
DISCRETE POWER DIODES and THYRISTORS
DATA BOOK

FAST RECOVERY DIODES

Stud Version

Features

- High power FAST recovery diode series
- 4.5 μ s recovery time
- High voltage ratings up to 4500V
- 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 125°C

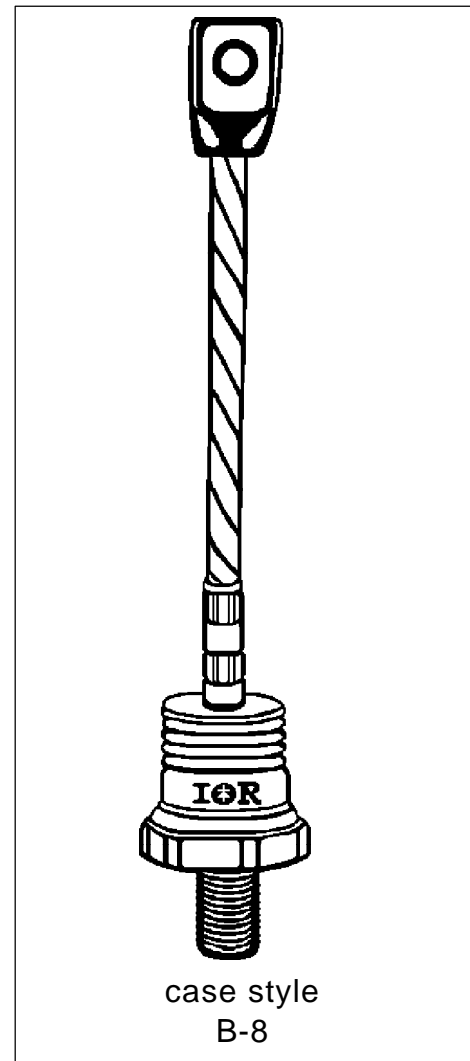
235A

Typical Applications

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

Major Ratings and Characteristics

Parameters	SD233N/R	Units
$I_{F(AV)}$	235	A
@ T_C	60	°C
$I_{F(RMS)}$	370	A
I_{FSM} @ 50Hz	5500	A
@ 60Hz	5760	A
I^2t @ 50Hz	151	KA ² s
@ 60Hz	138	KA ² s
V_{RRM} range	3000 to 4500	V
t_{rr}	4.5	μ s
@ T_J	125	°C
T_J	-40 to 125	°C



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
SD233N/R	30	3000	3100	50
	36	3600	3700	
	40	4000	4100	
	45	4500	4600	

Forward Conduction

Parameter	SD233N/R	Units	Conditions
$I_{F(AV)}$ Max. average forward current @ Case temperature	235	A	180° conduction, half sine wave.
	60	°C	
$I_{F(RMS)}$ Max. RMS current	370	A	@ 45°C case temperature
I_{FSM} Max. peak, one-cycle non-repetitive forward current	5500	A	t = 10ms No voltage reappplied
	5760		t = 8.3ms
	4630		t = 10ms 50% V_{RRM} reappplied
	4840		t = 8.3ms
I^2t Maximum I^2t for fusing	151	KA ² s	t = 10ms No voltage reappplied
	138		t = 8.3ms
	107		t = 10ms 50% V_{RRM} reappplied
	98		t = 8.3ms
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	1510	KA ² /s	t = 0.1 to 10ms, no voltage reappplied
$V_{F(TO)1}$ Low level of threshold voltage	1.56	V	(16.7% x π x $I_{F(AV)} < I < \pi$ x $I_{F(AV)}$), $T_J = T_J$ max.
$V_{F(TO)2}$ High level of threshold voltage	1.68		($I > \pi$ x $I_{F(AV)}$), $T_J = T_J$ max.
r_{f1} Low level of forward slope resistance	1.64	mΩ	(16.7% x π x $I_{F(AV)} < I < \pi$ x $I_{F(AV)}$), $T_J = T_J$ max.
r_{f2} High level of forward slope resistance	1.53		($I > \pi$ x $I_{F(AV)}$), $T_J = T_J$ max.
V_{FM} Max. forward voltage	3.2	V	$I_{pk} = 1000\text{A}$, $T_J = 125^\circ\text{C}$, $t_p = 400 \mu\text{s}$ 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)	
S50	5.0	1000	100	-50	4.5	680	240	

(*) $di/dt = 25\text{A}/\mu\text{s}$ @ $T_J = 25^\circ\text{C}$

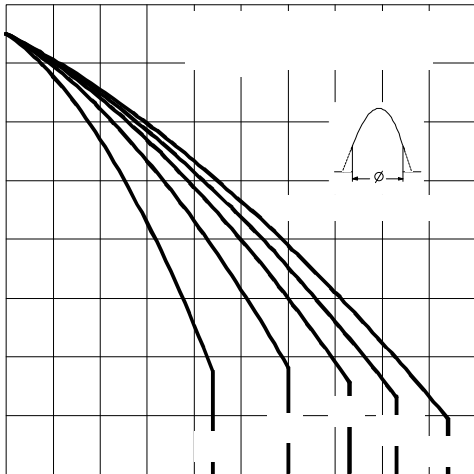


Fig. 1 - Current Ratings Characteristics

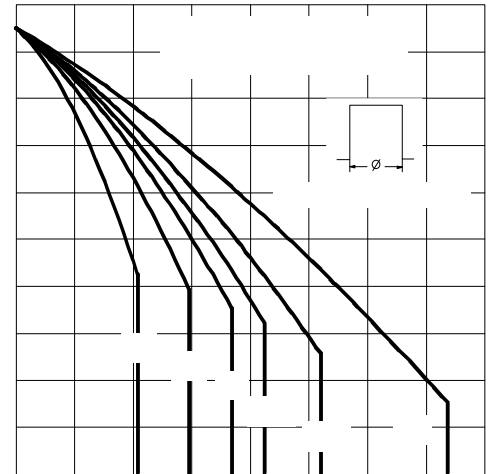


Fig. 2 - Current Ratings Characteristics

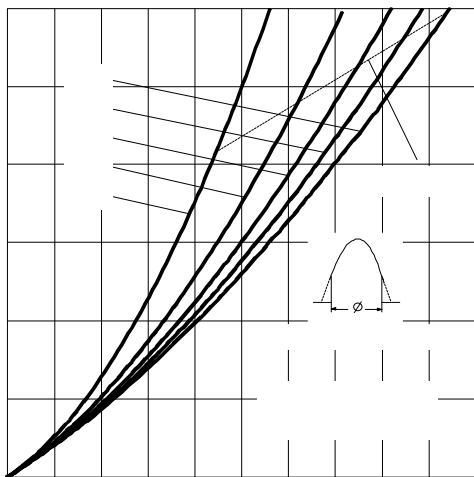


Fig. 3 - Forward Power Loss Characteristics

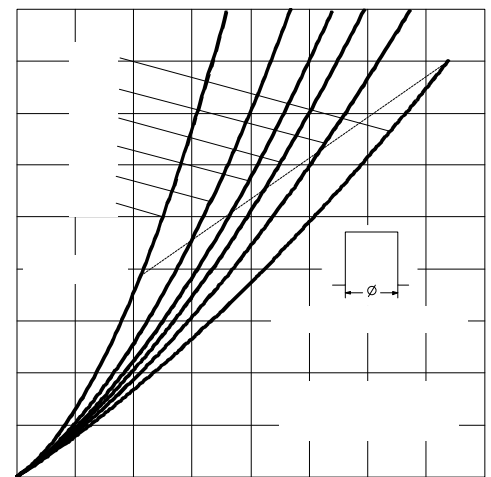


Fig. 4 - Forward Power Loss Characteristics

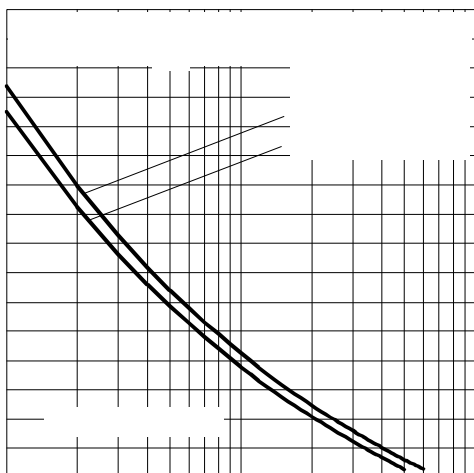


Fig. 5 - Maximum Non-repetitive Surge Current

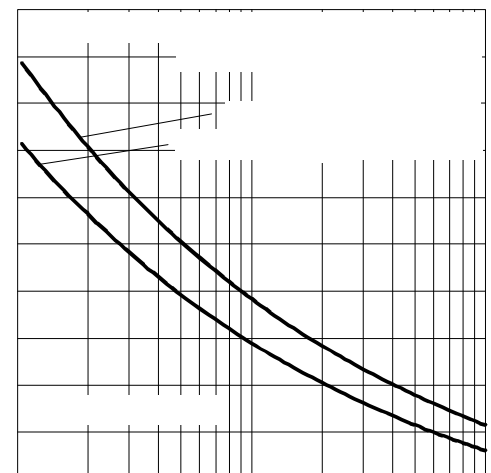


Fig. 6 - Maximum Non-repetitive Surge Current

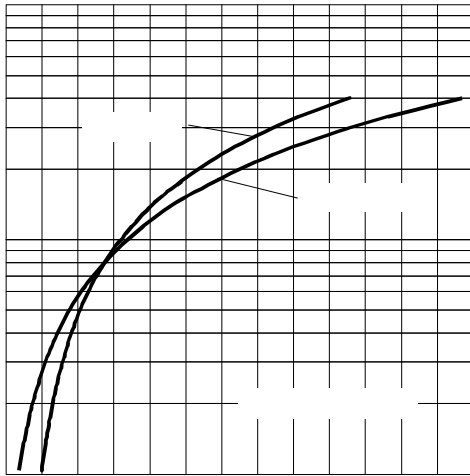


Fig. 7 - Forward Voltage Drop Characteristics

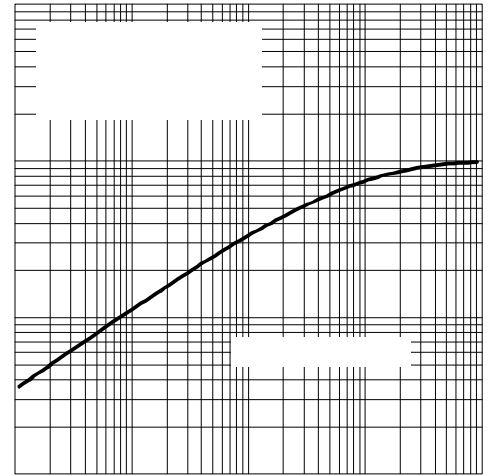


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

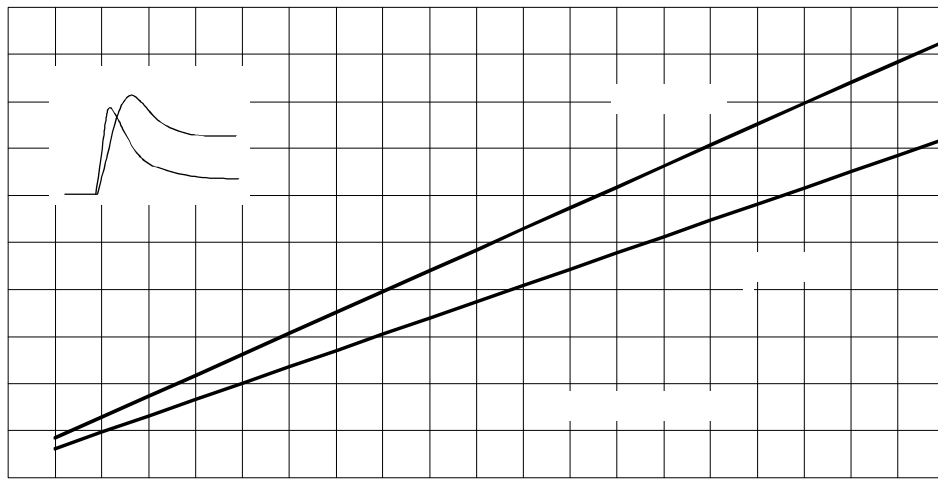


Fig. 9 - Typical Forward Recovery Characteristics

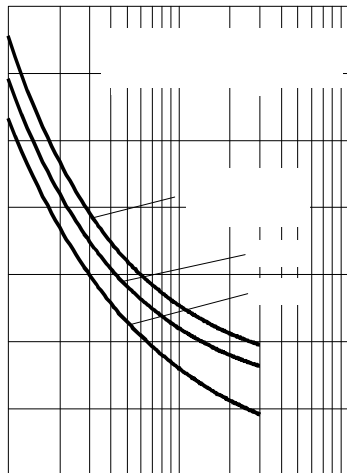


Fig. 10 - Recovery Time Characteristics

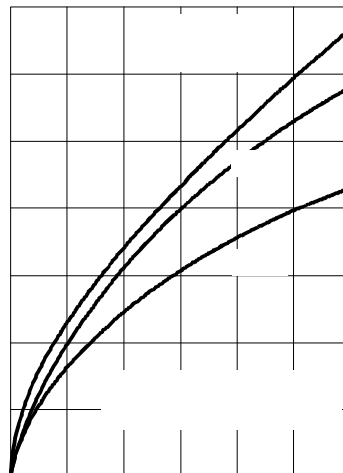


Fig. 11 - Recovery Charge Characteristics

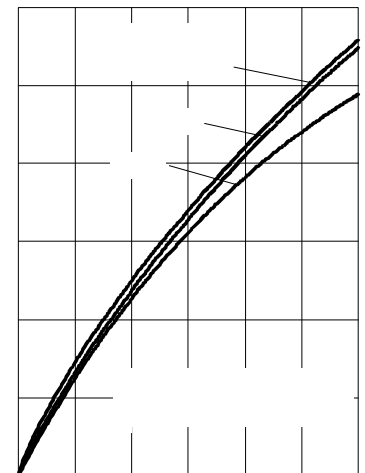


Fig. 12 - Recovery Current Characteristics

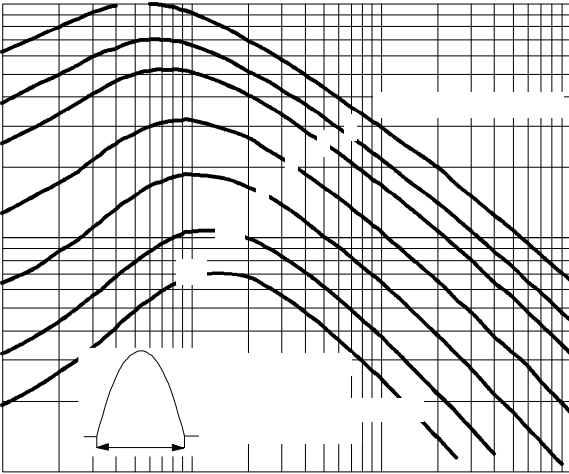


Fig. 13 - Maximum Total Energy Loss Per Pulse Characteristics

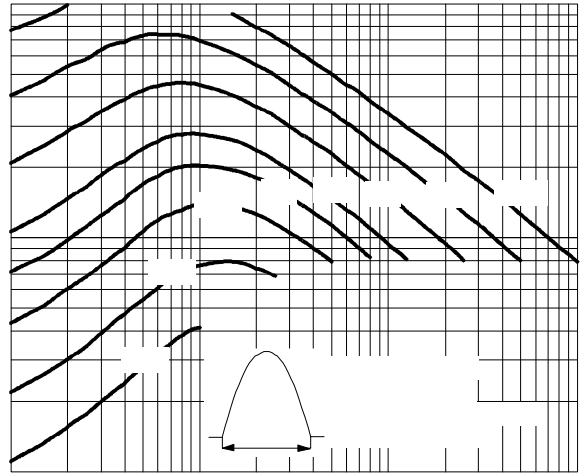


Fig. 14 - Frequency Characteristics

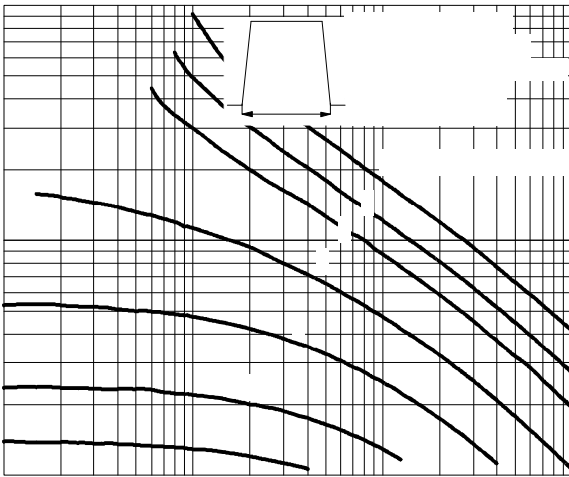


Fig. 15 - Maximum Total Energy Loss Per Pulse Characteristics

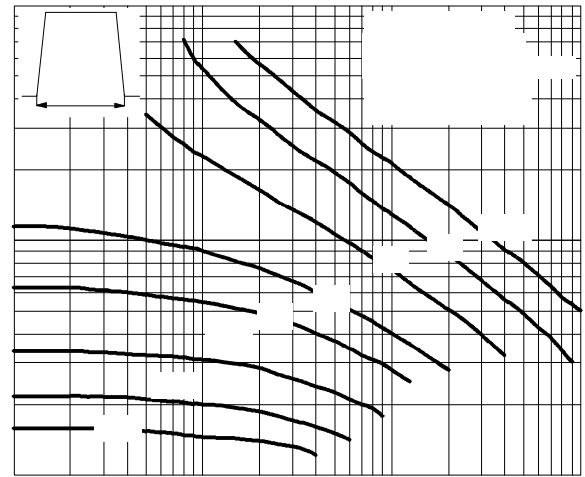


Fig. 16 - Frequency Characteristics

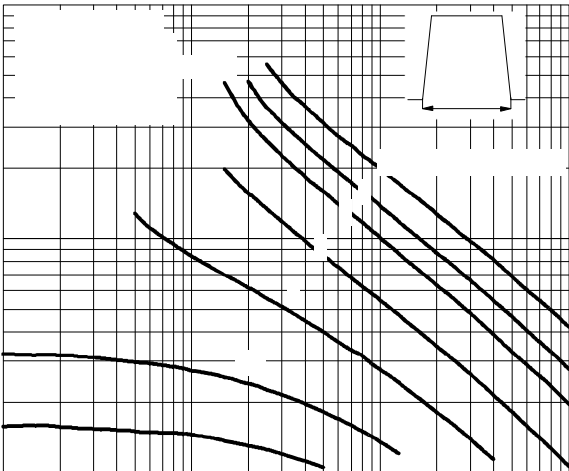


Fig. 17 - Maximum Total Energy Loss Per Pulse Characteristics

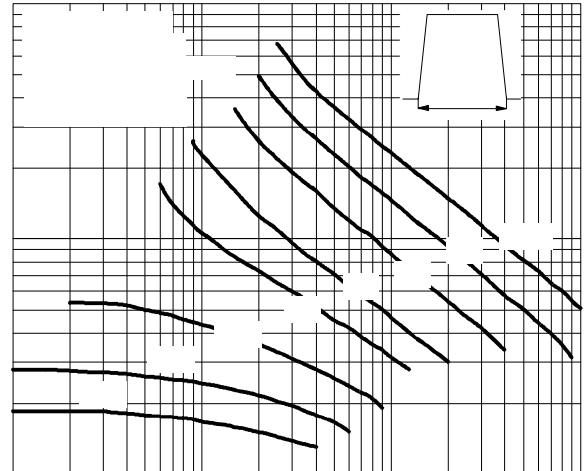


Fig. 18 - Frequency Characteristics

Thermal and Mechanical Specification

Parameter	SD233N/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	0.1	K/W	DC operation
R _{thCS} Max. thermal resistance, case to heatsink	0.04		Mounting surface, smooth, flat and greased
T Mounting torque ± 10%	50	Nm	Not lubricated threads
wt Approximate weight	454	g	
Case style	B-8		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 max.
120°	0.013	0.014		
90°	0.017	0.018		
60°	0.025	0.026		
30°	0.041	0.042		

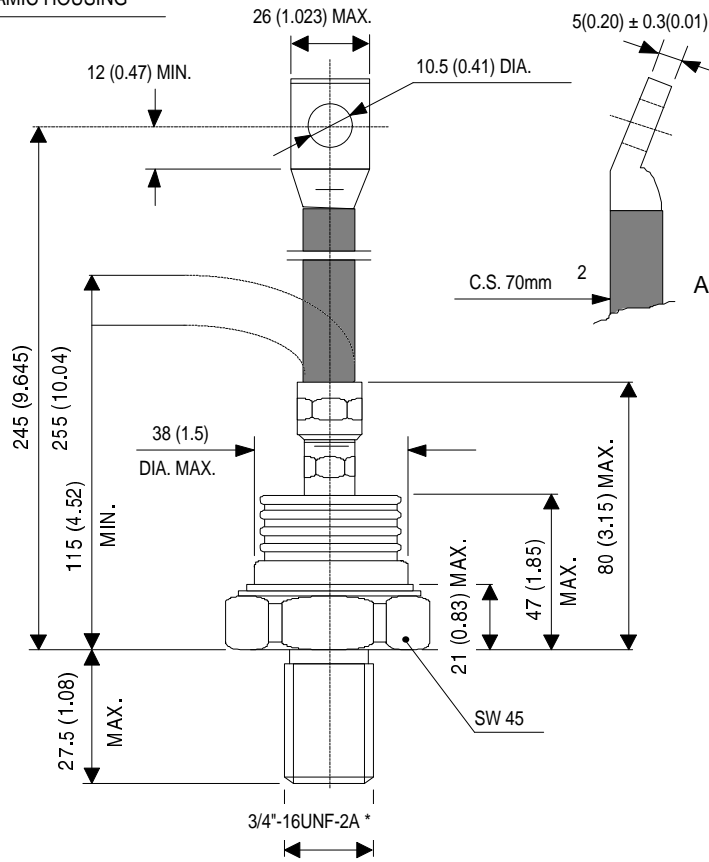
Ordering Information Table

Device Code	
	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="background-color: black; color: white; padding: 5px 10px; border: 1px solid black;">SD</div> <div style="background-color: black; color: white; padding: 5px 10px; border: 1px solid black;">23</div> <div style="background-color: black; color: white; padding: 5px 10px; border: 1px solid black;">3</div> <div style="background-color: black; color: white; padding: 5px 10px; border: 1px solid black;">N</div> <div style="background-color: black; color: white; padding: 5px 10px; border: 1px solid black;">45</div> <div style="background-color: black; color: white; padding: 5px 10px; border: 1px solid black;">S50</div> <div style="background-color: black; color: white; padding: 5px 10px; border: 1px solid black;">P</div> <div style="background-color: black; color: white; padding: 5px 10px; border: 1px solid black;">S</div> <div style="background-color: black; color: white; padding: 5px 10px; border: 1px solid black;">C</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> ①②③④⑤⑥⑦⑧⑨ </div>
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) T = Threaded Top Terminal 3/8" 24UNF-2A None = Not isolated lead
9	- C = Ceramic housing

SD233N/R Series

Outlines Table

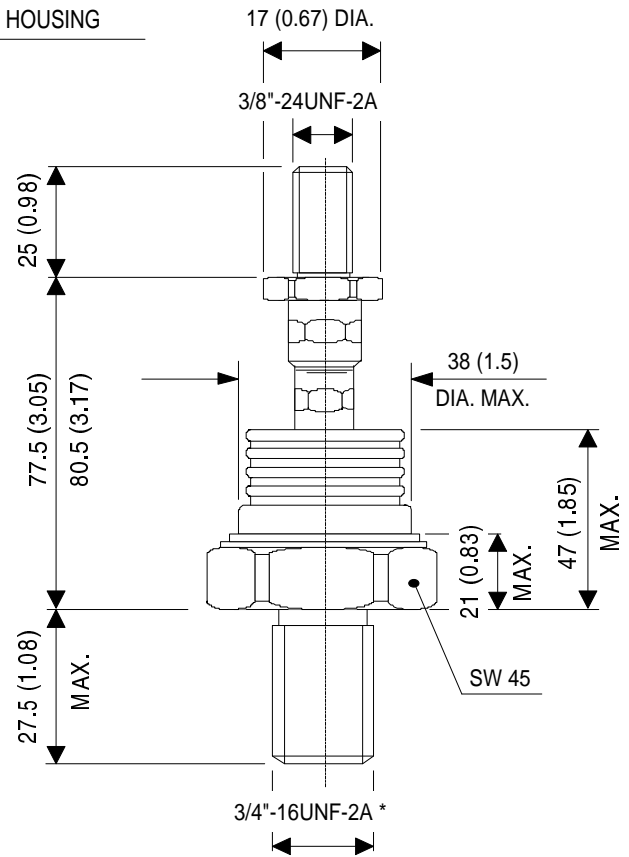
CERAMIC HOUSING



Case Style B-8
All dimensions in millimeters (inches)

* FOR METRIC DEVICE: M24 x 1.5 - SCREW LENGTH — 21(0.83) MAX.

CERAMIC HOUSING



Case Style B-8 with top thread terminal 3/8"
All dimensions in millimeters (inches)

* FOR METRIC DEVICE: M24 x 1.5 - SCREW LENGTH — 21(0.83) MAX.