

## SD153N/R SERIES

### FAST RECOVERY DIODES

### Stud Version

#### Features

- High power FAST recovery diode series
- 1.0 to 1.5  $\mu$ s recovery time
- High voltage ratings up to 1600V
- High current capability
- Optimized turn on and turn off characteristics
- Low forward recovery
- Fast and soft reverse recovery
- Compression bonded encapsulation
- Stud version JEDEC DO-30
- Maximum junction temperature 125°C

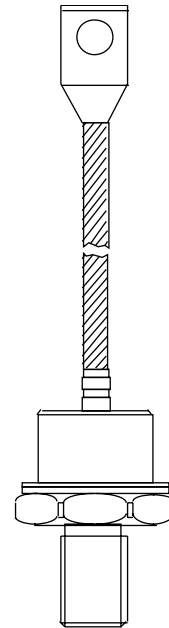
150A

#### Typical Applications

- Snubber diode for GTO
- High voltage free-wheeling diode
- Fast recovery rectifier applications

#### Major Ratings and Characteristics

| Parameters       | SD153N/R    | Units             |
|------------------|-------------|-------------------|
| $I_{F(AV)}$      | 150         | A                 |
| @ $T_C$          | 85          | °C                |
| $I_{F(RMS)}$     | 235         | A                 |
| $I_{FSM}$ @ 50Hz | 4280        | A                 |
| @ 60Hz           | 4480        | A                 |
| $I^2t$ @ 50Hz    | 92          | KA <sup>2</sup> s |
| @ 60Hz           | 84          | KA <sup>2</sup> s |
| $V_{RRM}$ range  | 400 to 1600 | V                 |
| $t_{rr}$ range   | 1.0 to 1.5  | $\mu$ s           |
| @ $T_J$          | 25          | °C                |
| $T_J$            | - 40 to 125 | °C                |



case style  
DO-205AC (DO-30)

## SD153N/R Series

Bulletin I2063 rev. A 09/94

International  
IOR Rectifier

### ELECTRICAL SPECIFICATIONS

#### Voltage Ratings

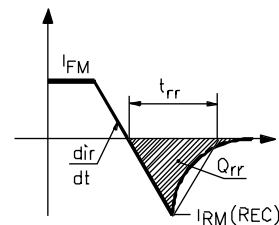
| Type number   | Voltage Code | $V_{RRM}$ max. repetitive peak and off-state voltage<br>V | $V_{RSM}$ , maximum non-repetitive peak voltage<br>V | $I_{RRM}$ max.<br>$T_J = 125^\circ\text{C}$<br>mA |
|---------------|--------------|-----------------------------------------------------------|------------------------------------------------------|---------------------------------------------------|
| SD153N/R..S10 | 04           | 400                                                       | 500                                                  | 35                                                |
|               | 08           | 800                                                       | 900                                                  |                                                   |
|               | 10           | 1000                                                      | 1100                                                 |                                                   |
| SD153N/R..S15 | 12           | 1200                                                      | 1300                                                 |                                                   |
|               | 14           | 1400                                                      | 1500                                                 |                                                   |
|               | 16           | 1600                                                      | 1700                                                 |                                                   |

#### Forward Conduction

| Parameter                                                     | SD153N/R | Units              | Conditions                                                                                   |
|---------------------------------------------------------------|----------|--------------------|----------------------------------------------------------------------------------------------|
| $I_{F(AV)}$ Max. average forward current @ Case temperature   | 150      | A                  | 180° conduction, half sine wave.                                                             |
|                                                               | 85       | °C                 |                                                                                              |
| $I_{F(RMS)}$ Max. RMS current                                 | 235      | A                  | DC @ 74°C case temperature                                                                   |
| $I_{FSM}$ Max. peak, one-cycle non-repetitive forward current | 4280     | A                  | t = 10ms No voltage                                                                          |
|                                                               | 4480     |                    | t = 8.3ms reapplied                                                                          |
|                                                               | 3600     |                    | t = 10ms 100% $V_{RRM}$                                                                      |
|                                                               | 3770     |                    | t = 8.3ms reapplied                                                                          |
| $I^2t$ Maximum $I^2t$ for fusing                              | 92       | KA <sup>2</sup> s  | t = 10ms No voltage                                                                          |
|                                                               | 84       |                    | t = 8.3ms reapplied                                                                          |
|                                                               | 65       |                    | t = 10ms 100% $V_{RRM}$                                                                      |
|                                                               | 59       |                    | t = 8.3ms reapplied                                                                          |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing                | 916      | KA <sup>2</sup> √s | t = 0.1 to 10ms, no voltage reapplied                                                        |
| $V_{F(TO)1}$ Low level of threshold voltage                   | 1.00     | V                  | $(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$ , $T_J = T_J \text{ max.}$ |
| $V_{F(TO)2}$ High level of threshold voltage                  | 1.46     |                    | $(I > \pi \times I_{F(AV)})$ , $T_J = T_J \text{ max.}$                                      |
| $r_{f1}$ Low level of forward slope resistance                | 1.35     | mΩ                 | $(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$ , $T_J = T_J \text{ max.}$ |
| $r_{f2}$ High level of forward slope resistance               | 0.52     |                    | $(I > \pi \times I_{F(AV)})$ , $T_J = T_J \text{ max.}$                                      |
| $V_{FM}$ Max. forward voltage                                 | 1.55     | V                  | $I_{pk} = 470 \text{ A}$ , $T_J = 25^\circ\text{C}$ , $t_p = 400 \mu\text{s}$ square pulse   |

#### Recovery Characteristics

| Code | $T_J = 25^\circ\text{C}$<br>typical $t_{rr}$<br>@ 25% $I_{RRM}$<br>(μs) | Test conditions                 |                   |              | Max. values @ $T_J = 125^\circ\text{C}$ |                  |                 |
|------|-------------------------------------------------------------------------|---------------------------------|-------------------|--------------|-----------------------------------------|------------------|-----------------|
|      |                                                                         | $I_{pk}$<br>Square Pulse<br>(A) | $di/dt$<br>(A/μs) | $V_r$<br>(V) | $t_{rr}$<br>@ 25% $I_{RRM}$<br>(μs)     | $Q_{rr}$<br>(μC) | $I_{rr}$<br>(A) |
| S10  | 1.0                                                                     | 350                             | 25                | -30          | 1.6                                     | 21               | 27              |
| S15  | 1.5                                                                     |                                 |                   |              | 2.3                                     | 61               | 37              |



### Thermal and Mechanical Specification

| Parameter                                            | SD153N/R         | Units | Conditions                                 |
|------------------------------------------------------|------------------|-------|--------------------------------------------|
| $T_J$ Max. operating temperature range               | -40 to 125       | °C    |                                            |
| $T_{stg}$ Max. storage temperature range             | -40 to 150       |       |                                            |
| $R_{thJC}$ Max. thermal resistance, junction to case | 0.16             | K/W   | DC operation                               |
| $R_{thCS}$ Max. thermal resistance, case to heatsink | 0.10             |       | Mounting surface, smooth, flat and greased |
| $T$ Mounting torque $\pm 10\%$                       | 15.5             | Nm    | Not lubricated threads                     |
|                                                      | 13.5             |       | Lubricated threads                         |
| wt Approximate weight                                | 120              | g     |                                            |
| Case style                                           | DO-205AC (DO-30) |       | See Outline Table                          |

### $\Delta R_{thJC}$ Conduction

(The following table shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC)

| Conduction angle | Sinusoidal conduction | Rectangular conduction | Units | Conditions                 |
|------------------|-----------------------|------------------------|-------|----------------------------|
| 180°             | 0.011                 | 0.012                  | K/W   | $T_J = T_{J \text{ max.}}$ |
| 120°             | 0.016                 | 0.019                  |       |                            |
| 90°              | 0.021                 | 0.023                  |       |                            |
| 60°              | 0.029                 | 0.030                  |       |                            |
| 30°              | 0.041                 | 0.041                  |       |                            |

### Ordering Information Table

### Device Code

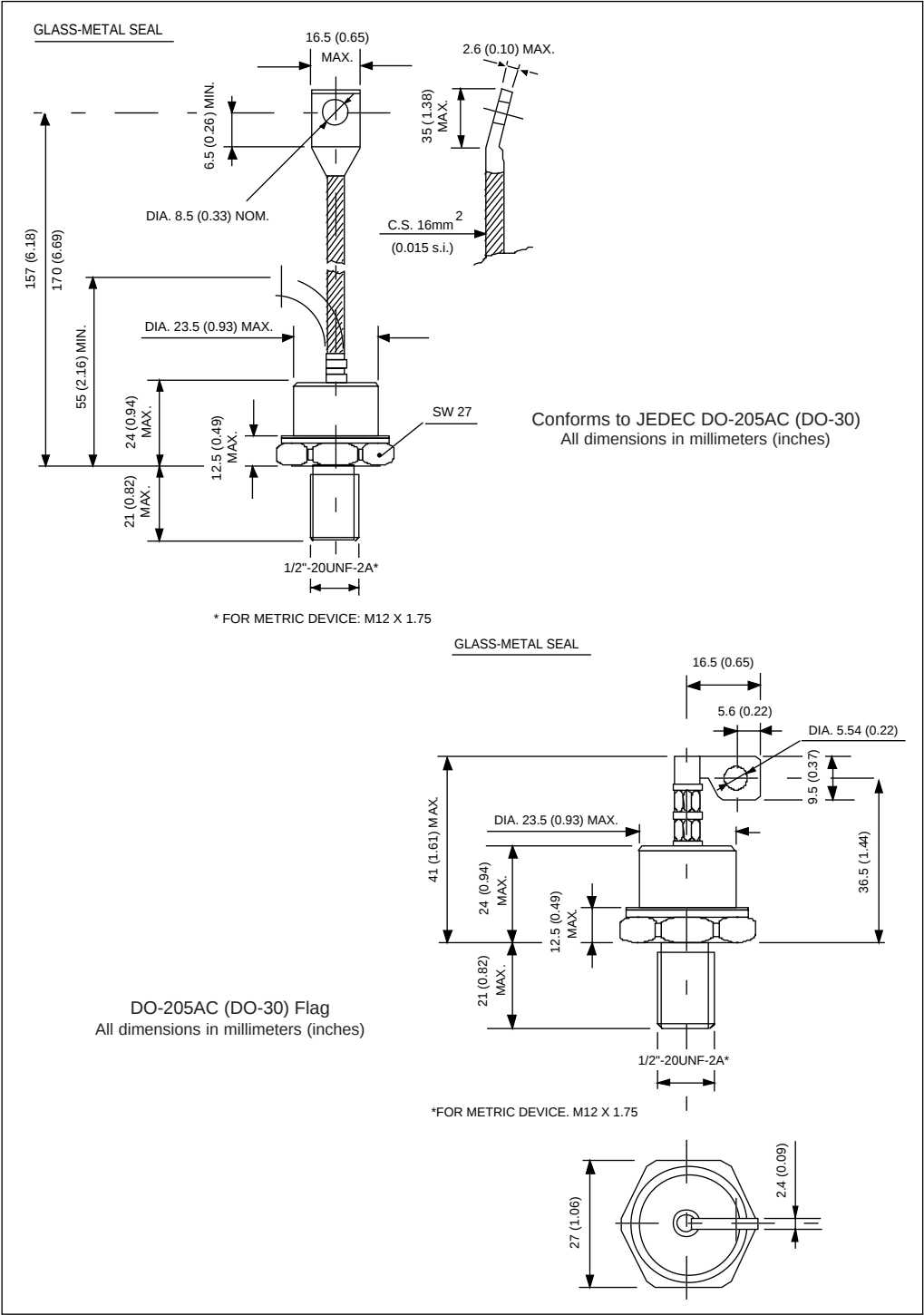
|    |    |   |   |    |     |   |   |   |
|----|----|---|---|----|-----|---|---|---|
| SD | 15 | 3 | R | 16 | S15 | P | B | V |
| ①  | ②  | ③ | ④ | ⑤  | ⑥   | ⑦ | ⑧ | ⑨ |

- 1** - Diode
- 2** - Essential part number
- 3** - 3 = Fast recovery
- 4** - N = Stud Normal Polarity (Cathode to Stud)  
R = Stud Reverse Polarity (Anode to Stud)
- 5** - Voltage code: Code x 100 =  $V_{RRM}$  (see Voltage Ratings table)
- 6** -  $t_{rr}$  code (see Recovery Characteristics table)
- 7** - P = Stud base DO-205AC (DO-30) 1/2" 20UNF-2A  
M = Stud base DO-205AC (DO-30) M12 X 1.75
- 8** - B = Flag top terminals (for Cathode/ Anode Leads)  
S = Isolated lead with silicone sleeve  
(Red = Reverse Polarity; Blue = Normal Polarity)  
None = Not isolated lead
- 9** - V = Glass-metal seal

**SD153N/R Series**

Bulletin I2063 rev. A 09/94

**Outline Table**



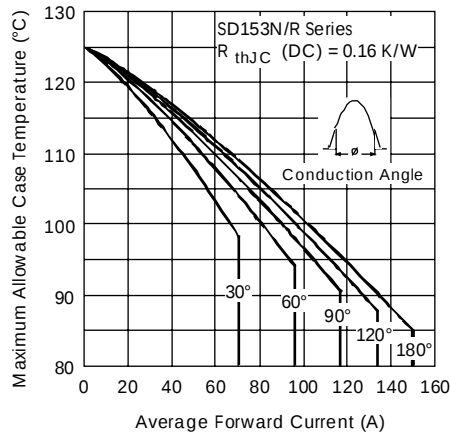


Fig. 1 - Current Ratings Characteristics

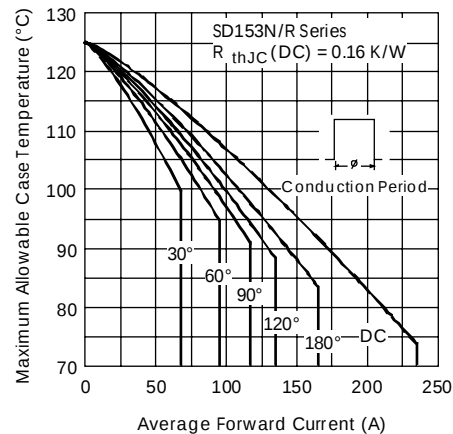


Fig. 2 - Current Ratings Characteristics

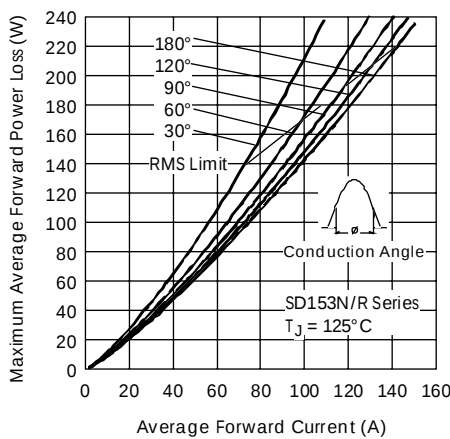


Fig. 3 - Forward Power Loss Characteristics

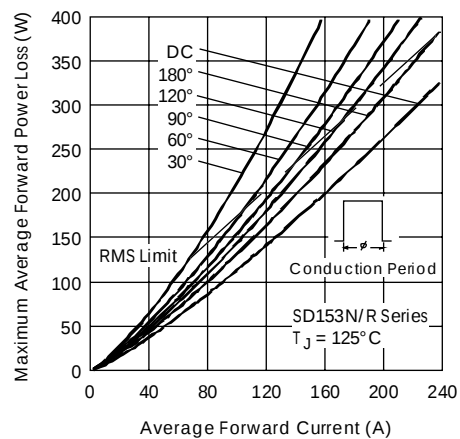


Fig. 4 - Forward Power Loss Characteristics

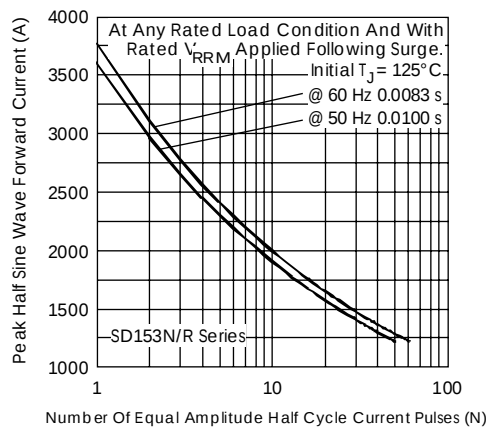


Fig. 5 - Maximum Non-repetitive Surge Current

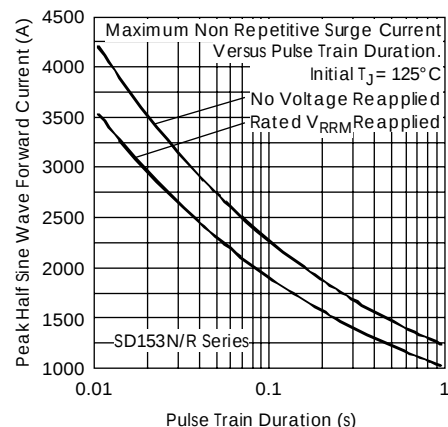


Fig. 6 - Maximum Non-repetitive Surge Current

## SD153N/R Series

Bulletin I2063 rev. A 09/94

International  
**IR** Rectifier

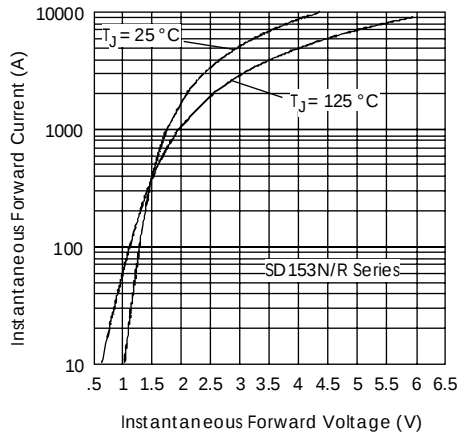


Fig. 7 - Forward Voltage Drop Characteristics

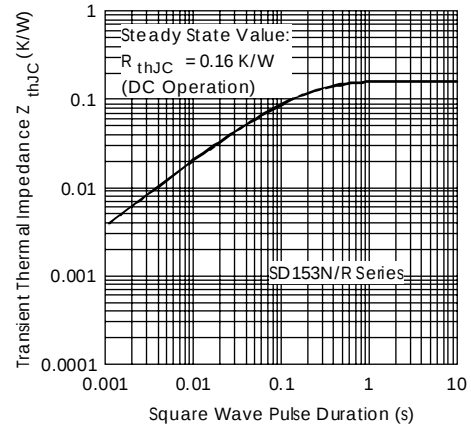


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

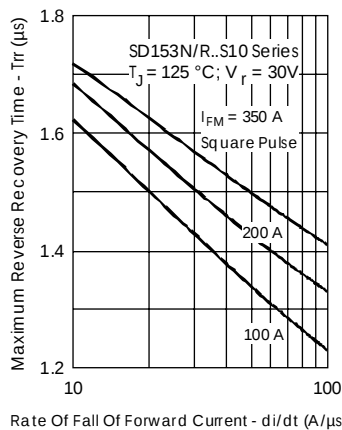


Fig. 9 - Recovery Time Characteristics

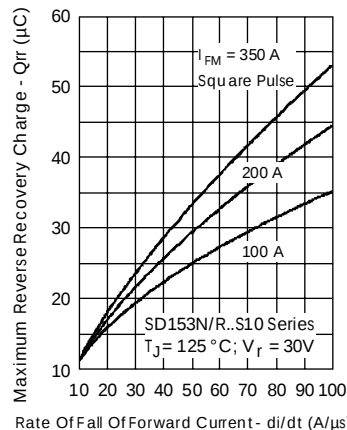


Fig. 10 - Recovery Charge Characteristics

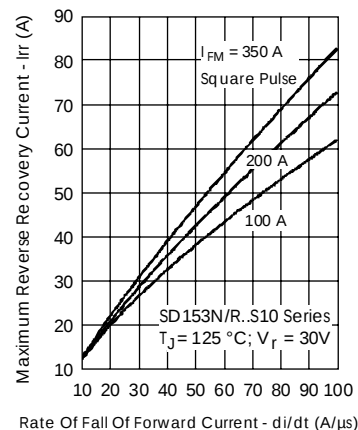


Fig. 11 - Recovery Current Characteristics

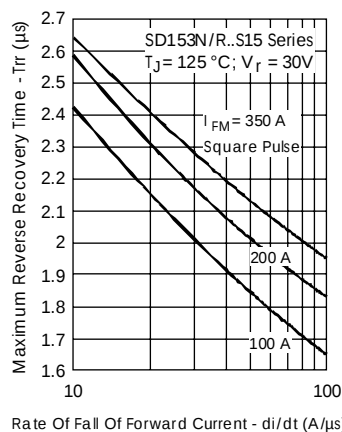


Fig. 12 - Recovery Time Characteristics

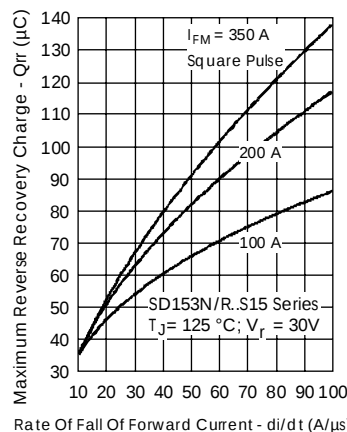


Fig. 13 - Recovery Charge Characteristics

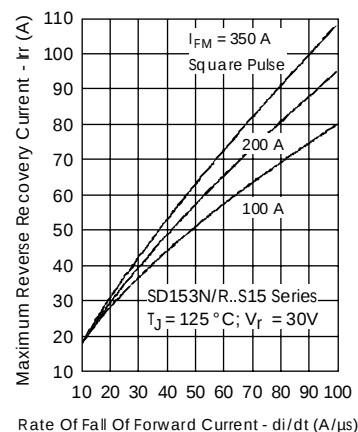


Fig. 14 - Recovery Current Characteristics

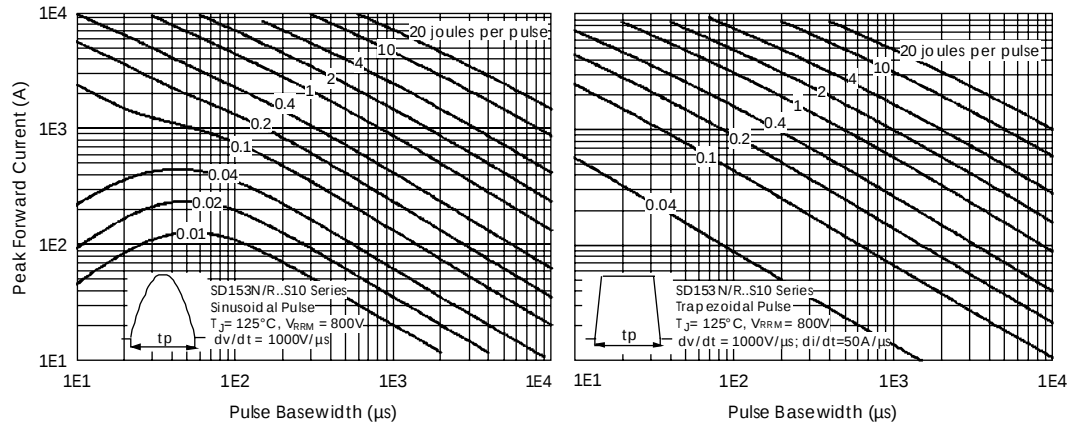


Fig. 15 - Maximum Total Energy Loss Per Pulse Characteristics

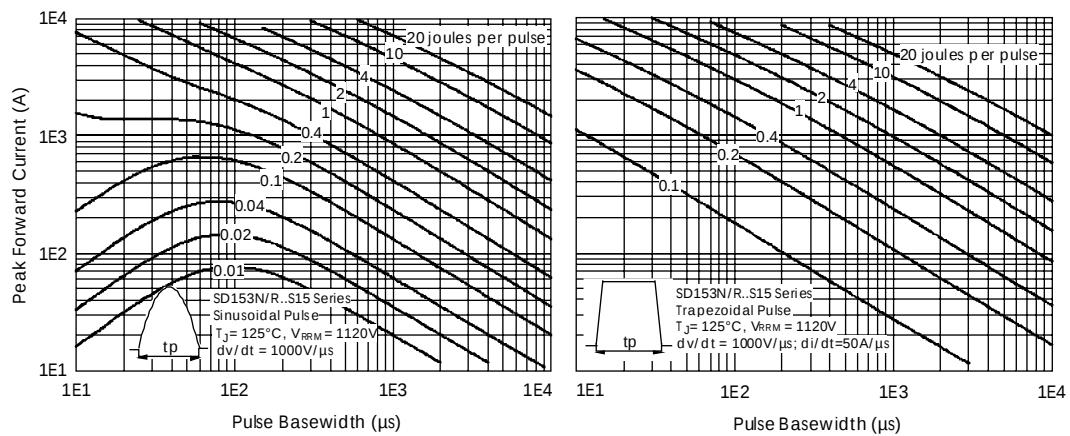


Fig. 16 - Maximum Total Energy Loss Per Pulse Characteristics