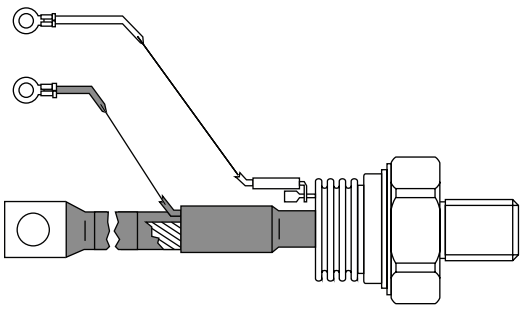
Phase Control Thyristors (Stud Version), 300 A



TO-209AE (TO-118)

FEATURES

- Center amplifying gate
- International standard case TO-209AE (TO-118)
- Hermetic metal case with ceramic insulator
- Threaded studs UNF 3/4"-16UNF-2A or ISO M24 x 1.5
- Compression bonded encapsulation for heavy duty operations such as severe thermal cycling
- Lead (Pb)-free
- Designed and qualified for industrial level

RoHS COMPLIANT

TYPICAL APPLICATIONS

- DC motor controls
- Controlled DC power supplies
- AC controllers

PRODUCT SUMMARY	
$I_{T(AV)}$	300 A

MAJOR RATINGS AND CHARACTERISTICS			
PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		300	A
	T_C	75	°C
$I_{T(RMS)}$		470	A
I_{TSM}	50 Hz	8000	
	60 Hz	8380	
I^2t	50 Hz	320	kA^2s
	60 Hz	292	
V_{DRM}/V_{RRM}		400 to 2000	V
t_q	Typical	100	µs
T_J		- 40 to 125	°C

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS				
TYPE NUMBER	VOLTAGE CODE	V_{DRM}/V_{RRM}, MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE V	V_{RSM}, MAXIMUM NON-REPETITIVE PEAK VOLTAGE V	I_{DRM}/I_{RRM} MAXIMUM AT $T_J = T_J$ MAXIMUM mA
ST300S	04	400	500	50
	08	800	900	
	12	1200	1300	
	16	1600	1700	
	18	1800	1900	
	20	2000	2100	

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS
Maximum average on-state current at case temperature	$I_{T(AV)}$	180° conduction, half sine wave			300	A
					75	°C
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 64 °C case temperature			470	A
Maximum peak, one-cycle non-repetitive surge current	I_{TSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	8000	
		t = 8.3 ms			8380	
		t = 10 ms	100 % V_{RRM} reapplied		6730	
		t = 8.3 ms			7040	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied		320	kA^2s
		t = 8.3 ms			292	
		t = 10 ms	100 % V_{RRM} reapplied		226	
		t = 8.3 ms			207	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied			3200	$kA^2\sqrt{s}$
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			0.97	V
High level value of threshold voltage	$V_{T(TO)2}$	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum			0.98	
Low level value of on-state slope resistance	r_{t1}	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ maximum			0.74	mΩ
High level value of on-state slope resistance	r_{t2}	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum			0.73	
Maximum on-state voltage	V_{TM}	I_{pk} = 940 A, $T_J = T_J$ maximum, t_p = 10 ms sine pulse			1.66	V
Maximum holding current	I_H	T_J = 25 °C, anode supply 12 V resistive load			600	mA
Typical latching current	I_L				1000	

SWITCHING

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum non-repetitive rate of rise of turned-on current	dI/dt	Gate drive 20 V, 20 Ω, $t_r \leq 1$ µs $T_J = T_J$ maximum, anode voltage ≤ 80 % V_{DRM}	1000	A/µs
Typical delay time	t_d	Gate current 1 A, dI_g/dt = 1 A/µs V_d = 0.67 % V_{DRM}, T_J = 25 °C	1.0	µs
Typical turn-off time	t_q	I_{TM} = 550 A, $T_J = T_J$ maximum, dI/dt = 40 A/µs, V_R = 50 V, dV/dt = 20 V/µs, gate 0 V 100 Ω, t_p = 500 µs	100	

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 % rated V_{DRM}	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 TYP.	VALUES MAX.	UNITS
Maximum peak gate power	P_{GM}	$T_J = T_J$ maximum, $t_p \leq 5$ ms		10.0		W
Maximum average gate power	$P_{G(AV)}$	$T_J = T_J$ maximum, f = 50 Hz, d% = 50		2.0		W
Maximum peak positive gate current	I_{GM}	$T_J = T_J$ maximum, $t_p \leq 5$ ms		3.0		A
Maximum peak positive gate voltage	$+ V_{GM}$	$T_J = T_J$ maximum, $t_p \leq 5$ ms		20		V
Maximum peak negative gate voltage	$- V_{GM}$			5.0		V
DC gate current required to trigger	I_{GT}	T_J = - 40 °C	Maximum required gate trigger/ current/voltage are the lowest value which will trigger all units 12 V anode to cathode applied	200	-	mA
		T_J = 25 °C		100	200	mA
		T_J = 125 °C		50	-	mA
DC gate voltage required to trigger	V_{GT}	T_J = - 40 °C		2.5	-	V
		T_J = 25 °C		1.8	3	V
		T_J = 125 °C		1.1	-	V
DC gate current not to trigger	I_{GD}	$T_J = T_J$ maximum	Maximum gate current/voltage not to trigger is the maximum value which will not trigger any unit with rated V_{DRM} anode to cathode applied	10		mA
DC gate voltage not to trigger	V_{GD}			0.25		V

THERMAL AND MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum operating junction temperature range	T_J		- 40 to 125	°C
Maximum storage temperature range	T_{Stg}		- 40 to 150	°C
Maximum thermal resistance, junction to case	R_{thJC}	DC operation	0.10	K/W
Maximum thermal resistance, case to heatsink	R_{thCS}	Mounting surface, smooth, flat and greased	0.03	K/W
Mounting torque, ± 10 %		Non-lubricated threads	48.5 (425)	N · m (lbf · in)
Approximate weight			535	g
Case style		See dimensions - link at the end of datasheet	TO-209AE (TO-118)	

ΔR_{thJC} CONDUCTION

CONDUCTION ANGLE	SINUSOIDAL CONDUCTION	RECTANGULAR CONDUCTION	TEST CONDITIONS	UNITS
180°	0.011	0.008	$T_J = T_J$ maximum	K/W
120°	0.013	0.014		
90°	0.017	0.018		
60°	0.025	0.026		
30°	0.041	0.042		

Note

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

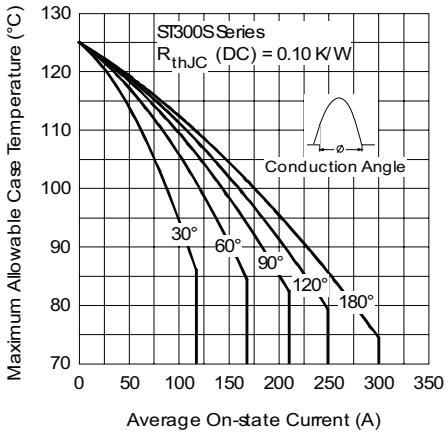


Fig. 1 - Current Ratings Characteristics

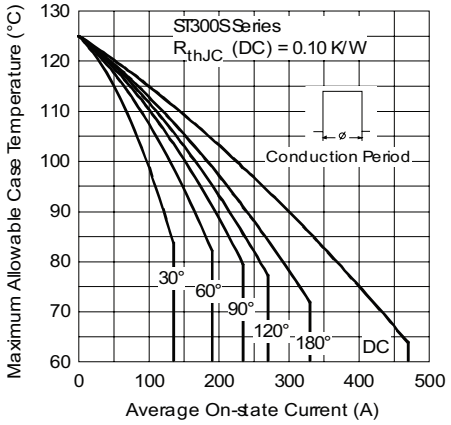


Fig. 2 - Current Ratings Characteristics

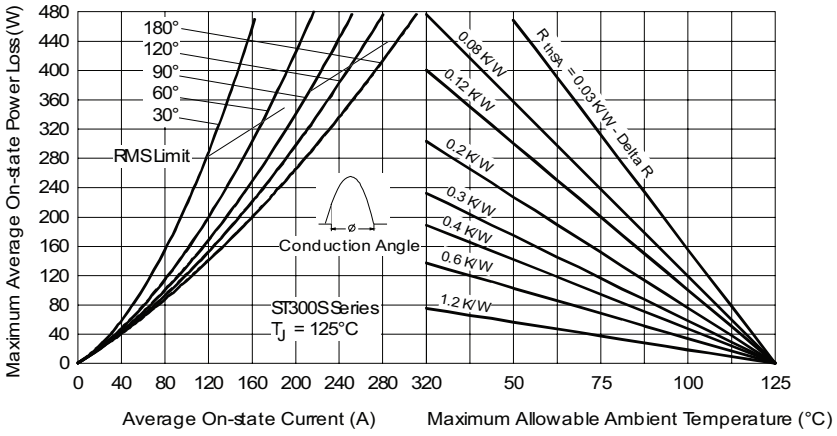


Fig. 3 - On-State Power Loss Characteristics

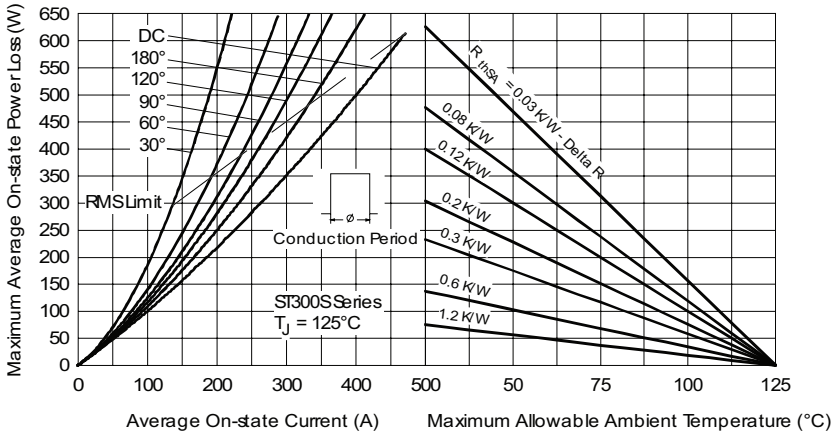


Fig. 4 - On-State Power Loss Characteristics

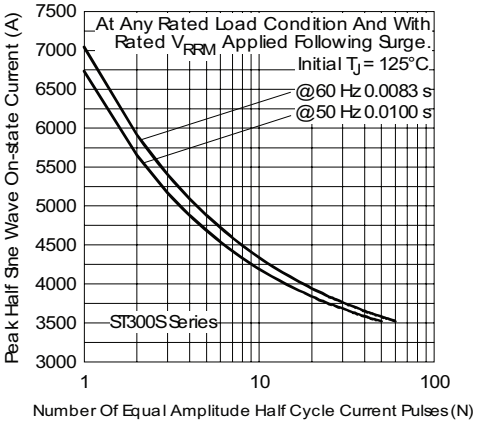


Fig. 5 - Maximum Non-Repetitive Surge Current

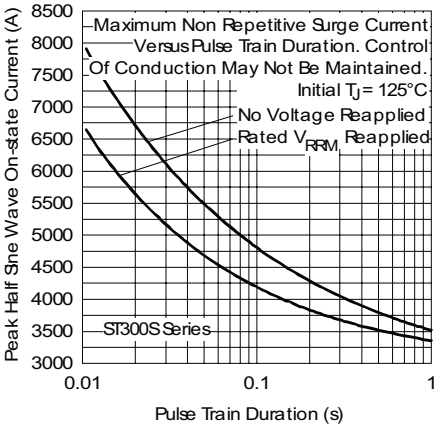


Fig. 6 - Maximum Non-Repetitive Surge Current

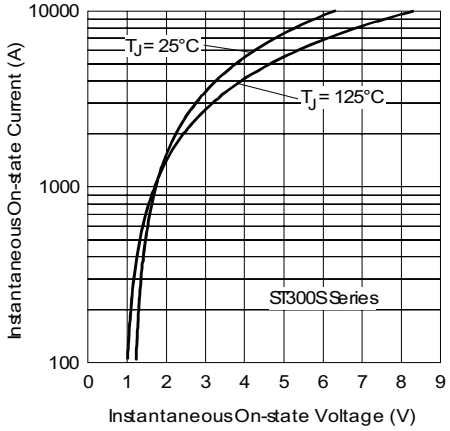


Fig. 7 - On-State Voltage Drop Characteristics

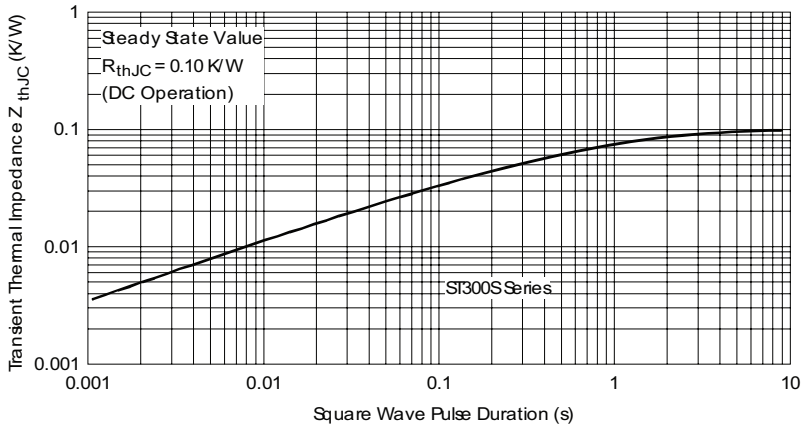


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

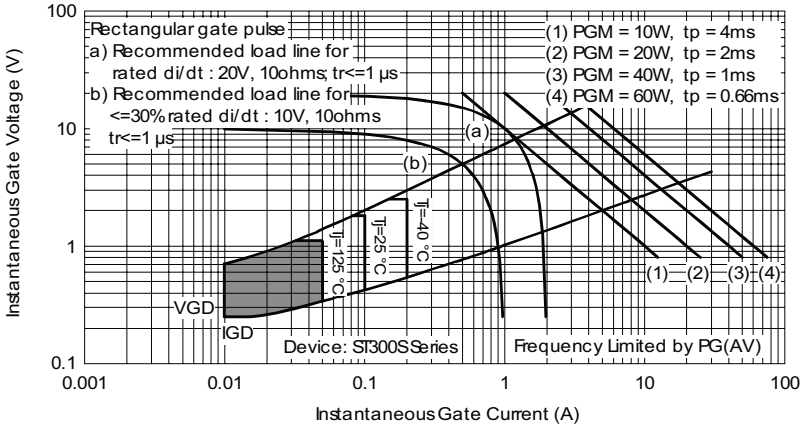


Fig. 9 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code

ST	30	0	S	20	P	0	-	PbF
1	2	3	4	5	6	7	8	9

1 - Thyristor

2 - Essential part number

3 - 0 = Converter grade

4 - S = Compression bonding stud

5 - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)

6 - P = Stud base 3/4" 16UNF-2A threads
M = Stud base metric threads (M24 x 1.5)

7 - 0 = Eyelet terminals (gate and auxiliary cathode leads)
1 = Fast-on terminals (gate and auxiliary cathode leads)
3 = Threaded top terminal 3/8" 24UNF-2A

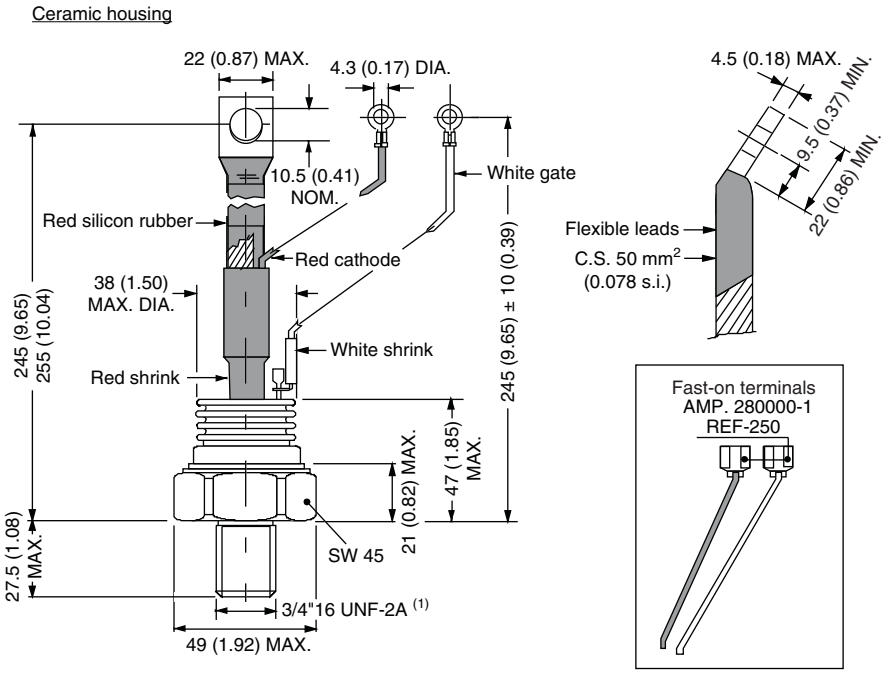
8 - Critical dV/dt:
- None = 500 V/µs (standard value)
- L = 1000 V/µs (special selection)

9 - Lead (Pb)-free

LINKS TO RELATED DOCUMENTS	
Dimensions	http://www.vishay.com/doc?95084

TO-209AE (TO-118)

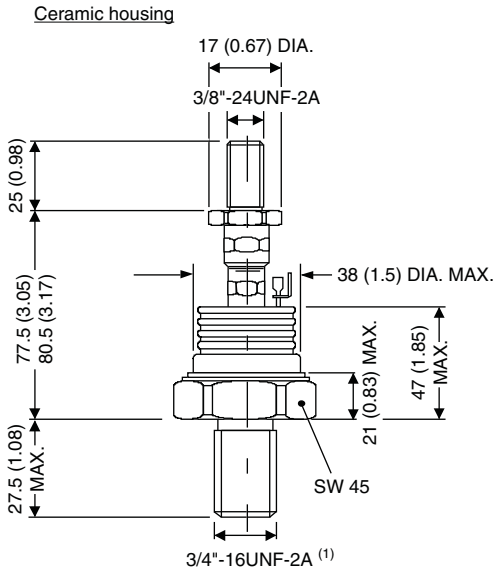
DIMENSIONS - TO-209AE (TO-118) in millimeters (inches)



Note

(1) For metric device: M24 x 1.5 - length screw 21 (0.83) maximum

DIMENSIONS - TO-209AE (TO-118) WITH TOP THREAD TERMINAL 3/8" in millimeters (inches)



Note

(1) For metric device: M24 x 1.5 - length screw 21 (0.83) maximum

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