

FAST RECOVERY DIODES

Stud Version

Features

- High power FAST recovery diode series
- 2.0 to 3.0 μ 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 case style B-8
- Maximum junction temperature 150°C

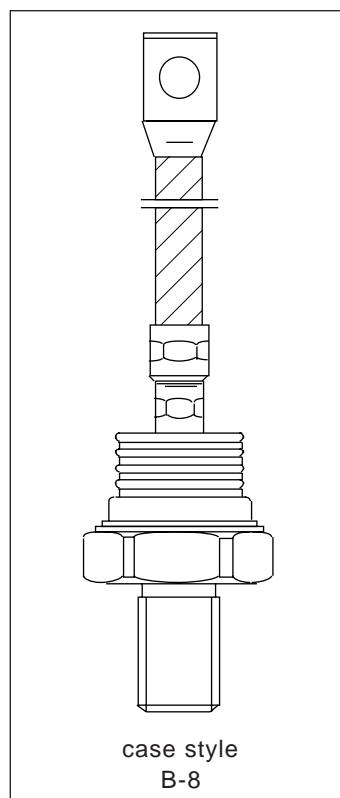
400A
450A

Typical Applications

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

Major Ratings and Characteristics

| Parameters | SD453N/R | | Units |
|------------------|--------------|--------------|---------|
| | S20 | S30 | |
| $I_{F(AV)}$ | 400 | 450 | A |
| @ T_C | 70 | 70 | °C |
| $I_{F(RMS)}$ | 630 | 710 | A |
| I_{FSM} @ 50Hz | 9300 | 9600 | A |
| @ 60Hz | 9730 | 10050 | A |
| V_{RRM} range | 1200 to 2500 | 1200 to 2500 | V |
| t_{rr} | 2.0 | 3.0 | μ s |
| @ T_J | 25 | 25 | °C |
| T_J | - 40 to 150 | | °C |



SD453N/R Series

Bulletin I2076 rev. A 09/94

International
IR Rectifier

ELECTRICAL SPECIFICATIONS

Voltage Ratings

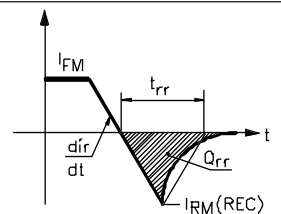
| Type number | Voltage Code | V_{RRM} , maximum repetitive peak reverse voltage V | V_{RSM} , maximum non-repetitive peak rev. voltage V | I_{RRM} max. @ $T_J = T_J$ max. mA |
|-------------|--------------|--|---|--|
| SD453N/R | 12 | 1200 | 1300 | 50 |
| | 16 | 1600 | 1700 | |
| | 20 | 2000 | 2100 | |
| | 25 | 2500 | 2600 | |

Forward Conduction

| Parameter | SD453N/R | | Units | Conditions |
|--|----------|-------|--------------------|--|
| | S20 | S30 | | |
| $I_{F(AV)}$ Max. average forward current @ case temperature | 400 | 450 | A | 180° conduction, half sine wave |
| | 70 | 70 | °C | |
| $I_{F(RMS)}$ Max. RMS forward current @ case temperature | 630 | 710 | A | |
| | 55 | 52 | °C | |
| I_{FSM} Max. peak, one-cycle forward, non-repetitive surge current | 9300 | 9600 | A | t = 10ms No voltage reappplied |
| | 9730 | 10050 | | t = 8.3ms reappplied |
| | 7820 | 8070 | | t = 10ms 100% V_{RRM} reappplied |
| | 8190 | 8450 | | t = 8.3ms reappplied |
| I^2t Maximum I^2t for fusing | 432 | 460 | KA ² s | t = 10ms No voltage reappplied |
| | 395 | 420 | | t = 8.3ms reappplied |
| | 306 | 326 | | t = 10ms 100% V_{RRM} reappplied |
| | 279 | 297 | | t = 8.3ms reappplied |
| $I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing | 4320 | 4600 | KA ² √s | t = 0.1 to 10ms, no voltage reappplied |
| $V_{F(TO)1}$ Low level value of threshold voltage | 1.00 | 0.95 | V | (16.7% x π x $I_{F(AV)} < I < \pi$ x $I_{F(AV)}$), $T_J = T_J$ max. |
| $V_{F(TO)2}$ High level value of threshold voltage | 1.09 | 1.04 | | ($I > \pi$ x $I_{F(AV)}$), $T_J = T_J$ max. |
| r_{f1} Low level value of forward slope resistance | 0.80 | 0.60 | mΩ | (16.7% x π x $I_{F(AV)} < I < \pi$ x $I_{F(AV)}$), $T_J = T_J$ max. |
| r_{f2} High level value of forward slope resistance | 0.74 | 0.54 | | ($I > \pi$ x $I_{F(AV)}$), $T_J = T_J$ max. |
| V_{FM} Max. forward voltage drop | 2.20 | 1.85 | V | $I_{pk} = 1500A$, $T_J = T_J$ max, $t_p = 10ms$ sinusoidal wave |

Recovery Characteristics

| Code | $T_J = 25^\circ\text{C}$ typical t_{rr} @ 25% I_{RRM} (μs) | Test conditions | | | Max. values @ $T_J = 150^\circ\text{C}$ | | |
|------|---|---------------------------------|-------------------|--------------|---|------------------|-----------------|
| | | I_{pk} Square Pulse (A) | di/dt (A/μs) | V_r (V) | t_{rr} @ 25% I_{RRM} (μs) | Q_{rr} (μC) | I_{rr} (A) |
| S20 | 2.0 | 1000 | 50 | -50 | 3.5 | 250 | 120 |
| S30 | 3.0 | 1000 | 50 | -50 | 5.0 | 380 | 150 |



Thermal and Mechanical Specifications

| Parameter | SD453N/R | | Units | Conditions |
|---|------------|-----|-------|--|
| | S20 | S30 | | |
| T _J Max. junction operating temperature range | -40 to 150 | | °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 | | Nm | Not lubricated threads |
| wt Approximate weight | 454 | | g | |
| Case style | B - 8 | | | See Outline Table |

ΔR_{thJ-hs} Conduction

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

| Conduction angle | Sinusoidal conduction | | Rectangular conduction | | Units | Conditions |
|------------------|-----------------------|-------|------------------------|-------|-------|--------------------------------------|
| | S20 | S30 | S20 | S30 | | |
| 180° | 0.010 | 0.010 | 0.008 | 0.008 | K/W | T _J = T _J max. |
| 120° | 0.014 | 0.014 | 0.014 | 0.014 | | |
| 90° | 0.017 | 0.017 | 0.019 | 0.019 | | |
| 60° | 0.025 | 0.025 | 0.026 | 0.026 | | |
| 30° | 0.042 | 0.042 | 0.042 | 0.042 | | |

Ordering Information Table

Device Code

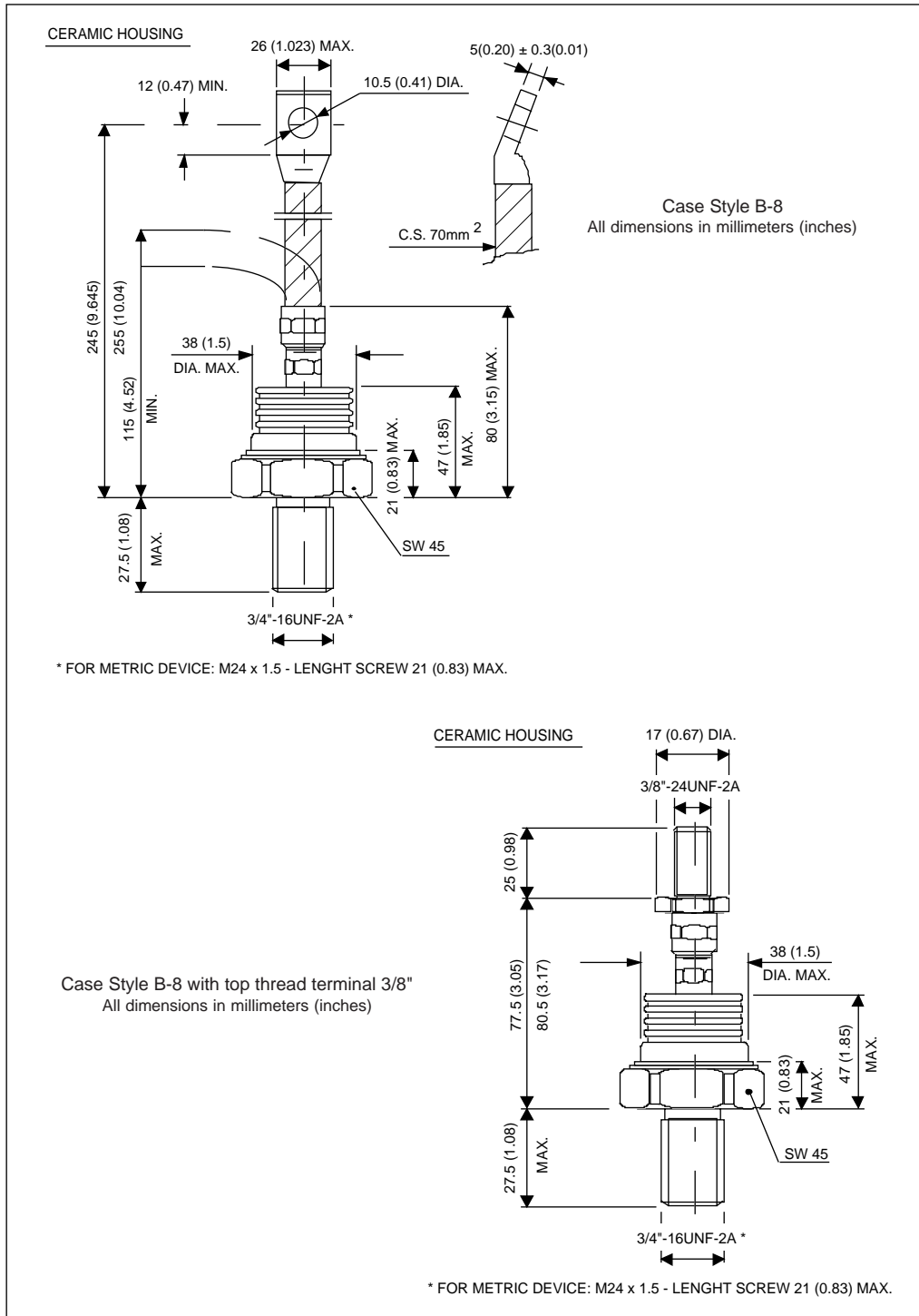
| | | | | | | | | |
|-----------|-----------|----------|----------|-----------|------------|----------|----------|----------|
| SD | 45 | 3 | N | 25 | S30 | P | S | C |
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ |

- 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)
None = Not isolated lead
T = Threaded Top Terminal 3/8" 24UNF-2A
- 9** - C = Ceramic housing

SD453N/R Series

Bulletin I2076 rev. A 09/94

Outlines Table



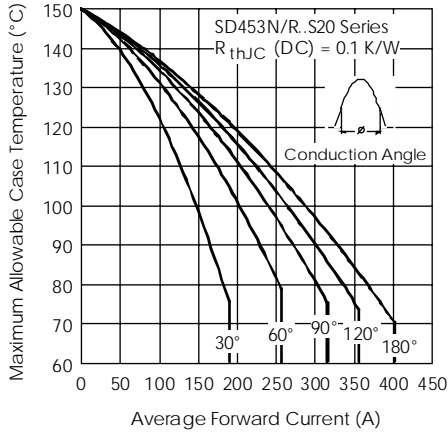


Fig. 1 - Current Ratings Characteristics

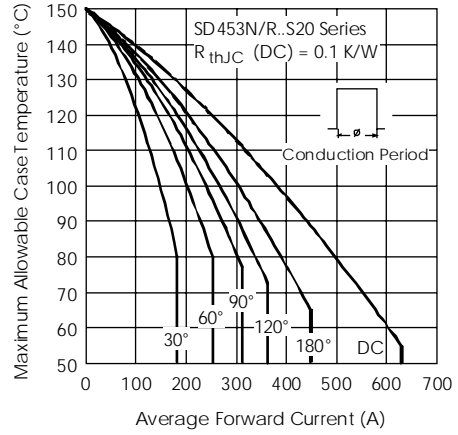


Fig. 2 - Current Ratings Characteristics

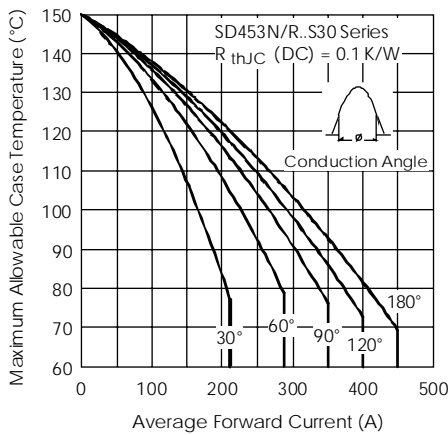


Fig. 3 - Current Ratings Characteristics

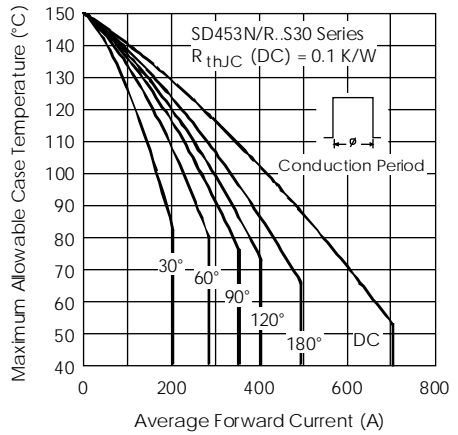


Fig. 4 - Current Ratings Characteristics

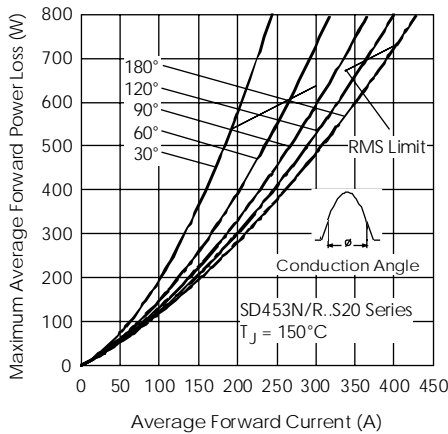


Fig. 5 - Forward Power Loss Characteristics

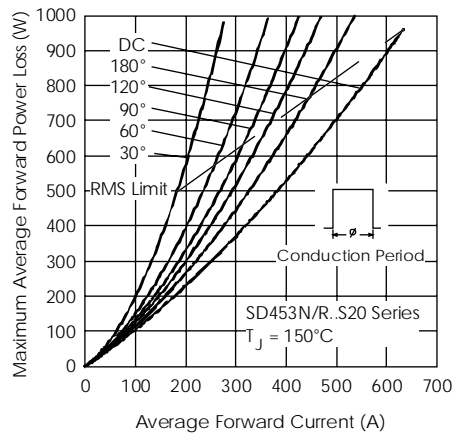


Fig. 6 - Forward Power Loss Characteristics

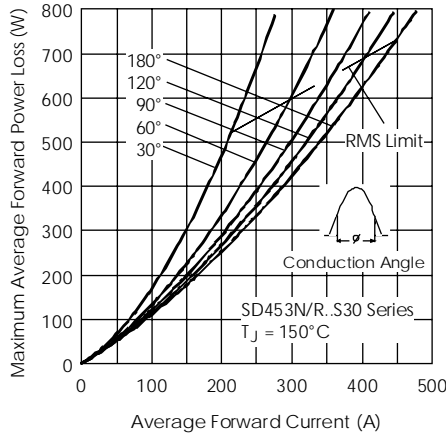


Fig. 7 - Forward Power Loss Characteristics

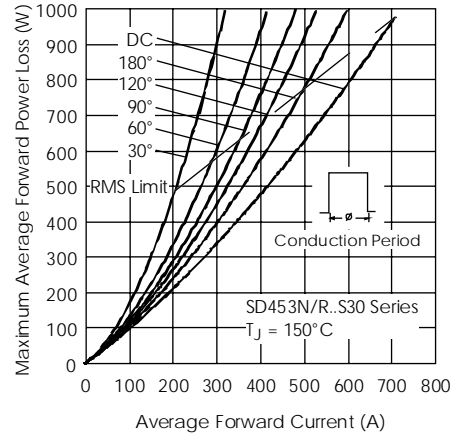


Fig. 8 - Forward Power Loss Characteristics

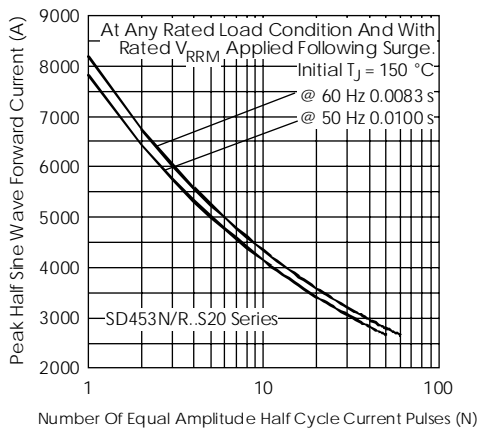


Fig. 9 - Maximum Non-repetitive Surge Current

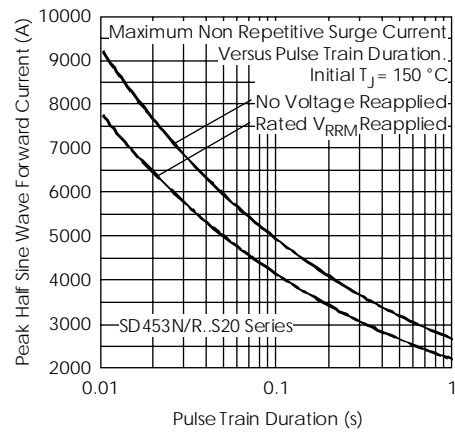


Fig. 10 - Maximum Non-repetitive Surge Current

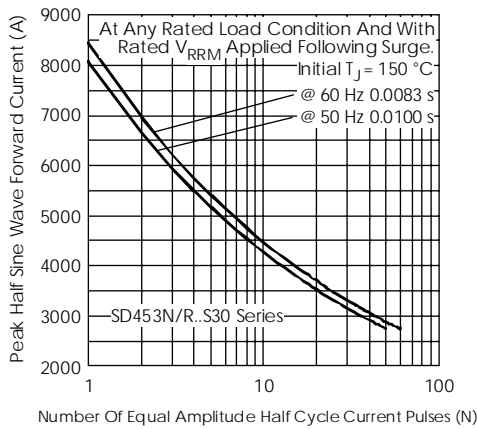


Fig. 11 - Maximum Non-repetitive Surge Current

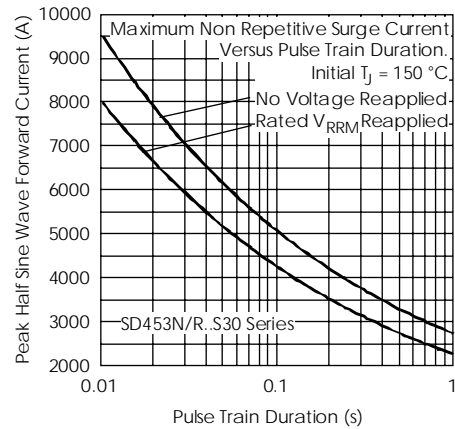


Fig. 12 - Maximum Non-repetitive Surge Current

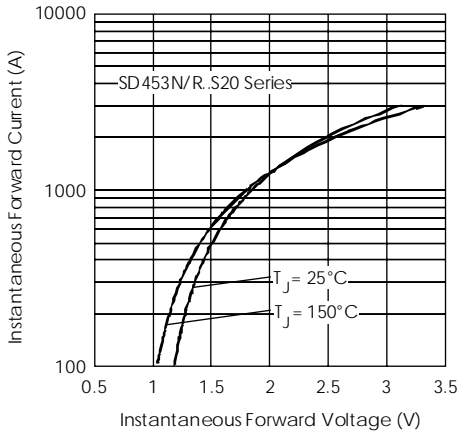


Fig. 13 - Forward Voltage Drop Characteristics

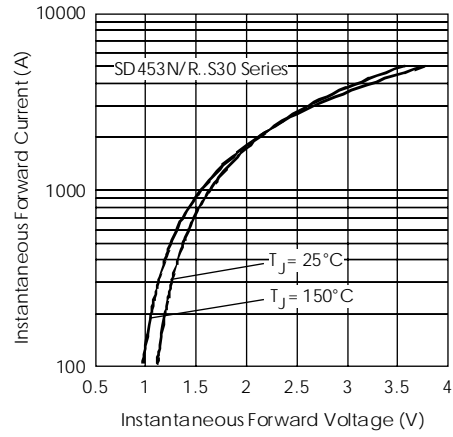


Fig. 14 - Forward Voltage Drop Characteristics

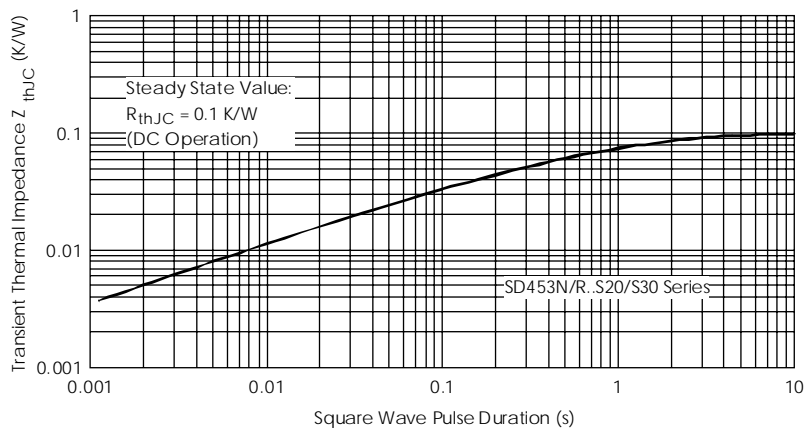


Fig. 15 - Thermal Impedance Z_{thJC} Characteristic

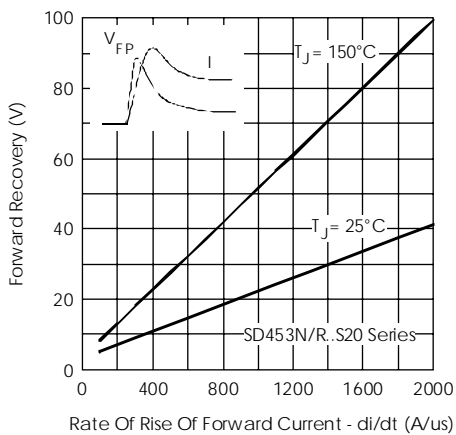


Fig. 16 - Typical Forward Recovery Characteristics

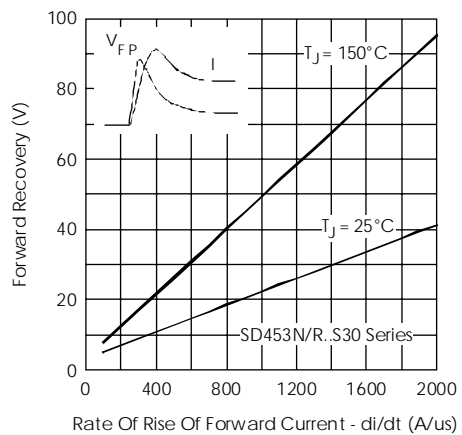


Fig. 17 - Typical Forward Recovery Characteristics

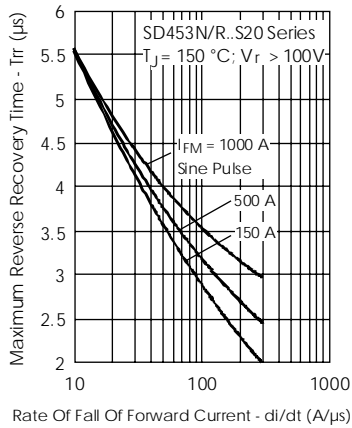


Fig. 18 - Recovery Time Characteristics

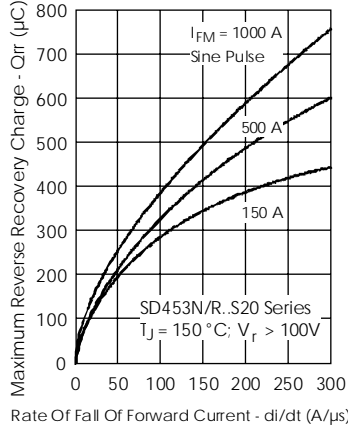


Fig. 19 - Recovery Charge Characteristics

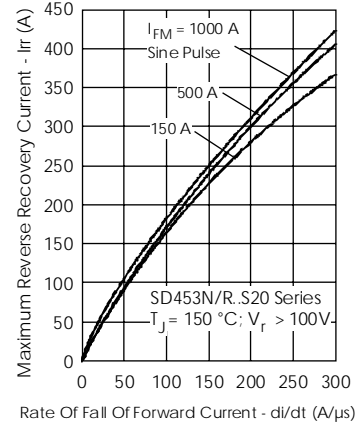


Fig. 20 - Recovery Current Characteristics

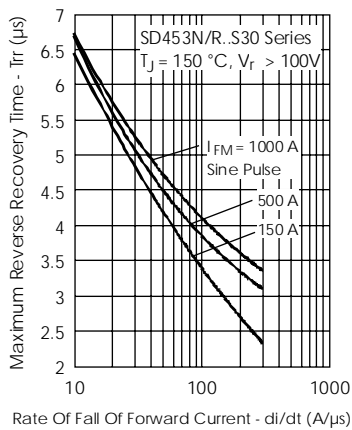


Fig. 21 - Recovery Time Characteristics

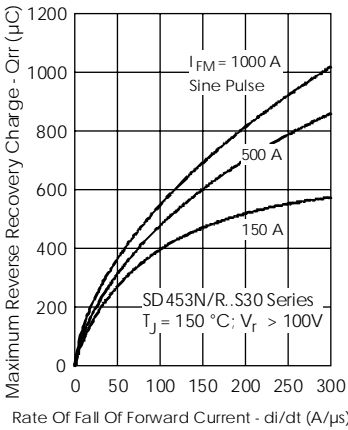


Fig. 22 - Recovery Charge Characteristics

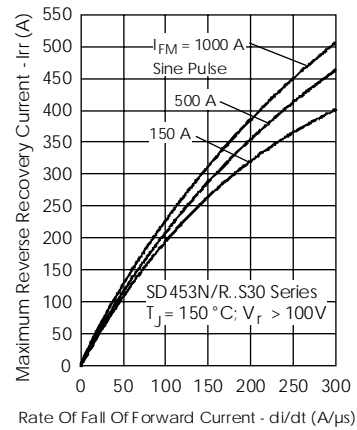


Fig. 23 - Recovery Current Characteristics

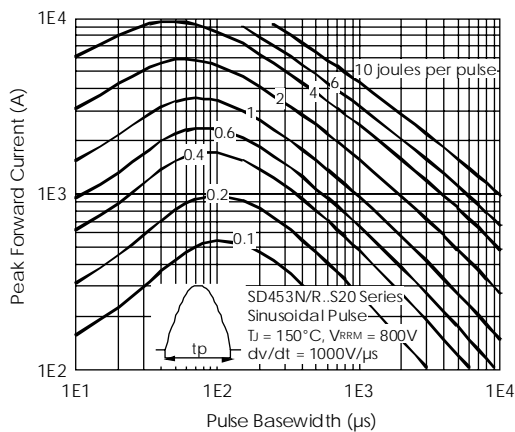


Fig. 24 - Maximum Total Energy Loss Per Pulse Characteristics

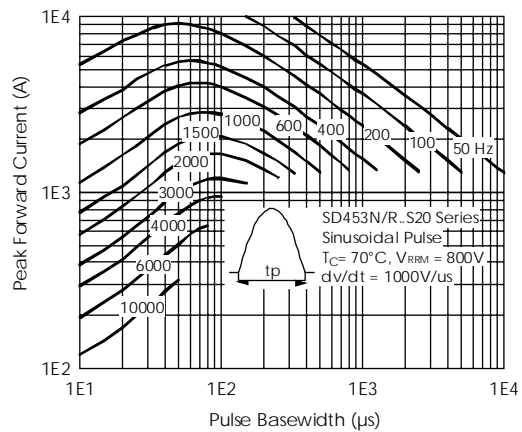


Fig. 25 - Frequency Characteristics

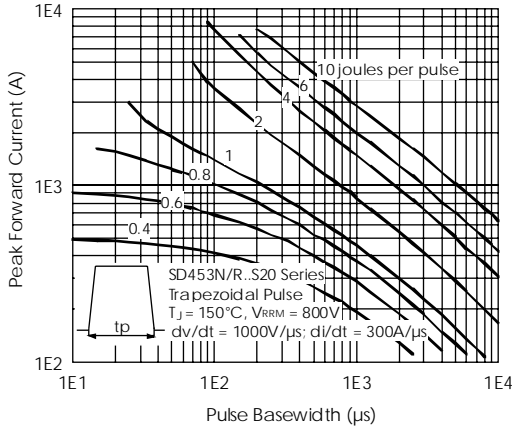


Fig. 26 - Maximum Total Energy Loss Per Pulse Characteristics

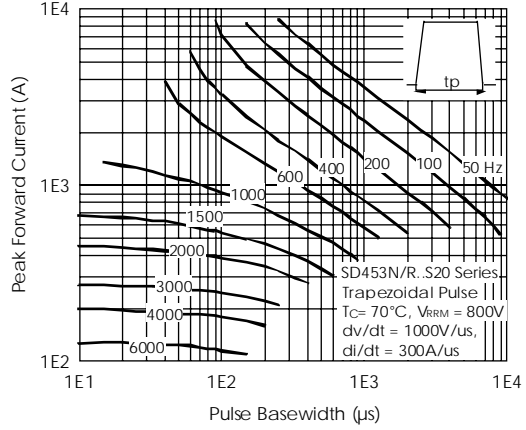


Fig. 27 - Frequency Characteristics

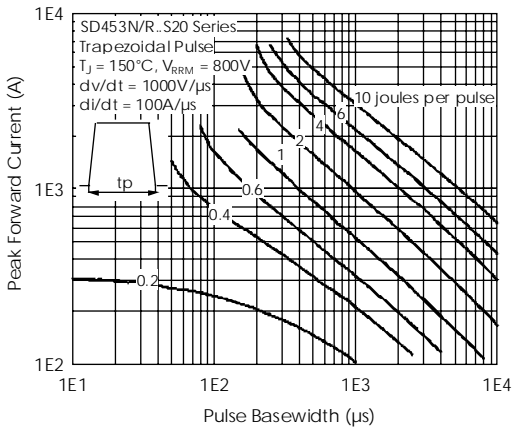


Fig. 28 - Maximum Total Energy Loss Per Pulse Characteristics

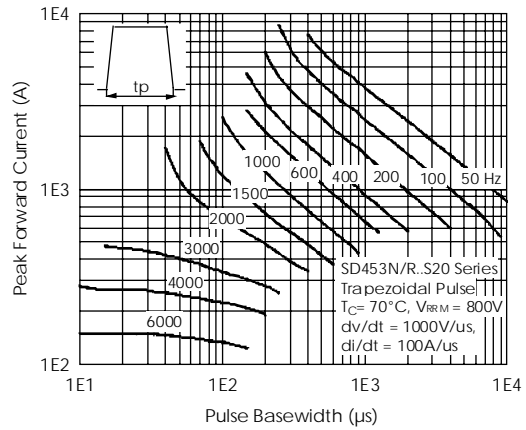


Fig. 29 - Frequency Characteristics

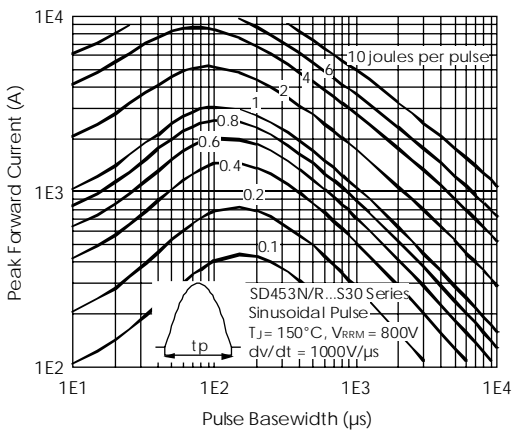


Fig. 30 - Maximum Total Energy Loss Per Pulse Characteristics

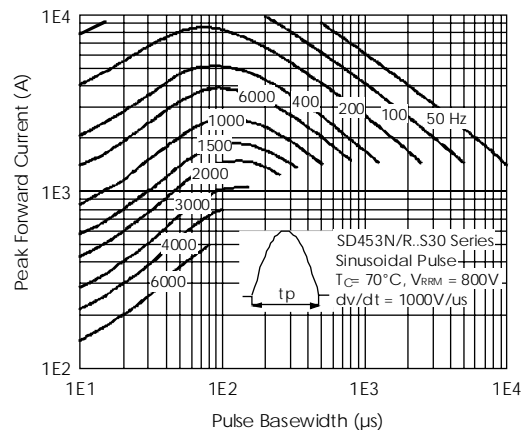


Fig. 31 - Frequency Characteristics

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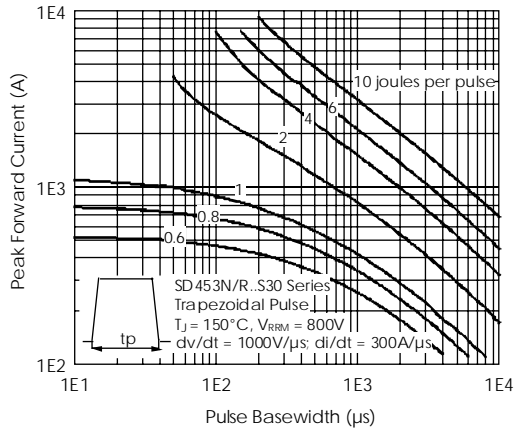


Fig. 32 - Maximum Total Energy Loss Per Pulse Characteristics

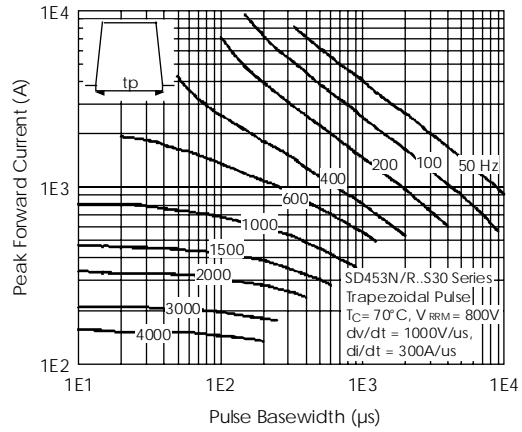


Fig. 33 - Frequency Characteristics

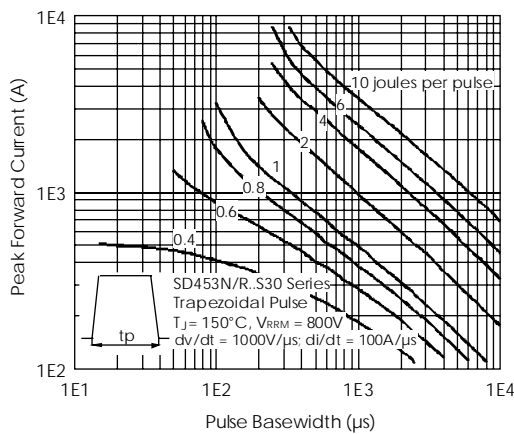


Fig. 34 - Maximum Total Energy Loss Per Pulse Characteristics

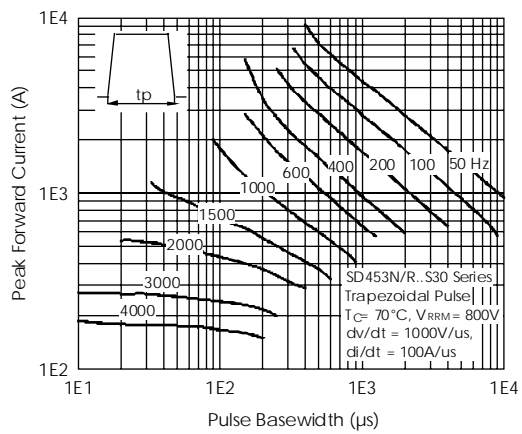


Fig. 35 - Frequency Characteristics