

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	$\pm 0.5, \pm 1$	1 to 1M	E24; E96 E24
					± 200	± 5		
					Zero-Ohm-Resistor: $R_{\max.} = 0.010 \Omega, I_{\max.} = 3 A$			
CRCW0603-HP e3	0603	RR1608	0.25	75	± 100	$\pm 0.5, \pm 1$	1 to 1M	E24; E96 E24
					± 200	± 5		
					Zero-Ohm-Resistor: $R_{\max.} = 0.008 \Omega, I_{\max.} = 5 A$			
CRCW0805-HP e3	0805	RR2012	0.33	150	± 100	$\pm 0.5, \pm 1$	1 to 1M	E24; E96 E24
					± 200	± 5		
					Zero-Ohm-Resistor: $R_{\max.} = 0.005 \Omega, I_{\max.} = 6 A$			
CRCW1206-HP e3	1206	RR3216	0.5	200	± 100	$\pm 0.5, \pm 1$	1 to 1M	E24; E96 E24
					± 200	± 5		
					Zero-Ohm-Resistor: $R_{\max.} = 0.005 \Omega, I_{\max.} = 10 A$			
CRCW1210-HP e3	1210	RR3225	0.75	200	± 100	$\pm 0.5, \pm 1$	1 to 1M	E24; E96 E24
					± 200	± 5		
					Zero-Ohm-Resistor: $R_{\max.} = 0.004 \Omega, I_{\max.} = 12 A$			
CRCW1218-HP e3	1218	RR3246	1.5	200	± 100	$\pm 0.5, \pm 1$	1 to 1M	E24; E96 E24
					± 200	± 5		
					Zero-Ohm-Resistor: $R_{\max.} = 0.004 \Omega, I_{\max.} = 20 A$			
CRCW2010-HP e3	2010	RR5025	1.0	400	± 100	$\pm 0.5, \pm 1$	1 to 1M	E24; E96 E24
					± 200	± 5		
					Zero-Ohm-Resistor: $R_{\max.} = 0.005 \Omega, I_{\max.} = 12 A$			
CRCW2512-HP e3	2512	RR6332	1.5	500	± 100	$\pm 0.5, \pm 1$	1 to 1M	E24; E96 E24
					± 200	± 5		
					Zero-Ohm-Resistor: $R_{\max.} = 0.005 \Omega, I_{\max.} = 16 A$			

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	$^{\circ}C$	- 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 $^{\circ}C$ is not exceeded.

**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
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MODEL/SIZE	VALUE	TOLERANCE	TCR	PACKAGING	SPECIAL
CRCW0402 CRCW0603 CRCW0805 CRCW1206 CRCW1210 CRCW1218 CRCW2010 CRCW2512	R = Decimal K = Thousand M = Million 0000 = Jumper	D = $\pm 0.5\%$ F = $\pm 1\%$ J = $\pm 5\%$ 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 k Ω 1M = 1 M Ω 0R0 = Jumper	$\pm 0.5\%$ $\pm 1\%$ $\pm 5\%$	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"	10 000	ED	ET7			
	330 mm/13"	50 000	EE	EF4			
CRCW0603-HP	180 mm/7"	5000	EA	ET1			
	285 mm/11.25"	10 000	EB	ET5			
	330 mm/13"	20 000	EC	ET6			
CRCW0805-HP	180 mm/7"	5000	EA	ET1			
	285 mm/11.25"	10 000	EB	ET5			
	330 mm/13"	20 000	EC	ET6			
CRCW1206-HP	180 mm/7"	5000	EA	ET1			
	285 mm/11.25"	10 000	EB	ET5			
	330 mm/13"	20 000	EC	ET6			
CRCW1210-HP	180 mm/7"	5000	EA	ET1			
	285 mm/11.25"	10 000	EB	ET5			
	330 mm/13"	20 000	EC	ET6			
CRCW1218-HP	180 mm/7"				4000	EK	ET9
CRCW2010-HP	180 mm/7"				4000	EF	E02
CRCW2512-HP	180 mm/7"				2000	EG	E67
					4000	EH	E82

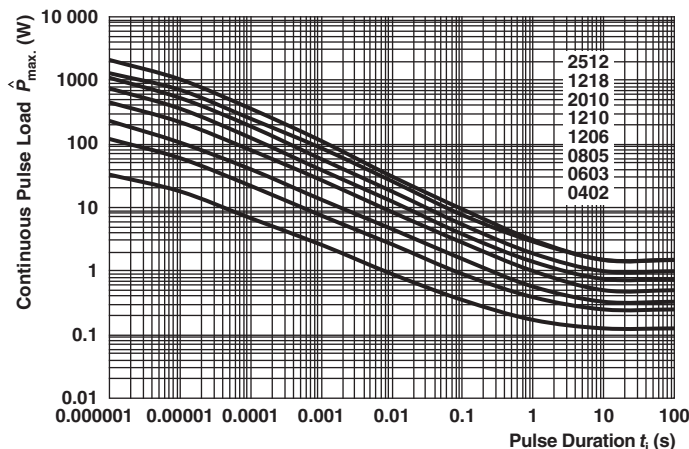
**DIMENSIONS** in millimeters

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**Single Pulse**

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

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



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:	1 Ω to 1 M Ω
			CRCW-HP e3	
4.5	-	Resistance	-	$\pm 0.5 \%$, $\pm 1 \%$, $\pm 5 \%$
4.7	-	Voltage proof	$U = 1.4 \times U_{\text{Ins}}$; 60 s	-
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R}$ $\leq 2 \times U_{\text{max.}}$; duration: According to style	$\pm (0.5 \% R + 0.05 \Omega)$
4.17.2	58 (Td)	Solderability	Solder bath method; Sn60Pb40; non-activated flux; (235 $\pm$ 5) $^{\circ}\text{C}$; (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) $^{\circ}\text{C}$; (3 $\pm$ 0.3) s	Good tinning ($\geq 95 \%$ covered) no visible damage
4.8.4.2	-	Temperature coefficient	(20/- 55/20) $^{\circ}\text{C}$ and (20/125/20) $^{\circ}\text{C}$	± 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 $\pm (0.25 \% R + 0.05 \Omega)$
4.19	14 (Na)	Rapid change of temperature	30 min. at - 55 $^{\circ}\text{C}$; 30 min at 125 $^{\circ}\text{C}$ 5 cycles 1000 cycles	$\pm (0.5 \% R + 0.05 \Omega)$ $\pm (1 \% R + 0.05 \Omega)$
4.23	-	Dry heat	-	$\pm (2 \% R + 0.1 \Omega)$
4.23.2	2 (Ba)	Damp heat, cyclic	125 $^{\circ}\text{C}$; 16 h	
4.23.3	30 (Db)	cold	55 $^{\circ}\text{C}$; $\geq 90 \%$ RH; 24 h; 1 cycle	
4.23.4	1 (Aa)	Low air pressure	- 55 $^{\circ}\text{C}$; 2 h	
4.23.5	13 (M)	-	1 kPa; (25 $\pm$ 10) $^{\circ}\text{C}$; 1 h	
4.23.6	30 (Db)	Damp heat, cyclic	55 $^{\circ}\text{C}$; $\geq 90 \%$ RH; 24 h; 5 cycle	
4.23.7	-	D.C. load	$U = \sqrt{P_{70} \times R}$	
4.25.1	-	Endurance at 70 $^{\circ}\text{C}$	$U = \sqrt{P_{70} \times R} \leq U_{\text{max.}}$ 1.5 h on; 0.5 h off; 70 $^{\circ}\text{C}$; 1000 h 70 $^{\circ}\text{C}$; 8000 h	$\pm (2 \% R + 0.1 \Omega)$ $\pm (4 \% R + 0.1 \Omega)$
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method; (260 $\pm$ 5) $^{\circ}\text{C}$; (10 $\pm$ 1) s	$\pm (0.5 \% R + 0.05 \Omega)$
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 $\pm$ 2) $^{\circ}\text{C}$; (93 $\pm$ 3) % RH; 56 days	$\pm (1 \% R + 0.05 \Omega)$
4.25.3	-	Endurance at upper category temperature	155 $^{\circ}\text{C}$; 1000 h	$\pm (2 \% R + 0.1 \Omega)$
4.40	-	Electrostatic discharge (human body model)	IEC 61340-3-1; 3 positive and 3 negative discharges; ESD voltage according to size	$\pm (1 \% R + 0.05 \Omega)$
4.29	45 (XA)	Component solvent resistance	Isopropyl alcohol; 50 $^{\circ}\text{C}$; method 2	No visible damage
4.30	45 (XA)	Solvent resistance of marking	Isopropyl alcohol; 50 $^{\circ}\text{C}$; 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/s ² ; 10 sweeps per axis	$\pm (0.5 \% R + 0.05 \Omega)$
4.37	-	Periodic electric overload	$U = \sqrt{15 \times P_{70} \times R} \leq 2 \times U_{\text{max.}}$ 0.1 s "ON"; 2.5 s "OFF"; 1000 cycles	$\pm (1 \% R + 0.05 \Omega)$
4.27	-	Single pulse high voltage overload, 10 μs /700 μs	$\dot{U} = 10 \times \sqrt{P_{70} \times R} \leq 2 \times U_{\text{max.}}$ 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.



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