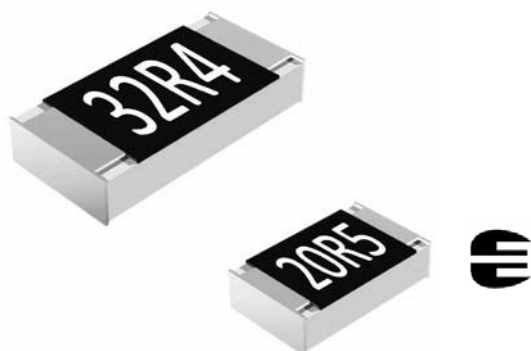


Lead (Pb)-Free Thick Film Chip Resistors with CECC Approval, Available with Established Reliability



FEATURES

- Approved to EN 140401-802, version E, with established reliability, failure rate level E6
- Approved to EN 140401-802, version A, without failure rate level
- Compliant to RoHS Directive 2002/95/EC



APPLICATIONS

- Military
- Avionics
- Industrial

TECHNICAL SPECIFICATIONS

DESCRIPTION	CRCW0805 EN802..	CRCW1206 EN802..
Imperial size	0805	1206
EN/CECC style	RR2012M	RR3216M
Resistance range	1 Ω to 1 M Ω ; 0 Ω	
Resistance tolerance	$\pm 5 \%$, $\pm 1 \%$	
Temperature coefficient	± 200 ppm/K, ± 100 ppm/K, ± 50 ppm/K	
Rated dissipation, P_{70}	0.125 W	0.25 W
Operating voltage, U_{max} , AC _{RMS} or DC	150 V	200 V
Permissible Film temperature, $\vartheta_{F max}$	125 °C	
Operating temperature range	- 55 °C to + 125 °C	
Max. resistance change at P_{70} for resistance range, $ \Delta R/R $ max. after:	10 Ω to 1 M Ω	
1000 h	$\leq 0.5 \%$	
8000 h	$\leq 1 \%$	
Insulation resistance	≥ 1 G Ω	
Permissible voltage against ambient (insulation):		
1 min; U_{ins}	200 V	300 V

Note

- 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.

TECHNICAL SPECIFICATIONS for "Version A"

DESCRIPTION	CRCW0805 EN802 E0	CRCW1206 EN802 E0
Nominal failure rate level	E0	
Quality factor, π_Q	3	
Failure rate, FIT _{observed}	$< 0.1 \times 10^{-9}/h$	

TECHNICAL SPECIFICATIONS for "Version E"

DESCRIPTION	CRCW0805 EN802 E6	CRCW1206 EN802 E6
Assessed failure rate level	E6 = $10^{-6}/h$	
Quality factor, π_Q	0.3	
Failure rate, FIT _{observed}	$< 0.1 \times 10^{-9}/h$	

Note

- Failure rate level E6 ($10^{-6}/h$, $\pi_Q = 0.3$), equivalent to MIL level P, is superior to level E5 ($10^{-5}/h$, $\pi_Q = 1$) and thus can be used as a replacement.

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE for “Version A”

TCR	TOLERANCE	RESISTANCE RANGE	
		CRCW0805 EN802 E0	CRCW1206 EN802 E0
± 200 ppm/K	± 5 %	1 Ω to 1 MΩ	1 Ω to 1 MΩ
± 100 ppm/K	± 1 %	10 Ω to 1 MΩ	10 Ω to 1 MΩ
± 50 ppm/K	± 1 %	100 Ω to 1 MΩ	100 Ω to 1 MΩ
Jumper		$R_{res} \leq 20 \text{ m}\Omega$; $I_{max.} = 1.5 \text{ A}$	$R_{res} \leq 20 \text{ m}\Omega$; $I_{max.} = 2.0 \text{ A}$

Note

- Resistance values of version A products (nominal failure rate E0) are available according to the E24 series for ± 5 % tolerance and according to the E24 and E96 series for ± 1 % tolerance.

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE for “Version E”

TCR	TOLERANCE	RESISTANCE RANGE	
		CRCW0805 EN802 E6	CRCW1206 EN802 E6
± 200 ppm/K	± 5 %	1.0 Ω to 9.1 Ω	1.0 Ω to 9.1 Ω
± 100 ppm/K	± 1 %	10 Ω to 1 MΩ	10 Ω to 1 MΩ
± 50 ppm/K	± 1 %	100 Ω to 1 MΩ	100 Ω to 1 MΩ
Jumper		$R_{res} \leq 20 \text{ m}\Omega$; $I_{max.} = 1.5 \text{ A}$	$R_{res} \leq 20 \text{ m}\Omega$; $I_{max.} = 2.0 \text{ A}$

Note

- According to EN 140401-802, resistance values of version E products (failure rate E6) are to be selected from the E24 series for ± 5 % tolerance and from the E96 series for ± 1 % tolerance.

PART NUMBER AND PRODUCT DESCRIPTION

Part Number: CRCW0805562RFKEAE6

C	R	C	W	0	8	0	5	5	6	2	R	F	K	E	A	E	6
MODEL/SIZE		RESISTANCE		TOLERANCE		TCR		PACKAGING		SPECIAL							
CRCW0805 CRCW1206		R = Decimal K = Thousand M = Million 0000 = Jumper		F = ± 1 % J = ± 5 % Z = Jumper		H = ± 50 ppm/K K = ± 100 ppm/K N = ± 200 ppm/K 0 = Jumper		EN EA EB		EN 140401-802 E6 EN 140401-802 E0							

Product Description: CRCW0805 100 562R 1 % ET1 EN802 E6

CRCW0805	100	562R	1 %	ET1	EN802	E6
MODEL/SIZE	TCR	RESISTANCE	TOLERANCE	PACKAGING	SPECIFICATION	FAILURE RATE LEVEL
CRCW0805 CRCW1206	± 50 ppm/K ± 100 ppm/K ± 200 ppm/K	10R = 10 Ω 562R = 562 Ω 10K = 10 kΩ 1M = 10 MΩ 0R0 = Jumper	± 1 % ± 5 %	E52 ET1 ET5	EN 140401-802	E6 E0

EN 140401-802 ORDERING INFORMATION

Example of the ordering information for a resistor: CRCW0805 100 562R 1 % EN802 E6

EN140401-802EZRR1608MS562RFE6

The elements used in the component number have the following meaning:

EN140401-802

EZ

RR1608M

S

562R

F

E6

EN detail specification number

Assessment level for the zero-defect approach

Style

Temperature coefficient, according to EN 60062

$U = \pm 200 \text{ ppm/K}$; $S = \pm 100 \text{ ppm/K}$; $R = \pm 50 \text{ ppm/K}$

Resistance value, according to EN 60062, 4 characters

Tolerance on rated resistance, according to EN 60062

$J = \pm 5 \%$; $F = \pm 1 \%$

Failure rate level according to EN 60115-1, table ZB.1
for "version A" the nominal failure rate level is E0

Please note that the EN 140401-802 ordering information is not specific to the nature of the termination plating.

Note

- The ordering information according to EN 140401-802: 2007 shown above succeeds and replaces the ordering information according to earlier versions of the detail specification EN 140401-802 or its predecessor CECC 40401-802, for example:

CECC 40401-802 EZ RC3715M B 562R F E6

CECC 40401-802 S RC3715 B 562R F E6

with

EZ; S

RR3216M; RR3216

B

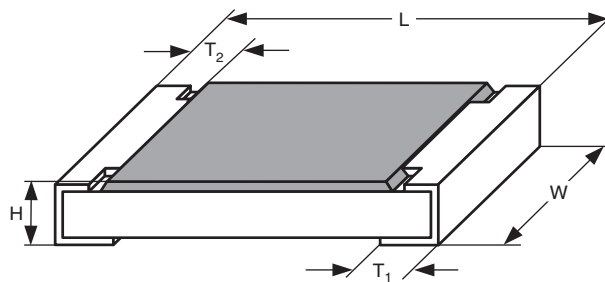
Assessment level, where EZ is successor to and superior replacement for S

Style, with suffix M for "metric"

Temperature coefficient, according to the detail specification

$A = \pm 200 \text{ ppm/K}$; $B = \pm 100 \text{ ppm/K}$; $C = \pm 50 \text{ ppm/K}$

DIMENSIONS



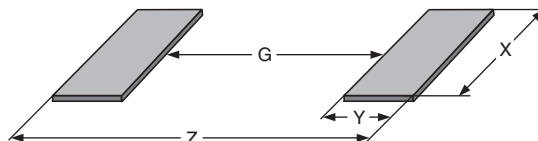
DIMENSIONS AND MASS

TYPE	L (mm)	W (mm)	H (mm)	T ₁ , T ₂ (mm)	MASS (mg)
CRCW0805 EN802..	2.00 ± 0.15	1.25 ± 0.15	0.5 ± 0.15	0.40 ± 0.20	≤ 5.5
CRCW1206 EN802..	3.20 ± 0.15	1.60 ± 0.15	0.5 ± 0.15	0.50 ± 0.25	≤ 10

Note

- The resistors are marked using the four-character code system of IEC 60062, 4.2.3 on their black protective coating.

PATTERN STYLES FOR CHIP RESISTORS



RECOMMENDED SOLDER PAD DIMENSIONS

TYPE	WAVE SOLDERING				REFLOW SOLDERING			
	G (mm)	Y (mm)	X (mm)	Z (mm)	G (mm)	Y (mm)	X (mm)	Z (mm)
CRCW0805 EN802..	0.65	1.40	1.50	3.45	0.65	1.10	1.40	2.85
CRCW1206 EN802..	1.50	1.60	1.90	4.70	1.50	1.25	1.75	4.00

PACKAGING						
MODEL	CODE	QUANTITY	CARRIER TAPE	WIDTH	PITCH	REEL DIAMETER
CRCW0805 EN802 ..	EN = E52 ⁽¹⁾	1000 ⁽¹⁾	Paper tape acc. IEC 60286-3 Type I	8 mm	4 mm	180 mm (7")
	EA = ET1	5000				285 mm (11.25")
	EB = ET5	10 000				285 mm (11.25")
CRCW1206 EN802 ..	EN = E52 ⁽¹⁾	1000 ⁽¹⁾				180 mm (7")
	EA = ET1	5000				285 mm (11.25")
	EB = ET5	10 000				285 mm (11.25")

Note

⁽¹⁾ Package of 1000 pieces, code EN and E52, is available only for products with established reliability, CRCW.. EN802 E6

DESCRIPTION

Production follows a set of instructions established for reproducibility. A thick film layer and a glass-over are deposited on a high grade ceramic substrate (Al₂O₃) with its prepared inner contacts. The target value is achieved by laser cutting an L shaped groove in the resistive layer. The resistor elements are covered by a protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure tin on nickel plating. A four-character code marking designates the resistance value in accordance with **IEC 60062** ⁽⁴⁾.

The result of the determined production is verified by an extensive testing procedure performed on 100 % of the individual resistors. Only accepted products are placed into the paper tape according to **EN 60286-3** ⁽⁴⁾, type I.

ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapour phase as shown in **IEC 61760-1** ⁽⁴⁾. Solderability is specified for 2 years after production.

The resistors are lead (Pb)-free, the pure tin plating provides compatibility with both, lead (Pb)-free and tin lead (SnPb) based soldering processes. The immunity of the plating against tin whisker growth has been proven under extensive testing.

The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The suitability of conformal coatings, if applied, shall be qualified by appropriate means to ensure the long-term stability of the whole system.

Notes

⁽²⁾ Global Automotive Declarable Substance List, see www.gadsl.org.

⁽³⁾ CEFIC (European Chemical Industry Council), EECA (European Electronic Component Manufacturers Association), EICTA (European trade organisation representing the information and communications technology and consumer electronics), see www.eicta.org → issue → environmental policy → chemicals → chemicals for electronics.

⁽⁴⁾ The quoted IEC standards are also released as EN standards with the same number and identical contents.

All products comply with the **GADSL** ⁽²⁾ and the **CEFIC-EECA-EICTA** ⁽³⁾ list of legal restrictions on hazardous substances. This includes full compliance with the following directives:

- 2000/53/EC End of Vehicle life Directive (ELV) and Annex II (ELV II)
- 2002/95/EC Restriction of the use of Hazardous Substances directive (RoHS)
- 2002/96/EC Waste Electrical and Electronic Equipment Directive (WEEE)

APPROVALS

The resistors are approved within the **IECQ-CECC** Quality Assessment System for Electronic Components to the detail specification **EN 140401-802** which refers to **EN 60115-1**, **EN 140400** and the variety of environmental test procedures of the **IEC 60068** ⁽⁴⁾ series.

Conformity is attested by the use of the **CECC** logo (E) as the Mark of Conformity on the package label.

RELATED PRODUCTS

A parallel family of lead (Pb)-bearing thick film chip resistors with CECC approval, available with established reliability, is available, see datasheet:

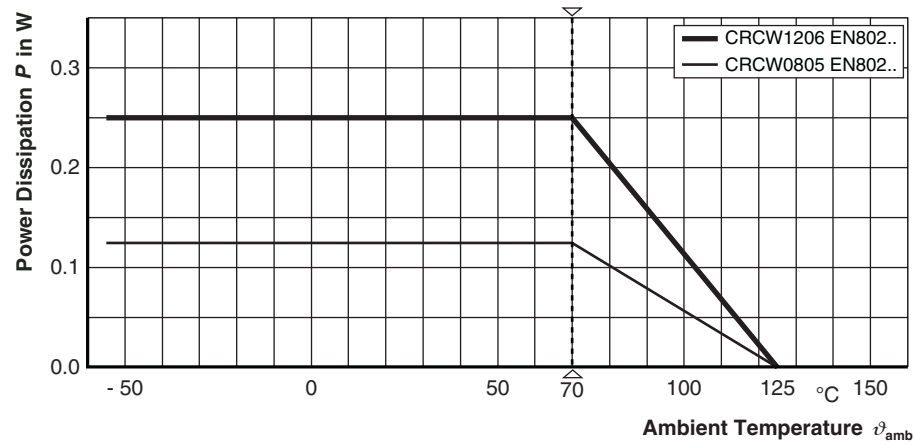
- "Lead (Pb)-Bearing Thick Film Chip Resistors with CECC Approval Available with Established Reliability", document no. 28808

A wider range of product sizes, TCR, tolerance and resistance values, plus the option of values from a different E series is available without approval to any EN specification (quality factor $\pi_Q = 10$). See the datasheets:

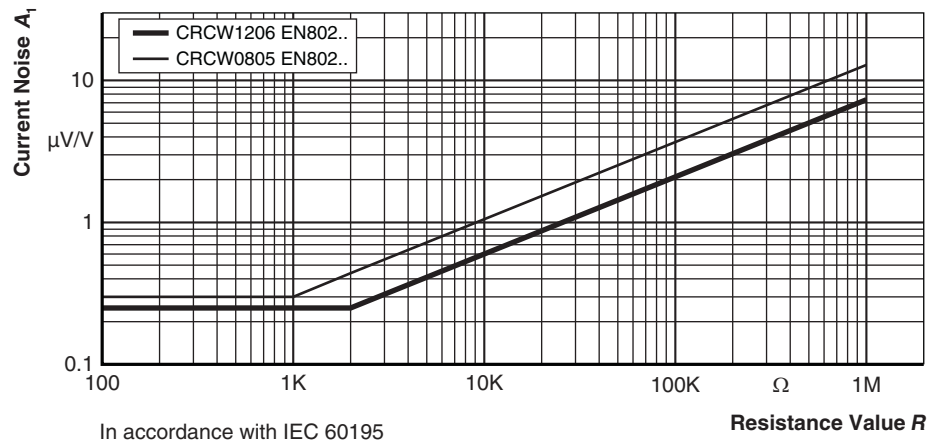
- "Lead (Pb)-free Thick Film, Rectangular Chip Resistors", document no. 20035
- "Thick Film, Rectangular Chip Resistors", products with lead bearing solder contacts, document no. 20008



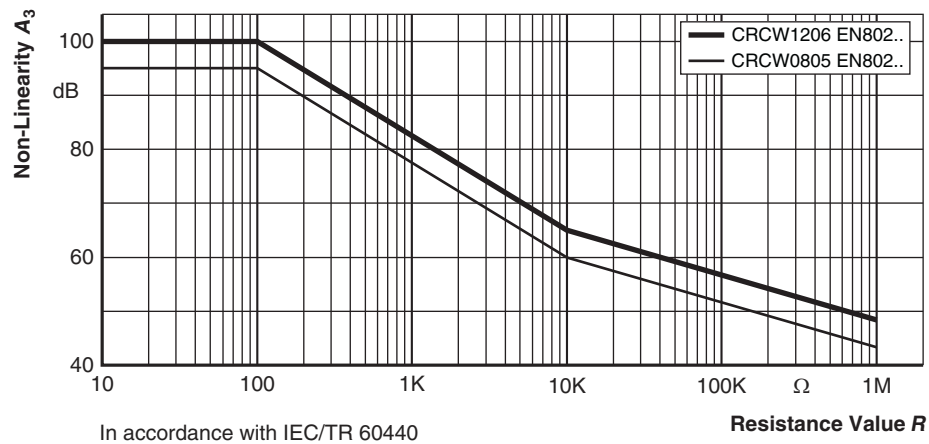
FUNCTIONAL PERFORMANCE



Derating



Current Noise - A_1



Non-Linearity - A_3

TESTS AND REQUIREMENTS

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

The components are approved in accordance with the IECQ-CECC system. For the full test schedule refer to the documents listed above. The testing also covers most of the requirements specified by EIA/IS-703 and JIS-C-5202.

The tests are carried out in accordance with IEC 60068 and under standard atmospheric conditions in accordance with

IEC 60068-1, 5.3. Climatic category LCT/UCT/56 (rated temperature range: Lower category temperature, upper category temperature; damp heat, long term, 56 days) is valid.

Unless otherwise specified the following values apply:

Temperature: 15 °C to 35 °C

Relative humidity: 45 % to 75 %

Air pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar).

The components are mounted for testing on printed-circuit boards in accordance with EN 140400, 2.3.3, unless otherwise specified.

TEST PROCEDURES AND REQUIREMENTS					
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)	
				STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER
			Stability for product types:	10 Ω to 1 M Ω	1.0 Ω to 1 M Ω
			CRCW0805 EN802.. CRCW1206 EN802..		
4.5	-	Resistance	-	$\pm 1 \%$	$\pm 5 \%$
4.7	-	Voltage proof	$U = 1.4 \times U_{ins}$; 60 s	No flashover or breakdown	
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$; duration acc. to style 0805: 1 s; 1206: 2 s	$\pm (0.25 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$
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) $^{\circ}\text{C}$	$\pm 50 \text{ ppm/K}$; $\pm 100 \text{ ppm/K}$	$\pm 200 \text{ ppm/K}$
4.32	21 (Uu3)	Shear (adhesion)	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 $\pm (0.25 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$
4.19	14 (Na)	Rapid change of temperature	30 min at - 55 $^{\circ}\text{C}$ 30 min at 125 $^{\circ}\text{C}$	$\pm (0.25 \% R + 0.05 \Omega)$ $\pm (1 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$ $\pm (1 \% R + 0.05 \Omega)$
			5 cycles		
			1000 cycles		

TEST PROCEDURES AND REQUIREMENTS					
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)	
				STABILITY CLASS 1 OR BETTER	STABILITY CLASS 2 OR BETTER
			Stability for product types:	10 Ω to 1 M Ω	1.0 Ω to 1 M Ω
			CRCW0805 EN802.. CRCW1206 EN802..		
4.23	2 (Ba) 30 (Db) 1 (Aa) 13 (M) 30 (Db) -	Climatic sequence:		$\pm (1 \% R + 0.05 \Omega)$	$\pm (2 \% R + 0.1 \Omega)$
4.23.2		Dry heat	125 °C; 16 h		
4.23.3		Damp heat, cyclic	55 °C; $\geq 90 \% RH$; 24 h; 1 cycle		
4.23.4		Cold	- 55 °C; 2 h		
4.23.5		Low air pressure	1 kPa; (25 $\pm$ 10) °C; 1 h		
4.23.6		Damp heat, cyclic	55 °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 °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	$\pm (1 \% R + 0.05 \Omega)$ $\pm (2 \% R + 0.05 \Omega)$	$\pm (2 \% R + 0.1 \Omega)$ $\pm (4 \% R + 0.1 \Omega)$
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method; (260 $\pm$ 5) °C; (10 $\pm$ 1) s	$\pm (0.25 \% R + 0.05 \Omega)$	$\pm (0.5 \% R + 0.05 \Omega)$
4.35	-	Flammability, needle flame test	IEC 60695-11-5 ⁽³⁾ , 10 s	No burning after 30 s	
4.24	78 (Cab)	Damp heat, steady state	(40 $\pm$ 2) °C (93 $\pm$ 3) % RH ; 56 days;	$\pm (1 \% R + 0.05 \Omega)$	$\pm (2 \% R + 0.1 \Omega)$
4.25.3	-	Endurance at upper category temperature	125 °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⁾ 3 pos. + 3 neg. discharges; Voltage acc. to style 0805: 800 V; 1206: 1000 V	$\pm (1 \% \Delta R + 0.05 \Omega)$	
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; $x, y, z \leq 1.5$ mm; $A \leq 200$ m/s ² ; 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 μ s/700 μ s	$U = 10 \times \sqrt{P_{70} \times R}$ $\leq 2 \times U_{max.}$; 10 pulses	$\pm (1 \% R + 0.05 \Omega)$	



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