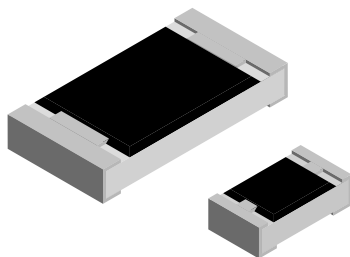


Pulse Proof, High Power Thick Film Chip Resistors



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
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

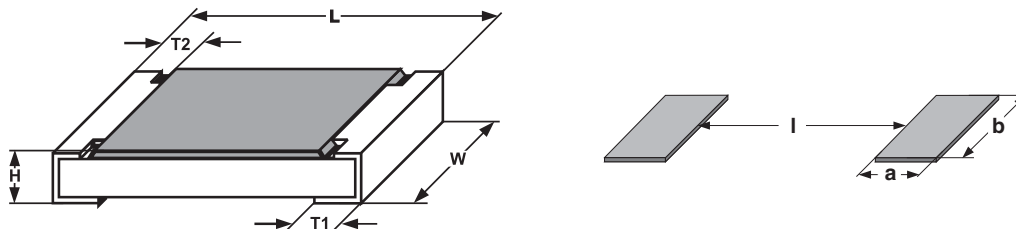
MODEL/SIZE	VALUE	TOLERANCE	TCR	PACKAGING	SPECIAL
CRCW0402 CRCW0603 CRCW0805 CRCW1206 CRCW1210 CRCW1218 CRCW2010 CRCW2512	R = Decimal K = Thousand M = Million 0000 = Jumper	D = $\pm 0.5\%$ F = $\pm 1\%$ J = $\pm 5\%$ Z = Jumper	K = ± 100 ppm/K N = ± 200 ppm/K 0 = Jumper	EA EB EC ED EE EF EG EH EK	Up to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

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

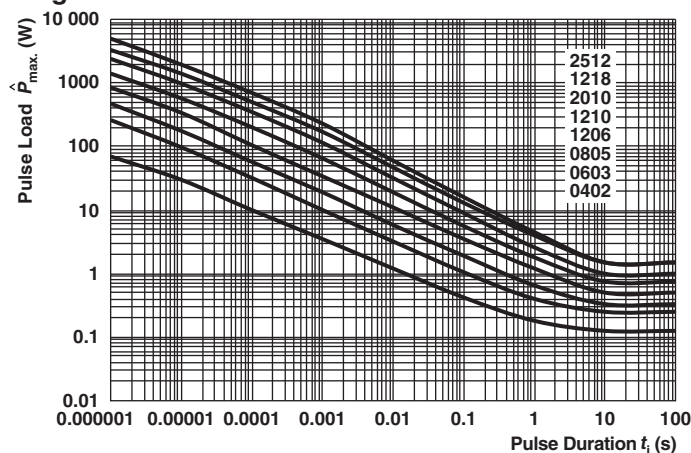
CRCW0603-HP	100	562R	1 %	ET1	e3
MODEL	TCR	RESISTANCE VALUE	TOLERANCE	PACKAGING	LEAD (Pb)-FREE
CRCW0402-HP CRCW0603-HP CRCW0805-HP CRCW1206-HP CRCW1210-HP CRCW1218-HP CRCW2010-HP CRCW2512-HP	± 100 ppm/K ± 200 ppm/K	10R = 10 Ω 562R = 562 Ω 10K = 10 k Ω 1M = 1 M Ω 0R0 = Jumper	$\pm 0.5\%$ $\pm 1\%$ $\pm 5\%$	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

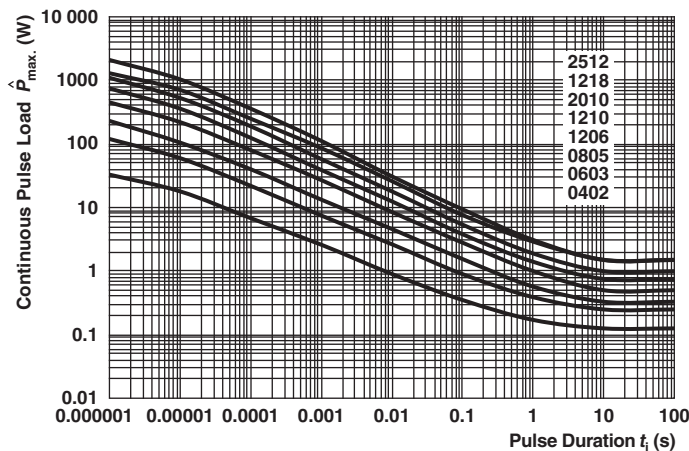
DIMENSIONS in millimeters


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


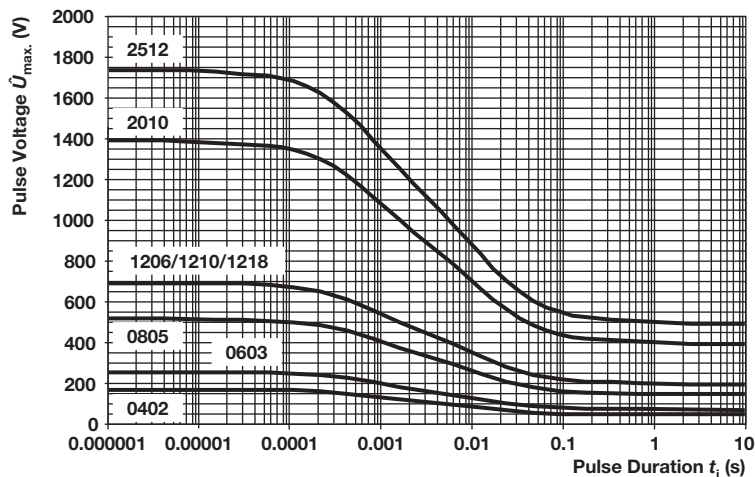
Maximum pulse load, single pulse; applicable if $\bar{P} \rightarrow 0$ and $n < 1000$ and $\hat{U} \leq \hat{U}_{max}$;
for permissible resistance change equivalent to 8000 h operation

Continuous Pulse



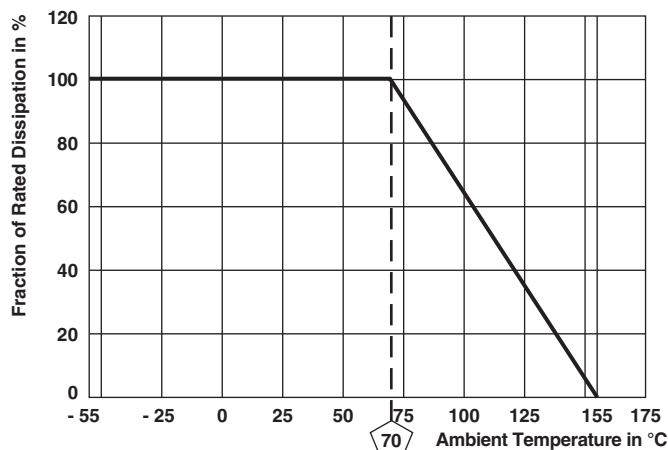
Maximum pulse load, continuous pulses; applicable if $\bar{P} \leq P(9_{amb})$ and $\hat{U} \leq \hat{U}_{max}$; for permissible resistance change equivalent to 8000 h operation

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.



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.