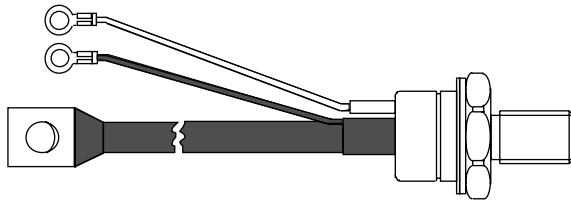


## Inverter Grade Thyristors (Stud Version), 85 A



TO-209AC (TO-94)

### FEATURES

- Center amplifying gate
- High surge current capability
- Low thermal impedance
- High speed performance
- Compression bonding
- Compliant to RoHS directive 2002/95/EC
- Designed and qualified for industrial level


**RoHS**  
COMPLIANT

### PRODUCT SUMMARY

$I_{T(AV)}$	85 A
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### TYPICAL APPLICATIONS

- Inverters
- Choppers
- Induction heating
- All types of force-commutated converters

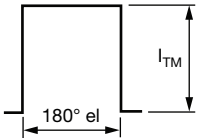
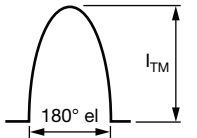
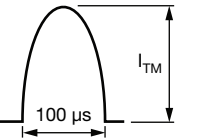
### MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		85	A
	$T_C$	85	°C
$I_{T(RMS)}$		135	A
$I_{TSM}$	50 Hz	2450	A
	60 Hz	2560	A
$I^2t$	50 Hz	30	kA <sup>2</sup> s
	60 Hz	27	
$V_{DRM}/V_{RRM}$		400 to 1200	V
$t_q$	Range	10 to 20	μs
$T_J$		- 40 to 125	°C

### ELECTRICAL SPECIFICATIONS

#### VOLTAGE RATINGS

TYPE NUMBER	VOLTAGE CODE	$V_{DRM}/V_{RRM}$ , MAXIMUM REPETITIVE PEAK VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK VOLTAGE V	$I_{DRM}/I_{RRM}$ MAX. AT $T_J = T_J$ MAX. mA
ST083S	04	400	500	30
	08	800	900	
	10	1000	1100	
	12	1200	1300	

CURRENT CARRYING CAPABILITY							
FREQUENCY							UNITS
50 Hz	210	120	330	270	2540	1930	A
400 Hz	200	120	350	210	1190	810	
1000 Hz	150	80	320	190	630	400	
2500 Hz	70	25	220	85	250	100	
Recovery voltage $V_r$	50	50	50	50	50	50	V
Voltage before turn-on $V_d$	$V_{DRM}$		$V_{DRM}$		$V_{DRM}$		
Rise of on-state current $di/dt$	50	50	-	-	-	-	A/ $\mu$ s
Case temperature	60	85	60	85	60	85	$^{\circ}$ C
Equivalent values for RC circuit	22/0.15		22/0.15		22/0.15		W/ $\mu$ F

ON-STATE CONDUCTION						
PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS
Maximum average on-state current at case temperature	$I_{T(AV)}$	180 $^{\circ}$ conduction, half sine wave			85	A
					85	$^{\circ}$ C
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 77 $^{\circ}$ C case temperature			135	A
Maximum peak, one half cycle, non-repetitive surge current	$I_{TSM}$	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	2450	
		t = 8.3 ms			2560	
		t = 10 ms	100 % $V_{RRM}$ reapplied		2060	
		t = 8.3 ms			2160	
Maximum $I^2t$ for fusing	$I^2t$	t = 10 ms	No voltage reapplied	30	kA $^2$ s	
		t = 8.3 ms		27		
		t = 10 ms	100 % $V_{RRM}$ reapplied	21		
		t = 8.3 ms		19		
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied			300	kA $^2\sqrt{s}$
Maximum peak on-state voltage	$V_{TM}$	$I_{TM} = 300$ A, $T_J = T_J$ maximum, $t_p = 10$ ms sine wave pulse			2.15	V
Low level value of threshold voltage	$V_{T(TO)1}$	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$ , $T_J = T_J$ maximum			1.46	
High level value of threshold voltage	$V_{T(TO)2}$	$(I > \pi \times I_{T(AV)})$ , $T_J = T_J$ maximum			1.52	
Low level value of forward slope resistance	$r_{t1}$	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$ , $T_J = T_J$ maximum			2.32	m $\Omega$
High level value of forward slope resistance	$r_{t2}$	$(I > \pi \times I_{T(AV)})$ , $T_J = T_J$ maximum			2.34	
Maximum holding current	$I_H$	$T_J = 25$ $^{\circ}$ C, $I_T > 30$ A			600	mA
Typical latching current	$I_L$	$T_J = 25$ $^{\circ}$ C, $V_A = 12$ V, $R_a = 6$ $\Omega$ , $I_G = 1$ A			1000	

SWITCHING					
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNITS
			MIN.	MAX.	
Maximum non-repetitive rate of rise of turned on current	$di/dt$	$T_J = T_J$ max., $V_{DRM} = \text{Rated } V_{DRM}$ , $I_{TM} = 2 \times di/dt$	1000		A/ $\mu$ s
Typical delay time	$t_d$	$T_J = 25$ $^{\circ}$ C, $V_{DM} = \text{Rated } V_{DM}$ , $I_{TM} = 50$ A DC, $t_p = 1$ $\mu$ s Resistive load, gate pulse: 10 V, 5 $\Omega$ source	0.80		$\mu$ s
Maximum turn-off time	$t_q$	$T_J = T_J$ maximum, $I_{TM} = 100$ A, commutating $di/dt = 10$ A/ $\mu$ s $V_R = 50$ V, $t_p = 200$ $\mu$ s, $dV/dt = 200$ V/ $\mu$ s	10	20	



<b>BLOCKING</b>				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum critical rate of rise of off-state voltage	dV/dt	T <sub>J</sub> = T <sub>J</sub> maximum, linear to 80 % V <sub>DRM</sub> , higher value available on request	500	V/μs
Maximum peak reverse and off-state leakage current	I <sub>RRM</sub> , I <sub>DRM</sub>	T <sub>J</sub> = T <sub>J</sub> maximum, rated V <sub>DRM</sub> /V <sub>RRM</sub> applied	30	mA

<b>TRIGGERING</b>				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak gate power	P <sub>GM</sub>	T <sub>J</sub> = T <sub>J</sub> maximum, f = 50 Hz, d% = 50	40	W
Maximum average gate power	P <sub>G(AV)</sub>		5	
Maximum peak positive gate current	I <sub>GM</sub>	T <sub>J</sub> = T <sub>J</sub> maximum, t <sub>p</sub> ≤ 5 ms	5	A
Maximum peak positive gate voltage	+ V <sub>GM</sub>		20	V
Maximum peak negative gate voltage	- V <sub>GM</sub>		5	
Maximum DC gate current required to trigger	I <sub>GT</sub>	T <sub>J</sub> = 25 °C, V <sub>A</sub> = 12 V, R <sub>a</sub> = 6 Ω	200	mA
Maximum DC gate voltage required to trigger	V <sub>GT</sub>		3	V
Maximum DC gate current not to trigger	I <sub>GD</sub>	T <sub>J</sub> = T <sub>J</sub> maximum, rated V <sub>DRM</sub> /V <sub>RRM</sub> applied	20	mA
Maximum DC gate voltage not to trigger	V <sub>GD</sub>		0.25	V

<b>THERMAL AND MECHANICAL SPECIFICATIONS</b>				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction operating temperature range	T <sub>J</sub>		- 40 to 125	°C
Maximum storage temperature range	T <sub>Stg</sub>		- 40 to 150	
Maximum thermal resistance, junction to case	R <sub>thJC</sub>	DC operation	0.195	K/W
Maximum thermal resistance, case to heatsink	R <sub>thCS</sub>	Mounting surface, smooth, flat and greased	0.08	
Mounting torque, ± 10 %		Non-lubricated threads	15.5 (137)	N · m (lbf · in)
		Lubricated threads	14 (120)	
Approximate weight			130	g
Case style		See dimensions - link at the end of datasheet	TO-209AC (TO-94)	

<b>ΔR<sub>thJC</sub> CONDUCTION</b>				
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION	RECTANGULAR CONDUCTION	TEST CONDITIONS	UNITS
180°	0.034	0.025	T <sub>J</sub> = T <sub>J</sub> maximum	K/W
120°	0.041	0.042		
90°	0.052	0.056		
60°	0.076	0.079		
30°	0.126	0.127		

**Note**

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

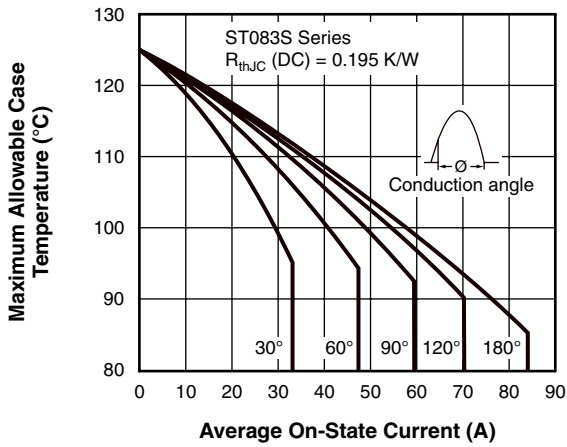


Fig. 1 - Current Ratings Characteristics

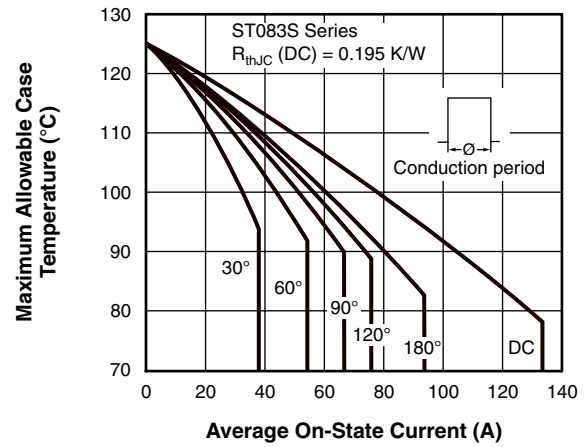


Fig. 2 - Current Ratings Characteristics

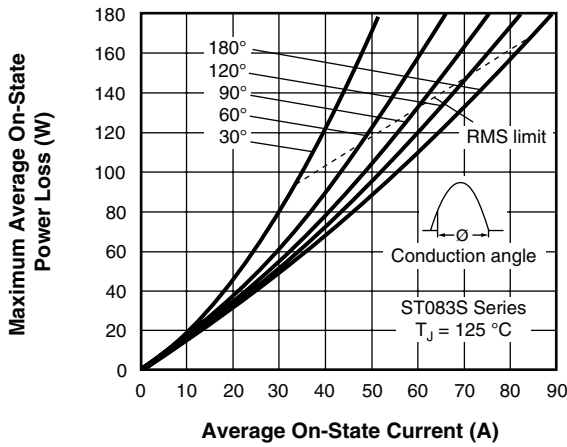


Fig. 3 - On-State Power Loss Characteristics

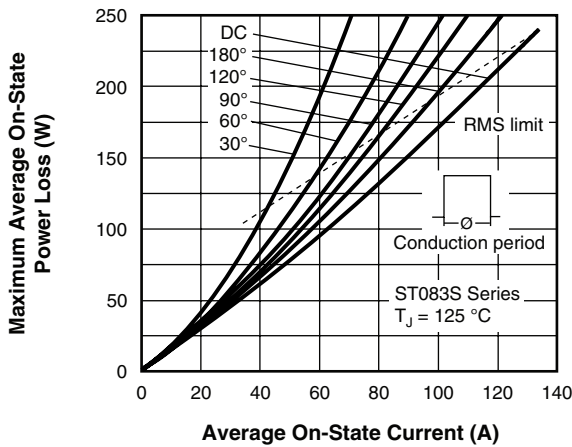
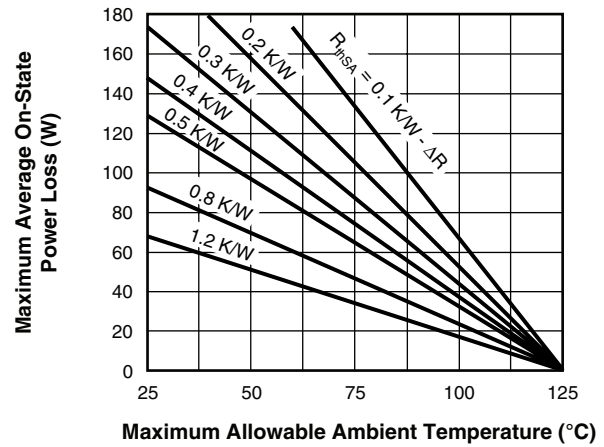
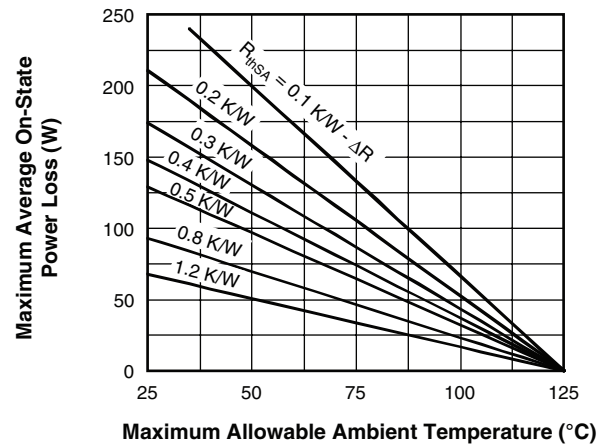


Fig. 4 - On-State Power Loss Characteristics



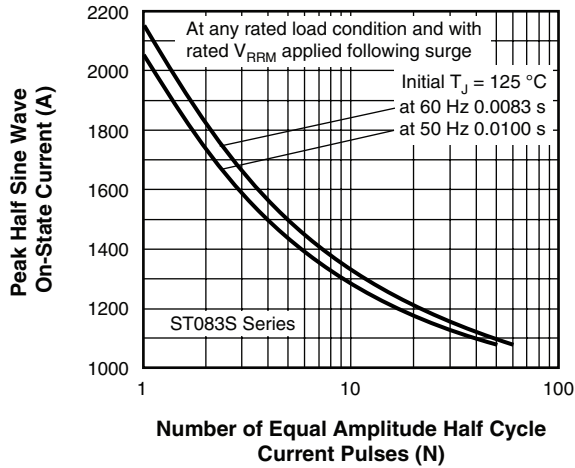


Fig. 5 - Maximum Non-Repetitive Surge Current

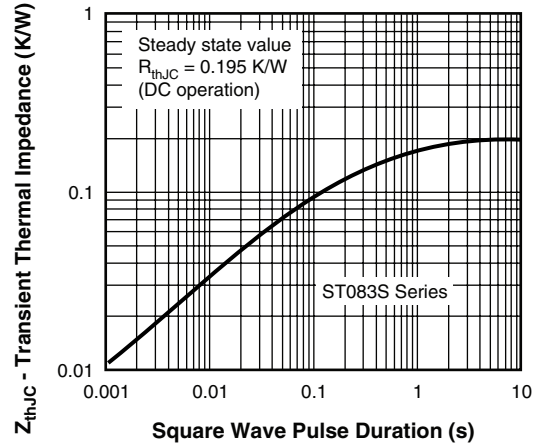


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

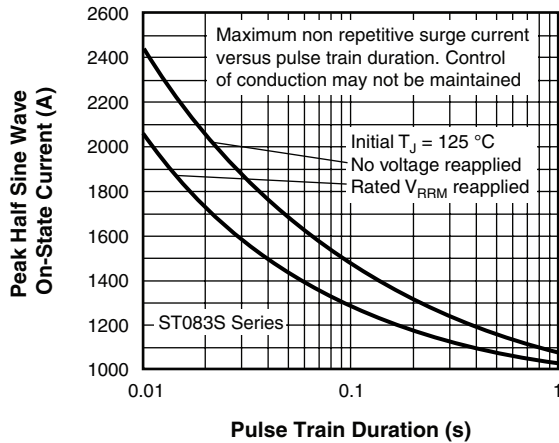


Fig. 6 - Maximum Non-Repetitive Surge Current

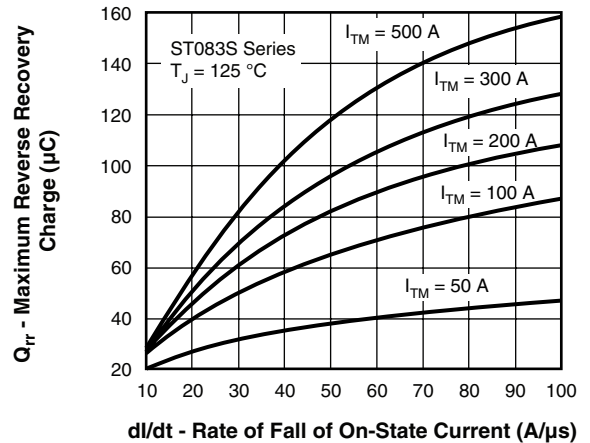


Fig. 9 - Reverse Recovered Charge Characteristics

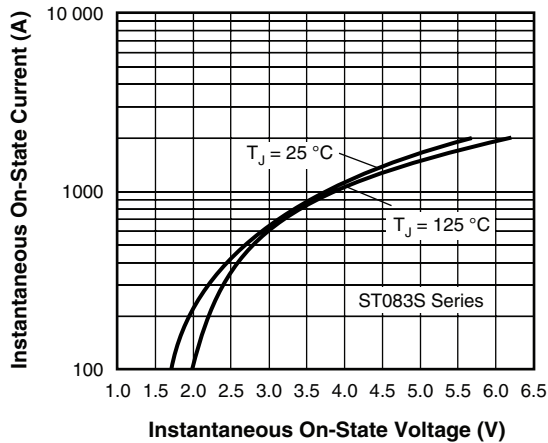


Fig. 7 - On-State Voltage Drop Characteristics

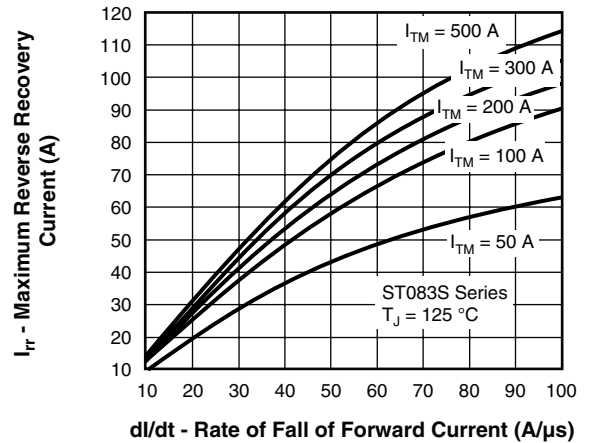


Fig. 10 - Reverse Recovery Current Characteristics

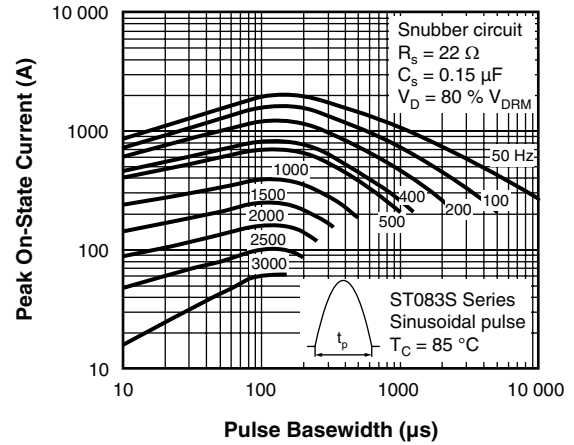
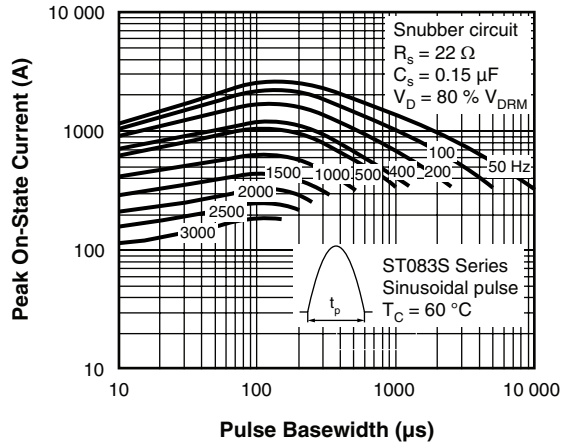


Fig. 11 - Frequency Characteristics

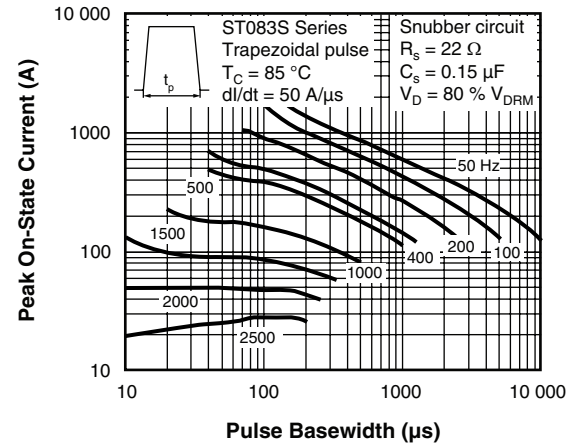
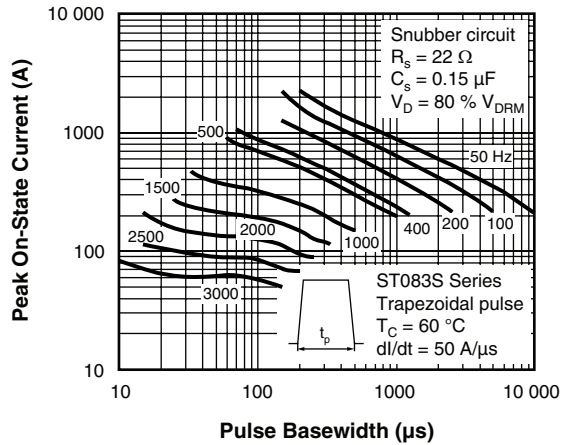


Fig. 12 - Frequency Characteristics

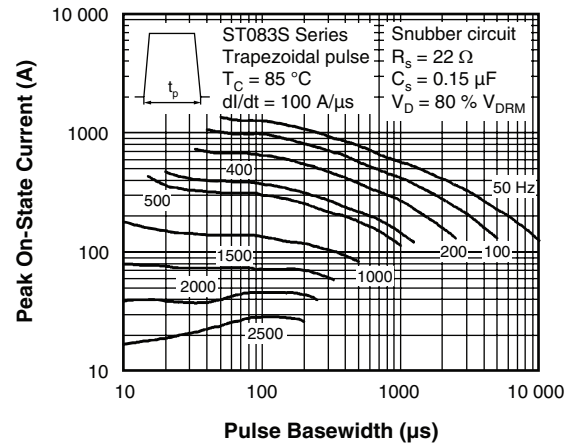
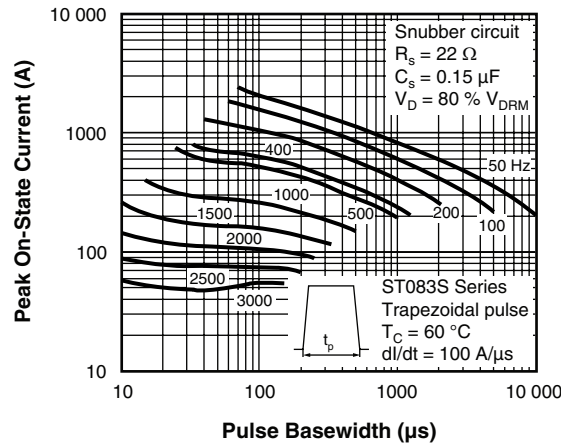


Fig. 13 - Frequency Characteristics

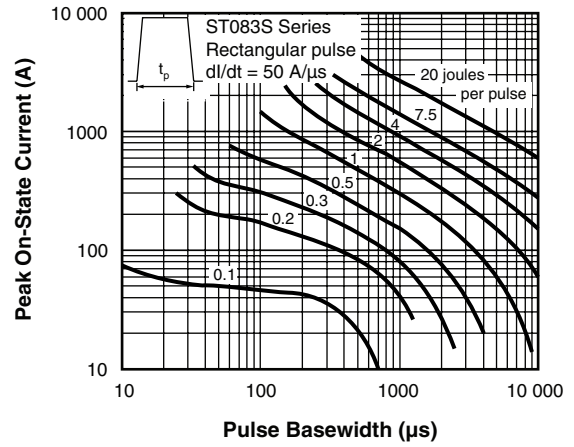
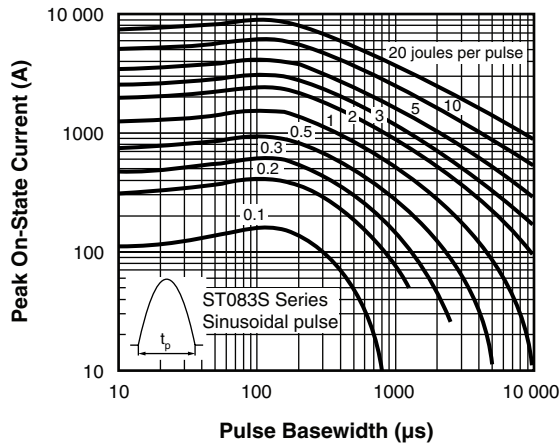


Fig. 14 - Maximum On-State Energy Power Loss Characteristics

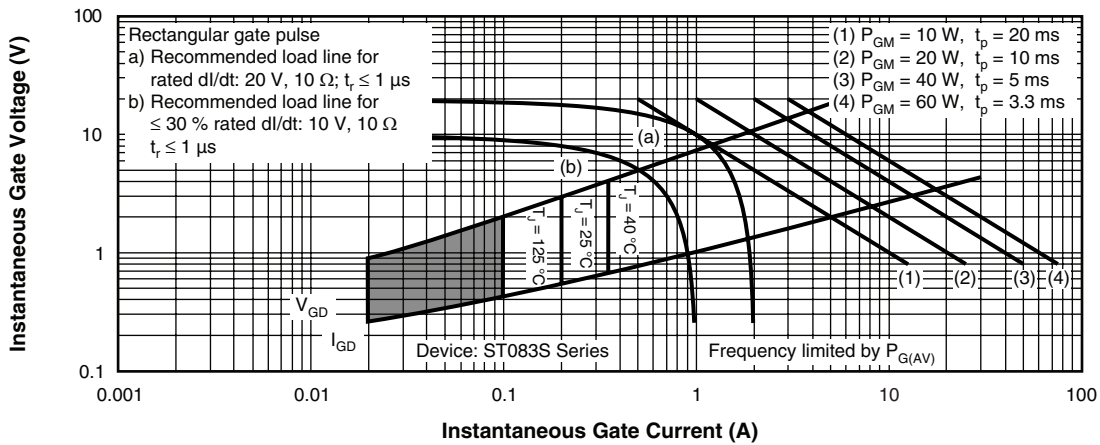


Fig. 15 - Gate Characteristics

# ST083SPbF Series



Vishay High Power Products Inverter Grade Thyristors  
(Stud Version), 85 A

## ORDERING INFORMATION TABLE

Device code	ST	08	3	S	12	P	F	N	0	PbF
	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

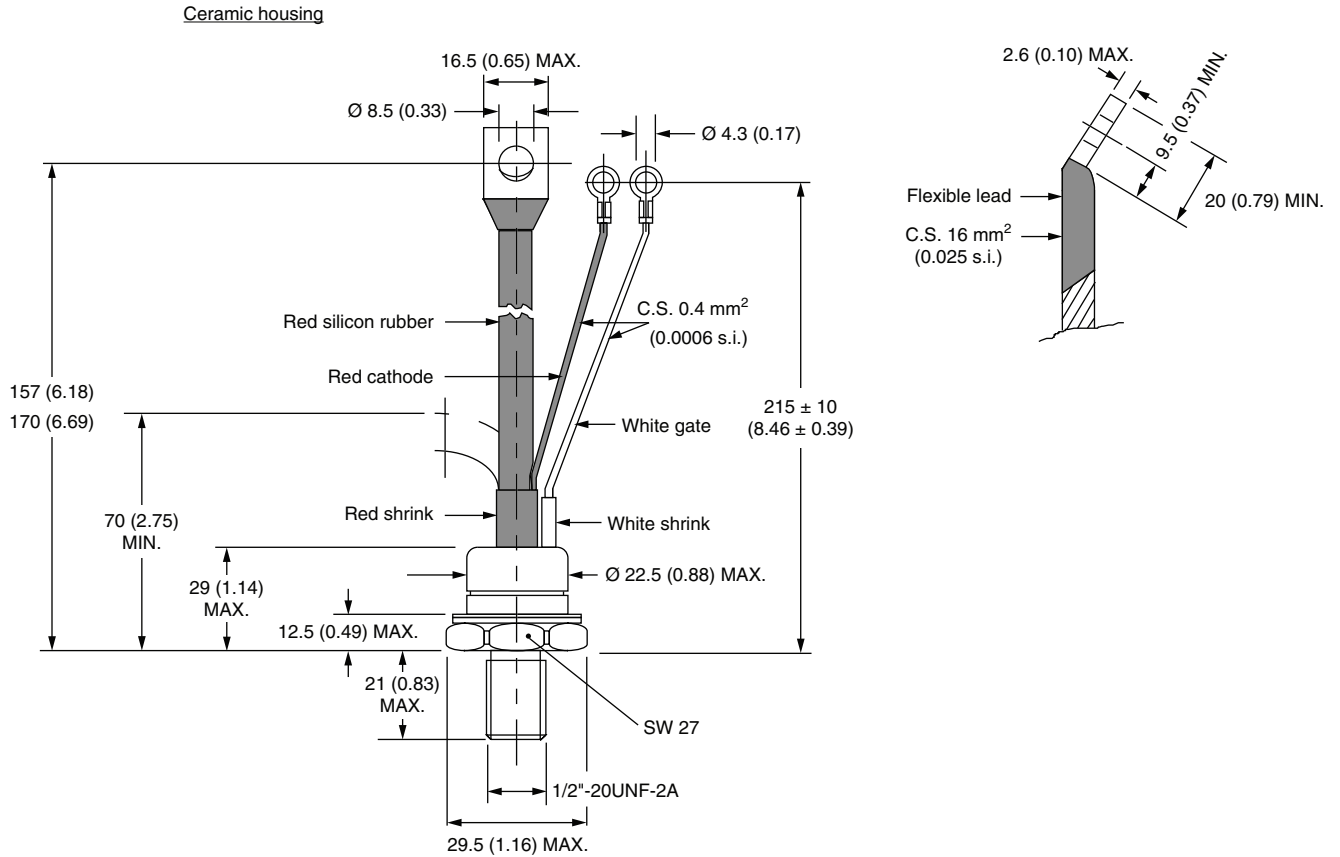
- 1** - Thyristor
- 2** - Essential part number
- 3** - 3 = Fast turn-off
- 4** - S = Compression bonding stud
- 5** - Voltage code x 100 =  $V_{RRM}$  (see Voltage Ratings table)
- 6** - • P = Stud base 1/2"-20UNF-2A threads  
• M = Metric M12, contact factory for availability
- 7** - Reapplied dV/dt code (for  $t_q$  test condition)
- 8** -  $t_q$  code
- 9** - • 0 = Eyelet terminals (gate and aux. cathode leads)  
• 1 = Fast-on terminals (gate and aux. cathode leads)  
• 2 = Flag terminals (gate and aux. cathode leads)
- 10** - PbF = Lead (Pb)-free

dV/dt - $t_q$ combinations available		
	dV/dt (V/ $\mu$ s)	200
$t_q$ ( $\mu$ s) up to 800V	10	FN
	20	FK
$t_q$ ( $\mu$ s) only for 1000/1200 V	20	FK

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95003">www.vishay.com/doc?95003</a>

## TO-209AC (TO-94) for ST083S and ST103S Series

**DIMENSIONS** in millimeters (inches)





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**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

# Mouser Electronics

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[ST083S08PFM1P](#) [ST083S08PFN2](#) [ST083S10PFK1](#) [ST083S10PFK2](#) [ST083S12PFK0L](#) [ST083S12PFK0LP](#)  
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