

### FAST RECOVERY DIODES

### Stud Version

#### Features

- High power FAST recovery diode series
- 2.0 to 3.0  $\mu$ 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

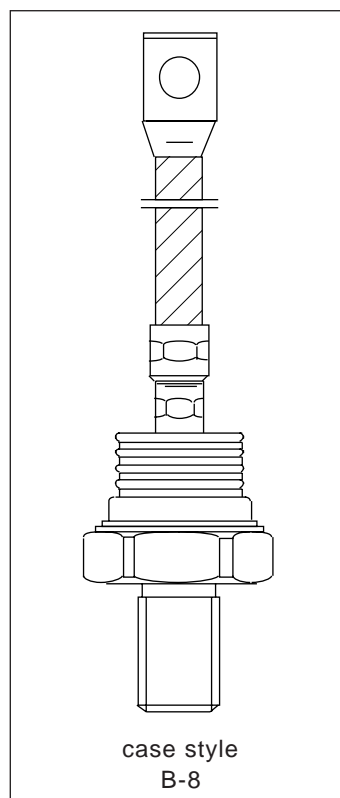
400A  
450A

#### 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	$\mu$ 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

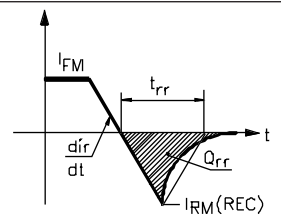
Type number	Voltage Code	$V_{RRM}$ , maximum repetitive peak reverse voltage V	$V_{RSM}$ , maximum non-repetitive peak rev. voltage V	$I_{RRM}$ max. @ $T_J = T_J$ max. mA
SD453N/R	12	1200	1300	50
	16	1600	1700	
	20	2000	2100	
	25	2500	2600	

#### 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 <sup>2</sup> 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 <sup>2</sup> √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 $\pi$ 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 $\pi$ 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	$T_J = 25^\circ C$ typical $t_{rr}$ @ 25% $I_{RRM}$ (μs)	Test conditions			Max. values @ $T_J = 150^\circ C$		
		$I_{pk}$ 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, $\pm 10\%$	50		Nm	Not lubricated threads
wt Approximate weight	454		g	
Case style	B-8			See Outline Table

$\Delta R_{thJ-hs}$  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	$T_J = T_J \text{ max.}$
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**

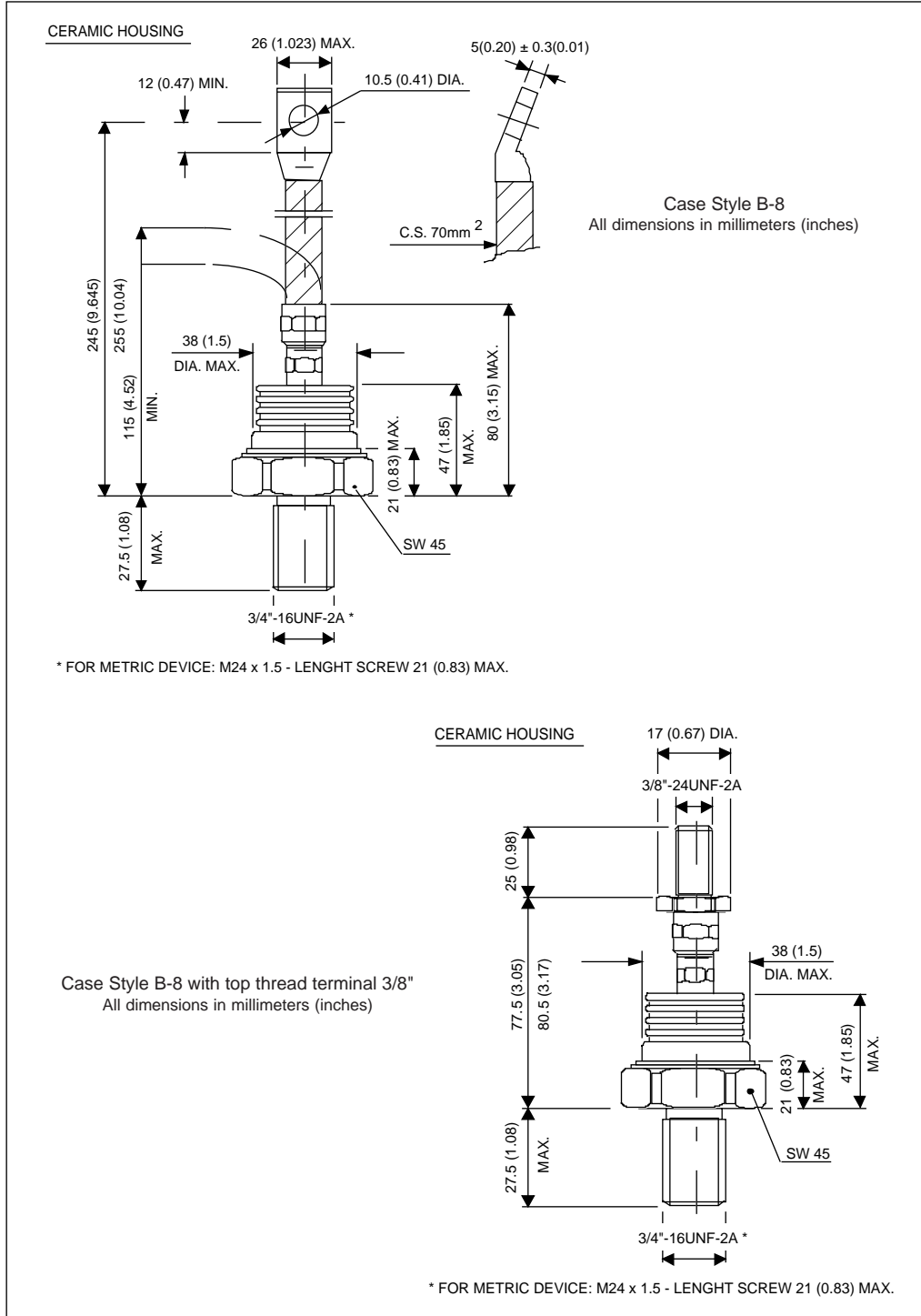
<b>SD</b>	<b>45</b>	<b>3</b>	<b>N</b>	<b>25</b>	<b>S30</b>	<b>P</b>	<b>S</b>	<b>C</b>
①	②	③	④	⑤	⑥	⑦	⑧	⑨

- 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**

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**Outlines Table**



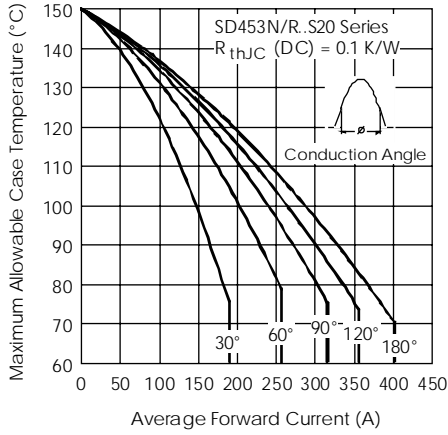


Fig. 1 - Current Ratings Characteristics

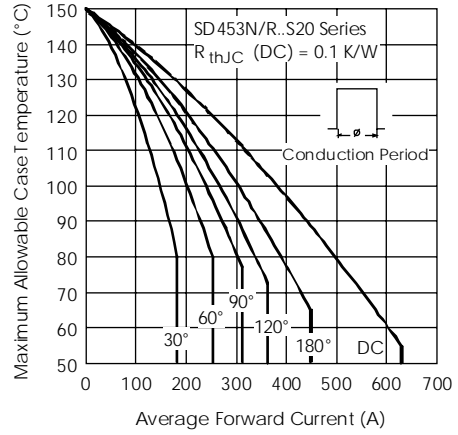


Fig. 2 - Current Ratings Characteristics

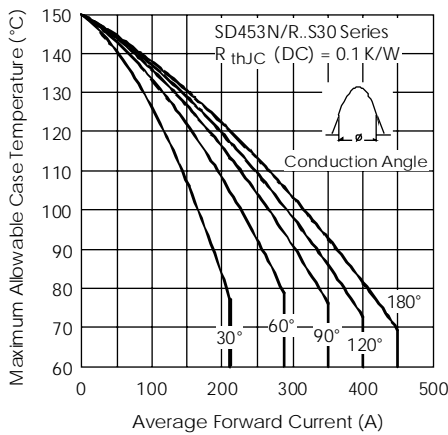


Fig. 3 - Current Ratings Characteristics

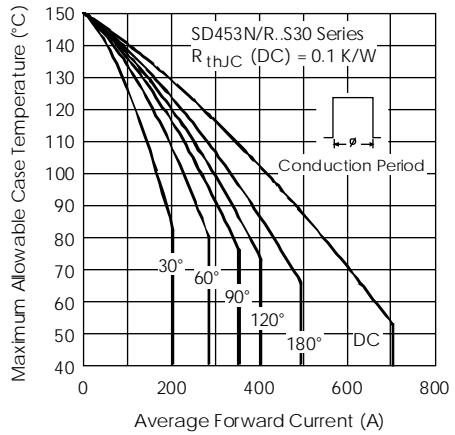


Fig. 4 - Current Ratings Characteristics

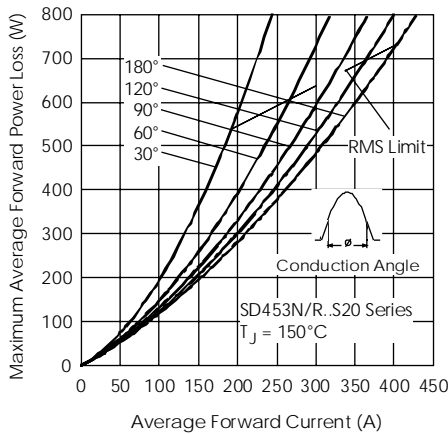


Fig. 5 - Forward Power Loss Characteristics

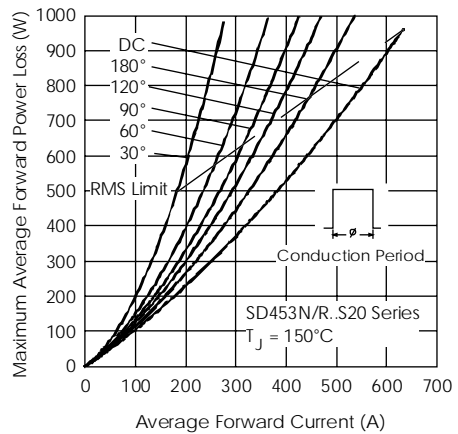


Fig. 6 - Forward Power Loss Characteristics

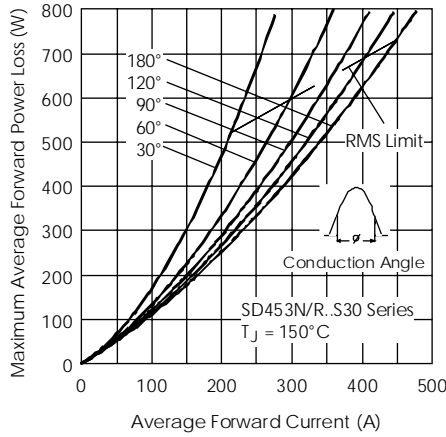


Fig. 7 - Forward Power Loss Characteristics

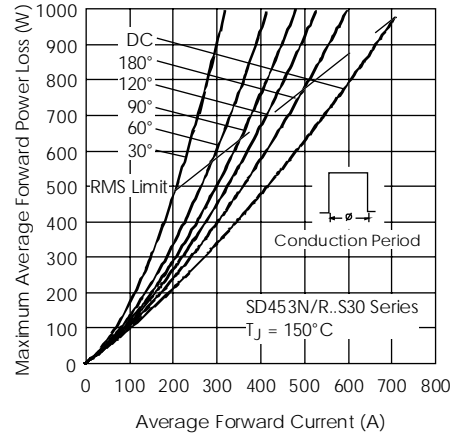


Fig. 8 - Forward Power Loss Characteristics

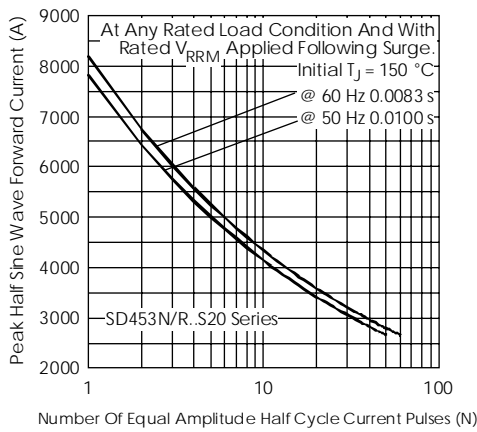


Fig. 9 - Maximum Non-repetitive Surge Current

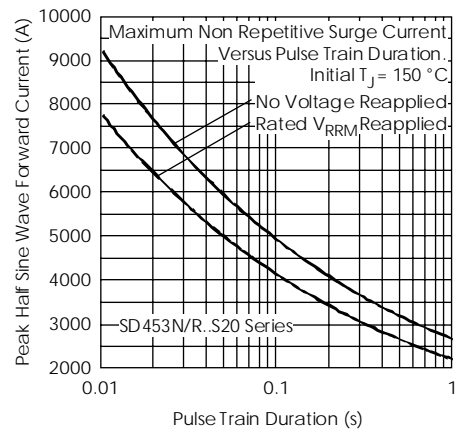


Fig. 10 - Maximum Non-repetitive Surge Current

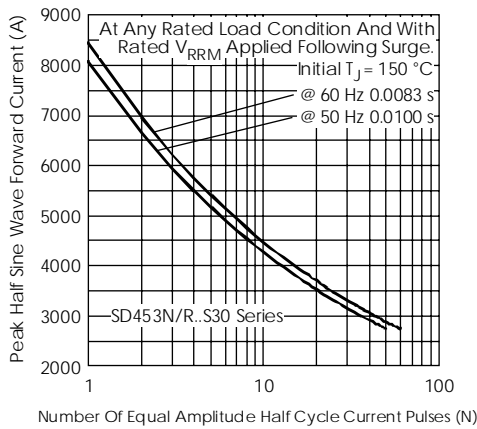


Fig. 11 - Maximum Non-repetitive Surge Current

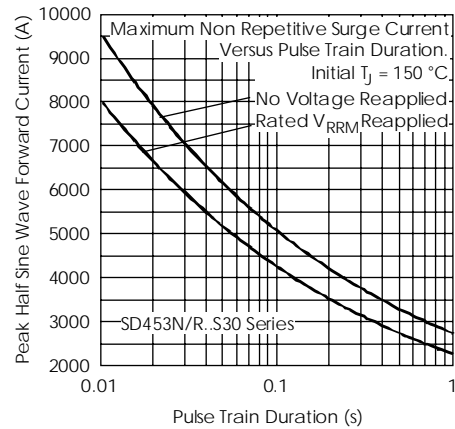


Fig. 12 - Maximum Non-repetitive Surge Current

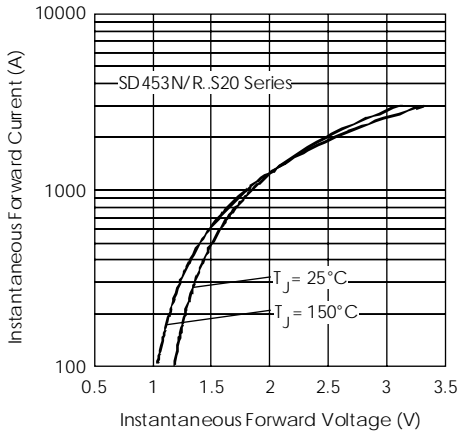


Fig. 13 - Forward Voltage Drop Characteristics

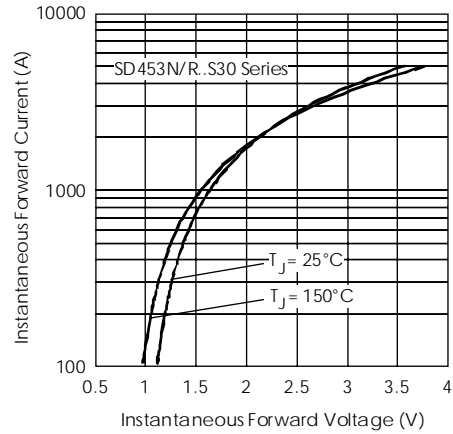


Fig. 14 - Forward Voltage Drop Characteristics

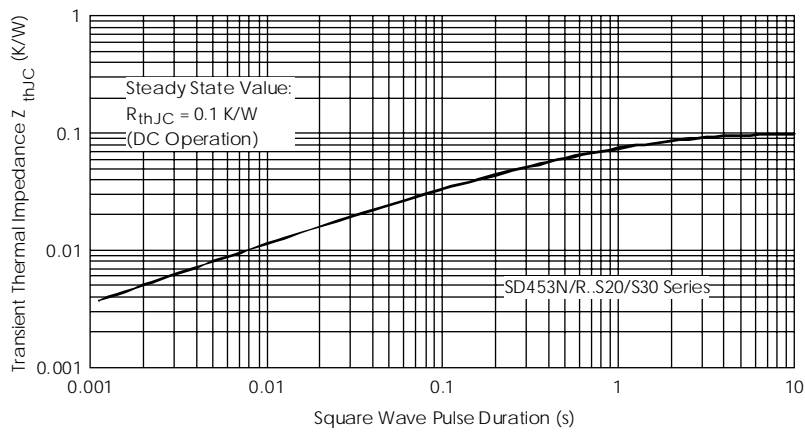


Fig. 15 - Thermal Impedance  $Z_{thJC}$  Characteristic

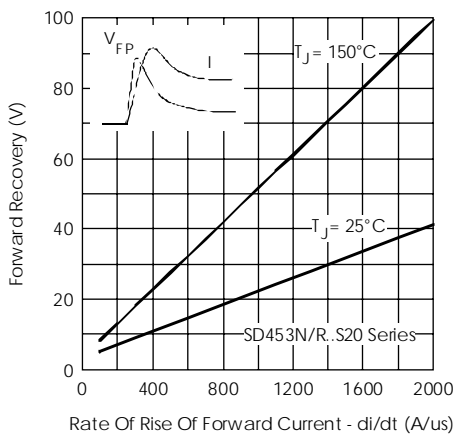


Fig. 16 - Typical Forward Recovery Characteristics

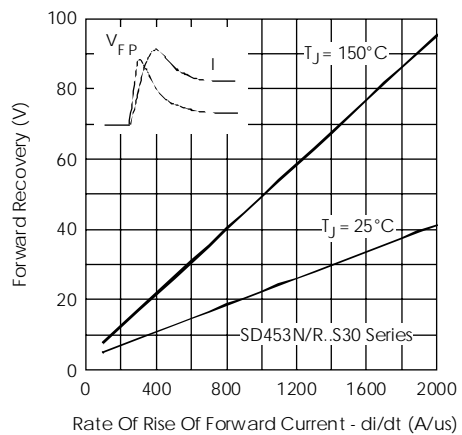


Fig. 17 - Typical Forward Recovery Characteristics

# SD453N/R Series

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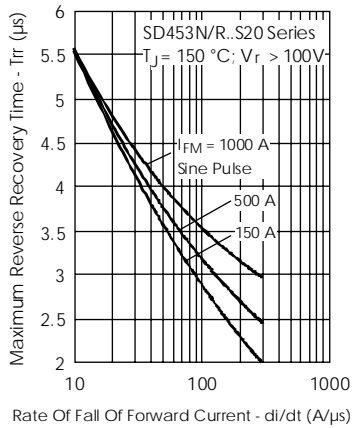


Fig. 18 - Recovery Time Characteristics

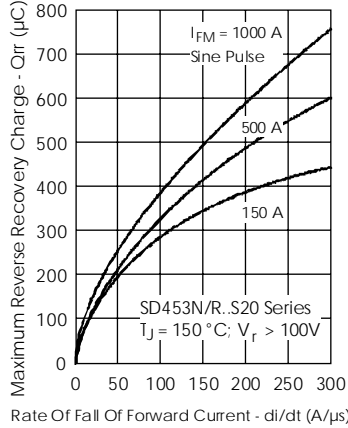


Fig. 19 - Recovery Charge Characteristics

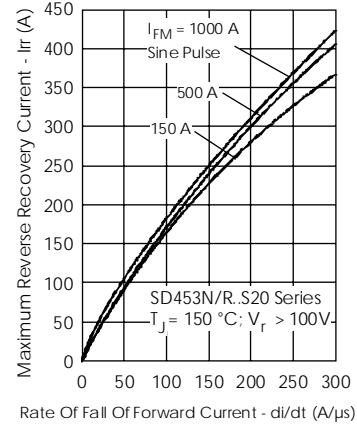


Fig. 20 - Recovery Current Characteristics

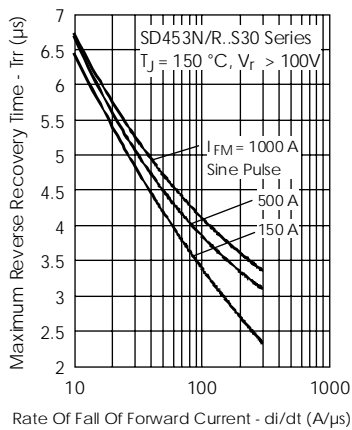


Fig. 21 - Recovery Time Characteristics

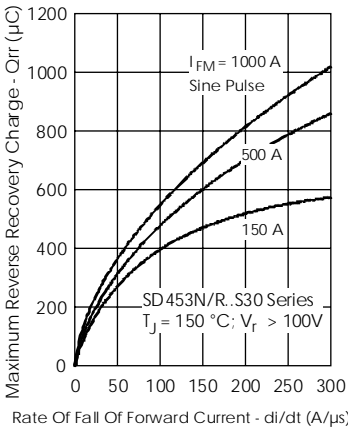


Fig. 22 - Recovery Charge Characteristics

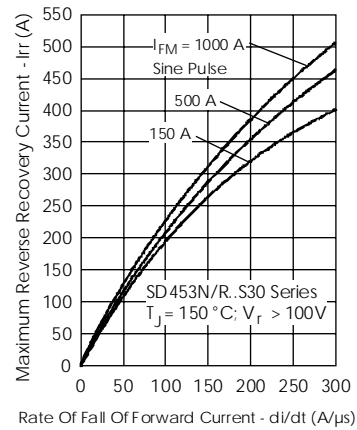


Fig. 23 - Recovery Current Characteristics

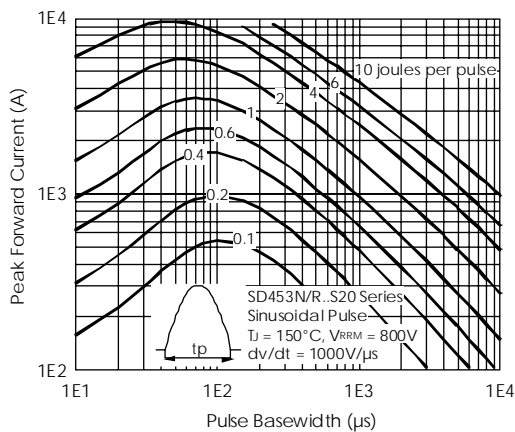


Fig. 24 - Maximum Total Energy Loss Per Pulse Characteristics

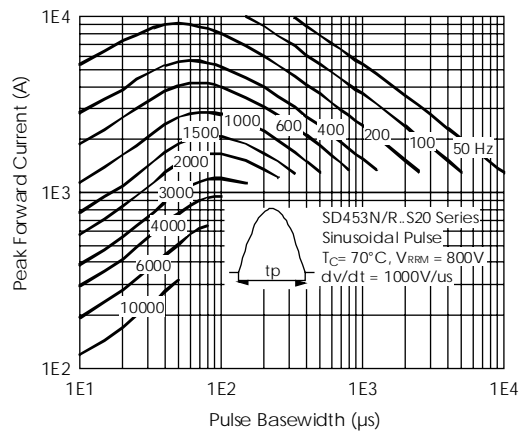


Fig. 25 - Frequency Characteristics



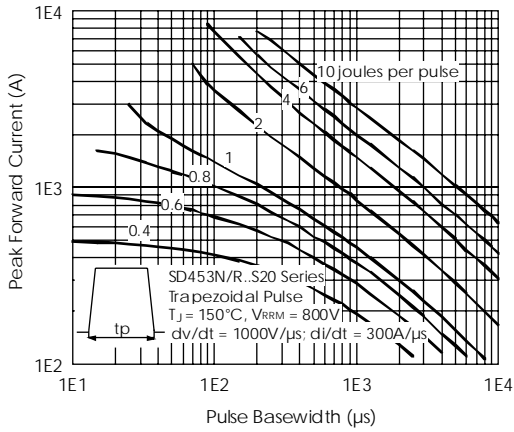


Fig. 26 - Maximum Total Energy Loss Per Pulse Characteristics

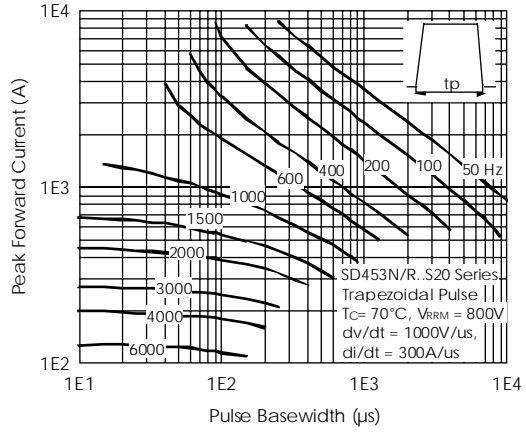


Fig. 27 - Frequency Characteristics

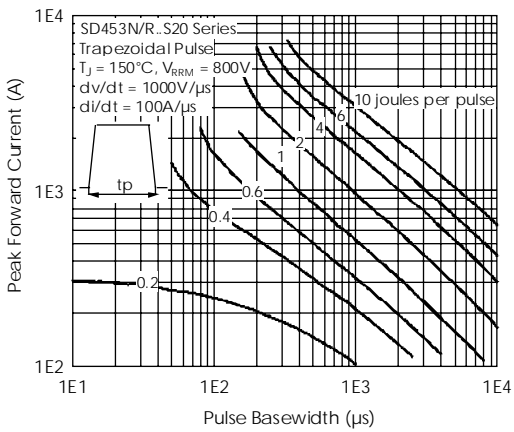


Fig. 28 - Maximum Total Energy Loss Per Pulse Characteristics

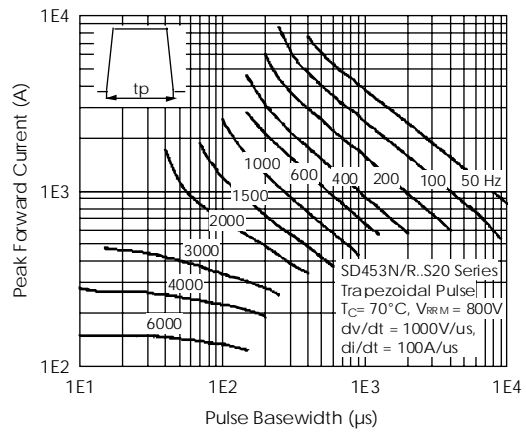


Fig. 29 - Frequency Characteristics

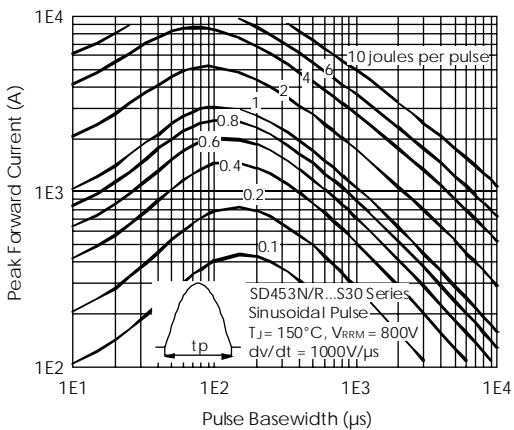


Fig. 30 - Maximum Total Energy Loss Per Pulse Characteristics

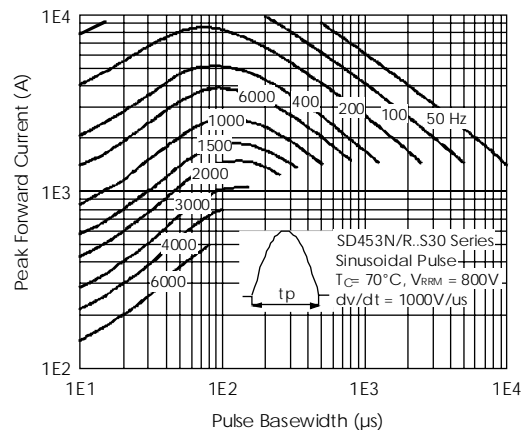


Fig. 31 - Frequency Characteristics

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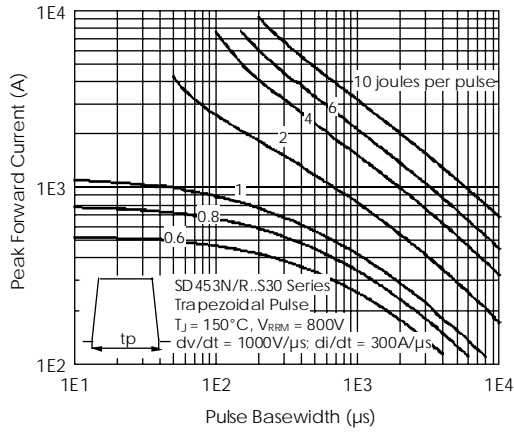


Fig. 32 - Maximum Total Energy Loss Per Pulse Characteristics

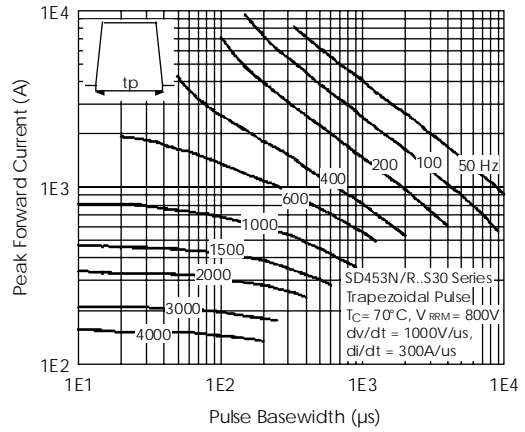


Fig. 33 - Frequency Characteristics

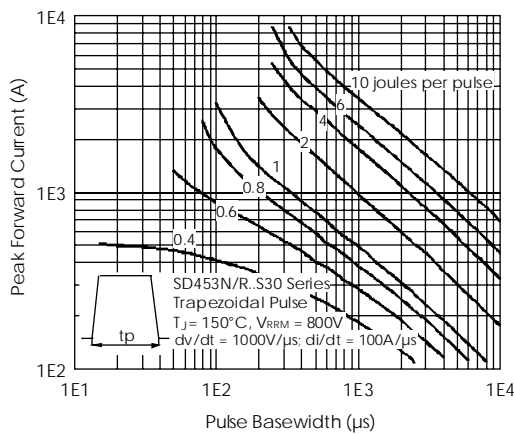


Fig. 34 - Maximum Total Energy Loss Per Pulse Characteristics

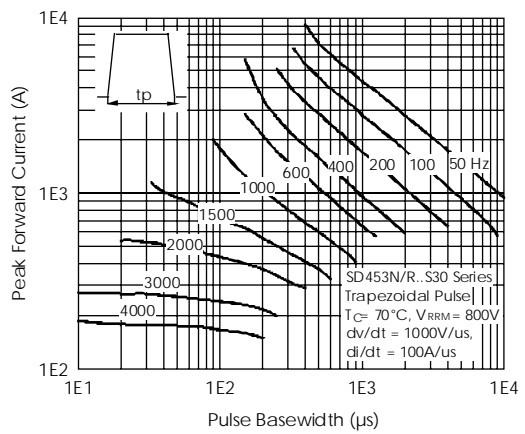


Fig. 35 - Frequency Characteristics