



BSI Standards Publication

**Study for the derating curve of surface  
mount fixed resistors - Derating curves  
based on terminal part temperature**

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## National foreword

This Published Document is the UK implementation of IEC/TR 63091:2017.

The UK participation in its preparation was entrusted to Technical Committee EPL/40X, Capacitors and resistors for electronic equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2017

ISBN 978 0 580 96276 9

ICS 31.040.10

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This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 October 2017.

### Amendments/corrigenda issued since publication

Date	Text affected
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# TECHNICAL REPORT

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**Study for the derating curve of surface mount fixed resistors – Derating curves based on terminal part temperature**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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ICS 31.040.10

ISBN 978-2-8322-4368-8

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## STUDY FOR THE DERATING CURVE OF SURFACE MOUNT FIXED RESISTORS –

### Derating curves based on terminal part temperature

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IEC TR 63091, which is a technical report, has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
40/2502/DTR	40/2532/RVDTR

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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## INTRODUCTION

Work began in 2012 to adopt the new derating curve suitable for the surface mount fixed resistors that use the terminal part temperature as the horizontal axis.

The derating curves for surface mount fixed resistors are defined in JIS C 5201-8:2014.

However, the principle of the derating curve was established when the resistors were cylindrically shaped, wired in the air and the heat was dissipated directly from the resistor body into the ambient environment. Therefore, it is not suitable for the surface mount fixed resistors that use the printed circuit boards as the main heat path.

It is necessary to fulfill the demands from the electric and electronic device manufacturers for raising the power ratings safely. Additionally, it is required to establish a new derating curve that is suitable for the surface mount fixed resistors so that they can be used safely in a high temperature environment, typically in automotive electronic devices.

Making a change of the temperature rule for evaluation of the fixed resistors from the ambient temperature to the temperature of the connection point (terminal part temperature of the resistor) will affect many defined contents of multiple standards in the IEC 60115 series. Additionally, it will mean changing the users' evaluation rules, so the impact will be enormous. Therefore, it has been decided to issue the Technical Report first to attract attention of the relevant market players and then, we will start working on changing the defined contents of the IEC 60115 series.

# STUDY FOR THE DERATING CURVE OF SURFACE MOUNT FIXED RESISTORS –

## Derating curves based on terminal part temperature

### 1 Scope

This Technical Report is applicable to SMD resistors with sizes equal or smaller than the RR6332M, including the typical rectangular and cylindrical SMD resistors mentioned in IEC 60115-8.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60115-1:2008, *Fixed resistors for use in electronic equipment – Part 1: Generic specification*

IEC 60115-8:2009, *Fixed resistors for use in electronic equipment – Part 8: Sectional specification: Fixed chip resistors*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 3.1

##### **terminal part temperature**

$T_t$

temperature of terminal part of the resistor

#### 3.2

##### **rated terminal part temperature**

terminal part temperature of the resistor at the time of the rated load life test

#### 3.3

##### **hotspot of the resistor**

hottest part of the resistor that is caused by the Joule heat generated from the resistive element when the current is applied and is generally located inside resistor's body

#### 3.4

##### **hotspot temperature**

$T_{hs}$

temperature of the internal hotspot of the resistor