
DISCRETE POWER DIODES and THYRISTORS

DATA BOOK



ST180S SERIES

PHASE CONTROL THYRISTORS

Stud Version

200A

Features

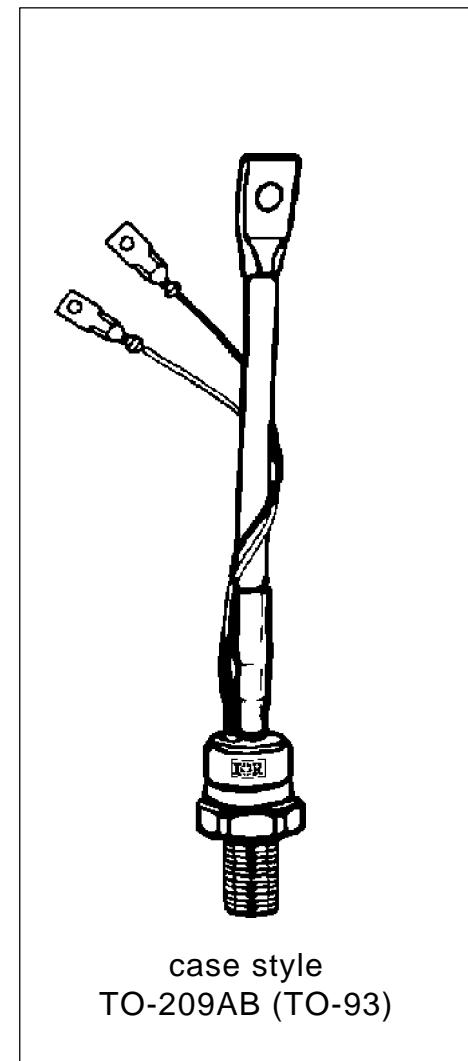
- Center amplifying gate
- Hermetic metal case with ceramic insulator
(Also available with glass-metal seal up to 1200V)
- International standard case TO-209AB (TO-93)
- Threaded studs UNF 3/4 - 16UNF2A or ISO M16x1.5
- Compression Bonded Encapsulation for heavy duty operations such as severe thermal cycling

Typical Applications

- DC motor controls
- Controlled DC power supplies
- AC controllers

Major Ratings and Characteristics

Parameters	ST180S	Units
$I_{T(AV)}$	200	A
@ T_c	85	°C
$I_{T(RMS)}$	314	A
I_{TSM}	5000	A
@ 50Hz	5230	A
I^2t	125	KA ² s
@ 60Hz	114	KA ² s
V_{DRM}/V_{RRM}	400 to 2000	V
t_q typical	100	μs
T_J	- 40 to 125	°C



ST180S Series

ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V_{DRM}/V_{RRM} , max. repetitive peak and off-state voltage V	V_{RSM} , maximum non-repetitive peak voltage V	I_{DRM}/I_{RRM} max. @ $T_J = T_J$ max mA
ST180S	04	400	500	30
	08	800	900	
	12	1200	1300	
	16	1600	1700	
	18	1800	1900	
	20	2000	2100	

On-state Conduction

Parameter	ST180S	Units	Conditions
$I_{T(AV)}$ @ Case temperature	200	A	180° conduction, half sine wave
	85	°C	
$I_{T(RMS)}$	314	A	DC @ 76°C case temperature
I_{TSM} Max. peak, one-cycle non-repetitive surge current	5000	A	Sinusoidal half wave, Initial $T_J = T_J$ max.
	5230		
	4200		
	4400		
I^2t Maximum I^2t for fusing	125	KA ² s	No voltage reapplied
	114		
	88		
	81		
$I^2\sqrt{t}$	1250	KA ² \sqrt{s}	t = 0.1 to 10ms, no voltage reapplied
$V_{T(TO)1}$ Low level value of threshold voltage	1.08	V	(16.7% $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$), $T_J = T_J$ max.
$V_{T(TO)2}$ High level value of threshold voltage	1.14		($I > \pi \times I_{T(AV)}$), $T_J = T_J$ max.
r_{t1} Low level value of on-state slope resistance	1.18	mΩ	(16.7% $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$), $T_J = T_J$ max.
r_{t2} High level value of on-state slope resistance	1.14		($I > \pi \times I_{T(AV)}$), $T_J = T_J$ max.
V_{TM}	1.75	V	$I_{pk} = 570A$, $T_J = 125^\circ C$, $t_p = 10ms$ sine pulse
I_H	600	mA	$T_J = T_J$ max, anode supply 12V resistive load
I_L	1000 (300)		

Switching

Parameter	ST180S	Units	Conditions
di/dt Max. non-repetitive rate of rise of turned-on current	1000	A/μs	Gate drive 20V, 20Ω, $t_r \leq 1\mu s$ $T_J = T_J$ max, anode voltage $\leq 80\% V_{DRM}$
t_d Typical delay time	1.0	μs	Gate current 1A, $di_g/dt = 1A/\mu s$ $V_d = 0.67\% V_{DRM}$, $T_J = 25^\circ C$
t_q Typical turn-off time	100		$I_{TM} = 300A$, $T_J = T_J$ max, $di/dt = 20A/\mu s$, $V_R = 50V$ $dv/dt = 20V/\mu s$, Gate 0V 100Ω, $t_p = 500\mu s$

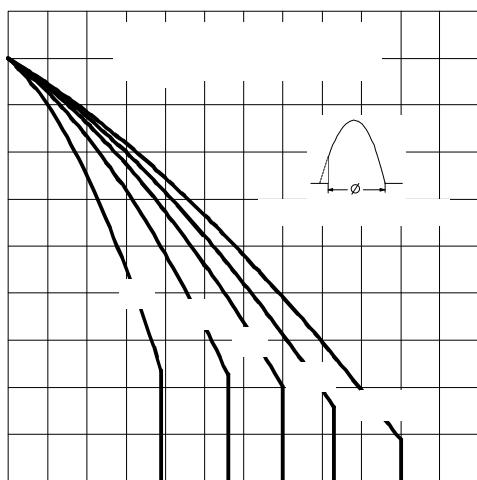


Fig. 1 - Current Ratings Characteristics

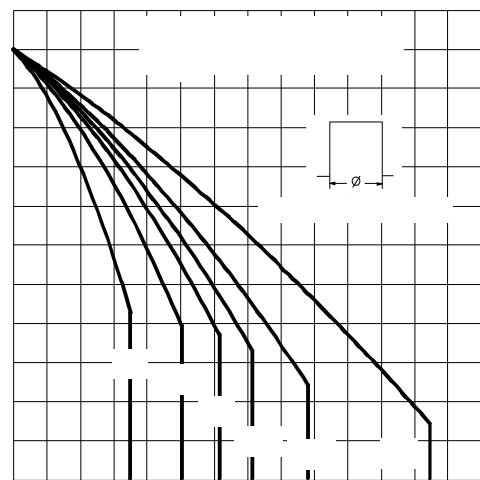


Fig. 2 - Current Ratings Characteristics

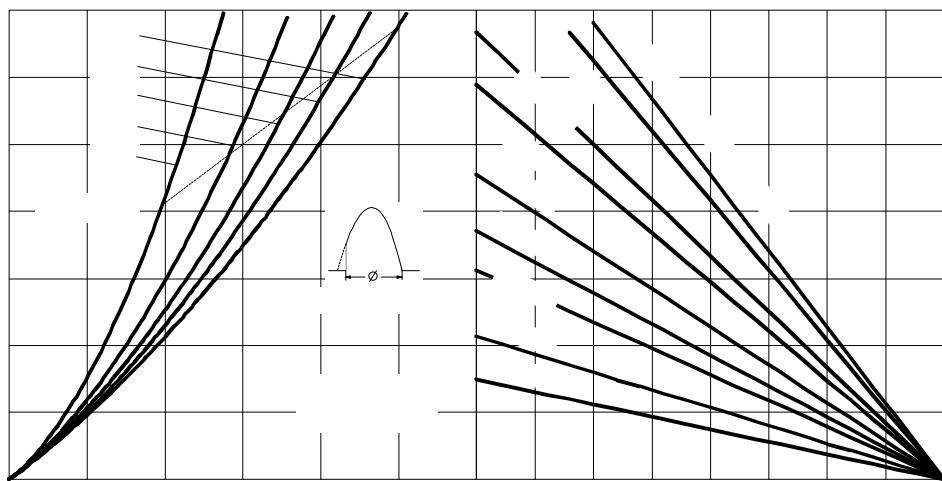
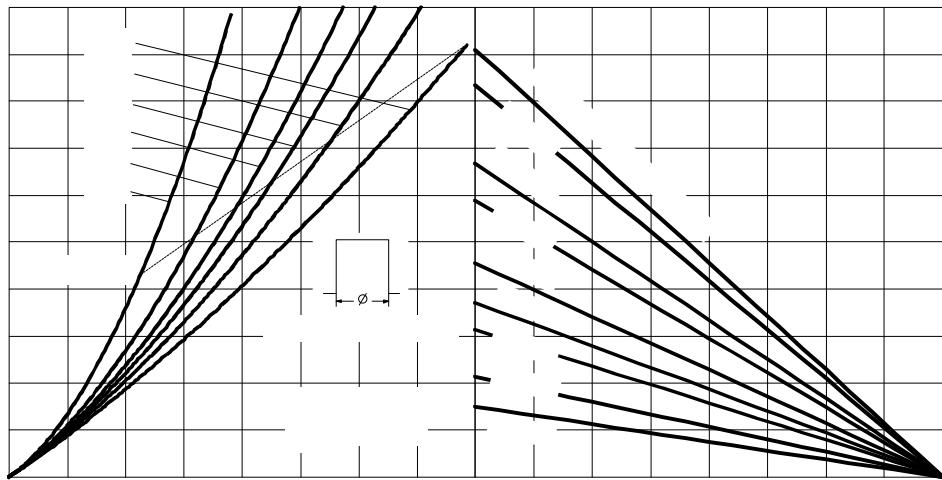


Fig. 3 - On-state Power Loss Characteristics



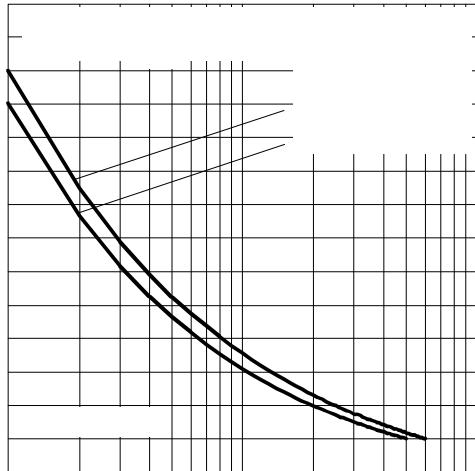


Fig. 5 - Maximum Non-Repetitive Surge Current

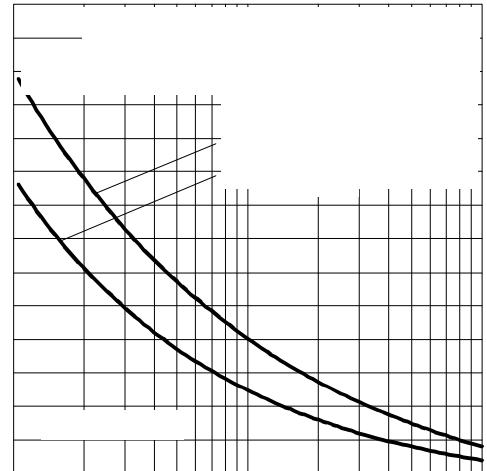


Fig. 6 - Maximum Non-Repetitive Surge Current

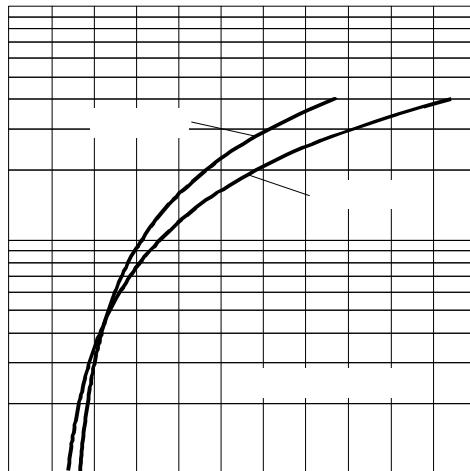


Fig. 7 - On-state Voltage Drop Characteristics

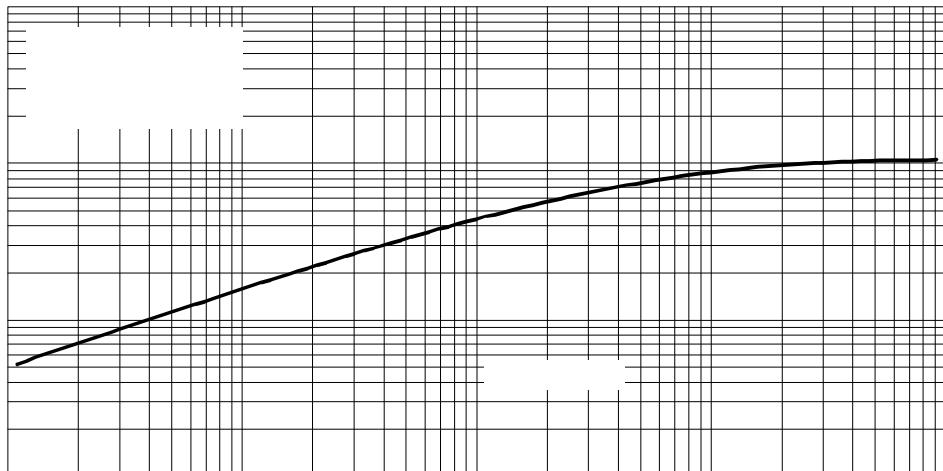


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

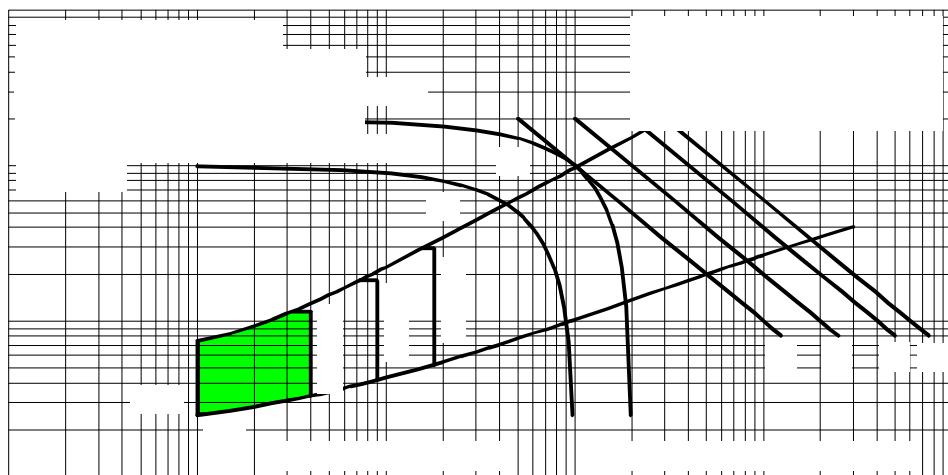


Fig. 9 - Gate Characteristics

Blocking

Parameter	ST180S	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/μs	$T_J = T_J$ max linear to 80% rated V_{DRM}
I_{DRM} I_{RRM} Max. peak reverse and off-state leakage current	30	mA	$T_J = T_J$ max, rated V_{DRM}/V_{RRM} applied

Triggering

Parameter	ST180S		Units	Conditions	
P_{GM} Maximum peak gate power	10		W	$T_J = T_J$ max, $t_p \leq 5\text{ms}$	
$P_{G(AV)}$ Maximum average gate power				$T_J = T_J$ max, $f = 50\text{Hz}$, $d\% = 50$	
I_{GM} Max. peak positive gate current	3.0		A	$T_J = T_J$ max, $t_p \leq 5\text{ms}$	
+ V_{GM} Maximum peak positive gate voltage	20		V	$T_J = T_J$ max, $t_p \leq 5\text{ms}$	
- V_{GM} Maximum peak negative gate voltage	5.0				
I_{GT} DC gate current required to trigger	TYP.	MAX.	mA	$T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$	
	180	-			
	90	150			
	40	-			
V_{GT} DC gate voltage required to trigger	2.9	-	V	$T_J = -40^\circ\text{C}$	
	1.8	3.0		$T_J = 25^\circ\text{C}$	
	1.2	-		$T_J = 125^\circ\text{C}$	
I_{GD} DC gate current not to trigger	10		mA	Max. gate current/ voltage not to trigger is the max. value which will not trigger any unit with rated V_{DRM} anode-to-cathode applied	
V_{GD} DC gate voltage not to trigger	0.25		V		

Thermal and Mechanical Specification

Parameter	ST180S	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	0.105	K/W	DC operation
R_{thCS} Max. thermal resistance, case to heatsink	0.04		Mounting surface, smooth, flat and greased
T Mounting torque, $\pm 10\%$	31 (275)	Nm (lbf-in)	Non lubricated threads
	24.5 (210)		Lubricated threads
wt Approximate weight	280	g	
Case style	TO - 209AB (TO-93)		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°	0.015	0.012	K/W	$T_J = T_{J \text{ max.}}$
120°	0.019	0.020		
90°	0.025	0.027		
60°	0.036	0.037		
30°	0.060	0.060		

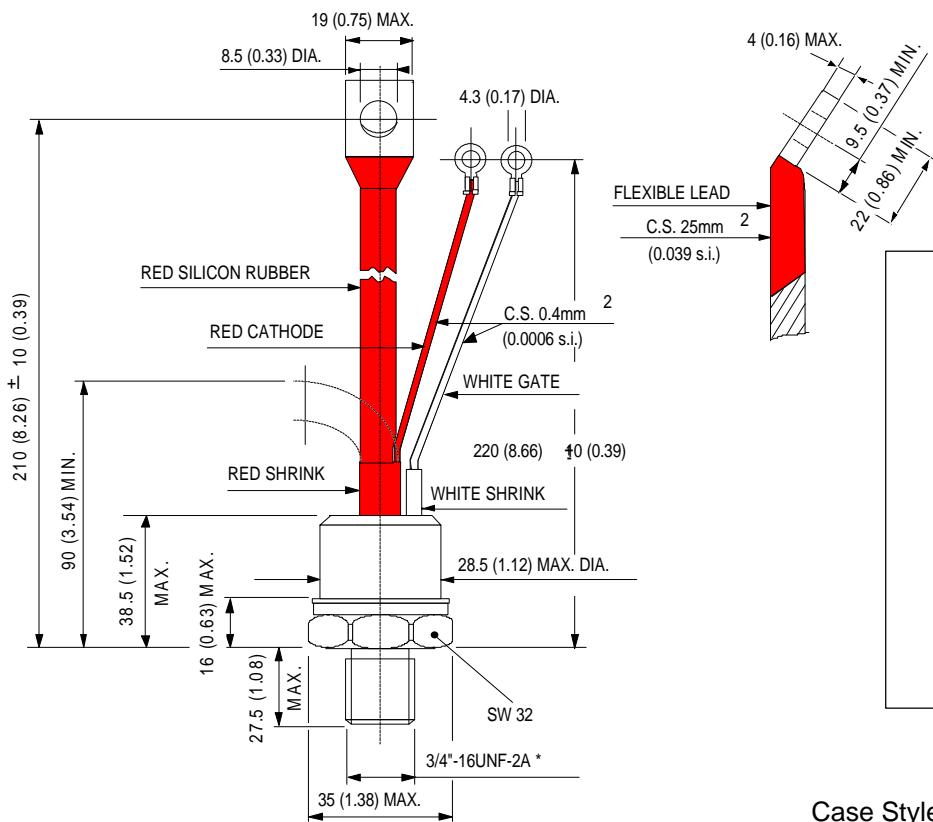
Ordering Information Table

Device Code	
ST	18 0 S 20 P 0
1 2 3 4 5 6 7 8 9	

1 - Thyristor
2 - Essential part number
3 - 0 = Converter grade
4 - S = Compression bonding Stud
5 - Voltage code: Code x 100 = V_{RRM} (See Voltage Rating Table)
6 - P = Stud base 16UNF threads
 M = Stud base metric threads (M16 x 1.5)
7 - 0 = Eyelet terminals (Gate and Auxiliary Cathode Leads)
 1 = Fast - on terminals (Gate and Auxiliary Cathode Leads)
 2 = Flag terminals (For Cathode and Gate Terminals)
8 - V = Glass-metal seal (only up to 1200V)
 None = Ceramic housing (over 1200V)
9 - Critical dv/dt: None = 500V/ μ sec (Standard value)
 L = 1000V/ μ sec (Special selection)

Outline Table

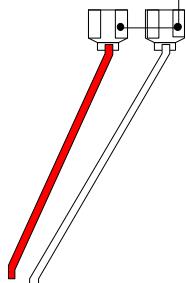
GLASS METAL SEAL



Fast-on Terminals

AMP. 280000-1

REF-250

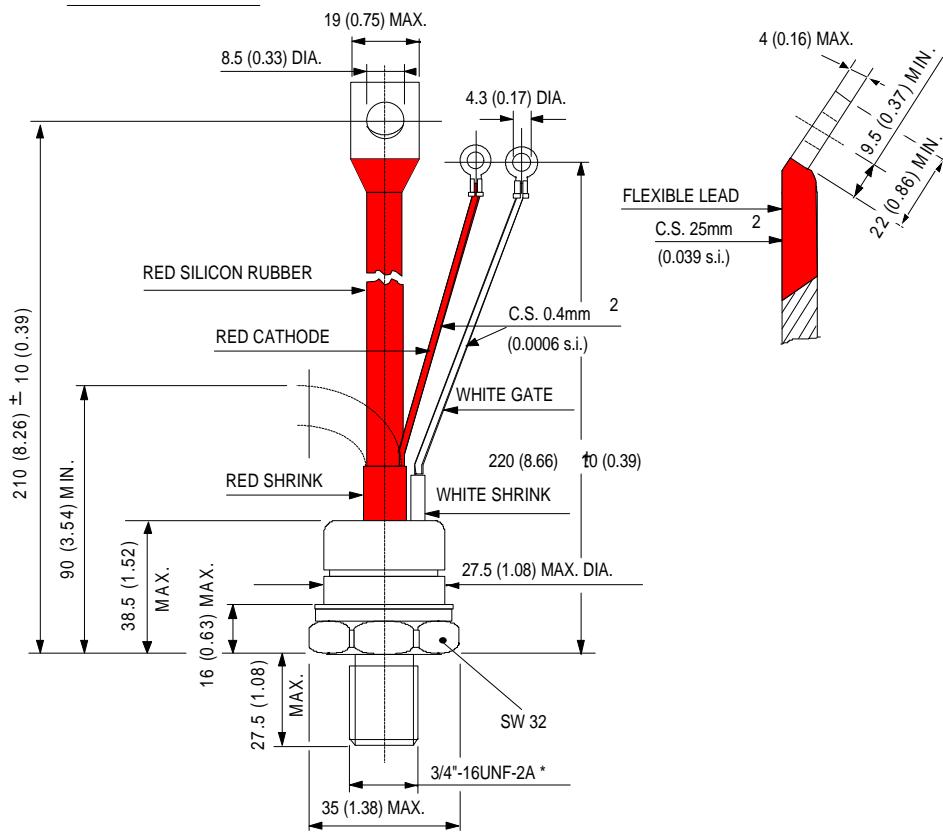


Case Style TO-209AB (TO-93)

All dimensions in millimeters (inches)

* FOR METRIC DEVICE : M16 x 1.5 - LENGTH 21 (0.83) MAX.

CERAMIC HOUSING



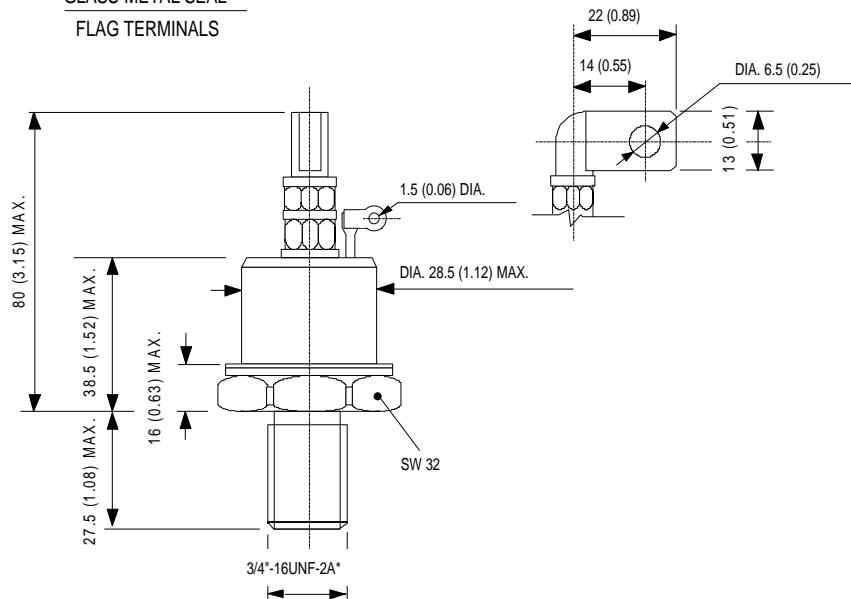
* FOR METRIC DEVICE : M16 x 1.5 - LENGTH 21 (0.83) MAX.

ST180S Series

Outline Table

GLASS-METAL SEAL

FLAG TERMINALS

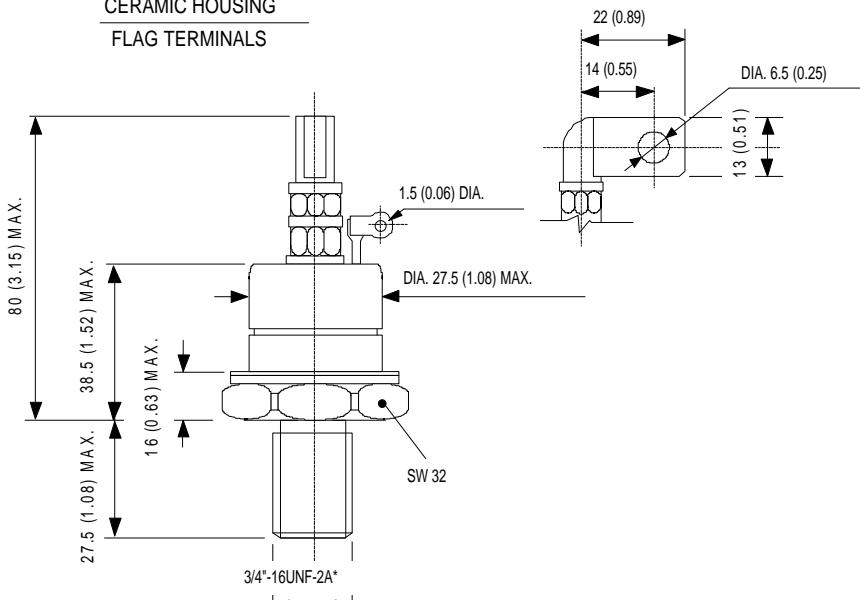


Case Style TO-209AB (TO-93) Flag

All dimensions in millimeters (inches)

CERAMIC HOUSING

FLAG TERMINALS



*FOR METRIC DEVICE. M16 X 1.5 - LENGTH 21 (0.83) MAX.

