

Bulletin I2065 rev. A 09/94

International
IR Rectifier

SD253N/R SERIES

FAST RECOVERY DIODES

Stud Version

Features

- High power FAST recovery diode series
- 1.5 to 2.0 μ s recovery time
- High voltage ratings up to 1600V
- 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-205AB (DO-9)
- Maximum junction temperature 125°C

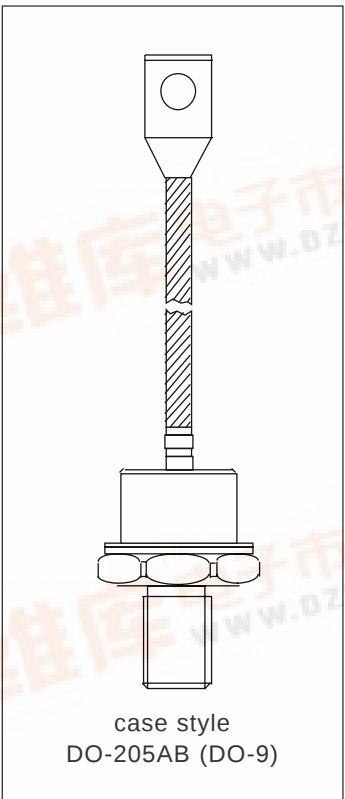
Typical Applications

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

Major Ratings and Characteristics

Parameters	SD253N/R	Units
$I_{F(AV)}$	250	A
@ T_C	85	°C
$I_{F(RMS)}$	392	A
I_{FSM} @ 50Hz	5350	A
@ 60Hz	5600	A
I^2t @ 50Hz	143	KA ² s
@ 60Hz	130	KA ² s
V_{RRM} range	400 to 1600	V
t_{rr} range	1.5 to 2.0	μ s
@ T_J	25	°C
T_J	- 40 to 125	°C

250A



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ELECTRICAL SPECIFICATIONS

Voltage Ratings

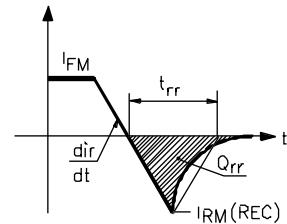
Type number	Voltage Code	V_{RRM} max. repetitive peak and off-state voltage V	V_{RSM} , maximum non-repetitive peak voltage V	I_{RRM} max. $T_J = 125^\circ\text{C}$ mA
SD253N/R..S15	04	400	500	35
	08	800	900	
	10	1000	1100	
SD253N/R..S20	12	1200	1300	
	14	1400	1500	
	16	1600	1700	

Forward Conduction

Parameter	SD253N/R	Units	Conditions
$I_{F(AV)}$ Max. average forward current @ Case temperature	250 85	A $^\circ\text{C}$	180° conduction, half sine wave.
$I_{F(RMS)}$ Max. RMS current	392	A	DC @ 74°C case temperature
I_{FSM} Max. peak, one-cycle non-repetitive forward current	5350 5600 4500 4710	A	t = 10ms t = 8.3ms No voltage reappplied 100% V_{RRM} reappplied Sinusoidal half wave,
I^2t Maximum I^2t for fusing	143 130 101 92	KA^2s	t = 10ms t = 8.3ms No voltage reappplied 100% V_{RRM} reappplied Initial $T_J = T_J$ max.
I^2/t Maximum I^2/t for fusing	1430	KA^2/s	t = 0.1 to 10ms, no voltage reappplied
$V_{F(TO)1}$ Low level of threshold voltage	0.87	V	$(16.7\% \times \pi \times I_{F(AV)}) < I < \pi \times I_{F(AV)}$, $T_J = T_J$ max.
$V_{F(TO)2}$ High level of threshold voltage	1.17		$I > \pi \times I_{F(AV)}$, $T_J = T_J$ max.
r_{f1} Low level of forward slope resistance	0.62	$\text{m}\Omega$	$(16.7\% \times \pi \times I_{F(AV)}) < I < \pi \times I_{F(AV)}$, $T_J = T_J$ max.
r_{f2} High level of forward slope resistance	0.29		$I > \pi \times I_{F(AV)}$, $T_J = T_J$ max.
V_{FM} Max. forward voltage	1.38	V	$I_{pk} = 785\text{A}$, $T_J = 25^\circ\text{C}$, $t_p = 400 \mu\text{s}$ square pulse

Recovery Characteristics

Code	$T_J = 25^\circ\text{C}$ typical t_{rr} @ 25% I_{RRM} (μs)	Test conditions			Max. values @ $T_J = 125^\circ\text{C}$		
		I_{pk} Square Pulse (A)	di/dt (A/ μs)	V_r (V)	t_{rr} @ 25% I_{RRM} (μs)	Q_{rr} (μC)	I_{rr} (A)
S15	1.5	750	25	-30	2.9	90	44
S20	2.0				3.2	107	46



Thermal and Mechanical Specification

Parameter	SD253N/R	Units	Conditions
T_J Max. operating temperature range	-40 to 125	°C	
T_{stg} Max. storage temperature range	-40 to 150		
R_{thJC} Max. thermal resistance, junction to case	0.115	K/W	DC operation
R_{thCS} Max. thermal resistance, case to heatsink	0.08		Mounting surface, smooth, flat and greased
T Mounting torque $\pm 10\%$	31	Nm	Not lubricated threads
	24.5		Lubricated threads
wt Approximate weight	250	g	
Case style	DO-205AB (DO-9)		See Outline Table

ΔR_{thJC} Conduction

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

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.010	0.008	K/W	$T_J = T_{J \text{ max.}}$
120°	0.013	0.014		
90°	0.017	0.019		
60°	0.025	0.027		
30°	0.044	0.044		

Ordering Information Table

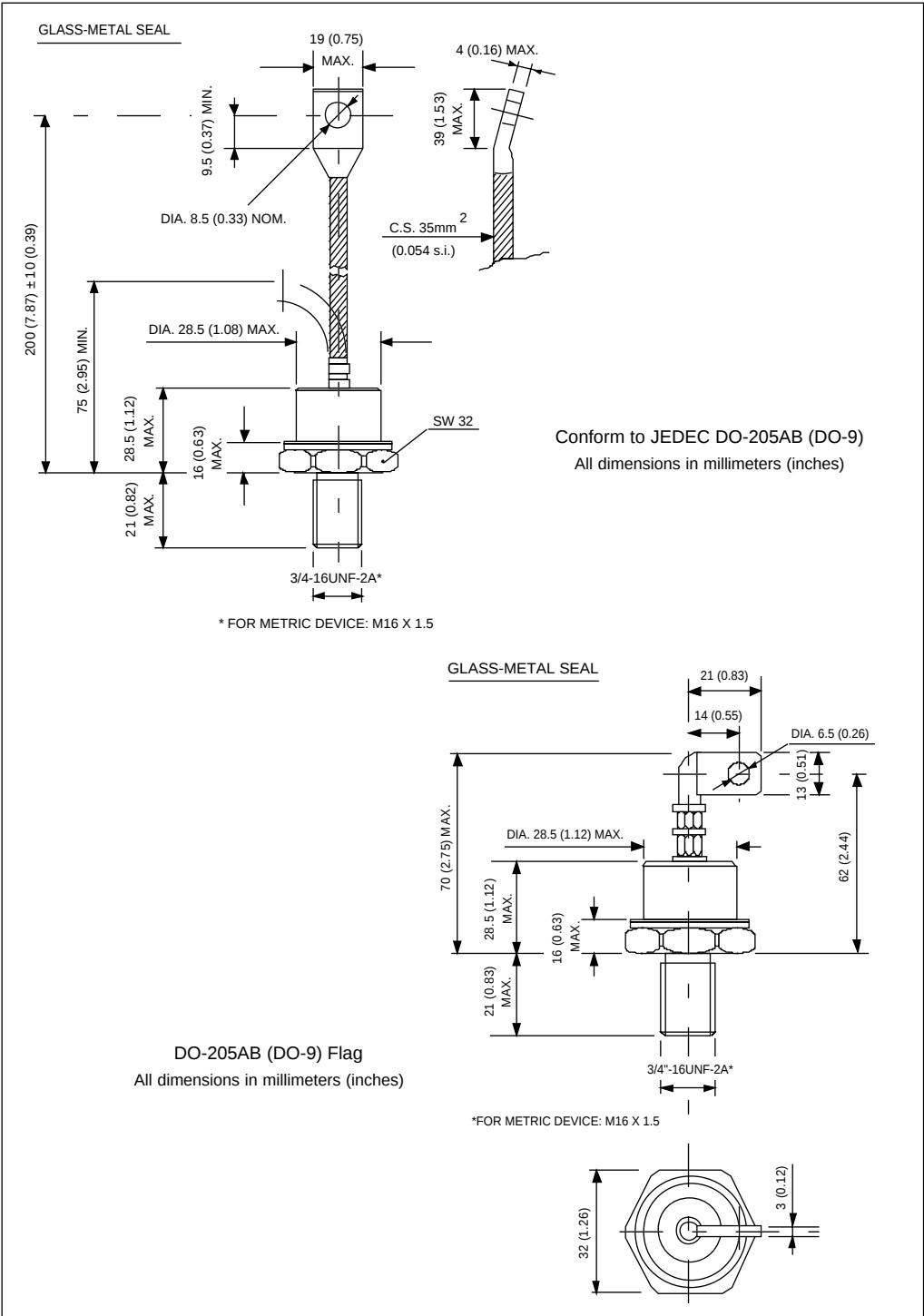
Device Code								
	SD	25	3	R	16	S20	P	B V
	①	②	③	④	⑤	⑥	⑦	⑧ ⑨
1	- Diode							
2	- Essential part number							
3	- 3 = Fast recovery							
4	- N = Stud Normal Polarity (Cathode to Stud) R = Stud Reverse Polarity (Anode to Stud)							
5	- Voltage code: Code x 100 = V_{RRM} (see Voltage Ratings table)							
6	- t_{rr} code (see Recovery Characteristics table)							
7	- P = Stud base DO-205AB (DO-9) 3/4" 16UNF-2A M = Stud base DO-205AB (DO-9) M16 X 1.5							
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	- V = Glass-metal seal							

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Outline Table



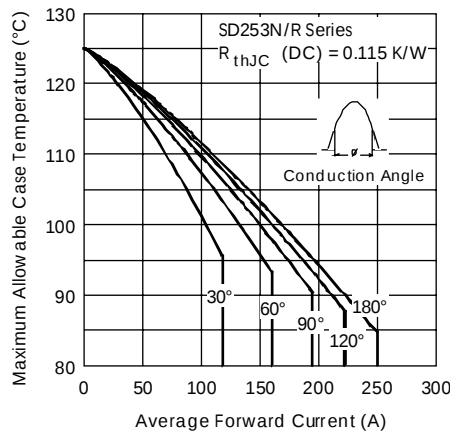


Fig. 1 - Current Ratings Characteristics

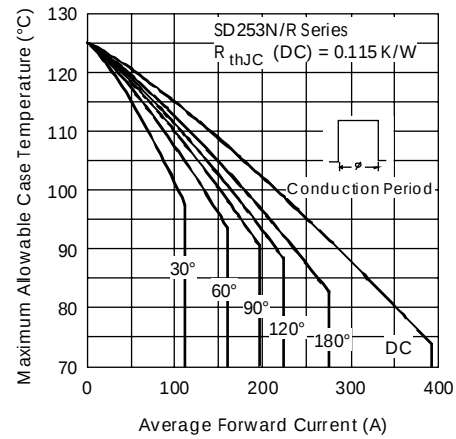


Fig. 2 - Current Ratings Characteristics

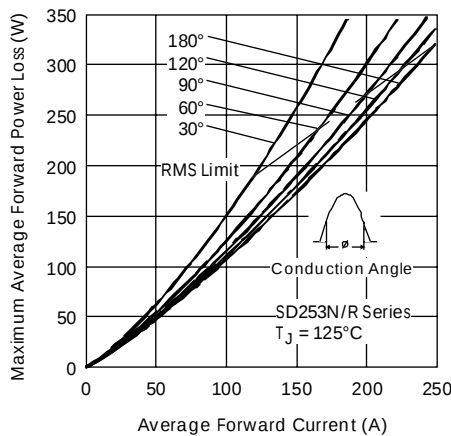


Fig. 3 - Forward Power Loss Characteristics

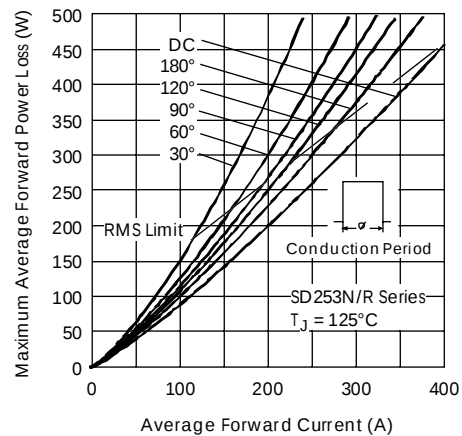


Fig. 4 - Forward Power Loss Characteristics

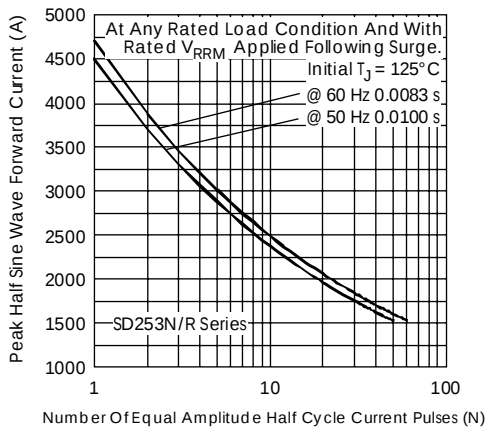


Fig. 5 - Maximum Non-repetitive Surge Current

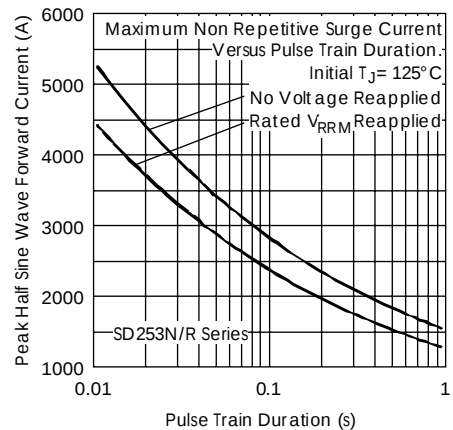


Fig. 6 - Maximum Non-repetitive Surge Current

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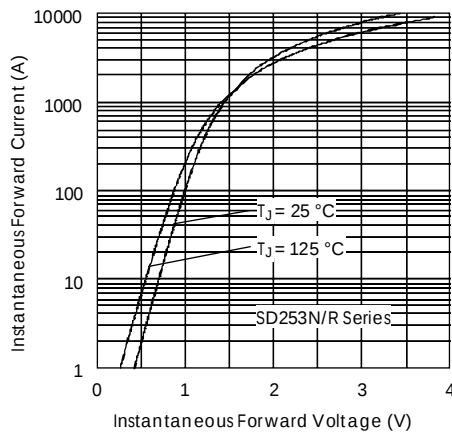


Fig. 7 - Forward Voltage Drop Characteristics

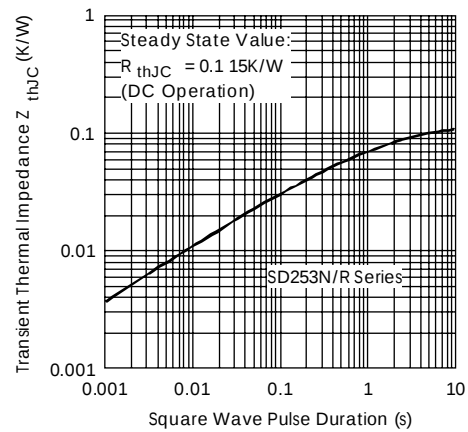


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

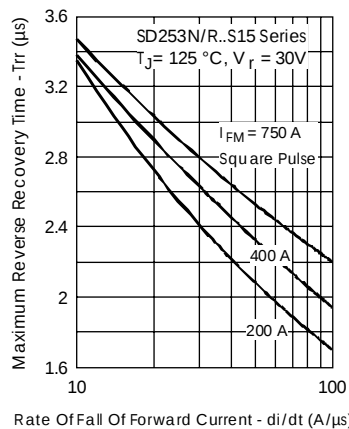


Fig. 9 - Recovery Time Characteristics

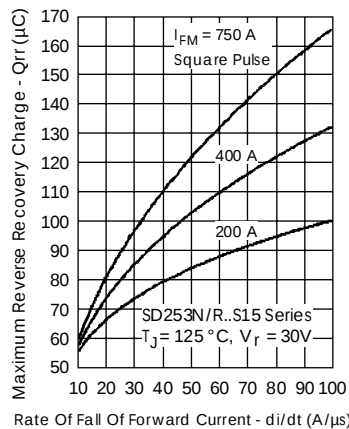


Fig. 10 - Recovery Charge Characteristics

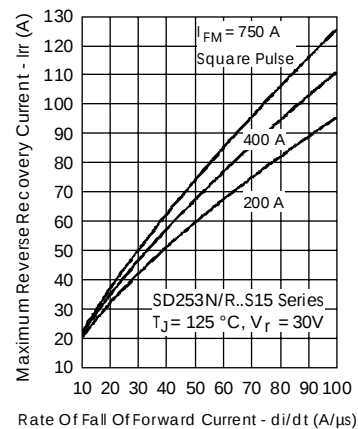


Fig. 11 - Recovery Current Characteristics

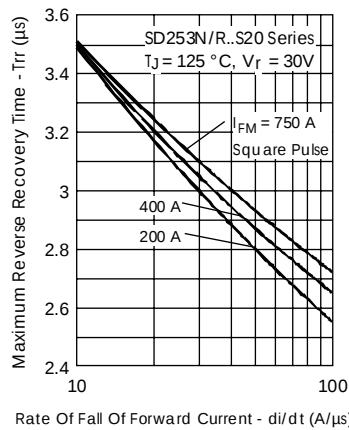


Fig. 12 - Recovery Time Characteristics

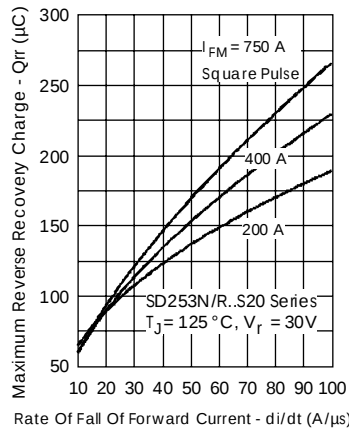


Fig. 13 - Recovery Charge Characteristics

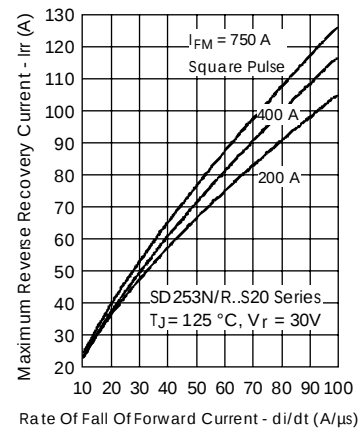


Fig. 14 - Recovery Current Characteristics

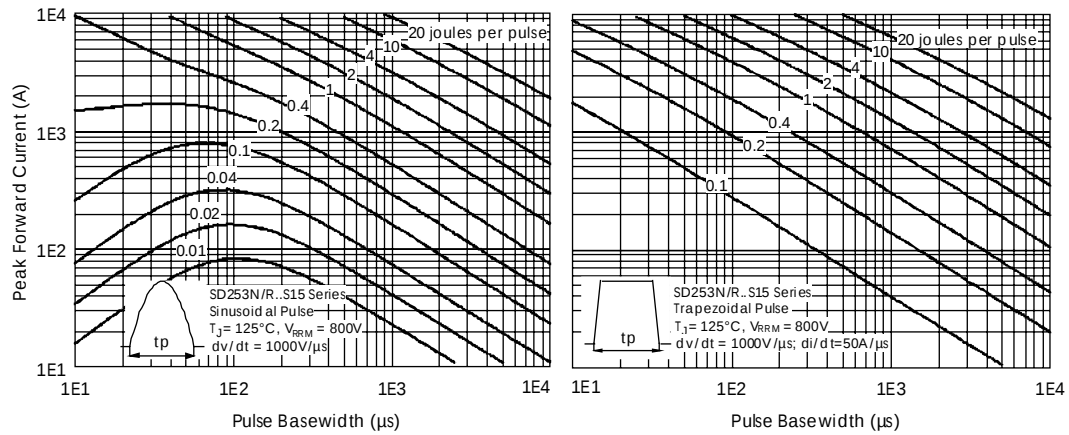


Fig. 15 - Maximum Total Energy Loss Per Pulse Characteristics

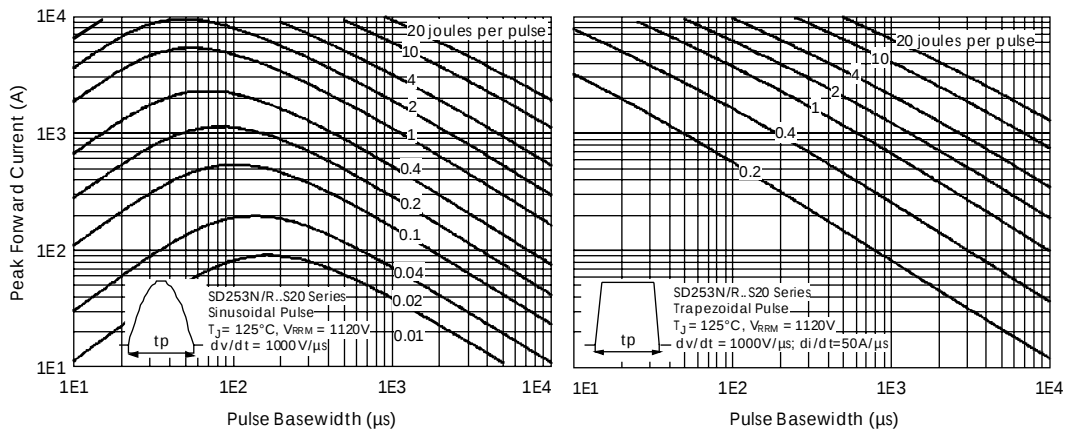


Fig. 16 - Maximum Total Energy Loss Per Pulse Characteristics