

INVERTER GRADE THYRISTORS

Stud Version

Features

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

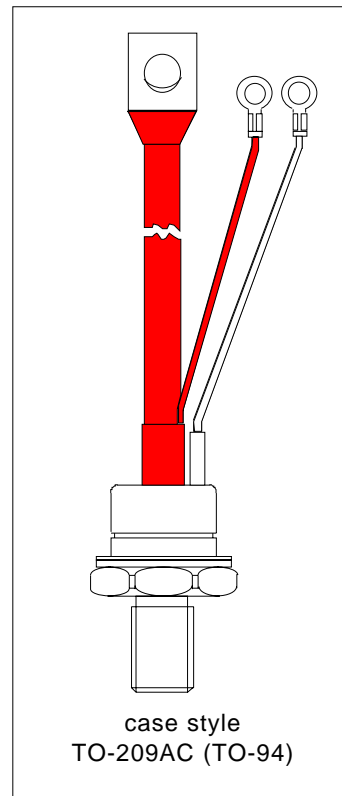
85A

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 ² s
@ 60Hz	27	KA ² 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

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. @ $T_J = T_{J \text{ max.}}$ mA
ST083S	04	400	500	30
	08	800	900	
	10	1000	1100	
	12	1200	1300	

Current Carrying Capability

Frequency							Units
	I_{TM}	I_{TM}	I_{TM}	I_{TM}	I_{TM}	I_{TM}	
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	
Voltage before turn-on Vd	V_{DRM}		V_{DRM}		V_{DRM}		
Rise of on-state current di/dt	50	50	-	-	-	-	A/ μ s
Case temperature	60	85	60	85	60	85	$^{\circ}$ C
Equivalent values for RC circuit	22 Ω / 0.15 μ F		22 Ω / 0.15 μ F		22 Ω / 0.15 μ F		

On-state Conduction

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

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 Ω	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}), T_J = T_J \text{ max.}$
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/ μs	$T_J = T_J \text{ max}, V_{DRM} = \text{rated } V_{DRM}$ $I_{TM} = 2 \times di/dt$
t_d Typical delay time	0.80	μs	$T_J = 25^\circ\text{C}, V_{DM} = \text{rated } V_{DRM}, I_{TM} = 50A \text{ DC}, t_p = 1\mu\text{s}$ Resistive load, Gate pulse: 10V, 5 Ω source
t_q Max. turn-off time	Min 10 Max 20		$T_J = T_J \text{ max}, I_{TM} = 100A, \text{commutating } di/dt = 10A/\mu\text{s}$ $V_R = 50V, t_p = 200\mu\text{s}, dv/dt = 200V/\mu\text{s}$

Blocking

Parameter	ST083S	Units	Conditions
dv/dt Maximum critical rate of rise of off-state voltage	500	V/ μs	$T_J = T_J \text{ max.}, \text{linear to } 80\% V_{DRM}, \text{higher value available on request}$
I_{DRM}^{RRM} 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		
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		

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Thermal and Mechanical Specifications

Parameter	ST083S	Units	Conditions
T_J Max. junction operating temperature range	-40 to 125	°C	
T_{stg} Max. storage temperature range	-40 to 150		
R_{thJC} Max. thermal resistance, junction to case	0.195	K/W	DC operation
R_{thCS} Max. thermal resistance, case to heatsink	0.08		Mounting surface, smooth, flat and greased
T Mounting torque, $\pm 10\%$	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_{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	$T_J = T_J \text{ max.}$
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/ μ s)	200
t_q (μ s) up to 800V	10	FN
	20	FK
t_q (μ s) only for 1000/1200V	20	FK

Outline Table

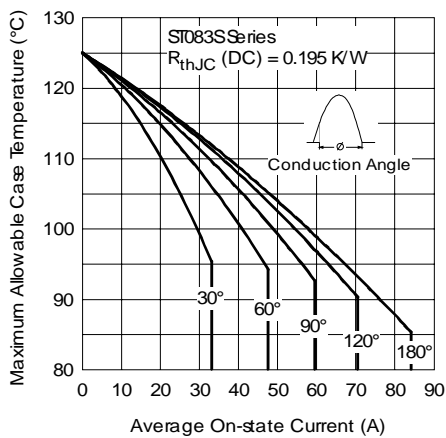
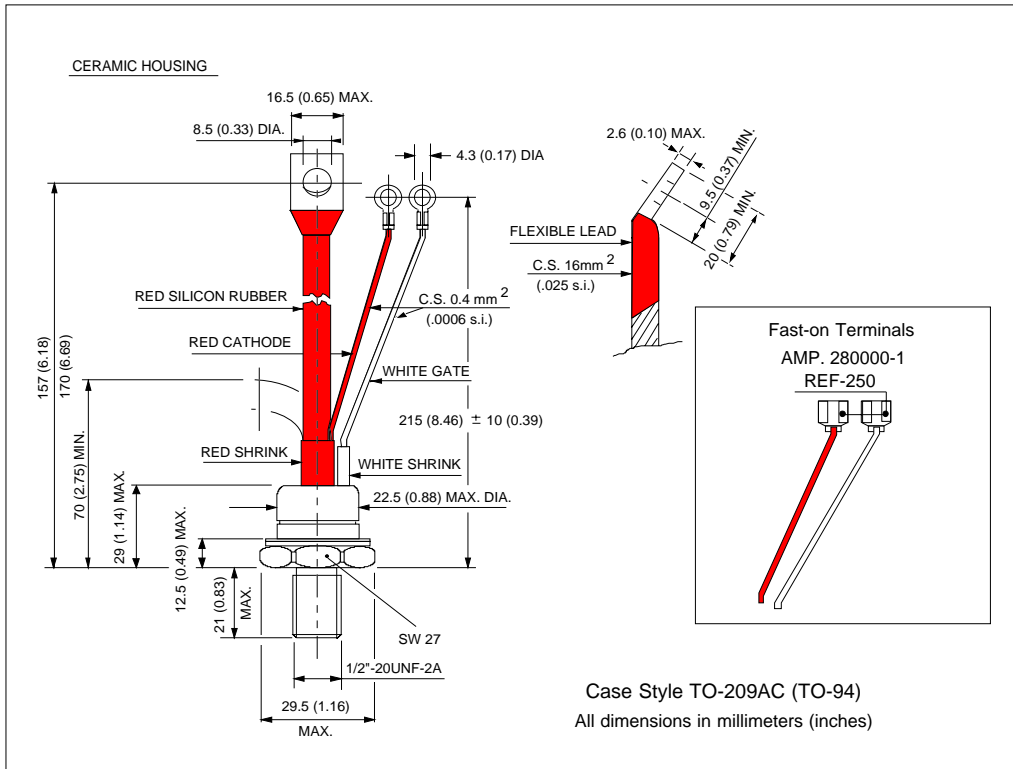


Fig. 1 - Current Ratings Characteristics

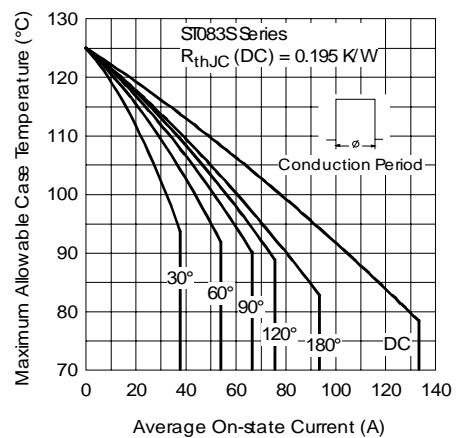


Fig. 2 - Current Ratings Characteristics

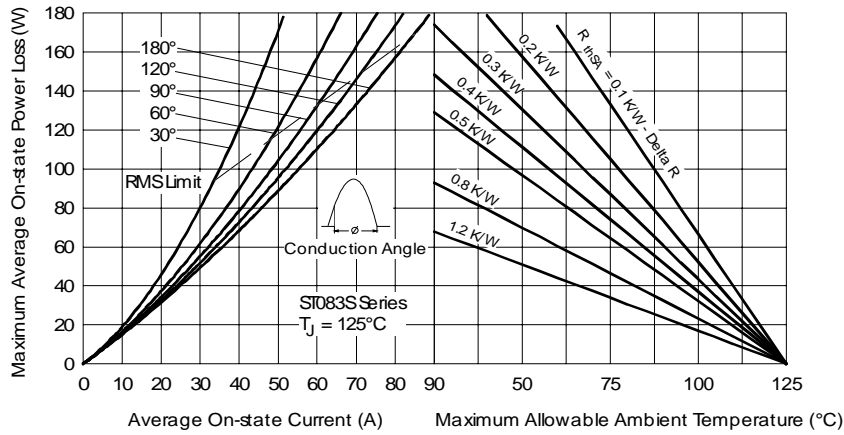


Fig. 3 - On-state Power Loss Characteristics

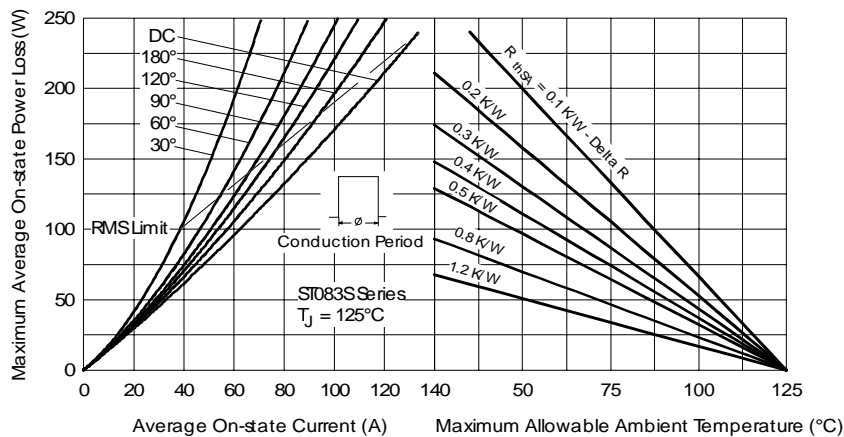


Fig. 4 - On-state Power Loss Characteristics

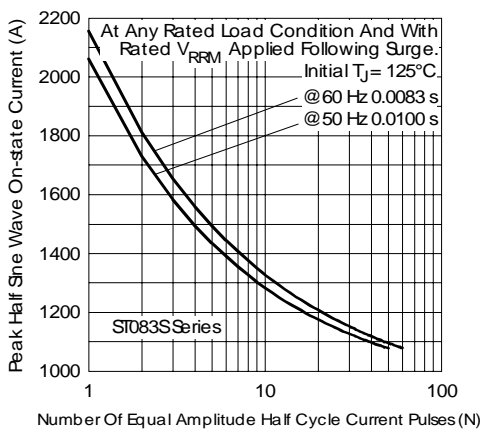


Fig. 5 - Maximum Non-repetitive Surge Current

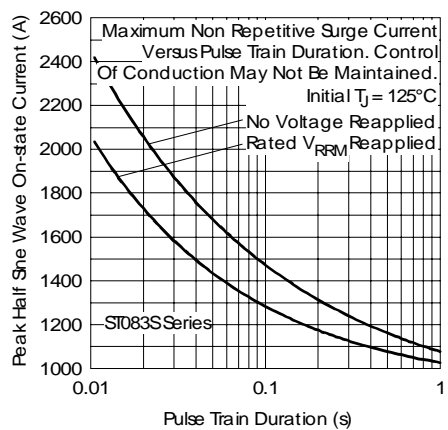


Fig. 6 - Maximum Non-repetitive Surge Current

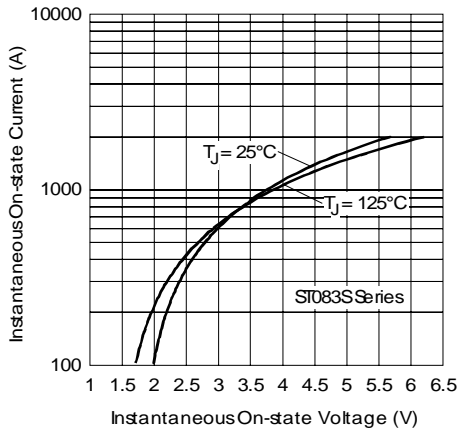


Fig. 7 - On-state Voltage Drop Characteristics

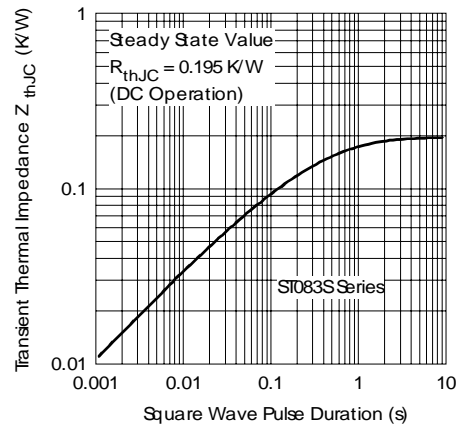


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

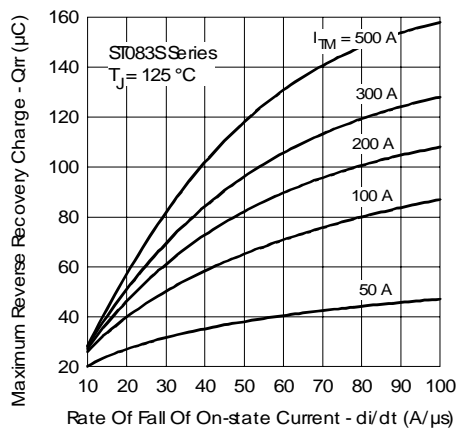


Fig. 9 - Reverse Recovered Charge Characteristics

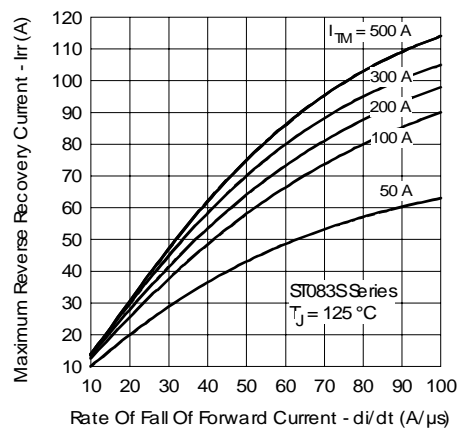


Fig. 10 - Reverse Recovery Current Characteristics

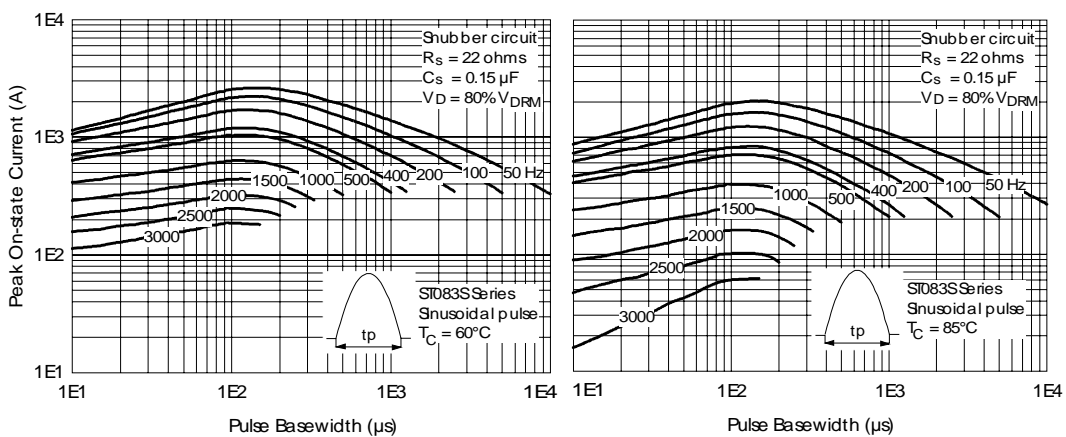


Fig. 11 - Frequency Characteristics

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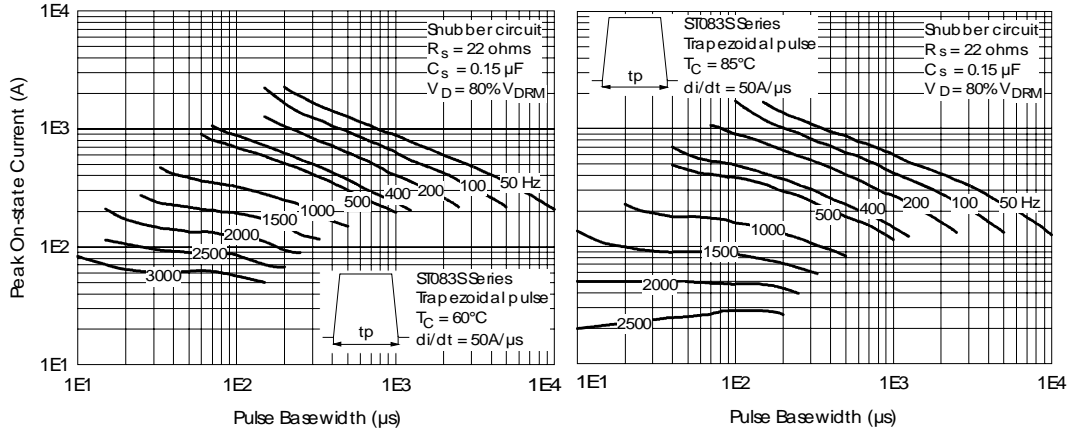


Fig. 12 - Frequency Characteristics

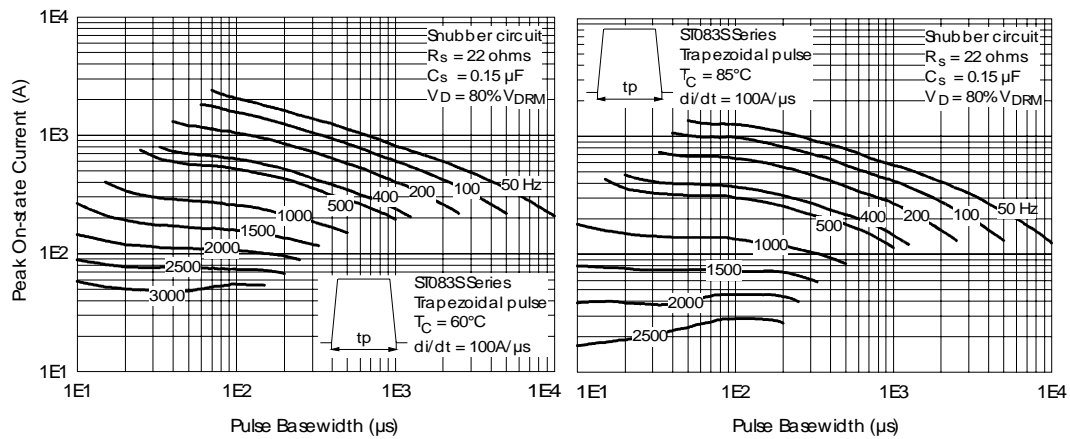


Fig. 13 - Frequency Characteristics

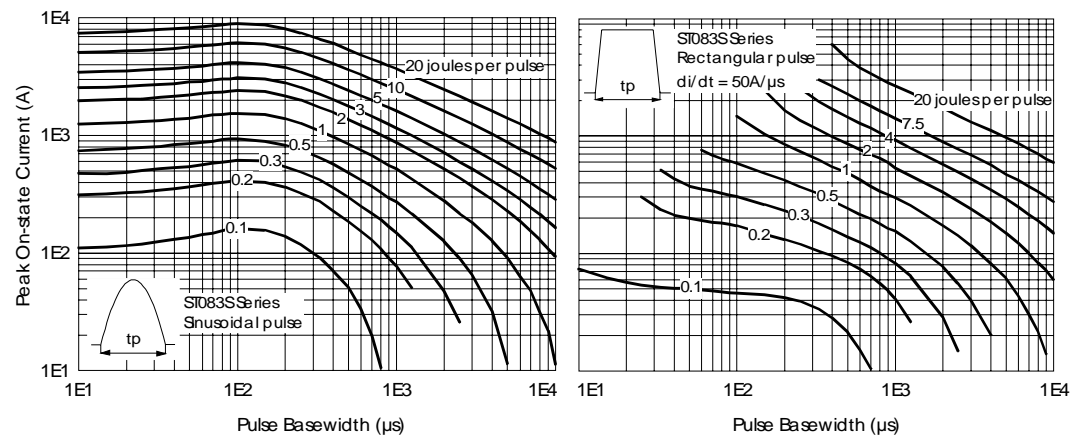


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

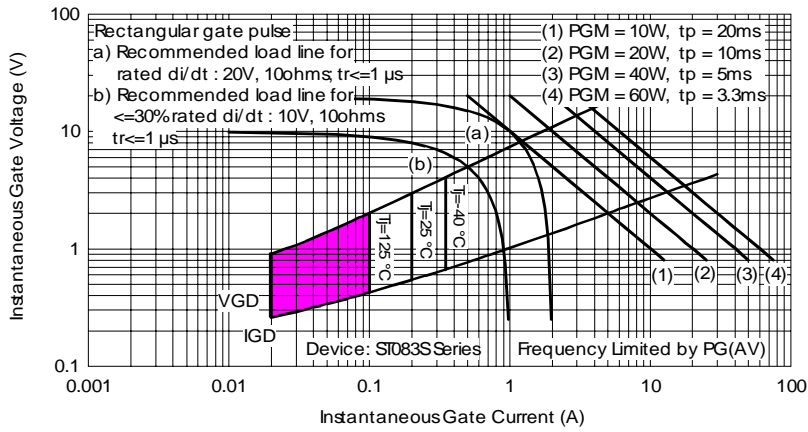


Fig. 15 - Gate Characteristics

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.