

#### 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
- Lead-Free

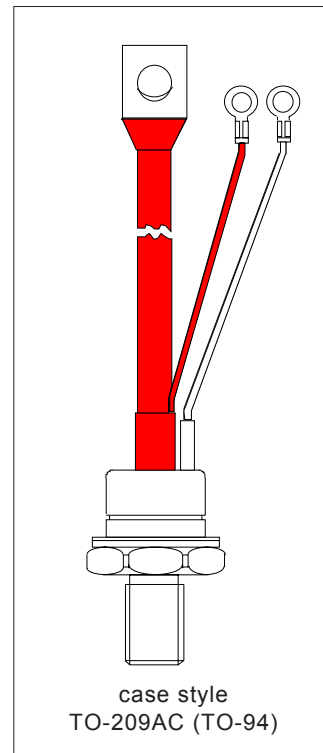
105A

#### Typical Applications

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

#### Major Ratings and Characteristics

Parameters	Values	Units
$I_{T(AV)}$	105	A
@ $T_C$	85	°C
$I_{T(RMS)}$	165	A
$I_{TSM}$ @ 50Hz	3000	A
@ 60Hz	3150	A
$I^2t$ @ 50Hz	45	KA <sup>2</sup> s
@ 60Hz	41	KA <sup>2</sup> s
$V_{DRM}/V_{RRM}$	400 to 800	V
$t_q$ range	10 to 25	μs
$T_J$	- 40 to 125	°C



## ST103SP Series

Bulletin I25217 09/05

International  
**IOR** 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. @ $T_J = T_{Jmax}$ . mA
ST103S	04	400	500	30
	08	800	900	

#### Current Carrying Capability

Frequency							Units
	Value 1	Value 2	Value 1	Value 2	Value 1	Value 2	
50Hz	280	180	440	330	4730	3630	A
400Hz	310	200	470	300	2500	1850	
1000Hz	320	200	480	310	1530	1090	
2500Hz	340	210	490	320	840	580	
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	Values	Units	Conditions	
$I_{T(AV)}$ Max. average on-state current @ Case temperature	105	A	180° conduction, half sine wave	
	85	°C		
$I_{T(RMS)}$ Max. RMS on-state current	165	A	DC @ 76°C case temperature	
$I_{TSM}$ Max. peak, one half cycle, non-repetitive surge current	3000		t = 10ms	No voltage
	3150		t = 8.3ms	reapplied
	2530		t = 10ms	100% $V_{RRM}$
	2650		t = 8.3ms	reapplied
$I^2t$ Maximum $I^2t$ for fusing	45	KA <sup>2</sup> s	t = 10ms	No voltage
	41		t = 8.3ms	reapplied
	32		t = 10ms	100% $V_{RRM}$
	29		t = 8.3ms	reapplied
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	450	KA <sup>2</sup> √s	t = 0.1 to 10ms, no voltage reapplied	

### On-state Conduction

Parameter	Values	Units	Conditions
$V_{TM}$ Max. peak on-state voltage	1.73	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	1.32		$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
$V_{T(TO)2}$ High level value of threshold voltage	1.35		$(I > \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
$r_{t1}$ Low level value of forward slope resistance	1.40	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	1.30		$(I > \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
$I_H$ 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	Values	Units	Conditions
di/dt Max. non-repetitive rate of rise of turned-on current	1000	A/ $\mu\text{s}$	$T_J = T_J \text{ max}, V_{DRM} = \text{rated } V_{DRM}$ $I_{TM} = 2 \times \text{di/dt}$
$t_d$ 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 25		$T_J = T_J \text{ max}, I_{TM} = 100A, \text{commutating di/dt} = 10A/\mu\text{s}$ $V_R = 50V, t_p = 200\mu\text{s}, \text{dv/dt: see table in device code}$

### Blocking

Parameter	Values	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	Values	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	V	

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### Thermal and Mechanical Specifications

Parameter	Values	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<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°	0.040	0.042		
90°	0.052	0.056		
60°	0.076	0.079		
30°	0.126	0.127		

### Ordering Information Table

Device Code									
<b>ST</b>	<b>10</b>	<b>3</b>	<b>S</b>	<b>08</b>	<b>P</b>	<b>F</b>	<b>N</b>	<b>0</b>	<b>P</b>
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
<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-2A								
<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)								
<b>10</b>	- Lead-Free								
<b>dv/dt - t<sub>q</sub> combinations available</b>									
	<b>dv/dt (V/μs)</b>	20	50	100	<b>200</b>	400			
	10	CN	DN	EN	<b>FN *</b>	--			
	12	CM	DM	EM	FM	HM			
	15	CL	DL	EL	<b>FL *</b>	HL			
	18	CP	DP	EP	FP	HP			
<b>t<sub>q</sub> (μs)</b>	20	CK	DK	EK	FK	HK			
	25	--	--	--	--	HJ			

Document Number: 94365

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Outline Table

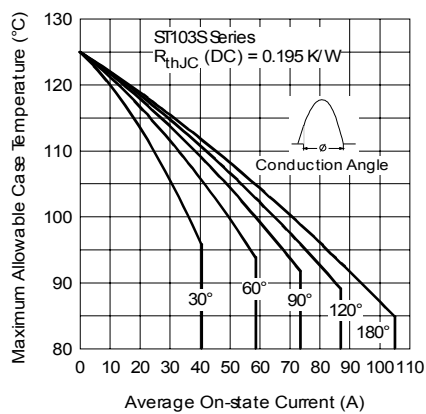
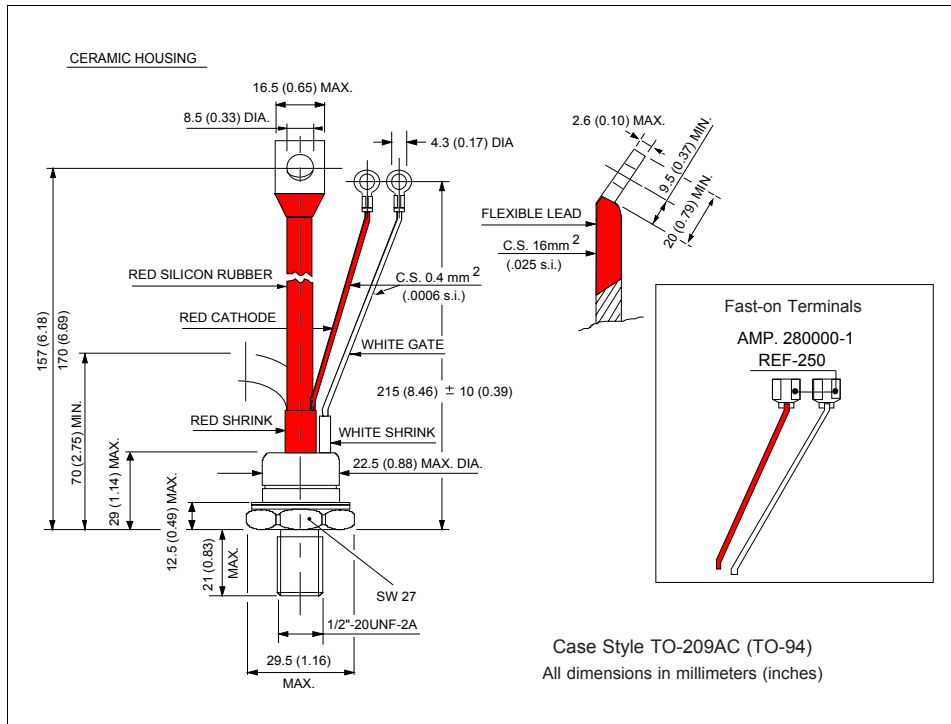


Fig. 1 - Current Ratings Characteristics

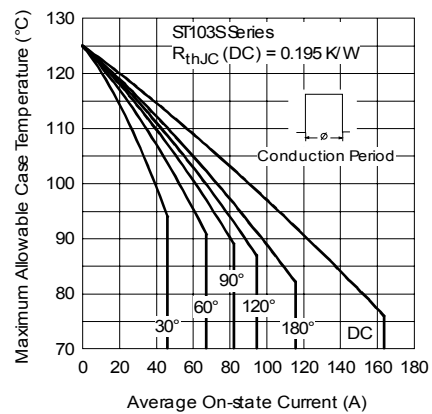


Fig. 2 - Current Ratings Characteristics

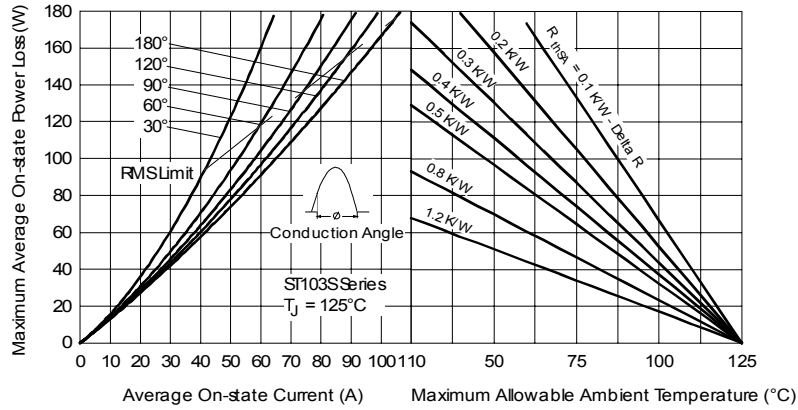


Fig. 3 - On-state Power Loss Characteristics

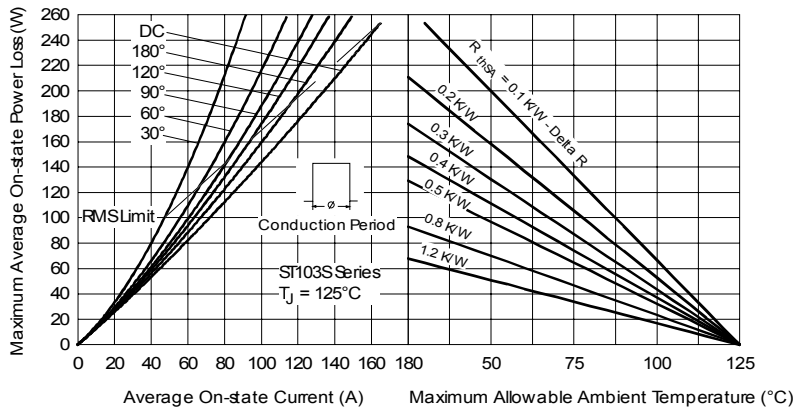


Fig. 4 - On-state Power Loss Characteristics

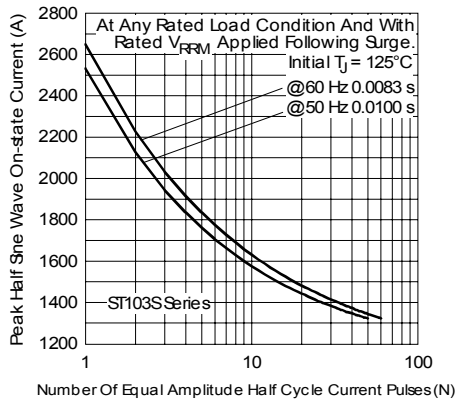


Fig. 5 - Maximum Non-repetitive Surge Current

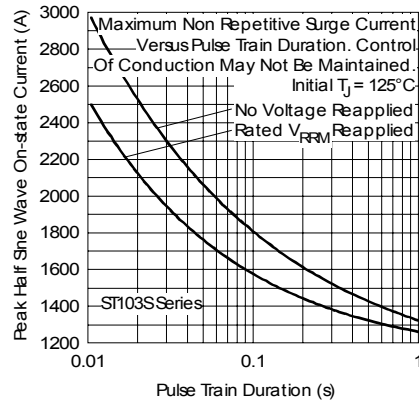


Fig. 6 - Maximum Non-repetitive Surge Current

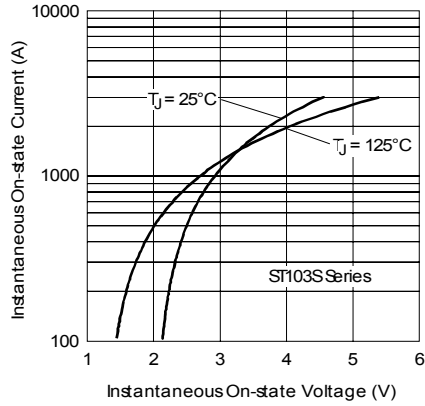


Fig. 7 - On-state Voltage Drop Characteristics

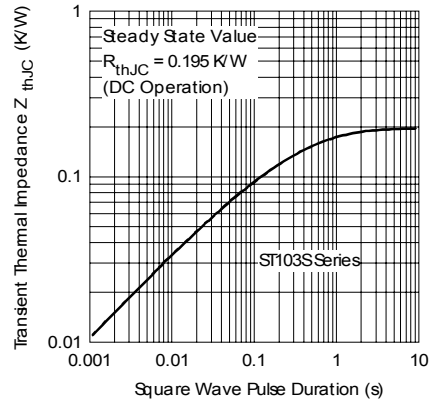


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

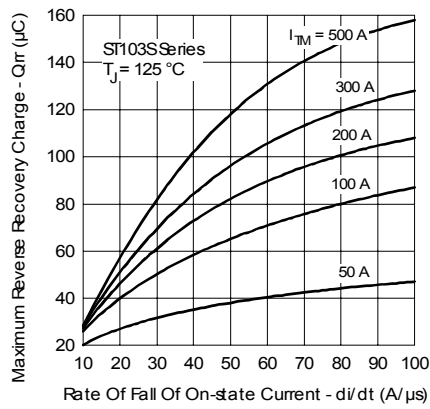


Fig. 9 - Reverse Recovered Charge Characteristics

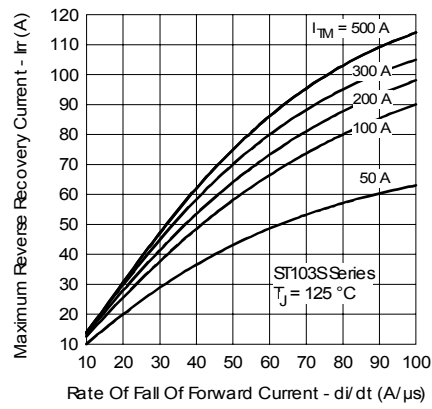


Fig. 10 - Reverse Recovery Current Characteristics

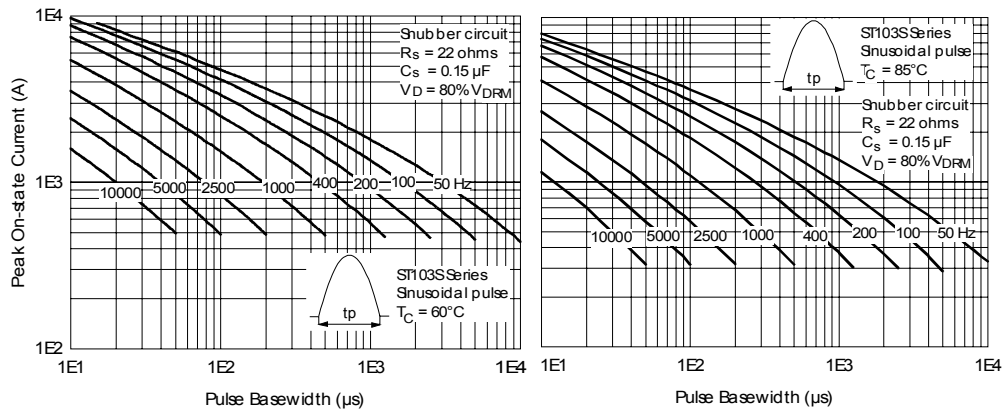


Fig. 11 - Frequency Characteristics

**ST103SP Series**

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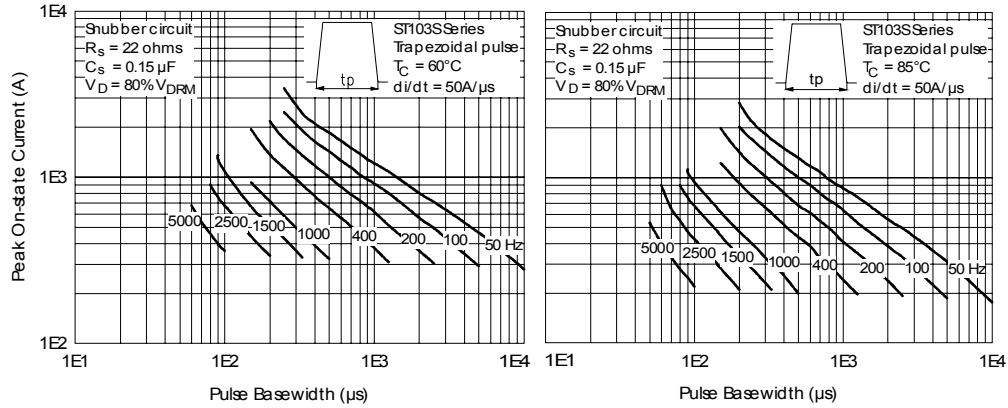


Fig. 12 - Frequency Characteristics

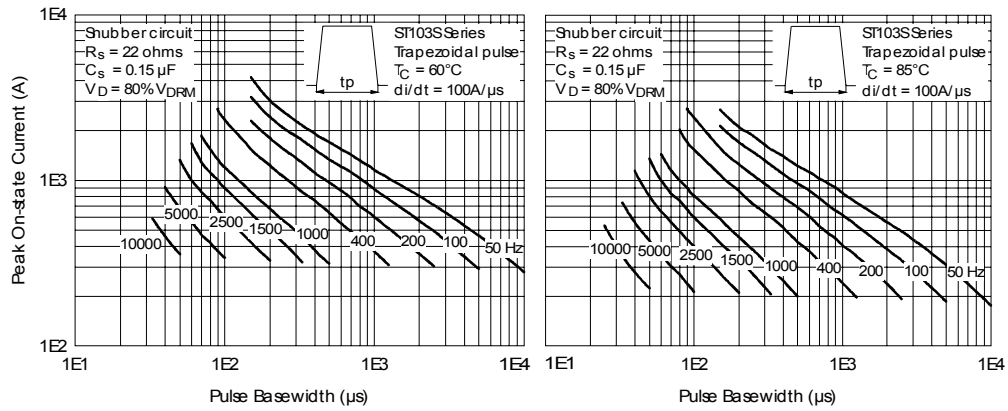


Fig. 13 - Frequency Characteristics

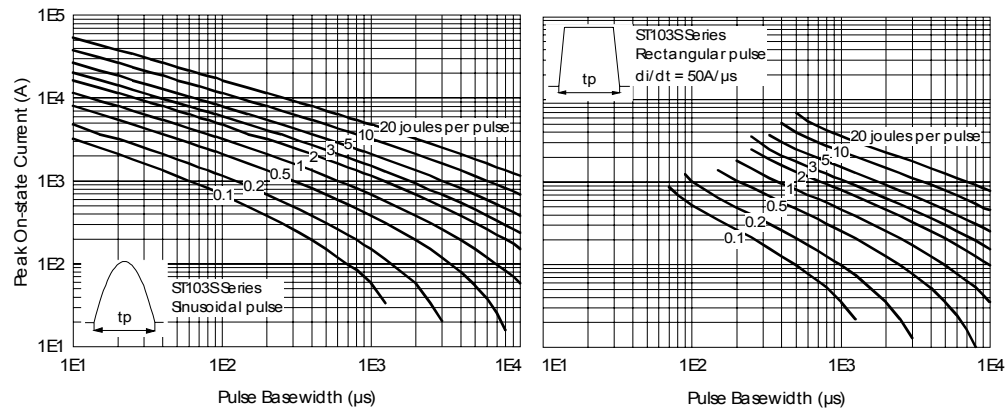


Fig. 14 - Maximum On-state Energy Power Loss Characteristics



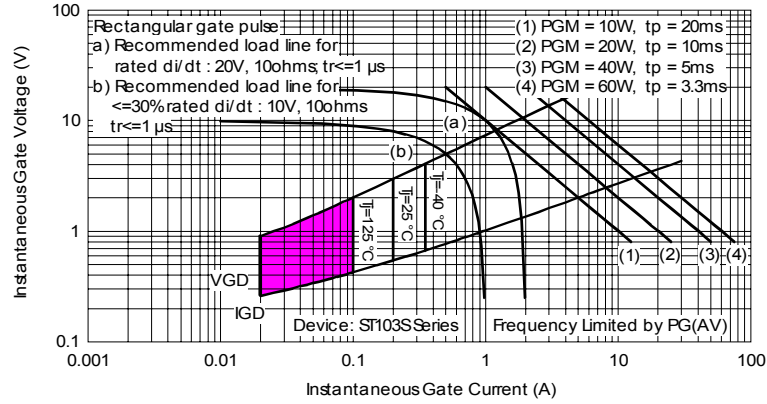


Fig. 15 - Gate Characteristics

Data and specifications subject to change without notice.  
 This product has been designed and qualified for Industrial Level and Lead-Free.  
 Qualification Standards can be found on IR's Web site.



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