

Medium Power Thyristors (Stud Version), 50A



FEATURES

- Improved glass passivation for high reliability
- High current rating
- Excellent dynamic characteristics
- $dV/dt = 1000 \text{ V}/\mu\text{s}$ option
- Superior surge capabilities
- Standard package
- Metric threads version available
- Types up to $1600\text{V } V_{\text{DRM}}/V_{\text{RRM}}$
- RoHs compliant



TO-208AC(TO-65)

TYPICAL APPLICATIONS

- Phase control applications in converters
- Lighting circuits
- Battery charges
- Regulated power supplies temperature and speed control circuit
- Can be supplied to meet stringent military, aerospace and other high reliability requirements

PRODUCT SUMMARY

$I_{T(AV)}$	50A
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MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		50	A
	T_C	94	°C
$I_{T(RMS)}$		78.5	A
I_{TSM}	50 HZ	1430	A
	60 HZ	1490	
i^2t	50 HZ	10.22	Ka ² s
	60 HZ	9.32	
$V_{\text{DRM}}/V_{\text{RRM}}$		600 to 1600	V
t_q	Typical	110	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 ⁽¹⁾ V	V _{RSM} , MAXIMUM NON-REPETITIVE PEAK VOLTAGE ⁽²⁾ V	I _{DRM} /I _{RRM} , MAXIMUM AT T _J = T _J MAXIMUM mA
50PT	06	600	700	15
	08	800	900	
	10	1000	1100	
	12	1200	1300	
	16	1600	1700	

Note

- (1) Units may be broken over non-repetitively in the off-state direction without damage, if di/dt does not exceed 20 A/μs
(2) For voltage pulses with tp ≤ 5 ms

FORWARD CONDUCTION					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum average forward current at case temperature	I _{T(AV)}	180° conduction, half sine wave		50	A
				94	°C
Maximum RMS on-state current	I _{T(RMS)}			78.5	A
Maximum peak, one-cycle non-repetitive surge current	I _{TSM}	t = 10ms	No voltage reapplied	1430	A
		t = 8.3ms	No voltage reapplied	1490	
		t = 10ms	100% V _{RRM} reapplied	1200	
		t = 8.3ms	100% V _{RRM} reapplied	1255	
Maximum I ² t for fusing	I ² t	t = 10ms	No voltage reapplied	10.22	A ² s
		t = 8.3ms	No voltage reapplied	9.32	
		t = 10ms	100% V _{RRM} reapplied	7.23	
		t = 8.3ms	100% V _{RRM} reapplied	6.59	
Maximum I ² √t for fusing	I ² √t	t = 0.1 to 10 ms, no voltage reapplied, T _J = T _J maximum		102.2	A ² √s
Low level value of threshold voltage	V _{T(TO)1}	(16.7 % × π × I _{T(AV)} < I < π × I _{T(AV)}), T _J = T _J maximum		0.94	V
High level value of threshold voltage	V _{T(TO)2}	(π × I _{T(AV)} < I < 20 × π × I _{T(AV)}), T _J = T _J maximum		1.08	
Low level value of on-state slope resistance	r _{t1}	(16.7 % × π × I _{T(AV)} < I < π × I _{T(AV)}), T _J = T _J maximum		4.08	mΩ
High level value of on-state slope resistance	r _{t2}	(π × I _{T(AV)} < I < 20 × π × I _{T(AV)}), T _J = T _J maximum		3.34	
Maximum on-state voltage	V _{TM}	I _{pk} = 157 A, T _J = 25°C		1.60	V
Maximum holding current	I _H	T _J = 25 °C, anode supply 22 V, resistive load initial I _T = 2A		150	mA
Latching current	I _L	Anode supply 6V, resistive load		300	

SWITCHING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum rate of rise of turned-on current	di/dt	$T_C = 125^\circ\text{C}$, $V_{DM} = 2/3 V_{DRM}$, $t_p = 200 \mu\text{s}$ $I_G = 0.3\text{A}$, $di_G/dt = 0.3 \text{A}/\mu\text{s}$	150	A/ μs
Typical delay time	t_d	$T_C = 25^\circ\text{C}$, $V_{DM} = \text{Rated } V_{DRM}$, $I_{TM} = 10 \text{A}$ dc resistive circuit Gate pulse = 10V, 15 Ω source, $t_p = 20 \mu\text{s}$	0.9	μs
Typical turn-off time	t_q	$T_C = 125^\circ\text{C}$, $I_{TM} = 50\text{A}$, reapplied $dV/dt = 20 \text{V}/\mu\text{s}$ $dI_r/dt = -10 \text{A}/\mu\text{s}$, $V_R = 50\text{V}$	110	

BLOCKING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum critical rate of rise of off-state voltage	dV/dt	$T_J = 125^\circ\text{C}$, $V_D = 2/3 V_{DRM}$, gate open	1000	V/ μs

TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Maximum peak gate power	P_{GM}	$T_J = T_J$ maximum, $t_p \leq 5 \text{ms}$	10	W	
Maximum average gate power	$P_{G(AV)}$		2.5		
Maximum peak positive gate current	I_{GM}		2.5	A	
Maximum peak positive gate voltage	$+V_{GM}$		20	V	
Maximum peak negative gate voltage	$-V_{GM}$		10		
DC gate current required to trigger	I_{GT}	$T_J = -40^\circ\text{C}$	Maximum required gate trigger current/voltage are the lowest value which will trigger all units 6 V anode to cathode applied	250	mA
		$T_J = 25^\circ\text{C}$		100	
		$T_J = 125^\circ\text{C}$		50	
DC gate voltage required to trigger	V_{GT}	$T_J = -40^\circ\text{C}$	3.5	V	
		$T_J = 25^\circ\text{C}$	2.0		
DC gate current not to trigger	I_{GD}	$T_J = T_J$ maximum, $V_{DRM} = \text{Rated value}$	5.0	mA	
DC gate voltage not to trigger	V_{GD}	$T_J = T_J$ maximum,	0.2	V	

THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum operating junction and storage temperature range	T_J, T_{stg}		- 40 to 125	$^\circ\text{C}$
Maximum thermal resistance, junction to case	R_{thJC}	DC operation	0.35	K/W
Maximum thermal resistance case to heatsink	R_{thCS}	Mounting surface, smooth, flat and greased	0.25	
Allowable mounting torque		Not-lubricated threads	$3.4^{+0}_{-10\%}$ (30)	N · m (lbf · in)
		Lubricated threads	$2.3^{+0}_{-10\%}$ (20)	N · m (lbf · in)
Approximate weight			16	g
			0.56	oz.
Case style		See dimensions - link at the end of datasheet	TO-208AC (TO-65)	

ΔR_{thJc} CONDUCTION				
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION	RECTANGULAR CONDUCTION	TEST CONDUCTIONS	UNITS
180°	0.078	0.057	T _J = T _J maximum	K/W
120°	0.094	0.098		
90°	0.120	0.130		
60°	0.176	0.183		
30°	0.294	0.296		

Note

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

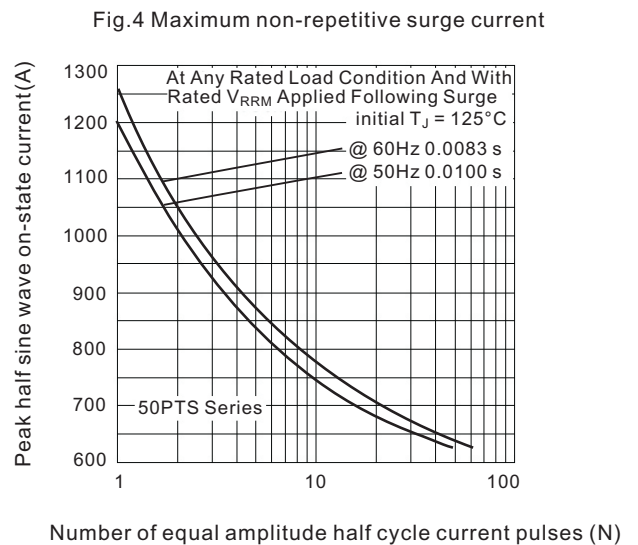
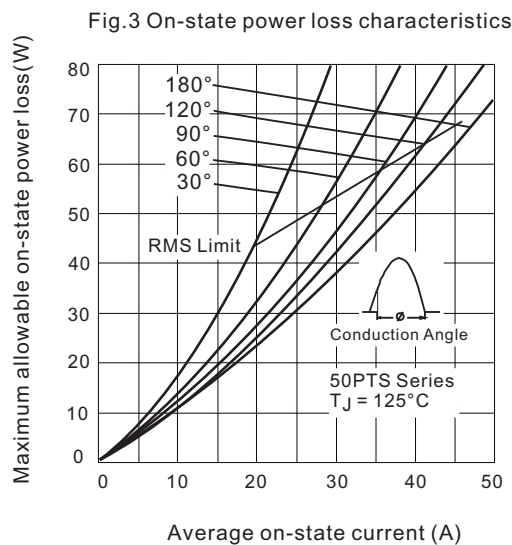
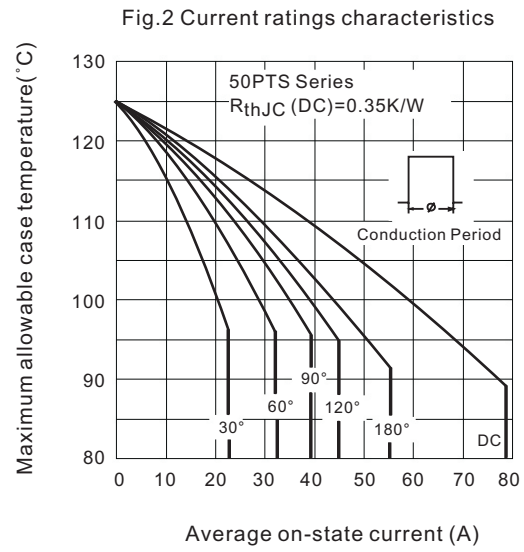
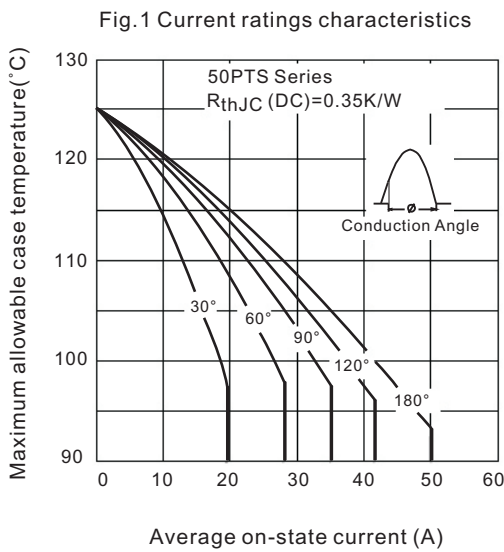


Fig.5 On-state power loss characteristics

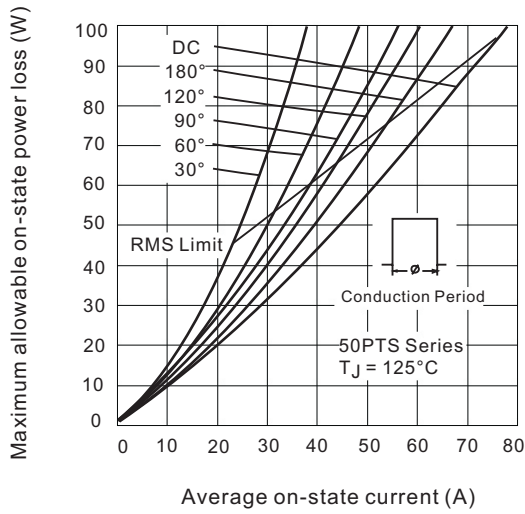


Fig.6 Maximum non-repetitive surge current

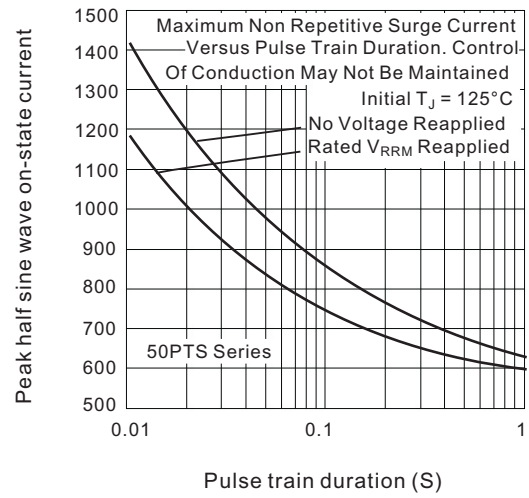


Fig.7 Forward voltage drop characteristics

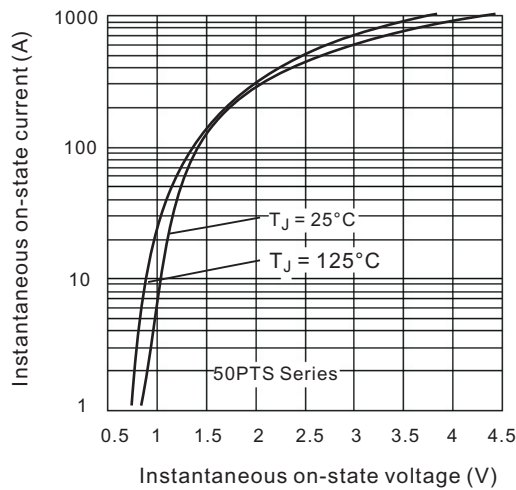


Fig.8 Thermal impedance Z_{thJC} Characteristics

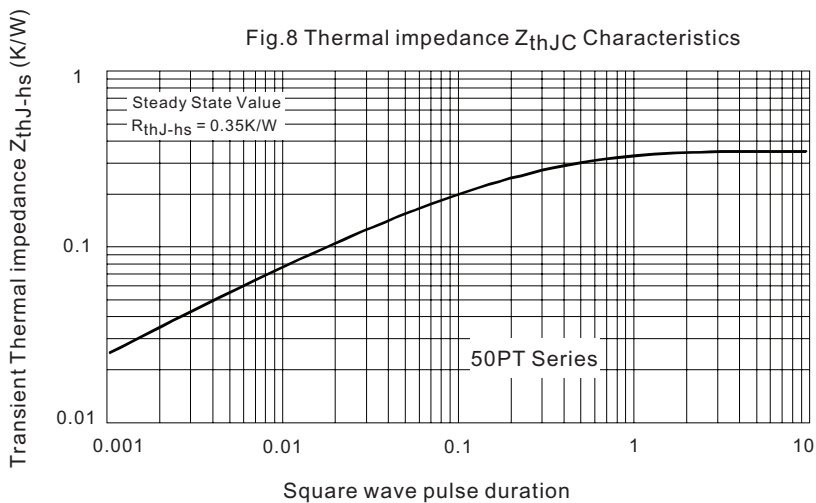
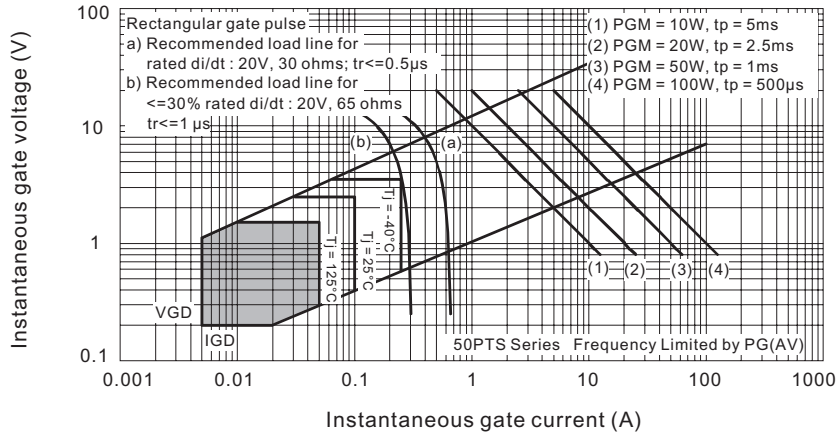


Fig.9 Gate characteristics



ORDERING INFORMATION TABLE

Device code	50	PT	12	S	M
	①	②	③	④	⑤
	①	-	Current Code		
	②	-	for SCR series		
	③	-	Voltage code × 100 = VRRM (see Voltage Ratings table)		
	④	-	S for stud type		
	⑤	-	None = Stud base TO-208AA (TO-65) 1/4"-28 UNF-2A M = Stud base TO-208AA (TO-65) M6×1		

GLASS - METAL SEAL

