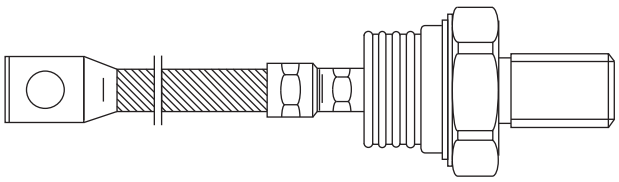
Fast Recovery Diodes (Stud Version), 400 A, 450 A



B-8

FEATURES

- High power fast recovery diode series
- 2.0 µs to 3.0 µs 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
- Designed and qualified for industrial level
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

PRODUCT SUMMARY	
$I_{F(AV)}$	400 A, 450 A
Package	B-8
Circuit configuration	Single diode

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	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	1200 to 2500	V
t_{rr}		2.0	3.0	µs
	T_J	25	25	°C
T_J		- 40 to 150	- 40 to 150	

ELECTRICAL SPECIFICATIONS

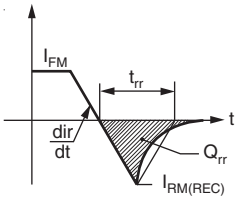
VOLTAGE RATINGS				
TYPE NUMBER	VOLTAGE CODE	V_{RRM}, MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	V_{RSM}, MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I_{RRM} MAXIMUM AT $T_J = T_J$ MAXIMUM mA
VS-SD453N/R	12	1200	1300	50
	16	1600	1700	
	20	2000	2100	
	25	2500	2600	

FORWARD CONDUCTION

PARAMETER	SYMBOL	TEST CONDITIONS			SD453N/R S20	SD453N/R S30	UNITS
Maximum average forward current at case temperature	$I_{F(AV)}$	180° conduction, half sine wave			400	450	A
					70	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 reapplied	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} reapplied		7820	8070	
		t = 8.3 ms			8190	8450	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		432	460	kA^2s
		t = 8.3 ms			395	420	
		t = 10 ms	100 % V_{RRM} reapplied		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 reapplied			4320	4600	$kA^2\sqrt{s}$
Low level value of threshold voltage	$V_{F(TO)1}$	(16.7 % x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ maximum			1.00	0.95	V
High level value of threshold voltage	$V_{F(TO)2}$	(I > π x $I_{F(AV)}$), $T_J = T_J$ maximum			1.09	1.04	
Low level value of forward slope resistance	r_{f1}	(16.7 % x π x $I_{F(AV)}$ < I < π x $I_{F(AV)}$), $T_J = T_J$ maximum			0.80	0.60	mW
High level value of forward slope resistance	r_{f2}	(I > π x $I_{F(AV)}$), $T_J = T_J$ 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	

ΔR_{thJC} CONDUCTION

CONDUCTION ANGLE	SINUSOIDAL CONDUCTION	RECTANGULAR CONDUCTION	TEST CONDITIONS	UNITS
180°	0.010	0.008	$T_J = T_J$ 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

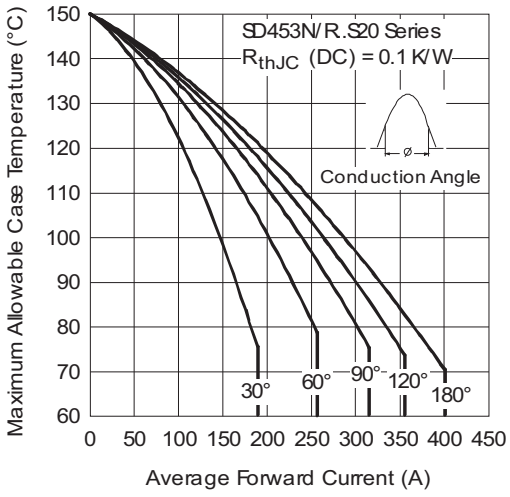


Fig. 1 - Current Ratings Characteristics

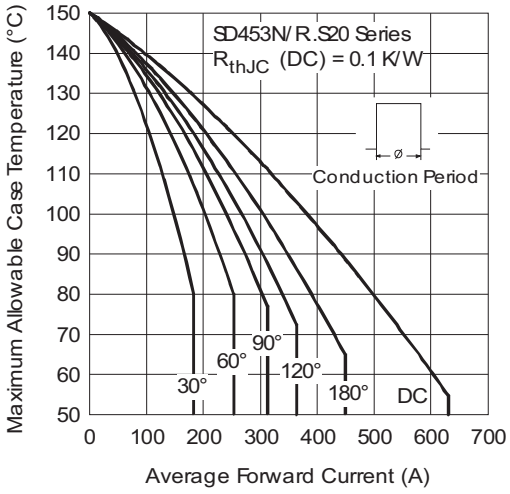


Fig. 2 - Current Ratings Characteristics

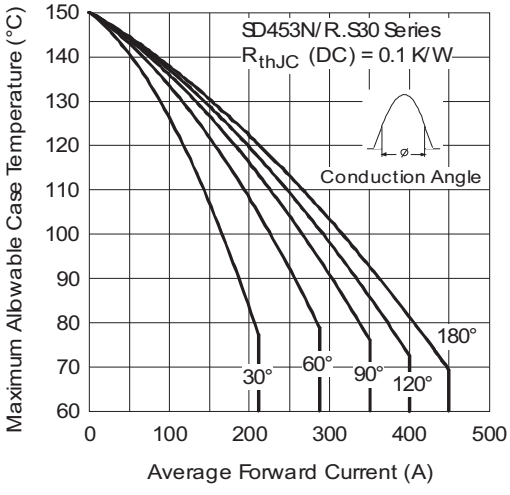


Fig. 3 - Current Ratings Characteristics

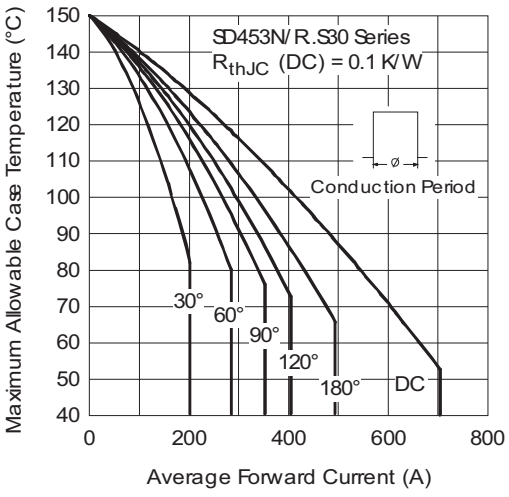


Fig. 4 - Current Ratings Characteristics

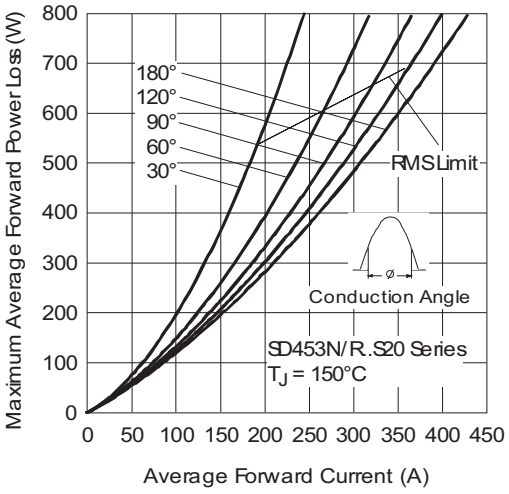


Fig. 5 - Forward Power Loss Characteristics

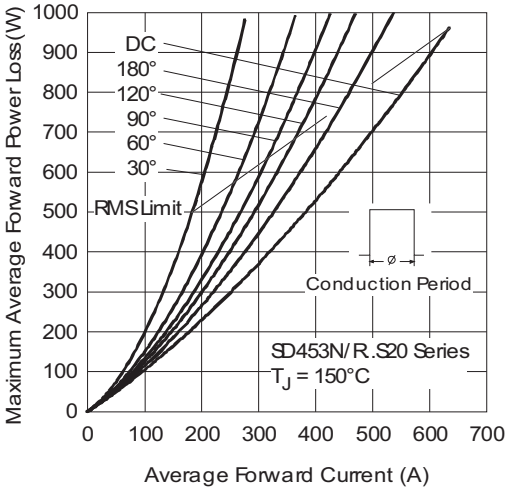


Fig. 6 - Forward Power Loss Characteristics

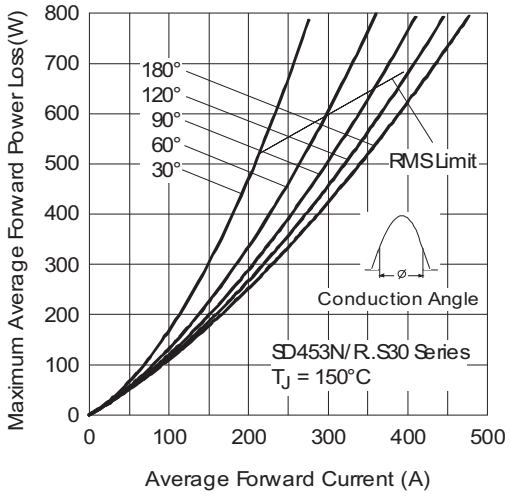


Fig. 7 - Forward Power Loss Characteristics

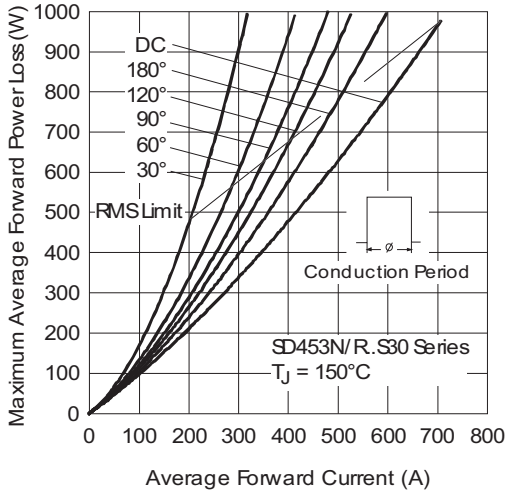


Fig. 8 - Forward Power Loss Characteristics

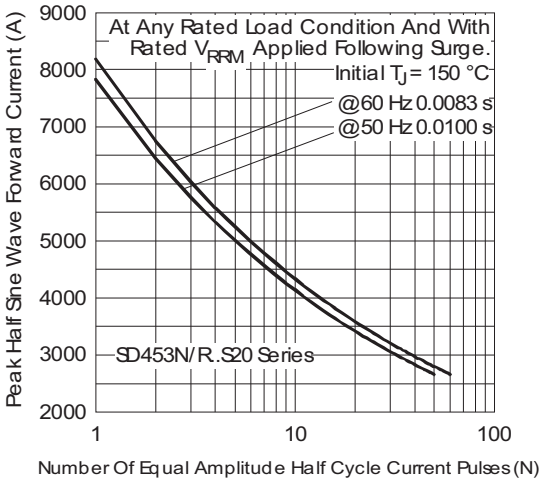


Fig. 9 - Maximum Non-Repetitive Surge Current

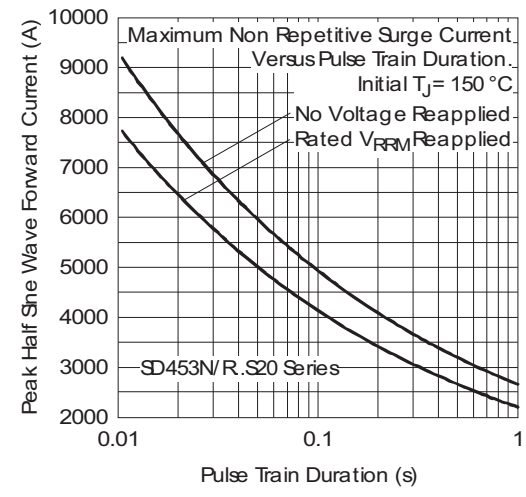


Fig. 10 - Maximum Non-Repetitive Surge Current

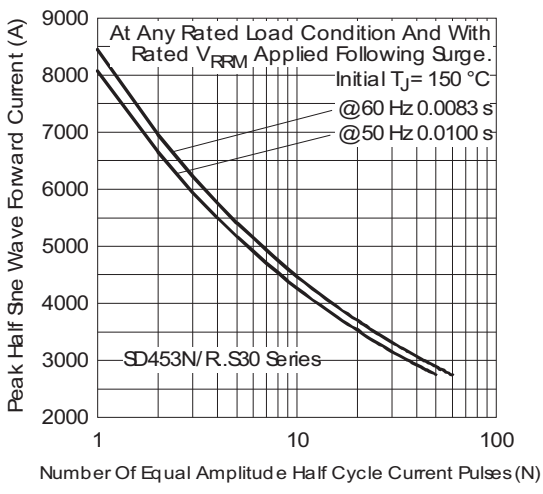


Fig. 11 - Maximum Non-Repetitive Surge Current

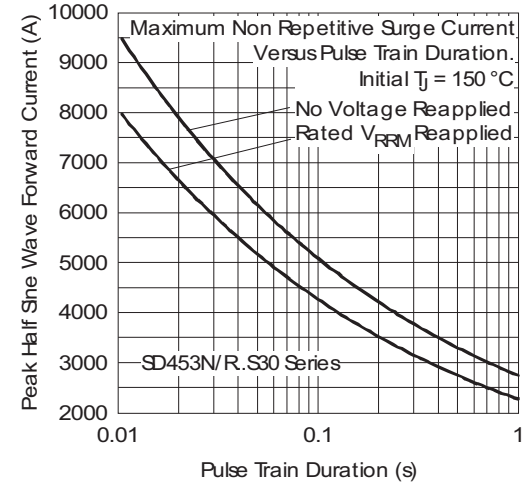


Fig. 12 - Maximum Non-Repetitive Surge Current

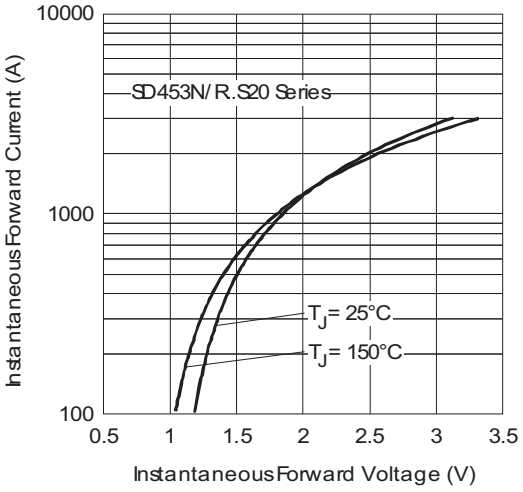


Fig. 13 - Forward Voltage Drop Characteristics

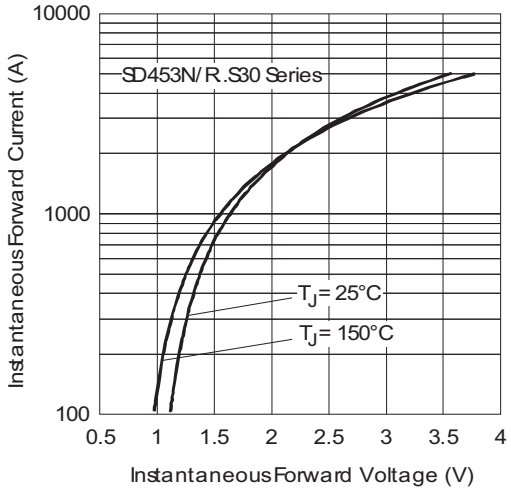


Fig. 14 - Forward Voltage Drop Characteristics

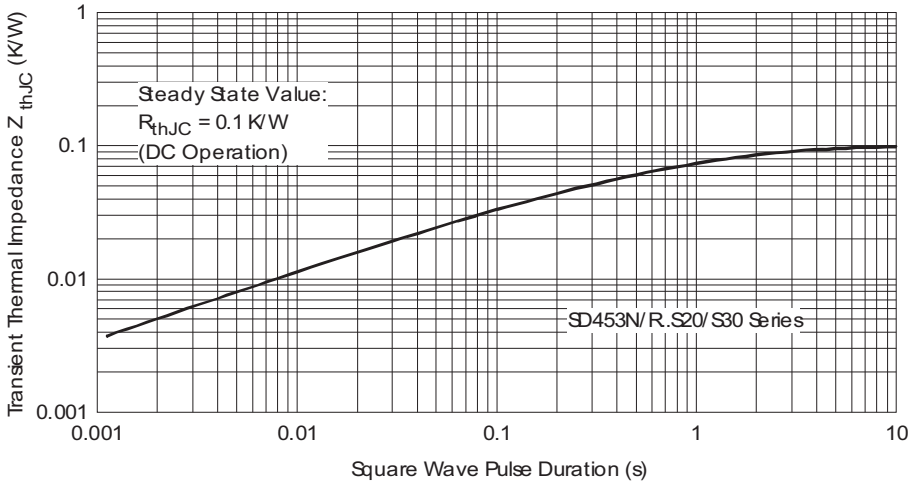


Fig. 15 - Thermal Impedance Z_{thJC} Characteristic

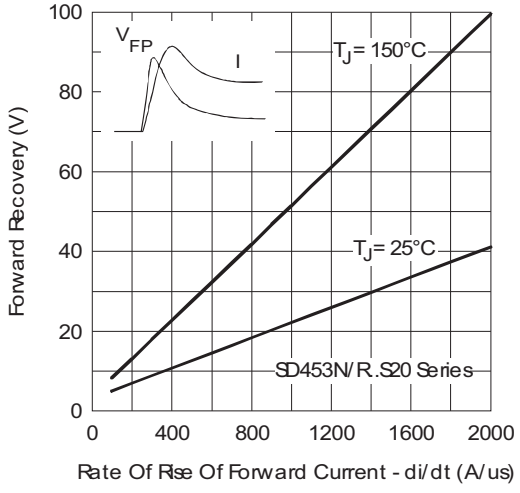


Fig. 16 - Typical Forward Recovery Characteristics

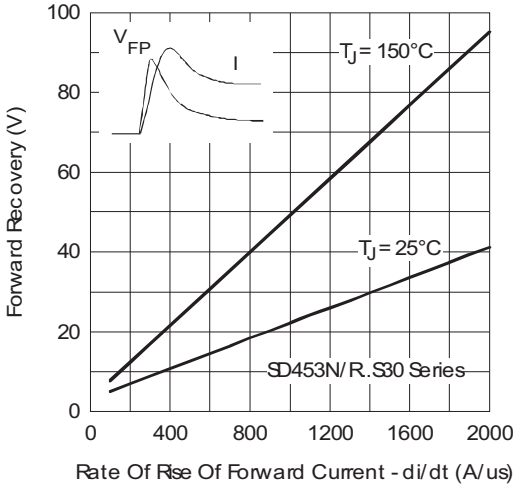


Fig. 17 - Typical Forward Recovery Characteristics

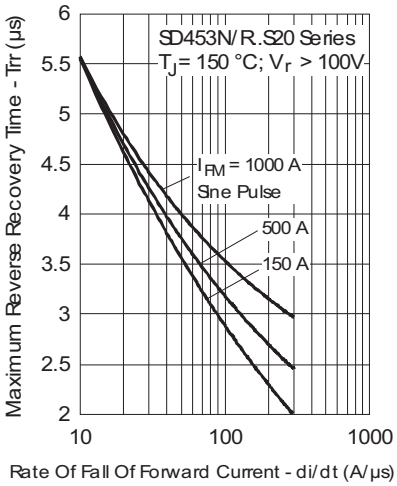


Fig. 18 - Recovery Time Characteristics

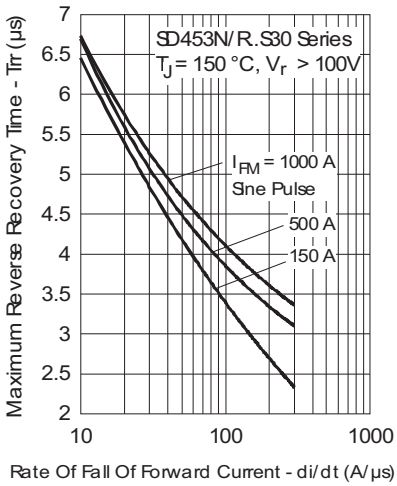


Fig. 21 - Recovery Time Characteristics

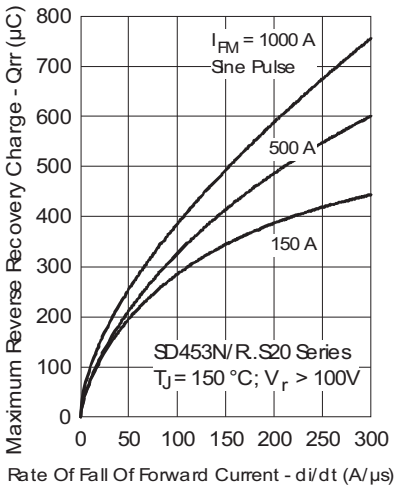


Fig. 19 - Recovery Charge Characteristics

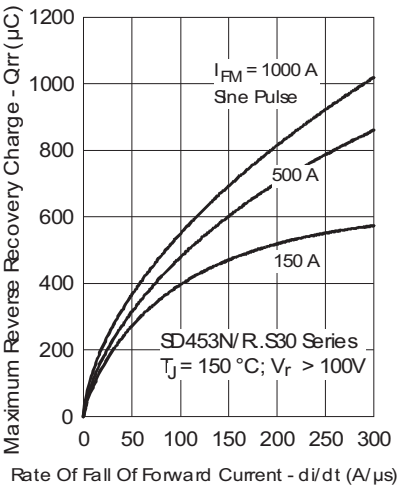


Fig. 22 - Recovery Charge Characteristics

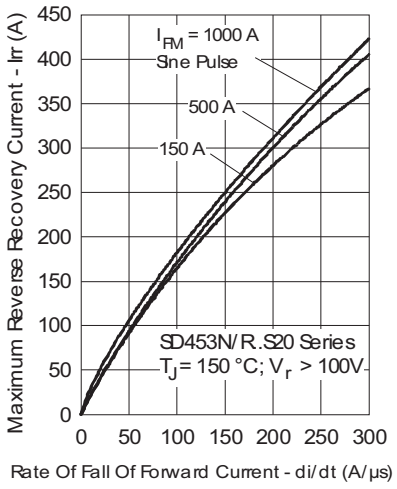


Fig. 20 - Recovery Current Characteristics

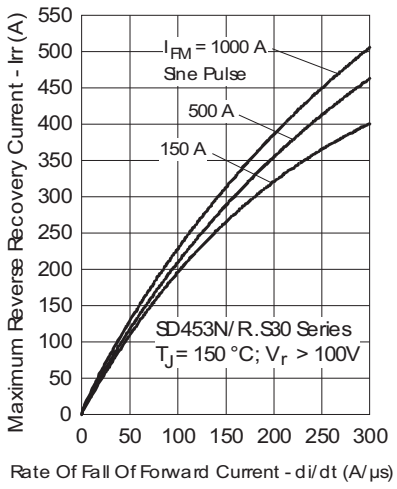


Fig. 23 - Recovery Current Characteristics

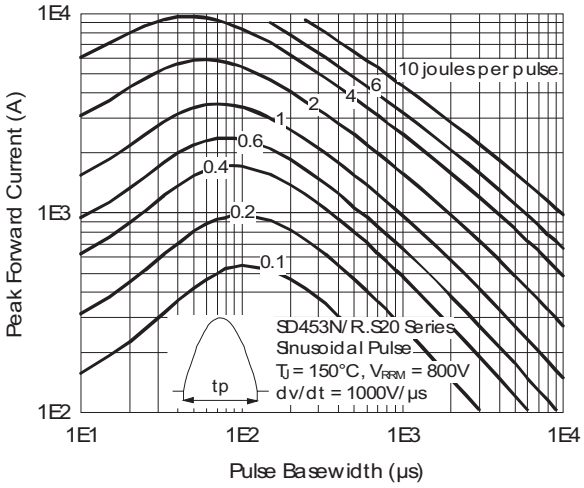


Fig. 24 - Maximum Total Energy Loss Per Pulse Characteristics

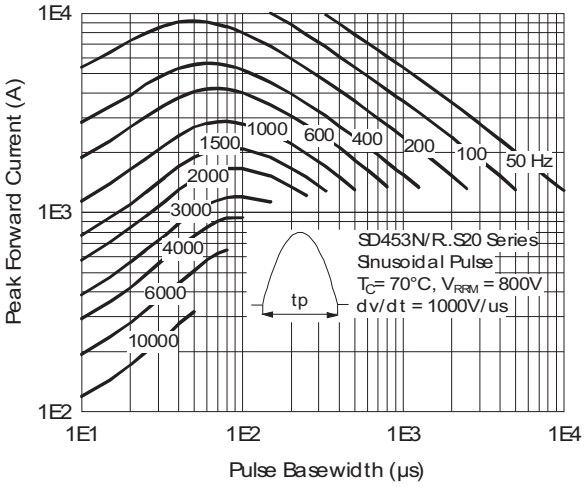


Fig. 25 - Frequency Characteristics

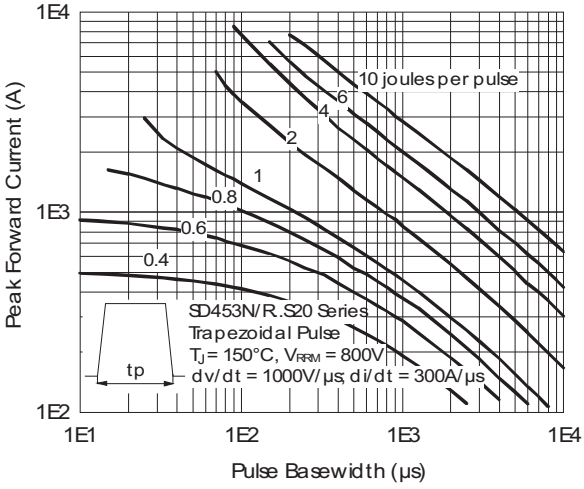


Fig. 26 - Maximum Total Energy Loss Per Pulse Characteristics

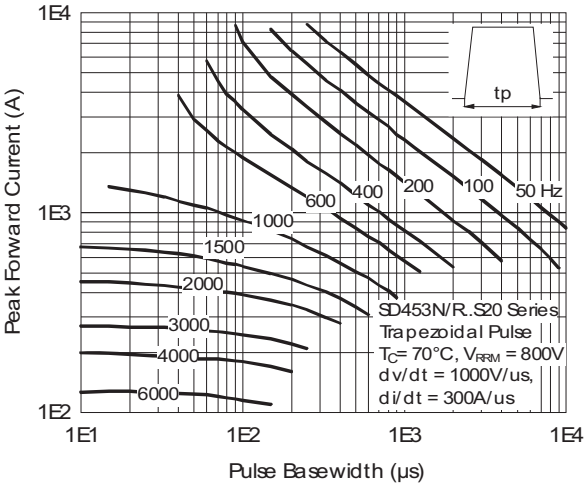


Fig. 27 - Frequency Characteristics

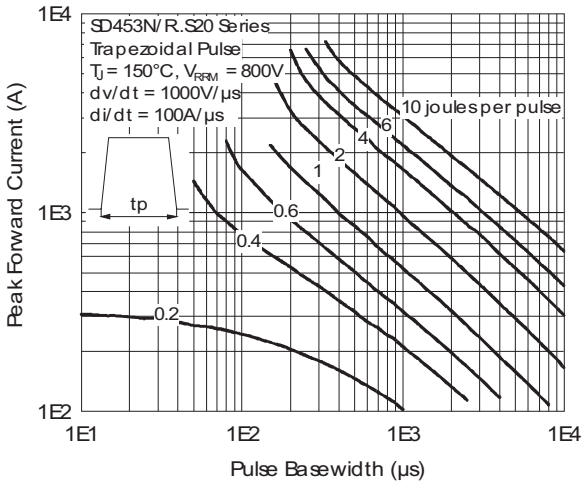


Fig. 28 - Maximum Total Energy Loss Per Pulse Characteristics

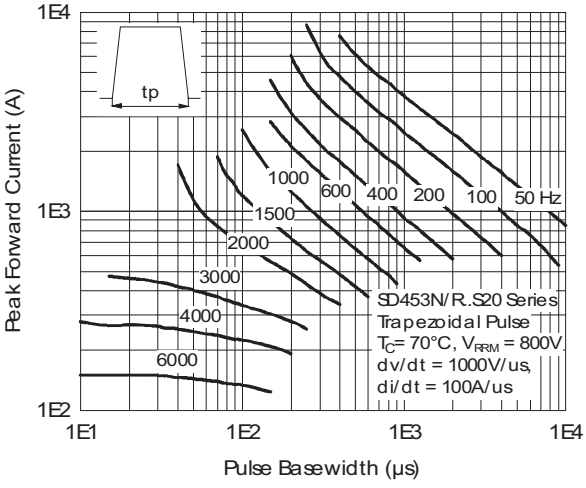


Fig. 29 - Frequency Characteristics

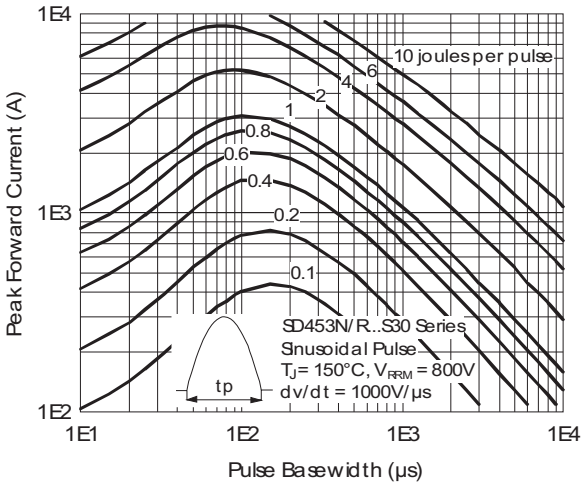


Fig. 30 - Maximum Total Energy Loss Per Pulse Characteristics

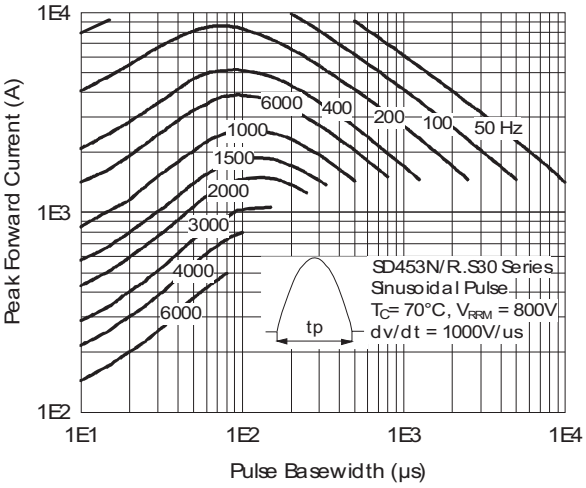


Fig. 31 - Frequency Characteristics

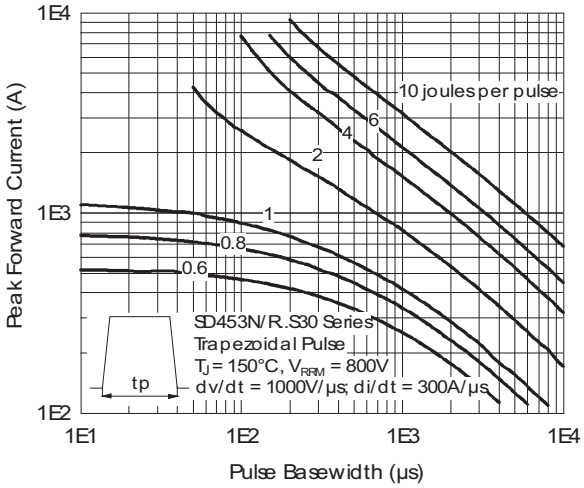


Fig. 32 - Maximum Total Energy Loss Per Pulse Characteristics

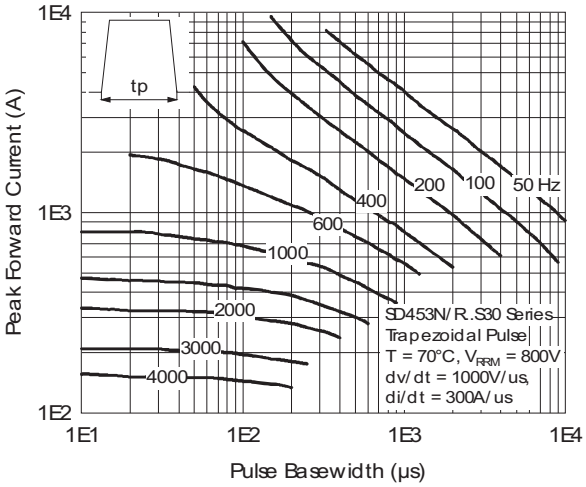


Fig. 33 - Frequency Characteristics

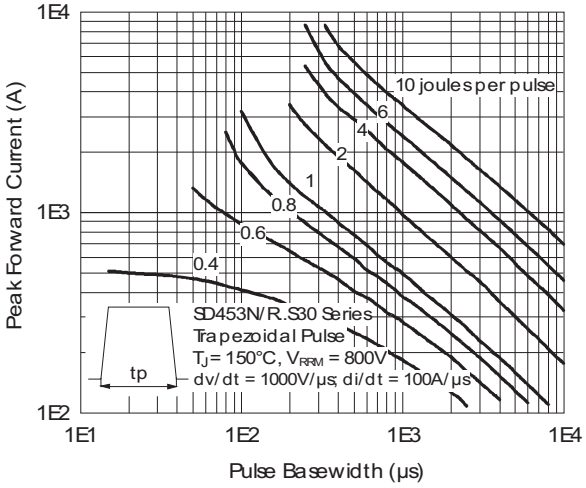


Fig. 34 - Maximum Total Energy Loss Per Pulse Characteristics

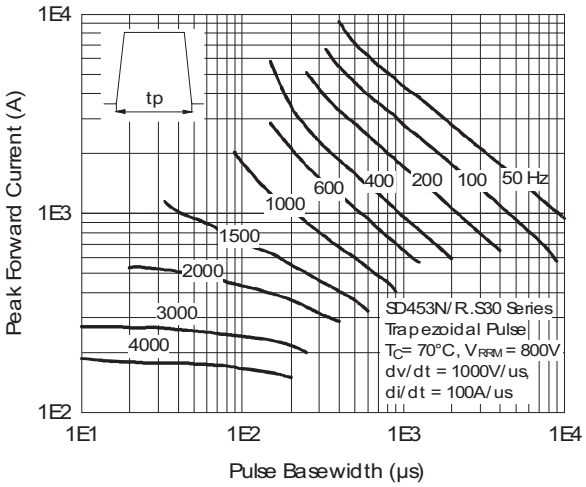


Fig. 35 - Frequency Characteristics

ORDERING INFORMATION TABLE

Device code

VS-	SD	45	3	N	25	S30	P	S	C
1	2	3	4	5	6	7	8	9	10

- 1 - Vishay Semiconductors product
- 2 - Diode
- 3 - Essential part number
- 4 - 3 = Fast recovery
- 5 - • N = Stud normal polarity (cathode to stud)
  • R = Stud reverse polarity (anode to stud)
- 6 - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)
- 7 - t_{rr} code (see Recovery Characteristics table)
- 8 - • P = Stud base B-8 3/4" 16UNF-2A
  • M = Stud base B-8 M24 x 1.5
- 9 - • S = Isolated lead with silicon sleeve
  (red = Reverse polarity; blue = Normal polarity)
  • None = Not isolated lead
  • T = Threaded top terminal 3/8" 24UNF-2A
- 10 - C = Ceramic housing

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95303

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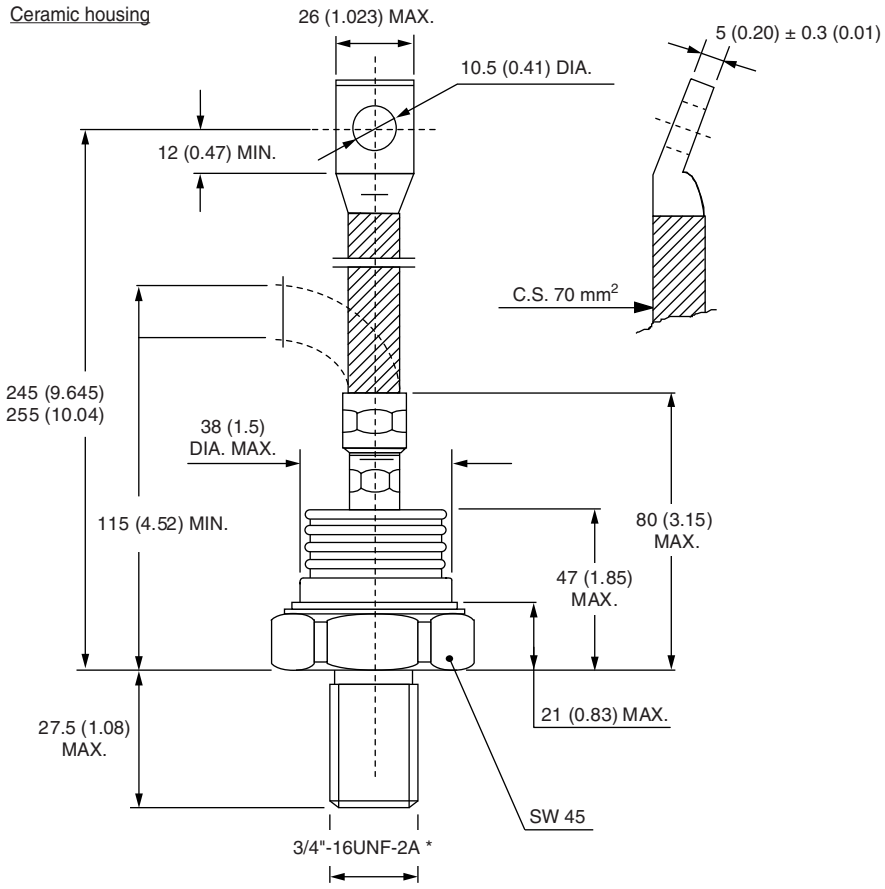
DIMENSIONS in millimeters (inches)



*For metric device: M24 x 1.5 - length 21 (0.83) MAX.
contact factory

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