

### FAST RECOVERY DIODES

### Stud Version

#### Features

- High power FAST recovery diode series
- 1.0 to 2.0  $\mu$ 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 JEDEC DO-30
- Maximum junction temperature 125°C

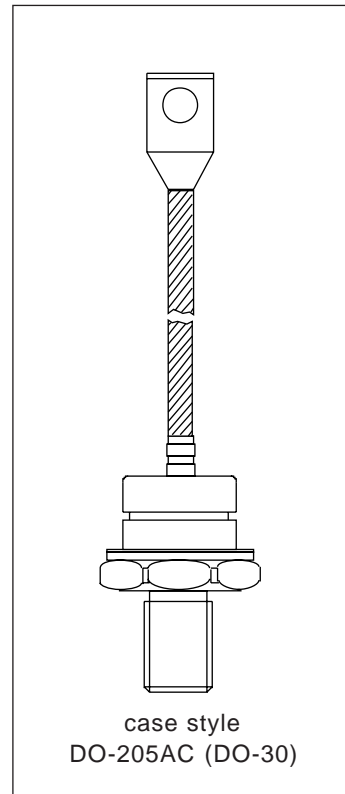
110A

#### Typical Applications

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

#### Major Ratings and Characteristics

Parameters	SD103N/R	Units
$I_{F(AV)}$	110	A
@ $T_C$	85	°C
$I_{F(RMS)}$	173	A
$I_{FSM}$ @ 50Hz	3570	A
@ 60Hz	3730	A
$I^2t$ @ 50Hz	64	KA <sup>2</sup> s
@ 60Hz	58	KA <sup>2</sup> s
$V_{RRM}$ range	400 to 2500	V
$t_{rr}$ range	1.0 to 2.0	$\mu$ s
@ $T_J$	25	°C
$T_J$	- 40 to 125	°C



**ELECTRICAL SPECIFICATIONS**

Voltage Ratings

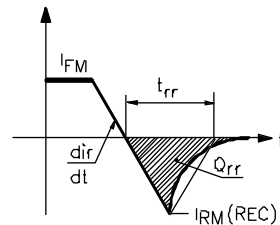
Type number	Voltage Code	V <sub>RRM</sub> max. repetitive peak and off-state voltage V	V <sub>RSM</sub> , maximum non-repetitive peak voltage V	I <sub>RRM</sub> max. T <sub>J</sub> = 125°C mA
SD103N/R..S10	04	400	500	35
	08	800	900	
	10	1000	1100	
SD103N/R..S15	12	1200	1300	
	14	1400	1500	
	16	1600	1700	
SD103N/R..S20	20	2000	2100	
	25	2500	2600	

Forward Conduction

Parameter	SD103N/R	Units	Conditions
I <sub>F(AV)</sub> Max. average forward current @ Case temperature	110	A	180° conduction, half sine wave.
	85	°C	
I <sub>F(RMS)</sub> Max. RMS current	173	A	DC @ 75°C case temperature
I <sub>FSM</sub> Max. peak, one-cycle non-repetitive forward current	3570	A	t = 10ms No voltage
	3730		t = 8.3ms reapplied
	3000		t = 10ms 100% V <sub>RRM</sub>
	3140		t = 8.3ms reapplied
I <sup>2</sup> t Maximum I <sup>2</sup> t for fusing	64	KA <sup>2</sup> s	t = 10ms No voltage
	58		t = 8.3ms reapplied
	45		t = 10ms 100% V <sub>RRM</sub>
	41		t = 8.3ms reapplied
I <sup>2</sup> √t Maximum I <sup>2</sup> √t for fusing	636	KA <sup>2</sup> √s	t = 0.1 to 10ms, no voltage reapplied
V <sub>F(TO)1</sub> Low level of threshold voltage	1.36	V	(16.7% × π × I <sub>F(AV)</sub> ) < I < π × I <sub>F(AV)</sub> , T <sub>J</sub> = T <sub>J</sub> max.
V <sub>F(TO)2</sub> High level of threshold voltage	1.94		(I > π × I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> max.
r <sub>f1</sub> Low level of forward slope resistance	2.55	mΩ	(16.7% × π × I <sub>F(AV)</sub> ) < I < π × I <sub>F(AV)</sub> , T <sub>J</sub> = T <sub>J</sub> max.
r <sub>f2</sub> High level of forward slope resistance	1.11		(I > π × I <sub>F(AV)</sub> ), T <sub>J</sub> = T <sub>J</sub> max.
V <sub>FM</sub> Max. forward voltage	2.23	V	I <sub>pk</sub> = 345A, T <sub>J</sub> = 25°C, t <sub>p</sub> = 400 μs square pulse

Recovery Characteristics

Code	T <sub>J</sub> = 25°C typical t <sub>rr</sub> @ 25% I <sub>RRM</sub> (μs)	Test conditions			Max. values @ T <sub>J</sub> = 125°C		
		I <sub>pk</sub> Square Pulse (A)	di/dt (A/μs)	V <sub>r</sub> (V)	t <sub>rr</sub> @ 25% I <sub>RRM</sub> (μs)	Q <sub>rr</sub> (μC)	I <sub>rr</sub> (A)
S10	1.0	350	25	-30	1.6	21	27
S15	1.5				2.3	61	37
S20	2.0				3.2	75	39



**Thermal and Mechanical Specification**

Parameter	SD103N/R	Units	Conditions
T <sub>J</sub> Max. operating temperature range	-40 to 125	°C	
T <sub>stg</sub> Max. storage temperature range	-40 to 150		
R <sub>thJC</sub> Max. thermal resistance, junction to case	0.16	K/W	DC operation
R <sub>thCS</sub> Max. thermal resistance, case to heatsink	0.10		Mounting surface, smooth, flat and greased
T Mounting torque ± 10%	15.5	Nm	Not lubricated threads
	13.5		Lubricated threads
wt Approximate weight	120	g	
Case style	DO-205AC(DO-30)		See Outline Table

**ΔR<sub>thJC</sub> Conduction**

(The following table shows the increment of thermal resistance R<sub>thJC</sub> when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.011	0.012	K/W	T <sub>J</sub> = T <sub>J</sub> max.
120°	0.016	0.019		
90°	0.021	0.023		
60°	0.029	0.030		
30°	0.041	0.041		

**Ordering Information Table**

**Device Code**

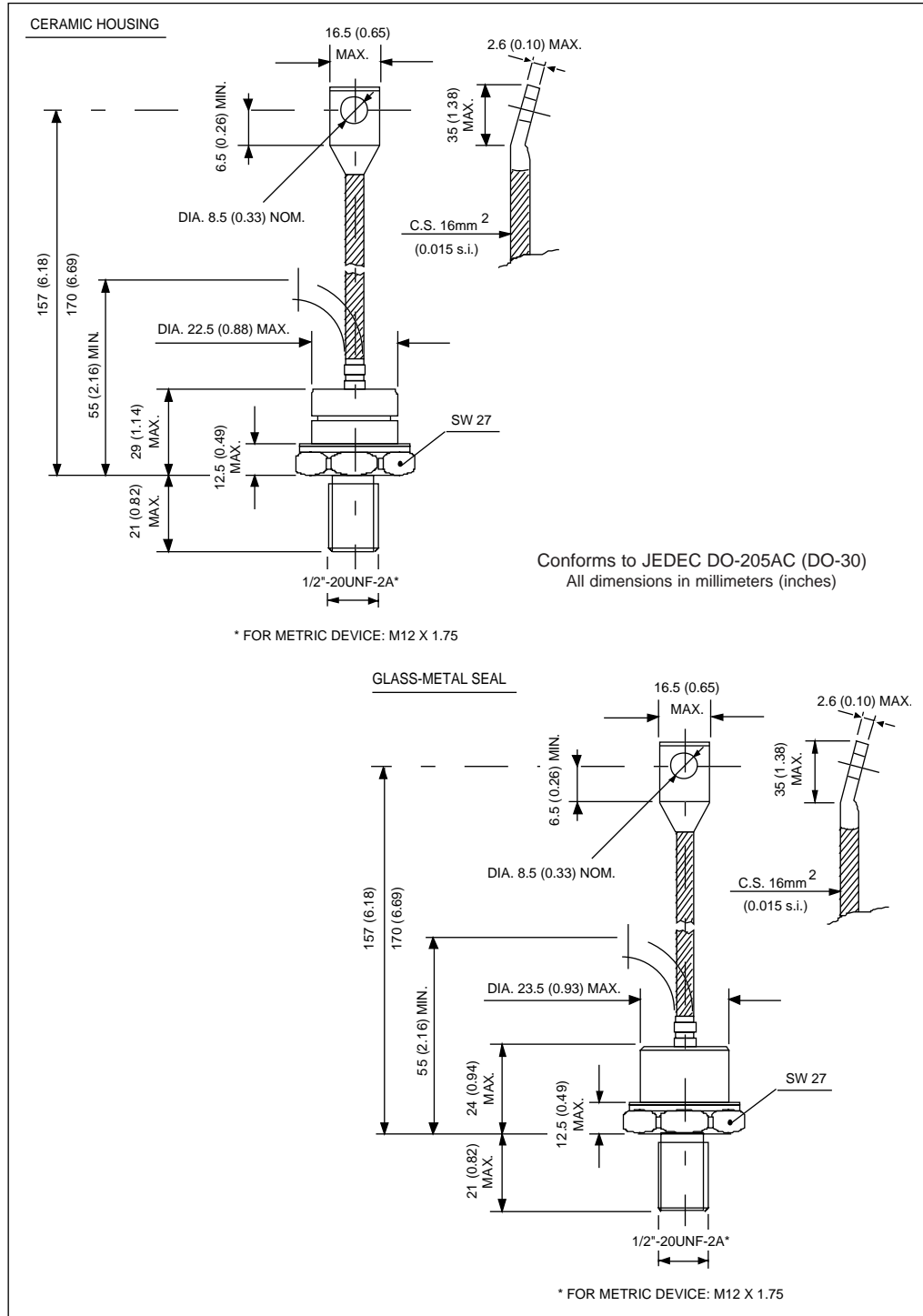
<b>SD</b>	<b>10</b>	<b>3</b>	<b>R</b>	<b>25</b>	<b>S20</b>	<b>P</b>	<b>B</b>	<b>C</b>
1	2	3	4	5	6	7	8	9

- 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<sub>RRM</sub> (see Voltage Ratings table)
- 6** - t<sub>rr</sub> code (see Recovery Characteristics table)
- 7** - P = Stud base DO-205AC (DO-30) 1/2" 20UNF-2A  
M = Stud base DO-205AC (DO-30) M12 X 1.75
- 8** - B = Flag top terminals (for Cathode/ Anode Leads)  
S = Isolated lead with silicone sleeve  
(Red = Reverse Polarity; Blue = Normal Polarity)  
None = Not isolated lead
- 9** - C = Ceramic housing (over 1600V)  
V = Glass-metal seal (only up to 1600V)

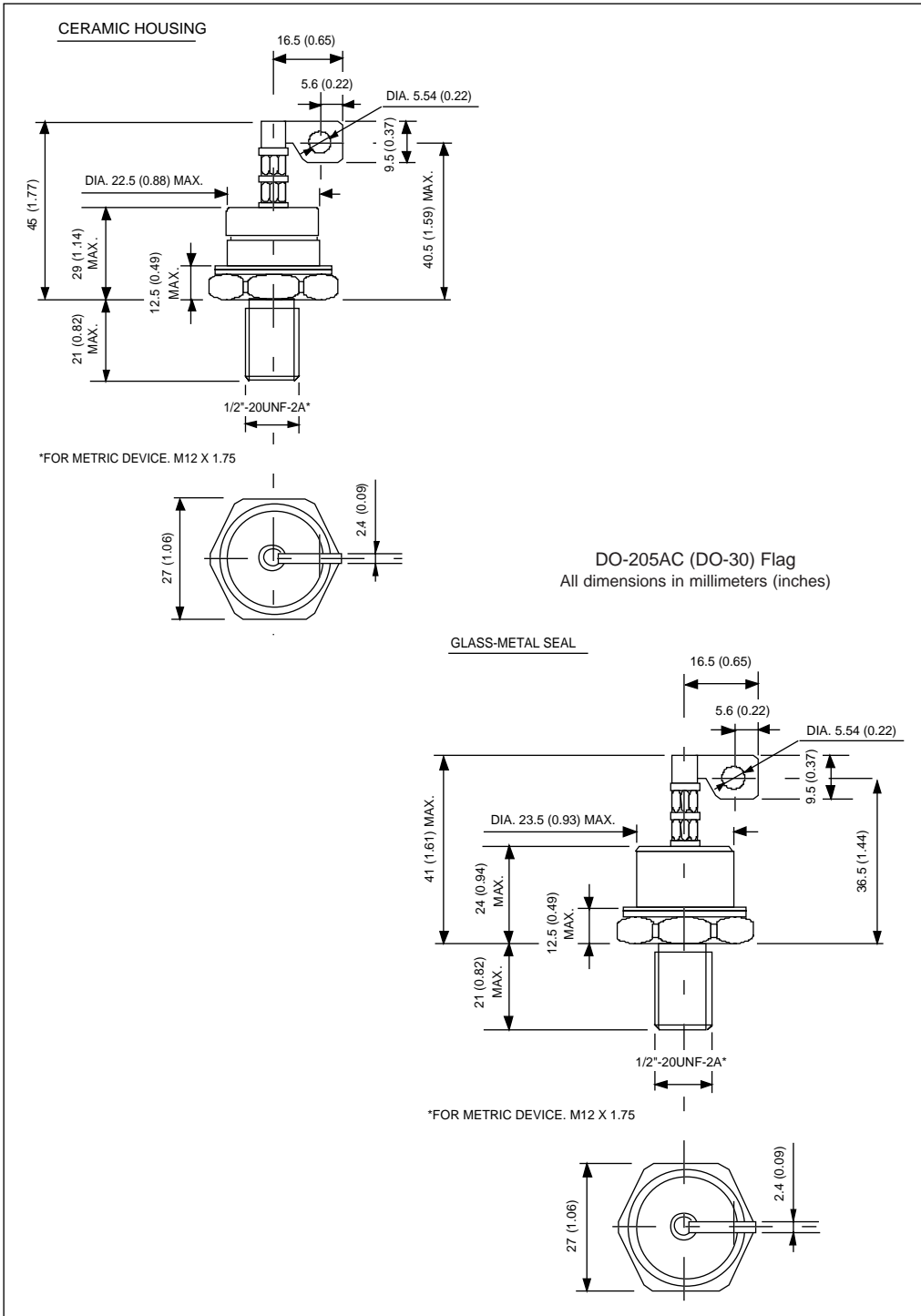
# SD103N/R Series

Bulletin I2062 rev. B 12/96

## Outline Table



Outline Table



# SD103N/R Series

Bulletin I2062 rev. B 12/96

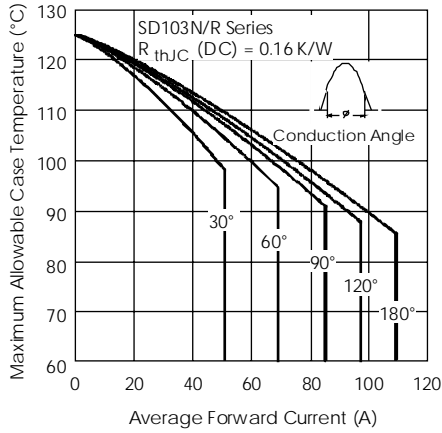


Fig. 1 - Current Ratings Characteristics

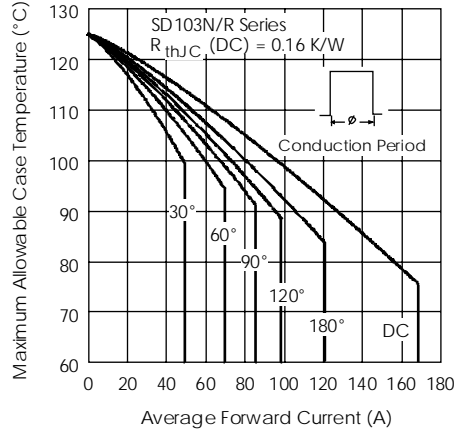


Fig. 2 - Current Ratings Characteristics

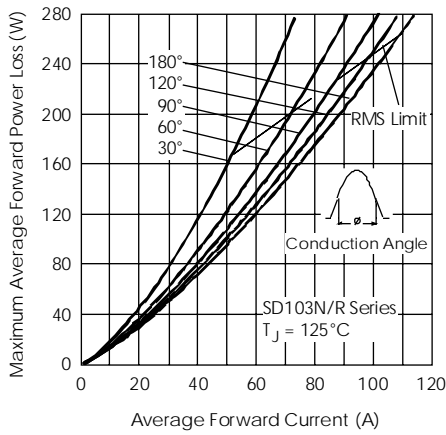


Fig. 3 - Forward Power Loss Characteristics

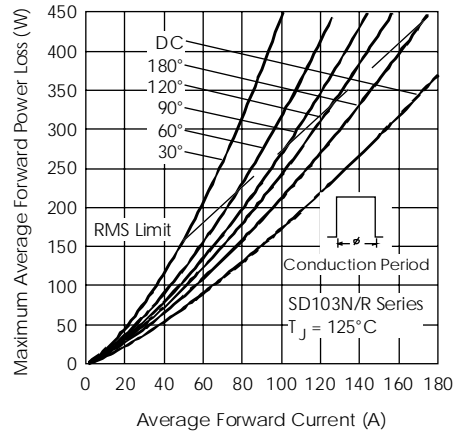


Fig. 4 - Forward Power Loss Characteristics

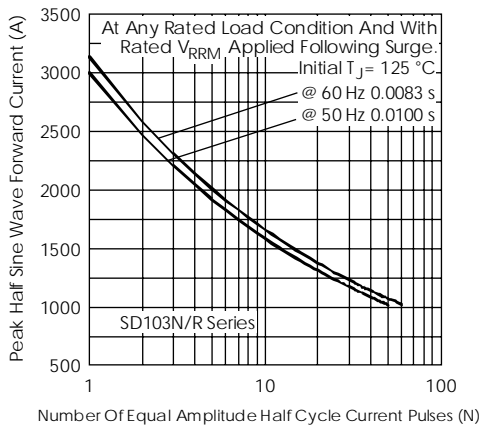


Fig. 5 - Maximum Non-repetitive Surge Current

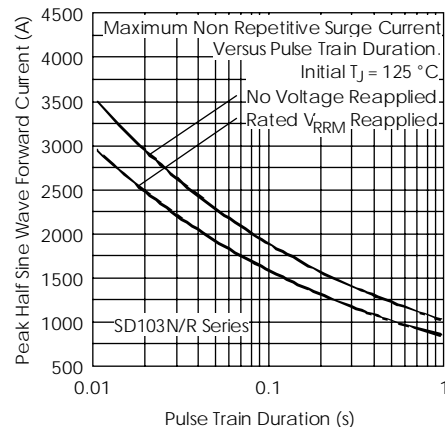


Fig. 6 - Maximum Non-repetitive Surge Current

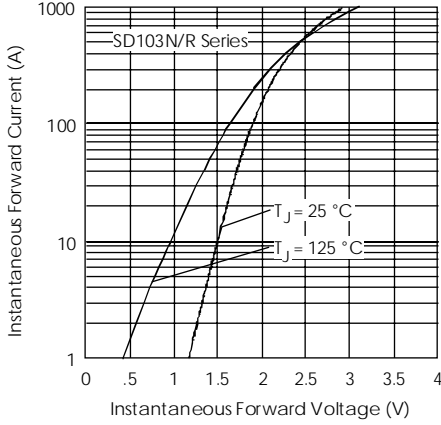


Fig. 7 - Forward Voltage Drop Characteristics

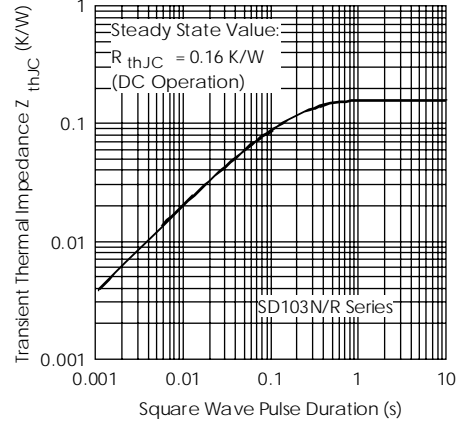


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

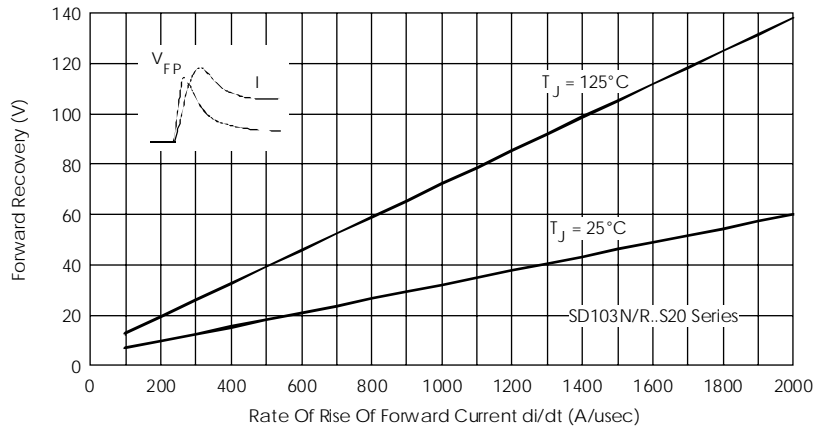


Fig. 9 - Typical Forward Recovery Characteristics

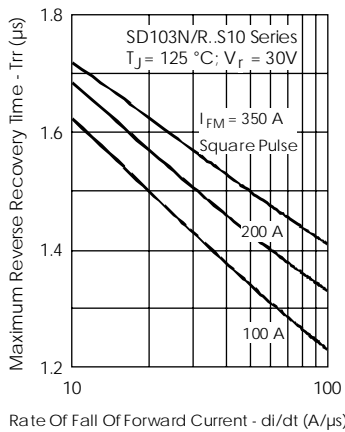


Fig. 10 - Recovery Time Characteristics

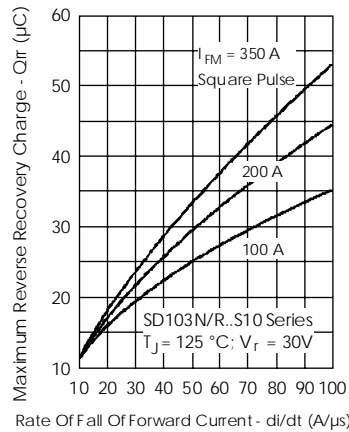


Fig. 11 - Recovery Charge Characteristics

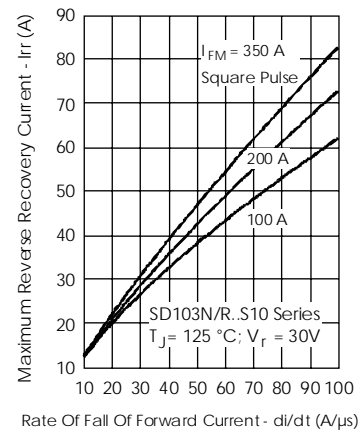


Fig. 12 - Recovery Current Characteristics

# SD103N/R Series

Bulletin I2062 rev. B 12/96

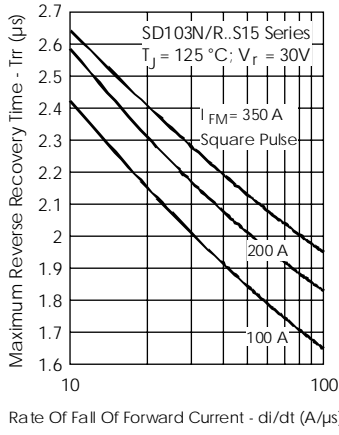


Fig. 13 - Recovery Time Characteristics

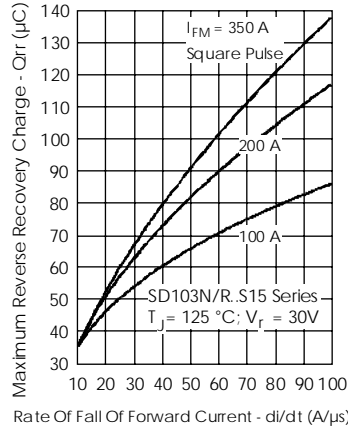


Fig. 14 - Recovery Charge Characteristics

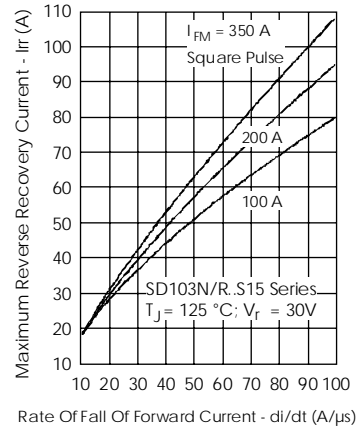


Fig. 15 - Recovery Current Characteristics

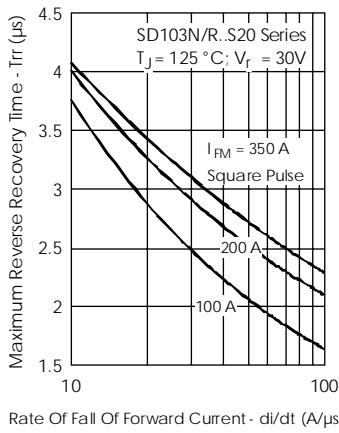


Fig. 16 - Recovery Time Characteristics

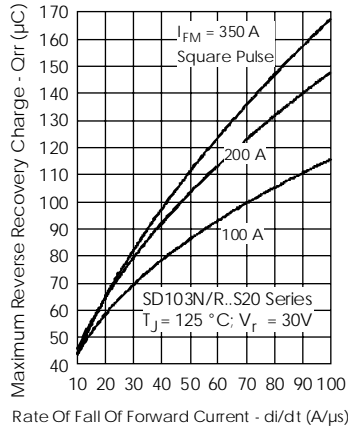


Fig. 17 - Recovery Charge Characteristics

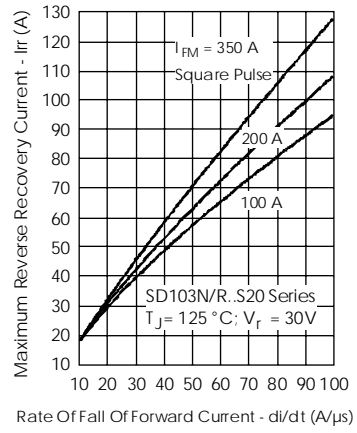


Fig. 18 - Recovery Current Characteristics

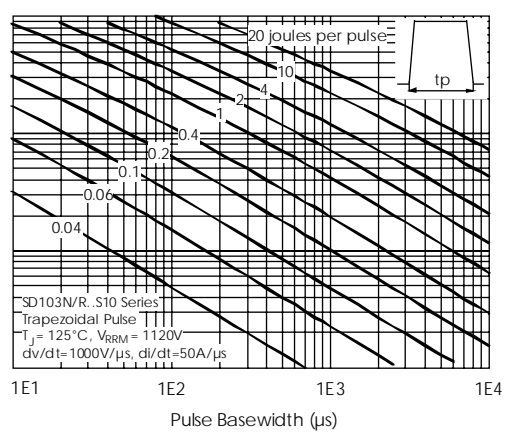
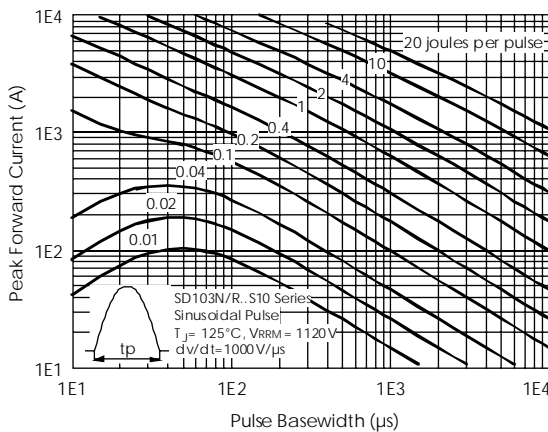


Fig. 19 - Maximum Total Energy Loss Per Pulse Characteristics



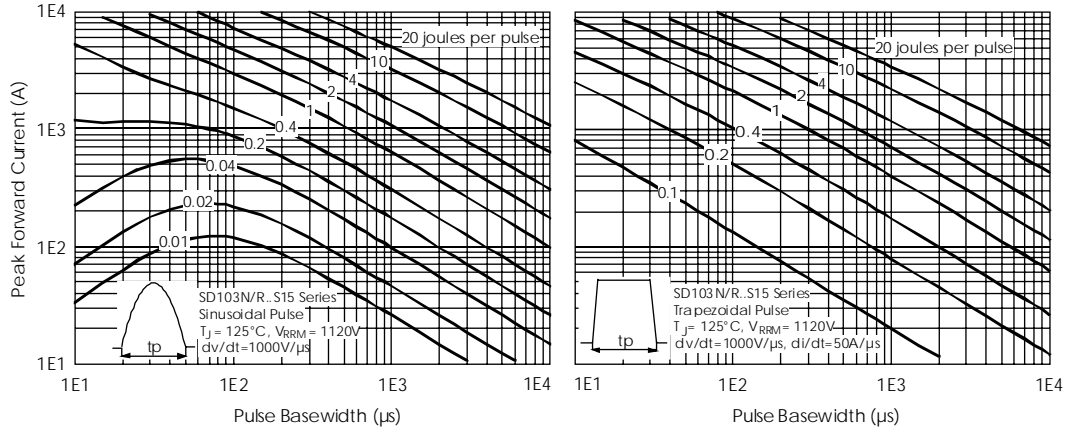


Fig. 20 - Maximum Total Energy Loss Per Pulse Characteristics

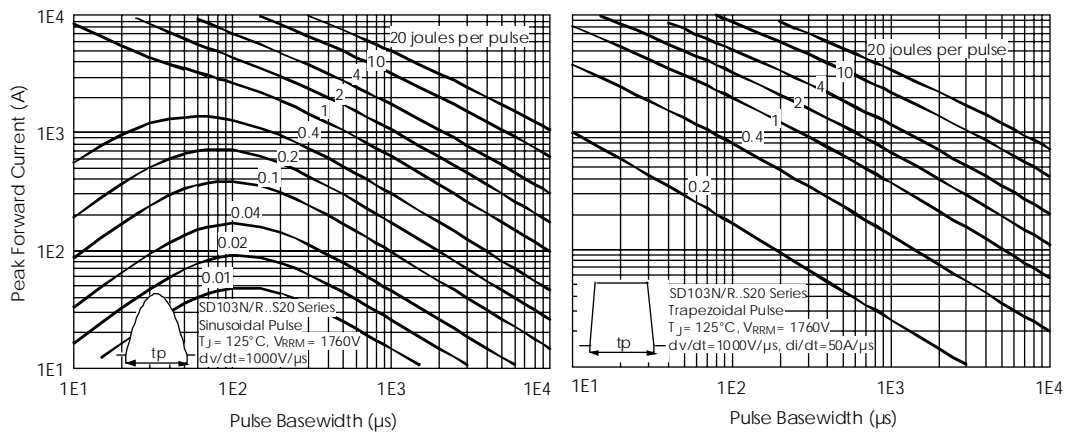


Fig. 21 - Maximum Total Energy Loss Per Pulse Characteristics