



DPC: 23 / 30451646 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 21 June 2023

Origin: International

Latest date for receipt of comments: 9 August 2023

Project No. 2022/00262

Responsible committee: EPL/47 Semiconductors

Interested committees:

Title: BS EN IEC 60747-2 Ed.4 Semiconductor devices

Part 2: Discrete devices - Rectifier diodes

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

**WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD.
THIS DRAFT IS NOT CURRENT BEYOND 9 August 2023**

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <http://standardsdevelopment.bsigroup.com>

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



47E/810/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 60747-2 ED4

DATE OF CIRCULATION:

2023-06-16

CLOSING DATE FOR COMMENTS:

2023-09-08

SUPERSEDES DOCUMENTS:

47E/775A/RR

IEC SC 47E : DISCRETE SEMICONDUCTOR DEVICES

SECRETARIAT:

Korea, Republic of

SECRETARY:

Mr Hojun Ryu

OF INTEREST TO THE FOLLOWING COMMITTEES:

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☐ SAFETY

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

Semiconductor devices - Part 2: Discrete devices - Rectifier diodes

NOTE FROM TC/SC OFFICERS:

This new edition work was decided at SC47E/WG3 ON-line meeting, and reported at SC47E plenary meeting 2021.

The voting result of this document will be discuss at the Frankfurt meeting 2023.

Copyright © 2023 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

Documents
AVA Document Sharing Hub

CONTENTS

1			
2			
3	FOREWORD		5
4	1 Scope		7
5	2 Normative references		7
6	3 Terms and definitions		7
7	4 Letter symbols		15
8	4.1 General		15
9	4.2 List of letter symbols		15
10	5 Essential ratings and characteristics (properties)		16
11	5.1 General		16
12	5.2 Ratings (limiting values)		16
13	5.2.1 Storage temperature (T_{stg})		16
14	5.2.2 Operating ambient, case, heatsink or junction temperature (T_a , T_c , T_s or T_{vj})		16
15	5.2.3 Non-repetitive peak reverse voltage (V_{RSM})		17
16	5.2.4 Repetitive peak reverse voltage (V_{RRM}) (where appropriate)		17
17	5.2.5 Continuous (direct) reverse voltage (V_R) (where appropriate)		17
18	5.2.6 Forward currents		17
19	5.2.7 Repetitive peak forward current (I_{FRM}) (where appropriate)		17
20	5.2.8 Non-repetitive surge forward current (I_{FSM})		17
21	5.2.9 I^2t value (of surge forward current) (I^2t)		18
22	5.2.10 Peak case non-rupture current (I_{RSMC}) (where appropriate)		18
23	5.2.11 Reverse power dissipation (for avalanche rectifier diodes)		18
24	5.2.12 Special requirements for mounting		18
25	5.3 Characteristics (properties)		18
26	5.3.1 General		18
27	5.3.2 Forward voltages		18
28	5.3.3 Breakdown voltage ($V_{(BR)}$) (of an avalanche rectifier diode)		19
29	5.3.4 Continuous (direct) reverse current ($I_{R(D)}$)		19
30	5.3.5 Repetitive peak reverse current (I_{RRM}) (where appropriate)		19
31	5.3.6 Reverse recovery characteristics (where appropriate)		19
32	5.3.7 Forward recovery characteristics (where appropriate)		20
33	5.3.8 Thermal resistance (R_{th})		20
34	5.3.9 Transient thermal impedance ($Z_{th}(t)$) (where appropriate)		20
35	6 Measuring and test methods		20
36	6.1 General		20
37	6.2 Measuring methods for electrical characteristics		21
38	6.2.1 Forward voltage		21
39	6.2.2 Breakdown voltage ($V_{(BR)}$) of avalanche rectifier diodes		23
40	6.2.3 Reverse current (I_R)		24
41	6.2.4 Repetitive peak reverse current (I_{RRM})		25

42	6.2.5	Recovered charge (Q_r), reverse recovery time (t_{rr}), reverse recovery energy (E_{rr}) and softness factor (S_{rr})	26
44	6.2.6	Total capacitive charge (Q_C)	30
45	6.2.7	Forward recovery time (t_{fr}) and peak forward recovery voltage (V_{frm})	32
46	6.3	Measuring methods for thermal properties	34
47	6.3.1	General	34
48	6.3.2	Thermal resistance (R_{th}) and transient thermal impedance ($Z_{th}(t)$)	34
49	6.4	Verification test methods for ratings (limiting values)	36
50	6.4.1	Non-repetitive peak reverse voltage (V_{RSM})	36
51	6.4.2	Non-repetitive surge forward current (I_{FSM})	37
52	6.4.3	Repetitive peak reverse power (P_{RRM}) or non-repetitive peak reverse power (P_{RSM}) of avalanche rectifier diodes	39
54	6.4.4	Peak case non-rupture current (I_{RSCM})	42
55	7	Requirements for type tests, routine tests, endurance tests and marking	44
56	7.1	Type tests	44
57	7.2	Routine tests	44
58	7.3	Measuring and test methods	45
59	7.4	Marking of rectifier diodes	45
60	7.5	Endurance test	45
61	7.5.1	General	45
62	7.5.2	List of endurance tests	45
63	7.5.3	Conditions for endurance tests	45
64	7.5.4	Acceptance-defining characteristics and acceptance criteria for endurance tests	45
65			
66	7.5.5	Acceptance-defining characteristics and acceptance criteria for reliability tests	46
67			
68		Bibliography	47
69			
70		Figure 1 – Reverse voltage ratings	8
71		Figure 2 – Forward current ratings	10
72		Figure 3 – Voltage waveform during forward recovery (Method I)	12
73		Figure 4 – Voltage waveform during forward recovery (Method II)	12
74		Figure 5 – Current waveform during reverse recovery	13
75		Figure 6 – Voltage and current waveforms and recovered charge during turn off	14
76		Figure 7 – Recovered charge Q_r , peak reverse recovery current I_{rrm} , reverse recovery time t_{rr} (idealized characteristics)	19
77			
78		Figure 8 – Circuit diagram for measurement of continuous (direct) forward voltage	21
79		Figure 9 – Circuit diagram for measurement of average forward voltage and/or peak forward voltage (AC method)	22
80			
81		Figure 10 – Graphic representation of forward voltage versus current characteristic	22
82		Figure 11 – Circuit diagram for measurement of peak forward voltage (pulse method)	23
83		Figure 12 – Circuit diagram for measurement of breakdown voltage	24
84		Figure 13 – Circuit diagram for measurement of reverse current	25

85	Figure 14 – Circuit diagram for measurement of peak reverse current	26
86	Figure 15 – Circuit diagram for measurement of recovered charge (half sinusoidal method) ..	27
87	Figure 16 – Current waveform through diode during recovery (half sinusoidal method)	27
88	Figure 17 – Circuit diagram for measurement of recovered charge (rectangular method)	29
89	Figure 18 – Current waveform through diode during recovery (rectangular method)	29
90	Figure 19 – Circuit diagram for measurement of total capacitive charge	31
91	Figure 20 – Circuit diagram for measurement of forward recovery	32
92	Figure 21 – Current waveform during forward recovery	32
93	Figure 22 – Voltage waveform during forward recovery	33
94	Figure 23 – Circuit diagram for measurement of thermal resistance and transient thermal	
95	impedance	34
96	Figure 25 – Circuit diagram for verification of peak reverse voltage	36
97	Figure 26 – Circuit diagram for verification of non-repetitive surge forward current	38
98	Figure 27 – Circuit diagram for verification of peak reverse power of avalanche rectifier diodes	
99	39	
100	Figure 28 – Triangular reverse current waveform	40
101	Figure 29 – Sinusoidal reverse current waveform	40
102	Figure 30 – Rectangular reverse current waveform	41
103	Figure 31 – Verification of non-repetitive peak reverse power P_{RSM} versus breakdown	42
104	Figure 32 – Circuit diagram for verification of peak case non-rupture current	43
105	Figure 33 – Waveform of reverse current through diode	43
106		
107	Table 1 – Voltages	15
108	Table 2 – Currents	15
109	Table 3 – Power dissipation	16
110	Table 4 – Switching characteristics	16
111	Table 5 – Minimum type and routine tests for rectifier diodes	45
112	Table 6 – Acceptance-defining characteristics for acceptance after endurance tests	46
113		
114		

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SEMICONDUCTOR DEVICES –

Part 2: Discrete devices – Rectifier diodes

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
 - 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
 - 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
 - 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
 - 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
 - 6) All users should ensure that they have the latest edition of this publication.
 - 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
 - 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
 - 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch> or www.iso.org/patents. IEC shall not be held responsible for identifying any or all such patent rights.
- IEC 60747-2 has been prepared by subcommittee 47E: Discrete semiconductor devices, of IEC technical committee 47: Semiconductor devices. It is an International Standard.
- This fourth edition cancels and replaces the third edition published in 2016. This edition constitutes a technical revision.
- This edition includes the following significant technical changes with respect to the previous edition:
- a) Some mistakes and confusing wording were amended;
 - b) The terms and definitions for partial thermal resistance junction-to-case are added;
 - c) Clauses 3, 4, 5, 6, and 7 were amended with some deletions of information no longer in use and with some necessary additions.

This International Standard is to be used in conjunction with IEC 60747-1:2006 and Amendment 1:2010.

The text of this International Standard is based on the following documents:

Draft	Report on voting
47E/XX/FDIS	47E/XX/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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.

SEMICONDUCTOR DEVICES –

Part 2: Discrete devices – Rectifier diodes

1 Scope

This part of IEC 60747 specifies product specific standards for terminology, letter symbols, essential ratings and characteristics (properties), measuring and test methods, requirements for type tests, routine tests, endurance tests and marking for the following discrete semiconductor devices:

- generic rectifier diodes;
- avalanche rectifier diodes;
- fast-switching rectifier diodes;
- Schottky barrier diodes.

If no ambiguity is likely to occur, any of the above will be referred to as diodes.

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 60050-521, *International Electrotechnical Vocabulary – Part 521: Semiconductor devices and integrated circuits* (available at <https://www.electropedia.org>)

IEC 60747-1:2006, *Semiconductor devices – Part 1: General*
IEC 60747-1:2006/AMD1: 2010

IEC 60749-23, *Semiconductor devices – Mechanical and climatic test methods – Part 23: High temperature operating life*

IEC 60749-25, *Semiconductor devices – Mechanical and climatic test methods – Part 25: Temperature cycling*

IEC 60749-34, *Semiconductor devices – Mechanical and climatic test methods – Part 34: Power cycling*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60747-1, IEC 60050-521 (except for definitions 521-05-18, 521-05-25 and 521-05-26) and the following apply.

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

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

3.1 General

3.1.1

forward direction

direction of the flow of continuous (direct) current in which a semiconductor diode has the lower resistance

3.1.2**reverse direction**

direction of the flow of continuous (direct) current in which a semiconductor diode has the higher resistance

3.1.3**anode terminal**

terminal to which forward current flows from the external circuit

3.1.4**cathode terminal**

terminal from which forward current flows to the external circuit

3.2 Voltages**3.2.1****repetitive peak reverse voltage**

V_{RRM}

highest instantaneous value of the reverse voltage, including all repetitive transient voltages, but excluding all non-repetitive transient voltages

Note 1 to entry: See Figure 1 – Reverse voltage ratings

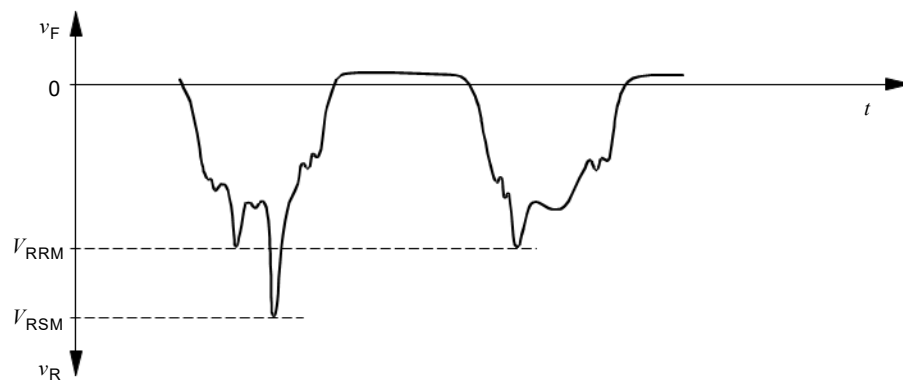


Figure 1 – Reverse voltage ratings

3.2.2**non-repetitive peak reverse voltage**

peak transient reverse voltage

V_{RSM}

highest instantaneous value of any non-repetitive transient reverse voltage

Note 1 to entry: The repetitive voltage is usually a function of the circuit and increases the power dissipation of the device. A non-repetitive transient voltage is usually due to an external cause and it is assumed that its effect has completely disappeared before the next transient arrives. See Figure 1 – Reverse voltage ratings

3.2.3**breakdown voltage**

$V_{(BR)}$

voltage in the region where breakdown occurs

3.2.4**forward voltage** V_F

voltage across the terminals which results from the flow of current in the forward direction

3.2.5**peak forward voltage** V_{FM}

voltage across the terminals which results from the specified peak forward current

3.2.6**forward recovery voltage** V_{fr}

varying voltage occurring during the forward recovery time after instantaneous switching from zero or a specified reverse voltage to a specified forward current

3.2.7**reverse voltage** V_R

constant voltage applied to a diode in the reverse direction

3.3 Currents**3.3.1****forward current** I_F

current flowing through the diode in forward direction

3.3.2**mean forward current** $I_{F(AV)}$

value of the forward current averaged over the full cycle

3.3.3**RMS forward current** $I_{F(RMS)}$

RMS value of the forward current over one complete cycle of the operating frequency

3.3.4**peak forward current** I_{FM}

maximum value of forward current time function

3.3.5**repetitive peak forward current** I_{FRM}

peak value of the forward current including all repetitive transient currents

Note 1 to entry: See Figure 6.

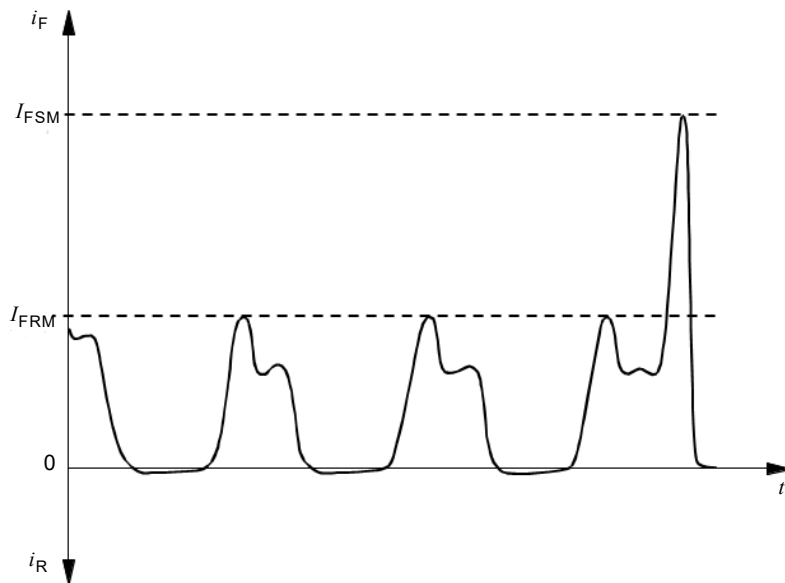


Figure 2 – Forward current ratings

3.3.6

non-repetitive surge forward current

I_{FSM}

forward current pulse of short time duration and specified waveform, whose application causes or would cause the maximum rated virtual junction temperature to be exceeded, but which is assumed to occur rarely and with a limited number of such occurrences during the service life of the device and to be a consequence of unusual circuit conditions (e.g. a fault)

Note 1 to entry: See Figure 6.

3.3.7

reverse current

I_R

current flowing through the diode when reverse voltage is applied

3.3.8

reverse recovery current

I_{rr}

part of the reverse current which occurs during the reverse recovery until quasi static conditions have been reached

3.3.9

I^2t value

integral of the square of non-repetitive surge forward current over the duration of the current surge

3.3.10

peak case non-rupture current

I_{RSMC}

peak value of reverse current that will not cause bursting of the case or the emission of a plasma beam under specified conditions, waveform and *duration of the current* as well as *temperature*

Note 1 to entry: This definition implies that a fine crack in the case might be found in a device subjected to the peak case non-rupture current, provided that no plasma beam was emitted. Parts of the case shall not break away, nor shall the device melt externally or burst into flames.

3.4 Power dissipation**3.4.1****total power dissipation** P_{tot}

sum of all partial power dissipation and the mean gate power dissipation, during a full cycle

3.4.2**forward power dissipation** P_{F}

partial power dissipation resulting from forward power

3.4.3**mean forward power dissipation** $P_{\text{F(AV)}}$

mean partial power dissipation resulting from forward power

3.4.4**forward recovery dissipation** P_{fr}

power dissipation during forward recovery

3.4.5**reverse power dissipation** P_{R}

partial power dissipation resulting from reverse power

3.4.6**reverse recovery dissipation** P_{rr}

power dissipation during reverse recovery

3.4.7**surge reverse power dissipation** P_{RSM}

<avalanche rectifier diodes> power which is dissipated within the diode resulting from surges occurring when it is operating in the reverse direction

3.4.8**repetitive peak reverse power dissipation** P_{RRM}

<avalanche rectifier diodes> power which is dissipated within the diode resulting from repetitive peak currents when it is operating in the reverse direction

3.4.9**mean reverse power dissipation** $P_{\text{R(AV)}}$

<avalanche rectifier diodes> power which is dissipated within the diode resulting from constant reverse current or as a mean value of a periodical function when it is operating in the reverse direction

3.4.10**partial thermal resistance junction-to-case, anode side** $R_{\text{th(j-c)A}}$

thermal resistance between the junction and the anode side of the case

3.4.11 partial thermal resistance junction-to-case, cathode side

$R_{th(j-c)K}$
thermal resistance between the junction and the cathode side of the case

3.5 Switching characteristics

3.5.1 forward recovery time

t_{fr}
time interval between the instant when the forward voltage rises through a specified first value and the instant when it falls from its peak value V_{frm} to a specified second value close to the final stable value of forward voltage, or when the extrapolated forward voltage reaches zero, upon the application of a specified step of forward current following a zero voltage or other specified reverse voltage condition

Note 1 to entry: See Figure 3 – Voltage waveform during forward recovery (Method I) and Figure 4 – Voltage waveform during forward recovery (Method II), especially for the final stable value and extrapolation of the forward voltage.

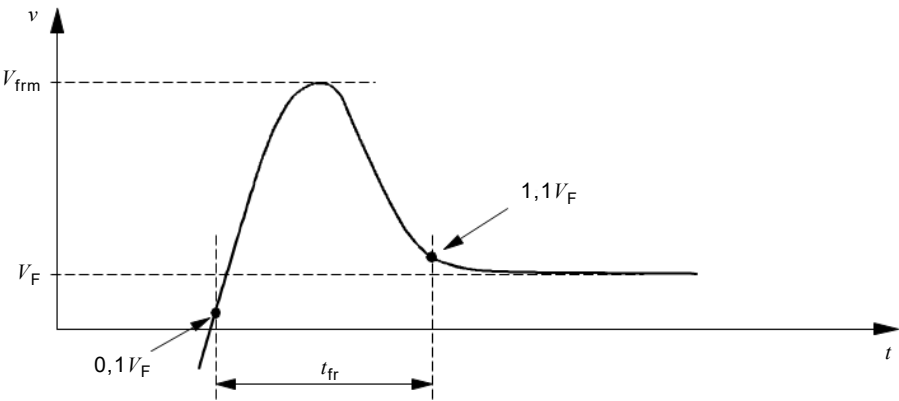


Figure 3 – Voltage waveform during forward recovery (Method I)

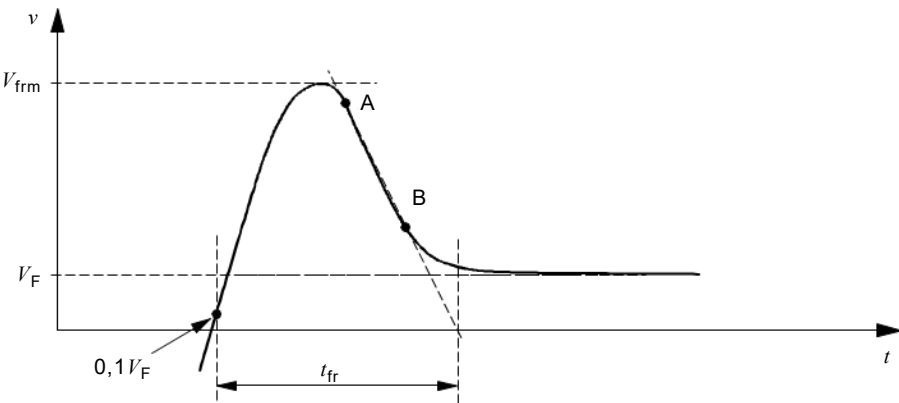


Figure 4 – Voltage waveform during forward recovery (Method II)

Note 2 to entry: For Method I, the specified first and second values referred to in the definition are usually 10% and 110%, respectively, of the final stable value (V_F in Figure 3 – Voltage waveform during forward recovery (Method I)).

Note 3 to entry: For Method II, the extrapolation is carried out with respect to specified points A and B where A and B are usually 90% and 50% of V_{frm} as shown in generalized form in Figure 4 – Voltage waveform during

forward recovery (Method II)

Note 4 to entry: The Method I is preferred for V_{frm} values up to about 10 V and the Method II for values considerably higher.

3.5.2

reverse recovery time

t_{rr}

time interval between the instant when the current passes through zero, when changing from the forward direction to the reverse direction, and the instant when the extrapolated reverse current reaches zero

Note 1 to entry: See Figure 5 – .

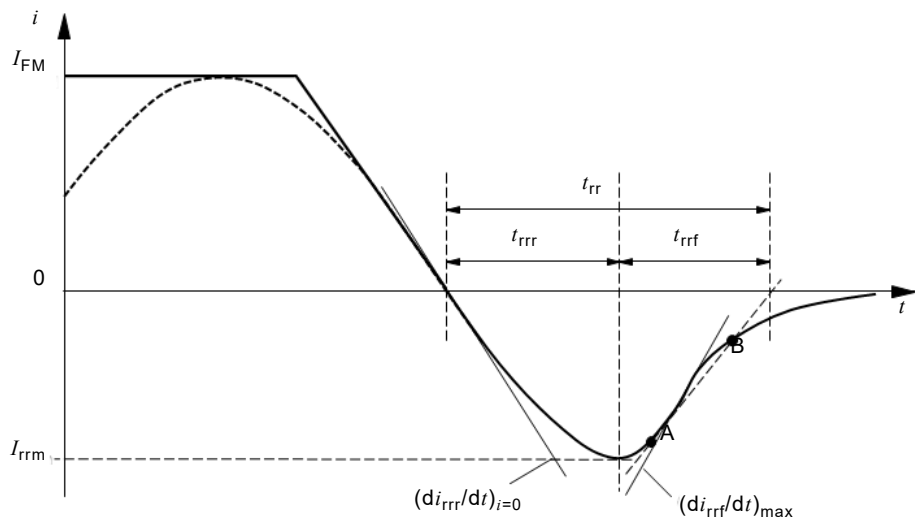


Figure 5 – Current waveform during reverse recovery

Note 2 to entry: The extrapolation is carried out with respect to specified points A and B as shown in generalized form in Figure 5 – . Point A is often specified at 90% of I_{rrm} , and point B at 25% of I_{rrm} .

3.5.3

reverse recovery current rise time

t_{rrr}

time interval between the beginning of the reverse recovery time and the instant when the reverse recovery current reaches its peak value after instantaneous switching from a specified forward current to a specified reverse voltage

3.5.4

reverse recovery current fall time

t_{rrf}

time interval between the instant when the reverse recovery current reaches its peak value and the end of reverse recovery time after instantaneous switching from a specified forward current to a specified reverse voltage

3.5.5

recovered charge

Q_{r}

total charge recovered from the diode during a specified integration time after switching from a specified forward current condition to a specified reverse condition: