THE DATASHEET OF

ST103S08PFN0

Bulletin I25183 rev. B 03/94

International
IOR Rectifier

ST103S SERIES

INVERTER GRADE THYRISTORS

Stud Version

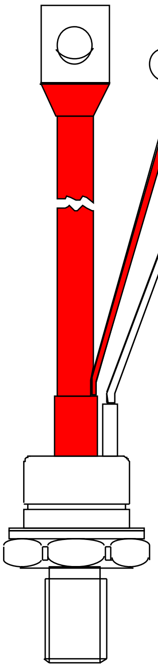
105A

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

Typical Applications

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



case style
TO-209AC (TO-94)

Major Ratings and Characteristics

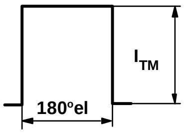
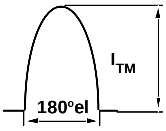
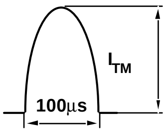
Parameters		ST103S	Units
$I_{T(AV)}$		105	A
	@ T_C	85	°C
$I_{T(RMS)}$		165	A
I_{TSM}	@ 50Hz	3000	A
	@ 60Hz	3150	A
I^2t	@ 50Hz	45	KA^2s
	@ 60Hz	41	KA^2s
V_{DRM}/V_{RRM}		400 to 800	V
t_q range		10 to 25	µs
T_J		- 40 to 125	°C

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
ST103S	04	400	500	30
	08	800	900	

Current Carrying Capability

Frequency							Units
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	ST103S	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	105	A	180° conduction, half sine wave		
	@ Case temperature	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 reapplied	Sinusoidal half wave, Initial T_J = T_J max
		3150		t = 8.3ms		
		2530		t = 10ms	100% V_{RRM} reapplied	
		2650		t = 8.3ms		
I^2t	Maximum I^2t for fusing	45	KA^2s	t = 10ms	No voltage reapplied	
		41		t = 8.3ms		
		32		t = 10ms	100% V_{RRM} reapplied	
		29		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	450	$KA^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		

On-state Conduction

	Parameter	ST103S	Units	Conditions
V_{TM}	Max. peak on-state voltage	1.73	V	I_{TM}= 300A, T_J = T_J max, t_p = 10ms sine wave pulse
$V_{T(TO)1}$	Low level value of threshold voltage	1.32		(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	1.35		(I > x π x $I_{T(AV)}$), T_J = T_J max.
r_{t1}	Low level value of forward slope resistance	1.40	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	1.30		(I > x 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	ST103S		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
		Min	Max		T_J = T_J max, I_{TM} = 100A, commutating di/dt = 10A/µs
t_q	Max. turn-off time	10	25		V_R = 50V, t_p = 200µs, dv/dt: see table in device code

Blocking

	Parameter	ST103S	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	30	mA	T_J = T_J max, rated V_{DRM}/V_{RRM} applied

Triggering

	Parameter	ST103S	Units	Conditions
P_{GM}	Maximum peak gate power	40	W	T_J = T_J 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 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	ST103S	Units	Conditions
$_J$	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, ± 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

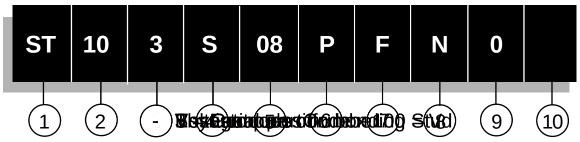
ΔR_{thJC} Conduction

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



$_{RRM}$ - [illegible]

$_q$ - [illegible] test condition)

$_q$ [illegible] Eyelet terminals (Gate and Aux. Cathode Leads)

1 = Fast-on terminals (Gate and Aux. Cathode Leads)

2 = Flag terminals (For Cathode and Gate Terminals)

- Critical dv/dt:

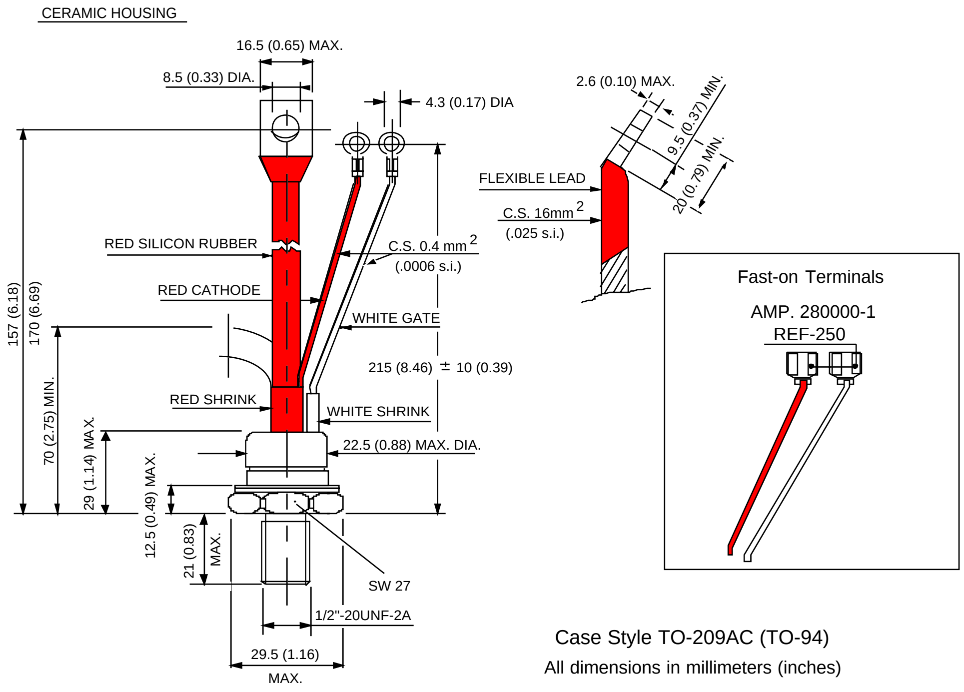
10 None = 500V/µsec (Standard value)

L = 1000V/µsec (Special selection)

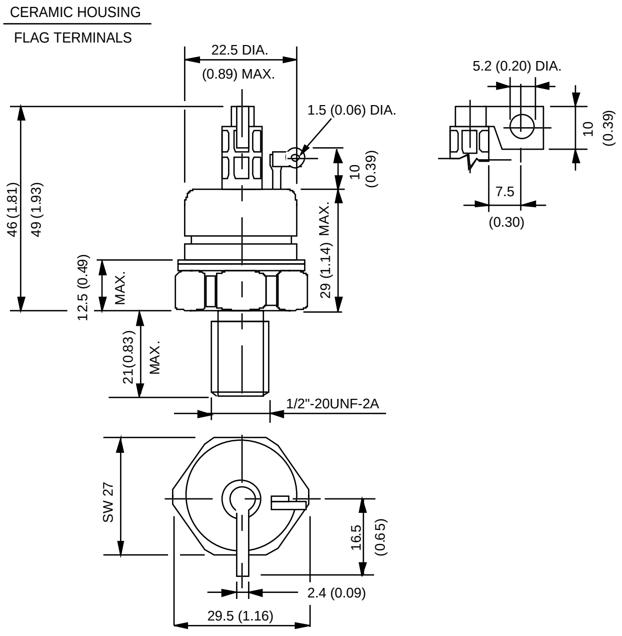
	$_q$ **combinations available**				
dv/dt (V/µs)	20	50	100	**200**	400
t_q (µs) 10	CN	DN	EN	**FN ***	--
12	CM	DM	EM	FM	HM
15	CL	DL	EL	**FL** *	HL
18	CP	DP	EP	FP	HP
20	CK	DK	EK	FK	HK
25	--	--	--	--	HJ

*****Standard part number.
All other types available only on request.

Outline Table



Case Style TO-209AC (TO-94)
All dimensions in millimeters (inches)



Case Style TO-208AD (TO-83)
All dimensions in millimeters (inches)

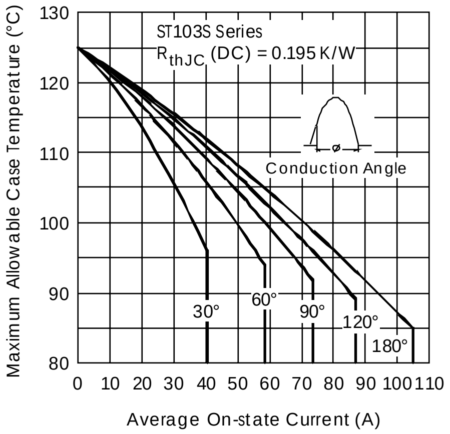


Fig. 1 - Current Ratings Characteristics

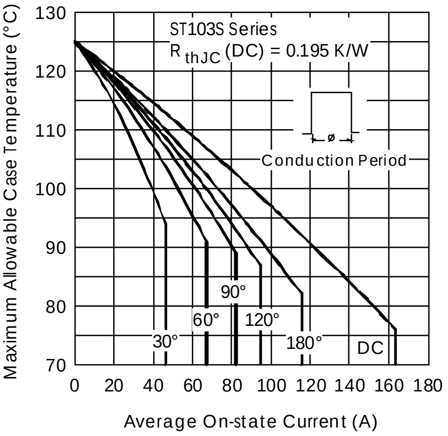


Fig. 2 - Current Ratings Characteristics

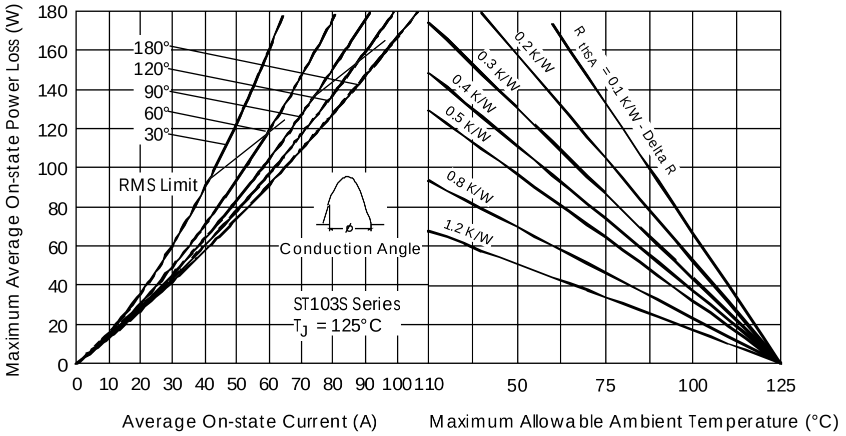


Fig. 3 - On-state Power Loss Characteristics

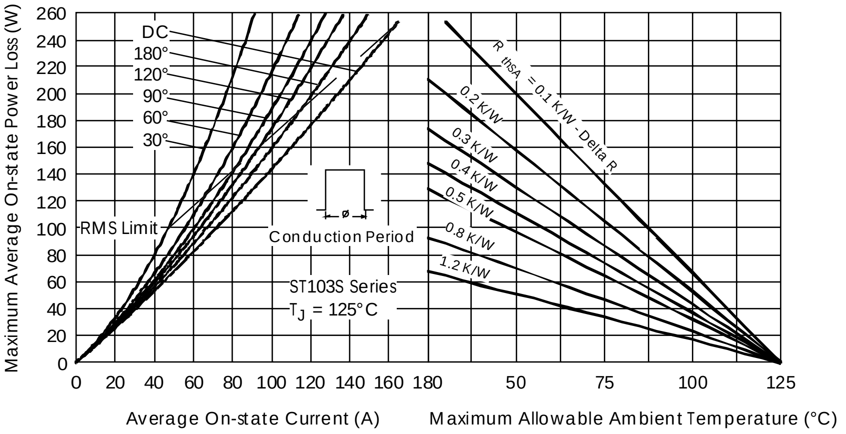


Fig. 4 - On-state Power Loss Characteristics

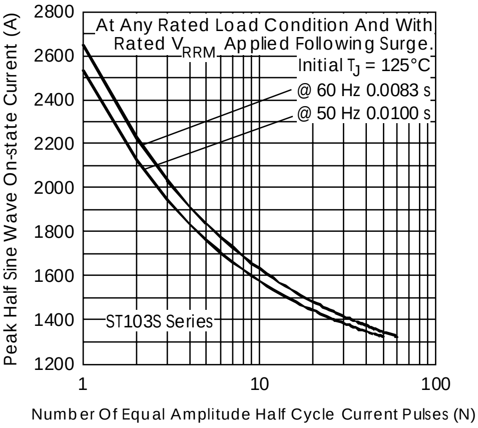


Fig. 5 - Maximum Non-repetitive Surge Current

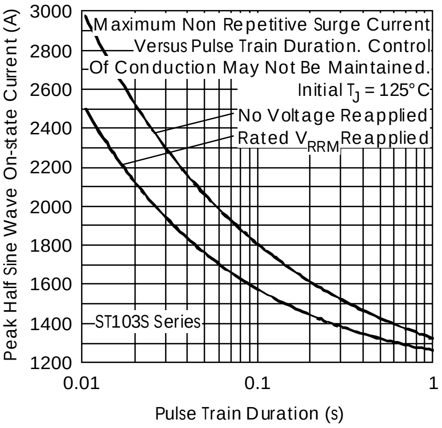


Fig. 6 - Maximum Non-repetitive Surge Current

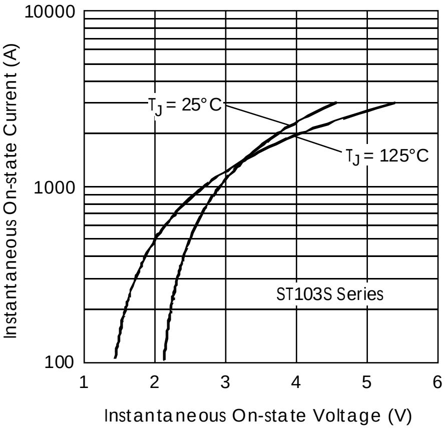


Fig. 7 - On-state Voltage Drop Characteristics

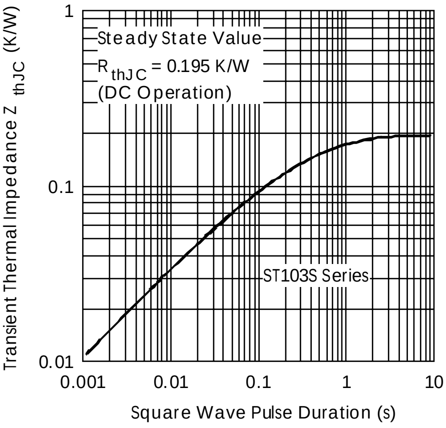


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

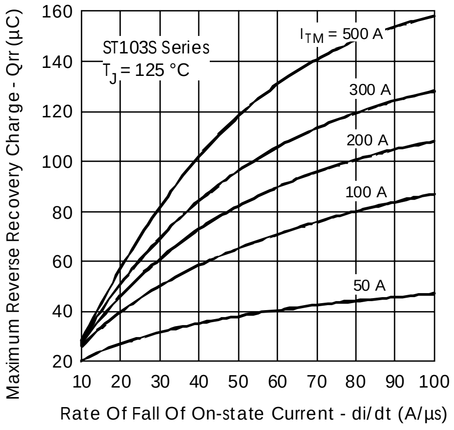


Fig. 9 - Reverse Recovered Charge Characteristics

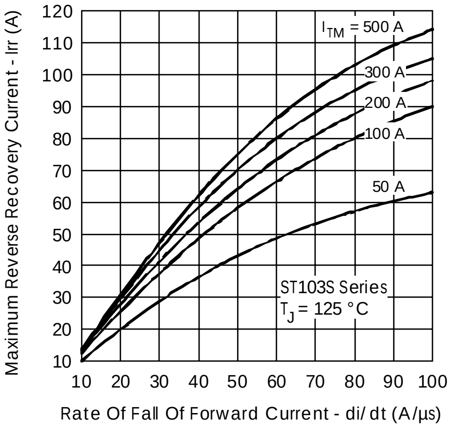


Fig. 10 - Reverse Recovery Current Characteristics

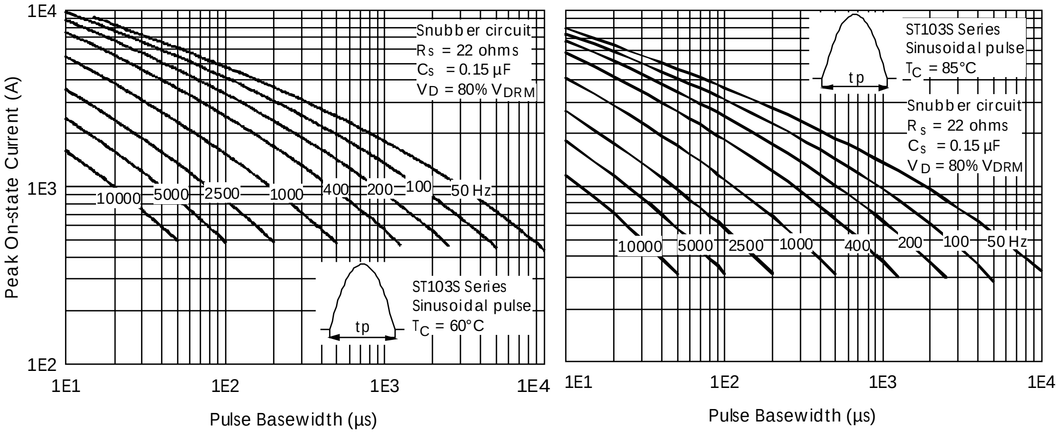


Fig. 11 - Frequency Characteristics

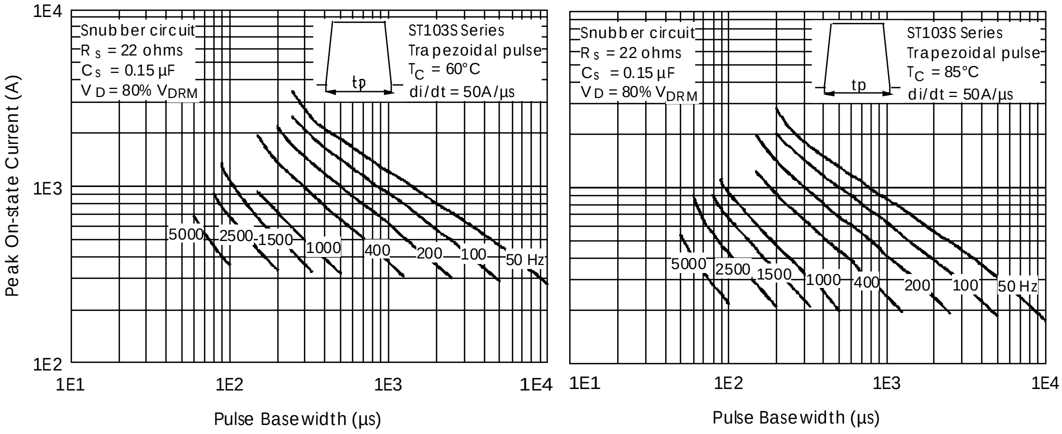


Fig. 12 - Frequency Characteristics

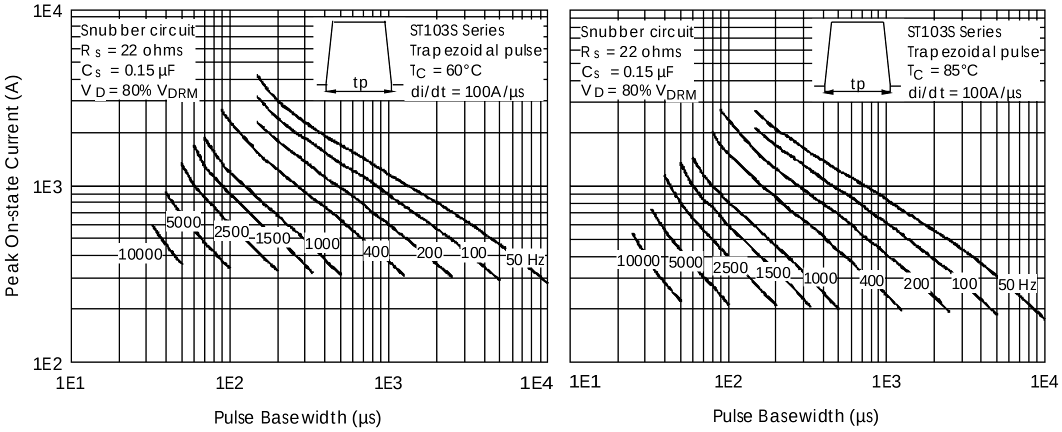


Fig. 13 - Frequency Characteristics

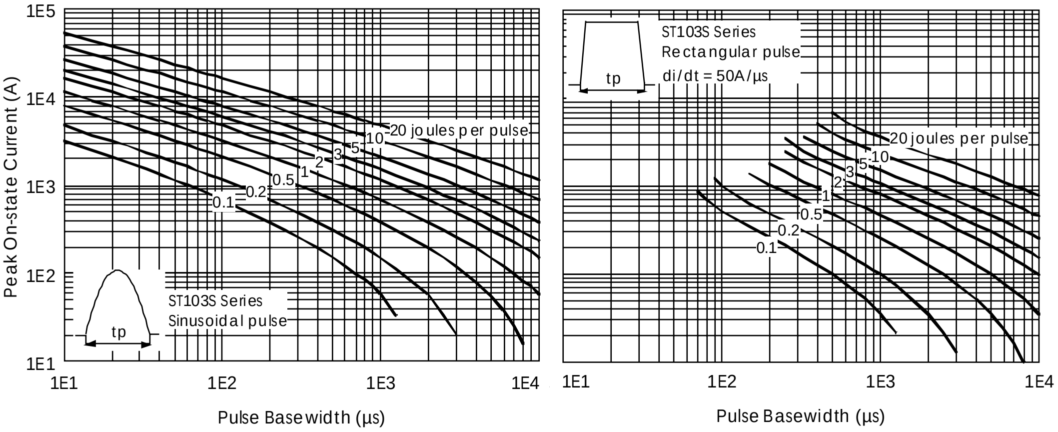


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

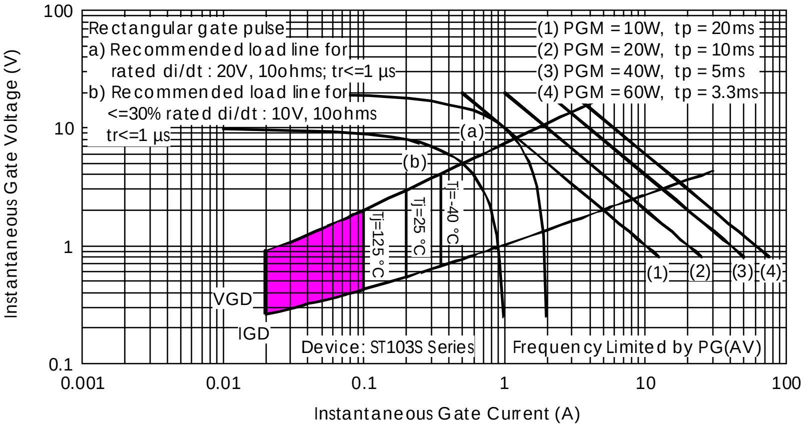


Fig. 15 - Gate Characteristics

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