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Fixed resistors for use in electronic equipment - Part 8: Sectional specification - Fixed surface mount resistors

Festwiderstände zur Verwendung in Geräten der Elektronik - Teil 8: Rahmenspezifikation: Oberflächenmontierbare (SMD) Festwiderstände

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English version

Fixed resistors for use in electronic equipment - Part 8: Sectional specification - Fixed surface mount resistors

(IEC 60115-8:2009, modified)

Résistances fixes utilisées dans les équipements électroniques - Partie 8 : Spécification intermédiaire - Résistances fixes pour montage en surface
(CEI 60115-8:2009, modifiée)

Festwiderstände zur Verwendung in Geräten der Elektronik - Teil 8: Rahmenspezifikation - Oberflächenmontierbare (SMD) Festwiderstände
(IEC 60115-8:2009, modifiziert)

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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 document EN 60115-8:2012 consists of the text of IEC 60115-8:2009, prepared by IEC/TC 40 "Capacitors and resistors for electronic equipment", together with the common modifications prepared by the Technical Committee CLC/TC 40XB "Resistors".

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2013-08-13
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2015-08-13

This document supersedes EN 140400:2003.

Preceding documents on the subject covered by this specification have been:

– EN 140400:1996-11

– CECC 40 400:1989-00,

EN 60115-8:2012 includes the following significant technical changes with respect to EN 140400:2003:

— introduction of a product classification based on application requirements;

— extension of the list of styles and dimensions;

— introduction of the code letters for temperature coefficient as given in EN 60062;

— introduction of description and test methods for lead-free soldering;

— introduction of a new system of test severities for the shear test;

— introduction of new test severities for the single-pulse high-voltage overload test;

— introduction of a test on the resistance to electrostatic discharge;

— amendment of the prescriptions for mounting of components;

— adoption of the IECQ rules of procedure, QC 001002-3:2005;

— separation of the test schedule into separate tables for qualification approval and for quality conformance inspection;

— consolidation of the prescription for 0 Ω resistors in a new annex;

— editorial revision.

In this document, the common modifications to IEC 60115-8:2009 are indicated by a vertical line in the left margin of the text.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

1 General

1.1 Scope

This part of EN 60115 is applicable to fixed surface mount resistors for use in electronic equipment.

These resistors are typically described according to types (different geometric shapes) and styles (different dimensions). They have metallized terminations and are primarily intended to be mounted directly on to a circuit board.

1.2 Object

The object of this standard is to prescribe preferred ratings and characteristics and to select from EN 60115-1, the appropriate quality assessment procedures, tests and measuring methods and to give general performance requirements for this type of resistor.

Test severities and requirements prescribed in detail specifications referring to this sectional specification shall be of equal or higher performance level, because lower performance levels are not permitted.

1.3 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 60062:2005 + corrigendum 2007, *Marking codes for resistors and capacitors* (IEC 60062:2004)

EN 60068-1:1994, *Environmental testing – Part 1: General and guidance (IEC 60068-1:1988 + A1:1992 + corrigendum Oct. 1988)*

EN 60068-2-20:2008, *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads* (IEC 60068-2-20:2008)

EN 60068-2-58:2004 + corrigendum 2004, *Environmental testing – Part 2-58: Tests – Test Td: Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)* (IEC 60068-2-58:2004)

EN 60115-1:2011, *Fixed resistors for use in electronic equipment – Part 1: Generic specification (IEC 60115-1:2008, modified)*

EN 61193-2:2007, *Quality assessment systems – Part 2: Selection and use of sampling plans for inspection of electronic components and packages (IEC 61193-2:2007)*

EN 61340-3-1, *Electrostatics – Part 3-1: Methods for simulation of electrostatic effects – Human body model (HBM) electrostatic discharge test waveforms (IEC 61340-3-1)*

EN 61760-1:2006, *Surface mounting technology – Part 1: Standard method for the specification of surface mounting components (SMDs) (IEC 61760-1:2006)*

1.4 Information to be specified in a detail specification

Detail specifications shall be derived from the relevant blank detail specification.

Detail specifications shall not specify requirements inferior to those of the generic specification, sectional specification or blank detail specification. When more severe requirements are included, they shall be listed in a subclause of the detail specification and indicated in the test schedules, for example by a note.

The following information shall be given in each detail specification and the values quoted shall preferably be selected from those given in the appropriate clause of this sectional specification.

1.4.1 Outline drawing

There shall be an illustration of the resistor as an aid to easy recognition and for comparison of the resistor with others.

1.4.2 Style and dimensions

See 2.1.1.

Dimensions and their associated tolerances, which affect interchangeability and mounting, shall be given in the detail specification.

1.4.3 Climatic category

See 2.1.2.

1.4.4 Limits of resistance change after testing

See 2.1.4.

1.4.5 Resistance range

See 2.2.1.

NOTE When products approved according to the detail specification have different ranges, the following statement should be added: “The range of values available in each style, together with the associated tolerance and temperature coefficient, is given in the register of approvals, available for example on the website www.iecq.org”.

1.4.6 Tolerance on rated resistance

See 2.2.2.

1.4.7 Temperature coefficient of resistance

See 2.1.3.

1.4.8 Rated dissipation

See 2.2.3.

The detail specification shall state the maximum allowable dissipation P_{70} at an ambient temperature of 70 °C (i.e. the rated temperature).

The detail specification shall state the maximum dissipation at temperatures other than 70 °C, for example the derating, either in a diagram or in the form of a statement. All break points shall be verified by test.

The mounting conditions are as described in 2.4.2.

1.4.9 Limiting element voltage

See 2.2.4.

1.4.10 Insulation voltage

This information is required only for insulated resistors.

See 2.2.6 and the definition for insulation voltage given in EN 60115-1:2011, 2.2.

For small size resistors where the dimensions of the test jig given in EN 60115-1:2011, 4.6 are not adequate, they shall be specified in the detail specification.

1.4.11 Insulation resistance

This information is required only for insulated resistors.

See 2.2.5.

For small size resistors where the dimensions of the test jig given in EN 60115-1:2011, 4.6 are not adequate, they shall be specified in the detail specification.

1.4.12 Marking

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 resistance using one of the coding systems provided by EN 60062:2005, and as many of the remaining items listed in EN 60115-1:2011, 2.4 as possible. All the required information shall be marked on the packaging.

1.4.13 Ordering information

The detail specification shall specify the following minimum information as required for the ordering resistors:

The number of the detail specification and style reference.

Resistance, tolerance on resistance and, if required, temperature coefficient of resistance according to EN 60062.

Failure rate level for products classified to Level R, according to EN 60115-1:2011, Annex ZR.

NOTE A nominal failure rate level E0 may be used for products classified to Level P, for which no failure rate level is assessed.

1.4.14 Mounting

The detail specification shall give guidance on methods of mounting for normal use, preferably based on the specification of assembly process conditions of EN 61760-1:2006, Clause 5. Mounting for test and measurement purposes (when required) shall be in accordance with 2.4.2 of this specification and EN 60115-1:2011, 4.31.

1.4.15 Storage

See EN 60115-1:2011, 2.7.

The detail specification shall specify the permissible duration of storage and, if required, periodicity, method and requirements of a re-examination to be applied.

1.4.16 Additional information

The detail specification may include additional information (which is not normally required to be verified by the inspection procedure), such as circuit diagrams, curves, drawings and notes needed for the clarification of the detail specification.

1.5 Product classification

The introduction of a product classification permits the user to select performance requirements according to the conditions of the intended end-use application.

Three general end product levels have been established to reflect characteristic differences in functional, performance and reliability requirements and to permit the use of suitable inspection and test schedules. It should be recognized that there may be overlaps of applications between the levels.

Level G – General electronic equipment, typically operated under benign or moderate environmental conditions, where the major requirement is function. Examples for level G include consumer products and telecommunication user terminals.

Level P – High-performance electronic equipment, where one or more of the following criteria applies:

– uninterrupted performance is desired or mandatory;
– operation in harsh environmental conditions;
– extended lifetime.

Examples for level P include professional equipment, telecommunication transmission systems, industrial control and measurement systems and most automotive applications operated outside the passenger compartment.

NOTE 1 This product classification to Level P adopts the former Version A.

Level R — High-performance and high-reliability electronic equipment, where the requirement for established reliability and for an approved failure rate level applies in addition to the criteria of Level P.

Examples for Level R include military & defence equipment, avionics and aerospace applications.

NOTE 2 This product classification to Level R adopts the former Version E.

Each level shall be used in individual detail specifications, except for Level P and Level R, which may be used in combined detail specifications.

2 Preferred characteristics, ratings and test severities

2.1 Preferred characteristics

The values given in detail specifications shall preferably be selected from the following.

2.1.1 Style and dimensions

The shape and dimensions of rectangular resistors, commonly referred to as chip resistors, is shown in Figure 1, with preferred styles and their respective dimensions given in Table 1a. Style designators of rectangular resistors are prefixed RR.

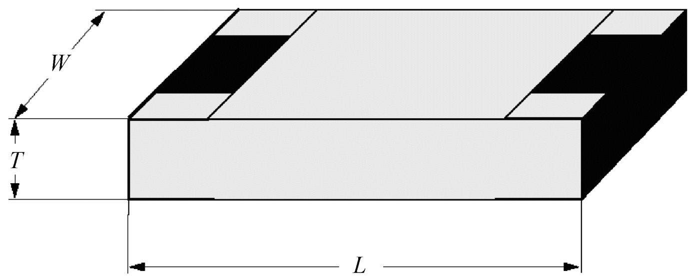

Figure 1 – Shape and dimensions of rectangular (RR) resistors

Table 1a – Preferred styles for rectangular (RR) resistors

Style		Dimensions		
Metric	Imperial [a]	Length *L* mm	Width *W* mm	Height *T* mm
RR0603M	RR0201	0,6 ± 0,05	0,3 ± 0,05	0,23 ± 0,05
RR1005M	RR0402	1,0 ± 0,05	0,5 ± 0,05	0,35 ± 0,05
RR1608M	RR0603	1,6 ± 0,1	0,8 ± 0,1	0,45 ± 0,1
RR2012M	RR0805	2,0 ± 0,1	1,25 ± 0,15	$0{,}5\ ^{+0{,}15}_{-0{,}10}$
RR3216M	RR1206	3,2 ± 0,2	1,6 ± 0,15	0,55 ± 0,1
RR3225M	RR1210	3,2 ± 0,2	2,5 ± 0,2	0,55 ± 0,1
RR3245M	RR1218	3,2 ± 0,2	4,6 ± 0,2	0,55 ± 0,1
RR4532M	RR1812	4,6 ± 0,2	3,2 ± 0,2	0,55 ± 0,1
RR5025M	RR2010	5,0 ± 0,2	2,5 ± 0,2	0,55 ± 0,2
RR6332M	RR2512	6,3 ± 0,2	3,2 ± 0,2	0,55 ± 0,2

[a] Historical style codes, for information only.

The shape and dimensions of cylindrical resistors, commonly referred to as MELF resistors, is shown in Figure 2, with preferred styles and their respective dimensions given in Table 1b. Style designators of cylindrical resistors are prefixed RC.

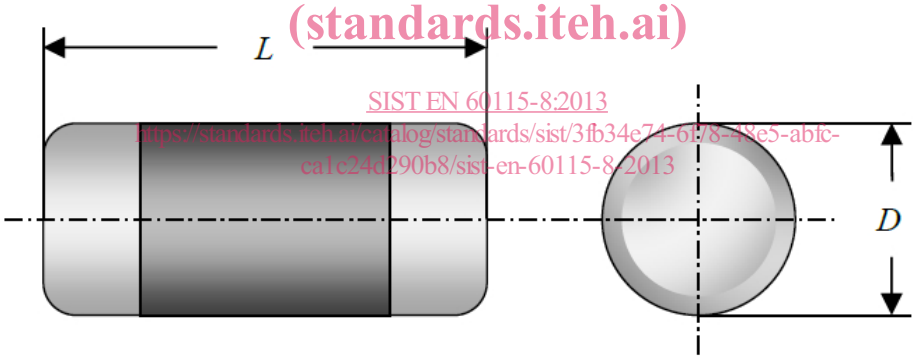

Figure 2 – Shape and dimensions of cylindrical (RC) resistors

Table 1b – Preferred styles for cylindrical (RC) resistors

Style Metric	Dimensions Length *L* mm	 Diameter *D* mm
RC1610M	$1,6\ ^{+0,10}_{-0,05}$	$1,0\ ^{+0,15}_{-0,05}$
RC2012M	$2,0 \pm 0,1$	$1,25\ ^{+0,2}_{-0,1}$
RC2211M	$2,2\ ^{0}_{-0,2}$	$1,1\ ^{0}_{-0,10}$
RC3715M [a]	$3,7\ ^{0}_{-0,3}$	$1,5\ ^{0}_{-0,2}$
RC6123M [b]	$6,1\ ^{0}_{-0,6}$	$2,3\ ^{0}_{-0,3}$

[a] Comparable to the IEC style RC3514M (L = (3,5 ± 0,2) mm; D = (1,4 ± 0,2) mm).

[b] Comparable to the IEC style RC5922M (L = (5,9 ± 0,2) mm; D = (2,2 ± 0,2) mm).

When the component style is other than described above, for example for surface mount wirewound resistors (Style designators are prefixed RW), the detail specification shall state such dimensional information as will adequately describe the resistor.

2.1.2 Preferred climatic categories

The surface mount resistors covered by this specification are classified into climatic categories according to the general rules given in EN 60068-1:1994, Annex A.

The lower and upper category temperature and the duration of the damp heat, steady state test shall be chosen from the following:

Lower category temperature (LCT) -55 °C; -40 °C; -25 °C and -10 °C.

Upper category temperature (UCT) 85 °C; 100 °C; 125 °C; 155 °C; 175 °C and 200 °C.

Duration of damp heat, steady state test: 10, 21 and 56 days.

The severities for the cold and dry heat tests are the lower and upper category temperatures respectively.

NOTE The climatic performance of assembled resistors is greatly influenced by the circuit board, the assembly method and a final coating.

2.1.3 Variation of resistance with temperature

The preferred limits of change in resistance for the variation of resistance with temperature test are given in Table 2.