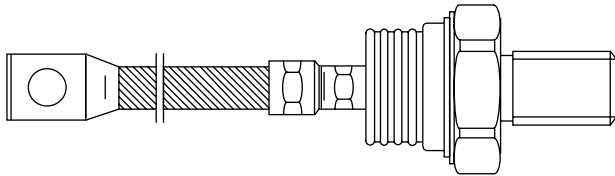


## Fast Recovery Diodes (Stud Version), 400/450 A


**B-8**
**FEATURES**

- High power fast recovery diode series
- 2.0 to 3.0  $\mu\text{s}$  recovery time
- High voltage ratings up to 2500 V
- 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
- RoHS compliant
- Lead (Pb)-free
- Designed and qualified for industrial level


**RoHS  
COMPLIANT**
**PRODUCT SUMMARY**

$I_{F(AV)}$	400/450 A
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**TYPICAL APPLICATIONS**

- Snubber diode for GTO
- High voltage freewheeling diode
- Fast recovery rectifier applications

**MAJOR RATINGS AND CHARACTERISTICS**

PARAMETER	TEST CONDITIONS	SD453N/R		UNITS
		S20	S30	
$I_{F(AV)}$		400	450	A
	$T_C$	70		°C
$I_{F(RMS)}$		630	710	A
$I_{FSM}$	50 Hz	9300	9600	
	60 Hz	9730	10 050	
$V_{RRM}$	Range	1200 to 2500		V
$t_{rr}$		2.0	3.0	$\mu\text{s}$
	$T_J$	25		°C
$T_J$		- 40 to 150		

**ELECTRICAL SPECIFICATIONS**
**VOLTAGE RATINGS**

TYPE NUMBER	VOLTAGE CODE	$V_{RRM}$ , MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$I_{RRM}$ MAXIMUM AT $T_J = T_J$ MAXIMUM mA
SD453N/R	12	1200	1300	50
	16	1600	1700	
	20	2000	2100	
	25	2500	2600	

FORWARD CONDUCTION							
PARAMETER	SYMBOL	TEST CONDITIONS		SD453N/R		UNITS	
				S20	S30		
Maximum average forward current at case temperature	$I_{F(AV)}$	180° conduction, half sine wave		400	450	A	
				70		°C	
Maximum RMS forward current at case temperature	$I_{F(RMS)}$			630	710	A	
				55	52	°C	
Maximum peak, one-cycle forward, non-repetitive surge current	$I_{FSM}$	t = 10 ms	No voltage reappplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	9300	9600	A
		t = 8.3 ms			9730	10 050	
		t = 10 ms	100 % $V_{RRM}$ reappplied		7820	8070	
		t = 8.3 ms			8190	8450	
Maximum $I^2t$ for fusing	$I^2t$	t = 10 ms	No voltage reappplied		432	460	kA <sup>2</sup> s
		t = 8.3 ms			395	420	
		t = 10 ms	100 % $V_{RRM}$ reappplied		306	326	
		t = 8.3 ms			279	297	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reappplied		4320	4600	kA <sup>2</sup> √s	
Low level value of threshold voltage	$V_{F(TO)1}$	$(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$ , $T_J = T_J$ maximum		1.00	0.95	V	
High level value of threshold voltage	$V_{F(TO)2}$	$(I > \pi \times I_{F(AV)})$ , $T_J = T_J$ maximum		1.09	1.04		
Low level value of forward slope resistance	$r_{f1}$	$(16.7\% \times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)})$ , $T_J = T_J$ maximum		0.80	0.60	mΩ	
High level value of forward slope resistance	$r_{f2}$	$(I > \pi \times I_{F(AV)})$ , $T_J = T_J$ maximum		0.74	0.54		
Maximum forward voltage drop	$V_{FM}$	$I_{pk} = 1500$ A, $T_J = T_J$ maximum, $t_p = 10$ ms sinusoidal wave		2.20	1.85	V	

RECOVERY CHARACTERISTICS								
CODE	MAXIMUM VALUE AT $T_J = 25$ °C	TEST CONDITIONS			TYPICAL VALUES AT $T_J = 150$ °C			
	$t_{rr}$ AT 25 % $I_{RRM}$ (μs)	$I_{pk}$ SQUARE PULSE (A)	dI/dt (A/μs)	$V_r$ (V)	$t_{rr}$ AT 25 % $I_{RRM}$ (μs)	$Q_{rr}$ (μC)	$I_{rr}$ (A)	
S20	2.0	1000	50	- 50	3.5	250	120	
S30	3.0				5.0	380	150	

THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction operating and storage temperature range	$T_J, T_{Stg}$		- 40 to 150	°C
Maximum thermal resistance, junction to case	$R_{thJC}$	DC operation	0.1	K/W
Maximum thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, smooth, flat and greased	0.04	
Mounting torque ± 10 %		Not-lubricated threads	50	Nm
Approximate weight			454	g
Case style		See dimensions (link at the end of datasheet)		B-8

$\Delta R_{thJC}$ CONDUCTION				
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION	RECTANGULAR CONDUCTION	TEST CONDITIONS	UNITS
180°	0.010	0.008	$T_J = T_{J \text{ maximum}}$	K/W
120°	0.014	0.014		
90°	0.017	0.019		
60°	0.025	0.026		
30°	0.042	0.042		

**Note**

- The table above shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC

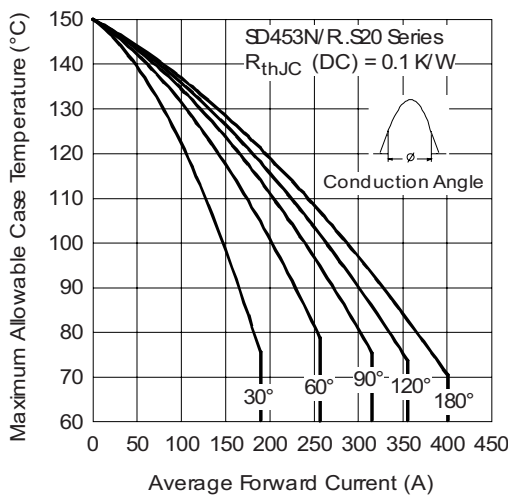


Fig. 1 - Current Ratings Characteristics

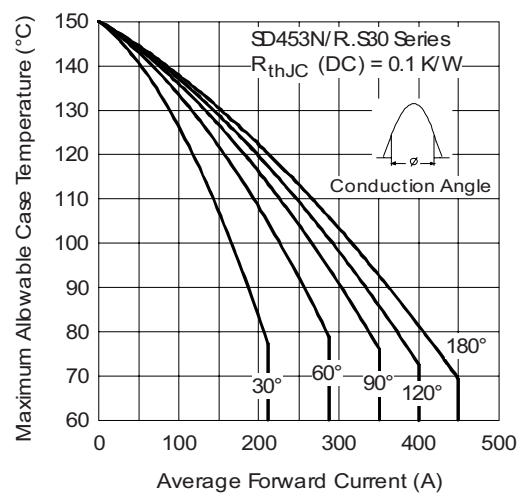


Fig. 3 - Current Ratings Characteristics

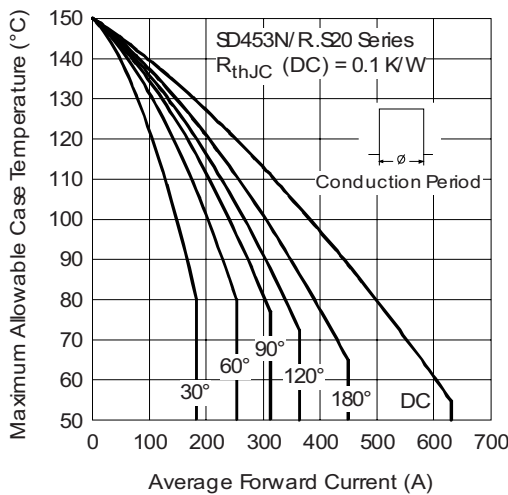


Fig. 2 - Current Ratings Characteristics

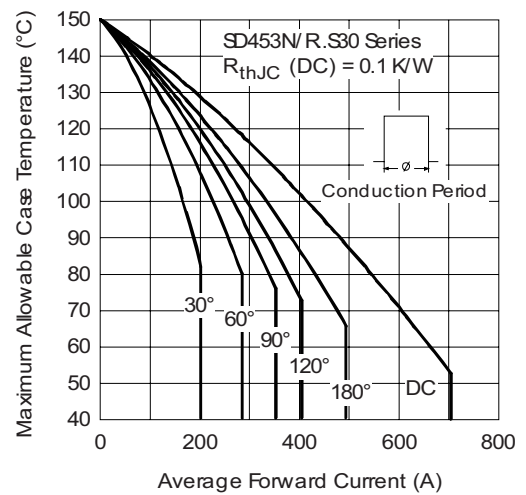


Fig. 4 - Current Ratings Characteristics

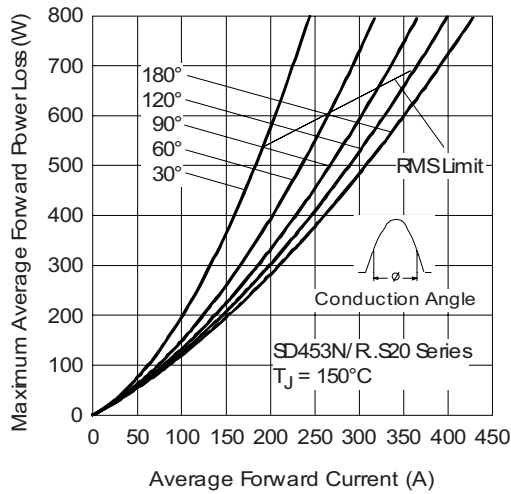


Fig. 5 - Forward Power Loss Characteristics

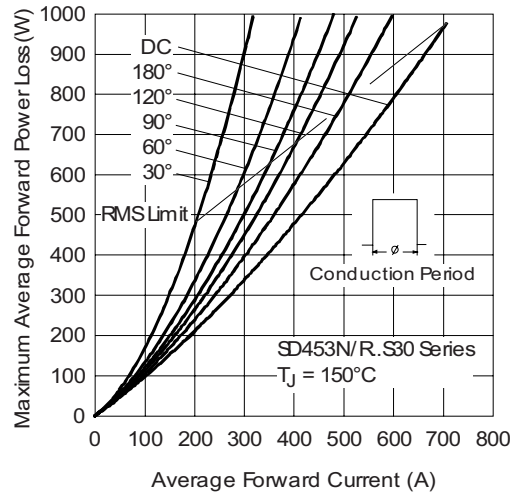


Fig. 8 - Forward Power Loss Characteristics

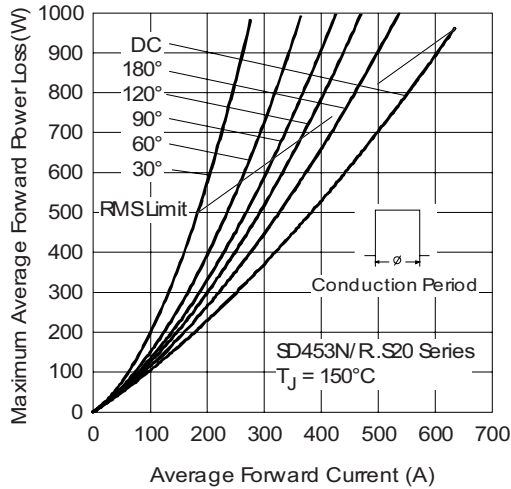


Fig. 6 - Forward Power Loss Characteristics

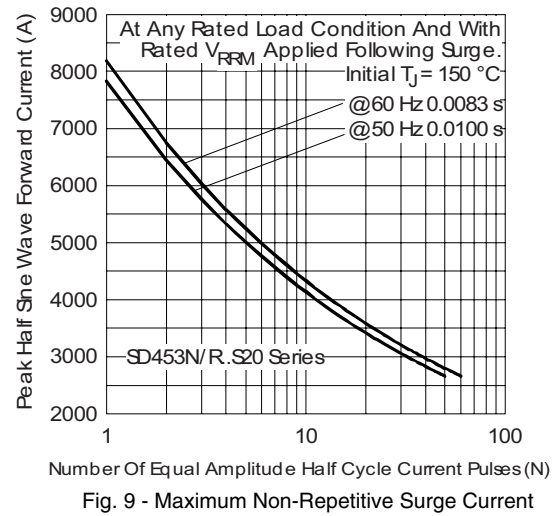


Fig. 9 - Maximum Non-Repetitive Surge Current

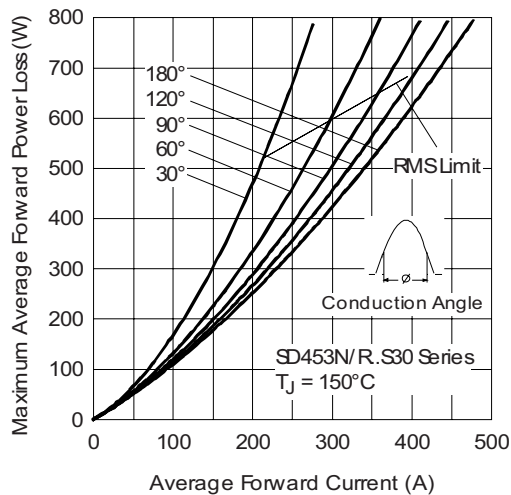


Fig. 7 - Forward Power Loss Characteristics

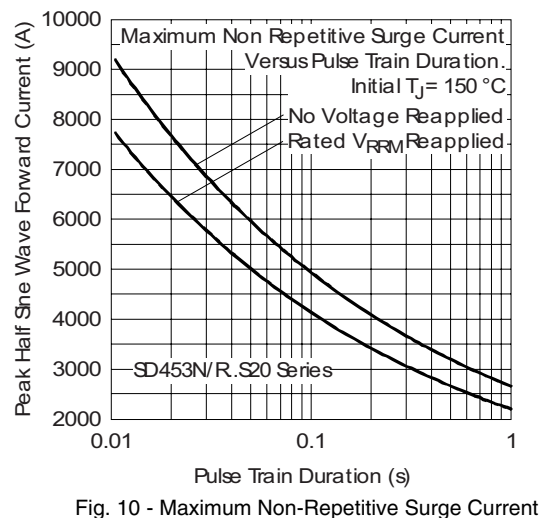


Fig. 10 - Maximum Non-Repetitive Surge Current

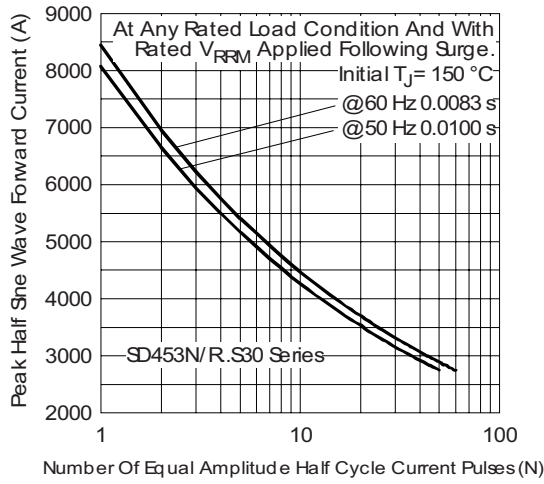


Fig. 11 - Maximum Non-Repetitive Surge Current

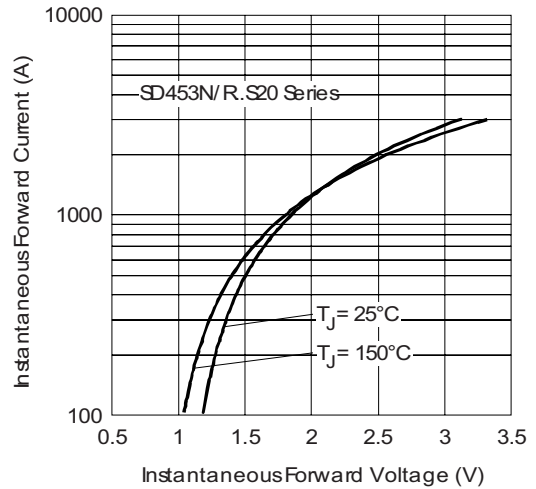


Fig. 13 - Forward Voltage Drop Characteristics

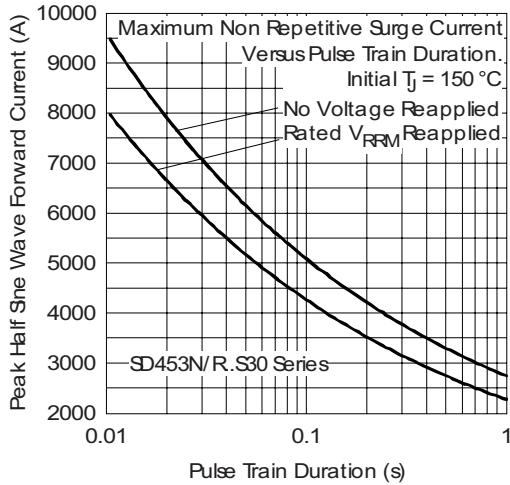


Fig. 12 - Maximum Non-Repetitive Surge Current

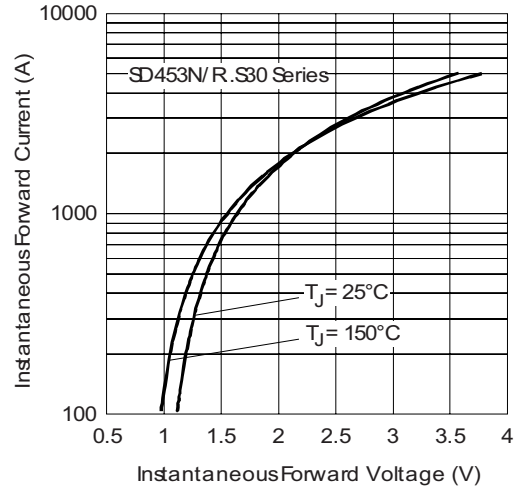


Fig. 14 - Forward Voltage Drop Characteristics

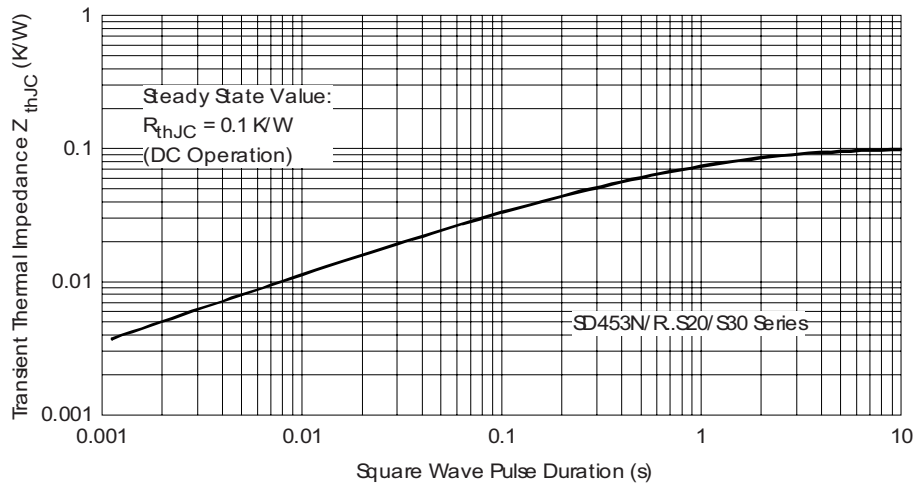


Fig. 15 - Thermal Impedance  $Z_{thJC}$  Characteristic

# SD453N/R Series

Vishay High Power Products Fast Recovery Diodes  
(Stud Version), 400/450 A

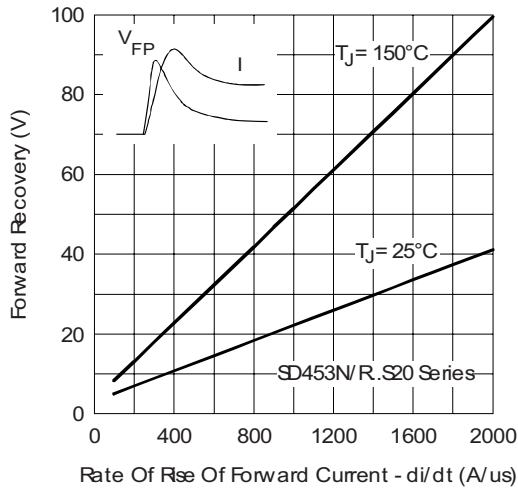


Fig. 16 - Typical Forward Recovery Characteristics

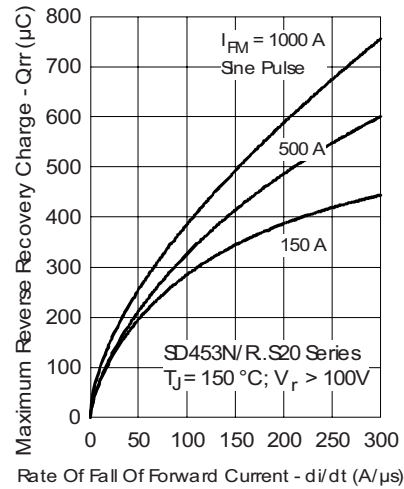


Fig. 19 - Recovery Charge Characteristics

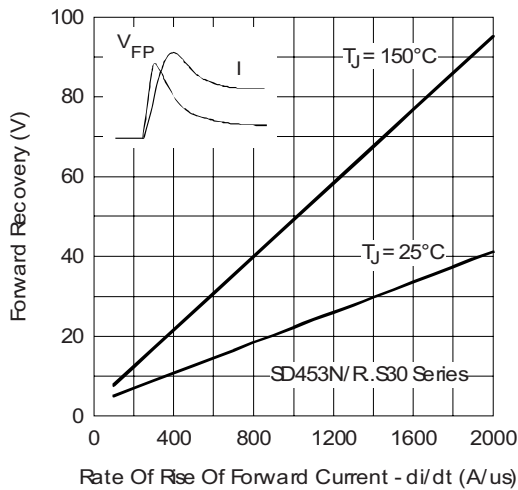


Fig. 17 - Typical Forward Recovery Characteristics

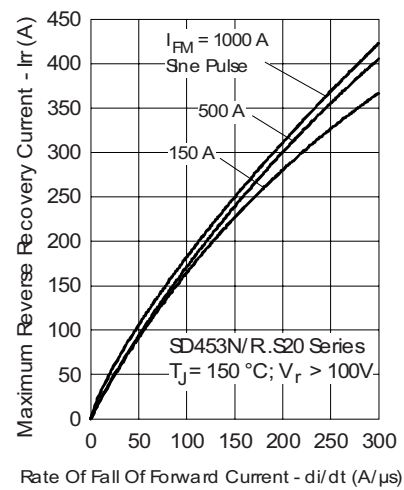


Fig. 20 - Recovery Current Characteristics

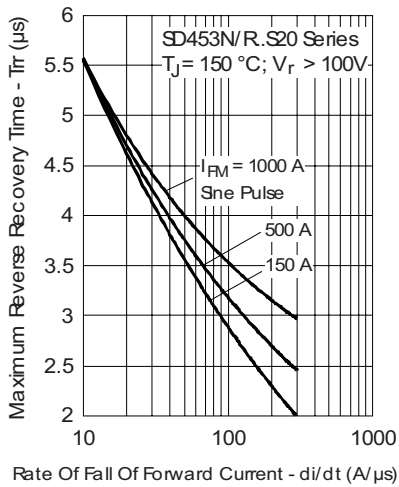


Fig. 18 - Recovery Time Characteristics

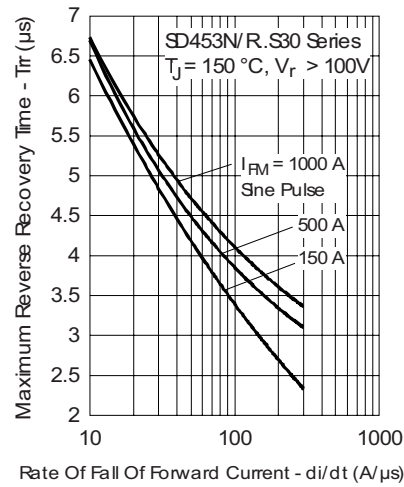


Fig. 21 - Recovery Time Characteristics

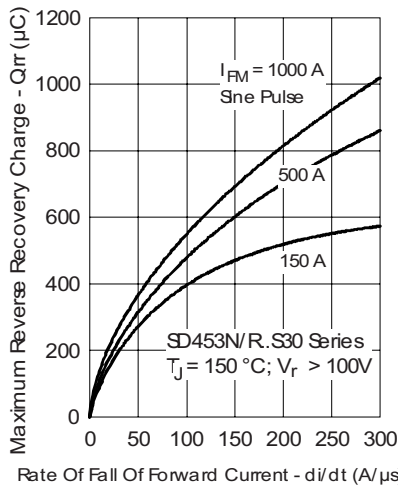


Fig. 22 - Recovery Charge Characteristics

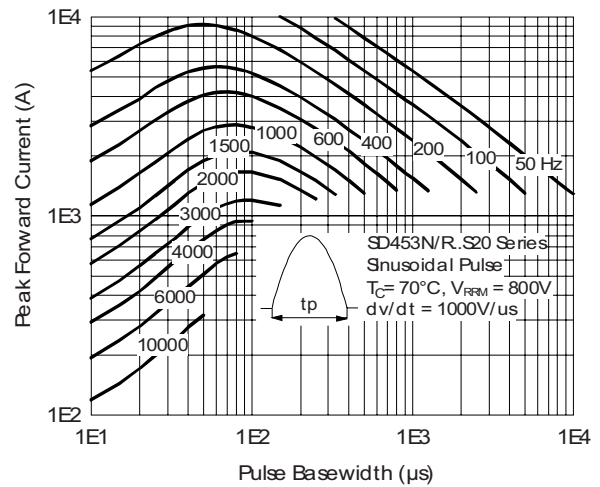


Fig. 25 - Frequency Characteristics

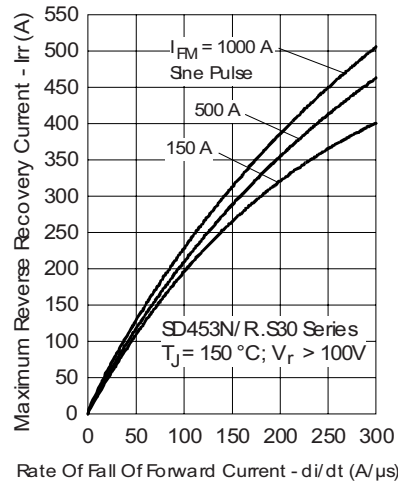


Fig. 23 - Recovery Current Characteristics

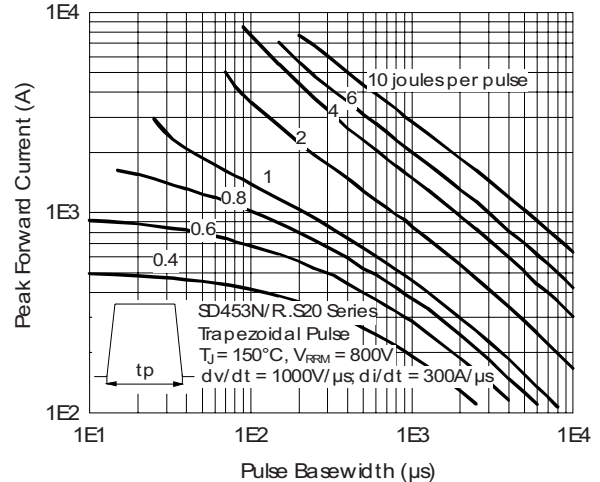


Fig. 26 - Maximum Total Energy Loss Per Pulse Characteristics

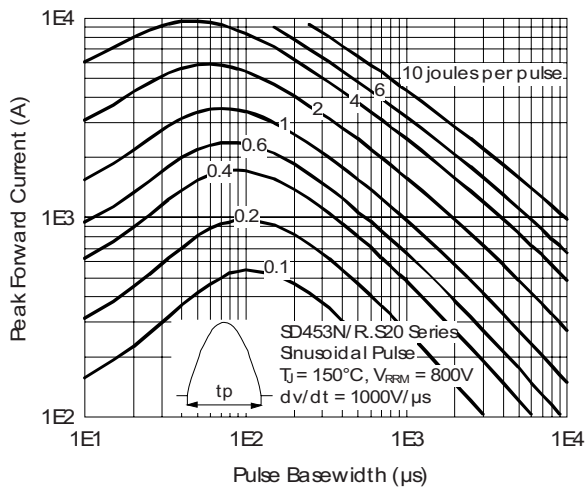


Fig. 24 - Maximum Total Energy Loss Per Pulse Characteristics

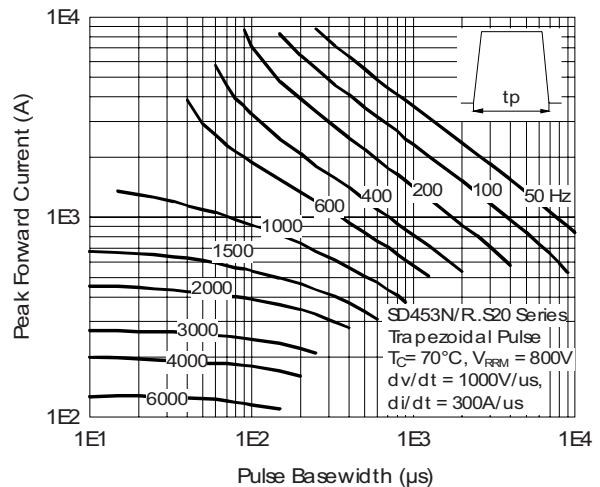


Fig. 27 - Frequency Characteristics

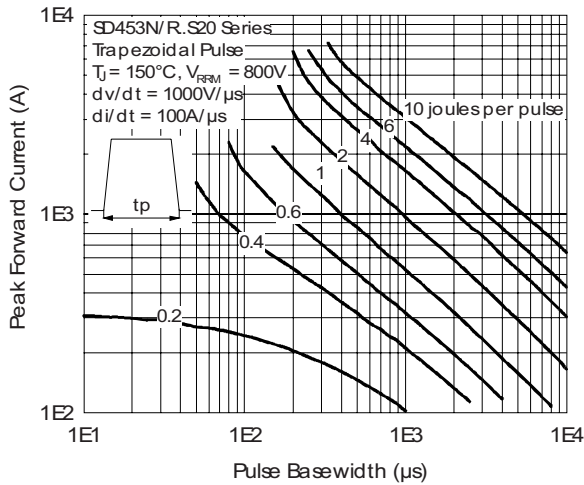


Fig. 28 - Maximum Total Energy Loss Per Pulse Characteristics

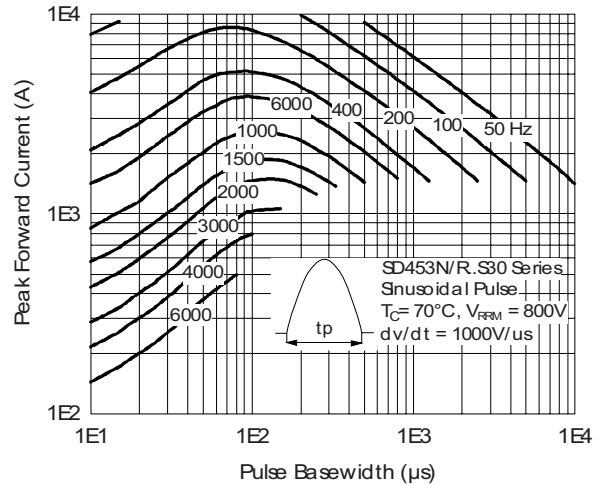


Fig. 31 - Frequency Characteristics

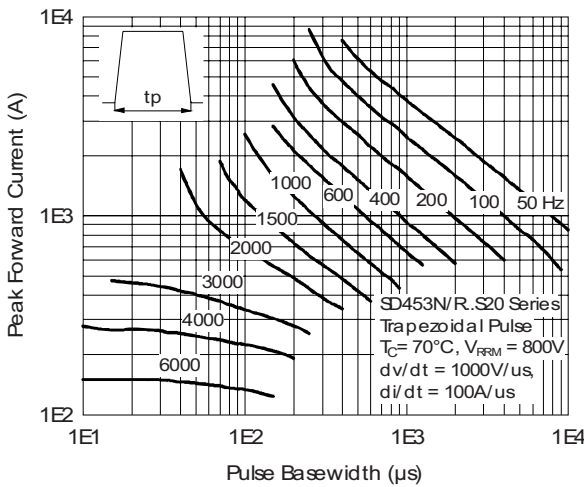


Fig. 29 - Frequency Characteristics

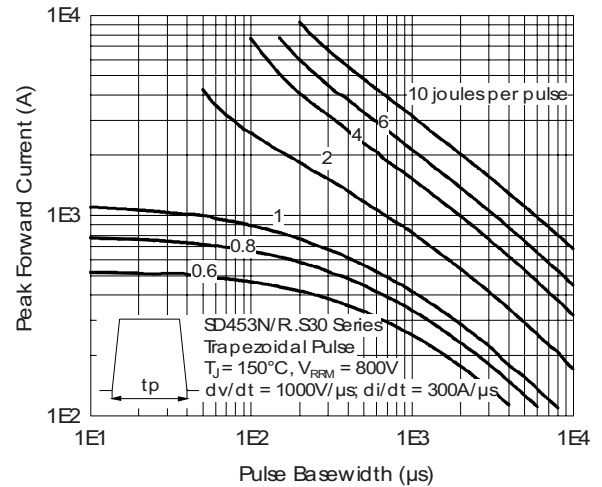


Fig. 32 - Maximum Total Energy Loss Per Pulse Characteristics

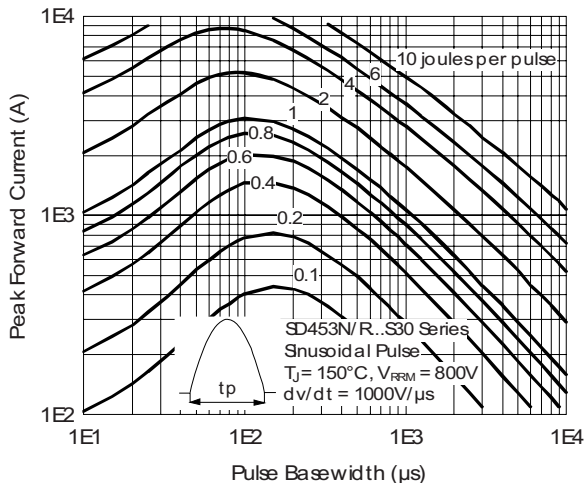


Fig. 30 - Maximum Total Energy Loss Per Pulse Characteristics

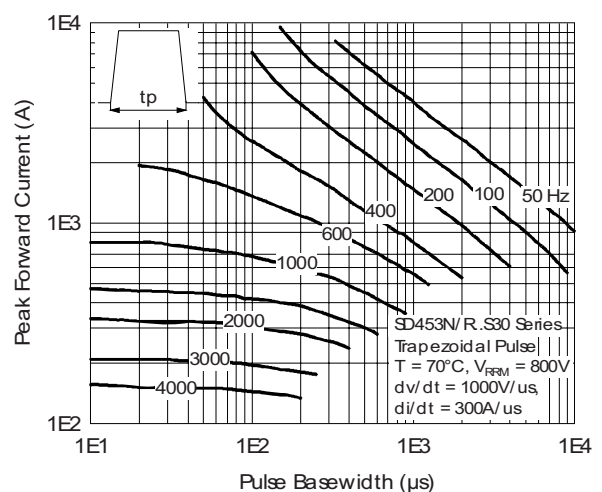


Fig. 33 - Frequency Characteristics



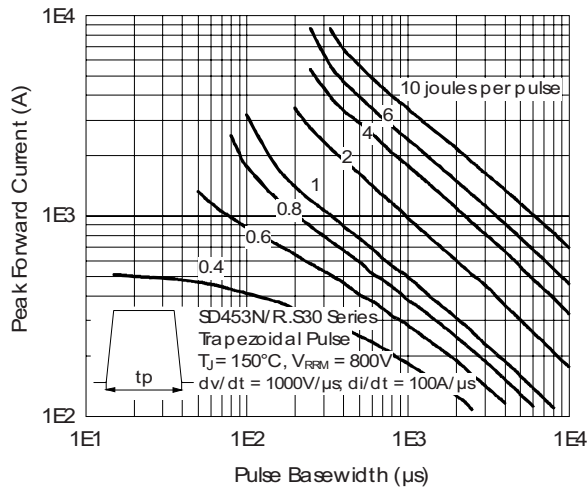


Fig. 34 - Maximum Total Energy Loss Per Pulse Characteristics

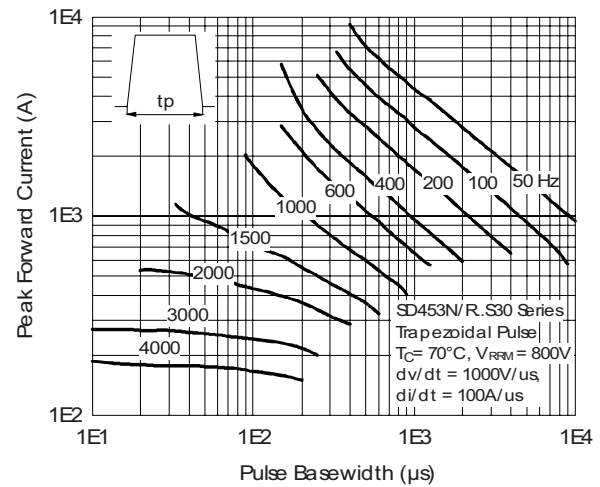


Fig. 35 - Frequency Characteristics

### 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 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 silicon sleeve (red = Reverse polarity; blue = Normal polarity)
  - None = Not isolated lead
  - T = Threaded top terminal 3/8" 24UNF-2A
- 9** - C = Ceramic housing

#### LINKS TO RELATED DOCUMENTS

Dimensions	<a href="http://www.vishay.com/doc?95303">http://www.vishay.com/doc?95303</a>
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