



ST280S SERIES

PHASE CONTROL THYRISTORS

Stud Version

Features

- Center amplifying gate
- Hermetic metal case with glass-metal seal insulator
- International standard case TO-209AB (TO-93)
- Compression Bonded Encapsulation for heavy duty operations such as severe thermal cycling

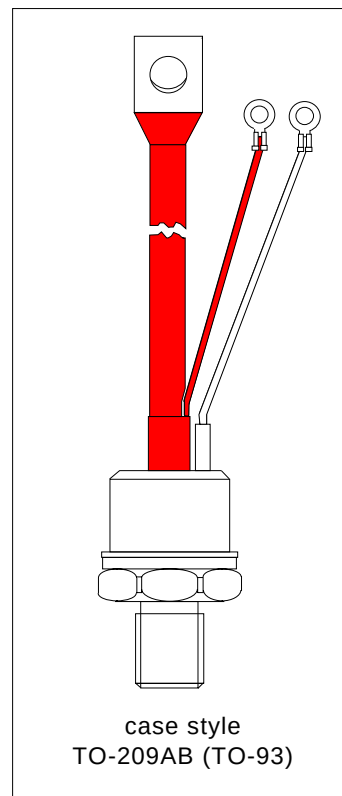
280A

Typical Applications

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

Major Ratings and Characteristics

Parameters	ST280S	Units
$I_{T(AV)}$	280	A
@ T_C	85	°C
$I_{T(RMS)}$	440	A
I_{TSM} @ 50Hz	7850	A
@ 60Hz	8220	A
I^2t @ 50Hz	308	KA ² s
@ 60Hz	281	KA ² s
V_{DRM}/V_{RRM}	400 to 600	V
t_q typical	100	μs
T_J	- 40 to 125	°C



ST280S Series

Bulletin I25161 rev. C 03/03

International
IRF Rectifier

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. @ $T_J = T_J \text{ max}$ mA
ST280S	04	400	500	30
	06	600	700	

On-state Conduction

Parameter	ST280S	Units	Conditions
$I_{T(AV)}$ Max. average on-state current @ Case temperature	280	A	180° conduction, half sine wave
	85	°C	
$I_{T(RMS)}$ Max. RMS on-state current	440	A	DC @ 75°C case temperature
I_{TSM} Max. peak, one-cycle non-repetitive surge current	7850	A	t = 10ms No voltage reappplied
	8220		t = 8.3ms reappplied
	6600		t = 10ms 100% V_{RRM}
	6900		t = 8.3ms reappplied
I^2t Maximum I^2t for fusing	310	KA ² s	t = 10ms No voltage reappplied
	220		t = 8.3ms reappplied
	218		t = 10ms 100% V_{RRM}
	200		t = 8.3ms reappplied
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	3100	KA ² √s	t = 0.1 to 10ms, no voltage reappplied
$V_{T(TO)1}$ Low level value of threshold voltage	0.84	V	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
$V_{T(TO)2}$ High level value of threshold voltage	0.88		$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
r_{t1} Low level value of on-state slope resistance	0.50	mΩ	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
r_{t2} High level value of on-state slope resistance	0.47		$(I > \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
V_{TM} Max. on-state voltage	1.28	V	$I_{pk} = 880A, T_J = T_J \text{ max, } t_p = 10ms$ sine pulse
I_H Maximum holding current	600	mA	$T_J = 25^\circ C$, anode supply 12V resistive load
I_L Max. (typical) latching current	1000 (300)		

Switching

Parameter	ST280S	Units	Conditions
di/dt Max. non-repetitive rate of rise of turned-on current	1000	A/μs	Gate drive 20V, 20Ω, $t_f \leq 1\mu s$ $T_J = T_J \text{ max, anode voltage} \leq 80\% V_{DRM}$
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		$I_{TM} = 300A, T_J = T_J \text{ max, } di/dt = 20A/\mu s, V_R = 50V$ $dv/dt = 20V/\mu s, \text{ Gate } 0V, 100\Omega, t_p = 500\mu s$

Blocking

Parameter	ST280S	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/ μ s	$T_J = T_J$ 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	ST280S	Units	Conditions
P_{GM} Maximum peak gate power	10.0	W	$T_J = T_J$ max, $t_p \leq 5ms$
$P_{G(AV)}$ Maximum average gate power	2.0		$T_J = T_J$ max, $f = 50Hz$, $d\% = 50$
I_{GM} Max. peak positive gate current	3.0	A	$T_J = T_J$ max, $t_p \leq 5ms$
$+V_{GM}$ Maximum peak positive gate voltage	20	V	$T_J = T_J$ max, $t_p \leq 5ms$
$-V_{GM}$ Maximum peak negative gate voltage	5.0		
I_{GT} DC gate current required to trigger	TYP. 180	mA	$T_J = -40^\circ C$ $T_J = 25^\circ C$ $T_J = 125^\circ C$ Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied
	90		
	40		
V_{GT} DC gate voltage required to trigger	2.9	V	$T_J = -40^\circ C$ $T_J = 25^\circ C$ $T_J = 125^\circ C$
	1.8		
	1.2		
I_{GD} DC gate current not to trigger	10	mA	$T_J = T_J$ max 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	ST280S	Units	Conditions
T_J Max. operating temperature range	-40 to 125	$^\circ C$	
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

ST280S Series

Bulletin I25161 rev. C 03/03

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°	0.016	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	28	0	S	06	P	0	V
1	2	3	4	5	6	7	8

- 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 3/4"-16UNF-2A threads
- 7 - 0 = Eyelet terminals (Gate and Auxiliary Cathode Leads)
1 = Fast - on terminals (Gate and Auxiliary Cathode Leads)
- 8 - V = Glass-metal seal

NOTE: For Metric Device M16 x 1.5 Contact Factory

Outline Table

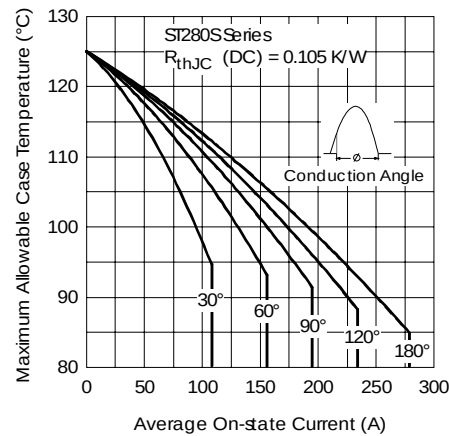
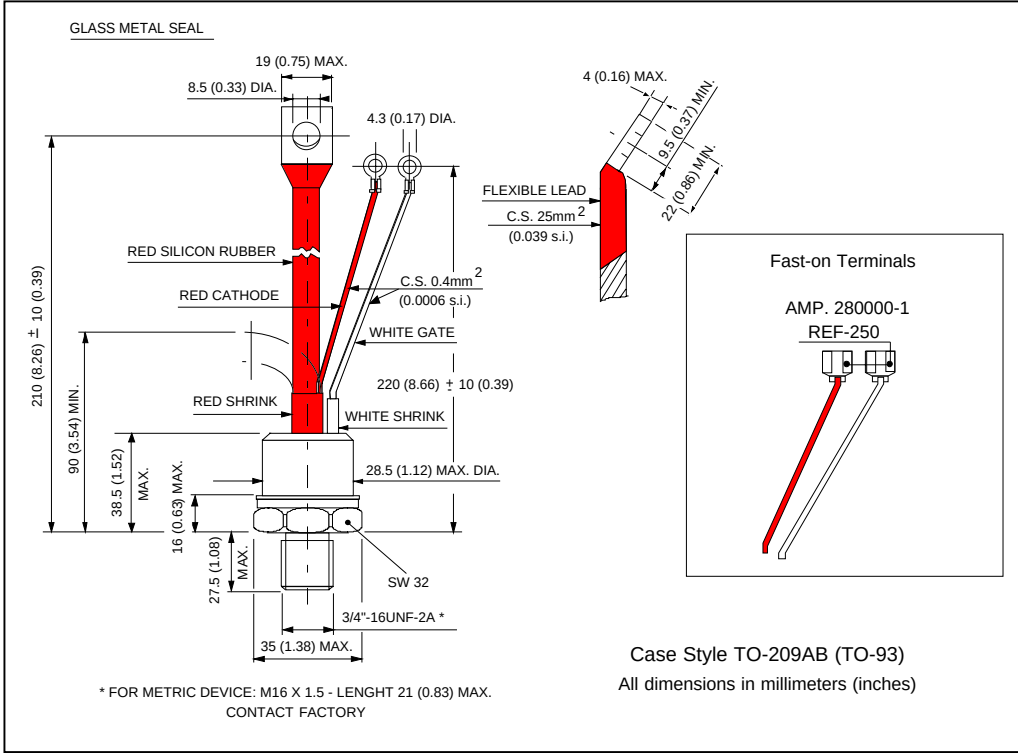


Fig. 1 - Current Ratings Characteristics

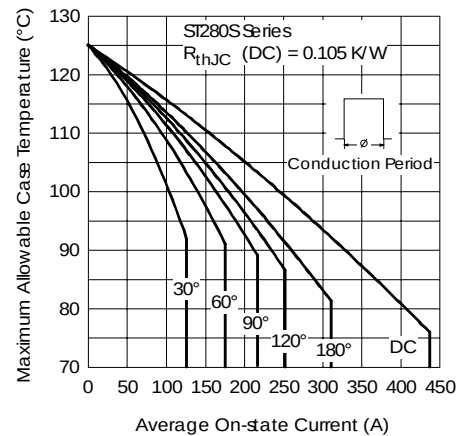


Fig. 2 - Current Ratings Characteristics

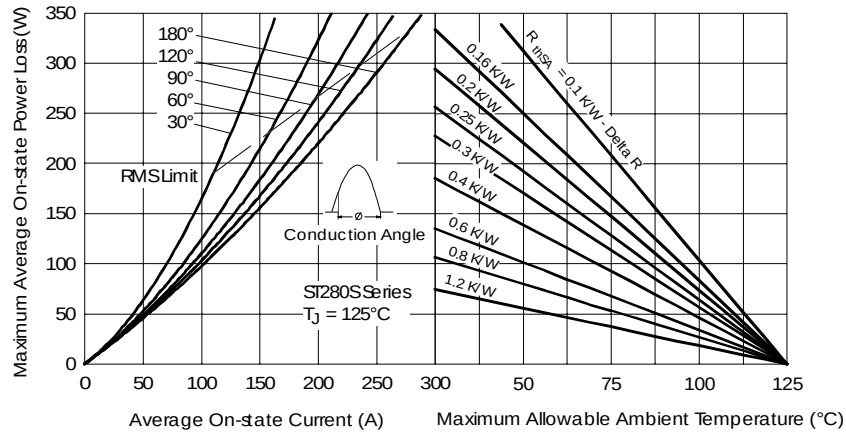


Fig. 3 - On-state Power Loss Characteristics

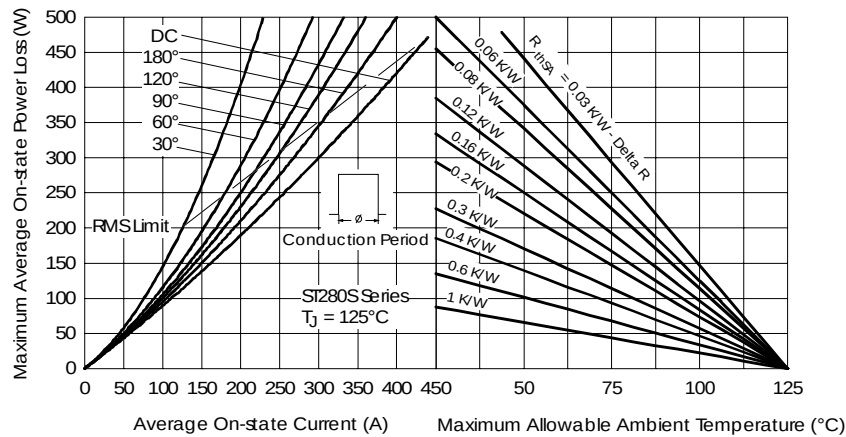


Fig. 4 - On-state Power Loss Characteristics

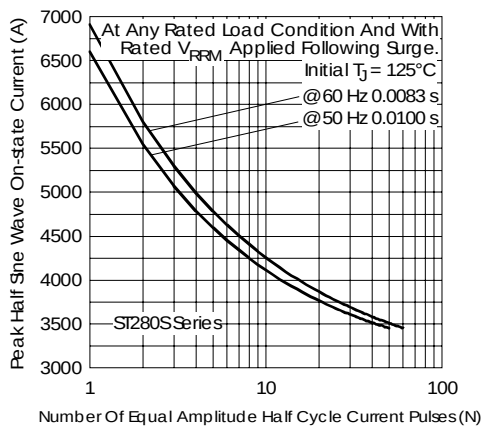


Fig. 5 - Maximum Non-Repetitive Surge Current

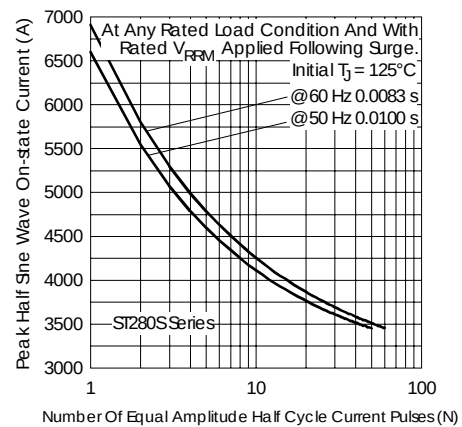


Fig. 6 - Maximum Non-Repetitive Surge Current

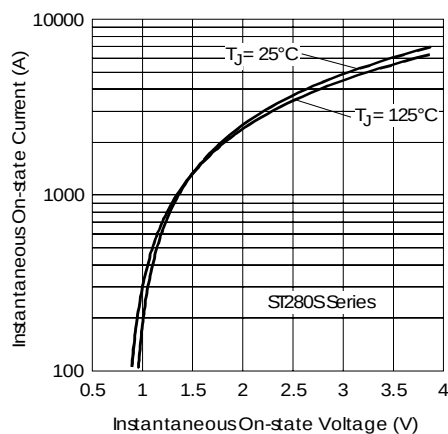


Fig. 7 - On-state Voltage Drop Characteristics

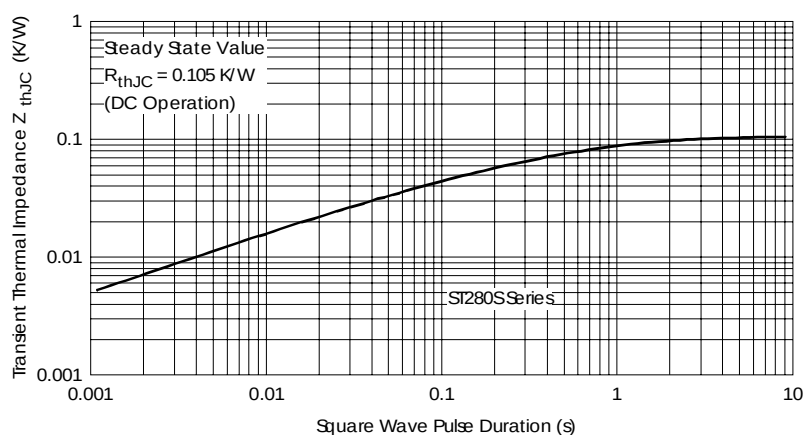


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

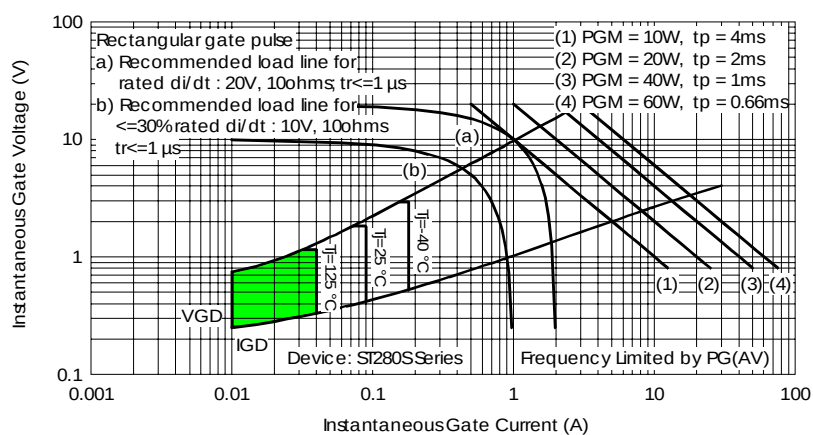


Fig. 9 - Gate Characteristics

ST280S Series

Bulletin I25161 rev. C 03/03

International
IOR Rectifier

Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial Level.
Qualification Standards can be found on IR's Web site.

International
IOR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7309
Visit us at www.irf.com for sales contact information. 03/03