

#### Features

- Center amplifying gate
- High surge current capability
- Low thermal impedance
- High speed performance

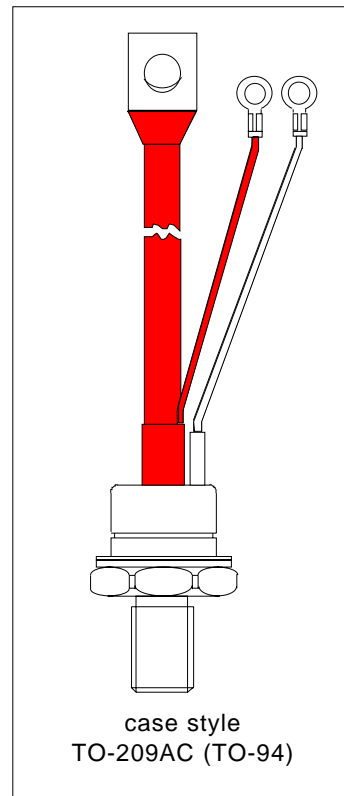
85A

#### Typical Applications

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

#### Major Ratings and Characteristics

Parameters	ST083S	Units
$I_{T(AV)}$	85	A
@ $T_C$	85	°C
$I_{T(RMS)}$	135	A
$I_{TSM}$ @ 50Hz	2450	A
@ 60Hz	2560	A
$I^2t$ @ 50Hz	30	KA <sup>2</sup> s
@ 60Hz	27	KA <sup>2</sup> s
$V_{DRM}/V_{RRM}$	400 to 1200	V
$t_q$ range (see table)	10 to 20	μs
$T_J$	- 40 to 125	°C



## ST083S Series

Bulletin I25185 rev. C 03/03

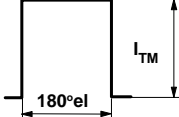
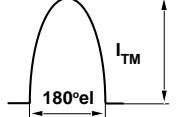
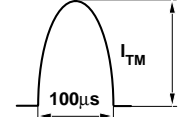
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### ELECTRICAL SPECIFICATIONS

#### 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 $V_r$	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	°C
Equivalent values for RC circuit	22 $\Omega$ / 0.15 $\mu$ F		22 $\Omega$ / 0.15 $\mu$ F		22 $\Omega$ / 0.15 $\mu$ F		

#### 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	KA²s	t = 10ms No voltage
	27		t = 8.3ms reapplied
	21		t = 10ms 100% $V_{RRM}$
	19		t = 8.3ms reapplied
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	300	KA²/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	$I_{TM} = 300A$ , $T_J = T_J \text{ max}$ , $t_p = 10ms$ 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	$T_J = 25^\circ C$ , $I_T > 30A$
$I_L$ Typical latching current	1000		$T_J = 25^\circ C$ , $V_A = 12V$ , $R_a = 6\Omega$ , $I_G = 1A$

### Switching

Parameter	ST083S	Units	Conditions
$di/dt$ Max. non-repetitive rate of rise of turned-on current	1000	A/ $\mu s$	$T_J = T_J \text{ max}$ , $V_{DRM} = \text{rated } V_{DRM}$ $I_{TM} = 2 \times di/dt$
$t_d$ Typical delay time	0.80	$\mu s$	$T_J = 25^\circ C$ , $V_{DM} = \text{rated } V_{DRM}$ , $I_{TM} = 50A$ DC, $t_p = 1\mu s$ Resistive load, Gate pulse: 10V, 5 $\Omega$ source
$t_q$ Max. turn-off time	Min 10 Max 20		$T_J = T_J \text{ max}$ , $I_{TM} = 100A$ , commutating $di/dt = 10A/\mu s$ $V_R = 50V$ , $t_p = 200\mu s$ , $dv/dt = 200V/\mu s$

### Blocking

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

### Triggering

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

## ST083S Series

Bulletin I25185 rev. C 03/03

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### 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

### $\Delta R_{thJC}$ 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°	0.034	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

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

- 1 - Thyristor
- 2 - Essential part number
- 3 - 3 = Fast turn off
- 4 - S = Compression bonding Stud
- 5 - Voltage code: Code x 100 =  $V_{RRM}$  (See Voltage Ratings Table)
- 6 - P = Stud Base 1/2"-20UNF-2A threads
- 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)

**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 1000/1200V	20	FK

Outline Table

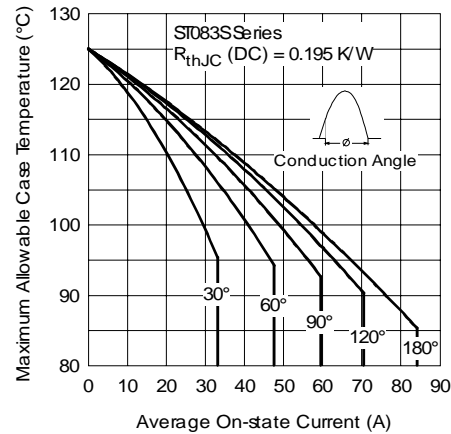
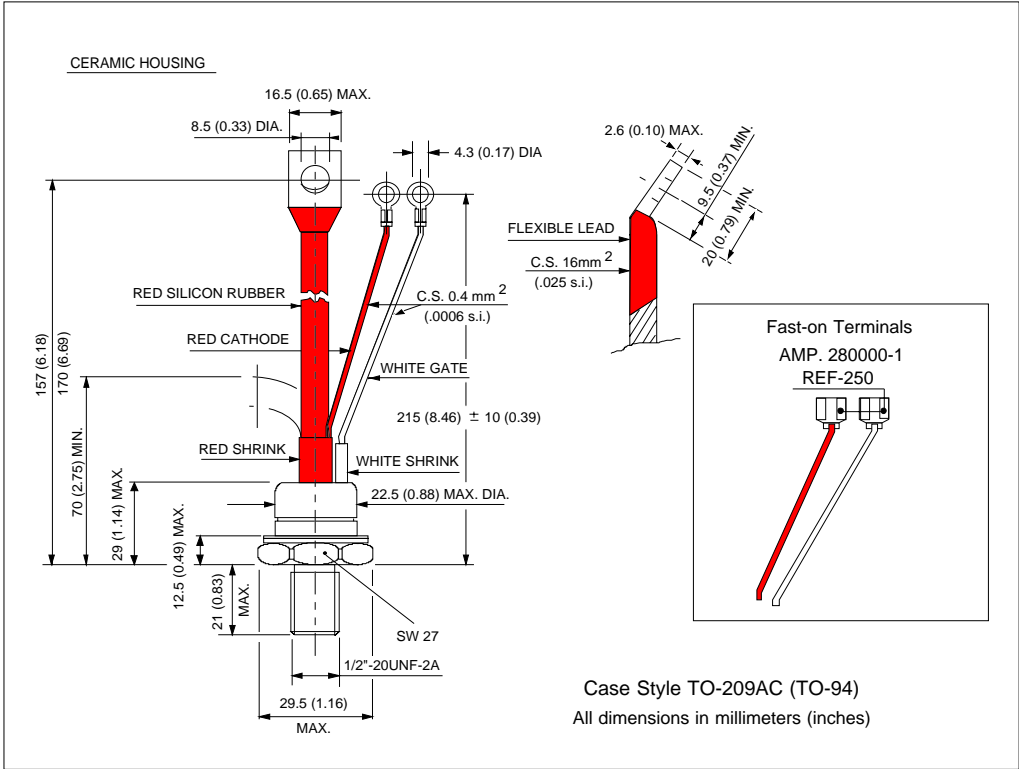


Fig. 1 - Current Ratings Characteristics

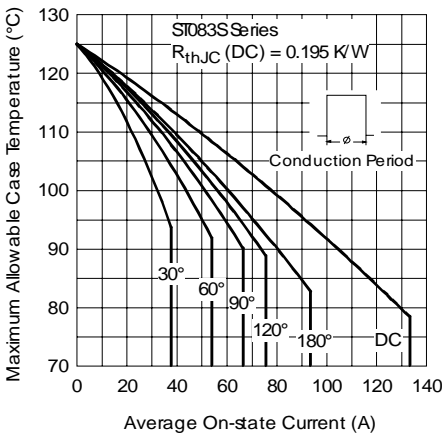


Fig. 2 - Current Ratings Characteristics

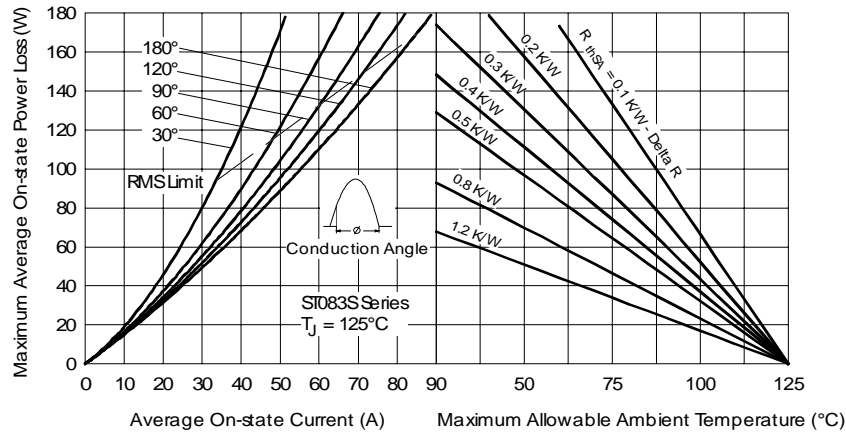


Fig. 3 - On-state Power Loss Characteristics

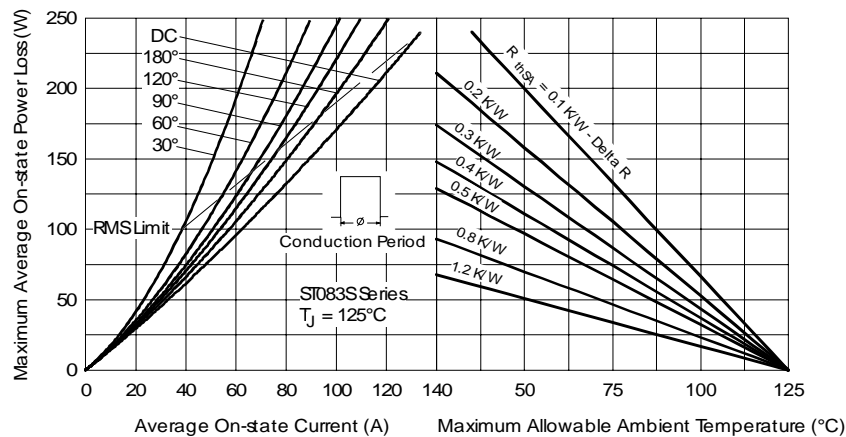


Fig. 4 - On-state Power Loss Characteristics

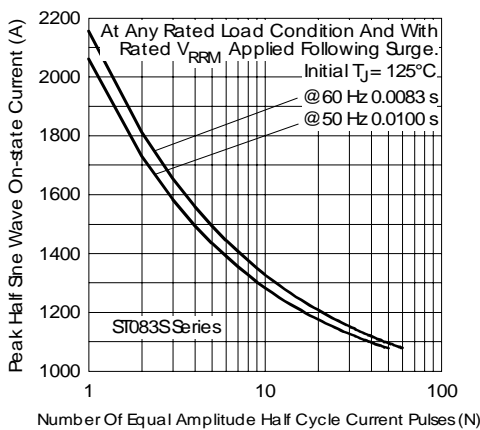


Fig. 5 - Maximum Non-repetitive Surge Current

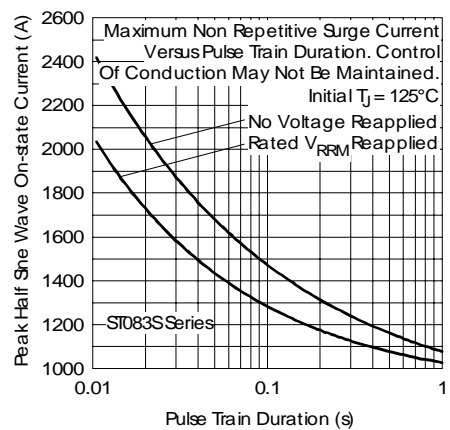


Fig. 6 - Maximum Non-repetitive Surge Current

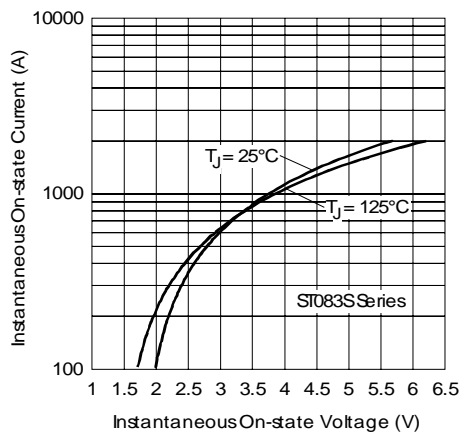


Fig. 7 - On-state Voltage Drop Characteristics

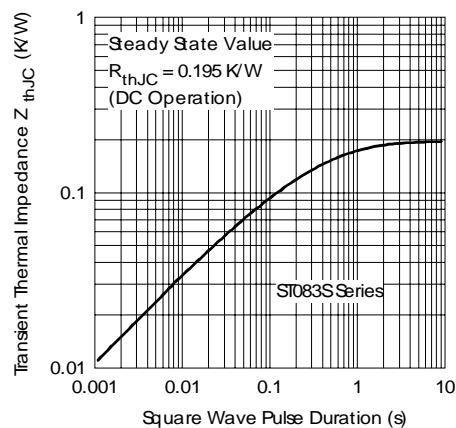


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

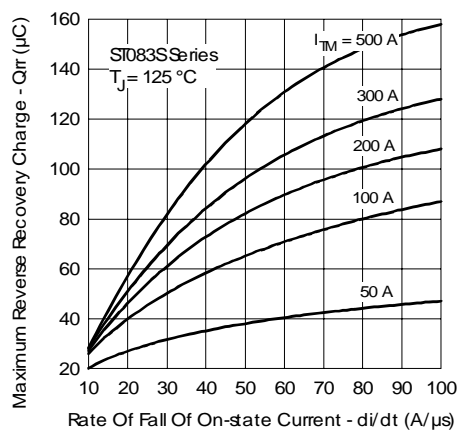


Fig. 9 - Reverse Recovered Charge Characteristics

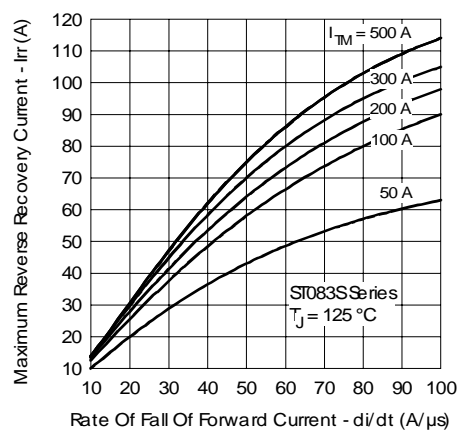


Fig. 10 - Reverse Recovery Current Characteristics

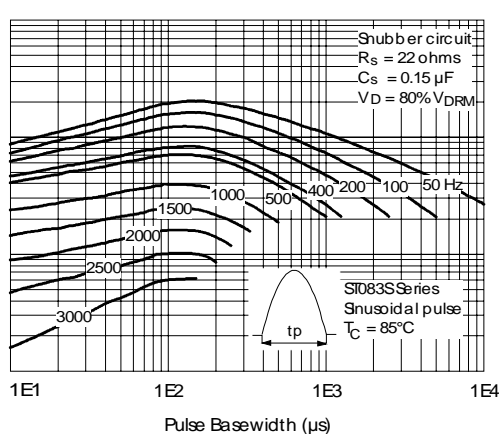
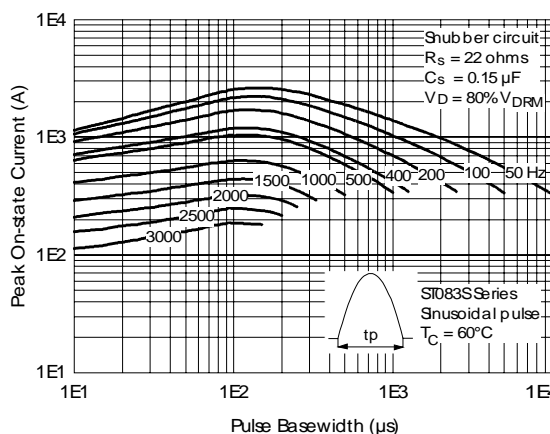


Fig. 11 - Frequency Characteristics

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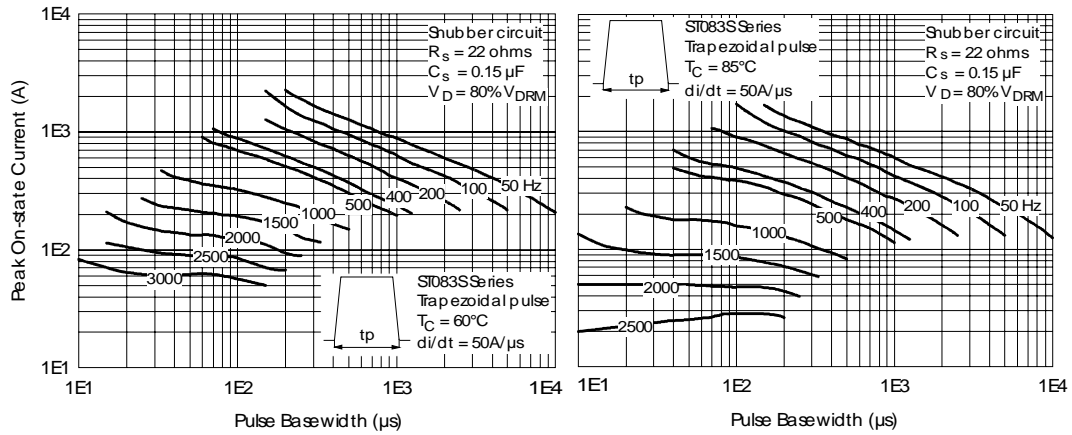


Fig. 12 - Frequency Characteristics

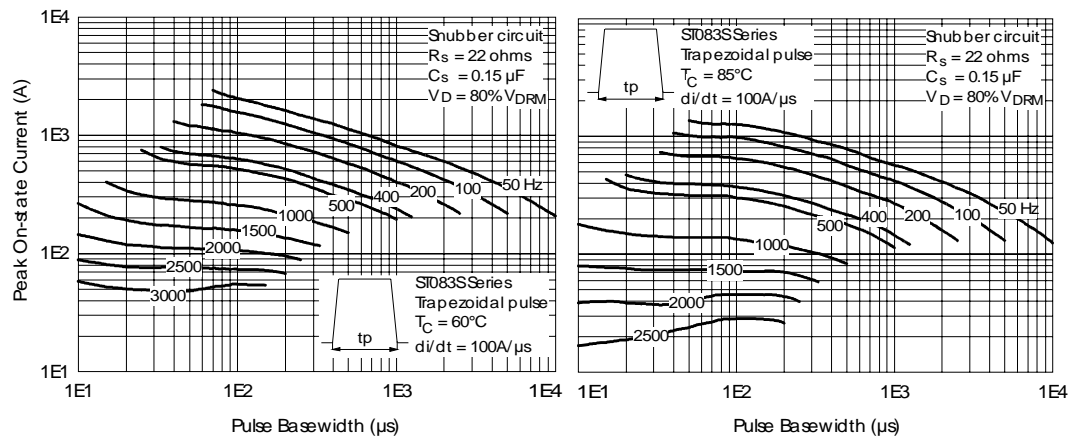


Fig. 13 - Frequency Characteristics

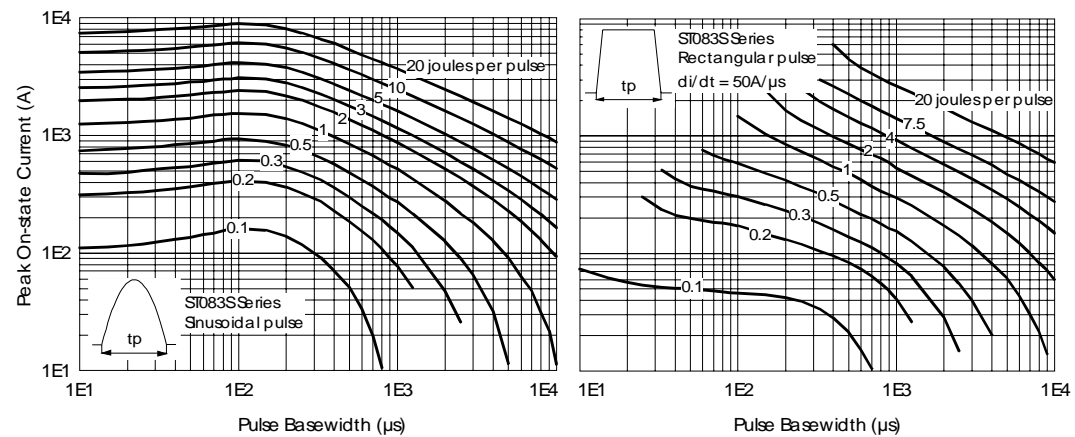


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

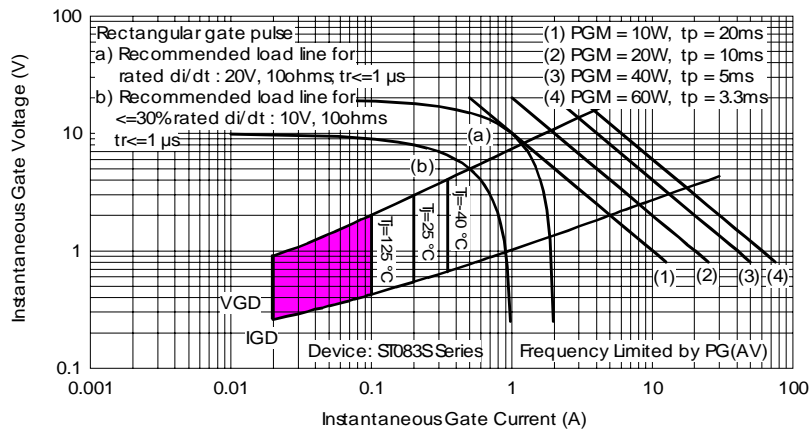


Fig. 15 - Gate Characteristics

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.

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