# THE DATASHEET OF

# SD233N36S50PSC

Bulletin I2094 rev. B 10/06

International
IOR Rectifier

# SD233N/R SERIES

## FAST RECOVERY DIODES

**Stud Version**

235A

### Features

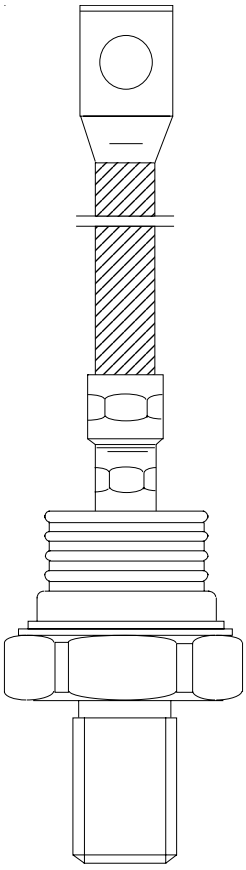
- High power FAST recovery diode series
- 4.5 µs recovery time
- High voltage ratings up to 4500V
- High current capability
- Optimized turn on and turn off characteristics
- Low forward recovery
- Fast and soft reverse recovery
- Compression bonded encapsulation
- Stud version case style B-8
- Maximum junction temperature 125°C
- RoHS Compliant

### Typical Applications

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

### Major Ratings and Characteristics

| Parameters | | SD233N/R | Units |
|---|---|---|---|
| $I_{F(AV)}$ | | 235 | A |
| | @ $T_C$ | 60 | °C |
| $I_{F(RMS)}$ | | 370 | A |
| $I_{FSM}$ | @ 50Hz | 5500 | A |
| | @ 60Hz | 5760 | A |
| $I^2t$ | @ 50Hz | 151 | $KA^2s$ |
| | @ 60Hz | 138 | $KA^2s$ |
| $V_{RRM}$ range | | 3000 to 4500 | V |
| $t_{rr}$ | | 4.5 | µs |
| | @ $T_J$ | 125 | °C |
| $T_J$ | | -40 to 125 | °C |



case style
B-8

## ELECTRICAL SPECIFICATIONS

### Voltage Ratings

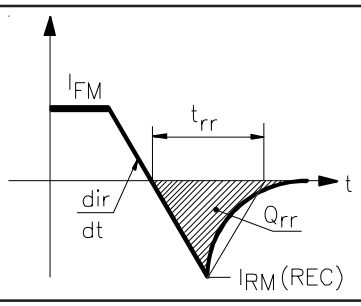
| Type number | Voltage Code | $V_{RRM}$ max. repetitive peak and off-state voltage V | $V_{RSM}$, maximum non-repetitive peak voltage V | $I_{RRM}$ max. $T_J$ = 125°C mA |
|---|---|---|---|---|
| SD233N/R | 30 | 3000 | 3100 | 50 |
| | 36 | 3600 | 3700 | |
| | 40 | 4000 | 4100 | |
| | 45 | 4500 | 4600 | |

### Forward Conduction

| | Parameter | SD233N/R | Units | Conditions | | |
|---|---|---|---|---|---|---|
| $I_{F(AV)}$ | Max. average forward current | 235 | A | 180° conduction, half sine wave. | | |
| | @ Case temperature | 60 | °C | | | |
| $I_{F(RMS)}$ | Max. RMS current | 370 | A | @ 45°C case temperature | | |
| $I_{FSM}$ | Max. peak, one-cycle non-repetitive forward current | 5500 | A | t = 10ms | No voltage reapplied | Sinusoidal half wave, Initial $T_J = T_J$ max. |
| | | 5760 | | t = 8.3ms | | |
| | | 4630 | | t = 10ms | 50% $V_{RRM}$ reapplied | |
| | | 4840 | | t = 8.3ms | | |
| $I^2t$ | Maximum $I^2t$ for fusing | 151 | $KA^2s$ | t = 10ms | No voltage reapplied | |
| | | 138 | | t = 8.3ms | | |
| | | 107 | | t = 10ms | 50% $V_{RRM}$ reapplied | |
| | | 98 | | t = 8.3ms | | |
| $I^2\sqrt{t}$ | Maximum $I^2\sqrt{t}$ for fusing | 1510 | $KA^2\sqrt{s}$ | t = 0.1 to 10ms, no voltage reapplied | | |
| $V_{F(TO)1}$ | Low level of threshold voltage | 1.56 | V | (16.7% x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ max. | | |
| $V_{F(TO)2}$ | High level of threshold voltage | 1.68 | | (I > π x $I_{F(AV)}$), $T_J = T_J$ max. | | |
| $r_{f1}$ | Low level of forward slope resistance | 1.64 | mΩ | (16.7% x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ max. | | |
| $r_{f2}$ | High level of forward slope resistance | 1.53 | | (I > π x $I_{F(AV)}$), $T_J = T_J$ max. | | |
| $V_{FM}$ | Max. forward voltage | 3.2 | V | $I_{pk}$= 1000A, $T_J$ = 125°C, $t_p$ = 400 µs square pulse | | |

### Recovery Characteristics

| Code | $T_J$ = 25°C typical $t_{rr}$ @ 25% $I_{RRM}$ (µs) | Test conditions $I_{pk}$ Square Pulse (A) | di/dt (*) (A/µs) | $V_r$ (V) | Max. values @ $T_J$ = 125°C $t_{rr}$ @ 25% $I_{RRM}$ (µs) | $Q_{rr}$ (µC) | $I_{rr}$ (A) |
|---|---|---|---|---|---|---|---|
| S50 | 5.0 | 1000 | 100 | - 50 | 4.5 | 680 | 240 |




(*) di/dt = 25A/us @ $T_J$ = 25°C

## Thermal and Mechanical Specification

| | Parameter | SD233N/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 | 0.1 | K/W | DC operation |
| $R_{thCS}$ | Max. thermal resistance, case to heatsink | 0.04 | | Mounting surface, smooth, flat and greased |
| T | Mounting torque ± 10% | 50 | N m | Not lubricated threads |
| wt | Approximate weight | 454 | g | |
| | Case style | B-8 | | See Outline Table |

## $\Delta R_{thJC}$ Conduction

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

| Conduction angle | Sinusoidal conduction | Rectangular conduction | Units | Conditions |
|---|---|---|---|---|
| 180° | 0.010 | 0.008 | K/W | $T_J = T_J$ max. |
| 120° | 0.013 | 0.014 | | |
| 90° | 0.017 | 0.018 | | |
| 60° | 0.025 | 0.026 | | |
| 30° | 0.041 | 0.042 | | |

## Ordering Information Table

**Device Code**

| SD | 23 | 3 | N | 45 | S50 | P | S | 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 = $V_{RRM}$ (see Voltage Ratings table)

**6** - $t_{rr}$ code (see Recovery Characteristics table)

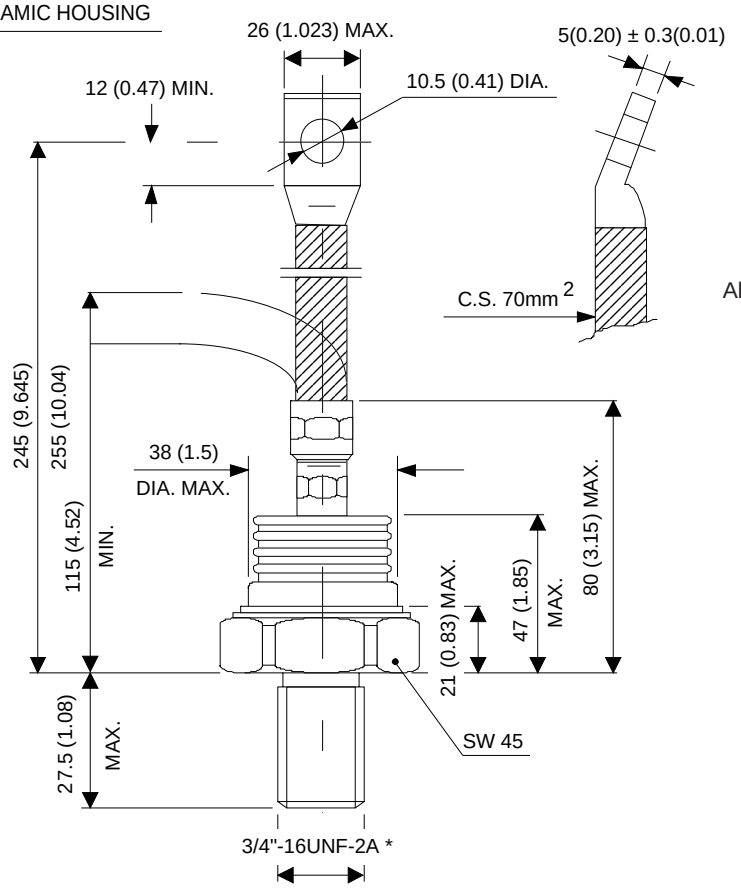
**7** - P = Stud base B-8 3/4" 16UNF-2A
M = Stud base B-8 M24 X 1.5

**8** - S = Isolated lead with silicone sleeve
(Red = Reverse Polarity; Blue = Normal Polarity)
T = Threaded Top Terminal 3/8" 24UNF-2A
None = Not isolated lead

**9** - C = Ceramic housing

## Outlines Table

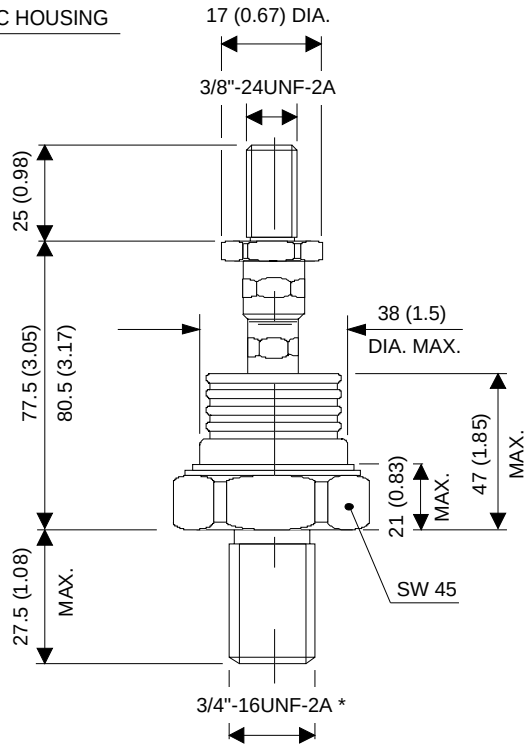
CERAMIC HOUSING




Case Style B-8
All dimensions in millimeters (inches)

* FOR METRIC DEVICE: M24 x 1.5 - LENGHT SCREW 21 (0.83) MAX.

CERAMIC HOUSING




Case Style B-8 with top thread terminal 3/8"
All dimensions in millimeters (inches)

* FOR METRIC DEVICE: M24 x 1.5 - LENGHT SCREW 21 (0.83) MAX.

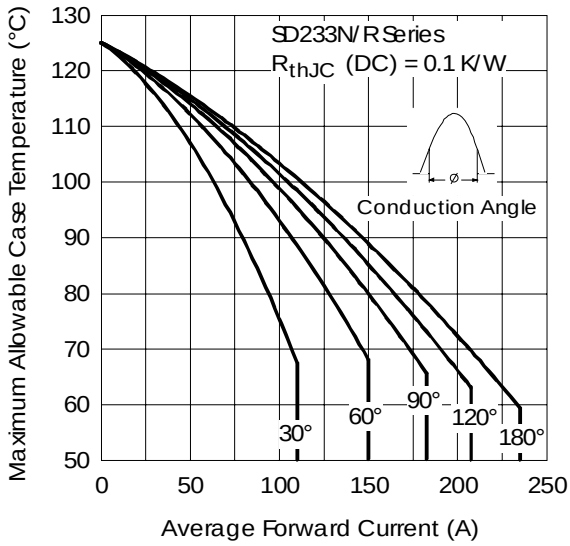



Fig. 1 - Current Ratings Characteristics

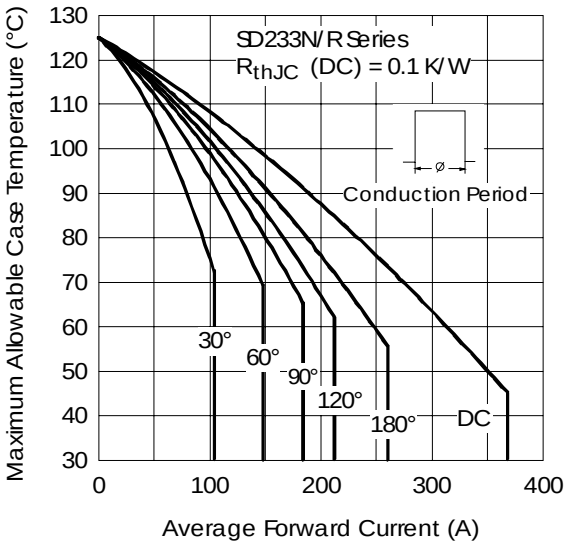



Fig. 2 - Current Ratings Characteristics

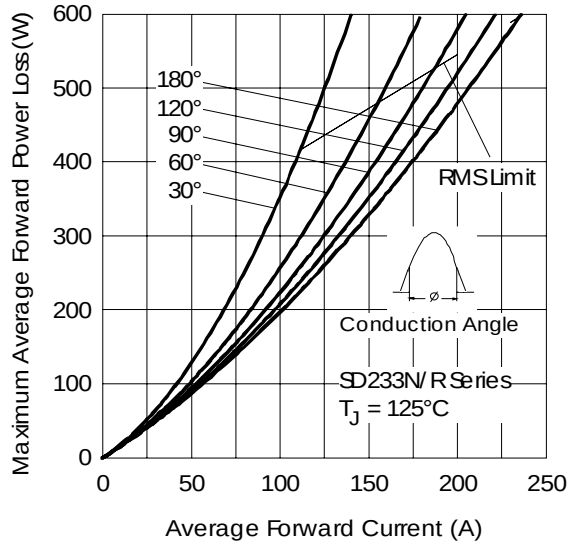



Fig. 3 - Forward Power Loss Characteristics

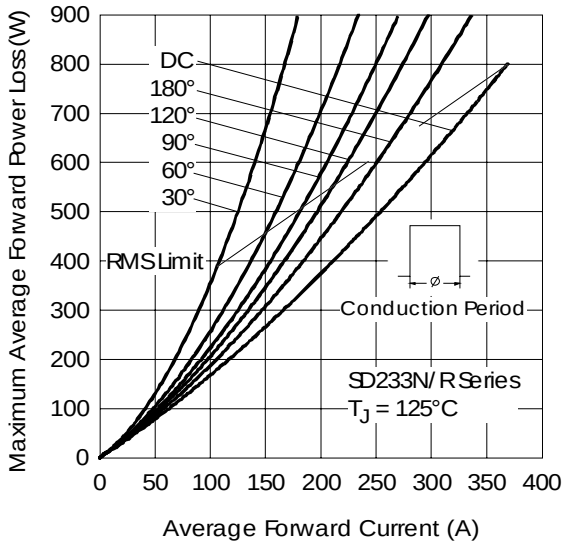



Fig. 4 - Forward Power Loss Characteristics

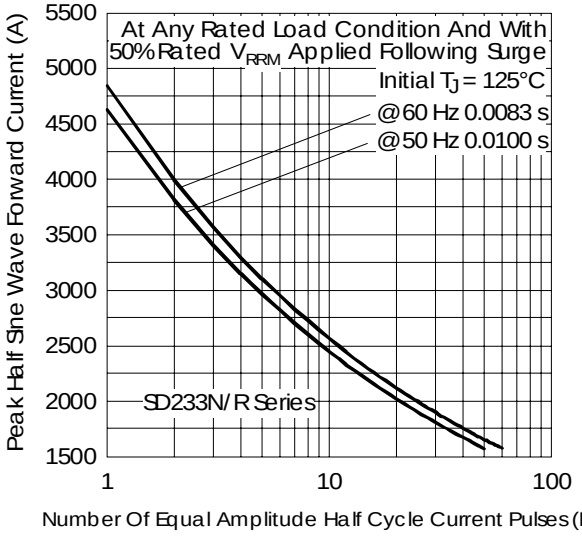



Fig. 5 - Maximum Non-repetitive Surge Current

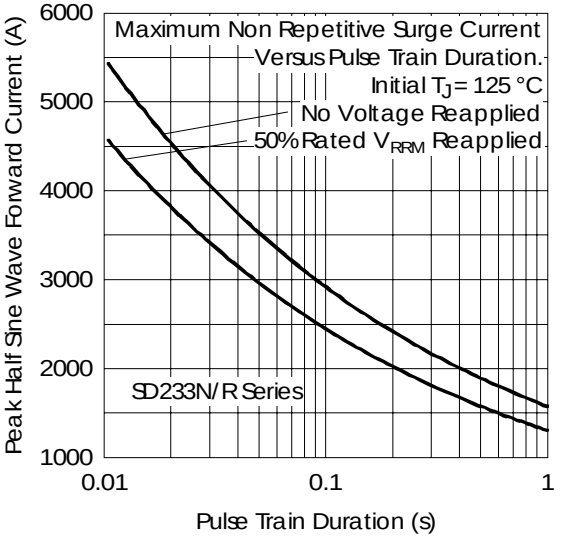



Fig. 6 - Maximum Non-repetitive Surge Current

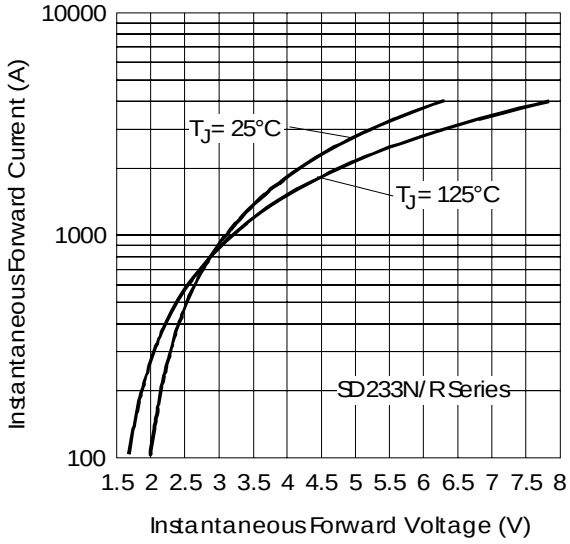



Fig. 7 - Forward Voltage Drop Characteristics

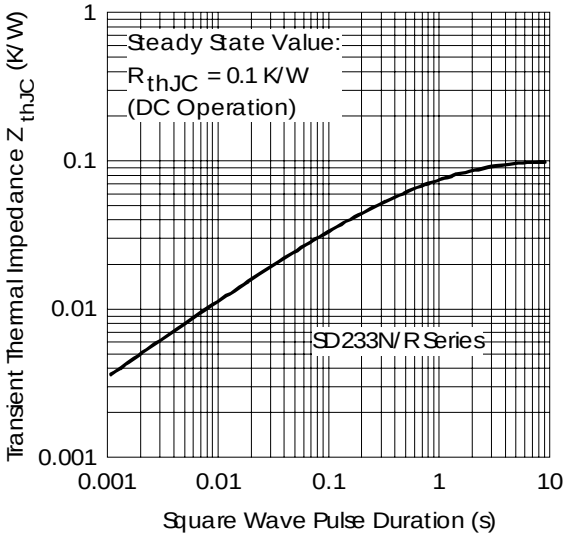



Fig. 8 - Thermal Impedance $Z_{thJC}$ Characteristic

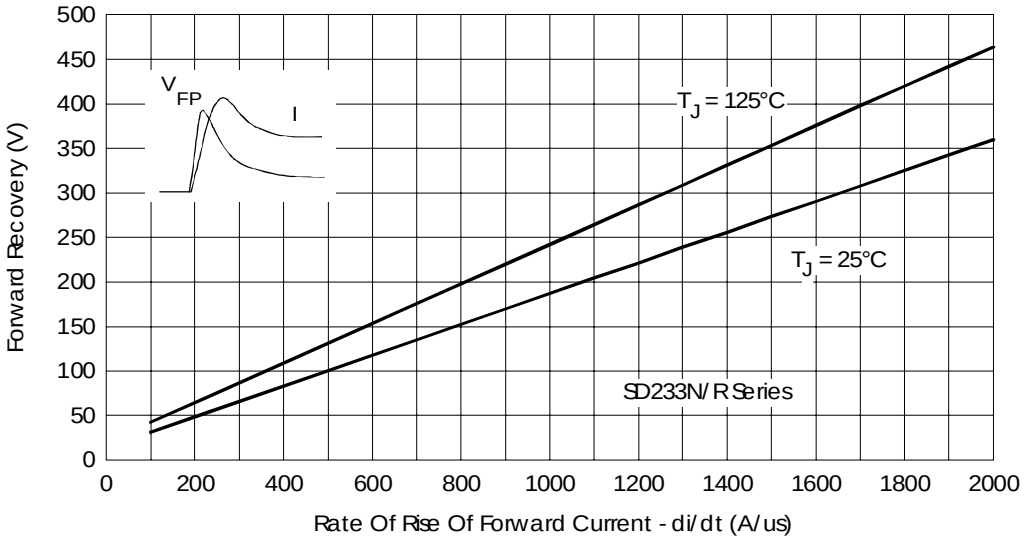



Fig. 9 - Typical Forward Recovery Characteristics

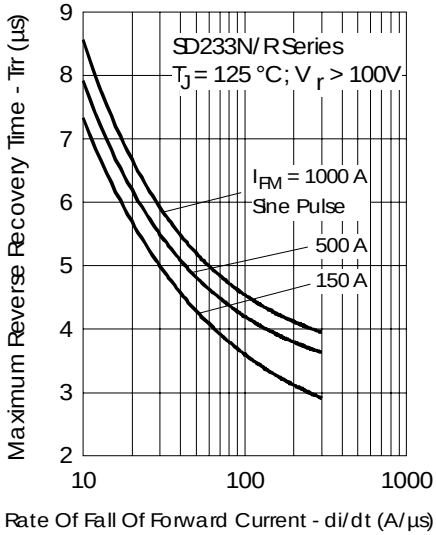



Fig. 10 - Recovery Time Characteristics

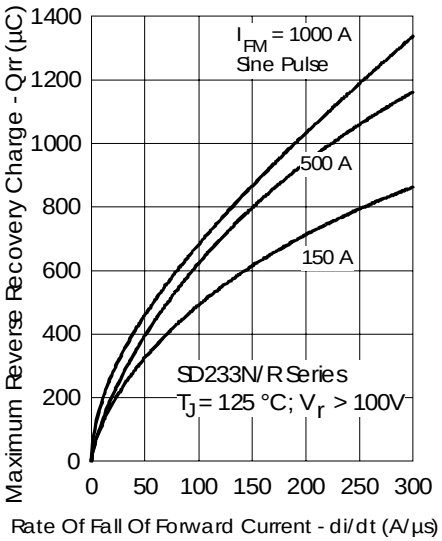



Fig. 11 - Recovery Charge Characteristics

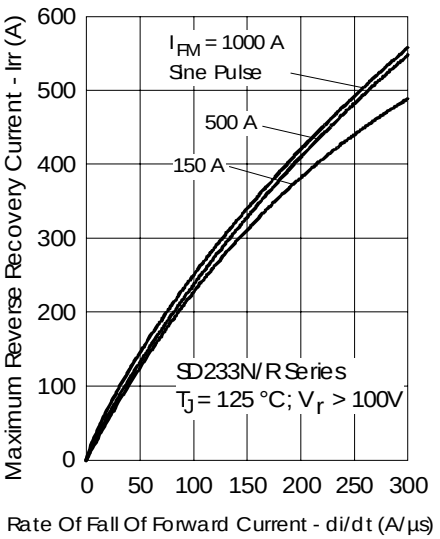



Fig. 12 - Recovery Current Characteristics

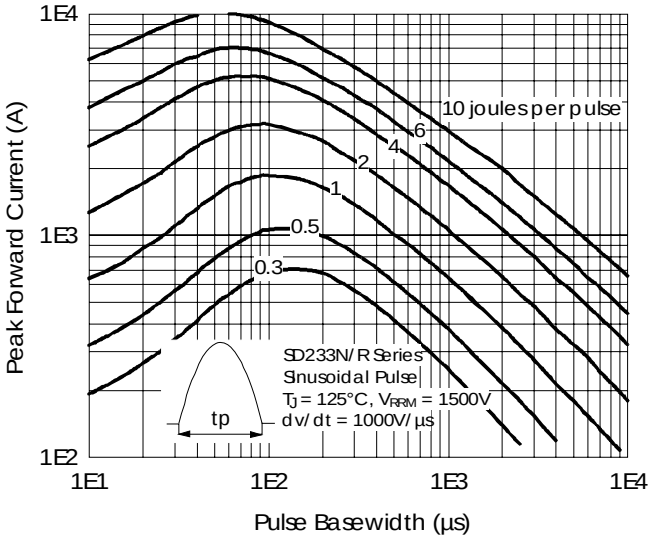



Fig. 13 - Maximum Total Energy Loss Per Pulse Characteristics

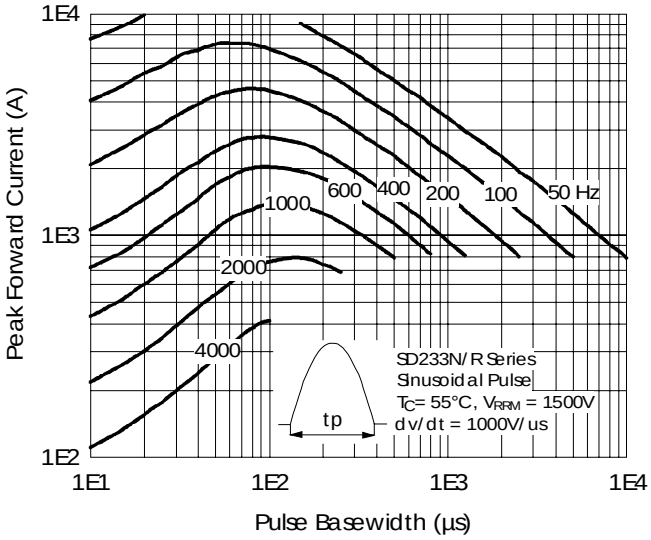



Fig. 14 - Frequency Characteristics

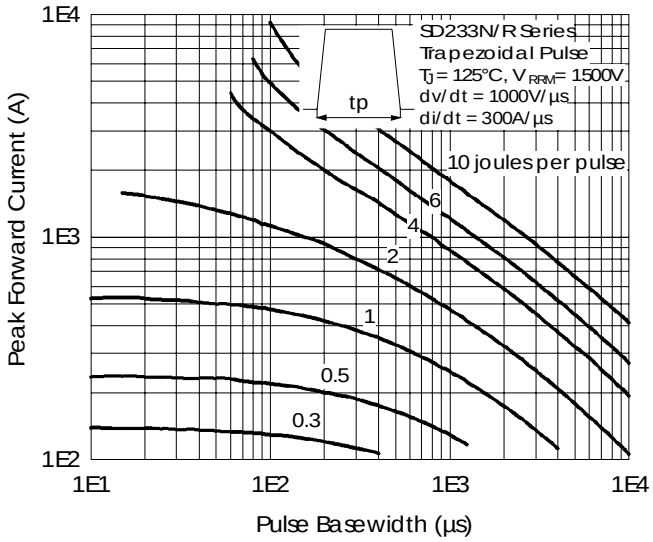



Fig. 15 - Maximum Total Energy Loss Per Pulse Characteristics

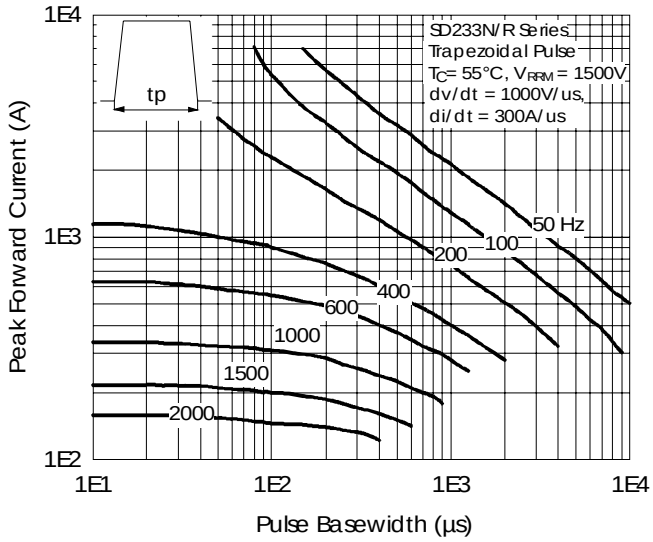



Fig. 16 - Frequency Characteristics

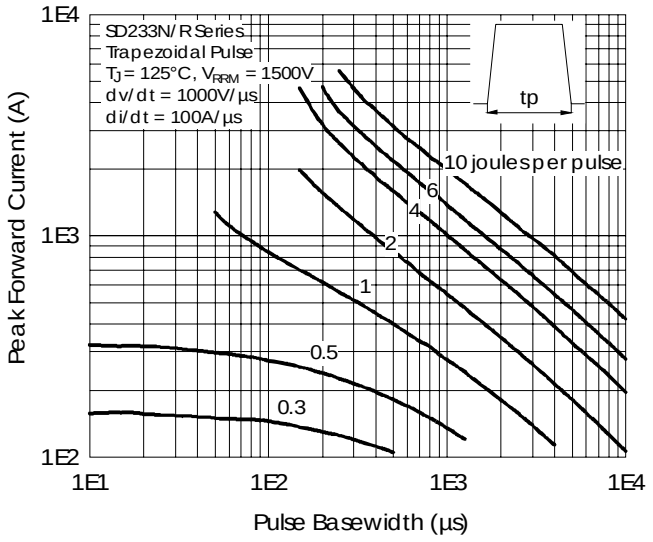



Fig. 17 - Maximum Total Energy Loss Per Pulse Characteristics

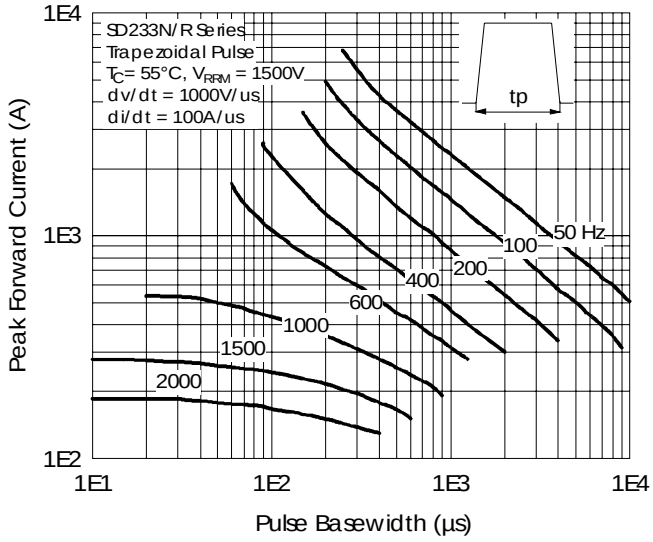



Fig. 18 - Frequency Characteristics

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

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