

### FAST RECOVERY DIODES

### Stud Version

#### Features

- High power FAST recovery diode series
- 1.0 to 2.0  $\mu\text{s}$  recovery time
- High voltage ratings up to 2500V
- 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-205AB (DO-9)
- Maximum junction temperature 125°C

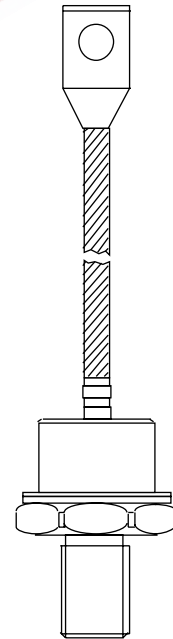
200A

#### Typical Applications

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

#### Major Ratings and Characteristics

| Parameters       | SD203N/R    | Units             |
|------------------|-------------|-------------------|
| $I_{F(AV)}$      | 200         | A                 |
| @ $T_C$          | 85          | °C                |
| $I_{F(RMS)}$     | 314         | A                 |
| $I_{FSM}$ @ 50Hz | 4990        | A                 |
| @ 60Hz           | 5230        | A                 |
| $I^2t$ @ 50Hz    | 125         | KA <sup>2</sup> s |
| @ 60Hz           | 114         | KA <sup>2</sup> s |
| $V_{RRM}$ range  | 400 to 2500 | V                 |
| $t_{rr}$ range   | 1.0 to 2.0  | $\mu\text{s}$     |
| @ $T_J$          | 25          | °C                |
| $T_J$            | - 40 to 125 | °C                |



case style  
DO-205AB (DO-9)

## SD203N/R Series

Bulletin I2064 rev. A 09/94

International  
IR Rectifier

### ELECTRICAL SPECIFICATIONS

#### Voltage Ratings

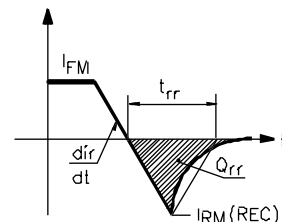
| Type number   | Voltage Code | $V_{RRM}$ max. repetitive peak and off-state voltage<br>V | $V_{RSM}$ , maximum non-repetitive peak voltage<br>V | $I_{RRM}$ max.<br>$T_J = 125^\circ\text{C}$<br>mA |
|---------------|--------------|---|--|---|
| SD203N/R..S10 | 04           | 400   | 500  | 35  |
|               | 08           | 800   | 900  |   |
|               | 10           | 1000  | 1100   |   |
| SD203N/R..S15 | 12           | 1200  | 1300   |   |
|               | 14           | 1400  | 1500   |   |
|               | 16           | 1600  | 1700   |   |
| SD203N/R..S20 | 20           | 2000  | 2100   |   |
|               | 25           | 2500  | 2600   |   |

#### Forward Conduction

| Parameter   | SD203N/R | Units              | Conditions   |
|---|----------|--------------------|--|
| $I_{F(AV)}$ Max. average forward current @ Case temperature   | 200      | A                  | 180° conduction, half sine wave.   |
|   | 85       | °C                 |  |
| $I_{F(RMS)}$ Max. RMS current                                 | 314      | A                  | DC @ 76°C case temperature   |
| $I_{FSM}$ Max. peak, one-cycle non-repetitive forward current | 4990     | A                  | t = 10ms No voltage  |
|   | 5230     |                    | t = 8.3ms reapplied  |
|   | 4200     |                    | t = 10ms 100% $V_{RRM}$  |
|   | 4400     |                    | t = 8.3ms reapplied  |
| $I^2t$ Maximum $I^2t$ for fusing                              | 125      | KA <sup>2</sup> s  | t = 10ms No voltage  |
|   | 114      |                    | t = 8.3ms reapplied  |
|   | 88       |                    | t = 10ms 100% $V_{RRM}$  |
|   | 81       |                    | t = 8.3ms reapplied  |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing                | 1250     | 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% $\times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)}$ ), $T_J = T_J$ max.      |
| $V_{F(TO)2}$ High level of threshold voltage                  | 1.47     |                    | ( $I > \pi \times I_{F(AV)}$ ), $T_J = T_J$ max.   |
| $r_{f1}$ Low level of forward slope resistance                | 1.10     | mΩ                 | (16.7% $\times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)}$ ), $T_J = T_J$ max.      |
| $r_{f2}$ High level of forward slope resistance               | 0.46     |                    | ( $I > \pi \times I_{F(AV)}$ ), $T_J = T_J$ max.   |
| $V_{FM}$ Max. forward voltage                                 | 1.65     | V                  | $I_{pk} = 628\text{A}$ , $T_J = 25^\circ\text{C}$ , $t_p = 400 \mu\text{s}$ square pulse |

#### Recovery Characteristics

| Code | $T_J = 25^\circ\text{C}$<br>typical $t_{rr}$<br>@ 25% $I_{RRM}$<br>( $\mu\text{s}$ ) | Test conditions                 |                                |              | Max. values @ $T_J = 125^\circ\text{C}$          |                               |                 |
|------|--|---------------------------------|--------------------------------|--------------|--|-------------------------------|-----------------|
|      |  | $I_{pk}$<br>Square Pulse<br>(A) | $di/dt$<br>(A/ $\mu\text{s}$ ) | $V_r$<br>(V) | $t_{rr}$<br>@ 25% $I_{RRM}$<br>( $\mu\text{s}$ ) | $Q_{rr}$<br>( $\mu\text{C}$ ) | $I_{rr}$<br>(A) |
| S10  | 1.0  | 750                             | 25                             | -30          | 2.4  | 52                            | 33              |
| S15  | 1.5  |                                 |                                |              | 2.9  | 90                            | 44              |
| S20  | 2.0  |                                 |                                |              | 3.2  | 107                           | 46              |



**Thermal and Mechanical Specification**

| Parameter   | SD203N/R        | Units | Conditions                                 |
|---|-----------------|-------|--|
| T <sub>J</sub> Max. operating temperature range             | -40 to 125      | °C    |  |
| T <sub>stg</sub> Max. storage temperature range             | -40 to 150      |       |  |
| R <sub>thJC</sub> Max. thermal resistance, junction to case | 0.115           | K/W   | DC operation                               |
| R <sub>thCS</sub> Max. thermal resistance, case to heatsink | 0.08            |       | Mounting surface, smooth, flat and greased |
| T Mounting torque ±10%                                      | 31              | Nm    | Not lubricated threads                     |
|   | 24.5            |       | Lubricated threads                         |
| wt Approximate weight                                       | 250             | g     |  |
| Case style  | DO-205AB (DO-9) |       | See Outline Table                          |

**ΔR<sub>thJC</sub> Conduction**

(The following table shows the increment of thermal resistance R<sub>thJC</sub> when devices operate at different conduction angles than DC)

| Conduction angle | Sinusoidal conduction | Rectangular conduction | Units | Conditions                           |
|------------------|-----------------------|------------------------|-------|--------------------------------------|
| 180°             | 0.010                 | 0.008                  | K/W   | T <sub>J</sub> = T <sub>J</sub> max. |
| 120°             | 0.013                 | 0.014                  |       |                                      |
| 90°              | 0.017                 | 0.019                  |       |                                      |
| 60°              | 0.025                 | 0.027                  |       |                                      |
| 30°              | 0.044                 | 0.044                  |       |                                      |

**Ordering Information Table**

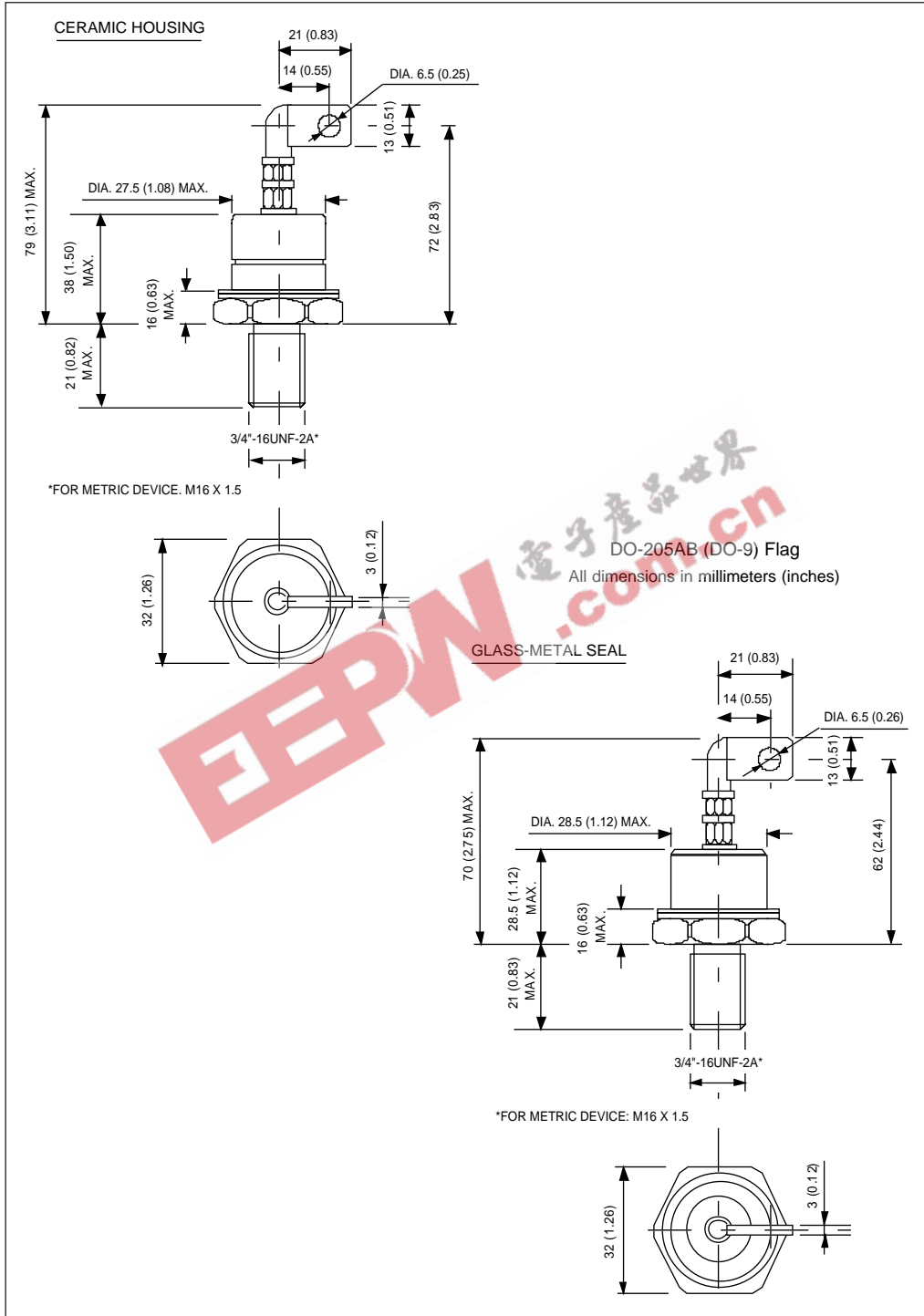
Device Code

|    |    |   |   |    |     |   |   |   |
|----|----|---|---|----|-----|---|---|---|
| SD | 20 | 3 | R | 25 | S20 | P | B | C |
| 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<sub>RRM</sub> (see Voltage Ratings table)
- 6** - t<sub>rr</sub> code (see Recovery Characteristics table)
- 7** - P = Stud base DO-205AB (DO-9) 3/4" 16UNF-2A  
M = Stud base DO-205AB (DO-9) M16 X 1.5
- 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** - C = Ceramic housing (over 1600V)  
V = Glass-metal seal (only up to 1600V)



Outline Table



# SD203N/R Series

Bulletin I2064 rev. A 09/94

International  
IRF Rectifier

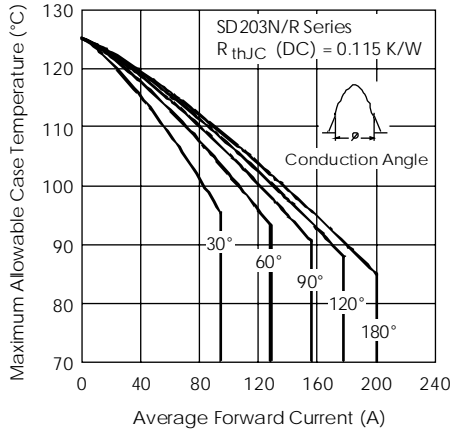


Fig. 1 - Current Ratings Characteristics

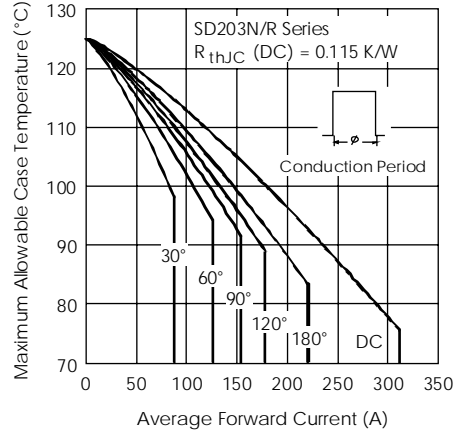


Fig. 2 - Current Ratings Characteristics

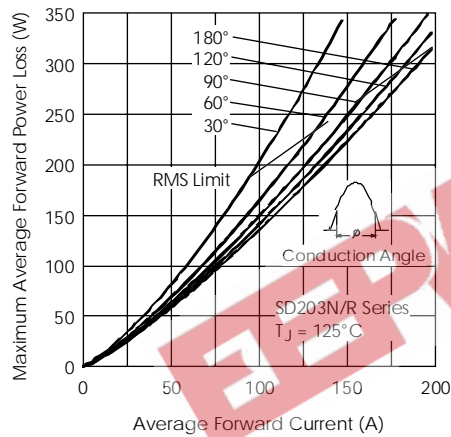


Fig. 3 - Forward Power Loss Characteristics

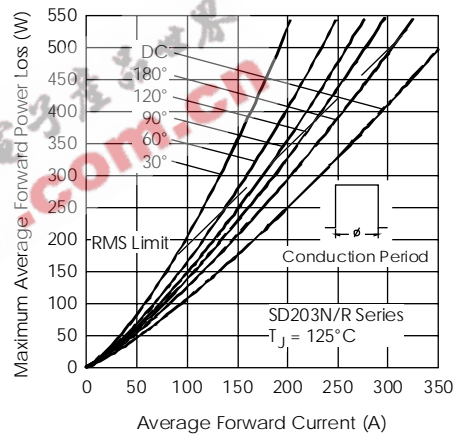


Fig. 4 - Forward Power Loss Characteristics

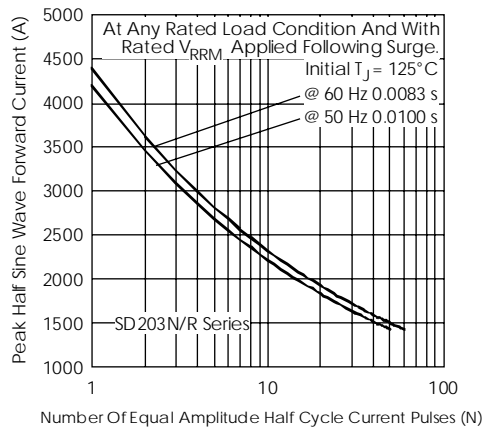


Fig. 5 - Maximum Non-repetitive Surge Current

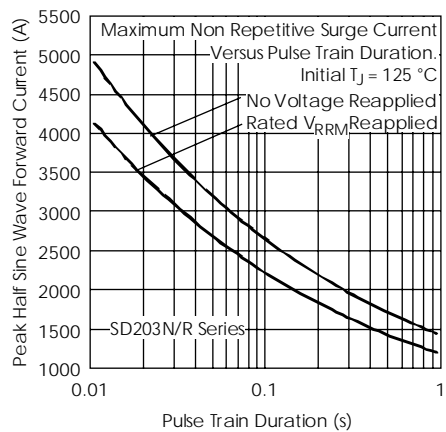


Fig. 6 - Maximum Non-repetitive Surge Current

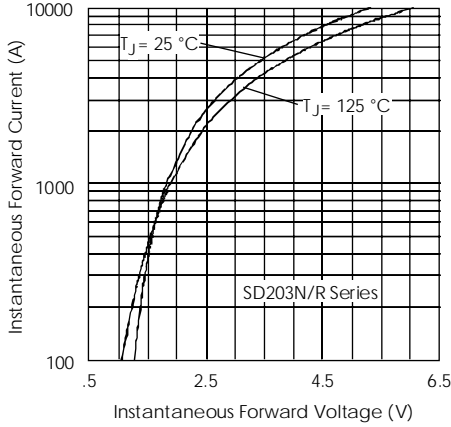


Fig. 7 - Forward Voltage Drop Characteristics

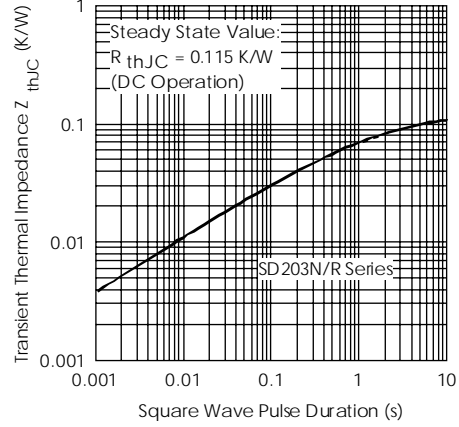


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

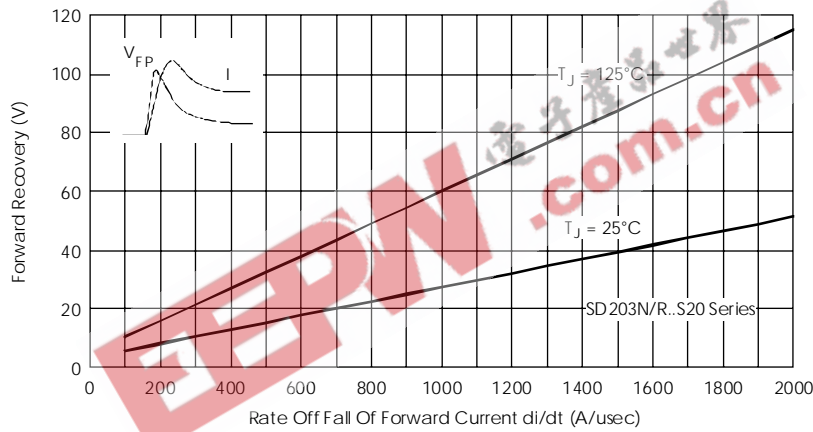


Fig. 9 - Typical Forward Recovery Characteristics

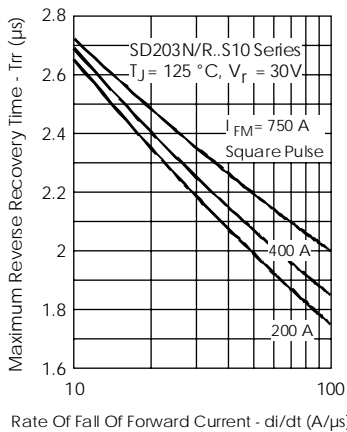


Fig. 10 - Recovery Time Characteristics

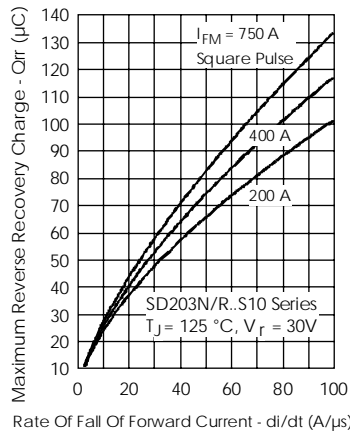


Fig. 11 - Recovery Charge Characteristics

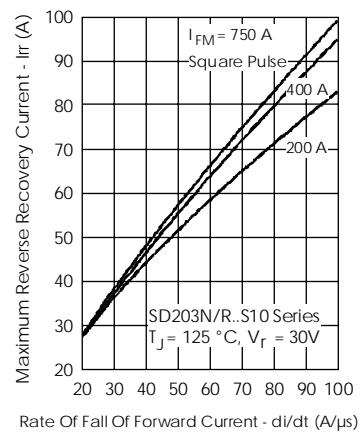


Fig. 12 - Recovery Current Characteristics

# SD203N/R Series

Bulletin I2064 rev. A 09/94

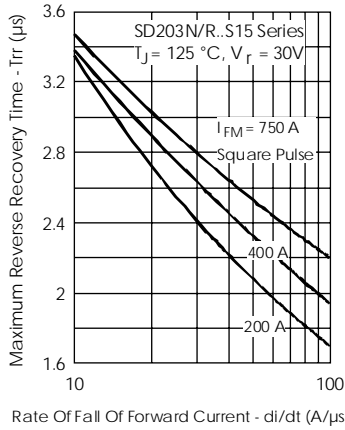


Fig. 13 - Recovery Time Characteristics

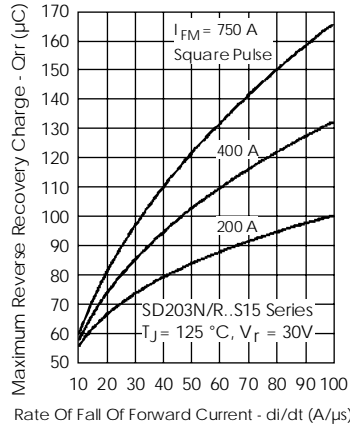


Fig. 14 - Recovery Charge Characteristics

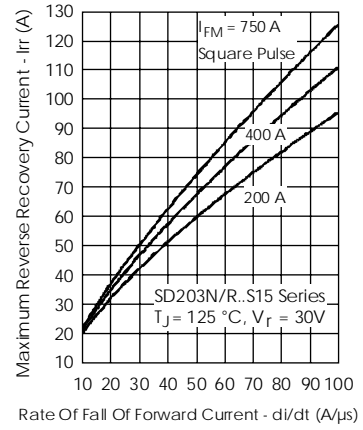


Fig. 15 - Recovery Current Characteristics

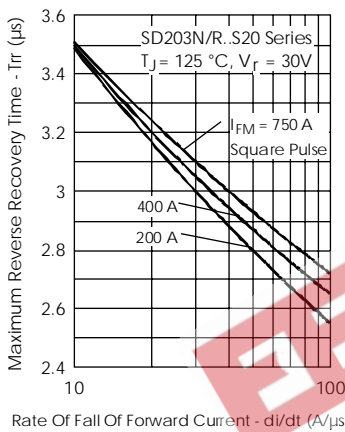


Fig. 16 - Recovery Time Characteristics

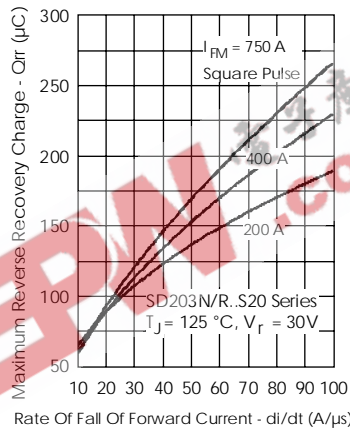


Fig. 17 - Recovery Charge Characteristics

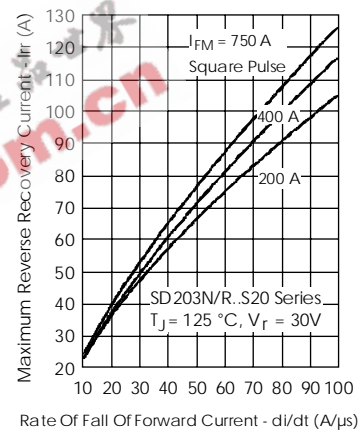


Fig. 18 - Recovery Current Characteristics

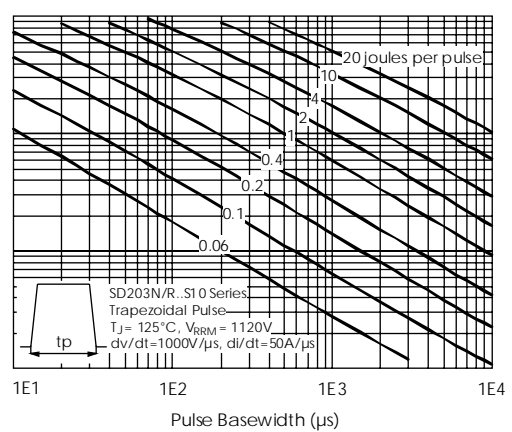
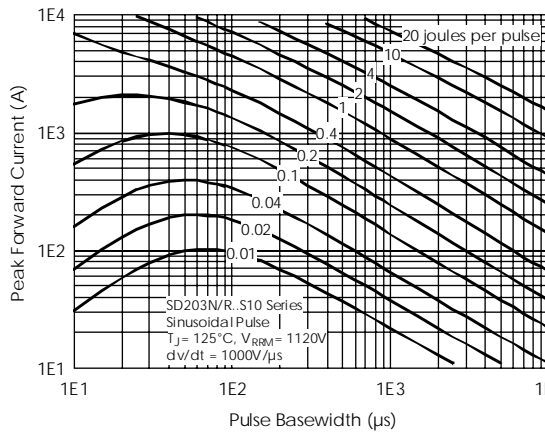


Fig. 19 - Maximum Total Energy Loss Per Pulse Characteristics



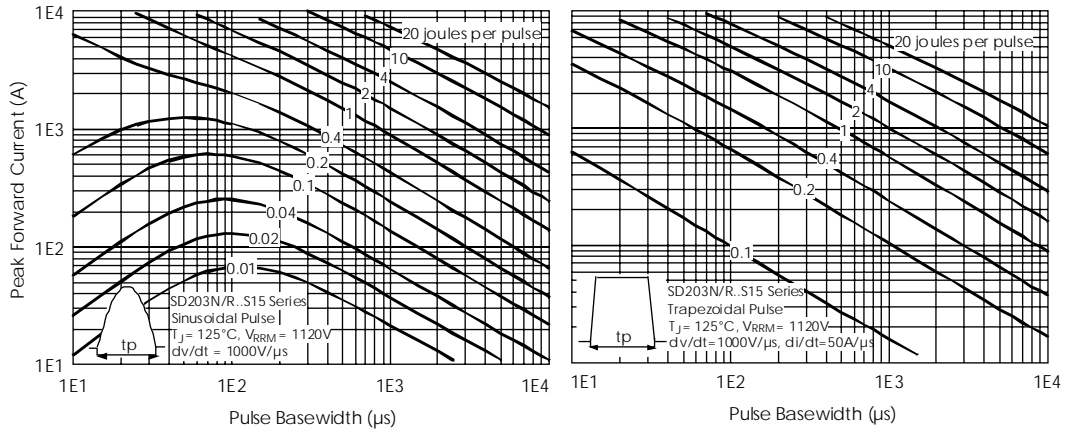


Fig. 20 - Maximum Total Energy Loss Per Pulse Characteristics

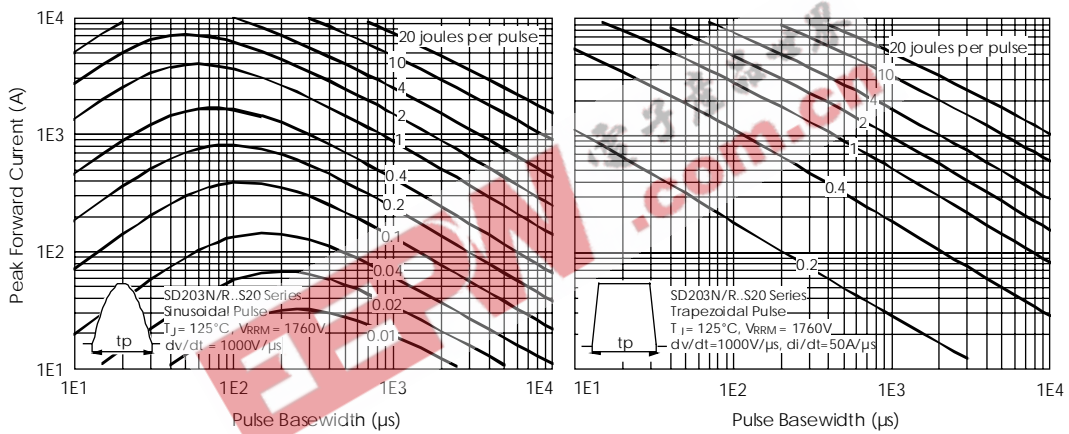


Fig. 21 - Maximum Total Energy Loss Per Pulse Characteristics