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IEEE Guide for the Application of Surge Protective Components in Surge Protective Devices and Equipment Ports—Part 3: Silicon PN-Junction

IEEE Power and Energy Society

Sponsored by the
Surge Protective Devices Committee

IEEE
3 Park Avenue
New York, NY 10016-5997
USA

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Abstract: Surge protective components (SPCs) used in power and telecom surge protective devices (SPDs) and equipment ports are covered in the IEEE C62.42™ guide series. This part, Part 3 of the series, describes silicon PN-Junction clamping diode SPCs and covers technology variants, including forward biased semiconductor diodes, Zener breakdown semiconductor diodes, avalanche breakdown semiconductor diodes, punch-through semiconductor bipolar junction transistor diodes, and fold-back semiconductor bidirectional transistor diodes, as well as component construction; characteristics; ratings; and application examples.

Keywords: avalanche breakdown, clamping, diode, fold back, forward biased, IEEE C62.42.3™, PN-junction, punch-through, silicon, Zener breakdown

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

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William Travis, *Vice Chair*

Tim Ardley
Robert Ashton
Frank Basciano
Nisar Chaudhry
Leonard Drewes
Bob Fried
Ernie Gallo
Bogdan Klobassa
Peter Kobsa
Albert Martin
Wolfgang Oertel
Thomas Tran

The following members of the individual balloting committee voted on this guide. Balloters may have voted for approval, disapproval, or abstention.

Robert Ashton
Frank Basciano
William Bush
William Byrd
Randall Groves
Phillip Havens
Raymond Hill
Werner Hoelzl
Ronald Hotchkiss
John John
Yuri Khersonsky
Jim Kulchisky
Lawrence Long
Albert Martin
Michael J. Maytum
Michael Newman
Charles Ngethe
Wolfgang Oertel
Lorraine Padden
Iulian Profir
Thomas Rozek
Nikunj Shah
Jerry Smith
David Tepen
James Timperley
John Vergis
John Wang
Jian Yu

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Annette D. Reilly
Robby Robson
Dorothy Stanley
Adrian Stephens
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Howard Wolfman
Yu Yuan

*Member Emeritus

Introduction

This introduction is not part of IEEE Std C62.42.3-2017, IEEE Guide for the Application of Surge Protective Components in Surge Protective Devices and Equipment Ports—Part 3: Silicon PN-Junction.

PN-junction voltage clamping diodes have one or more PN junctions in a silicon chip. Depending on the PN-junction arrangement the clamping characteristic can be one of five types: forward-biased, Zener, avalanche, punch-through, or fold-back. The chosen component technology for a given application depends on the required clamping voltage. Clamping voltages above 10 V dictate the use of avalanche or fold-back technologies. Clamping voltages of 6 V and below are best suited to punch-through or forward-biased technologies. To lower the capacitance, these clamping components are integrated with series diodes or diode bridges. Making the diode bridge a multi-phase diode bridge allows the protection of multiple conductors with a single clamping protection component.

Clause 3 of this document gives the terms used to describe the different types of P-N-junction voltage clamping component and Clause 4 covers the various physical PN-junction constructions. Clause 5 deals with the characteristics of the different PN-junction structures and Clause 6 details the component ratings. Clause 7 describes application examples for the protection of ac, dc, or signal circuits and component series and parallel combinations.

Acknowledgments

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IEEE Guide for the Application of Surge Protective Components in Surge Protective Devices and Equipment Ports—Part 3: Silicon PN-Junction

1. Scope

The IEEE C62.42™ guide series covers surge protective components (SPCs) used in power and telecom surge protective devices (SPDs) and equipment ports. This part, Part 3 of the series, describes Silicon PN-Junction Clamping Diode SPCs and covers:

- Technology variants
  - Forward biased semiconductor diodes
  - Zener breakdown semiconductor diodes
  - Avalanche breakdown semiconductor diodes
  - Punch-through semiconductor bipolar junction transistor diodes
  - Fold-back semiconductor bidirectional transistor diodes
- Component construction
- Characteristics
- Ratings
- Application examples

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

IEEE Std C62.42.0™, IEEE Guide for the Application of Surge Protective Components in Surge Protective Devices and Equipment Ports—Overview.[1,2]

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