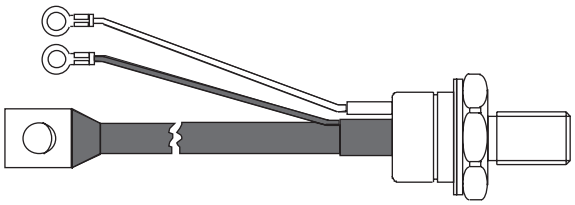
Inverter Grade Thyristors (Stud Version), 85 A



TO-209AC (TO-94)

FEATURES

- Center amplifying gate
- High surge current capability
- Low thermal impedance
- High speed performance
- Compression bonding
- Lead (Pb)-free
- Designed and qualified for industrial level

Pb-free
RoHS COMPLIANT

TYPICAL APPLICATIONS

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

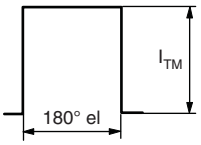
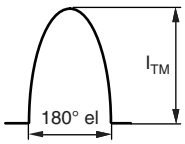
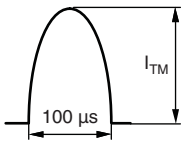
PRODUCT SUMMARY	
$I_{T(AV)}$	85 A

MAJOR RATINGS AND CHARACTERISTICS			
PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		85	A
	T_C	85	°C
$I_{T(RMS)}$		135	A
I_{TSM}	50 Hz	2450	A
	60 Hz	2560	A
I^2t	50 Hz	30	kA^2s
	60 Hz	27	
V_{DRM}/V_{RRM}		400 to 1200	V
t_q	Range	10 to 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. AT $T_J = T_J$ MAX. mA
ST083S	04	400	500	30
	08	800	900	
	10	1000	1100	
	12	1200	1300	

CURRENT CARRYING CAPABILITY

FREQUENCY							UNITS
50 Hz	210	120	330	270	2540	1930	A
400 Hz	200	120	350	210	1190	810	
1000 Hz	150	80	320	190	630	400	
2500 Hz	70	25	220	85	250	100	
Recovery voltage V_r	50	50	50	50	50	50	V
Voltage before turn-on V_d	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	22/0.15		22/0.15		22/0.15		Ω/µF

ON-STATE CONDUCTION

PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS
Maximum average on-state current at case temperature	$I_{T(AV)}$	180° conduction, half sine wave			85	A
					85	°C
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 77 °C case temperature			135	A
Maximum peak, one half cycle, non-repetitive surge current	I_{TSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	2450	
		t = 8.3 ms			2560	
		t = 10 ms	100 % V_{RRM} reapplied		2060	
		t = 8.3 ms			2160	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		30	kA^2s
		t = 8.3 ms			27	
		t = 10 ms	100 % V_{RRM} reapplied		21	
		t = 8.3 ms			19	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied			300	$kA^2\sqrt{s}$
Maximum peak on-state voltage	V_{TM}	I_{TM} = 300 A, $T_J = T_J$ maximum, t_p = 10 ms sine wave pulse			2.15	V
Low level value of threshold voltage	$V_{T(TO)1}$	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ maximum			1.46	
High level value of threshold voltage	$V_{T(TO)2}$	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum			1.52	
Low level value of forward slope resistance	r_{t1}	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ maximum			2.32	mΩ
High level value of forward slope resistance	r_{t2}	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum			2.34	
Maximum holding current	I_H	T_J = 25 °C, I_T > 30 A			600	mA
Typical latching current	I_L	T_J = 25 °C, V_A = 12 V, R_a = 6 Ω, I_G = 1 A			1000	

SWITCHING					
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNITS
			MIN.	MAX.	
Maximum non-repetitive rate of rise of turned on current	dI/dt	$T_J = T_J$ max., V_{DRM} = Rated V_{DRM}, I_{TM} = 2 x dI/dt	1000		A/µs
Typical delay time	t_d	T_J = 25 °C, V_{DM} = Rated V_{DM}, I_{TM} = 50 A DC, t_p = 1 µs Resistive load, gate pulse: 10 V, 5 Ω source	0.80		µs
Maximum turn-off time	t_q	$T_J = T_J$ maximum, I_{TM} = 100 A, commutating dI/dt = 10 A/µs V_R = 50 V, t_p = 200 µs, dV/dt = 200 V/µs	10	20	

BLOCKING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum critical rate of rise of off-state voltage	dV/dt	$T_J = T_J$ maximum, linear to 80 % V_{DRM}, higher value available on request	500	V/µs
Maximum peak reverse and off-state leakage current	I_{RRM}, I_{DRM}	$T_J = T_J$ maximum, rated V_{DRM}/V_{RRM} applied	30	mA

TRIGGERING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak gate power	P_{GM}	$T_J = T_J$ maximum, f = 50 Hz, d% = 50	40	W
Maximum average gate power	$P_{G(AV)}$		5	
Maximum peak positive gate current	I_{GM}	$T_J = T_J$ maximum, $t_p \leq$ 5 ms	5	A
Maximum peak positive gate voltage	+ V_{GM}		20	V
Maximum peak negative gate voltage	- V_{GM}		5	
Maximum DC gate currrent required to trigger	I_{GT}	T_J = 25 °C, V_A = 12 V, R_a = 6 Ω	200	mA
Maximum DC gate voltage required to trigger	V_{GT}		3	V
Maximum DC gate current not to trigger	I_{GD}	$T_J = T_J$ maximum, rated V_{DRM}/V_{RRM} applied	20	mA
Maximum DC gate voltage not to trigger	V_{GD}		0.25	V

THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction operating temperature range	T_J		- 40 to 125	°C
Maximum storage temperature range	T_{Stg}		- 40 to 150	
Maximum thermal resistance, junction to case	R_{thJC}	DC operation	0.195	K/W
Maximum thermal resistance, case to heatsink	R_{thCS}	Mounting surface, smooth, flat and greased	0.08	
Mounting torque, ± 10 %		Non-lubricated threads	15.5 (137)	N · m (lbf · in)
		Lubricated threads	14 (120)	
Approximate weight			130	g
Case style		See dimensions - link at the end of datasheet	TO-209AC (TO-94)	

ΔR_{thJC} CONDUCTION				
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION	RECTANGULAR CONDUCTION	TEST CONDITIONS	UNITS
180°	0.034	0.025	$T_J = T_J$ maximum	K/W
120°	0.041	0.042		
90°	0.052	0.056		
60°	0.076	0.079		
30°	0.126	0.127		

Note

- The table above shows the increment of thermal resistance R_{thJC} when devices operate at different conduction angles than DC

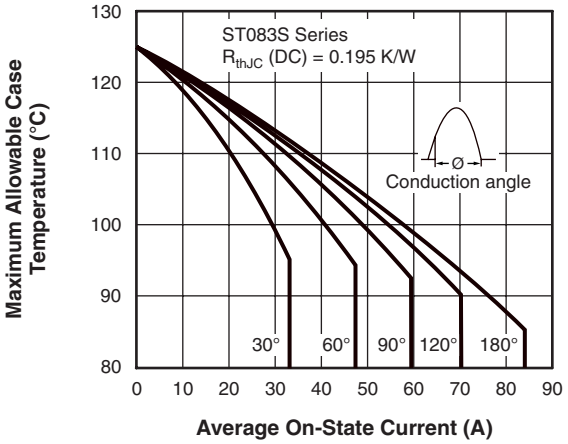


Fig. 1 - Current Ratings Characteristics

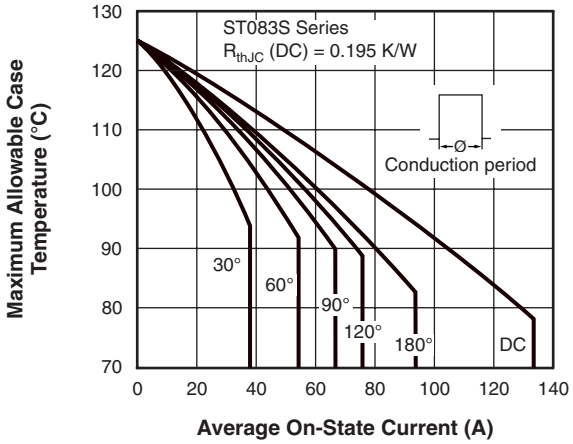
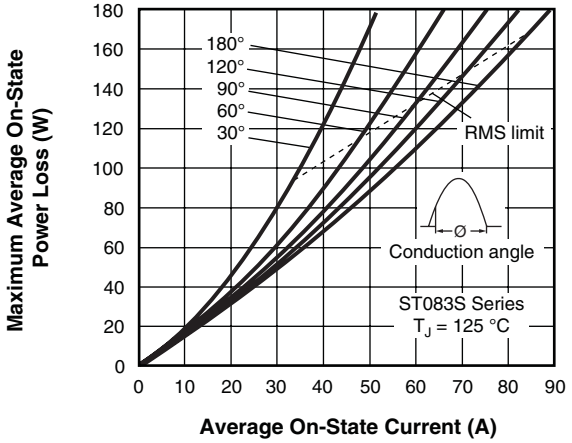


Fig. 2 - Current Ratings Characteristics



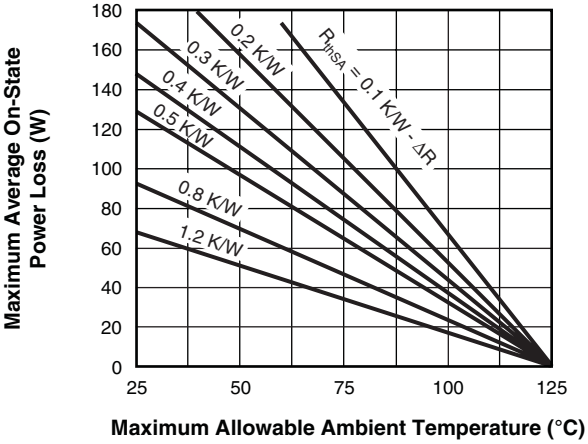
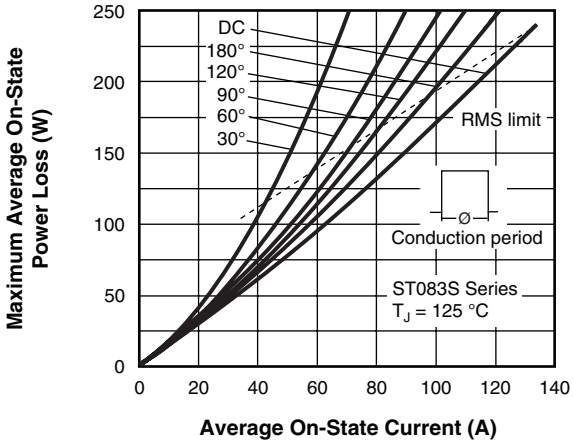


Fig. 3 - On-State Power Loss Characteristics



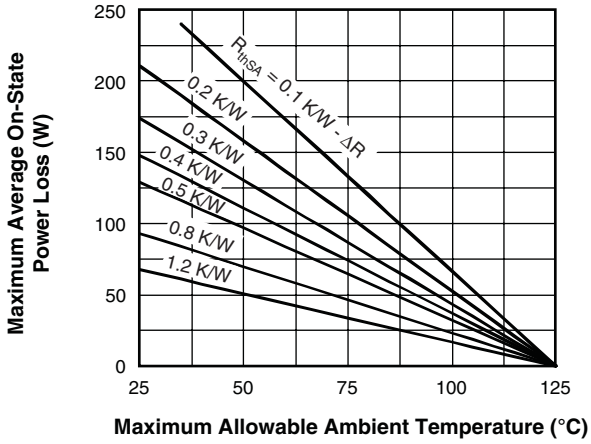


Fig. 4 - On-State Power Loss Characteristics

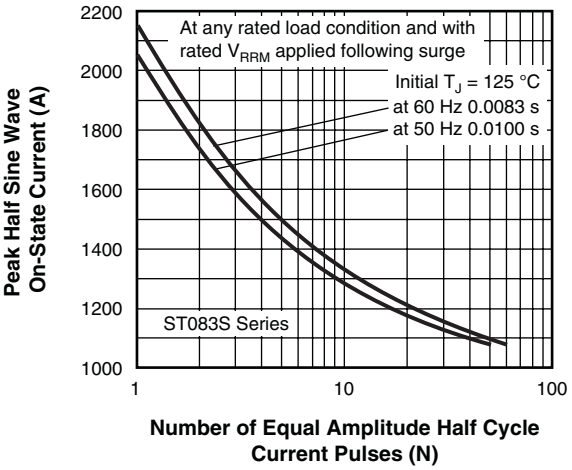


Fig. 5 - Maximum Non-Repetitive Surge Current

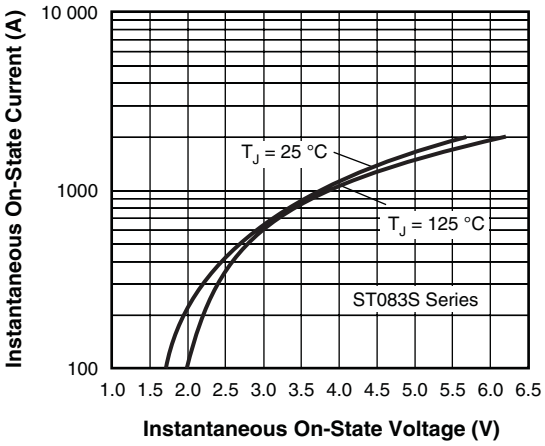


Fig. 7 - On-State Voltage Drop Characteristics

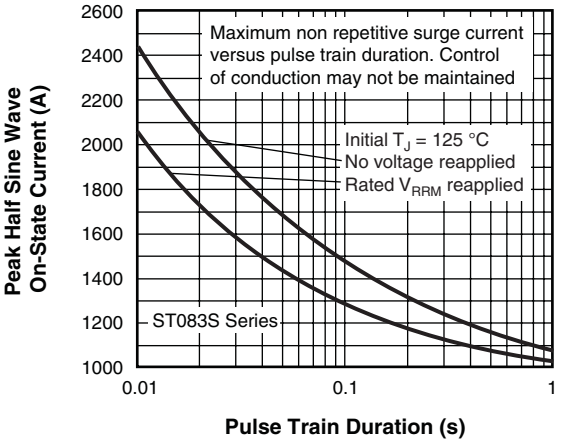


Fig. 6 - Maximum Non-Repetitive Surge Current

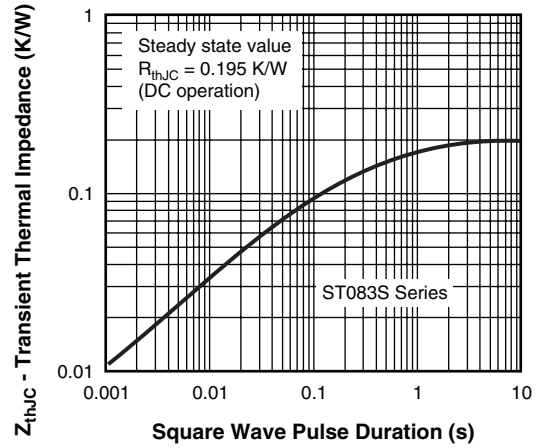


Fig. 8 - Thermal Impedance Z_{thJC} Characteristic

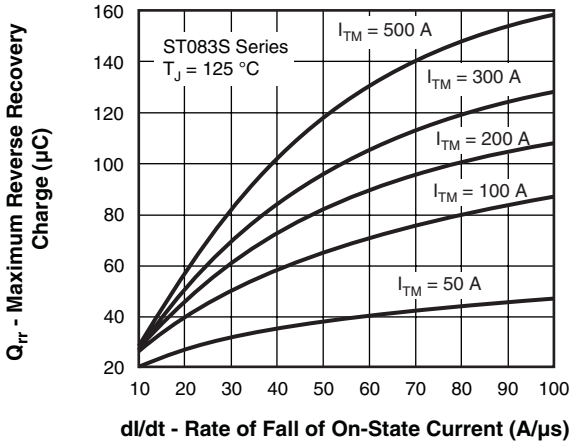


Fig. 9 - Reverse Recovered Charge Characteristics

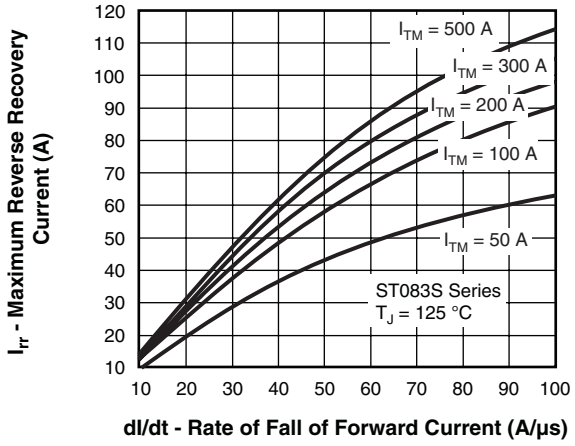
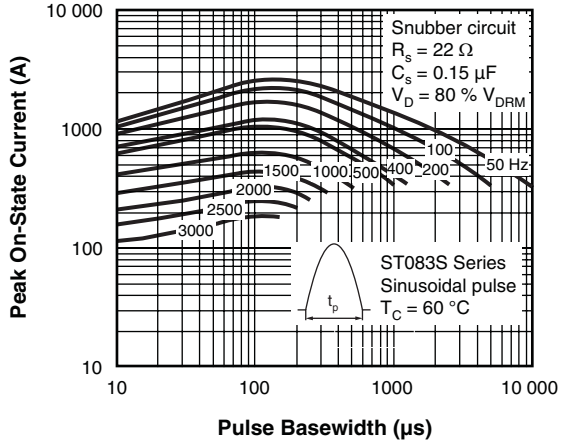


Fig. 10 - Reverse Recovery Current Characteristics



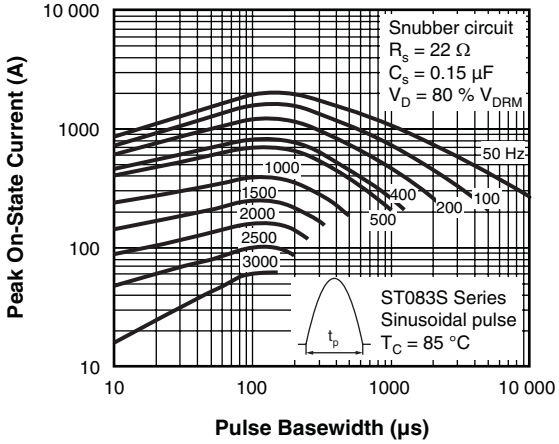
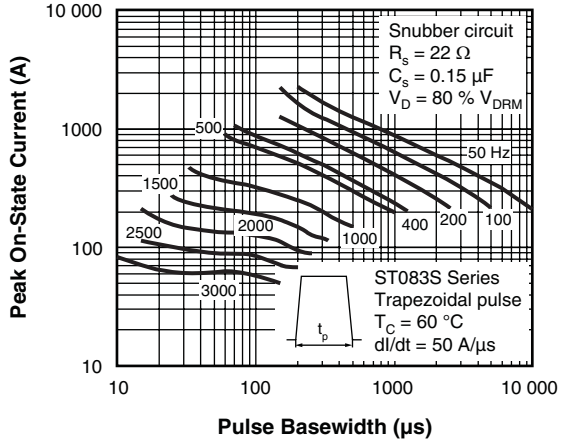


Fig. 11 - Frequency Characteristics



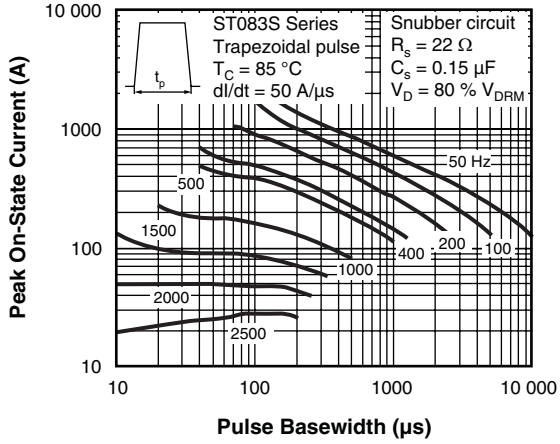


Fig. 12 - Frequency Characteristics

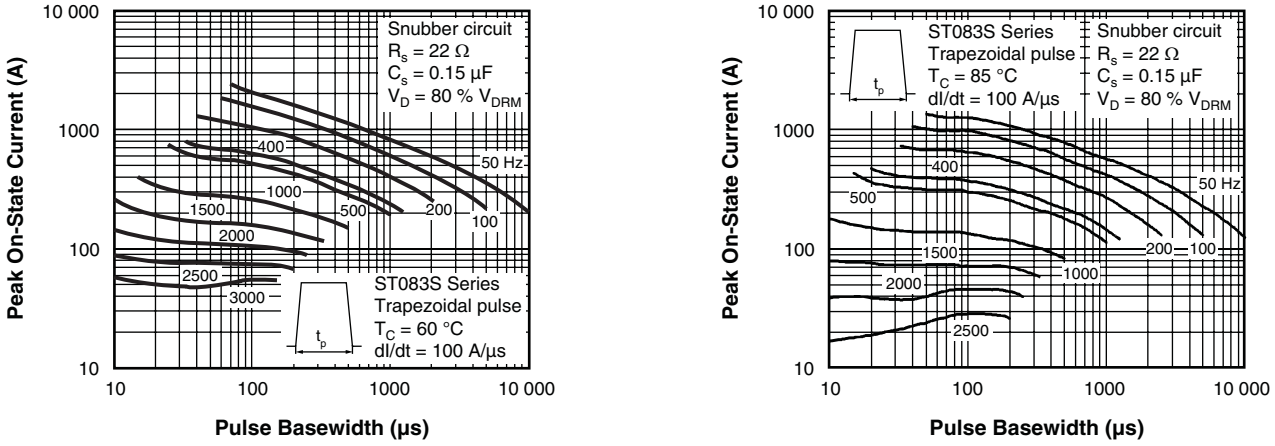


Fig. 13 - Frequency Characteristics

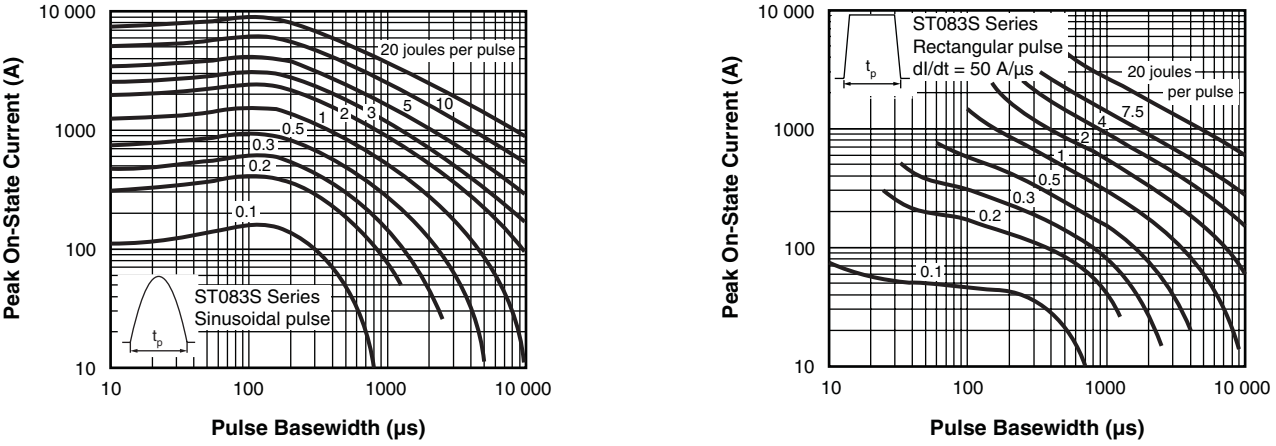


Fig. 14 - Maximum On-State Energy Power Loss Characteristics

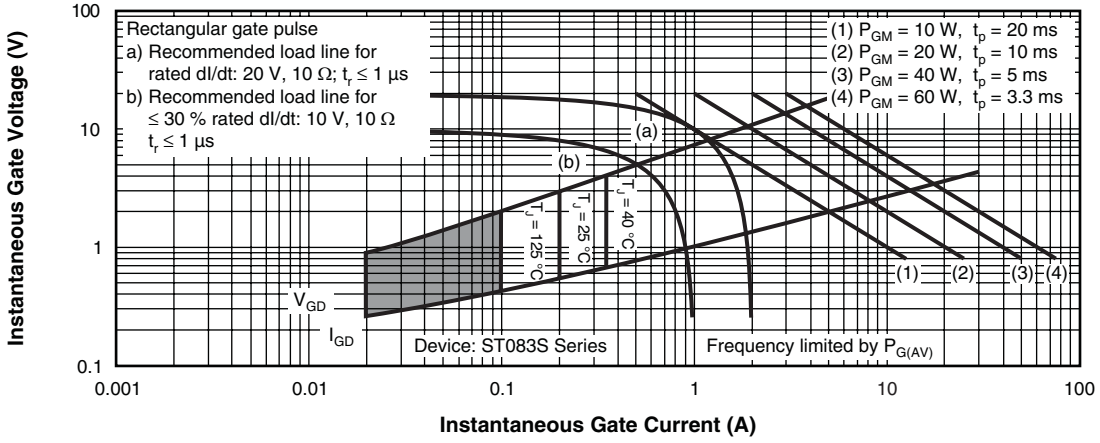


Fig. 15 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code

ST	08	3	S	12	P	F	N	0	PbF
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 x 100 = V_{RRM} (see Voltage Ratings table)

6 - P = Stud base 1/2"-20UNF-2A threads

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)

10 - PbF = Lead (Pb)-free

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 1000/1200 V	20	FK

LINKS TO RELATED DOCUMENTS	
Dimensions	http://www.vishay.com/doc?95003

Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.