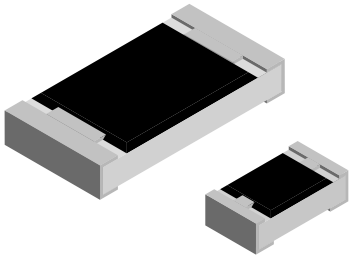
Pulse Proof, High Power Thick Film Chip Resistors



FEATURES

- Excellent pulse load capability
- Enhanced power rating
- Double side printed resistor element
- Protective overglaze
- Pure tin solder contacts on Ni barrier layer provides compatibility with lead (Pb)-free and lead containing soldering processes
- AEC-Q200 qualified, rev. C compliant
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	CASE SIZE INCH	CASE SIZE METRIC	POWER RATING P_{70} W	LIMITING ELEMENT VOLTAGE $U_{max.}$ AC/DC	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE Ω	SERIES
CRCW0402-HP e3	0402	RR1005	0.125 (1)	50	± 100	± 0.5, ± 1	1 to 1M	E24; E96
					± 200	± 5		E24
			Zero-Ohm-Resistor: $R_{max.}$ = 0.010 Ω, $I_{max.}$ = 3 A					
CRCW0603-HP e3	0603	RR1608	0.25	75	± 100	± 0.5, ± 1	1 to 1M	E24; E96
					± 200	± 5		E24
			Zero-Ohm-Resistor: $R_{max.}$ = 0.008 Ω, $I_{max.}$ = 5 A					
CRCW0805-HP e3	0805	RR2012	0.33	150	± 100	± 0.5, ± 1	1 to 1M	E24; E96
					± 200	± 5		E24
			Zero-Ohm-Resistor: $R_{max.}$ = 0.005 Ω, $I_{max.}$ = 6 A					
CRCW1206-HP e3	1206	RR3216	0.5	200	± 100	± 0.5, ± 1	1 to 1M	E24; E96
					± 200	± 5		E24
			Zero-Ohm-Resistor: $R_{max.}$ = 0.005 Ω, $I_{max.}$ = 10 A					
CRCW1210-HP e3	1210	RR3225	0.75	200	± 100	± 0.5, ± 1	1 to 1M	E24; E96
					± 200	± 5		E24
			Zero-Ohm-Resistor: $R_{max.}$ = 0.004 Ω, $I_{max.}$ = 12 A					
CRCW1218-HP e3	1218	RR3246	1.5	200	± 100	± 0.5, ± 1	1 to 1M	E24; E96
					± 200	± 5		E24
			Zero-Ohm-Resistor: $R_{max.}$ = 0.004 Ω, $I_{max.}$ = 20 A					
CRCW2010-HP e3	2010	RR5025	1.0	400	± 100	± 0.5, ± 1	1 to 1M	E24; E96
					± 200	± 5		E24
			Zero-Ohm-Resistor: $R_{max.}$ = 0.005 Ω, $I_{max.}$ = 12 A					
CRCW2512-HP e3	2512	RR6332	1.5	500	± 100	± 0.5, ± 1	1 to 1M	E24; E96
					± 200	± 5		E24
			Zero-Ohm-Resistor: $R_{max.}$ = 0.005 Ω, $I_{max.}$ = 16 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 document "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.

(1) CRCW0402-HP resistors feature a single side printed resistive layer only.

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CRCW 0402-HP	CRCW 0603-HP	CRCW 0805-HP	CRCW 1206-HP	CRCW 1210-HP	CRCW 1218-HP	CRCW 2010-HP	CRCW 2512-HP
Rated dissipation P_{70} (2)	W	0.125	0.25	0.33	0.5	0.75	1.5	1.0	1.5
Limiting element voltage $U_{max.}$ AC/DC	V	50	75	150	200	200	200	400	500
Insulation voltage $U_{ins.}$ (1 min)	V	> 75	> 100	> 200	> 300	> 300	> 300	> 300	> 300
Insulation resistance	Ω	$> 10^9$							
Category temperature range	°C	- 55 to + 155							
Weight	mg	0.65	2	5.5	10	18	31	25.5	42

Note

(2) The power dissipation on the resistors 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.

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PART NUMBER AND PRODUCT DESCRIPTION

Part Number: CRCW0603562RFKEAHP [1]

C	R	C	W	0	6	0	3	5	6	2	R	F	K	E	A	H	P

MODEL/SIZE	VALUE	TOLERANCE	TCR	PACKAGING	SPECIAL
CRCW0402 **CRCW0603** **CRCW0805** **CRCW1206** **CRCW1210** **CRCW1218** **CRCW2010** **CRCW2512**	**R** = Decimal **K** = Thousand **M** = Million **0000** = Jumper	**D** = ± 0.5 % **F** = ± 1 % **J** = ± 5 % **Z** = Jumper	**K** = ± 100 ppm/K **N** = ± 200 ppm/K **0** = Jumper	**EA** **EB** **EC** **ED** **EE** **EF** **EG** **EH** **EK**	Up to 2 digits **HP** = Pulse proof, high power

Product Description: CRCW0603-HP 100 562R 1 % ET1 e3

CRCW0603-HP	100	562R	1 %	ET1	e3
MODEL	TCR	RESISTANCE VALUE	TOLERANCE	PACKAGING	LEAD (Pb)-FREE
CRCW0402-HP **CRCW0603-HP** **CRCW0805-HP** **CRCW1206-HP** **CRCW1210-HP** **CRCW1218-HP** **CRCW2010-HP** **CRCW2512-HP**	± **100** ppm/K ± **200** ppm/K	**10R** = 10 Ω **562R** = 562 Ω **10K** = 10 kΩ **1M** = 1 MΩ **0R0** = Jumper	**± 0.5 %** **± 1 %** **± 5 %**	**ET1** **ET5** **ET6** **ET7** **EF4** **EG1** **E02** **E67** **E82** **ET9**	**e3** = Pure tin termination finish

Note

[1] Preferred way for ordering products is by use of the PART NUMBER.

PACKAGING

MODEL	UNIT	PAPER TAPE ON REEL ACC. TO IEC 60286-3, TYPE I			BLISTER TAPE ON REEL ACC. TO IEC 60286-3, TYPE II		
		QUANTITY	PART NUMBER	PRODUCT DESC.	QUANTITY	PART NUMBER	PRODUCT DESC.
CRCW0402-HP	180 mm/7" 330 mm/13"	10 000 50 000	ED EE	ET7 EF4			
CRCW0603-HP	180 mm/7" 285 mm/11.25" 330 mm/13"	5000 10 000 20 000	EA EB EC	ET1 ET5 ET6			
CRCW0805-HP	180 mm/7" 285 mm/11.25" 330 mm/13"	5000 10 000 20 000	EA EB EC	ET1 ET5 ET6			
CRCW1206-HP	180 mm/7" 285 mm/11.25" 330 mm/13"	5000 10 000 20 000	EA EB EC	ET1 ET5 ET6			
CRCW1210-HP	180 mm/7" 285 mm/11.25" 330 mm/13"	5000 10 000 20 000	EA EB EC	ET1 ET5 ET6			
CRCW1218-HP	180 mm/7"				4000	EK	ET9
CRCW2010-HP	180 mm/7"				4000	EF	E02
CRCW2512-HP	180 mm/7"				2000 4000	EG EH	E67 E82

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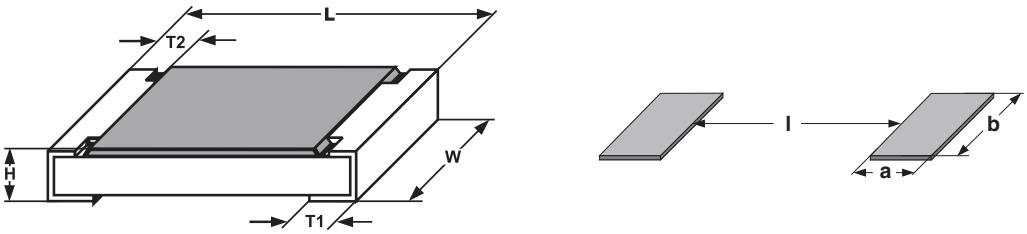
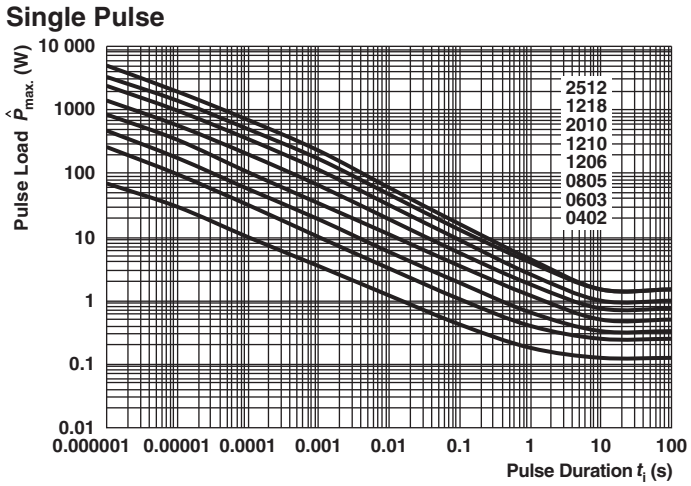
DIMENSIONS in millimeters



SIZE		DIMENSIONS					SOLDER PAD DIMENSIONS					
							REFLOW SOLDERING			WAVE SOLDERING		
INCH	METRIC	L	W	H	T1	T2	a	b	l	a	b	l
0402	1005	1.0 ± 0.05	0.5 ± 0.05	0.3 ± 0.1	0.25 ± 0.1	0.2 ± 0.1	0.4	0.6	0.5			
0603	1608	1.6 ± 0.1	0.85 ± 0.1	0.45 ± 0.1	0.3 ± 0.2	0.3 ± 0.2	0.5	0.9	1.0	0.9	0.9	1.0
0805	2012	2.0 ± 0.15	1.25 ± 0.15	0.50 ± 0.1	0.4 ± 0.2	0.35 ± 0.2	0.7	1.3	1.2	0.9	1.3	1.3
1206	3216	3.1 ± 0.2	1.6 ± 0.15	0.50 ± 0.15	0.5 ± 0.2	0.45 ± 0.2	0.9	1.7	2.0	1.1	1.7	2.3
1210	3225	3.2 ± 0.2	2.5 ± 0.2	0.6 ± 0.1	0.45 ± 0.2	0.4 ± 0.2	0.9	2.5	2.0	1.1	2.5	2.2
1218	3246	3.1 ± 0.2	4.6 ± 0.2	0.6 ± 0.1	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



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

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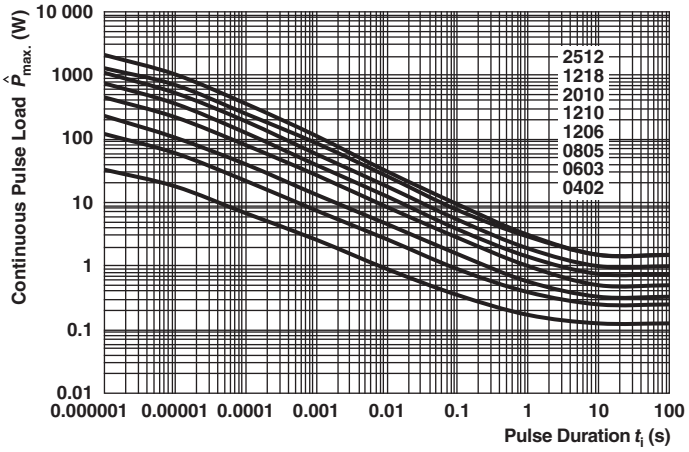
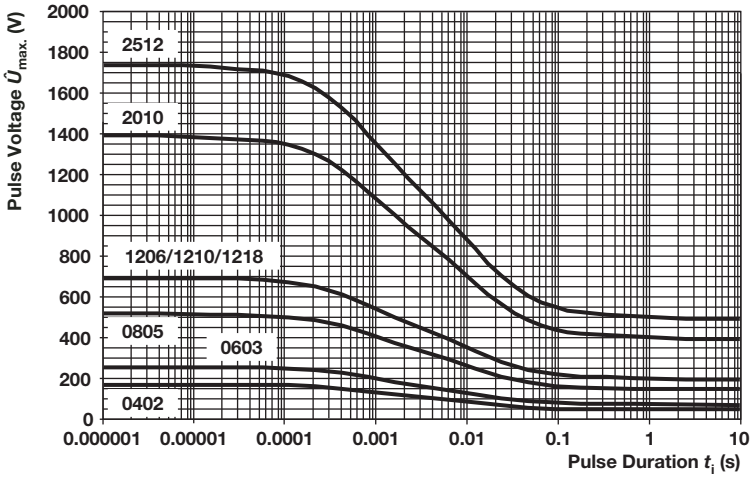
Continuous Pulse



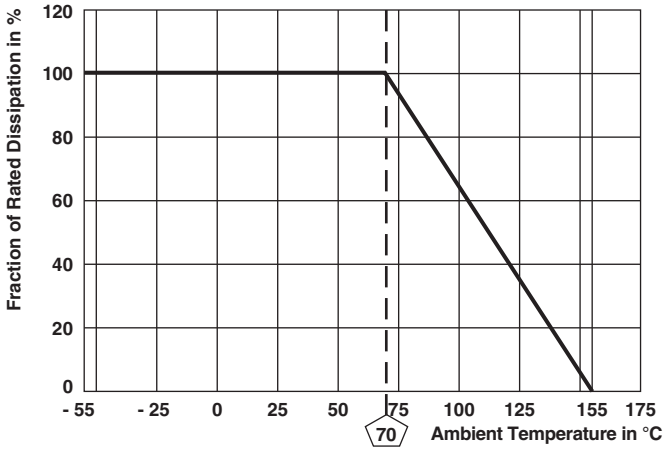
Maximum pulse load, continuous pulses; applicable if $\bar{P} \leq P(\vartheta_{amb})$ and $\hat{U} \leq \hat{U}_{max.}$; for permissible resistance change equivalent to 8000 h operation

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



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TEST PROCEDURES AND REQUIREMENTS				
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR) STABILITY CLASS 2 OR BETTER
			Stability for product types: CRCW-HP e3	1 Ω to 1 MΩ
4.5	-	Resistance	-	± 0.5 %, ± 1 %, ± 5 %
4.7	-	Voltage proof	$U = 1.4 \times U_{ins}$; 60 s	-
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R}$ $\leq 2 \times U_{max.}$; duration: According to style	± (0.5 % R + 0.05 Ω)
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
			Solder bath method; Sn96.5Ag3Cu0.5; non-activated flux; (245 ± 5) °C; (3 ± 0.3) 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 (UU3)	Shear (adhesion)	RR 1608 and smaller: 9 N RR 2012 and larger: 45 N	No visible damage
4.33	21 (UU1)	Substrate bending	Depth 2 mm; 3 times	No visible damage, no open circuit in bent position ± (0.25 % R + 0.05 Ω)
4.19	14 (Na)	Rapid change of temperature	30 min. at - 55 °C; 30 min at 125 °C 5 cycles 1000 cycles	± (0.5 % R + 0.05 Ω) ± (1 % R + 0.05 Ω)
4.23	-	Dry heat	-	± (2 % R + 0.1 Ω)
4.23.2	2 (Ba)	Damp heat, cyclic	125 °C; 16 h	
4.23.3	30 (Db)	cold	55 °C; ≥ 90 % RH; 24 h; 1 cycle	
4.23.4	1 (Aa)	Low air pressure	- 55 °C; 2 h	
4.23.5	13 (M)	-	1 kPa; (25 ± 10) °C; 1 h	
4.23.6	30 (Db)	Damp heat, cyclic	55 °C; ≥ 90 % RH; 24 h; 5 cycle	
4.23.7	-	D.C. 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	± (2 % R + 0.1 Ω) ± (4 % R + 0.1 Ω)
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method; (260 ± 5) °C; (10 ± 1) s	± (0.5 % R + 0.05 Ω)
4.35	-	Flammability, needle flame test	IEC 60695-15-5; 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	± (2 % R + 0.1 Ω)
4.40	-	Electrostatic discharge (human body model)	IEC 61340-3-1; 3 positive and 3 negative discharges; ESD voltage according 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
4.22	6 (Fc)	Vibration, endurance by sweeping	f = 10 Hz to 2000 Hz; x, y, z ≤ 1.5 mm; A ≤ 200 m/s2; 10 sweeps per axis	± (0.5 % R + 0.05 Ω)
4.37	-	Periodic electric overload	$U = \sqrt{15 \times P_{70} \times R} \leq 2 \times U_{max.}$ 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	$\hat{U} = 10 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$ 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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