 \Omega)$ $\pm (2 \% R + 0.1 \Omega)$
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 $\pm$ 5) °C; (10 $\pm$ 1) s	$\pm (0.25 \% R + 0.05 \Omega)$
4.24	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	$\pm (1 \% R + 0.05 \Omega)$
4.27	-	Single pulse high voltage overload, 10 $\mu$ s/700 $\mu$ 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, environmental test procedures

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



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