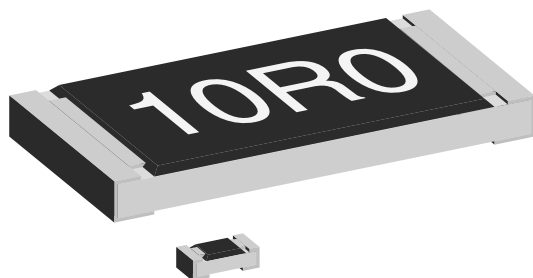


## Standard Thick Film Chip Resistors



### FEATURES

- Stability  $\Delta R/R = 1\%$  for 1000 h at 70 °C
- 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
- Compliant to RoHS Directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition
- AEC-Q200 qualified



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### STANDARD ELECTRICAL SPECIFICATIONS

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

# **TECHNICAL SPECIFICATIONS**

PARAMETER	UNIT	D10/ CRCW0402	D11/ CRCW0603	D12/ CRCW0805	D25/ CRCW1206	CRCW1210	CRCW1218	CRCW2010	CRCW2512
Rated dissipation $P_{70}$ <sup>(1)</sup>	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	$\Omega$	> $10^9$							
Category temperature range	°C	- 55 to + 155							
Failure rate	$h^{-1}$	< $0.1 \times 10^{-9}$							
Weight	mg	0.65	2	5.5	10	16	29.5	25.5	40.5

## **Note**

<sup>(1)</sup> 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

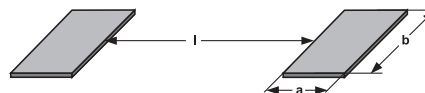
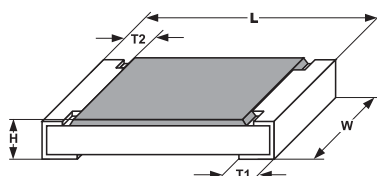
C	R	C	W	0	6	0	3	5	6	2	R	F	K	E	C				
MODEL				VALUE				TOLERANCE				TCR				PACKAGING		SPECIAL	
CRCW0402 CRCW0603 CRCW0805 CRCW1206 CRCW1210 CRCW1218 CRCW2010 CRCW2512				R = Decimal K = Thousand M = Million 0000 = Jumper				F = ± 1.0 % J = ± 5.0 % Z = Jumper				K = ± 100 ppm/K N = ± 200 ppm/K 0 = Jumper				EA, EB, EC, ED, EE, EF, EG, EH, 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	$\pm 200$ ppm/K $\pm 100$ ppm/K	10R = 10 $\Omega$ 562R = 562 $\Omega$ 10K = 10 k $\Omega$ 1M0 = 1 M $\Omega$ 0R0 = Jumper	$\pm 5\%$ $\pm 1\%$	ET1, ET5, ET6, ET7, EF4, E02, E67, E82, ET9	e3 = Pure tin termination finish

**PACKAGING**

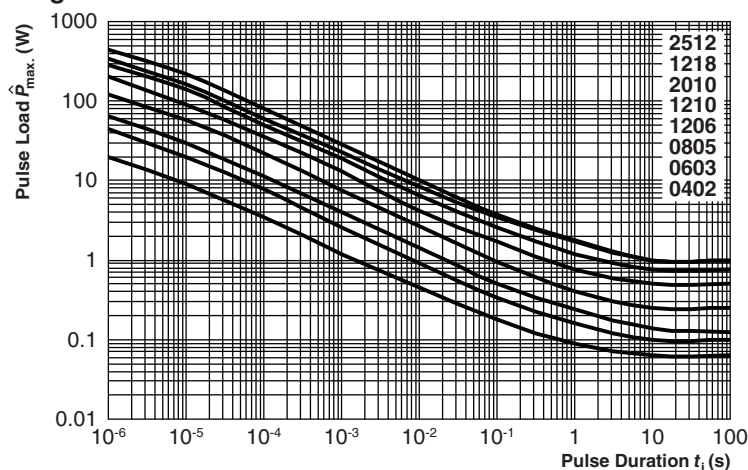
MODEL	UNIT	PAPER TAPE ON REEL ACC. TO IEC 60286-3, TYPE I			BLISTER TAPE ON REEL ACC. TO IEC 60286-3, TYPE II		
		QUANTITY	PART NUMBER	PRODUCT DESC.	QUANTITY	PART NUMBER	PRODUCT DESC.
D10/CRCW0402	180 mm/7"	10 000	ED	ET7			
	330 mm/13"	50 000	EE	EF4			
D11/CRCW0603	180 mm/7"	5000	EA	ET1			
	285 mm/11.25"	10 000	EB	ET5			
	330 mm/13"	20 000	EC	ET6			
D12/CRCW0805	180 mm/7"	5000	EA	ET1			
	285 mm/11.25"	10 000	EB	ET5			
	330 mm/13"	20 000	EC	ET6			
D25/CRCW1206	180 mm/7"	5000	EA	ET1			
	285 mm/11.25"	10 000	EB	ET5			
	330 mm/13"	20 000	EC	ET6			
CRCW1210	180 mm/7"	5000	EA	ET1			
	285 mm/11.25"	10 000	EB	ET5			
	330 mm/13"	20 000	EC	ET6			
CRCW1218	180 mm/7"				4000	EK	ET9
CRCW2010	180 mm/7"				4000	EF	E02
CRCW2512	180 mm/7"				2000	EG	E67
					4000	EH	E82

**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 <sup>+0.10</sup> <sub>-0.05</sub>	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 <sup>+0.20</sup> <sub>-0.10</sub>	1.25 ± 0.15	0.45 ± 0.05	0.3 <sup>+0.20</sup> <sub>-0.10</sub>	0.3 ± 0.2	0.7	1.3	1.2	0.9	1.3	1.3
1206	3216	3.2 <sup>+0.10</sup> <sub>-0.20</sub>	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 <sup>+0.10</sup> <sub>-0.20</sub>	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

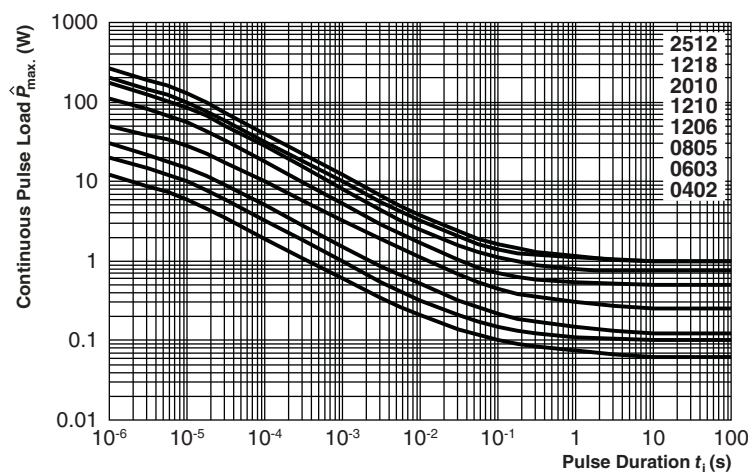
## FUNCTIONAL PERFORMANCE

## Single Pulse



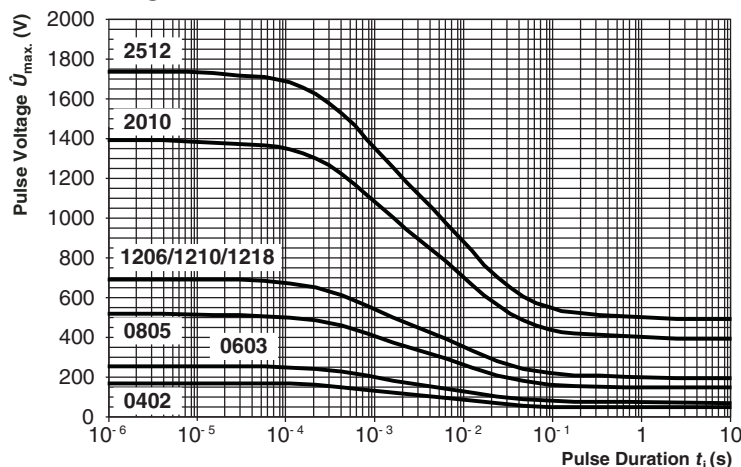
Maximum pulse load, single pulse; applicable if  $\bar{P} \rightarrow 0$  and  $n < 1000$  and  $\bar{U} \leq \bar{U}_{max}$ ; for permissible resistance change equivalent to 8000 h operation

## Continuous Pulse



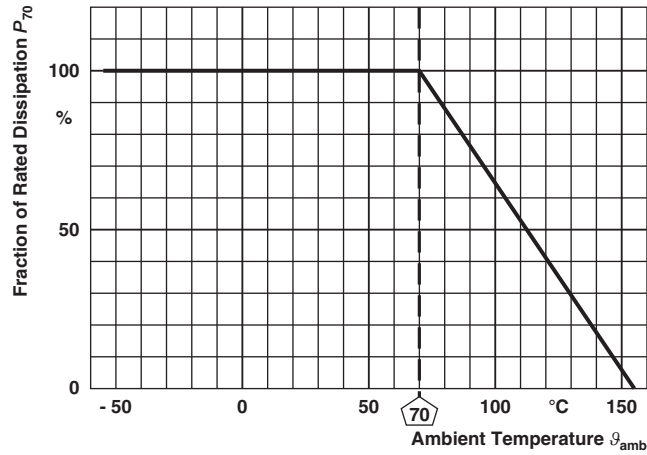
Maximum pulse load, continuous pulses; applicable if  $\bar{P} \leq P(9_{amb})$  and  $\bar{U} \leq \bar{U}_{max}$ ; for permissible resistance change equivalent to 8000 h operation

## Pulse Voltage

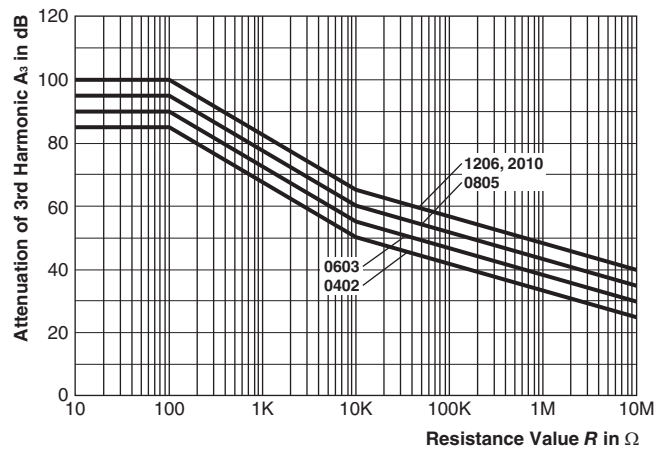


Maximum pulse voltage, single and continuous pulses; applicable if  $\hat{P} \leq \hat{P}_{max}$ ; for permissible resistance change equivalent to 8000 h operation

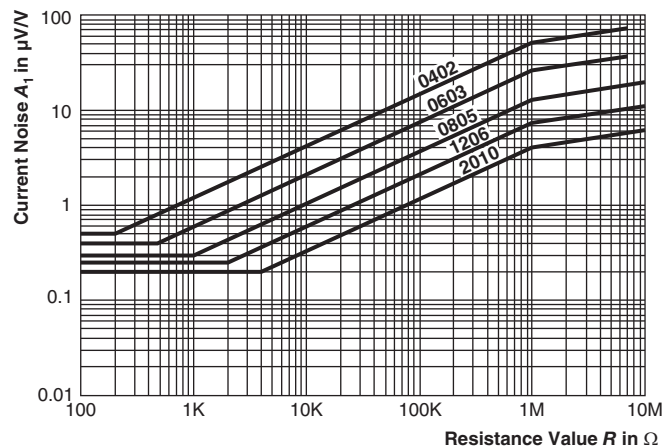
### Derating



### Non-Linearity



### Current Noise



TEST PROCEDURES AND REQUIREMENTS					
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )	
				SIZE 0402 to 2512	
				STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER
			Stability for product types:	1 $\Omega$ to 10 M $\Omega$	
			D/CRCW e3		
4.5	-	Resistance	-	$\pm 1 \%$	$\pm 5 \%$
4.7	-	Voltage proof	$U = 1.4 \times U_{\text{ins}}$ ; 60 s	No flashover or breakdown	
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{\text{max.}}$ ; duration: Acc. to style	$\pm (0.25 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$
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) $^{\circ}\text{C}$	$\pm 100 \text{ ppm/K}$	$\pm 200 \text{ ppm/K}$
4.32	21 (Uu <sub>3</sub> )	Shear (adhesion)	RR 1608 and smaller: 9 N RR 2012 and larger: 45 N	No visible damage	
4.33	21 (Uu <sub>1</sub> )	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	$\pm (0.25 \% R + 0.05 \Omega)$ $\pm (1 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$ $\pm (1 \% R + 0.05 \Omega)$
4.23	-	Climatic sequence:	-	$\pm (1 \% R + 0.05 \Omega)$	$\pm (2 \% R + 0.1 \Omega)$
4.23.2	2 (Ba)	Dry heat	125 $^{\circ}\text{C}$ ; 16 h		
4.23.3	30 (Db)	Damp heat, cyclic	55 $^{\circ}\text{C}$ ; $\geq 90 \%$ RH; 24 h; 1 cycle		
4.23.4	1 (Aa)	Cold	- 55 $^{\circ}\text{C}$ ; 2 h		
4.23.5	13 (M)	Low air pressure	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 cycles		
4.23.7	-	DC 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	$\pm (1 \% R + 0.05 \Omega)$	$\pm (2 \% R + 0.1 \Omega)$
			70 $^{\circ}\text{C}$ ; 8000 h	$\pm (2 \% R + 0.1 \Omega)$	$\pm (4 \% R + 0.1 \Omega)$



TEST PROCEDURES AND REQUIREMENTS					
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )	
				SIZE 0402 to 2512	
				STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER
			Stability for product types:	1 $\Omega$ to 10 M $\Omega$	
			D/CRCW e3		
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method (260 $\pm$ 5) $^{\circ}$ C; (10 $\pm$ 1) s	$\pm$ (0.25 % $R$ + 0.05 $\Omega$ )	$\pm$ (0.5 % $R$ + 0.05 $\Omega$ )
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 $\pm$ 2) $^{\circ}$ C; (93 $\pm$ 3) % RH; 56 days	$\pm$ (1 % $R$ + 0.05 $\Omega$ )	
4.25.3	-	Endurance at upper category temperature	155 $^{\circ}$ C, 1000 h	$\pm$ (1 % $R$ + 0.05 $\Omega$ )	$\pm$ (2 % $R$ + 0.1 $\Omega$ )
4.40	-	Electrostatic discharge (human body model)	IEC 61340-3-1; 3 pos. + 3 neg. discharges; ESD voltage acc. to size	$\pm$ (1 % $R$ + 0.05 $\Omega$ )	
4.29	45 (XA)	Component solvent resistance	Isopropyl alcohol; 50 $^{\circ}$ C; method 2	No visible damage	
4.30	45 (XA)	Solvent resistance of marking	Isopropyl alcohol; 50 $^{\circ}$ 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 $\leq$ 1.5 mm; A $\leq$ 200 m/s <sup>2</sup> ; 10 sweeps per axis	$\pm$ (0.25 % $R$ + 0.05 $\Omega$ )	$\pm$ (0.5 % $R$ + 0.05 $\Omega$ )
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	$\pm$ (1 % $R$ + 0.05 $\Omega$ )	
4.27	-	Single pulse high voltage overload, 10 $\mu$ s/700 $\mu$ s	$\hat{U} = 10 \times \sqrt{P_{70} \times R}$ $\leq 2 \times U_{\max.}$ ; 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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