

Förderverein für Elektrotechnische Normung (FEN) e. V.
Cenelec Electronic Components Committee

CECC

Système Harmonisé d'Assurance de la Qualité
des Composants Electroniques

SPECIFICATION INTERMEDIAIRE:

RESISTANCES FIXES A FAIBLE
DISSIPATION POUR MONTAGE
EN SURFACE (CHIPSES)

Harmonized System of Quality Assessment for
Electronic Components

SECTIONAL SPECIFICATION:

FIXED LOW POWER SURFACE
MOUNTING (CHIP) RESISTORS

Harmonisiertes Gütebestätigungssystem für
Bauelemente der Elektronik

RAHMENSPEZIFIKATIONEN:

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SECTIONAL SPECIFICATION SURFACE MOUNTING (CHIP) RESISTORS

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Foreword

The CENELEC Electronic Components Committee (CECC) is composed of those member countries of the European Committee for Electrotechnical Standardization (CENELEC) who wish to take part in a harmonized System for electronic components of assessed quality.

The object of the System is to facilitate international trade by the harmonization of the specifications and quality assessment procedures for electronic components, and by the grant of an internationally recognized Mark, or Certificate, of Conformity. The components produced under the System are thereby accepted by all member countries without further testing.

This specification has been formally approved by the CECC, and has been prepared for those countries taking part in the System who wish to issue national harmonized specifications for FIXED LOW POWER SURFACE MOUNTING (CHIP) RESISTORS. It should be read in conjunction with the current regulations for the CECC System.

At the date of printing of this specification, the member countries of the CECC are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom, and copies of it can be obtained from the addresses shown in the blue fly sheet.

Preface

This specification was prepared by CECC WG 4A: Fixed resistors.

It is based, wherever possible, on the Publications of the International Electrotechnical Commission.

The text of this specification was circulated to the CECC for voting in the document indicated below and was ratified by the President of the CECC for printing as a CECC Specification.

Document	Date of voting	Report on the Voting
CECC (Secretariat) 1930	May 1986	CECC (Secretariat)2084

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Section 1: Scope

This sectional specification prescribes the preferred values for characteristics and ratings and also the inspection requirements for fixed surface mounting resistors of assessed quality. These resistors generally have metallised connecting pads and are intended to be mounted directly on to substrates, for example hybrid integrated circuits or printed boards. It selects from the generic specification, CECC 40 000, the appropriate methods of test to be used in detail specifications derived from this specification.

Associated with this specification are one or more blank detail specifications each referenced by a CECC number. A blank detail specification which has been completed as specified in 2.5 of this specification forms a detail specification. Such detail specifications may be used for the grant of Qualification Approval to a resistor and for the performance of Quality Conformance Inspection in accordance with the CECC System.

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Section 2: Preferred characteristics, ratings and severities for environmental and overload tests

2.1 Characteristics

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

2.1.1 Climatic severities. The resistors covered by this document are classified into climatic categories according to the general rules given in IEC 68-1.

The standard severities for the cold, dry heat and damp heat, steady state, tests are within the following ranges:

Cold (Test A)	+5 °C to -55 °C
Dry heat (Test B)	+85 °C to +155 °C
Damp heat, steady state (Test C)	4 to 56 days

Values selected within these ranges shall be chosen from those listed in the relevant tests of IEC 68-2.

The severities for the cold and dry heat tests are the lower and upper category temperatures. For some resistors, these temperatures will occur between two of the preferred temperatures given in IEC 68-2. In this case, the nearest preferred temperature within the category temperature range of the resistors shall be chosen for this severity.

NOTE. The surface mounting resistor itself shows the above humidity resistance in the unmounted state. The climatic performance of the resistor is greatly influenced by the mounting substrate, the mounting method and the final coating.

2.1.2 Temperature characteristics and temperature coefficients of resistance. The preferred limits of change in resistance for the temperature characteristic of resistance test are given in the table on page 6. Each line in the table on page 6 gives the temperature coefficient and corresponding temperature characteristic for 20 °C to 70 °C and limits of change in resistance for the measurement of temperature characteristic of resistance (4.7 of CECC 40 000) on the basis of the category temperature ranges for 2.1.1 of this document.

Temp. coeff. $10^{-6}/K$	Temp. char. 20/70 °C %	Percentage change in resistance						
		-55/20	-40/20	-25/20	20/85*	20/100	20/125	20/155
± 500	± 2,5	± 3,75	± 3	± 2,25	± 3,25	± 4	± 5,25	± 6,75
± 250	± 1,25	± 1,88	± 1,5	± 1,13	± 1,62	± 2	± 2,62	± 3,38
± 100	± 0,5	± 0,75	± 0,6	± 0,45	± 0,65	± 0,8	± 1,05	± 1,35
± 50	± 0,25	± 0,375	± 0,3	± 0,23	± 0,325	± 0,4	± 0,525	± 0,675
± 25	± 0,125	± 0,188	± 0,15	± 0,113	± 0,162	± 0,2	± 0,262	± 0,338
± 15	± 0,075	± 0,113	± 0,09	± 0,068	± 0,098	± 0,12	± 0,158	± 0,203
± 10	± 0,05	± 0,075	± 0,06	± 0,045	± 0,065	± 0,08	± 0,105	± 0,135
* Resistors having an upper category temperature of +85 °C need not be measured between 20 °C and 70 °C								

If measurements are required at additional temperatures, these shall be specified in the detail specification.

2.1.3 Limits for change in resistance. The preferred combinations of standard limits for change in resistance in each of the tests listed in the heading of the following table are as indicated in the lines of the table.

NOTE. The clause numbers in the heading of the table refer to CECC 40 000.

4.20 Climatic sequence	4.11 Overload
4.21 Damp heat, steady state	D4.5 Adhesion
4.24 Endurance	D4.6 Bond strength of end face plating
	D4.3.2 Resistance to soldering heat
	4.16 Rapid change of temperature
$\pm (5 \% + 0,1\Omega)$	$\pm (1,0 \% + 0,05\Omega)$
$\pm (3 \% + 0,1\Omega)$	$\pm (0,5 \% + 0,05\Omega)$
$\pm (2 \% + 0,1\Omega)$	$\pm (0,5 \% + 0,05\Omega)$
$\pm (1 \% + 0,05\Omega)$	$\pm (0,25 \% + 0,05\Omega)$
$\pm (0,5 \% + 0,05\Omega)$	$\pm (0,10 \% + 0,01\Omega)$
$\pm (0,25 \% + 0,05\Omega)$	$\pm (0,05 \% + 0,01\Omega)$
$\pm (0,10 \% + 0,01\Omega)$	$\pm (0,02 \% + 0,01\Omega)$
$\pm (0,05 \% + 0,01\Omega)$	$\pm (0,01 \% + 0,01\Omega)$

2.1.4 Limits for insulation resistance. The standard limit for insulation resistance is 1 G Ω minimum.

2.2 Ratings

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

2.2.1 Rated resistance. See 2.2.4 of CECC 40 000.

2.2.2 Tolerances on rated resistance. The standard tolerances on rated resistance are:

± 10 ; ± 5 ; ± 2 ; ± 1 ; $\pm 0,5$; $\pm 0,25$; $\pm 0,1$; $\pm 0,05$; $\pm 0,025$; $\pm 0,01$ %
or 10 m Ω .

2.2.3 Rated dissipation (in the mounted state). The standard values of rated dissipation at 70 °C are:

0,03 W; 0,063 W; 0,125 W; 0,25 W; 0,5 W; 1,0 W; and 2,0 W.

NOTE. The rated dissipation refers to the resistors as mounted on the epoxy-glass substrate described in D4.4 (figure 4) of CECC 40 000 with the dimensional details given in the detail specification. For resistors not intended for mounting on such a substrate, the detail specification shall fully describe the reference conditions.

2.2.4 Limiting element voltage. The standard values of limiting element voltage are:

50 V; 75 V; 100 V; 150 V; 200 V; and 250 V d.c. or a.c. r.m.s.

2.3 Severities for environmental and overload tests

Test severities given in detail specifications shall preferably be chosen from the following:

2.3.1 Drying. Procedure 1 of 4.2 of CECC 40 000 shall be used.

2.3.2 Overload (in the mounted condition). Sub-clause 4.11 of CECC 40 000 with the following details:

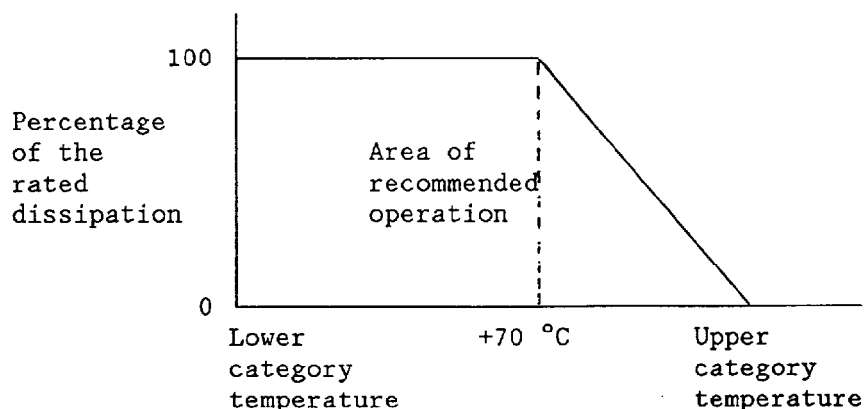
Applied voltage: 2,5 times the rated voltage or twice the limiting element voltage, whichever is the less.

Duration : 2 s.

NOTE. Unless otherwise specified in the detail specification, the test shall be carried out on resistors mounted on the epoxy-glass substrate. The resistors shall be spaced apart by a distance equal to the maximum dimension of the resistor.

2.4 Derating curve (in the mounted condition)

The detail specification shall state the maximum dissipation at temperatures other than 70 °C. All break points on the curve shall be verified by test.



A larger area of operation may be given in the detail specification provided it includes all the areas given above.

2.5 Information to be specified in the detail specification

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

NOTE. The information given in 2.5.1 to 2.5.5 may, for convenience be presented in tabular form.

2.5.1 Style and dimensions. The following styles are preferred:

(a) Style RC (cylindrical resistors)

Code	Length L (mm)	Outside diameter D (mm)
RC 6123	$5,9 \pm 0,2$	2,3 max.
RC 3175	$3,5 \pm 0,2$	1,5 max.

(b) Style RR (rectangular resistors)

Code	Length L (mm)	Width W (mm)	Thickness T (mm)
RR 0505	$1,25 \pm 0,2$	$1,25 \pm 0,2$	$0,6 \pm 0,1$
RR 0805	$2,0 \pm 0,3$	$1,25 \pm 0,2$	$0,6 \pm 0,1$
RR 1005	$2,5 \pm 0,3$	$1,25 \pm 0,2$	$0,6 \pm 0,1$
RR 1010	$2,5 \pm 0,3$	$2,5 \pm 0,3$	$0,6 \pm 0,1$
RR 1206	$3,2 \pm 0,4$	$1,6 \pm 0,2$	$0,6 \pm 0,1$
RR 1605	$4,0 \pm 0,4$	$1,25 \pm 0,2$	$0,6 \pm 0,1$

(c) Style RS (square resistors)

Code	Length L (mm)	Width W (mm)	Thickness T (mm)
RS 0805	$2,0 \pm 0,3$	$1,25 \pm 0,2$	$1,25 \pm 0,2$
RS 1206	$3,2 \pm 0,4$	$1,6 \pm 0,2$	$1,6 \pm 0,2$

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2.5.2 *Rated dissipation*. See 2.2.3.

2.5.3 *Limiting element voltage*. See 2.2.4.

2.5.4 *Resistance range*. See 2.2.1.

NOTE. Where products approved to the detail specification may have different ranges, the following statement should be made:

'The range of products available in each style is given in the Qualified Products List'.

2.5.5 *Tolerances on rated resistance*. See 2.2.2 and the Note in 2.5.4.

2.5.6 *Climatic category*. See 2.1.1.

2.5.7 *Limits of resistance change after 1000 h endurance test*. See 2.1.3.

2.5.8 *Temperature characteristic of resistance*. See 2.1.2.

The corresponding temperature coefficient of resistance may be quoted for information.

2.5.9 *Derating curve*. This information shall be given either as shown in 2.4 or in the form of a statement.

2.5.10 *Marking*. Surface mounting resistors are generally not marked on the body. If some marking can be applied to the body, the resistor shall be marked with the rated resistance and as many of the remaining items listed in 2.4.1 of CECC 40 000. All the items shall be marked on the package.

2.5.11 *Ordering information*. The detail specification shall specify that the following information is required when ordering resistors.

- (a) Rated resistance.
- (b) Tolerance on rated resistance.
- (c) CECC number of detail specification and style reference.
- (d) Temperature coefficient of resistance.

2.5.12 *Additional information (not for inspection purposes)*. The detail specification may include 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.

Section 3: Inspection

3.1 Formation of inspection lots

Any inspection lot shall consist of resistors of the same style. It should be representative of those extremes of the resistance range produced during the period. Styles having the same nominal dimensions but different temperature characteristics of resistance produced during the period may be aggregated, except for the purposes of subgroups which contain a test for temperature characteristic of resistance. The extremes, or any critical value of the ranges of resistance and temperature characteristics of resistance for which Qualification Approval has been granted shall be inspected during a period which is approved by the National Supervising Inspectorate (ONS) (See Note).

The specimens for Groups C and D shall be collected over the last 13 weeks of the inspection period.

NOTE. 'Low' values shall be within $\begin{smallmatrix} +200 \\ -0 \end{smallmatrix}$ % of the current lowest approved resistance value (or lowest value manufactured within the approval range).

'High' values shall be within $\begin{smallmatrix} +0 \\ -30 \end{smallmatrix}$ % of the current highest approved resistance value (or highest value produced within the approval range).

'Critical' values shall be within $\begin{smallmatrix} +0 \\ -20 \end{smallmatrix}$ % of the calculated value.

3.2 Test methods

Test methods shall be selected from those given in CECC 40 000 or, failing that, shall be described in the detail specification.

3.3 Qualification approval

When it is desired to obtain Qualification Approval by adopting the fixed sample size procedure (see 3.3.3 of CECC 40 000), use shall be made of the test schedule in annex A.

The conditions of test and the performance requirements shall be identical to those prescribed for quality conformance inspection in the detail specification.

All specimens which are to be submitted to Group 3 inspection onwards shall have previously passed Groups 1 and 2 inspection.

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Annex A

Fixed sample size Qualification Approval test schedule for fixed low power surface mounting (chip) resistors

See Notes 1 and 2.

Clause number and test	Conditions of test	Performance requirements	Defectives permitted								
			n	c	t						
<u>Group 1</u> Non-destructive			125	1	2						
4.3.1 Visual examination		As in 4.3.1									
4.3.2 Marking (if applicable)		As in 4.3.2									
<u>Group 2</u> Non-destructive			125	1							
4.3.3 Dimensions (gauging)		As specified in the detail specification									
4.4 Resistance		As in 4.4.2									
<u>Group 3</u> Non-destructive			50	1	1						
D4.2 Voltage proof	(Insulated resistors only)	As in D4.2.3									
D4.1 Insulation resistance	(Insulated resistors only)	$R: \geq 1 \Omega$									
<u>Group 4</u> Destructive			20	1							
D4.3.1 Soldering-solderability (See Note 3)	Visual examination	As in D4.3.1.5									
4.11 Overload	The resistors shall be mounted as in D4.4 The applied voltage shall be 2,5 times the rated voltage or twice the limiting element voltage, whichever is the less. Duration: 2 s Visual examination Resistance	As in 4.11.3 $\Delta R: \leq \pm (-- \% R + -- \Omega)$									
4.7 Temperature characteristic of resistance		<table><tr><td>LCT / 20</td><td>20 / UCT</td></tr><tr><td colspan="2">$\Delta R: \leq$</td></tr><tr><td>-- %R</td><td>-- %R</td></tr></table>	LCT / 20	20 / UCT	$\Delta R: \leq$		-- %R	-- %R			
LCT / 20	20 / UCT										
$\Delta R: \leq$											
-- %R	-- %R										

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See Notes 1 and 2.

Clause number and test	Conditions of test	Performance requirements	Defectives permitted		
			n	c	t
<u>Group 5</u>	<u>Destructive</u>		20	1	3
<u>Half of the sample</u>					
The resistors shall be mounted as in D4.4 on the printed board					
D4.6 Bond strength of end face plating (See Note 4)	Electrical continuity Visual examination Resistance	No open circuits when the board is in the bent position As in D4.6.6 $\Delta R: \leq \pm (--- \%R + ---\Omega)$			
<u>Other half of the sample</u>					
The resistors shall be mounted as in D4.4 on the printed board					
D4.5 Adhesion	Visual examination (Attributable only to the component)	As in D4.5.3			
4.16 Rapid change of temperature	T _A : Lower category temperature T _B : Upper category temperature Visual examination Resistance	As in 4.16.4 $\Delta R: \leq \pm (--- \%R + ---\Omega)$			
<u>All of the sample</u>					
4.20 Climate sequence					
- Dry heat					
- Damp heat, cyclic, first cycle					
- Cold					
- Lower air pressure	(Not applicable)				
- Damp heat, cyclic, remaining cycles					
- D.C. load					
- Final measurements	Visual examination Resistance	There shall be no visible damage to the resistor $\Delta R: \leq \pm (--- \%R + ---\Omega)$			

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