Bulletin I25179 rev. D 03/03

International
IOR Rectifier

ST183S SERIES

INVERTER GRADE THYRISTORS

Stud Version

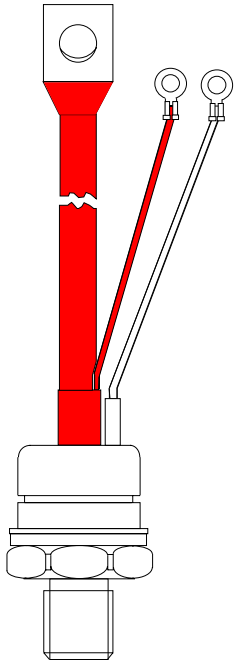
195A

Features

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

Typical Applications

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



case style
TO-209AB (TO-93)

Major Ratings and Characteristics

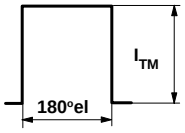
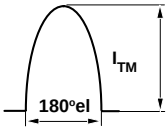
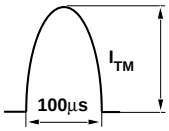
Parameters		ST183S	Units
$I_{T(AV)}$		195	A
	@ T_C	85	°C
$I_{T(RMS)}$		306	A
I_{TSM}	@ 50Hz	4900	A
	@ 60Hz	5130	A
I^2t	@ 50Hz	120	KA^2s
	@ 60Hz	110	KA^2s
V_{DRM}/V_{RRM}		400 to 800	V
t_q		15 - 20	µs
T_J		- 40 to 125	°C

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. @ $T_J = T_J$ max. mA
ST183S	04	400	500	40
	08	800	900	

Current Carrying Capability

Frequency							Units
50Hz	570	370	900	610	7040	5220	A
400Hz	560	360	940	630	3200	2280	
1000Hz	500	300	925	610	1780	1200	
2500Hz	340	190	760	490	880	560	
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	47Ω / 0.22µF		47Ω / 0.22µF		47Ω / 0.22µF		

On-state Conduction

	Parameter	ST183S	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	195	A	180° conduction, half sine wave		
	@ Case temperature	85	°C			
$I_{T(RMS)}$	Max. RMS on-state current	306	A	DC @ 74°C case temperature		
I_{TSM}	Max. peak, one half cycle, non-repetitive surge current	4900	A	t = 10ms	No voltage reapplied	Sinusoidal half wave, Initial $T_J = T_J$ max
		5130		t = 8.3ms		
		4120		t = 10ms	100% V_{RRM} reapplied	
		4310		t = 8.3ms		
I^2t	Maximum I^2t for fusing	120	KA^2s	t = 10ms	No voltage reapplied	
		110		t = 8.3ms		
		85		t = 10ms	100% V_{RRM} reapplied	
		78		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	1200	$KA^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		

On-state Conduction

	Parameter	ST183S	Units	Conditions
V_{TM}	Max. peak on-state voltage	1.80	V	I_{TM}= 600A, $T_J = T_J$ max, t_p = 10ms sine wave pulse
$V_{T(TO)1}$	Low level value of threshold voltage	1.40		(16.7% x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ max.
$V_{T(TO)2}$	High level value of threshold voltage	1.45		(I > π x $I_{T(AV)}$), $T_J = T_J$ max.
r_{t1}	Low level value of forward slope resistance	0.67	mΩ	(16.7% x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ max.
r_{t2}	High level value of forward slope resistance	0.58		(I > π x $I_{T(AV)}$), $T_J = T_J$ max.
I_H	Maximum holding current	600	mA	T_J = 25°C, I_T > 30A
I_L	Typical latching current	1000		T_J = 25°C, V_A= 12V, Ra = 6Ω, I_G= 1A

Switching

	Parameter	ST183S		Units	Conditions
di/dt	Max. non-repetitive rate of rise of turned-on current	1000		A/µs	$T_J = T_J$ max, V_{DRM} = rated V_{DRM} I_{TM} = 2 x di/dt
t_d	Typical delay time	1.1		µs	T_J = 25°C, V_{DM} = rated V_{DRM}, I_{TM} = 50A DC, t_p= 1µs Resistive load, Gate pulse: 10V, 5Ω source
		Min	Max		
t_q	Max. turn-off time	15	20		$T_J = T_J$ max, I_{TM} = 300A, commutating di/dt = 20A/µs V_R = 50V, t_p = 500µs, dv/dt = 200V/µs

Blocking

	Parameter	ST183S	Units	Conditions
dv/dt	Maximum critical rate of rise of off-state voltage	500	V/µs	$T_J = T_J$ max., linear to 80% V_{DRM}, higher value available on request
I_{RRM} I_{DRM}	Max. peak reverse and off-state leakage current	40	mA	$T_J = T_J$ max, rated V_{DRM}/V_{RRM} applied

Triggering

	Parameter	ST183S	Units	Conditions
P_{GM}	Maximum peak gate power	60	W	$T_J = T_J$ max, f = 50Hz, d% = 50
$P_{G(AV)}$	Maximum average gate power	10		
I_{GM}	Max. peak positive gate current	10	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		
I_{GT}	Max. DC gate current required to trigger	200	mA	$T_J = T_J$ max, V_A = 12V, Ra = 6Ω
V_{GT}	Max. DC gate voltage required to trigger	3	V	
I_{GD}	Max. DC gate current not to trigger	20	mA	$T_J = T_J$ max, rated V_{DRM} applied
V_{GD}	Max. DC gate voltage not to trigger	0.25	V	

Thermal and Mechanical Specifications

	Parameter	ST183S	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	0.105	K/W	DC operation
R_{thCS}	Max. thermal resistance, case to heatsink	0.04		Mounting surface, smooth, flat and greased
T	Mounting torque, ± 10%	31 (275)	Nm (Ibf-in)	Non lubricated threads
		24.5 (210)	Nm (Ibf-in)	Lubricated threads
wt	Approximate weight	280	g	
	Case style	TO-209AB (TO-93)		See Outline Table

ΔR_{thJC} Conduction

(The following table shows the increment of thermal resistence 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	$T_J = T_J$ 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

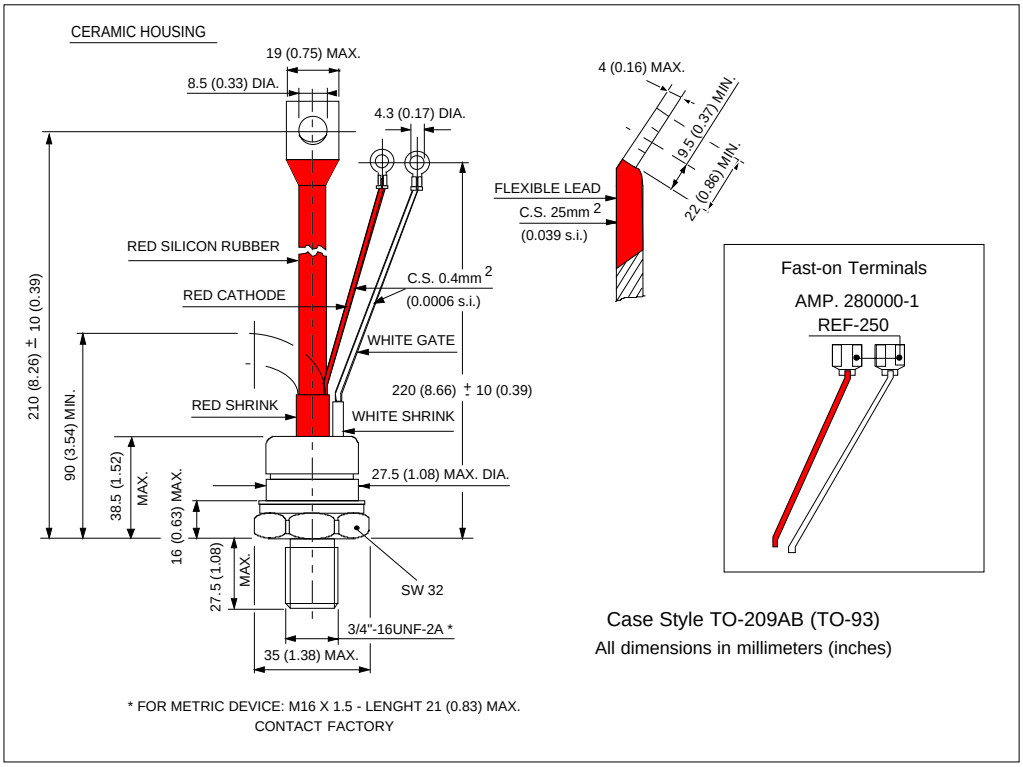
ST	18	3	S	08	P	F	K	0
1	2	3	4	5	6	7	8	9

- **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 3/4" 16UNF-2A
- **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)

NOTE: For Metric device M16 x 1.5 Contact Factory

dv/dt - t_q combinations available		
	dv/dt (V/µs)	**200**
t_q(µs)	15	FL
	20	FK

Outline Table



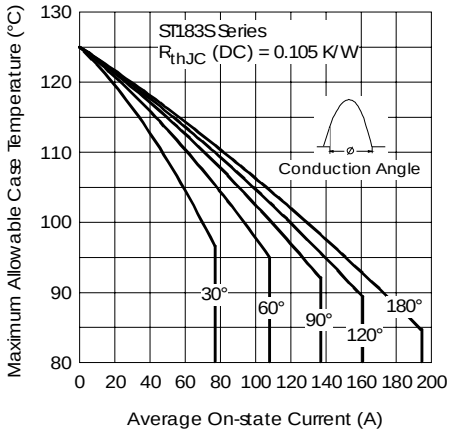


Fig. 1 - Current Ratings Characteristics

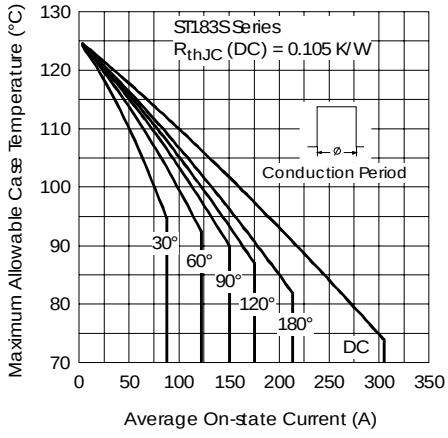


Fig. 2 - Current Ratings Characteristics

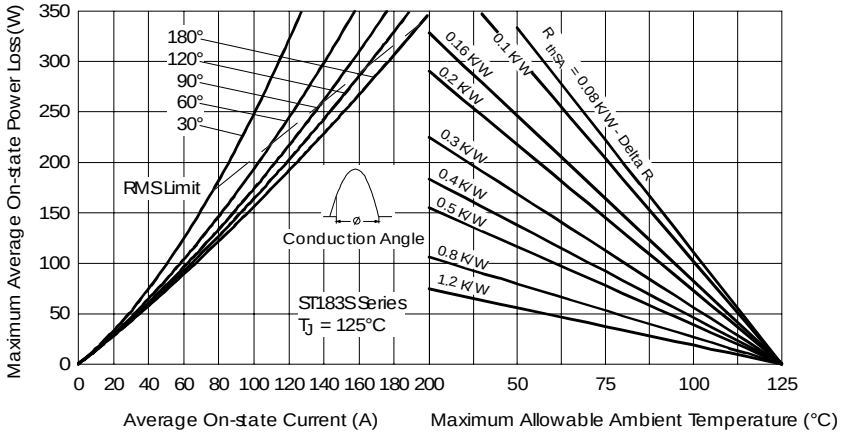


Fig. 3 - On-state Power Loss Characteristics

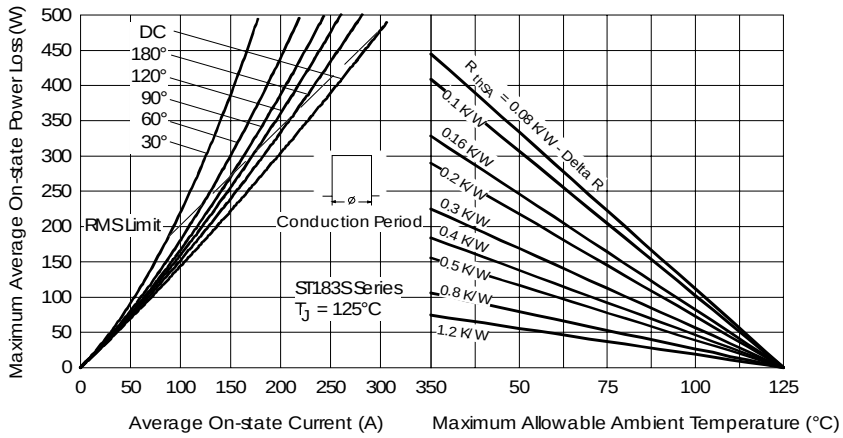


Fig. 4 - On-state Power Loss Characteristics

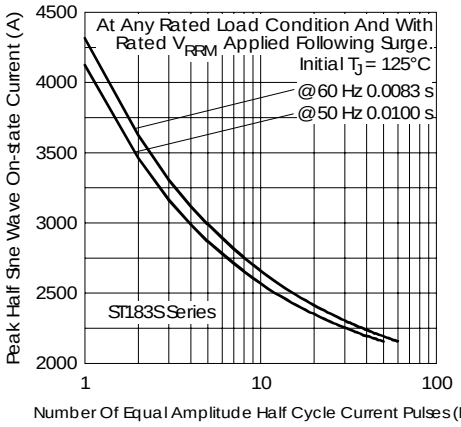


Fig. 5 - Maximum Non-repetitive Surge Current

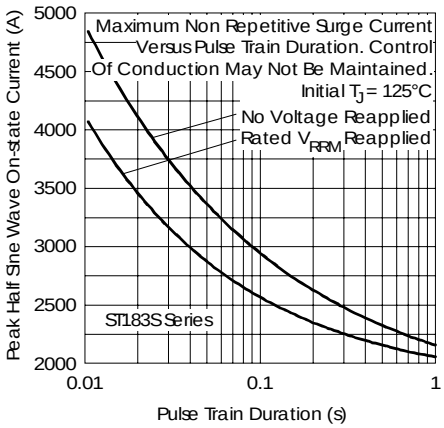


Fig. 6 - Maximum Non-repetitive Surge Current

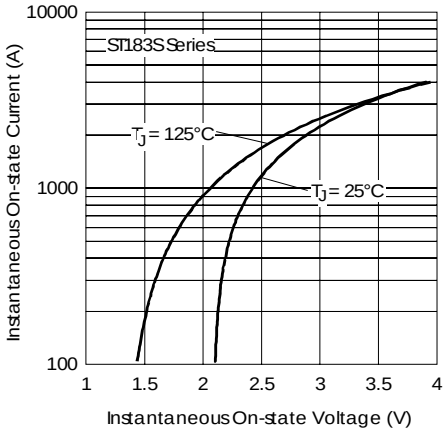


Fig. 7 - On-state Voltage Drop Characteristics

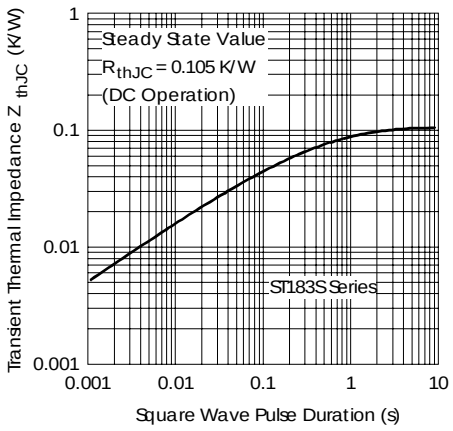


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

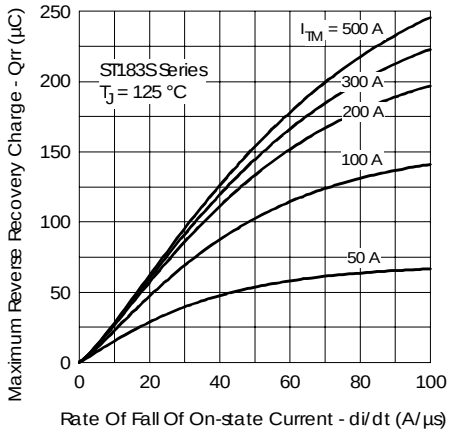


Fig. 9 - Reverse Recovered Charge Characteristics

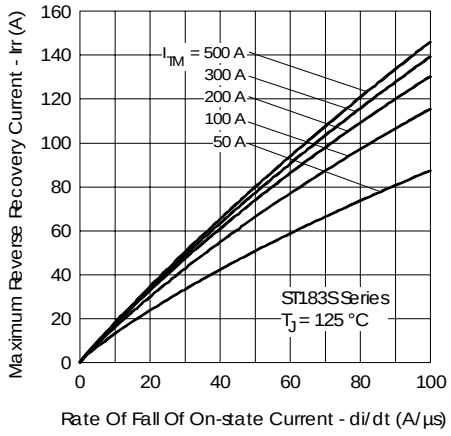


Fig. 10 - Reverse Recovery Current Characteristics

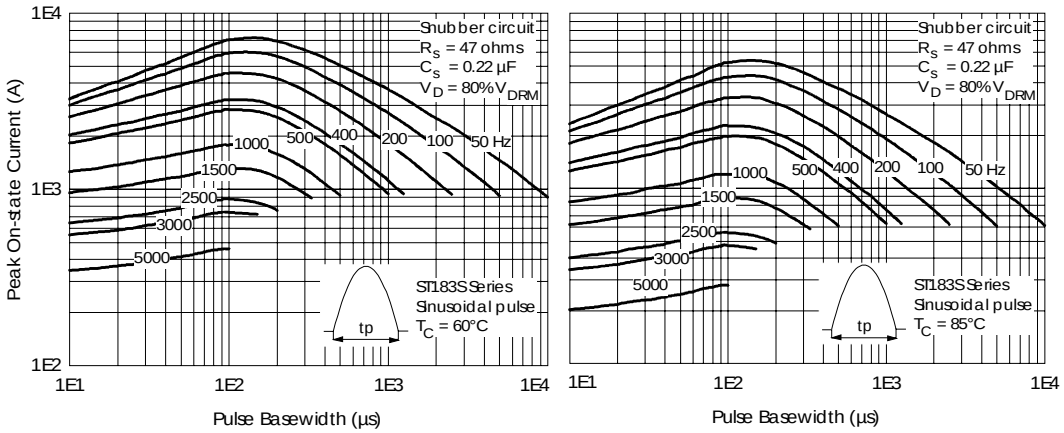


Fig. 11 - Frequency Characteristics

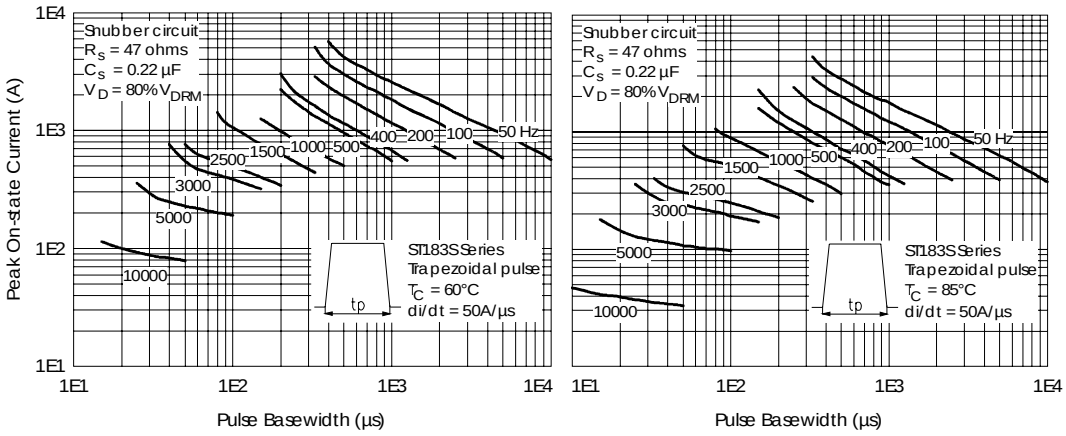


Fig. 12 - Frequency Characteristics

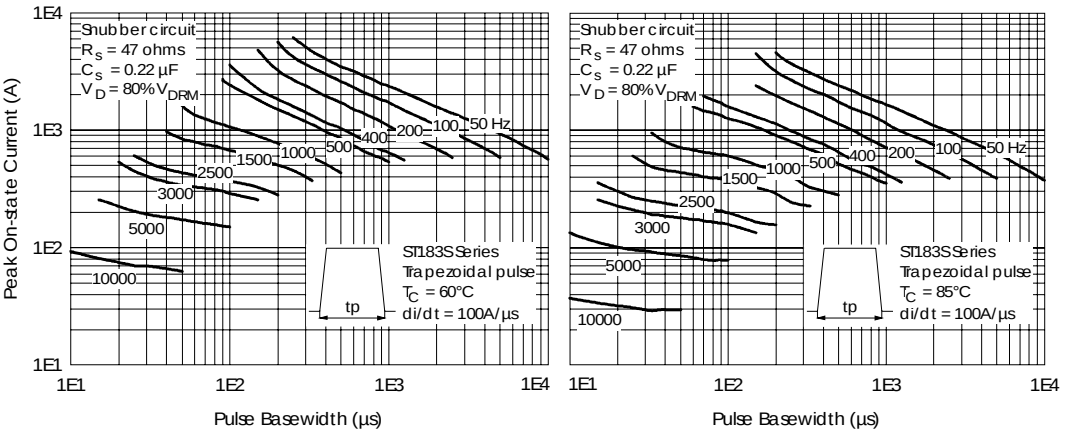


Fig. 13 - Frequency Characteristics

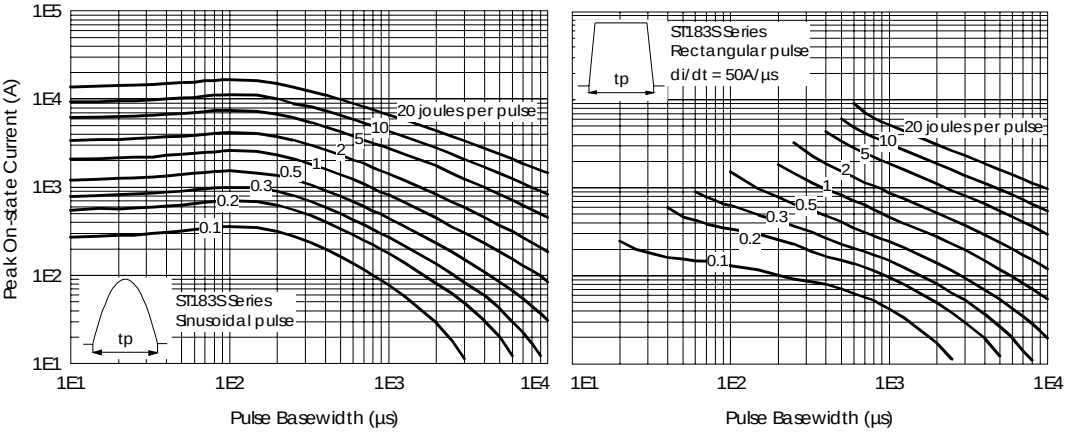


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

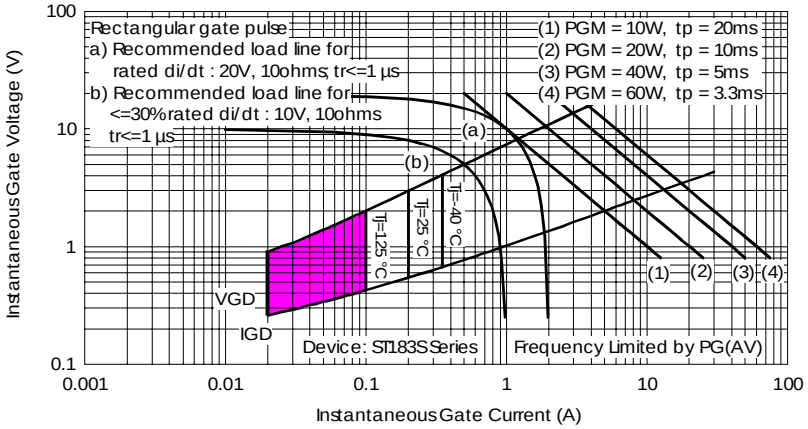


Fig. 15 - Gate Characteristics

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