Bulletin I25173 rev. C 03/03

International
IOR Rectifier

ST303S SERIES

INVERTER GRADE THYRISTORS **Stud Version**

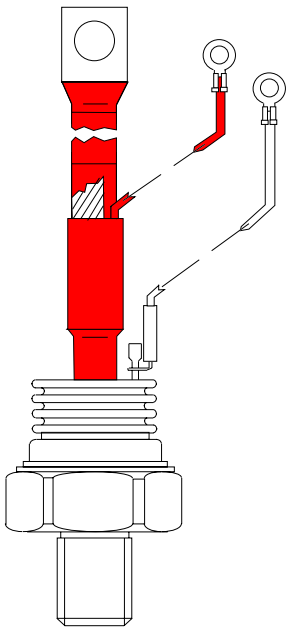
Features

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

300A

Typical Applications

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



case style
TO-209AE (TO-118)

Major Ratings and Characteristics

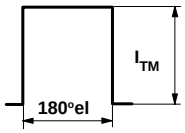
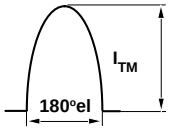
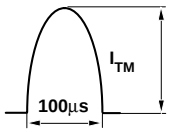
Parameters		ST303S	Units
$I_{T(AV)}$		300	A
	@ T_C	65	°C
$I_{T(RMS)}$		471	A
I_{TSM}	@ 50Hz	7950	A
	@ 60Hz	8320	A
I^2t	@ 50Hz	316	KA^2s
	@ 60Hz	288	KA^2s
V_{DRM}/V_{RRM}		400 to 1200	V
t_q		10 - 20	µs
T_J		- 40 to 125	°C

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
ST303S	04	400	500	50
	08	800	900	
	12	1200	1300	

Current Carrying Capability

Frequency							Units
50Hz	670	470	1050	940	5240	4300	A
400Hz	480	330	1021	710	1800	1270	
1000Hz	230	140	760	470	730	430	
2500Hz	35	-	150	-	90	-	
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	40	65	40	65	40	65	°C
Equivalent values for RC circuit	10Ω / 0.47µF		10Ω / 0.47µF		10Ω / 0.47µF		

On-state Conduction

Parameter		ST303S	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	300	A	180° conduction, half sine wave		
	@ Case temperature	65	°C			
$I_{T(RMS)}$	Max. RMS on-state current	471	A	DC @ 45°C case temperature		
I_{TSM}	Max. peak, one half cycle, non-repetitive surge current	7950	A	t = 10ms	No voltage reapplied	Sinusoidal half wave, Initial $T_J = T_J$ max
		8320		t = 8.3ms		
		6690		t = 10ms	100% V_{RRM} reapplied	
		7000		t = 8.3ms		
I^2t	Maximum I^2t for fusing	316	KA^2s	t = 10ms	No voltage reapplied	
		288		t = 8.3ms		
		224		t = 10ms	100% V_{RRM} reapplied	
		204		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	3160	$KA^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		

On-state Conduction

	Parameter	ST303S	Units	Conditions
V_{TM}	Max. peak on-state voltage	2.16	V	I_{TM}= 1255A, T_J = T_J max, t_p = 10ms sine wave pulse
$V_{T(TO)1}$	Low level value of threshold voltage	1.44		(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	1.46		(I > π x $I_{T(AV)}$), T_J = T_J max.
r_{t1}	Low level value of forward slope resistance	0.57	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	0.56		(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	ST303S	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	0.80	µs	T_J= 25°C, V_{DM} = rated V_{DRM}, I_{TM} = 50A DC, t_p= 1µs Resistive load, Gate pulse: 10V, 5Ω source
t_q	Max. turn-off time	10 - 20		T_J = T_J max, I_{TM} = 550A, commutating di/dt = 40A/µs V_R = 50V, t_p = 500µs, dv/dt = 200V/µs

Blocking

	Parameter	ST303S	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	50	mA	T_J = T_J max, rated V_{DRM}/V_{RRM} applied

Triggering

	Parameter	ST303S	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 ≤ 5ms
$+V_{GM}$	Maximum peak positive gate voltage	20	V	T_J = T_J max, t_p ≤ 5ms
$-V_{GM}$	Maximum peak negative gate voltage	5		
I_{GT}	Max. DC gate current required to trigger	200	mA	T_J = 25°C, 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	ST303S	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	0.10	K/W	DC operation
R_{thCS}	Max. thermal resistance, case to heatsink	0.03		Mounting surface, smooth, flat and greased
T	Mounting torque, ± 10%	48.5 (425)	Nm (lbf-in)	Non lubricated threads
wt	Approximate weight	535	g	
	Case style	TO-209AE (TO-118)		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°	0.011	0.008	K/W	$T_J = T_J$ max.
120°	0.013	0.014		
90°	0.017	0.018		
60°	0.025	0.026		
30°	0.041	0.042		

Ordering Information Table

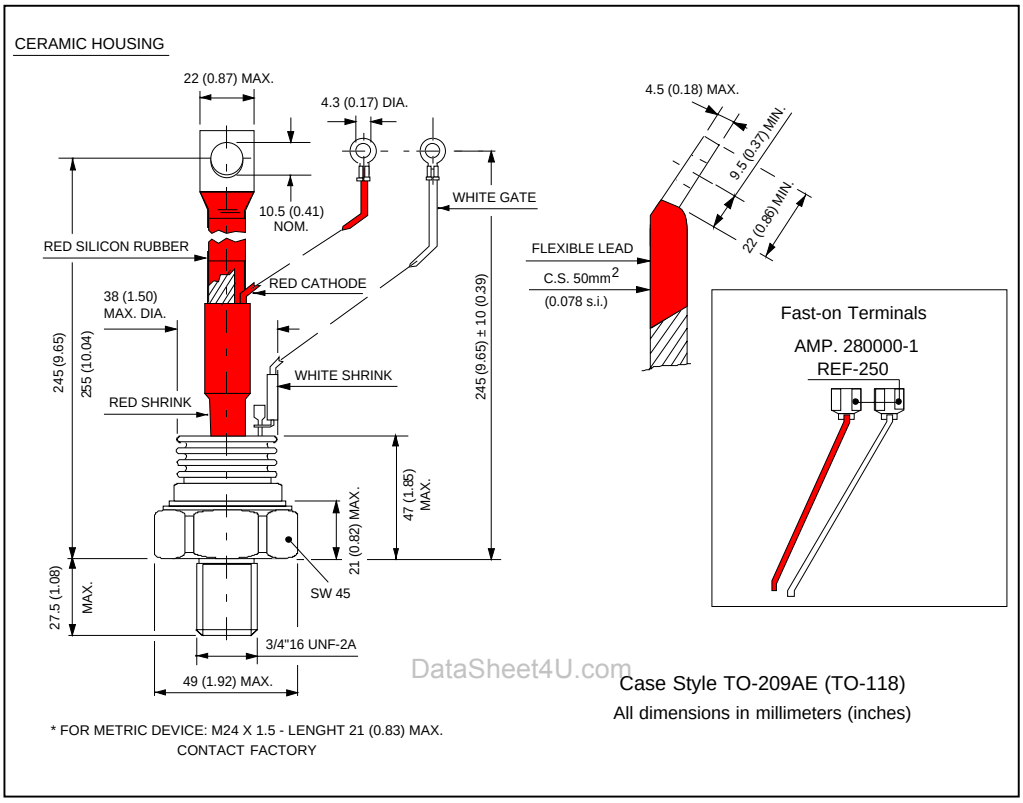
Device Code

ST	30	3	S	12	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)

dv/dt - t_q combinations available		
	dv/dt (V/µs)	**200**
t_q(µs) up to 800V	10	FN
	20	FK
t_q(µs) only for 1000/1200V	20	FK

Outline Table



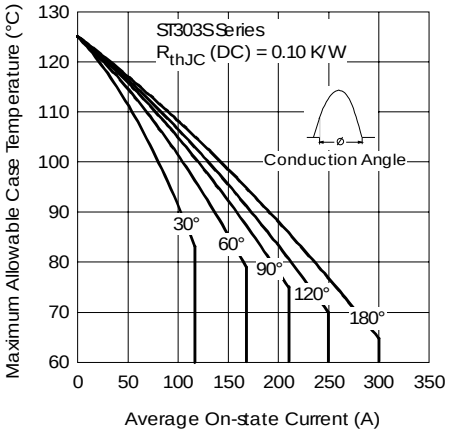


Fig. 1 - Current Ratings Characteristics

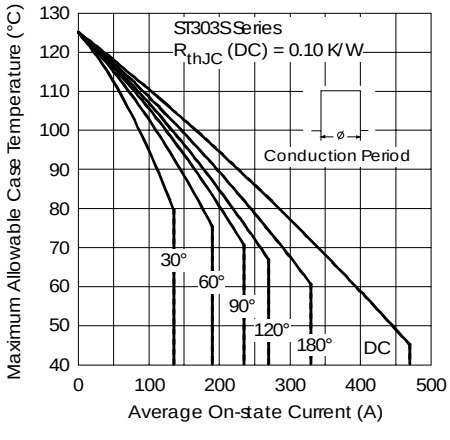


Fig. 2 - Current Ratings Characteristics

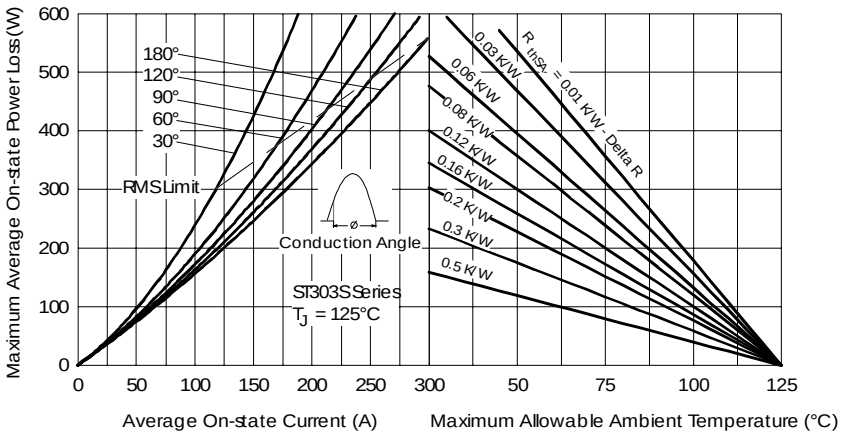


Fig. 3 - On-state Power Loss Characteristics

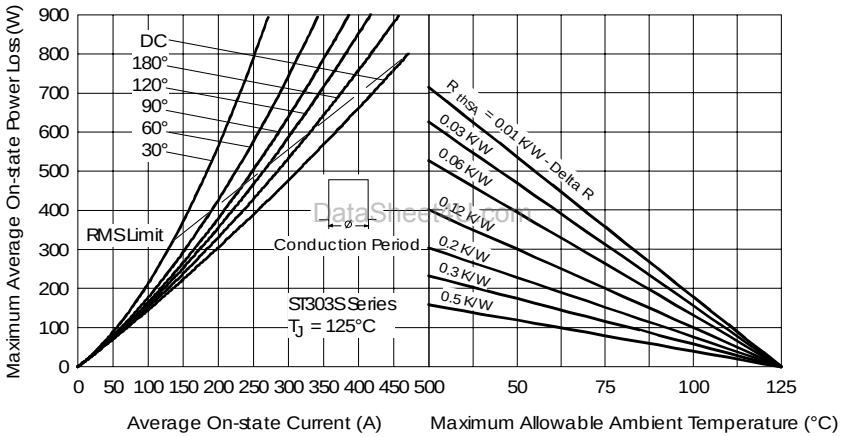


Fig. 4 - On-state Power Loss Characteristics

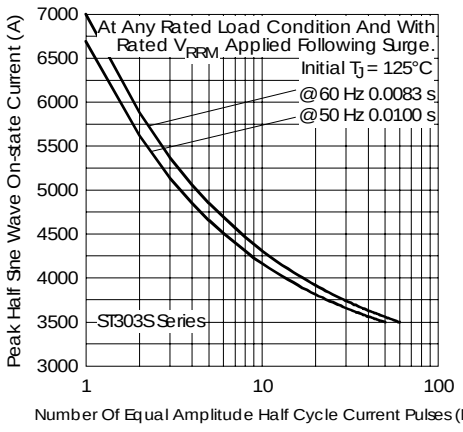


Fig. 5 - Maximum Non-repetitive Surge Current

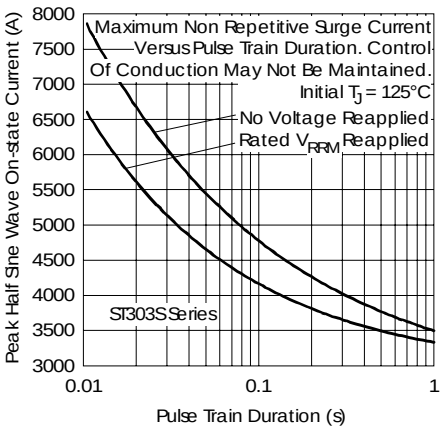


Fig. 6 - Maximum Non-repetitive Surge Current

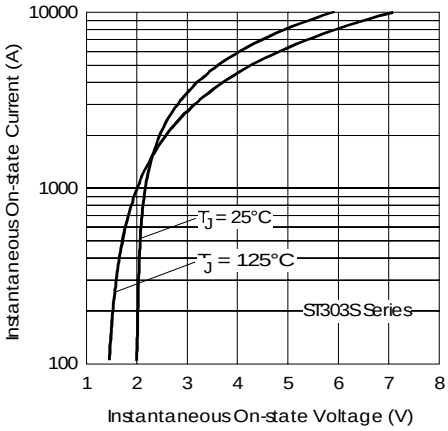


Fig. 7 - On-state Voltage Drop Characteristics

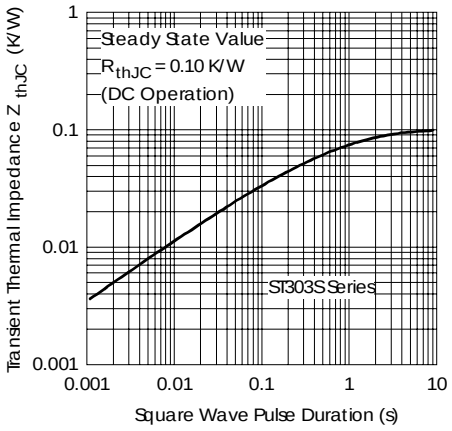


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

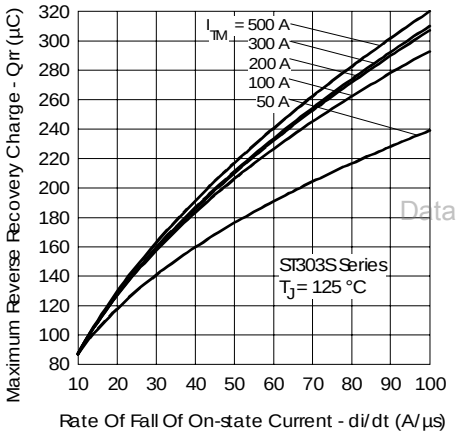


Fig. 9 - Reverse Recovered Charge Characteristics

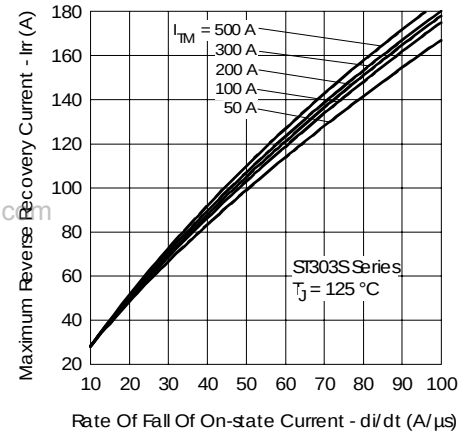


Fig. 10 - Reverse Recovery Current Characteristics

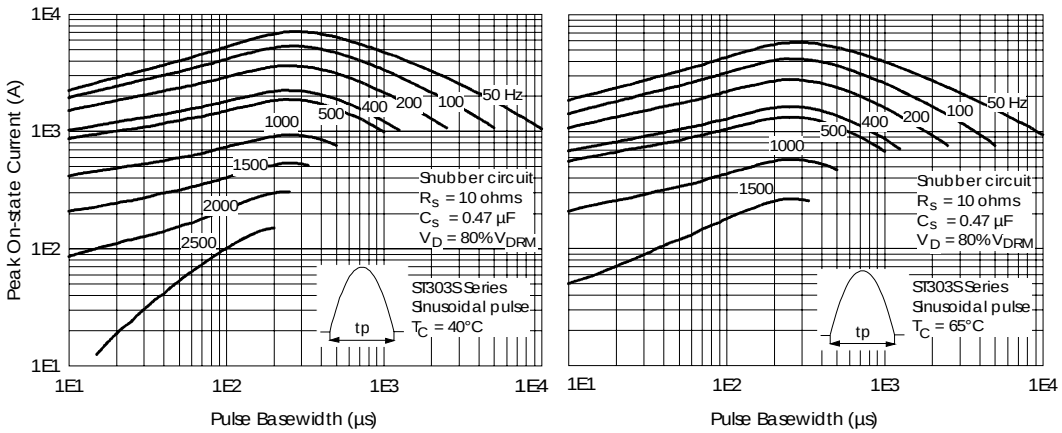


Fig. 11 - Frequency Characteristics

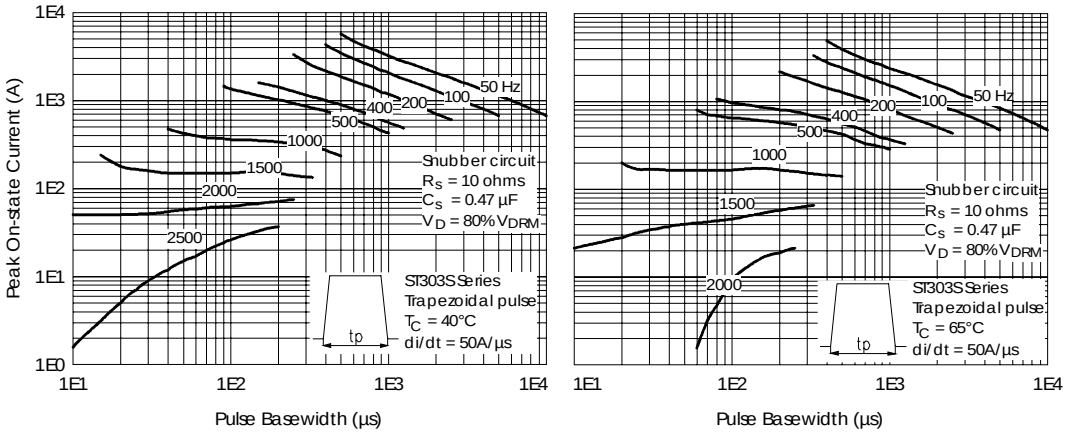


Fig. 12 - Frequency Characteristics

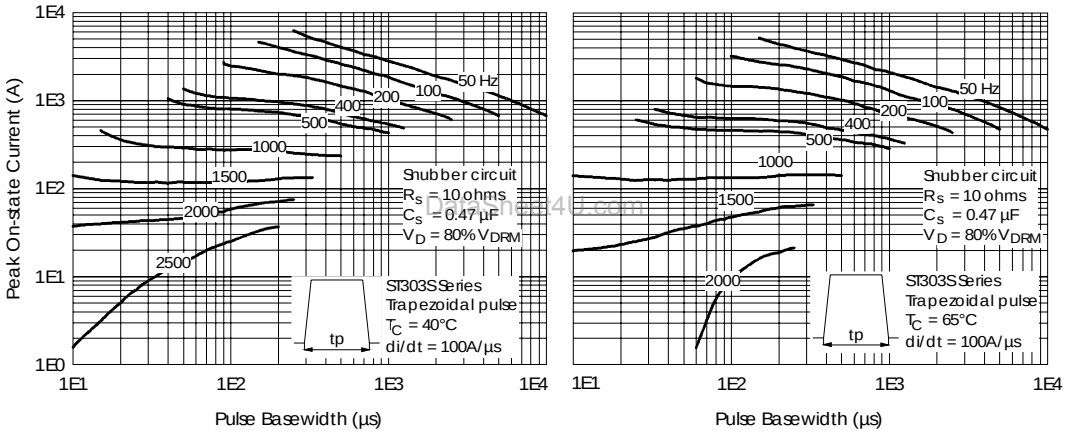


Fig. 13 - Frequency Characteristics

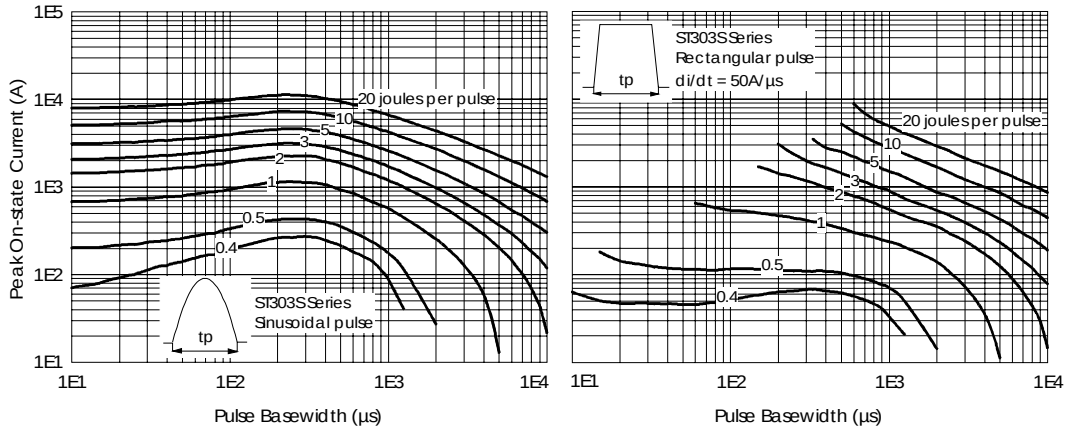


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

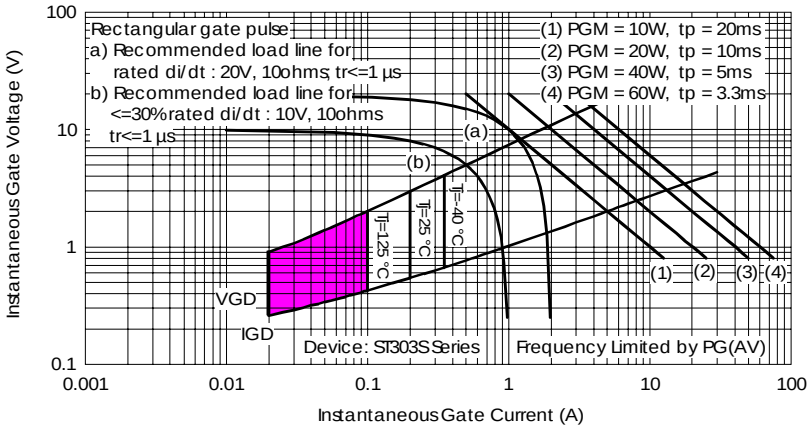


Fig. 15 - Gate Characteristics

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.

International
IOR Rectifier

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