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Podrobna specifikacija: Fiksni folijski upori majhnih moļi za površinsko montaģo - Pravokotni - Razreda stabilnosti 1; 2

Detail specification: Fixed low power film SMD resistors - Rectangular - Stability classes 1; 2

Bauartspezifikation: SMD Schicht-Festwiderstände niedriger Belastbarkeit - Rechteckig - Stabilitätsklassen 1; 2

Spécification particuliere: Résistances couche fixes a faible dissipation CMS - Rectangulaires - Catégories de stabilité 1; 2

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Detail specification: Fixed low power film SMD resistors - Rectangular - Stability classes 1; 2

Spécification particulière:
Résistances couche fixes
à faible dissipation CMS -
Rectangulaires -
Catégories de stabilité 1; 2

Bauartspezifikation:
SMD Schicht-Festwiderstände
niedriger Belastbarkeit -
Rechteckig -
Stabilitätsklassen 1; 2

This European Standard was approved by CENELEC on 2007-05-01. 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

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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 140401-802 on 2007-05-01.

This European Standard supersedes EN 140401-802:2002 + A1:2004.

Preceding documents on the subject covered by this specification have been

– CECC 40 401-802:1998,

only on resistors without established reliability, now version A

– CECC 40 401-002:1993,
– CECC 40 401-004:1984; 1985; 1990; 1992,
– CECC 40 401-007:1989; 1990; 1992,

only on resistors with established reliability, now version E

– CECC 40 401-006:1989; 1991; 1993.

Compared to the superseded standard, the following changes have been implemented:

– modification of the title;
– introduction of a test on the resistance to electrostatic discharge in 1.6 and Annex A;
– introduction of description and test methods for lead-free soldering in 1.8, 1.10.3 and Annex A;
– introduction of the code letters for temperature coefficient as given in EN 60062;
– revision of the ordering information in 1.9.4;
– revised information on pulse load capability in 1.10.6;
– revised information on resistance value drift in 1.10.7;
– revised information on current noise in 1.10.9;
– adoption of the IECQ rules of procedure, QC 001002-3;
– revision of the sample quantities and the sequence of tests in Annex A;
– editorial revision.

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)	2008-05-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2010-05-01

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 140401-802	Detail specification: Fixed low power film SMD resistors - Rectangular - Stability classes 1; 2

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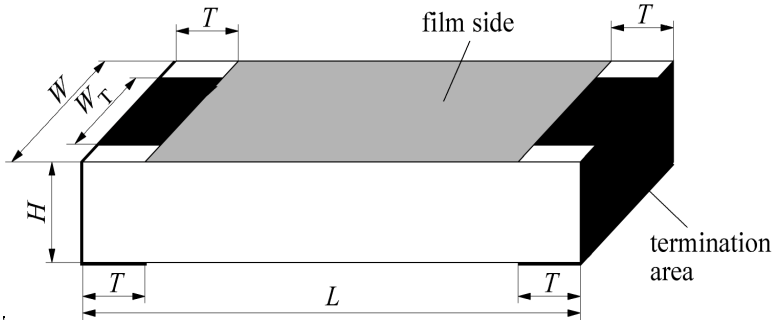
Specification available from the National Committees members of CENELEC	**EN 140401-802**
Electronic components of assessed quality in accordance with EN 60115-1:2001 + A1:2001 EN 140400:2003 EN 140401:2002	
 Other shapes are permitted within the given dimensions. **Figure 1 – Outline and dimensions** (see Table 1)	Fixed low power film chip resistors with rectangular base for surface mounting. Style: RR Ceramic substrate with protected, insulated, resistance film (thick film) and solder terminations Assessment level EZ [a] Version A: with 100- %-test Version E: with failure rate level and 100- %-test Stability classes 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		Width *W* mm		Height *H* mm		Termination *T* mm		Mass[a] mg
metric	**inch**	**min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Max.**
RR 1005M	RR 0402	0,95	1,10	0,45	0,60	0,25	0,40	0,10	0,35	0,8
RR 1608M	RR 0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	2,1
RR 2012M	RR 0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	6,0
RR 3216M	RR 1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	10,0
RR 5025M	RR 2010	4,80	5,20	2,30	2,70	0,35	0,75	0,35	0,85	30,0

[a] For information only.

Termination: $W_T \geq 0{,}75 \cdot W$
Thickness: 0,005 mm to 0,05 mm.

Information about manufacturers who have components qualified to this detail specification is available in the approvals section of the website http://www.iecq.org

Table 2a – Ratings for stability classes 2 and 1

Style	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
RR 1005M	63	50	75	75
RR 1608M	100	75	100	75
RR 2012M	125	150	200	75
RR 3216M	250	200	300	75
RR 5025M	500	300	300	75

Table 2b – Ratings for 0 Ω resistors

Style	Maximum current I_{max} A	Maximum resistance value[a] R_{max} mΩ	Insulation voltage d.c. or a.c. (peak) U_{ins} V	
			1 min	continuous
RR 1005M	0,63	20	75	75
RR 1608M	1,0	20	100	75
RR 2012M	1,5	20	200	75
RR 3216M	2,0	20	300	75
RR 5025M	3,0	20	300	75

[a] The resistance value shall be measured on the film side.

1.2 Derating curve

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

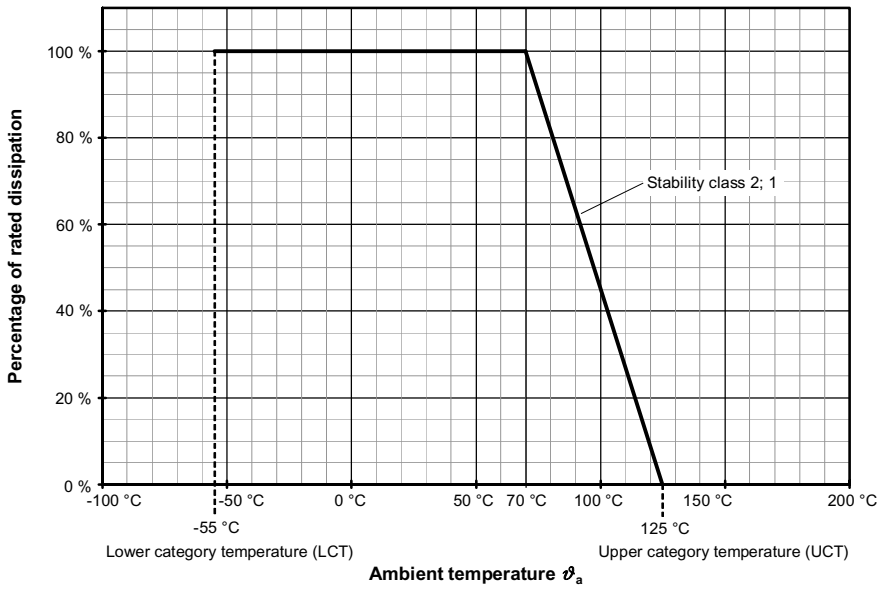


Figure 2 – Derating curve

1.3 Resistance range and tolerance on rated resistance

1.3.1 Version A

The following combinations of temperature coefficient and tolerance on rated resistance may be approved only. Products from this extent shall be used for the qualification approval according to 2.2.1 and for the quality conformance inspection according to 2.3. Resistance values of an 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. RR 1608M 1 % > 1 MΩ shall fulfil the requirements of stability class 1).

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		
RR 1005M	± 5	J	± 200	1 Ω to 6,8 MΩ	2
	± 2	G	± 100	10 Ω to 1 MΩ	2
	± 1	F	± 100; ± 50	10 Ω to 1 MΩ	1
RR 1608M	± 5	J	± 200	1 Ω to 6,8 MΩ	2
	± 2	G	± 100	10 Ω to 1 MΩ	2
	± 1	F	± 100; ± 50	10 Ω to 1 MΩ	1
RR 2012M	± 5	J	± 200	1 Ω to 10 MΩ	2
	± 2	G	± 100	10 Ω to 1 MΩ	2
	± 1	F	± 100; ± 50	10 Ω to 1 MΩ	1
RR 3216M	± 5	J	± 200	1 Ω to 10 MΩ	2
	± 2	G	± 100	10 Ω to 1 MΩ	2
	± 1	F	± 100; ± 50	10 Ω to 1 MΩ	1
RR 5025M	± 5	J	± 200	1 Ω to 10 MΩ	2
	± 2	G	± 100	10 Ω to 1 MΩ	2
	± 1	F	± 100 ; ± 50	10 Ω to 1 MΩ	1

0 Ω-resistors according to Table 2b for all styles.

[a] Code letters according to EN 60062.

1.3.2 Version E

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

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			
RR 1005M	± 5	J	± 200	1 Ω to 6,8 MΩ	2	E24
	± 1	F	± 100	100 Ω to 33,2 kΩ	1	E96
RR 1608M	± 5	J	± 200	1 Ω to 6,8 MΩ	2	E24
	± 1	F	± 100	10 Ω to 1 MΩ	1	E96
RR 2012M	± 5	J	± 200	1 Ω to 9,1 Ω	2	E24
				1,1 MΩ to 10 MΩ	2	
	± 1	F	± 100	10 Ω to 1 MΩ	1	E96
			± 50	10 Ω to 1 MΩ	1	
RR 3116M	± 5	J	± 200	1 Ω to 9,1 Ω	2	E24
				1,1 MΩ to 10 MΩ	2	
	± 1	F	± 100	10 Ω to 1 MΩ	1	E96
			± 50	10 Ω to 1 MΩ	1	
RR 5025M	± 5	J	± 200	1 Ω to 9,1 Ω	2	E24
				1,1 MΩ to 10 MΩ	2	
	± 1	F	± 100	10 Ω to 1 MΩ	1	E96
			± 50	10 Ω to 1 MΩ	1	

0 Ω-resistors according to Table 2b for all styles.

[a] Code letters according to EN 60062.

1.4 Variation of resistance with temperature and temperature rise

Table 4 – Temperature coefficients and limits of resistance change

Temperature coefficient			Limit of resistance change $\Delta R/R$ %	
ppm/K	Code[a]	Code[b]	LCT / Reference temp. °C -55 / 20	Reference temp. / UCT °C 20 / 125
± 200	U[c]	A	± 1,5	± 2,1
± 100	S	B	± 0,75	± 1,05
± 50	R	C	± 0,375	± 0,525

[a] Code letters according to EN 60062.

[b] Historical code letters according to EN 140400, for information only.

[c] Tightening of the definition of code letter U (EN 60062: U = 250 ppm/K).

Table 5 – Limit of temperature rise

Stability class	Limit of temperature rise at rated dissipation
2; 1	$T_r \leq 55$ K

1.5 Climatic categories

Table 6 – Climatic categories

Stability class	Climatic category LCT / UCT / Duration
2; 1	55 / 125 / 56

1.6 Limits for change of resistance at tests

Table 7a – Limits for change of resistance at tests

Stability class	Limit of resistance change ΔR			
	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, 5 cycles 4.22 Vibration 4.33 Substrate bending
		1 000 h	Extended, 8 000 h	
2	± (2 % R + 0,1 Ω)	± (2 % R + 0,1 Ω)	± (4 % R + 0,1 Ω) [a]	± (0,5 % R + 0,05 Ω)
1	± (1 % R + 0,05 Ω)	± (0,5 % R + 0,05 Ω) [a]	± (1 % R + 0,05 Ω) [a]	± (0,25 % R + 0,05 Ω)

[a] Tightening of the general definition of stability classes against the requirements of EN 140400, 2.1.4.

Table 7b – Limits for change of resistance at tests

Stability class	Limit of resistance change ΔR			
	EN 60115-1, 4.19 Rapid change of temperature, 1 000 cycles	EN 60115-1, 4.27 Single pulse high voltage overload test	EN 60115-1, 4.27 Periodic electric overload	EN 60115-1, 4.40 Electrostatic discharge [a]
2	± (1 % R + 0,05 Ω)	± (1 % R + 0,05 Ω)	± (1 % R + 0,05 Ω)	± (1 % R + 0,05 Ω)
1				

[a] Human Body Model (HBM) according to EN 61340-3-1, 3 positive + 3 negative discharges.

1.7 Non-linear properties

If for resistors in the range 10 Ω ≤ *R* ≤ 10 MΩ measurement of non-linearity is required according to 2.1.2, the measured values shall be above the limits given in the diagram below. The resistors shall be tested according to IEC/TR 60440 where the test voltage shall be the rated voltage.

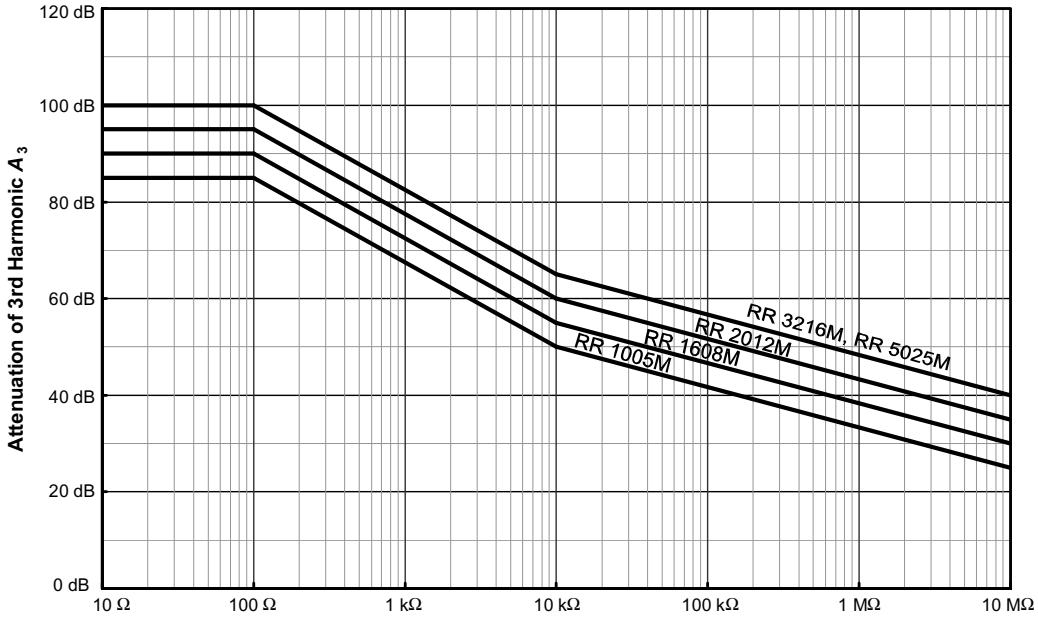


Figure 3 – Limits of non-linearity in resistors

1.8 Tests related to soldering

1.8.1 Severities for solderability testing

To prove the compatibility of resistors according to this specification with lead free solder, e.g. SnCu, SnCuNi, SnAg or SnAgCu, and traditional SnPb solder, solderability shall be tested with both types of solder.

a) Solderability with traditional SnPb solder shall be tested according to EN 60068-2-58, 8.2.1, solder bath method, with the following conditions:

Solder alloy:	Sn60Pb40 or Sn63Pb37
Solder bath temperature:	(235 ± 5) °C
Immersion time:	(2 ± 0,2) s

b) Solderability with lead-free solder shall be tested according to EN 60068-2-58, 8.1.1, solder bath method, with the following conditions (Group 3):

Solder alloy:	Sn96,5Ag3,0Cu0,5
Solder bath temperature:	(245 ± 5) °C
Immersion time:	(3 ± 0,3) s

or with the following conditions (Group 4):

Solder alloy:	Sn99,3Cu0,7
Solder bath temperature:	(250 ± 5) °C
Immersion time:	(3 ± 0,3) s

The categories Group 3 and Group 4 are defined in EN 60068-2-58 for the discrimination of the wide variety of lead-free solder alloys by means of the related typical soldering processes an their specific temperature ranges. Group 3, described as “medium-high temperature”, lists examples of solder alloys SnAg, SnAgCu and SnAgBi, all intended for both reflow and flow (wave) soldering. Group 4, described as “high temperature”, covers SnCu solder, primarily intended for flow (wave) soldering.

1.8.2 Severities for testing resistance to soldering heat

The severity of the resistance to soldering heat test is determined by the peak temperature and by the temperature slopes before and after the dwell time at the peak temperature. Therefore no separate tests are required for lead free soldering, e.g. SnCu, SnCuNi, SnAg or SnAgCu, and traditional SnPb soldering, if the more severe test condition from those given in EN 60068-2-58 is adopted.

For the solder bath method, EN 60068-2-58, 8.1.1 for lead-free soldering, and EN 60068-2-58, 8.2.1 for SnPb soldering require similar test conditions:

Solder alloy:	any alloy SnPb or SnCu or SnAgCu or SnAg
Solder bath temperature:	(260 ± 5) °C
Immersion time:	(10 ± 1) s
Test cycles:	one only

The solder bath method is the most severe test method, representing the soldering stress of all wave soldering and reflow soldering methods.

Table 8 – Test method for resistance to soldering heat test

Stability class	Test method for resistance to soldering heat test
2; 1	Solder bath method

1.9 Marking, packaging and ordering designation

1.9.1 Marking of the component

Surface mount resistors are generally not marked on the body.

However, if marking is applied to version A resistors, the component shall be marked with the rated resistance using a letter and digit code according to EN 60062, Clause 4, preferably the four-character code according to EN 60062, 4.2.3.

For version E resistors, the component shall be marked with the rated resistance using a letter and digit code according to EN 60062, Clause 4, preferably the four-character code according to EN 60062, 4.2.3. The marking of the styles RR 1005M and RR 1608M is not required.

Marking of the temperature coefficient and of any other item from the list of EN 60115-1, 2.4.1 shall be the choice of the manufacturer.

1.9.2 Taping

Components may be taped or put in a bulk case. For environmental protection packaging into bulk cases is preferred.

Taping shall be in accordance with EN 60286-3 type I. Bulk case packaging shall be in accordance with EN 60286-6.

1.9.3 Marking of the packaging

The packaging of the component shall be marked with ordering information in accordance to 1.9.4 and additionally with

– CECC or IECQ sign of conformity,
– CECC or IECQ manufacturer code,
– NATO manufacturer code (only version E, if required),
– date code of manufacture according to EN 60062.

Additional information is permissible.