

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



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 Ω | SERIES |
|-----------------|-----------------------|---------------------|-------------------------------|---|----------------------------------|---------------------|------------------------------|--------|
| D10/CRCW0402-IF | 0402 | RR1005M | 0.063 | 50 | ± 200 | ± 5 ± 10 | 1.0 to 100K | E24 |
| D11/CRCW0603-IF | 0603 | RR1608M | 0.10 | 75 | ± 200 | ± 5 ± 10 | 1.0 to 100K | E24 |
| D12/CRCW0805-IF | 0805 | RR2012M | 0.125 | 150 | ± 200 | ± 5 ± 10 | 1.0 to 100K | E24 |
| D25/CRCW1206-IF | 1206 | RR3216M | 0.25 | 200 | ± 200 | ± 5 ± 10 | 1.0 to 100K | E24 |
| CRCW1210-IF | 1210 | RR3225M | 0.50 | 200 | ± 200 | ± 5 ± 10 | 1.0 to 100K | E24 |
| CRCW2010-IF | 2010 | RR5025M | 0.75 | 400 | ± 200 | ± 5 ± 10 | 1.0 to 100K | E24 |
| CRCW2512-IF | 2512 | RR6332M | 1.0 | 500 | ± 200 | ± 5 ± 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} ⁽¹⁾ | 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 | Ω | $> 10^9$ | | | | | | |
| 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

- ⁽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.



| 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 ^{+0.10} / _{-0.05} | 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 ^{+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 | RR3216M | 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 | 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

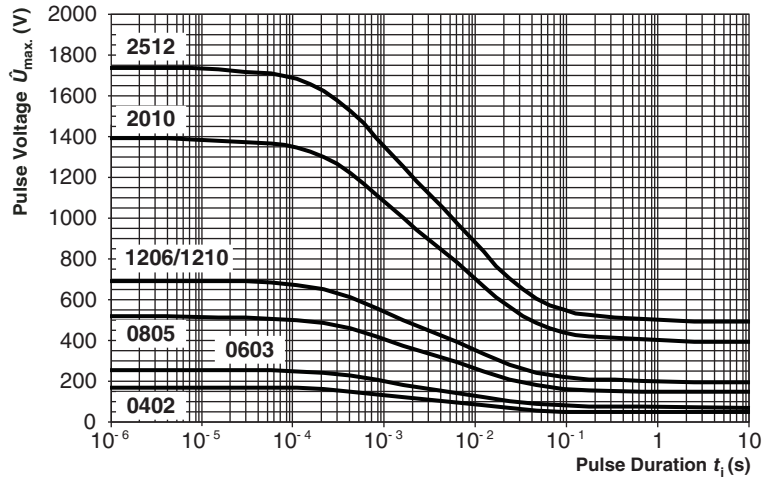


Maximum pulse load, single pulse; applicable if $\bar{P} \rightarrow 0$ and $n \leq 1000$ and $\dot{U} \leq \dot{U}_{max}$; for permissible resistance change equivalent to 8000 h operation

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



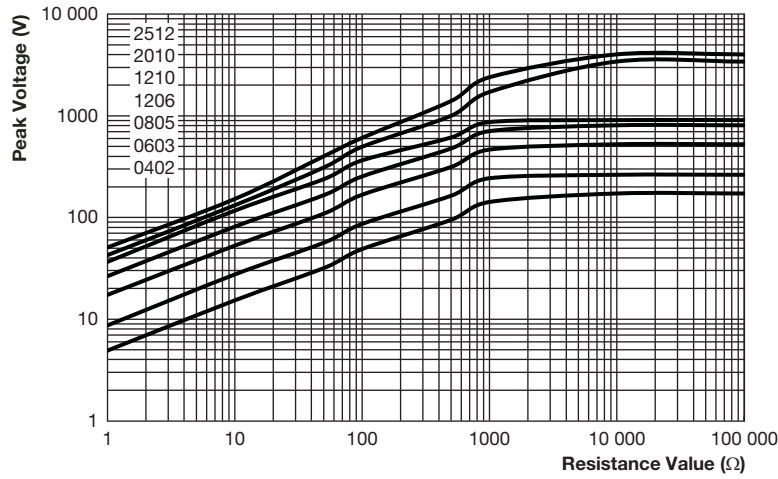
Maximum pulse load, continuous pulses; applicable if $P \leq P(\vartheta_{amb})$ and $\dot{U} \leq \dot{U}_{max}$; for permissible resistance change equivalent to 8000 h operation



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

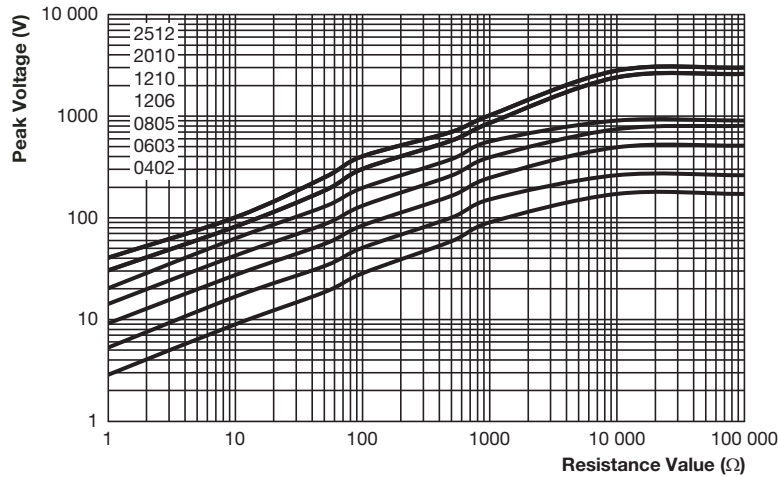


Single-pulse high voltage overload test 1.2 μ s/50 μ s EN 140000 4.27



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

Single-pulse high voltage overload test 10 μ s/700 μ s EN 140000 4.27



Pulse load rating in accordance to EN 60115-1, 4.27; 10 μ s/700 μ 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 (ΔR) |
| | | | | STABILITY CLASS 1 OR BETTER |
| | | | Stability for product type: | |
| | | | D/CRCW-IF e3 | 1 Ω to 100 k Ω |
| 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) $^{\circ}$ 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) $^{\circ}$ C, (3 \pm 0.3) s | Good tinning ($\geq 95\%$ covered); no visible damage |
| 4.8.4.2 | - | Temperature coefficient | (20/- 55/20) $^{\circ}$ C and (20/125/20) $^{\circ}$ C | ± 200 ppm/K |
| 4.19 | 14 (Na) | Rapid change of temperature | 30 min. at - 55 $^{\circ}$ C; 30 min. at 125 $^{\circ}$ C | |
| | | | 5 cycles 1000 cycles | $\pm (0.25\% R + 0.05 \Omega)$ $\pm (1\% R + 0.05 \Omega)$ |



| TEST PROCEDURES AND REQUIREMENTS | | | | |
|----------------------------------|----------------------------------|--|--|---|
| EN 60115-1 CLAUSE | IEC 60082-2 TEST METHOD | TEST | PROCEDURE | REQUIREMENTS PERMISSIBLE CHANGE (ΔR) |
| | | | STABILITY CLASS 1 OR BETTER | |
| | | | Stability for product type: D/CRCW-IF e3 | |
| 4.23 | - | Climatic sequence: | - | $\pm (1 \% R + 0.05 \Omega)$ |
| 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 | |
| 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 μs /700 μs | $\hat{U} = 10 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.};$ 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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