SLOVENSKI STANDARD

SIST EN 140401-803:2003

01-oktober-2003

Detail specification: Fixed low power non wire-wound surface mount (SMD) resistors - Cylindrical - Stability classes 0,05; 0,1; 0,25; 0,5; 1; 2

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Bauartspezifikation: Oberflchenmontierbare nichtdrachtgewickelte Festwiderstnde (SMD) niedriger Belastbarkeit - Zylindrisch - Stabilittsklassen 0,05; 0,1; 0,25; 0,5; 1; 2

Spcification particulire: Rsistances fixes non bobines, faible dissipation pour montage en surface (CMS) - Cylindriques - Catgories de stabilit 0,05; 0,1; 0,25; 0,5; 1; 2

Ta slovenski standard je istoveten z: EN 140401-803:2002

ICS:

31.040.10 Fiksni upor Fixed resistors

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EUROPEAN STANDARD

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Supersedes CECC 40 401-803:1997

English version

Detail specification: Fixed low power non wire-wound surface mount (SMD) resistors - Cylindrical - Stability classes 0,05; 0,1; 0,25; 0,5; 1; 2

Spécification particulière:
Résistances fixes non bobinées
à faible dissipation pour montage
en surface (CMS) -
Cylindriques -
Catégories de stabilité 0,05; 0,1; 0,25; 0,5;
1; 2

Bauartspezifikation:
Oberflächenmontierbare nichtdracht-
gewickelte Festwiderstände (SMD)
niedriger Belastbarkeit -
Zylindrisch -
Stabilitätsklassen 0,05; 0,1; 0,25; 0,5; 1; 2

This European Standard was approved by CENELEC on 2001-11-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 140401-803:2002 E

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 40XB, Resistors.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 140401-803 on 2001-11-01.

This European Standard supersedes CECC 40 401-803:1997.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-02-01

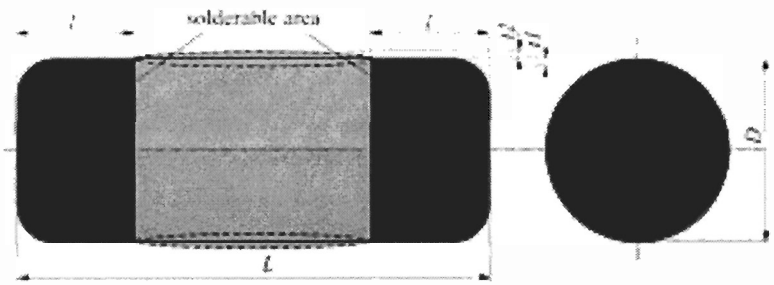
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2004-11-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes A and C are normative and annex B is informative.

This specification is part of four documents describing fixed resistors for surface mount technology as follows:

EN 60115-1	Fixed resistors for use in electronic equipment – Part 1: Generic Specification (IEC 60115-1, mod.)
EN 140400	Sectional Specification: Fixed low power surface mount (SMD) resistors
EN 140401	Blank Detail Specification: Fixed low power non wire-wound surface mount (SMD) resistors
EN 140401-803	Detail specification: Fixed low power non wire-wound surface mount (SMD) resistors, cylindrical

Contents

Specification available from CENELEC Central Secretariat, 35, Rue de Stassart, B-Brussels, or from the National Committees members of CENELEC	**EN 140401-803**
Electronic components of assessed quality in accordance with: EN 60115-1:2001 EN 140400:200X EN 140401:2002	**Issue 2** May 2002
 Other shapes are permitted within the given dimensions. **Figure 1 - Outline and dimensions (see Table 1)**	Fixed low power non wire-wound surface mount resistors (SMD), cylindrical Style: RC Ceramic body with protected, insulated, spiraled resistance film and solder terminations, thin film, for application on rigid or flexible printed board. Assessment level EZ [a] Version A: with 100-%-test Version E: with failure rate level and 100-%-test Stability classes 0,05; 0,1; 0,25; 0,5; 1 and 2
[a] For explanations on assessment level EZ see 2.1.1	

1 Characteristics and ratings

Various parameters of this component are precisely specified in this specification. Unspecified parameters may vary from one component to another.

1.1 Dimensions and ratings

Table 1 - Style and dimensions

Style		Length L mm		Diameter D mm		Cap length l mm		t_1 mm	t_2 mm	Weight [a] mg
metric	**DIN**	**min.**	**max.**	**min.**	**max.**	**min.**	**max.**	**max.**	**max.**	**max.**
RC 2211M	0102	1,9	2,2	1,0	1,1	0,35	0,45	0,05	0,05	7,8
RC 3715M	0204	3,3	3,7	1,2	1,6	0,50	0,90	0,10	0,05	18
RC 6123M	0207	5,5	6,1	2,0	2,5	0,80	1,40	0,20	0,05	78
[a] For information only										

Table 2a - Ratings for stability classes 2; 1; 0,5; 0,25

Style	Stability class	Rated dissipation P_{70} mW	Limiting element voltage d.c. or a.c. (r.m.s) U_{max} V	Insulation voltage d.c. or a.c. (peak) U_{ins} V	
				1 min	**continuous**
RC 2211M	2; 1; 0,5; 0,25	200	150	200	75
RC 3715M	2; 1; 0,5; 0,25	250	200	300	75
RC 6123M	2; 1; 0,5; 0,25	400	300	500	75

Information about manufacturers who have components qualified to this detail specification is available in the current CECC 00 200: Register of Approvals

Table 2b - Ratings for stability class 0,05; 0,1

Style	Stability class	Rated dissipation P_{70} mW	Limiting element voltage d.c. or a.c. (r.m.s) U_{max} V	Insulation voltage d.c. or a.c. (peak) U_{ins} V	
				1 min	continuous
RC 2211M	0,1; 0,05	63	150	200	75
RC 3715M	0,1; 0,05	75	200	300	75
RC 6123M	0,1; 0,05	100	300	500	75

Table 2c - Ratings for 0 Ω resistors

Style	Maximum current I_{max} A	Maximum resistance value R_{max} mΩ	Insulation voltage d.c. or a.c. (peak) U_{ins} V	
			1 min	continuous
RC 2211M	2	20	200	75
RC 3715M	3	20	300	75
RC 6123M	5	20	500	75

1.2 Derating curve

Resistors covered by this specification are derated according to the following diagram:

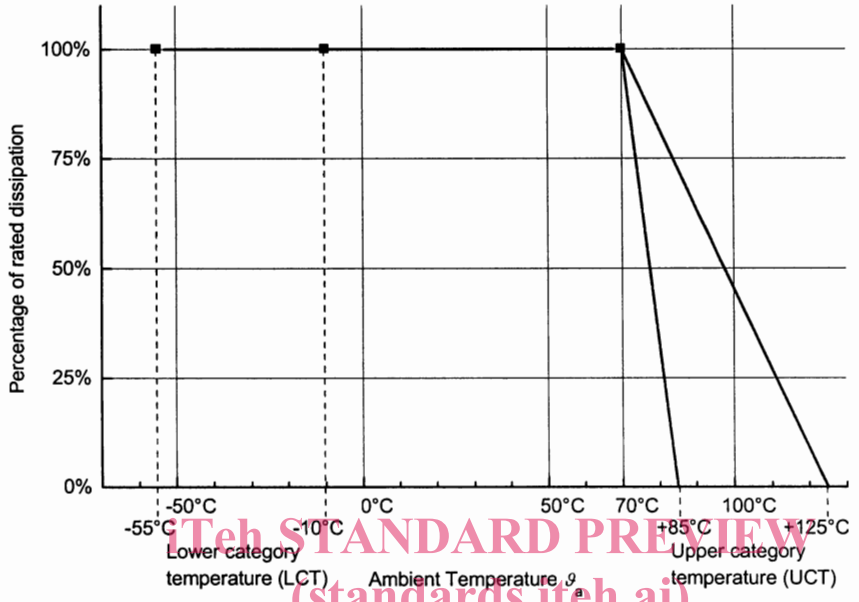


Figure 2 - Derating curve

For the category temperatures of stability classes refer to Table 6.

1.3 Resistance range and tolerance on rated resistance

Version A:

The following combinations of temperature coefficient, tolerance on rated resistance shall be used for qualification approval according to 2.2.1 and quality conformance inspection according to 2.3. Resistance values of E-series according to IEC 60063 shall be used.

The qualification of resistance values below or beyond the specified resistance values is permitted, if they fulfil the requirements of the closest stability class (e.g. RC 3715M 1 % >10 MΩ shall fulfil the requirements of stability class 2).

Table 3a - Resistance range, tolerance on rated resistance for version A

Style	Tolerance on rated resistance		Temperature coefficient	Resistance range	Stability class
	%	Code[a]	ppm/K		
RC 2211M	± 5	J	± 50	0,22 Ω to < 1 Ω	1
	± 2	G	± 50	1 Ω to < 10 Ω	0,5
	± 1	F	± 50; ± 25	10 Ω to 221 kΩ	0,25
				> 221 kΩ to 2,21 MΩ	2
	± 0,5	D	± 50; ± 25	10 Ω to 221 kΩ	0,25
	± 0,25	C	± 25; ± 15; ± 10; ± 5	22 Ω to 221 kΩ	0,25
				43 Ω to < 100 Ω	0,1
				100 Ω to 100 kΩ	0,05
				> 100 kΩ to 221 kΩ	0,1
	± 0,1	B	± 25; ± 15; ± 10	43 Ω to 221 kΩ	0,25
			± 25; ± 15; ± 10; ± 5	43 Ω to < 100 Ω	0,1
				100 Ω to 100 kΩ	0,05
				> 100 kΩ to 147 kΩ	0,1
RC 3715M	± 5	J	± 50	0,22 Ω to < 1 Ω	1
	± 1	F	± 50	1 Ω to < 10 Ω	0,5
			± 50; ± 25	10 Ω to 332 kΩ	0,25
				> 332 kΩ to 10 MΩ	2
	± 0,5	D	± 50; ± 25	10 Ω to 332 kΩ	0,25
	± 0,25	C	± 25; ± 15; ± 10	22 Ω to 332 kΩ	0,25
			± 25; ± 15; ± 10; ± 5	43 Ω to < 100 Ω	0,1
				100 Ω to 100 kΩ	0,05
				> 100 kΩ to 221 kΩ	0,1
	± 0,1	B	± 25; ± 15; ± 10	43 Ω to 332 kΩ	0,25
			± 25; ± 15; ± 10; ± 5	43 Ω to < 100 Ω	0,1
				100 Ω to 100 kΩ	0,05
				> 100 kΩ to 221 kΩ	0,1
RC 6123M	± 5	J	± 50	0,22 Ω to < 1 Ω	1
	± 1	F	± 50	1 Ω to < 10 Ω	0,5
			± 50; ± 25	10 Ω to 1 MΩ	0,25
				> 1 MΩ to 10 MΩ	2
	± 0,5	D	± 50; ± 25	10 Ω to 1 MΩ	0,25
	± 0,25	C	± 25; ± 15; ± 10	22 Ω to 1 MΩ	0,25
			± 25; ± 15; ± 10; ± 5	43 Ω to < 100 Ω	0,1
				100 Ω to 270 kΩ	0,05
				> 270 kΩ to 510 kΩ	0,1
	± 0,1	B	± 25; ± 15; ± 10	43 Ω to 1 MΩ	0,25
			± 25; ± 15; ± 10; ± 5	43 Ω to < 100 Ω	0,1
				100 Ω to 270 kΩ	0,05
				> 270 kΩ to 510 kΩ	0,1
0 Ω-resistors according to Table 2c for all styles					
[a] Code letters according to EN 60062					

Version E:

The following combinations of temperature coefficient, tolerance on rated resistance and E-series according to IEC 60063 shall be used for qualification approval according to 2.2.2 and quality conformance inspection according to 2.3 and are permitted only.

Table 3b - Resistance range, tolerance on rated resistance for version E

Style	Tolerance on rated resistance		Temperature coefficient	Resistance range	Stability class	E series
	%	Code [a]	ppm/K			
RC 2211M	± 2	G	± 50	1 Ω to 9,1 Ω	0,5	E24
	± 1	F	± 50	10 Ω to 221 kΩ	0,25	E96
				> 221 kΩ to 2,21 MΩ	2	
	± 0,1	B	± 15	75 Ω to 100 kΩ	0,25	E192
RC 3715M	± 1	F	± 50	1 Ω to < 10 Ω	0,5	E96
				10 Ω to 332 kΩ	0,25	
				> 332 kΩ to 5,11 MΩ	2	
	± 0,25	C	± 10	22 Ω to < 43 Ω	0,25	E192
				43 Ω to 221 k Ω	0,1	
			± 5	100 Ω to 100 kΩ	0,05	
	± 0,1	B	± 15	75 Ω to 100 kΩ	0,25	
			± 10	43 Ω to 221 kΩ	0,1	
			± 5	100 Ω to 100 kΩ	0,05	
RC 6123M	± 1	F	± 50	1 Ω to < 10 Ω	0,5	E96
				10 Ω to 1 MΩ	0,25	
				> 1 MΩ to 10 MΩ	2	
	± 0,1	B	± 15	75 Ω to 499 kΩ	0,25	E192
0 Ω-resistors according to Table 2c for all styles						
[a] Code letters according to EN 60062						

1.4 Variation of resistance with temperature and temperature rise

Table 4 - Temperature coefficents and percentage change of resistance (acc. to EN 140400, Table 2)

Temperature coefficient		Limit of resistance change $\Delta R/R$ %				
		Stability classes 2; 1; 0,5; 0,25			Stability classes 0,1; 0,05	
ppm/K	Code [a]	Temp. charact. 20 °C / 70 °C	LCT / Ref. temp. -55 °C / 20 °C	Ref. temp. / UCT 20 °C / 125 °C	LCT / Ref. temp. -10 °C / 20 °C	Ref. temp. / UCT 20 °C / 85 °C
± 50	C	± 0,250	± 0,375	± 0,525	–	–
± 25	D	± 0,125	± 0,188	± 0,263	± 0,075	± 0,163
± 15	E	± 0,075	± 0,113	± 0,158	± 0,045	± 0,098
± 10	F	± 0,050	± 0,075	± 0,105	± 0,030	± 0,065
± 5	G	± 0,025	± 0,038	± 0,053	± 0,015	± 0,033
[a] Code letter according to EN 140400, Table 2						

Table 5 - Limit of temperature rise

Stability class	Limit of temperature rise at rated dissipation
2; 1; 0,5; 0,25	$T_r \leq 55$ K
0,1; 0,05	$T_r \leq 15$ K

The thermal resistance is calculated to $R_{th} = T_r / P_{70}$.

1.5 Climatic categories

Table 6 - Climatic categories

Stability class	Climatic category LCT / UCT / Duration
2; 1; 0,5; 0,25	55 / 125 / 56
0,1; 0,05	10 / 085 / 56

1.6 Limits for change of resistance at tests

Table 7 - Limits for change of resistance at tests

Stability class	Limit of resistance change $\Delta R/R$			
	EN 60115-1, 4.23 Climatic sequence 4.24 Damp heat, steady state 4.25.3 Endurance at upper category temperature	EN 60115-1, 4.25.1 Endurance at 70 °C		EN 60115-1, 4.13 Overload 4.18 Resistance to soldering heat 4.19 Rapid change of temperature 4.22 Vibration
		1 000 h	Extended, 8 000 h	4.33 Substrate bending test
2	± (2 % R + 0,1 Ω) [b]	± (0,5 % R + 0,05 Ω) [a]	±(1 % R + 0,05 Ω) [a]	± (0,5 % R + 0,05 Ω)
1	± (1 % R + 0,05 Ω)	± (0,25 % R + 0,05 Ω) [a]	±(0,5 % R + 0,05 Ω) [a]	± (0,25 % R + 0,05 Ω)
0,5	± (0,5 % R + 0,05 Ω)	± (0,25 % R + 0,05 Ω) [a]	±(0,5 % R + 0,05 Ω) [a]	± (0,1 % R + 0,01 Ω)
0,25	± (0,25 % R + 0,05 Ω)	± (0,25 % R + 0,05 Ω)	±(0,5 % R + 0,05 Ω)	± (0,05 % R + 0,01 Ω)
0,1	± (0,1 % R + 0,01 Ω) [a]	± (0,1 % R + 0,01 Ω)	±(0,25 % R + 0,01 Ω)	± (0,02 % R + 0,01 Ω) [a]
0,05	± (0,05 % R + 0,01 Ω)	± (0,05 % R + 0,01 Ω)	±(0,1 % R + 0,01 Ω)	± (0,01 % R + 0,01 Ω) [a]

[a] Tightening of the general definition of stability classes against the requirements of EN 140400, 2.1.4
[b] +2/-0,5 % R+0,05 Ω for Endurance at upper category temperature, see also [a]

1.7 Non-linear properties

(for resistance values ≥ 10 Ω)

If measurement of non-linearity according to 2.1.1 is required the measured values shall be above the limits given in the diagram below. The resistors shall be tested according to IEC 60440 where the test voltage shall be the rated voltage.

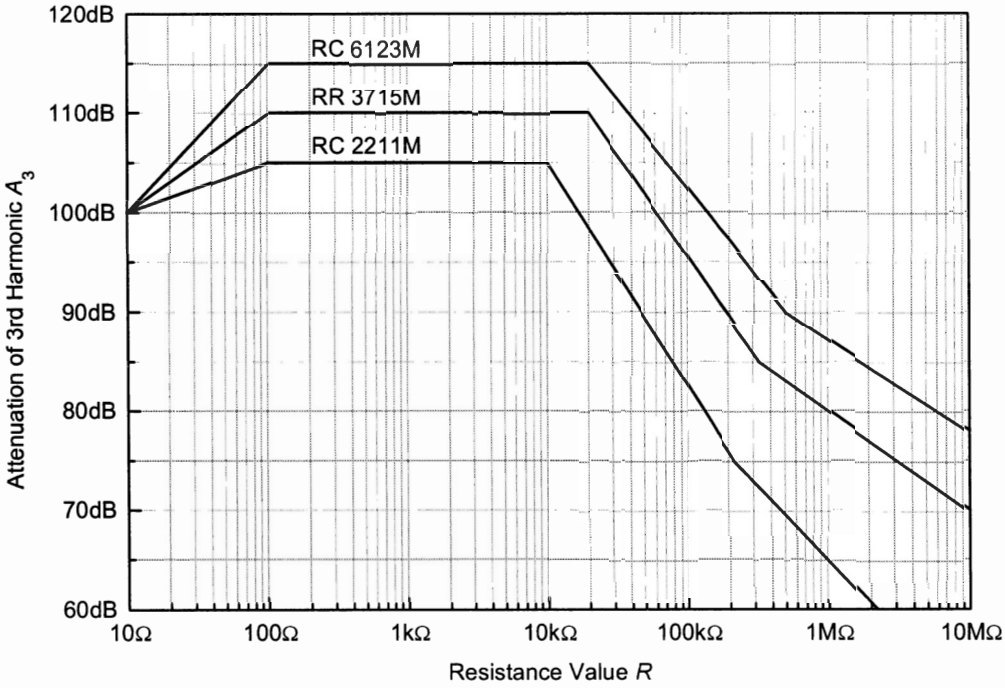


Figure 3 - Limits of non-linearity in resistors

1.8 Marking, packaging and ordering designation

1.8.1 Component

Surface mount resistors are generally not marked on the body. However, if some marking is applied to the body, the resistor shall be marked with the rated resistance, tolerance on rated resistance and temperature coefficient according to clause 2 of EN 60062 + Amendment 1 (colour code) or according to clause 3 of EN 60062 (alphanumeric code) and as many of the remaining items listed in 2.4.1 of EN 60115-1 (only version A).

For version E the component shall be marked according to clause 2 or 3 of EN 60062.

NOTE If marking according to clause 2 of EN 60062 is applied:
- 0 Ω-Resistors are marked with one black colour band,
- the temperature coefficent shall be marked with an interrupted band or with the colour of the body.

1.8.2 Package

The package of the component shall be marked with ordering information in accordance to 1.8.4 with additionally

- CECC sign of conformity,
- CECC manufacturer code,
- NATO manufacturer code (only version E, if required),
- date code of manufacture according to EN 60062, additional information is allowed.

1.8.3 Packaging / Taping

Components may be taped or put in a bulk case.
Taping shall be in accordance with EN 60286-3 type II. Bulk case packaging shall be in accordance with EN 60286-6.
For environmental protection packaging into bulk cases is preferred.