

INVERTER GRADE THYRISTORS
Stud Version
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

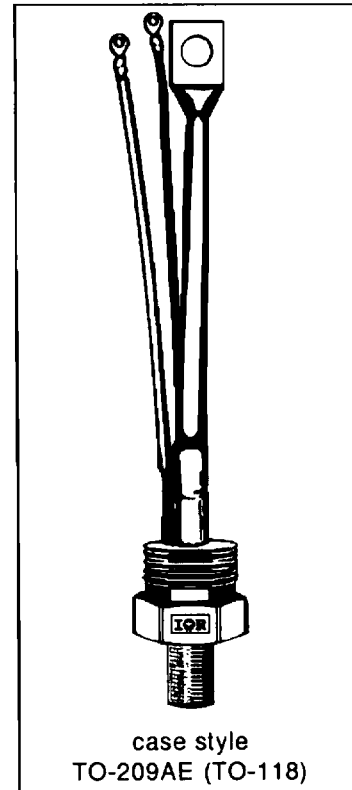
300A
Typical Applications

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

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 range (*)	10 to 30	μs
T_J	- 40 to 125	°C

(*) $t_q = 10$ to $20\mu s$ for 400 to 800V devices
 $t_q = 15$ to $30\mu s$ for 1000 to 1200V devices



ST303S Series

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	
	10	1000	1100	
	12	1200	1300	

Current Carrying Capability

Frequency							Units
	V_{DRM}	V_{ORM}	V_{DRM}	V_{ORM}	V_{DRM}	V_{ORM}	
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 V_r	50	50	50	50	50	50	V
Voltage before turn-on V_d	V_{DRM}		V_{ORM}		V_{DRM}		
Rise of on-state current di/dt	50	50	-	-	-	-	A/ μ s
Case temperature	40	65	40	65	40	65	$^{\circ}$ C
Equivalent values for RC circuit	10 Ω / 0.47 μ F		10 Ω / 0.47 μ F		10 Ω / 0.47 μ F		

On-state Conduction

Parameter	ST303S	Units	Conditions	
$I_{T(AV)}$ Max. average on-state current @ Case temperature	300	A	180° conduction, half sine wave	
	65	$^{\circ}$ C		
$I_{T(RMS)}$ Max. RMS on-state current	471	A	DC @ 45 $^{\circ}$ C case temperature	
I_{TSM} Max. peak, one half cycle, non-repetitive surge current	7950		t = 10ms	No voltage reapplied
	8320		t = 8.3ms	reapplied
	6690		t = 10ms	100% V_{RRM}
	7000		t = 8.3ms	reapplied
2t Maximum I^2t for fusing	316	KA 2 s	t = 10ms	
	288		t = 8.3ms	
	224		t = 10ms	
	204		t = 8.3ms	
$I^2\sqrt{t}$ Maximum $I^2\sqrt{t}$ for fusing	3160	KA 2 /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	$I_{TM} = 1255A, T_J = T_J \text{ max}, t_p = 10\text{ms sine wave pulse}$
$V_{T(TO)1}$ Low level value of threshold voltage	1.44		$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
$V_{T(TO)2}$ High level value of threshold voltage	1.46		$(I > \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
r_{11} Low level value of forward slope resistance	0.57	m Ω	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
r_{12} High level value of forward slope resistance	0.56		$(I > \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
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	ST303S	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 30		$T_J = T_J \text{ max}, I_{TM} = 550A, \text{commutating } di/dt = 40A/\mu\text{s}$ $V_R = 50V, t_p = 500\mu\text{s}, dv/dt: \text{ see table in device code}$

(*) $t_q = 10$ to $20\mu\text{s}$ for 400 to 800V devices; $t_q = 15$ to $30\mu\text{s}$ for 1000 to 1200V devices.

Blocking

Parameter	ST303S	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_{RRM} I_{DRM} Max. peak reverse and off-state leakage current	50	mA	$T_J = T_J \text{ max}, \text{rated } V_{DRM}/V_{RRM} \text{ applied}$

Triggering

Parameter	ST303S	Units	Conditions
P_{GM} Maximum peak gate power	60	W	$T_J = T_J \text{ max}, f = 50\text{Hz}, d\% = 50$
$P_{G(AV)}$ Maximum average gate power	10		
I_{GM} Max. peak positive gate current	10	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	

ST303S Series

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, $\pm 10\%$	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 resistance 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	$T_J = T_J \text{ max.}$
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

N

0

①

②

③

④

⑤

⑥

⑦

⑧

⑨

⑩

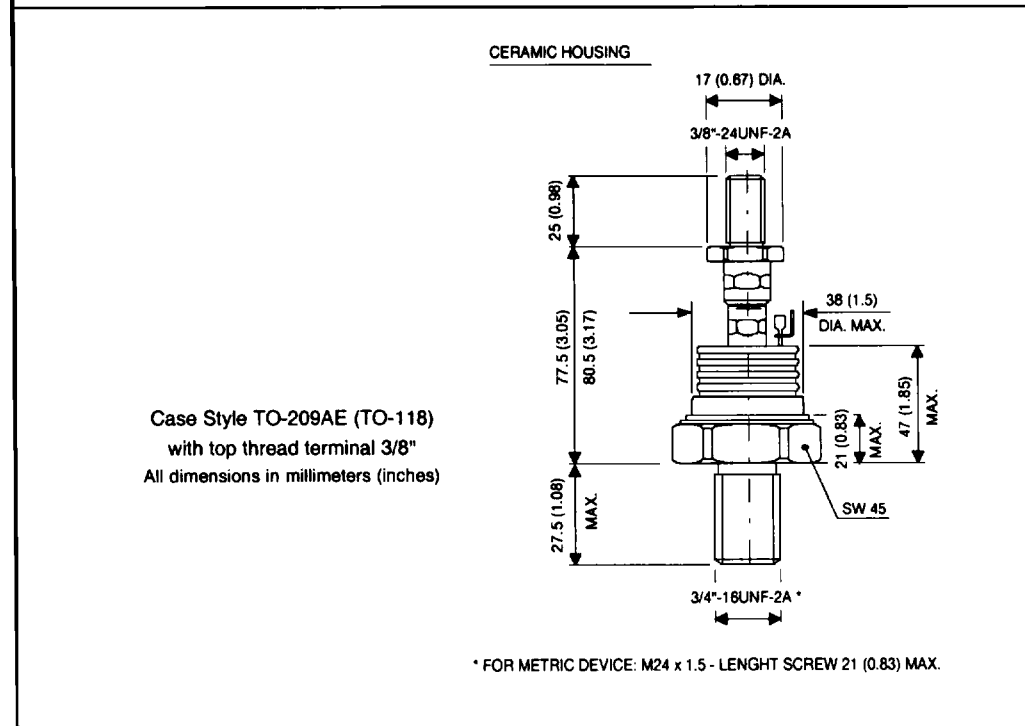
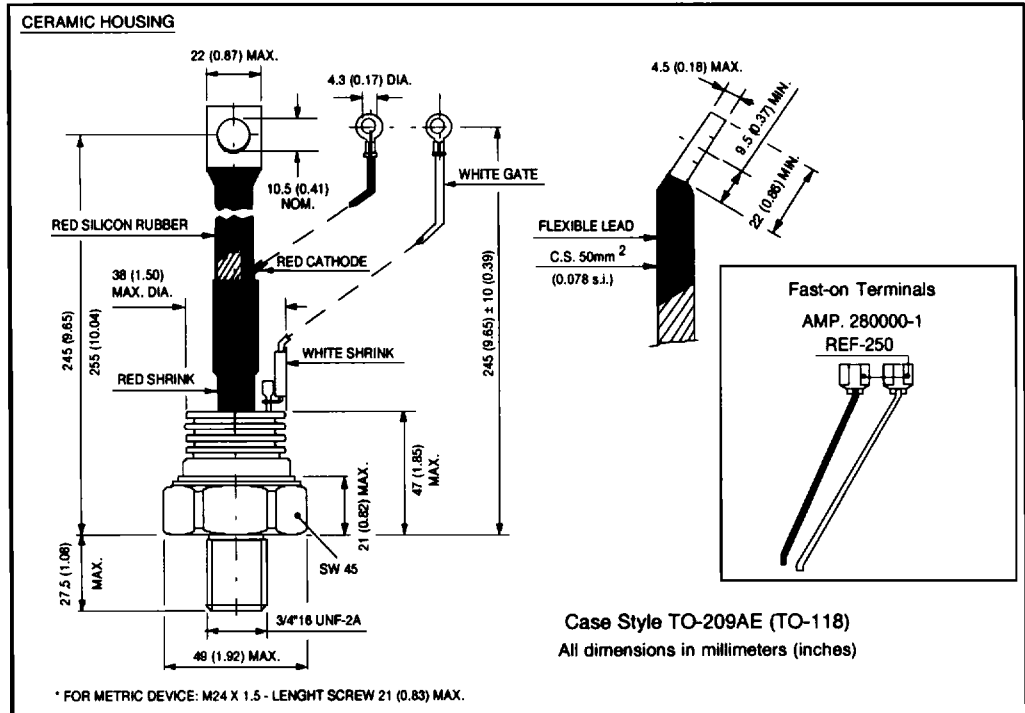
- 1** - Thyristor
- 2** - Essential part number
- 3** - 3 = Fast turn off
- 4** - S = Compression bonding Stud
- 5** - Voltage code: Code x 100 = V_{RRM} (See Voltage Ratings table)
- 6** - P = Stud base 3/4" 16UNF-2A
M = Stud base metric threads M24 x 1.5
- 7** - Reapplied dv/dt code (for t_q test condition)
- 8** - t_q code
- 9** - 0 = Eyelet terminals (Gate and Aux. Cathode Leads)
1 = Fast-on terminals (Gate and Aux. Cathode Leads)
3 = Threaded top terminal 3/8" 24UNF-2A
- 10** - Critical dv/dt:
None = 500V/ μ sec (Standard value)
L = 1000V/ μ sec (Special selection)

dv/dt - t_q combinations available

	dv/dt (V/ μ s)	20	50	100	200	400	
t_q (μ s)	10	CN	DN	EN	FN *	HN	
	12	CM	DM	EM	FM	HM	
	up to 800V	15	CL	DL	EL	FL *	HL
		20	CK	DK	EK	FK *	HK
t_q (μ s)	15	CL	--	--	--	--	
	18	CP	DP	--	--	--	
	only for 1000/1200V	20	CK	DK	EK	FK *	HK
		25	CJ	DJ	EJ	FJ *	HJ
	30	--	DH	EH	FH	HH	

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

Outline Table



INV SCR
STUD
MFR

ST303S Series

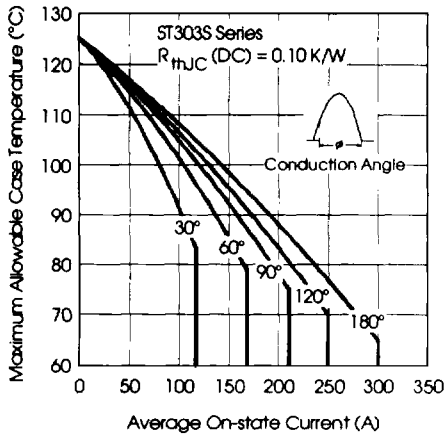


Fig. 1 - Current Ratings Characteristics

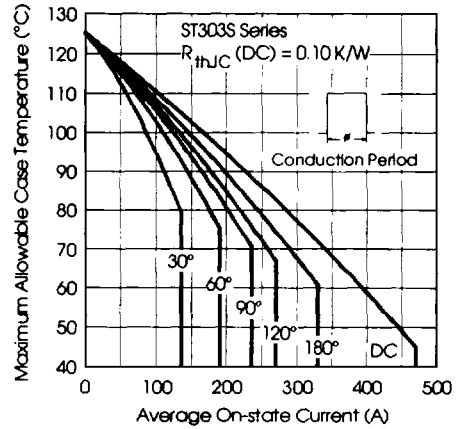


Fig. 2 - Current Ratings Characteristics

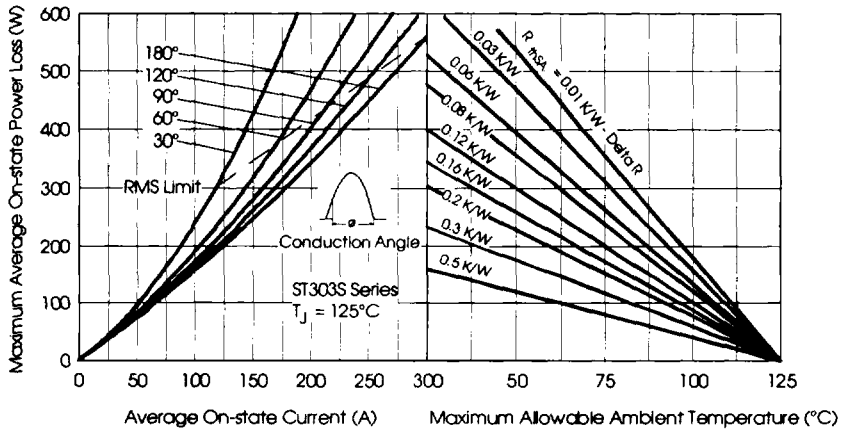


Fig. 3 - On-state Power Loss Characteristics

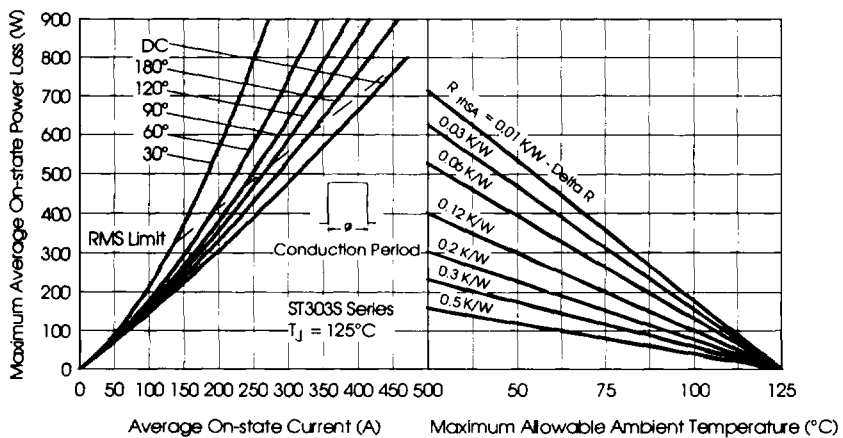


Fig. 4 - On-state Power Loss Characteristics

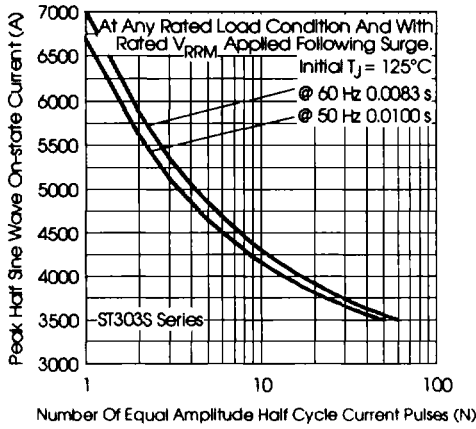


Fig. 5 - Maximum Non-repetitive Surge Current

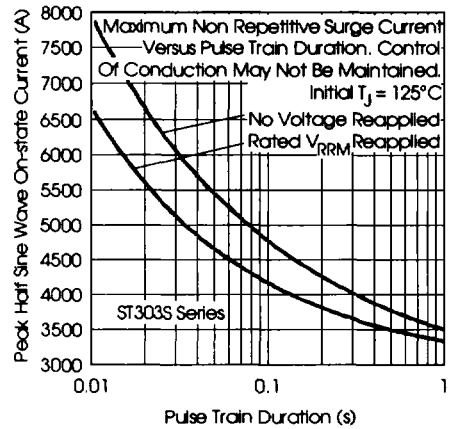


Fig. 6 - Maximum Non-repetitive Surge Current

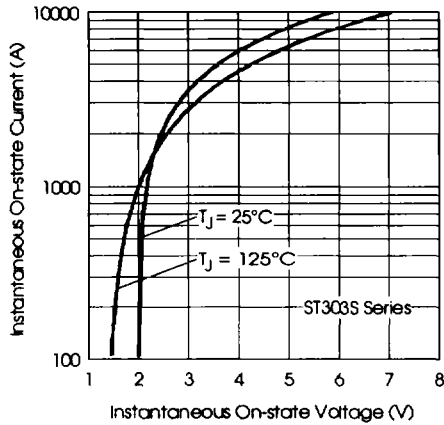


Fig. 7 - On-state Voltage Drop Characteristics

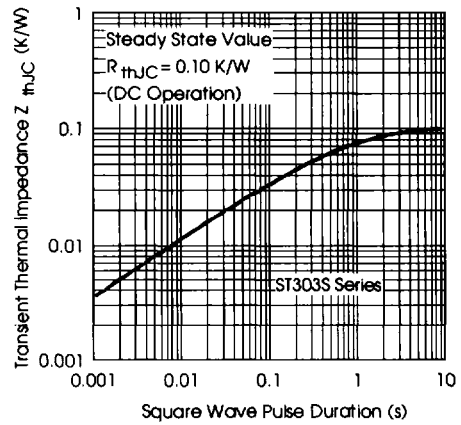


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

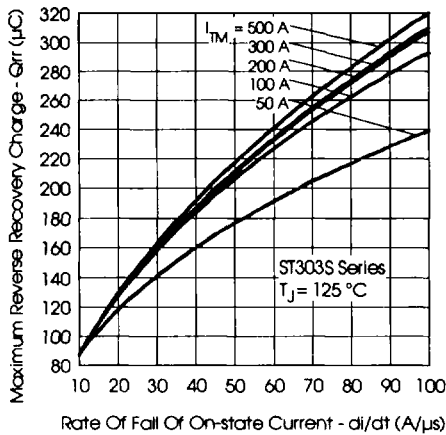


Fig. 9 - Reverse Recovered Charge Characteristics

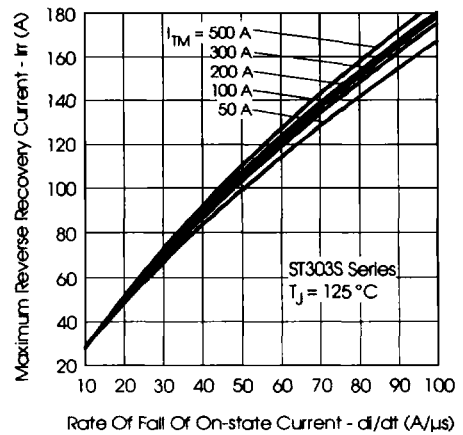


Fig. 10 - Reverse Recovery Current Characteristics



ST303S Series

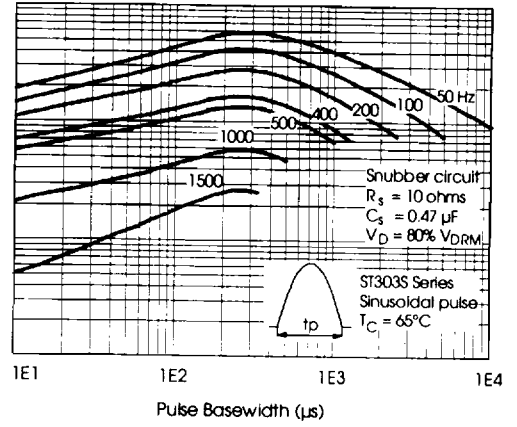
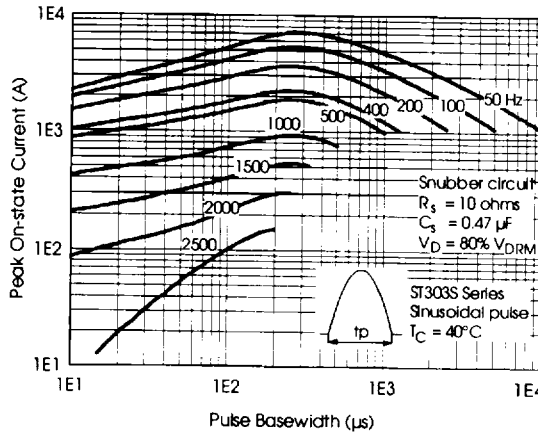


Fig. 11 - Frequency Characteristics

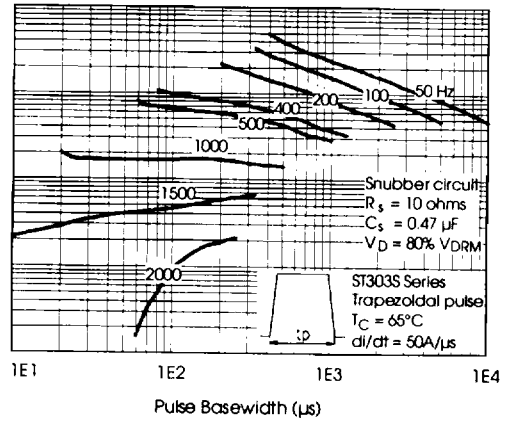
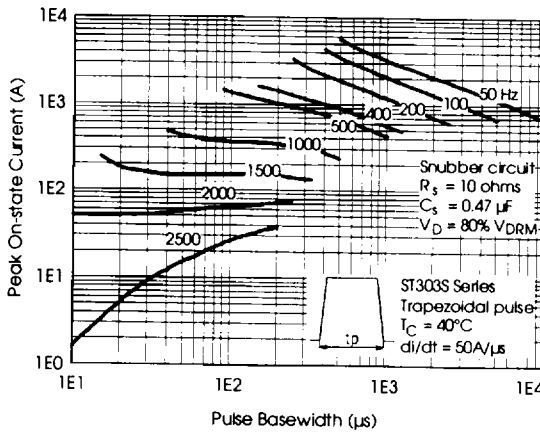


Fig. 12 - Frequency Characteristics

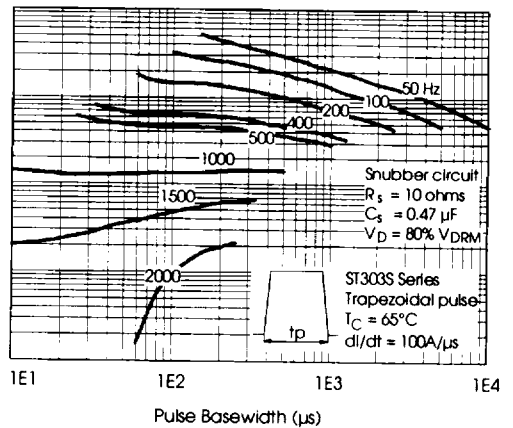
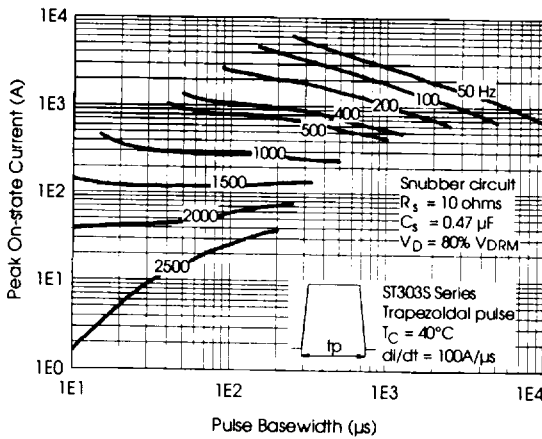


Fig. 13 - Frequency Characteristics

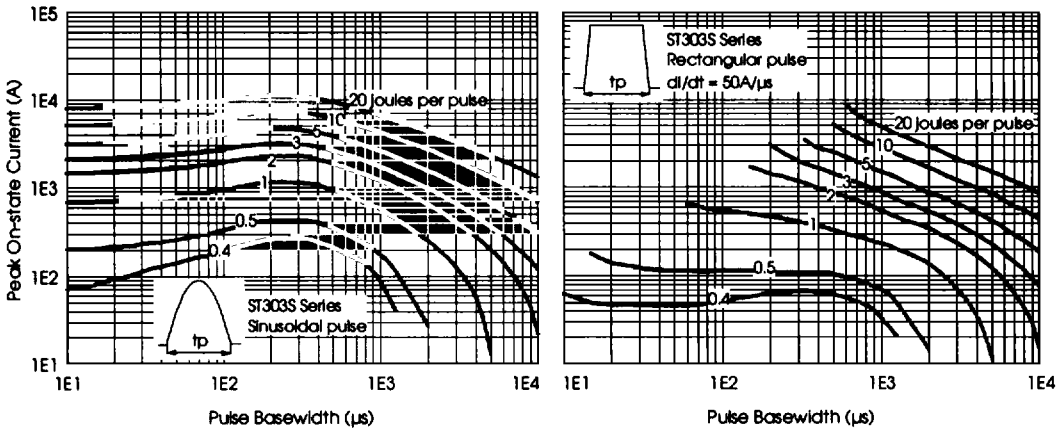


Fig. 14 - Maximum On-state Energy Power Loss Characteristics

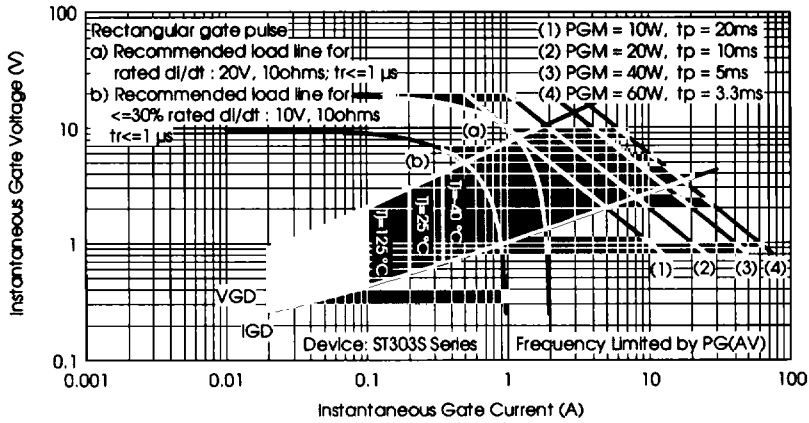


Fig. 15 - Gate Characteristics

INVT
SCR
STUD
MTD