



# SD253N/R SERIES

## FAST RECOVERY DIODES

Stud Version

### Features

- High power FAST recovery diode series
- 1.5 to 2.0  $\mu$ 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-205AB (DO-9)
- Maximum junction temperature 125°C

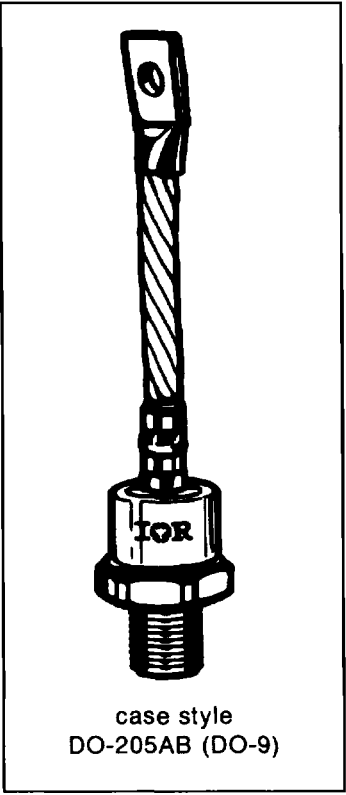
250A

### Typical Applications

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

### Major Ratings and Characteristics

| Parameters       | SD253N/R    | Units             |
|------------------|-------------|-------------------|
| $I_{F(AV)}$      | 250         | A                 |
| @ $T_c$          | 85          | °C                |
| $I_{F(RMS)}$     | 392         | A                 |
| $I_{FSM}$ @ 50Hz | 5350        | A                 |
| @ 60Hz           | 5600        | A                 |
| $I^2t$ @ 50Hz    | 143         | KA <sup>2</sup> s |
| @ 60Hz           | 130         | KA <sup>2</sup> s |
| $V_{RRM}$ range  | 400 to 1600 | V                 |
| $t_{rr}$ range   | 1.5 to 2.0  | $\mu$ s           |
| @ $T_J$          | 25          | °C                |
| $T_J$            | - 40 to 125 | °C                |



FAST REC  
DIODE

## SD253N/R Series

### ELECTRICAL SPECIFICATIONS

#### Voltage Ratings

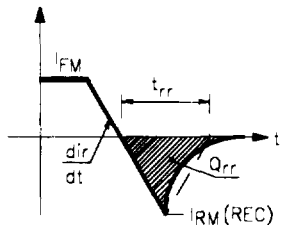
| Type number   | Voltage Code | $V_{RRM}$ max. repetitive peak and off-state voltage<br>V | $V_{RSM}$ , maximum non-repetitive peak voltage<br>V | $I_{RRM}$ max.<br>$T_J = 125^\circ\text{C}$<br>mA |
|---------------|--------------|-----------------------------------------------------------|------------------------------------------------------|---------------------------------------------------|
| SD253N/R..S15 | 04           | 400                                                       | 500                                                  | 35                                                |
|               | 08           | 800                                                       | 900                                                  |                                                   |
|               | 10           | 1000                                                      | 1100                                                 |                                                   |
| SD253N/R..S20 | 12           | 1200                                                      | 1300                                                 |                                                   |
|               | 14           | 1400                                                      | 1500                                                 |                                                   |
|               | 16           | 1600                                                      | 1700                                                 |                                                   |

#### Forward Conduction

| Parameter                                                        | SD253N/R | Units                        | Conditions                                                                                      |
|------------------------------------------------------------------|----------|------------------------------|-------------------------------------------------------------------------------------------------|
| $I_{F(AV)}$ Max. average forward current<br>@ Case temperature   | 250      | A                            | 180° conduction, half sine wave.                                                                |
|                                                                  | 85       | °C                           |                                                                                                 |
| $I_{F(RMS)}$ Max. RMS current                                    | 392      | A                            | DC @ 74°C case temperature                                                                      |
| $I_{FSM}$ Max. peak, one-cycle<br>non-repetitive forward current | 5350     | A                            | $t = 10\text{ms}$ No voltage                                                                    |
|                                                                  | 5600     |                              | $t = 8.3\text{ms}$ reapplied                                                                    |
|                                                                  | 4500     |                              | $t = 10\text{ms}$ 100% $V_{RRM}$                                                                |
|                                                                  | 4710     |                              | $t = 8.3\text{ms}$ reapplied                                                                    |
| $I^2t$ Maximum $I^2t$ for fusing                                 | 143      | $\text{KA}^2\text{s}$        | $t = 10\text{ms}$ No voltage                                                                    |
|                                                                  | 130      |                              | $t = 8.3\text{ms}$ reapplied                                                                    |
|                                                                  | 101      |                              | $t = 10\text{ms}$ 100% $V_{RRM}$                                                                |
|                                                                  | 92       |                              | $t = 8.3\text{ms}$ reapplied                                                                    |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing                   | 1430     | $\text{KA}^2\sqrt{\text{s}}$ | $t = 0.1$ to $10\text{ms}$ , no voltage reapplied                                               |
| $V_{F(TO)1}$ Low level of threshold voltage                      | 0.87     | 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                     | 1.17     |                              | $I > \pi \times I_{F(AV)}$ , $T_J = T_J \text{ max.}$                                           |
| $r_{f1}$ Low level of forward slope resistance                   | 0.62     | $\text{m}\Omega$             | $(16.7\% \times \pi \times I_{F(AV)}) < I < \pi \times I_{F(AV)}$ , $T_J = T_J \text{ max.}$    |
| $r_{f2}$ High level of forward slope resistance                  | 0.29     |                              | $I > \pi \times I_{F(AV)}$ , $T_J = T_J \text{ max.}$                                           |
| $V_{FM}$ Max. forward voltage                                    | 1.38     | V                            | $I_{pk} = 785\text{A}$ , $T_J = 25^\circ\text{C}$ , $t_p = 400\text{ }\mu\text{s}$ 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) |
| S15  | 1.5                                                                                  | 750                             | 25                             | -30          | 2.9                                              | 90                            | 44              |
| S20  | 2.0                                                                                  |                                 |                                |              | 3.2                                              | 107                           | 46              |



## Thermal and Mechanical Specification

| Parameter                                            | SD253N/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 | 0.115           | K/W   | DC operation                               |
| $R_{thCS}$ Max. thermal resistance, case to heatsink | 0.08            |       | Mounting surface, smooth, flat and greased |
| $T$ Mounting torque $\pm 10\%$                       | 31              | Nm    | Not lubricated threads                     |
|                                                      | 24.5            |       | Lubricated threads                         |
| wt Approximate weight                                | 250             | g     |                                            |
| Case style                                           | DO-205AB (DO-9) |       | 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)

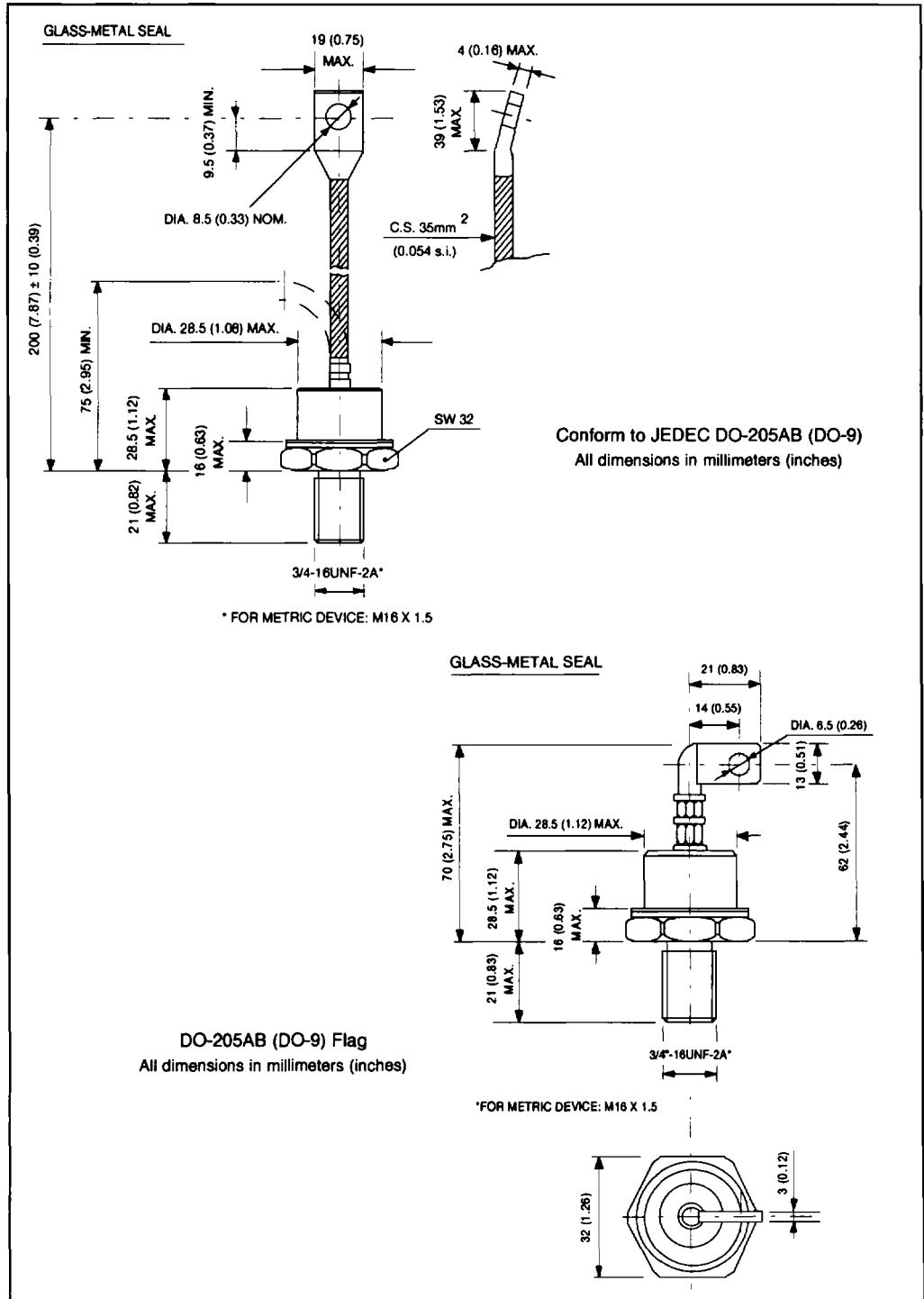
| Conduction angle | Sinusoidal conduction | Rectangular conduction | Units | Conditions                 |
|------------------|-----------------------|------------------------|-------|----------------------------|
| 180°             | 0.010                 | 0.008                  | K/W   | $T_J = T_{J \text{ max.}}$ |
| 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          | 25                                                                                                                                                                            | 3 | R | 16 | S20 | 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)<br>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<br>M = Stud base DO-205AB (DO-9) M16 X 1.5                                                                                      |   |   |    |     |   |   |   |
| 8           | - B = Flag top terminals (for Cathode/ Anode Leads)<br>S = Isolated lead with silicone sleeve<br>(Red = Reverse Polarity; Blue = Normal Polarity)<br>None = Not isolated lead |   |   |    |     |   |   |   |
| 9           | - V = Glass-metal seal                                                                                                                                                        |   |   |    |     |   |   |   |

# SD253N/R Series

## Outline Table



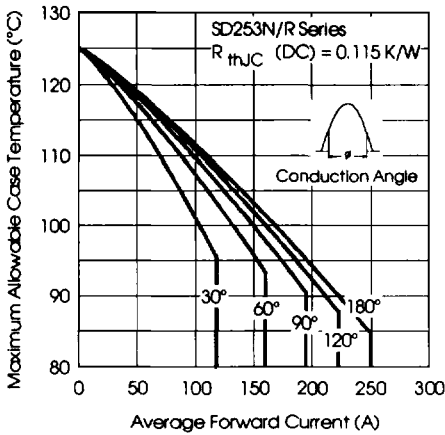


Fig. 1 - Current Ratings Characteristics

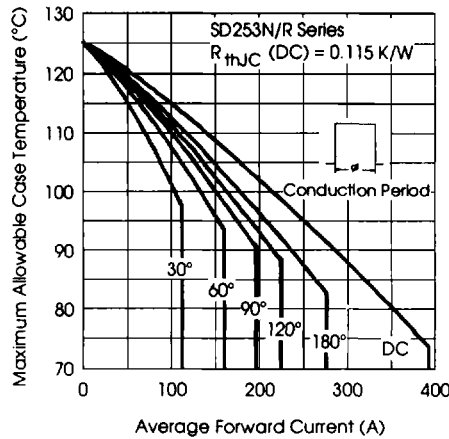


Fig. 2 - Current Ratings Characteristics

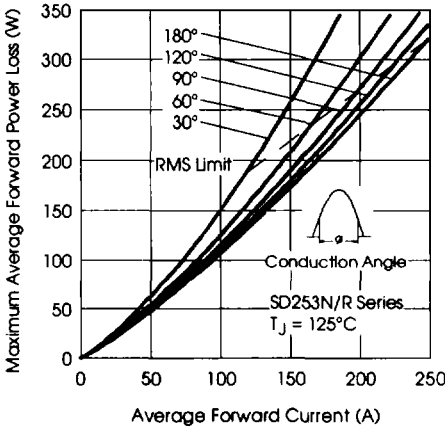


Fig. 3 - Forward Power Loss Characteristics

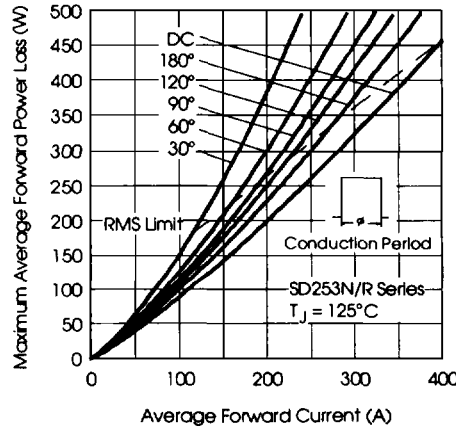


Fig. 4 - Forward Power Loss Characteristics

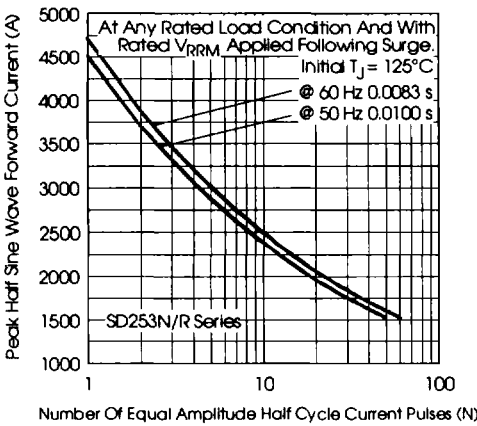


Fig. 5 - Maximum Non-repetitive Surge Current

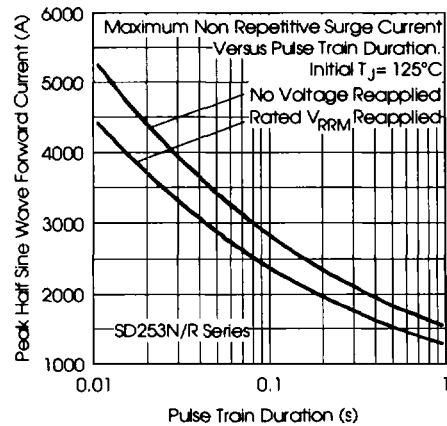


Fig. 6 - Maximum Non-repetitive Surge Current

## SD253N/R Series

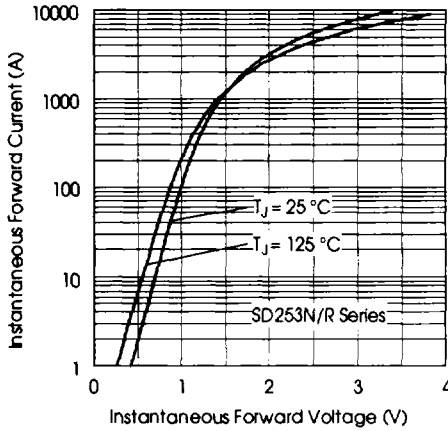


Fig. 7 - Forward Voltage Drop Characteristics

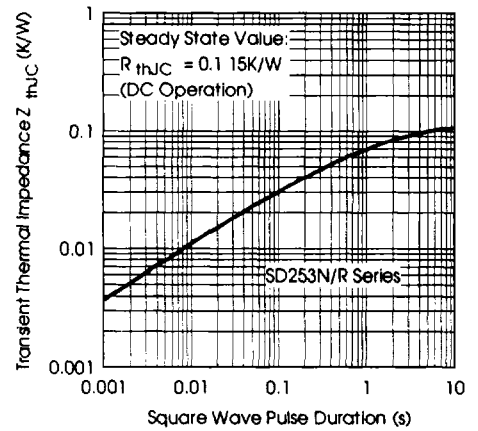


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

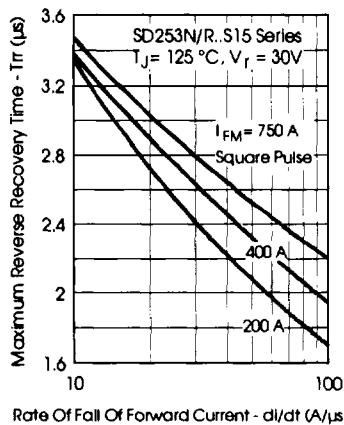


Fig. 9 - Recovery Time Characteristics

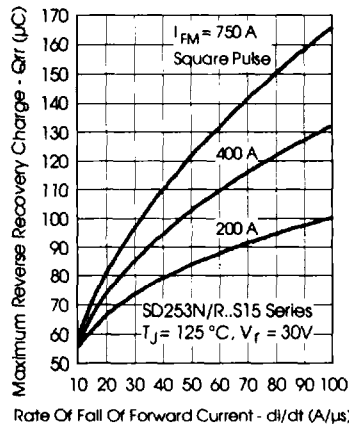


Fig. 10 - Recovery Charge Characteristics

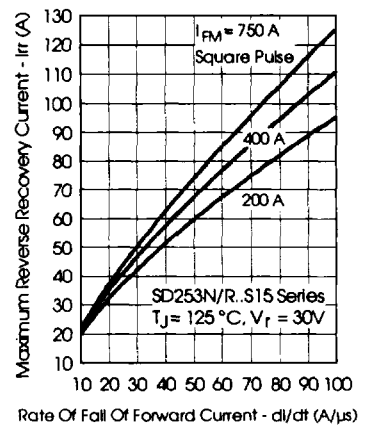


Fig. 11 - Recovery Current Characteristics

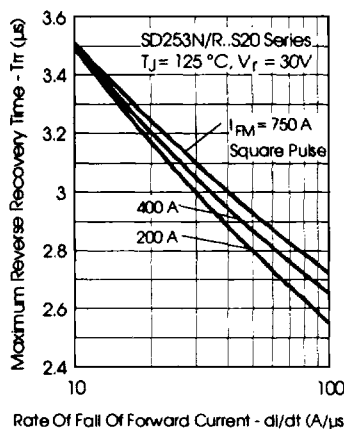


Fig. 12 - Recovery Time Characteristics

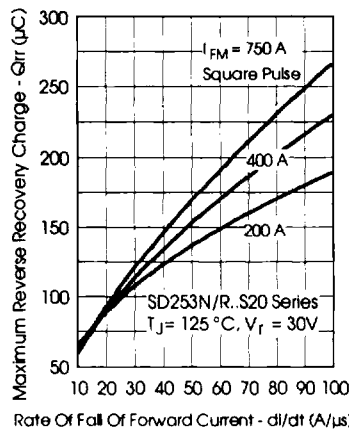


Fig. 13 - Recovery Charge Characteristics

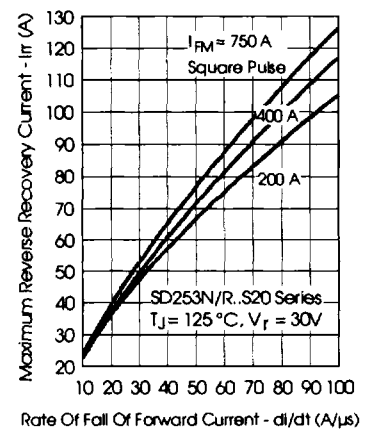


Fig. 14 - Recovery Current Characteristics

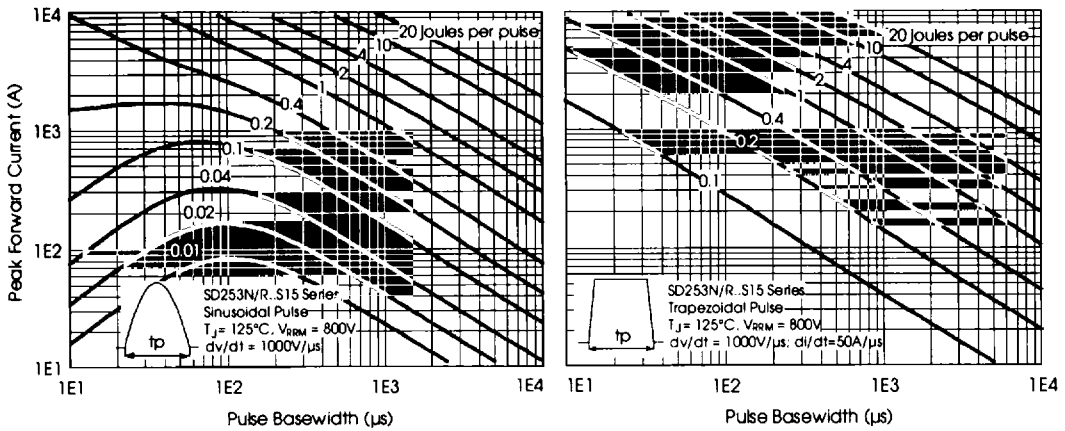


Fig. 15 - Maximum Total Energy Loss Per Pulse Characteristics

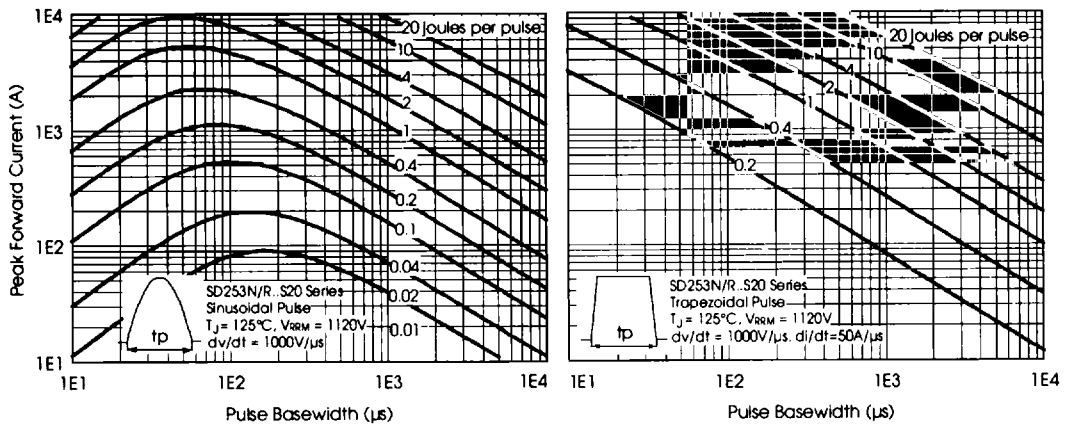


Fig. 16 - Maximum Total Energy Loss Per Pulse Characteristics