

# **JEDEC STANDARD**

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## **Avalanche Breakdown Diode (ABD) Transient Voltage Suppressors**

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### **JESD210A**

(Revision of JESD210, December 2007)

**MARCH 2017**

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**JEDEC SOLID STATE TECHNOLOGY ASSOCIATION**



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## AVALANCHE BREAKDOWN DIODE (ABD) TRANSIENT VOLTAGE SUPPRESSORS

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## Introduction

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Avalanche breakdown diodes (ABDs) described in this document are used as surge protectors by limiting or clamping transient overvoltages and diverting surge currents away from the circuits they are intended to protect. ABDs exhibit relatively high impedance at normal system voltages. They limit transient overvoltages by providing a low impedance to conduct the surge current. These devices may offer either unidirectional or bidirectional protection. ABDs are commonly used in power and communications circuits. Avalanche breakdown diodes are similar to regulator (i.e., Zener) diodes, except that they are designed for short-duration overvoltage protection identified as random recurring transients where cooling occurs before repeating, rather than continuous voltage regulation. They may be single two-lead devices or may have multiple (junctions) devices in a single package.

For the purpose of achieving, specific registration formats are available to fit particular types of avalanche breakdown diodes. These formats are subject to change as new semiconductor developments or circuit applications become practicable. At present, the following formats are available:

<b>NUMBER</b>	<b>DESCRIPTION</b>
<a href="#">RDF-12</a>	Diode, Voltage Transient Suppressor Family

# **AVALANCHE BREAKDOWN DIODE (ABD) TRANSIENT VOLTAGE SUPPRESSORS**

## **(Device Definitions, Rating Verification Tests, and Characteristic Testing)**

(From JEDEC BoD Ballot JCB-04-55 and JCB-12-70, formulated under the cognizance of the JC-22.5 Subcommittee on Transient Voltage Suppressors.)

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## **1 Scope**

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This standard is applicable to avalanche breakdown diodes when used as a surge protector or transient voltage suppressor (TVS). It describes terms and definitions and explains methods for verifying device ratings and measuring device characteristics. This standard may be applied to other surge-protection components with similar characteristics as the ABD.

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## **2 Terms and definitions**

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These may use terms similar to other regulator devices such as Zener diodes but have variations unique to ABD's.

### **2.1 Basic concepts**

**2.1.1 avalanche breakdown diode (ABD):** A transient voltage suppressor that is a semiconductor diode with a single p-n junction (or with multiple p-n junctions none of which interact) whose operation depends in part on its breakdown characteristics.

**2.1.2 stand-off (nonconducting) region:** The portion of the voltage-current characteristic of a reverse-biased p-n junction that exhibits a high resistance to the passage of current.

**2.1.3 breakdown region:** The portion of the voltage-current characteristic beyond the initiation of breakdown for an increasing magnitude of reverse current.

**2.1.4 forward-conducting region (of a unidirectional ABD):** The portion of the voltage-current characteristic of a unidirectional ABD forward-biased p-n junction that exhibits a low small-signal resistance to the passage of current.

**2.1.5 anode terminal (A, a):** The terminal connected to the p-type region of the p-n junction or, when two or more p-n junctions are connected in series with the same polarity, to the extreme p-type region.

**NOTE** For unidirectional blocking or low-capacitance ABDs, any rectifier diode(s) that may be included are ignored in the determination of the anode terminal.

## 2 Terms and definitions (cont'd)

**2.1.6 cathode terminal (K, k):** The terminal connected to the n-type region of the p-n junction or, when two or more p-n junctions are connected in series with the same polarity, to the extreme n-type region.

NOTE For unidirectional blocking or low-capacitance ABDs, any rectifier diode(s) that may be included are ignored in the determination of the cathode terminal.

## 2.2 Classes of avalanche breakdown diodes (ABDs)

**2.2.1 unidirectional ABD:** A two-terminal ABD with a voltage-current avalanche breakdown characteristic in one direction and either a forward or a blocking characteristic in the other. (See Figures 1a and 1b.)

NOTE Large transient currents will be clamped for positive cathode-to-anode voltages when driven into the avalanche breakdown region with one or more p-n junctions placed in series or parallel with each junction connected in the same direction. Large transient currents may also be clamped for negative cathode-to-anode voltages at significantly lower voltages with the typical forward-conducting characteristics of a single p-n junction (or of multiple p-n junctions connected in the same direction). The most common type of unidirectional ABD has a forward-conducting characteristic.

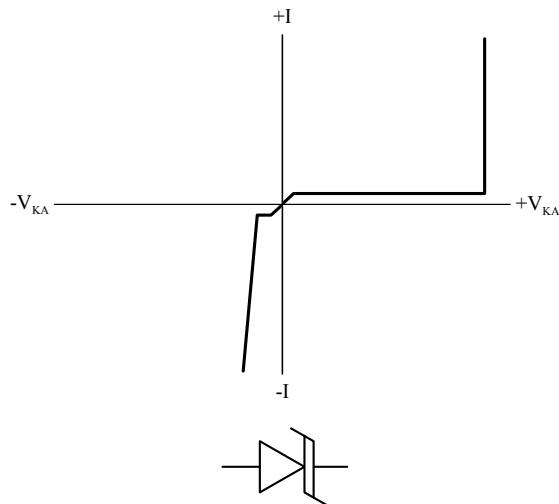


Figure 1a — Unidirectional-conducting ABD

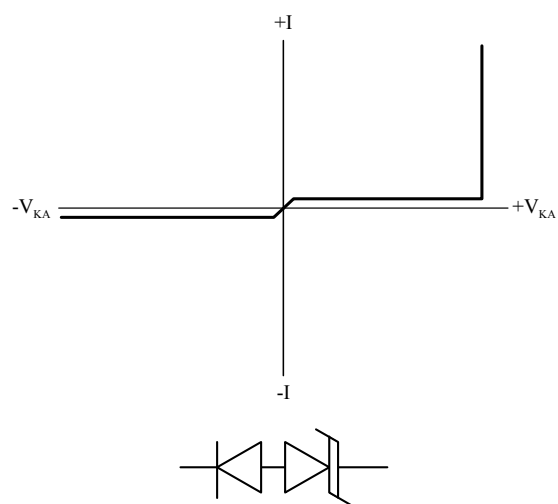


Figure 1b — Unidirectional-blocking ABD