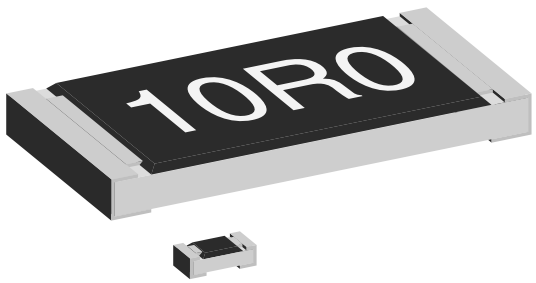
chanhvinh.com

Standard Thick Film Chip Resistors



FEATURES

- Stability $\Delta R/R$ = 1 % for 1000 h at 70 ° C
- 2 mm pitch packaging option for 0603 size
- Pure tin solder contacts on Ni barrier layer provides compatibility with lead (Pb)-free and lead containing soldering processes
- Metal glaze on high quality ceramic
- AEC-Q200 qualified
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE		RATED DISSIPATION $P_{70\,°C}$ W	LIMITING ELEMENT VOLTAGE $U_{max.}$ AC/DC	TEMPERATURE COEFFICIENT ppm/K	TOLERANCE %	RESISTANCE RANGE Ω	SERIES
	INCH	METRIC						
D10/CRCW0402	0402	RR 1005M	0.063	50	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 1.5 A					
D11/CRCW0603	0603	RR 1608M	0.10	75	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 2.0 A					
D12/CRCW0805	0805	RR 2012M	0.125	150	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 2.5 A					
D25/CRCW1206	1206	RR 3216M	0.25	200	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 3.5 A					
CRCW1210	1210	RR 3225M	0.5	200	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 5.0 A					
CRCW1218	1218	RR 3246M	1.0	200	± 100 ± 200	± 1 ± 5	1R0 to 2M2	E24; E96 E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 7.0 A					
CRCW2010	2010	RR 5025M	0.75	400	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 6.0 A					
CRCW2512	2512	RR 6332M	1.0	500	± 100 ± 200	± 1 ± 5	1R0 to 10M	E24; E96 E24
			Zero-Ohm-Resistor: $R_{max.}$ = 20 mΩ, $I_{max.}$ at 70 °C = 7.0 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 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.

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

chanhvinh.com

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	D10/ CRCW0402	D11/ CRCW0603	D12/ CRCW0805	D25/ CRCW1206	CRCW1210	CRCW1218	CRCW2010	CRCW2512
Rated dissipation P_{70} (1)	W	0.063	0.1	0.125	0.25	0.5	1.0	0.75	1.0
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							
Failure rate	h^{-1}	< 0.1 x 10^{-9}							
Weight	mg	0.65	2	5.5	10	16	29.5	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: CRCW0603562RFKEC

C	R	C	W	0	6	0	3	5	6	2	R	F	K	E	C		

MODEL	VALUE	TOLERANCE	TCR	PACKAGING	SPECIAL
CRCW0402 **CRCW0603** **CRCW0805** **CRCW1206** **CRCW1210** **CRCW1218** **CRCW2010** **CRCW2512**	**R** = Decimal **K** = Thousand **M** = Million **0000** = Jumper	**F** = ± 1.0 % **J** = ± 5.0 % **Z** = Jumper	**K** = ± 100 ppm/K **N** = ± 200 ppm/K **0** = Jumper	**EA, EB,** **EC, ED,** **EE, EF,** **EG, EH,** **EI, EL,** **EK**	Up to 2 digits

Product Description: D11/CRCW0603 100 562R 1 % ET6 e3

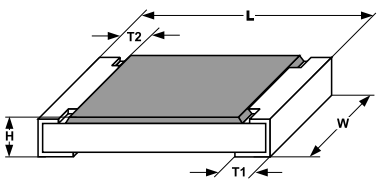
D11/CRCW0603	100	562R	1 %	ET6	e3
MODEL	TCR	RESISTANCE VALUE	TOLERANCE	PACKAGING	LEAD (Pb)-FREE
D10/CRCW0402 **D11/CRCW0603** **D12/CRCW0805** **D25/CRCW1206** **CRCW1210** **CRCW1218** **CRCW2010** **CRCW2512**	± **200** ppm/K ± **100** ppm/K	**10R** = 10 Ω **562R** = 562 Ω **10K** = 10 kΩ **1M0** = 1 MΩ **0R0** = Jumper	± **5 %** ± **1 %**	**ET1, ET2,** **ET3, ET4,** **ET5, ET6,** **ET7, ET8,** **ET9, EF4,** **E02, E67,** **E82**	**e3** = Pure tin termination finish

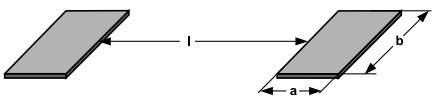
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

chanhvinh.com

PACKAGING						
MODEL	CODE	QUANTITY	CARRIER TAPE	WIDTH	PITCH	REEL DIAMETER
CRCW0402	ED = ET7	10 000	Paper tape acc. to IEC 60068-3 Type I	8 mm	2 mm	180 mm/7"
	EE = EF4	50 000				330 mm/13"
CRCW0603	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		8 mm	4 mm	180 mm/7"
	EB = ET5	10 000				285 mm/11.25"
	EC = ET6	20 000				330 mm/13"
CRCW0805	EA = ET1	5000		8 mm	4 mm	180 mm/7"
	EB = ET5	10 000				285 mm/11.25"
	EC = ET6	20 000				330 mm/13"
CRCW1206	EA = ET1	5000		8 mm	4 mm	180 mm/7"
	EB = ET5	10 000				285 mm/11.25"
	EC = ET6	20 000				330 mm/13"
CRCW1210	EA = ET1	5000		8 mm	4 mm	180 mm/7"
	EB = ET5	10 000				285 mm/11.25"
	EC = ET6	20 000				330 mm/13"
CRCW1218	EK = ET9	4000	Blister tape acc. to IEC 60068-3 Type II	12 mm	4 mm	180 mm/7"
CRCW2010	EF = E02	4000		12 mm	4 mm	180 mm/7"
CRCW2512	EG = E67	2000		12 mm	8 mm	180 mm/7"
	EH = E82	4000			4 mm	

DIMENSIONS





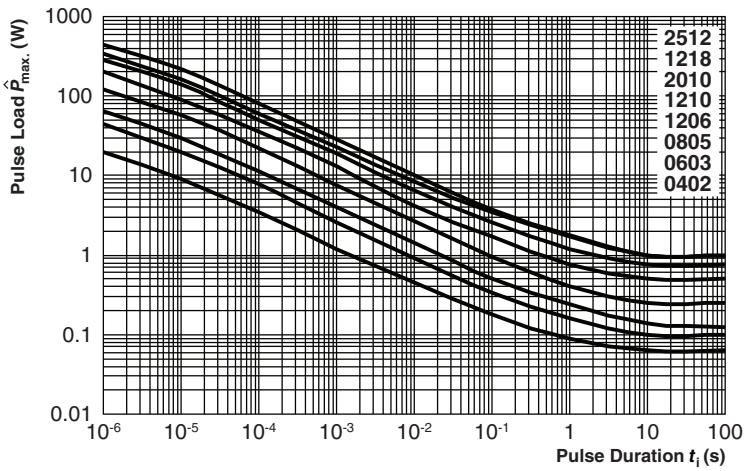
SIZE		DIMENSIONS in millimeters					SOLDER PAD DIMENSIONS in millimeters					
							REFLOW SOLDERING			WAVE SOLDERING		
INCH	METRIC	L	W	H	T1	T2	a	b	l	a	b	l
0402	1005	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.25 ± 0.05	0.2 ± 0.1	0.4	0.6	0.5			
0603	1608	1.55 $^{+0.10}_{-0.05}$	0.85 ± 0.1	0.45 ± 0.05	0.3 ± 0.2	0.3 ± 0.2	0.5	0.9	1.0	0.9	0.9	1.0
0805	2012	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	3216	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	3225	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
1218	3246	3.2 $^{+0.10}_{-0.20}$	4.6 ± 0.15	0.55 ± 0.05	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

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

chanhvinh.com

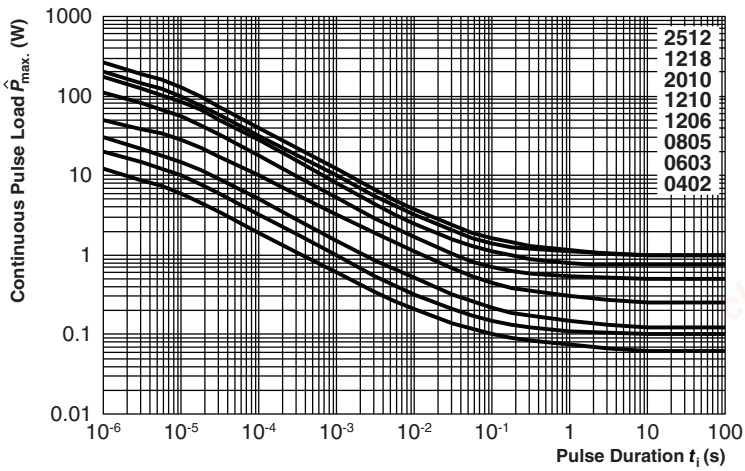
FUNCTIONAL PERFORMANCE

Single Pulse

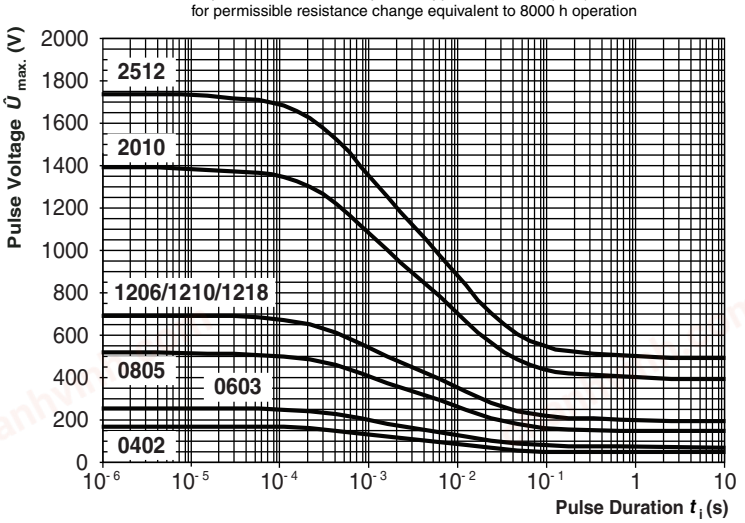


Maximum pulse load, single pulse; applicable if $\bar{P} \rightarrow 0$ and $n < 1000$ and $\hat{U} \leq \hat{U}_{max.}$; for permissible resistance change equivalent to 8000 h operation

Continuous Pulse



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

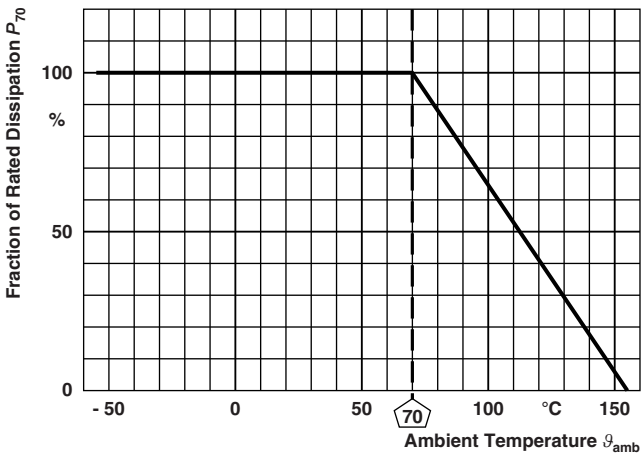


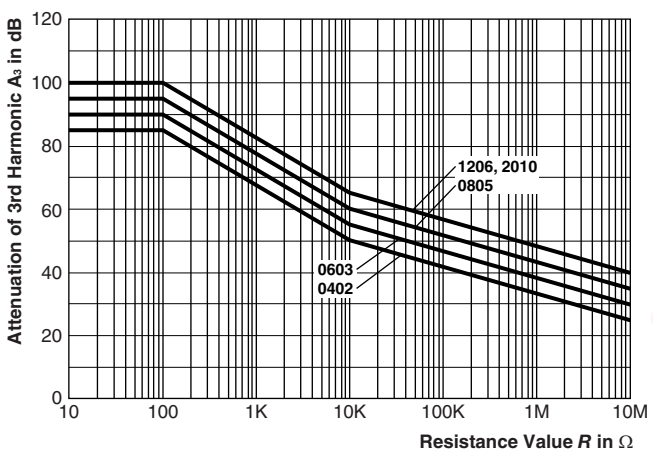
Maximum pulse voltage, single and continuous pulses; applicable if $\hat{P} \leq \hat{P}_{max.}$; for permissible resistance change equivalent to 8000 h operation

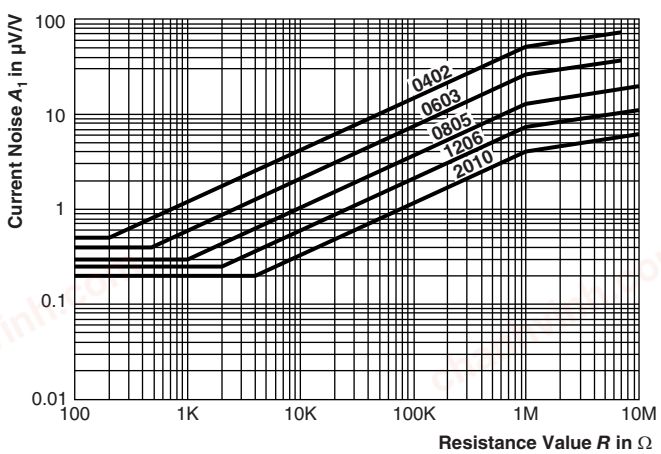
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

chanhvinh.com

Derating







THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

chanhvinh.com

TEST PROCEDURES AND REQUIREMENTS

EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)	
				SIZE 0402 to 2512	
				STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER
			Stability for product types:		
			D/CRCW e3	1 Ω to 10 MΩ	
4.5	-	Resistance	-	± 1 %	± 5 %
4.7	-	Voltage proof	U = 1.4 x U_{ins}; 60 s	No flashover or breakdown	
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R}$ ≤ 2 x $U_{max.}$; duration: Acc. to style	± (0.25 % R + 0.05 Ω)	± (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 (Uu_3)	Shear (adhesion)	RR 1608 and smaller: 9 N RR 2012 and larger: 45 N	No visible damage	
4.33	21 (Uu_1)	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	± (0.25 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)
			1000 cycles	± (1 % R + 0.05 Ω)	± (1 % R + 0.05 Ω)
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; ≥ 90 % RH; 24 h; 1 cycle		
4.23.4	1 (Aa)	Cold	- 55 °C; 2 h	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)
4.23.5	13 (M)	Low air pressure	1 kPa; (25 ± 10) °C; 1 h		
4.23.6	30 (Db)	Damp heat, cyclic	55 °C; ≥ 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	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)
			70 °C; 8000 h	± (2 % R + 0.1 Ω)	± (4 % R + 0.1 Ω)

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

chanhvinh.com

TEST PROCEDURES AND REQUIREMENTS					
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)	
				SIZE 0402 to 2512	
				STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER
			Stability for product types:	1 Ω to 10 MΩ	
			D/CRCW e3		
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 ± 5) °C; (10 ± 1) s	± (0.25 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)
4.35	-	Flamability, needle flame test	IEC 60695-11-5; 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	± (1 % R + 0.05 Ω)	± (2 % R + 0.1 Ω)
4.40	-	Electrostatic discharge (human body model)	IEC 61340-3-1; 3 pos. + 3 neg. discharges; ESD voltage acc. 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/s^2; 10 sweeps per axis	± (0.25 % R + 0.05 Ω)	± (0.5 % R + 0.05 Ω)
4.37	-	Periodic electric overload	$U = \sqrt{15 \times P_{70} \times R}$ ≤ 2 x $U_{max.}$; 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	$\hat{U} = 10 \times \sqrt{P_{70} \times R}$ ≤ 2 x $U_{max.}$; 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-x, environmental test procedures

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

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

chanhvinh.com

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.