

# International IR Rectifier

## 15ETH03SPbF 15ETH03-1PbF

### Ultrafast Rectifier

#### Features

- Ultrafast Recovery Time
- Low Forward Voltage Drop
- Low Leakage Current
- 175°C Operating Junction Temperature
- Lead-Free ("PbF" suffix)

$$t_{rr} = 40\text{ns}$$

$$I_{F(AV)} = 15\text{Amp}$$

$$V_R = 300\text{V}$$

#### Description/ Applications

International Rectifier's 300V series are the state of the art Ultrafast recovery rectifiers designed with optimized performance of forward voltage drop and Ultrafast recovery time.

The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness and reliability characteristics.

These devices are intended for use in the output rectification stage of SMPS, UPS, DC-DC converters as well as freewheeling diodes in low voltage inverters and chopper motor drives.

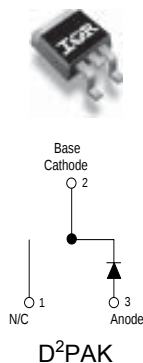
Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

#### Absolute Maximum Ratings

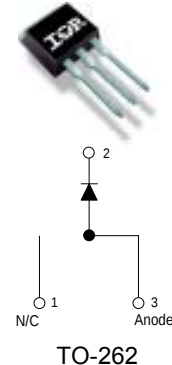
| Parameters                                                                | Max         | Units            |
|---------------------------------------------------------------------------|-------------|------------------|
| $V_{RRM}$ Repetitive Peak Reverse Voltage                                 | 300         | V                |
| $I_{F(AV)}$ Average Rectified Forward Current @ $T_C = 142^\circ\text{C}$ | 15          | A                |
| $I_{FSM}$ Non Repetitive Peak Surge Current @ $T_J = 25^\circ\text{C}$    | 140         |                  |
| $T_J, T_{STG}$ Operating Junction and Storage Temperatures                | - 65 to 175 | $^\circ\text{C}$ |

#### Case Styles

15ETH03SPbF



15ETH03-1PbF



**Electrical Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

| Parameters                                        | Min | Typ  | Max  | Units         | Test Conditions                                    |
|---------------------------------------------------|-----|------|------|---------------|----------------------------------------------------|
| $V_{BR}, V_f$ Breakdown Voltage, Blocking Voltage | 300 | -    | -    | V             | $I_R = 100\mu\text{A}$                             |
| $V_F$ Forward Voltage                             | -   | 1.05 | 1.25 | V             | $I_F = 15\text{A}, T_J = 25^\circ\text{C}$         |
|                                                   | -   | 0.85 | 1.00 | V             | $I_F = 15\text{A}, T_J = 125^\circ\text{C}$        |
| $I_R$ Reverse Leakage Current                     | -   | 0.05 | 40   | $\mu\text{A}$ | $V_R = V_R \text{ Rated}$                          |
|                                                   | -   | 12   | 400  | $\mu\text{A}$ | $T_J = 125^\circ\text{C}, V_R = V_R \text{ Rated}$ |
| $C_T$ Junction Capacitance                        | -   | 45   | -    | pF            | $V_R = 300\text{V}$                                |
| $L_S$ Series Inductance                           | -   | 8    | -    | nH            | Measured lead to lead 5mm from package body        |

**Dynamic Recovery Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

| Parameters                       | Min | Typ | Max | Units | Test Conditions                                                         |
|----------------------------------|-----|-----|-----|-------|-------------------------------------------------------------------------|
| $t_{rr}$ Reverse Recovery Time   | -   | -   | 40  | ns    | $I_F = 1.0\text{A}, di_F/dt = 50\text{A}/\mu\text{s}, V_R = 30\text{V}$ |
|                                  | -   | 32  | -   |       | $T_J = 25^\circ\text{C}$                                                |
|                                  | -   | 45  | -   |       | $T_J = 125^\circ\text{C}$                                               |
| $I_{RRM}$ Peak Recovery Current  | -   | 2.4 | -   | A     | $T_J = 25^\circ\text{C}$                                                |
|                                  | -   | 6.1 | -   |       | $T_J = 125^\circ\text{C}$                                               |
| $Q_{rr}$ Reverse Recovery Charge | -   | 38  | -   | nC    | $T_J = 25^\circ\text{C}$                                                |
|                                  | -   | 137 | -   |       | $T_J = 125^\circ\text{C}$                                               |

$I_F = 15\text{A}$   
 $di_F/dt = -200\text{A}/\mu\text{s}$   
 $V_R = 200\text{V}$

**Thermal - Mechanical Characteristics**

| Parameters                                                   | Min       | Typ  | Max                           | Units                     |
|--------------------------------------------------------------|-----------|------|-------------------------------|---------------------------|
| $T_J$ Max. Junction Temperature Range                        | - 65      | -    | 175                           | $^\circ\text{C}$          |
| $T_{Stg}$ Max. Storage Temperature Range                     | - 65      | -    | 175                           |                           |
| $R_{thJC}$ Thermal Resistance, Junction to Case Per Leg      | -         | 1.02 | 2.0                           | $^\circ\text{C}/\text{W}$ |
| $R_{thJA}$ ① Thermal Resistance, Junction to Ambient Per Leg | -         | -    | 70                            |                           |
| $R_{thCS}$ ② Thermal Resistance, Case to Heatsink            | -         | 0.2  | -                             |                           |
| Weight                                                       | -         | 2.0  | -                             | g                         |
|                                                              | -         | 0.07 | -                             | (oz)                      |
| Mounting Torque                                              | 6.0       | -    | 12                            | Kg-cm                     |
|                                                              | 5.0       | -    | 10                            | lbf.in                    |
| Marking Device                                               | 15ETH03S  |      | Case style D <sup>2</sup> Pak |                           |
|                                                              | 15ETH03-1 |      | Case style TO-262             |                           |

① Typical Socket Mount

② Mounting Surface, Flat, Smooth and Greased

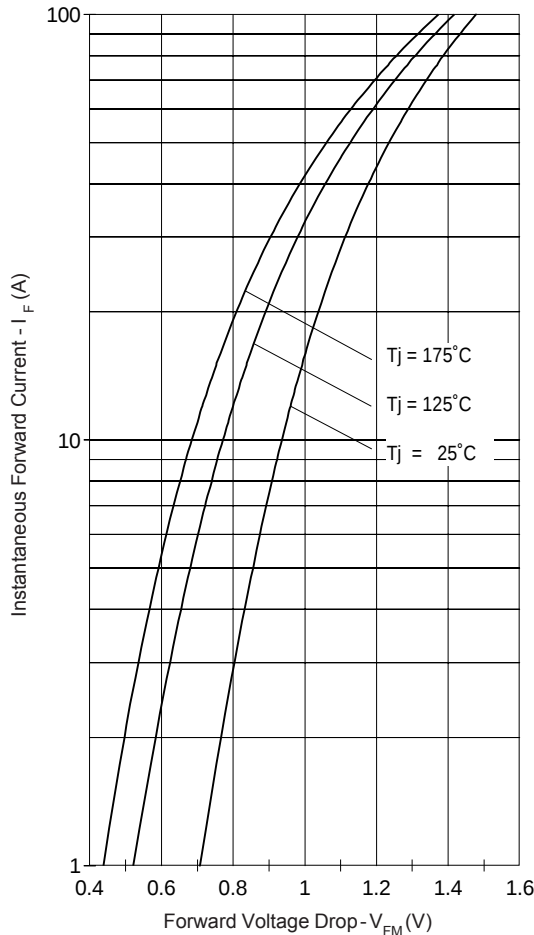


Fig. 1 - Typical Forward Voltage Drop Characteristics

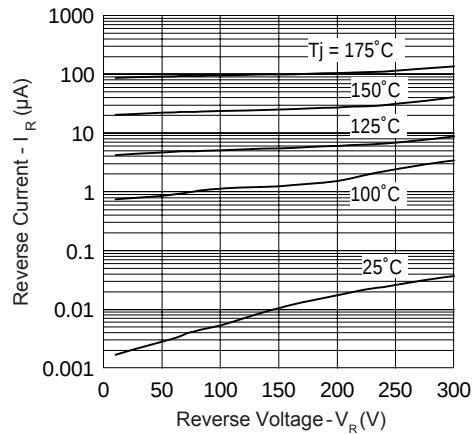


Fig. 2 - Typical Values Of Reverse Current Vs. Reverse Voltage

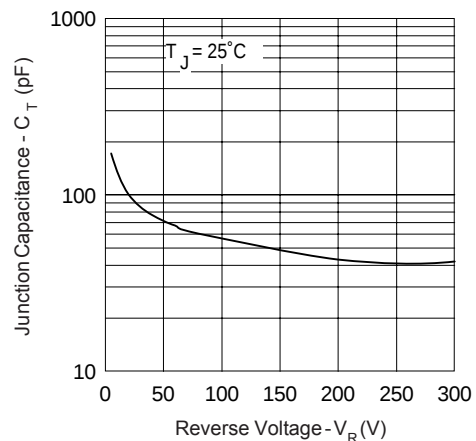


Fig. 3 - Typical Junction Capacitance Vs. Reverse Voltage

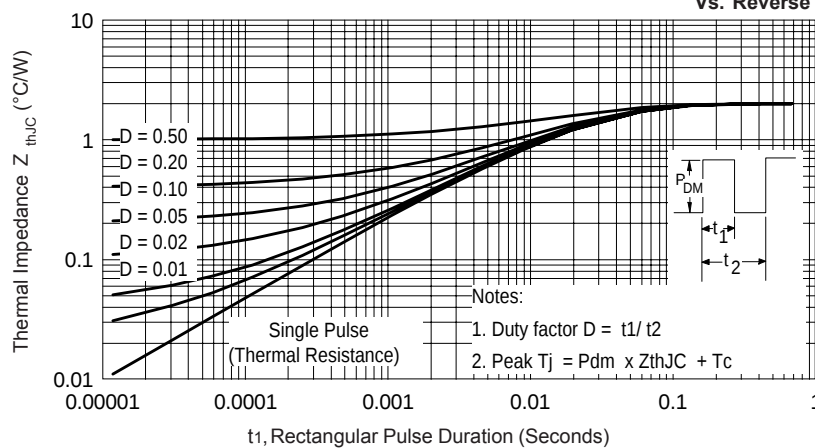
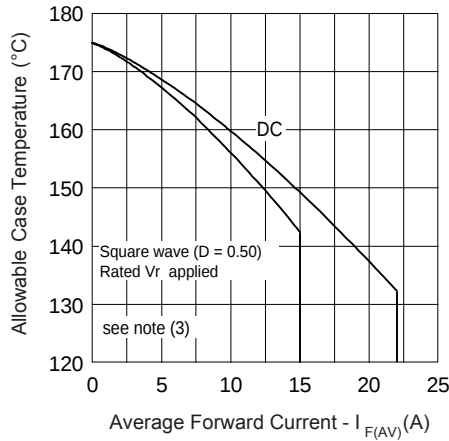
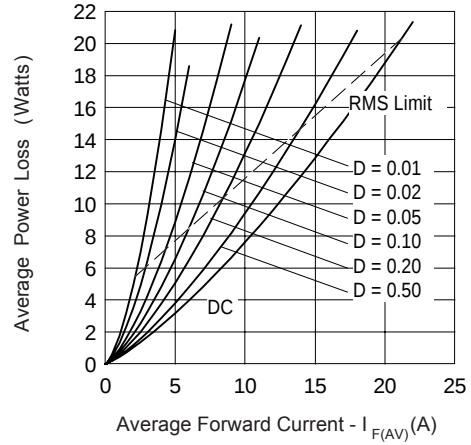


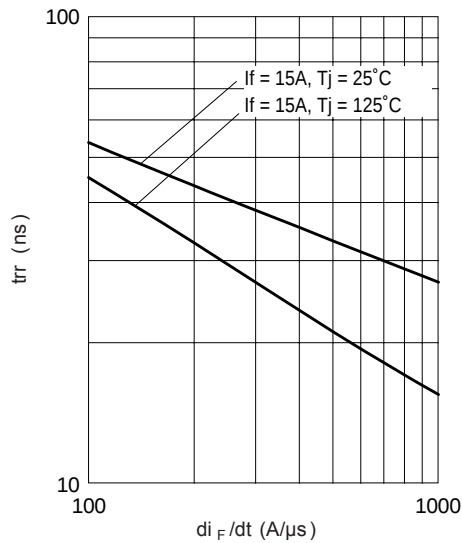
Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics



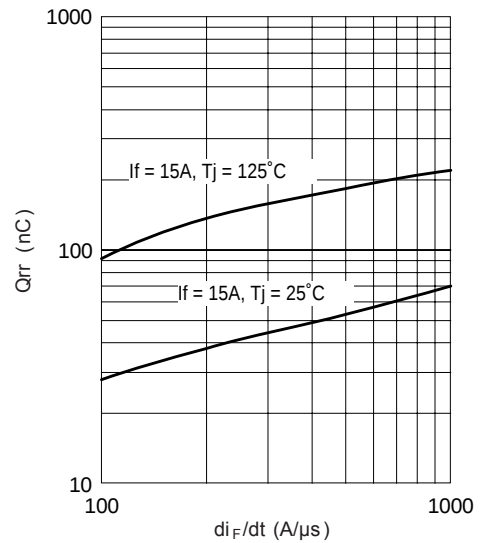
**Fig. 5 - Max. Allowable Case Temperature Vs. Average Forward Current**



**Fig. 6 - Forward Power Loss Characteristics**



**Fig. 7 - Typical Reverse Recovery vs.  $di_F/dt$**

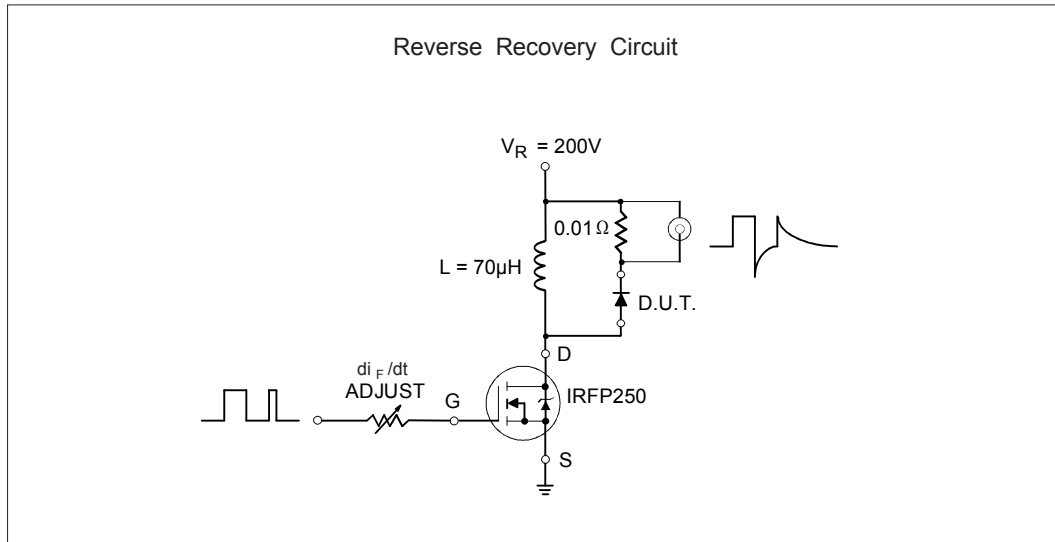


**Fig. 8 - Typical Stored Charge vs.  $di_F/dt$**

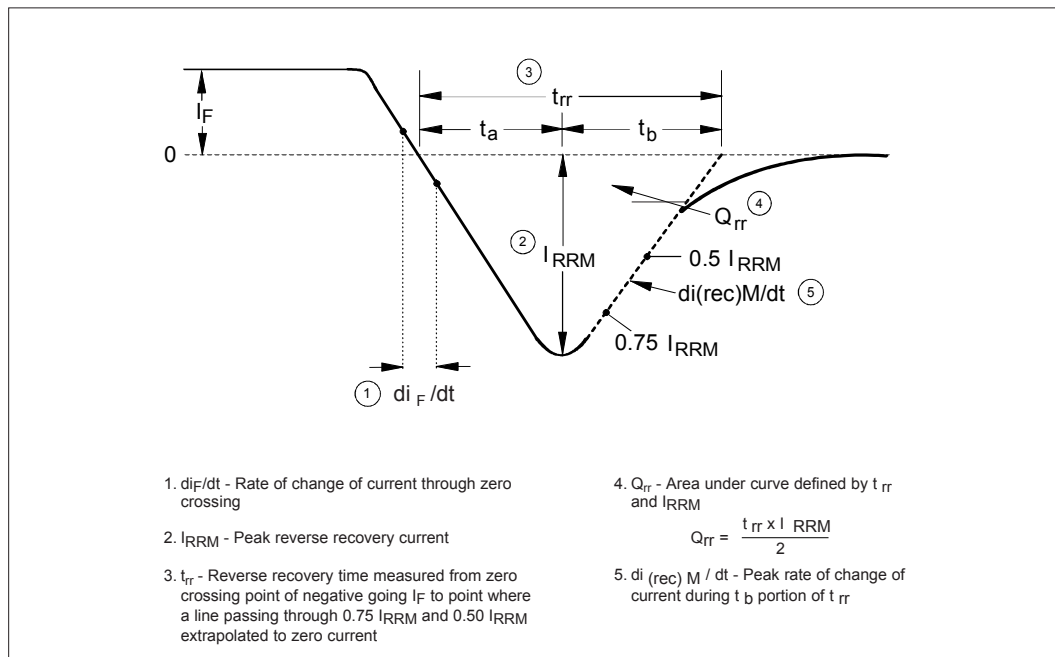
(3) Formula used:  $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$ ;

$P_d$  = Forward Power Loss =  $I_{F(AV)} \times V_{FM} @ (I_{F(AV)} / D)$  (see Fig. 6);

$P_{d_{REV}}$  = Inverse Power Loss =  $V_{R1} \times I_{R1} (1 - D)$ ;  $I_{R1} @ V_{R1} = \text{rated } V_R$

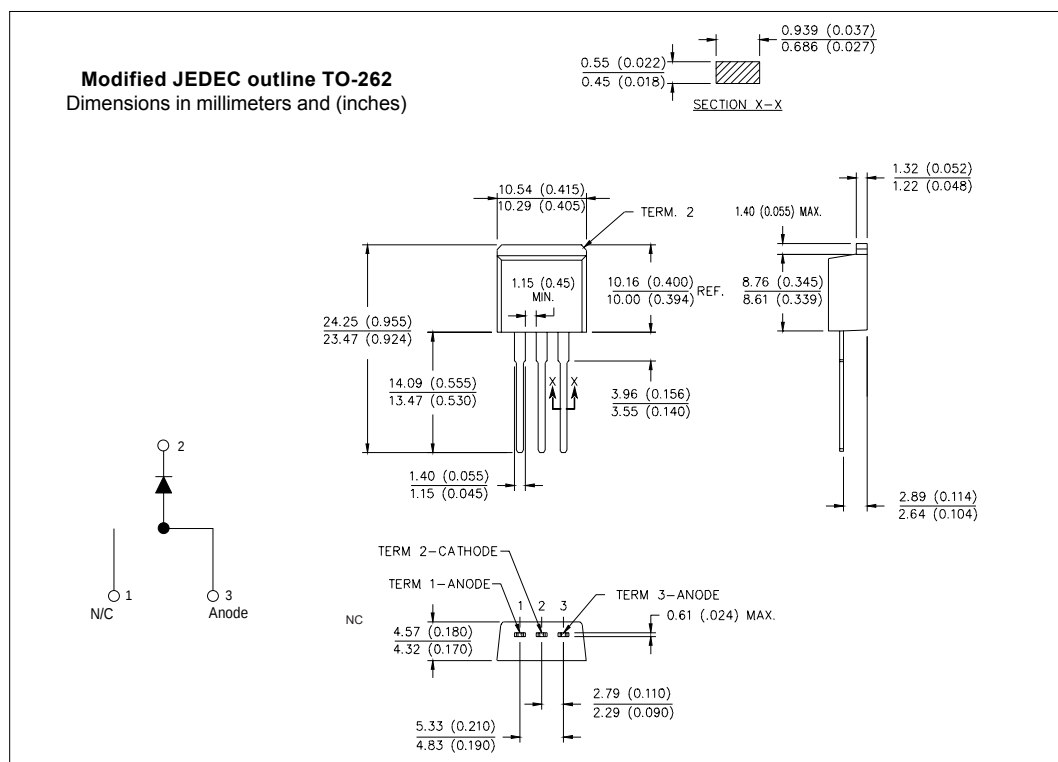
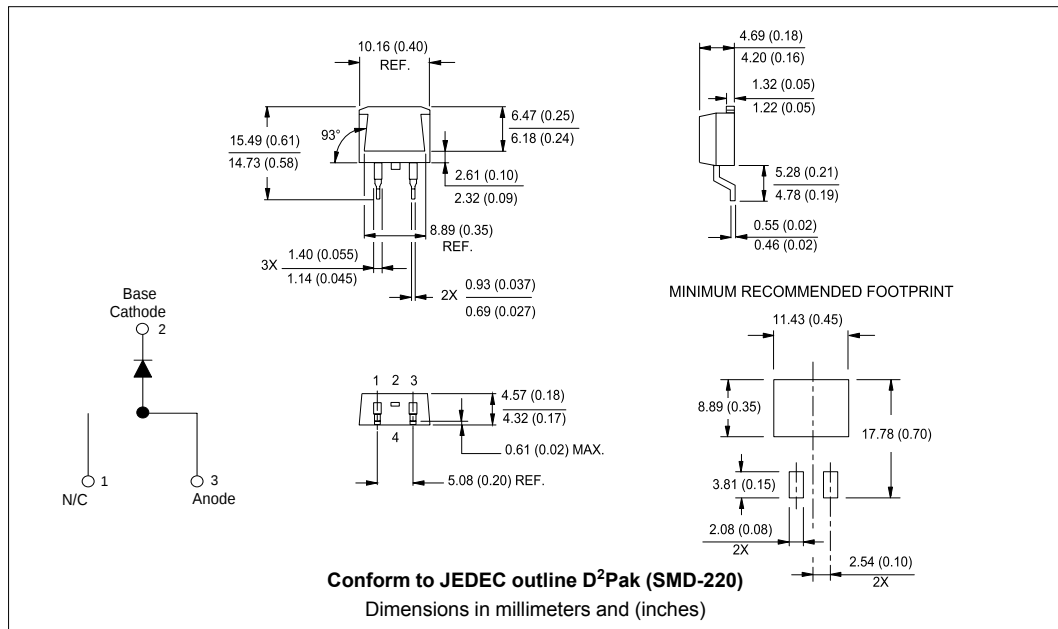


**Fig. 9 - Reverse Recovery Parameter Test Circuit**



**Fig. 10 - Reverse Recovery Waveform and Definitions**

## Outlines Table

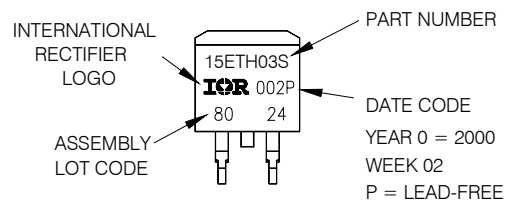


## Part Marking Information

### D<sup>2</sup>PAK

EXAMPLE: THIS IS A 15ETH03S  
LOT CODE 8024  
ASSEMBLED ON WW 02, 2000

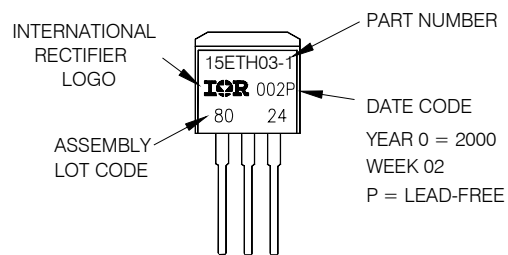
Note: "P" in assembly line  
position indicates "Lead-Free"



### TO-262

EXAMPLE: THIS IS A 15ETH03-1  
LOT CODE 8024  
ASSEMBLED ON WW 02, 2000

Note: "P" in assembly line  
position indicates "Lead-Free"



The technical drawing illustrates the SMD-220 component from three perspectives: top, side, and reel views. The top view shows a rectangular component with two mounting tabs, with dimensions for width (1.60 mm), height (1.50 mm), and various internal features. The side view shows the component's profile, including the mounting tabs and the central body. The reel view shows the component mounted on a reel, with dimensions for the reel diameter (360 mm) and the component's position on the reel (13.50 mm).

**Dimensions in millimeters and (inches)**

**SMD-220 Tape & Reel**

When ordering, indicate the part number, part orientation, and the quantity. Quantities are in multiples of 800 pieces per reel for both TRL and TRR.

## Ordering Information Table

| Device Code |   |                                                                                                                                                                                                                                      |   |    |   |     |     |
|-------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|---|-----|-----|
| 15          | E | T                                                                                                                                                                                                                                    | H | 03 | S | TRL | PbF |
| 1           | 2 | 3                                                                                                                                                                                                                                    | 4 | 5  | 6 | 7   | 8   |
| 1           | - | Current Rating (15 = 15A)                                                                                                                                                                                                            |   |    |   |     |     |
| 2           | - | E = Single Diode                                                                                                                                                                                                                     |   |    |   |     |     |
| 3           | - | T = TO-220, D <sup>2</sup> Pak                                                                                                                                                                                                       |   |    |   |     |     |
| 4           | - | H = HyperFast Recovery                                                                                                                                                                                                               |   |    |   |     |     |
| 5           | - | Voltage Rating (03 = 300V)                                                                                                                                                                                                           |   |    |   |     |     |
| 6           | - | <ul style="list-style-type: none"> <li>S = D<sup>2</sup>Pak</li> <li>-1 = TO-262</li> </ul>                                                                                                                                          |   |    |   |     |     |
| 7           | - | <ul style="list-style-type: none"> <li>none = Tube (50 pieces)</li> <li>TRL = Tape &amp; Reel (Left Oriented, for D<sup>2</sup>Pak package)</li> <li>TRR = Tape &amp; Reel (Right Oriented, for D<sup>2</sup>Pak package)</li> </ul> |   |    |   |     |     |
| 8           | - | <ul style="list-style-type: none"> <li>none = Standard Production</li> <li>PbF = Lead-Free</li> </ul>                                                                                                                                |   |    |   |     |     |

Data and specifications subject to change without notice.  
This product has been designed and qualified for Industrial Level and Lead-Free.  
Qualification Standards can be found on IR's Web site.

International  
**IR** Rectifier

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