

### INVERTER GRADE THYRISTORS

### Stud Version

#### Features

- All diffused design
- Center amplifying gate
- Guaranteed high  $dv/dt$
- Guaranteed high  $di/dt$
- High surge current capability
- Low thermal impedance
- High speed performance

85A

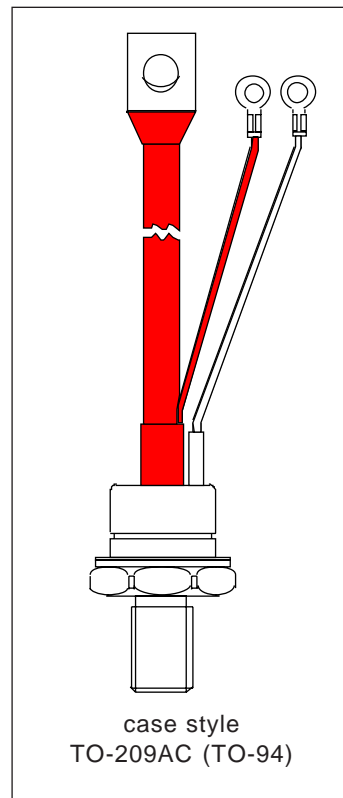
#### Typical Applications

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

#### Major Ratings and Characteristics

Parameters	ST083S	Units
$I_{T(AV)}$	85	A
	@ $T_C$	$^{\circ}C$
$I_{T(RMS)}$	135	A
$I_{TSM}$	@ 50Hz	A
	@ 60Hz	A
$I^2t$	@ 50Hz	$KA^2s$
	@ 60Hz	$KA^2s$
$V_{DRM}/V_{RRM}$	400 to 1200	V
$t_q$ range (*)	10 to 30	$\mu s$
$T_J$	- 40 to 125	$^{\circ}C$

(\*)  $t_q = 10$  to  $20\mu s$  for 400 to 800V devices  
 $t_q = 15$  to  $30\mu s$  for 1000 to 1200V devices



## ST083S Series

Bulletin I25185 rev. B 03/94

International  
IR Rectifier

### 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. @ $T_J = T_J$ max. mA
ST083S	04	400	500	30
	08	800	900	
	10	1000	1100	
	12	1200	1300	

#### Current Carrying Capability

Frequency				Units			
50Hz	210	120	330	270	2540	1930	A
400Hz	200	120	350	210	1190	810	
1000Hz	150	80	320	190	630	400	
2500Hz	70	25	220	85	250	100	
Recovery voltage Vr	50	50	50	50	50	50	V
Voltage before turn-on Vd	$V_{DRM}$		$V_{DRM}$		$V_{DRM}$		
Rise of on-state current di/dt	50	50	-	-	-	-	A/µs
Case temperature	60	85	60	85	60	85	°C
Equivalent values for RC circuit	22Ω / 0.15µF		22Ω / 0.15µF		22Ω / 0.15µF		

#### On-state Conduction

Parameter	ST083S	Units	Conditions		
$I_{T(AV)}$ Max. average on-state current @ Case temperature	85	A	180° conduction, half sine wave		
	85	°C			
$I_{T(RMS)}$ Max. RMS on-state current	135	A	DC @ 77°C case temperature		
	$I_{TSM}$ Max. peak, one half cycle, non-repetitive surge current			2450	t = 10ms No voltage
				2560	t = 8.3ms reapplied
				2060	t = 10ms 100% $V_{RRM}$
2160	t = 8.3ms reapplied				
$I^2t$ Maximum $I^2t$ for fusing	30	KA <sup>2</sup> s	Sinusoidal half wave, Initial $T_J = T_J$ max		
	27			t = 10ms No voltage	
	21			t = 8.3ms reapplied	
	19			t = 10ms 100% $V_{RRM}$	
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	300	KA <sup>2</sup> √s	t = 0.1 to 10ms, no voltage reapplied		

On-state Conduction

Parameter	ST083S	Units	Conditions
$V_{TM}$ Max. peak on-state voltage	2.15	V	$I_{TM} = 300A, T_J = T_J \text{ max}, t_p = 10\text{ms sine wave pulse}$
$V_{T(TO)1}$ Low level value of threshold voltage	1.46		$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
$V_{T(TO)2}$ High level value of threshold voltage	1.52		$(I > \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
$r_{t1}$ Low level value of forward slope resistance	2.32	m $\Omega$	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
$r_{t2}$ High level value of forward slope resistance	2.34		$(I > \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
$I_H$ Maximum holding current	600	mA	$T_J = 25^\circ\text{C}, I_T > 30A$
$I_L$ Typical latching current	1000		$T_J = 25^\circ\text{C}, V_A = 12V, R_a = 6\Omega, I_G = 1A$

Switching

Parameter	ST083S	Units	Conditions
$di/dt$ Max. non-repetitive rate of rise of turned-on current	1000	A/ $\mu\text{s}$	$T_J = T_J \text{ max}, V_{DRM} = \text{rated } V_{DRM}$ $I_{TM} = 2 \times di/dt$
$t_d$ Typical delay time	0.80	$\mu\text{s}$	$T_J = 25^\circ\text{C}, V_{DM} = \text{rated } V_{DRM}, I_{TM} = 50A \text{ DC}, t_p = 1\mu\text{s}$ Resistive load, Gate pulse: 10V, 5 $\Omega$ source
$t_q$ Max. turn-off time (*)	Min 10 Max 30		$T_J = T_J \text{ max}, I_{TM} = 100A, \text{commutating } di/dt = 10A/\mu\text{s}$ $V_R = 50V, t_p = 200\mu\text{s}, dv/dt: \text{ see table in device code}$

(\*)  $t_q = 10$  to  $20\mu\text{s}$  for 400 to 800V devices;  $t_q = 15$  to  $30\mu\text{s}$  for 1000 to 1200V devices.

Blocking

Parameter	ST083S	Units	Conditions
$dv/dt$ Maximum critical rate of rise of off-state voltage	500	V/ $\mu\text{s}$	$T_J = T_J \text{ max.}, \text{ linear to } 80\% V_{DRM}, \text{ higher value available on request}$
$I_{RRM}$ $I_{DRM}$ Max. peak reverse and off-state leakage current	30	mA	$T_J = T_J \text{ max}, \text{ rated } V_{DRM}/V_{RRM} \text{ applied}$

Triggering

Parameter	ST083S	Units	Conditions
$P_{GM}$ Maximum peak gate power	40	W	$T_J = T_J \text{ max}, f = 50\text{Hz}, d\% = 50$
$P_{G(AV)}$ Maximum average gate power	5		
$I_{GM}$ Max. peak positive gate current	5	A	$T_J = T_J \text{ max}, t_p \leq 5\text{ms}$
$+V_{GM}$ Maximum peak positive gate voltage	20	V	$T_J = T_J \text{ max}, t_p \leq 5\text{ms}$
$-V_{GM}$ Maximum peak negative gate voltage	5		
$I_{GT}$ Max. DC gate current required to trigger	200	mA	$T_J = 25^\circ\text{C}, V_A = 12V, R_a = 6\Omega$
$V_{GT}$ Max. DC gate voltage required to trigger	3	V	
$I_{GD}$ Max. DC gate current not to trigger	20	mA	$T_J = T_J \text{ max}, \text{ rated } V_{DRM} \text{ applied}$
$V_{GD}$ Max. DC gate voltage not to trigger	0.25		

## ST083S Series

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**IRF** Rectifier

### Thermal and Mechanical Specifications

Parameter	ST083S	Units	Conditions
T <sub>J</sub> Max. junction operating temperature range	-40 to 125	°C	
T <sub>stg</sub> Max. storage temperature range	-40 to 150		
R <sub>thJC</sub> Max. thermal resistance, junction to case	0.195	K/W	DC operation
R <sub>thCS</sub> Max. thermal resistance, case to heatsink	0.08		Mounting surface, smooth, flat and greased
T Mounting torque, ± 10%	15.5 (137)	Nm (lbf-in)	Non lubricated threads
	14 (120)	Nm (lbf-in)	Lubricated threads
wt Approximate weight	130	g	
Case style	TO-209AC (TO-94)		See Outline Table

### ΔR<sub>thJC</sub> Conduction

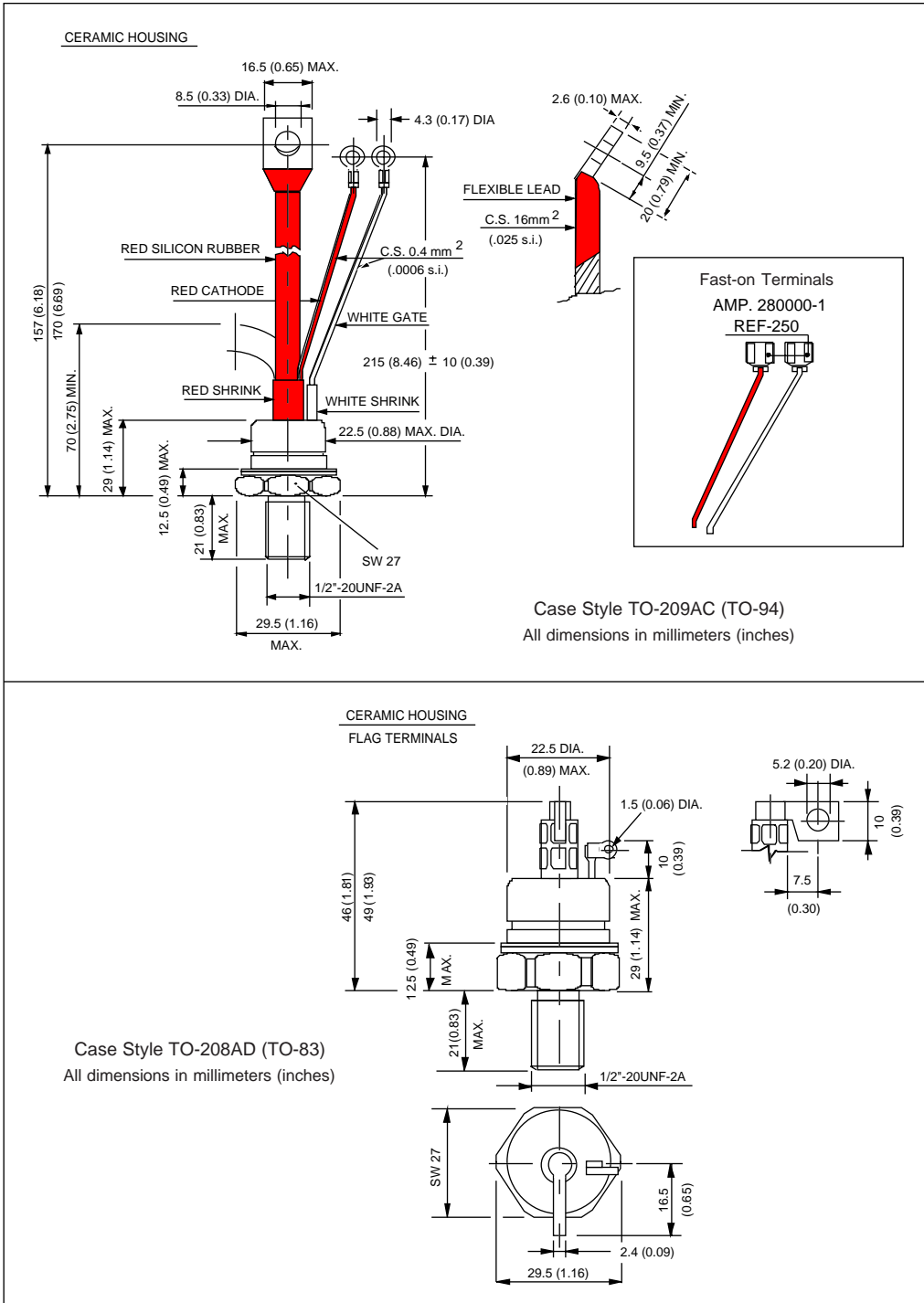
(The following table shows the increment of thermal resistance R<sub>thJC</sub> when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.034	0.025	K/W	T <sub>J</sub> = T <sub>J</sub> max.
120°	0.041	0.042		
90°	0.052	0.056		
60°	0.076	0.079		
30°	0.126	0.127		

### Ordering Information Table

Device Code									
1	2	3	4	5	6	7	8	9	10
ST	08	3	S	12	P	F	K	0	
<b>1</b>	- Thyristor								
<b>2</b>	- Essential part number								
<b>3</b>	- 3 = Fast turn off								
<b>4</b>	- S = Compression bonding Stud								
<b>5</b>	- Voltage code: Code x 100 = V <sub>RRM</sub> (See Voltage Ratings Table)								
<b>6</b>	- P = Stud Base 1/2" 20UNF								
<b>7</b>	- Reapplied dv/dt code (for t <sub>q</sub> Test Condition)								
<b>8</b>	- t <sub>q</sub> code								
<b>9</b>	- 0 = Eyelet terminals (Gate and Aux. Cathode Leads) 1 = Fast-on terminals (Gate and Aux. Cathode Leads) 2 = Flag terminals (For Cathode and Gate Terminals)								
<b>10</b>	- Critical dv/dt: None = 500V/μsec (Standard value) L = 1000V/μsec (Special selection)								
<b>dv/dt - t<sub>q</sub> combinations available</b>									
<b>dv/dt (V/μs)</b>									
t <sub>q</sub> (μs) up to 800V	10	CN	DN	EN	<b>FN</b> *	HN			
	12	CM	DM	EM	<b>FM</b> *	HM			
	15	CL	DL	EL	FL	HL			
	18	CP	DP	EP	<b>FP</b> *	HP			
	20	CK	DK	EK	<b>FK</b> *	HK			
t <sub>q</sub> (μs) only for 1000/1200V	15	CL	--	--	--	--			
	18	CP	DP	EP	<b>FP</b> *	--			
	20	CK	DK	EK	<b>FK</b> *	HK			
	25	CJ	DJ	EJ	FJ	HJ			
	30	--	DH	EH	FH	HH			
*Standard part number. All other types available only on request.									

Outline Table



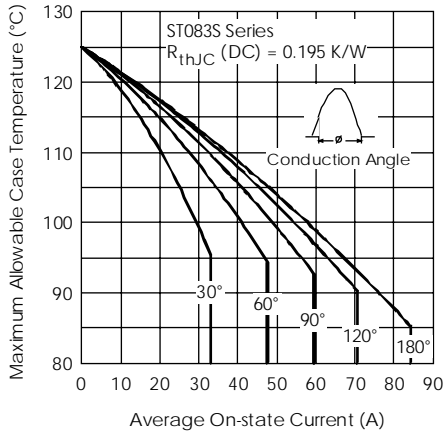


Fig. 1 - Current Ratings Characteristics

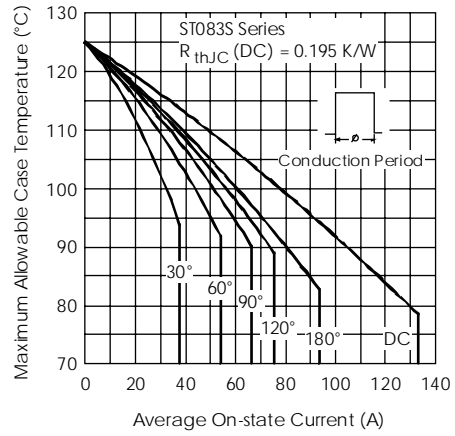


Fig. 2 - Current Ratings Characteristics

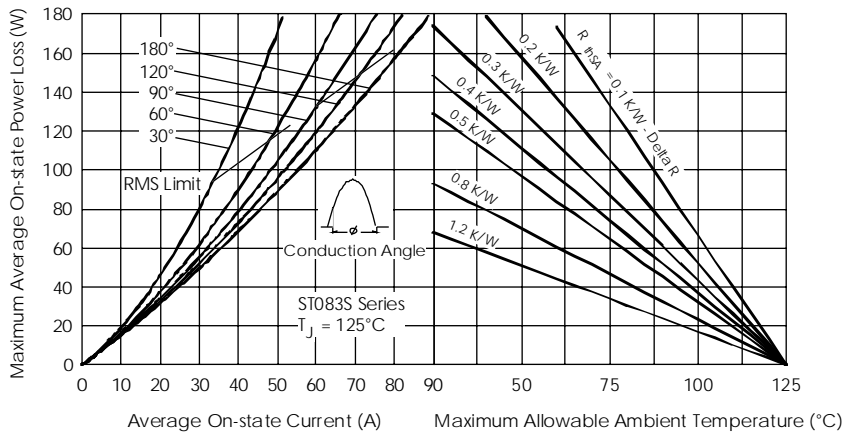


Fig. 3 - On-state Power Loss Characteristics

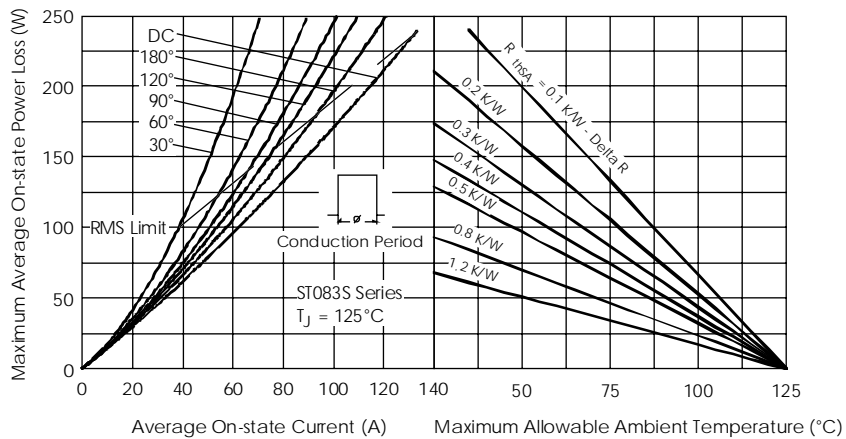


Fig. 4 - On-state Power Loss Characteristics

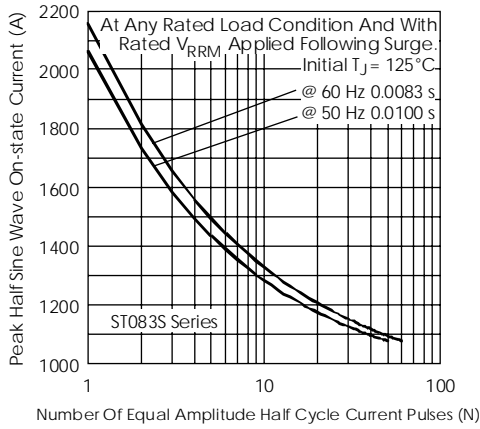


Fig. 5 - Maximum Non-repetitive Surge Current

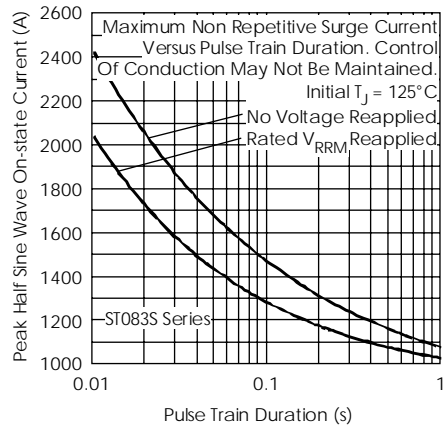


Fig. 6 - Maximum Non-repetitive Surge Current

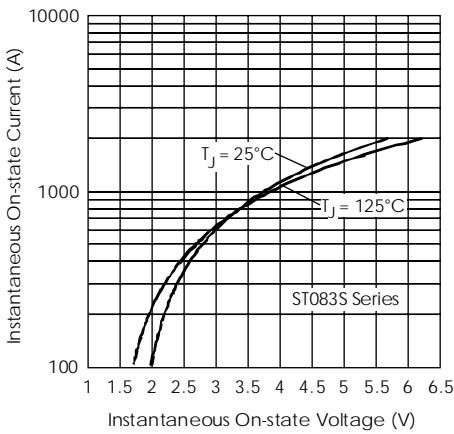


Fig. 7 - On-state Voltage Drop Characteristics

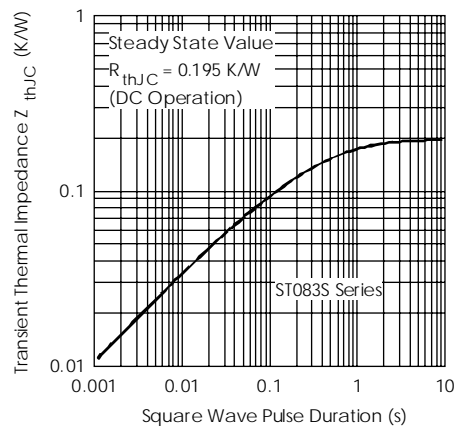


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

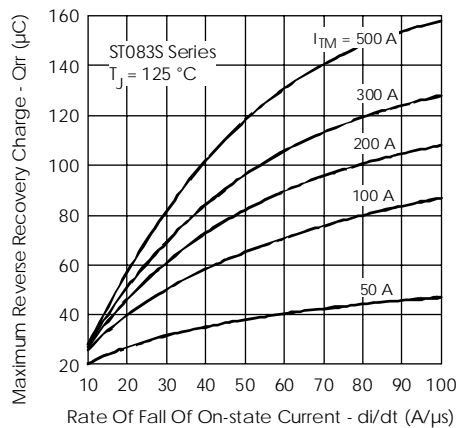


Fig. 9 - Reverse Recovered Charge Characteristics

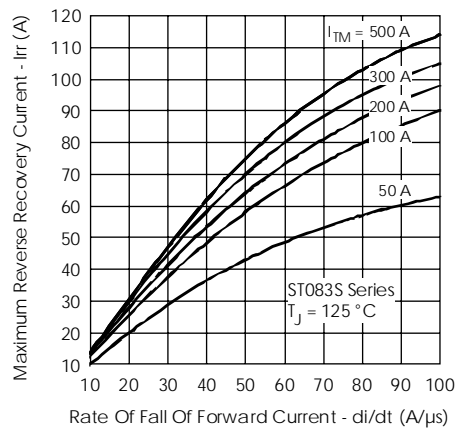


Fig. 10 - Reverse Recovery Current Characteristics

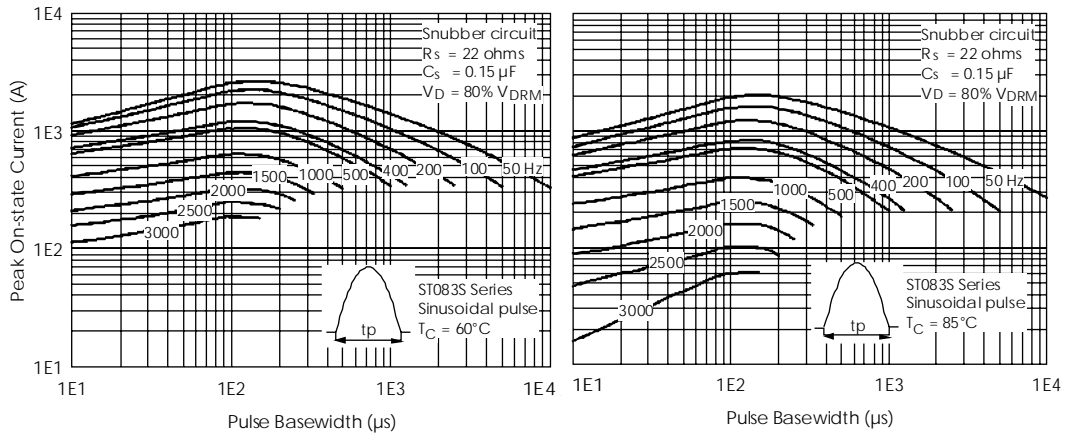


Fig. 11 - Frequency Characteristics

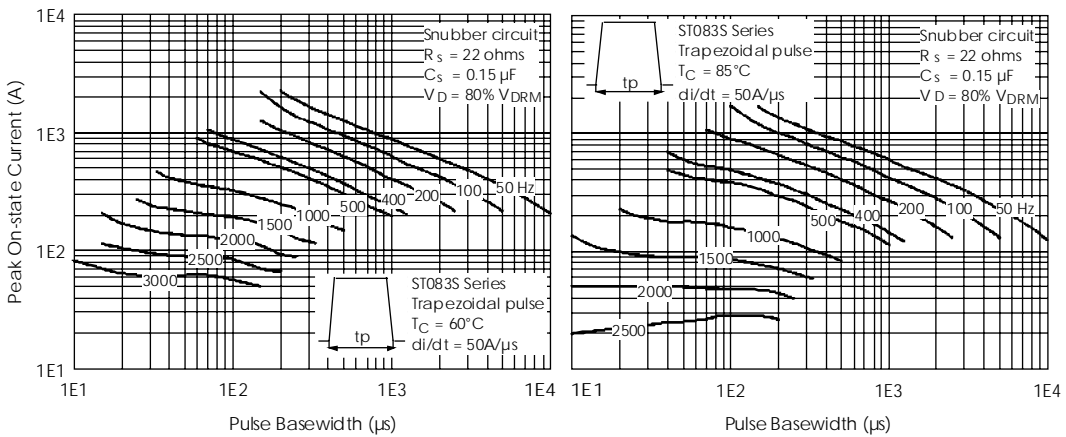


Fig. 12 - Frequency Characteristics

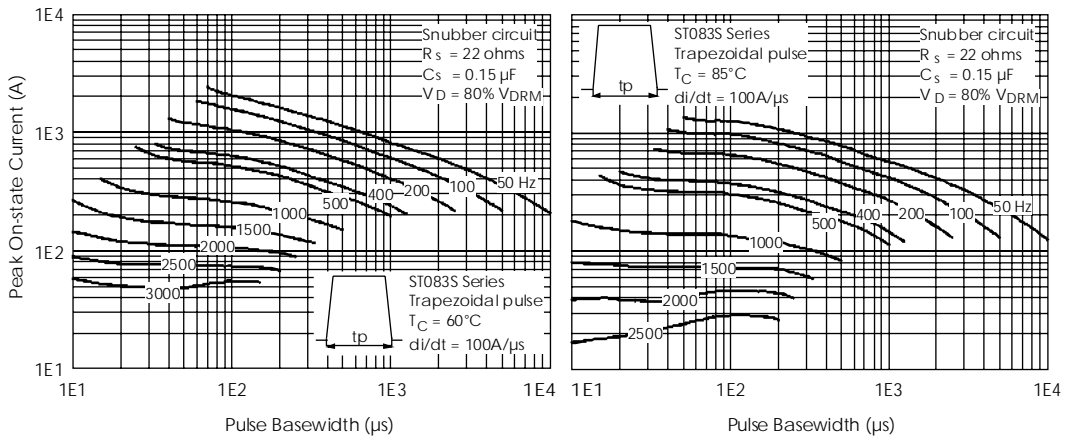


Fig. 13 - Frequency Characteristics



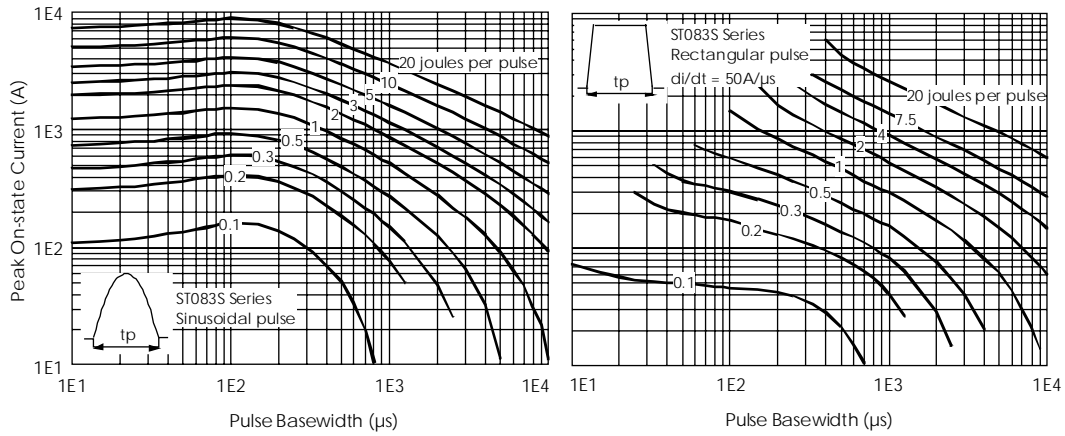


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

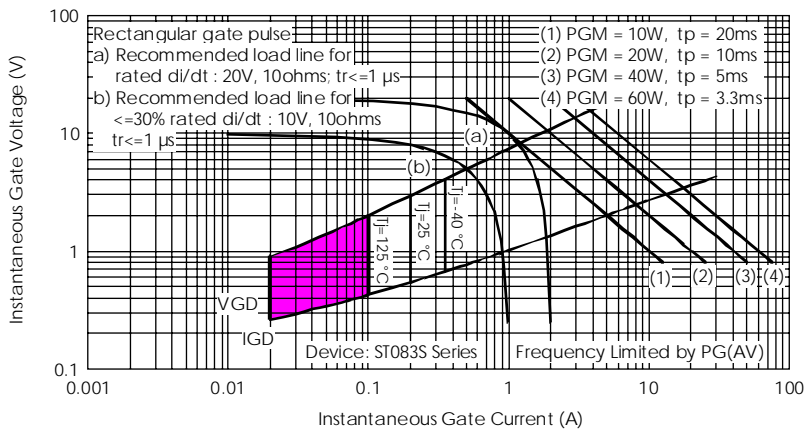


Fig. 15 - Gate Characteristics