

Medium Power Thyristors (Stud Version), 50 A



TO-208AC (TO-65)

FEATURES

- 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 1200 V V_{DRM}/V_{RRM}
- RoHS compliant



TYPICAL APPLICATIONS

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

PRODUCT SUMMARY

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

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		50	A
	T_C	94	$^{\circ}\text{C}$
$I_{T(RMS)}$		80	A
I_{TSM}	50 Hz	1430	A
	60 Hz	1490	
I^2t	50 Hz	10.18	kA^2s
	60 Hz	9.30	
V_{DRM}/V_{RRM}		100 to 1200	V
t_q	Typical	110	μs
T_J		- 40 to 125	$^{\circ}\text{C}$

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
50RIA	10	100	150	15
	20	200	300	
	40	400	500	
	60	600	700	
	80	800	900	
	100	1000	1100	
	120	1200	1300	

Notes

(1) Units may be broken over non-repetitively in the off-state direction without damage, if di/dt does not exceed 20 A/ μ s

(2) For voltage pulses with $t_p \leq 5$ ms

ABSOLUTE MAXIMUM RATINGS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum average on-state current at case temperature	$I_{T(AV)}$	180° sinusoidal conduction		50	A
				94	°C
Maximum RMS on-state current	$I_{T(RMS)}$			80	A
Maximum peak, one-cycle non-repetitive surge current	I_{TSM}	t = 10 ms	No voltage reappplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	A
		t = 8.3 ms			
		t = 10 ms	100 % V_{RRM} reappplied		
		t = 8.3 ms			
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reappplied		kA ² s
		t = 8.3 ms			
		t = 10 ms	100 % V_{RRM} reappplied		
		t = 8.3 ms			
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reappplied, $T_J = T_J$ maximum		101.8	kA ² \sqrt{s}
Low level value of threshold voltage	$V_{T(TO)1}$	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ maximum		0.94	V
High level value of threshold voltage	$V_{T(TO)2}$	$(\pi \times I_{T(AV)} < I < 20 \times \pi \times I_{T(AV)})$, $T_J = T_J$ maximum		1.08	
Low level value of on-state slope resistance	r_{t1}	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ maximum		4.08	m Ω
High level value of on-state slope resistance	r_{t2}	$(\pi \times I_{T(AV)} < I < 20 \times \pi \times I_{T(AV)})$, $T_J = T_J$ 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 $I_T = 2$ A		200	mA
Latching current	I_L	Anode supply 6 V, resistive load		400	



SWITCHING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum rate of rise of turned-on current	di/dt	T _C = 125 °C, V _{DM} = Rated V _{DRM} , Gate pulse = 20 V, 15 Ω, t _p = 6 μs, t _r = 0.1 μs maximum I _{TM} = (2 x rated di/dt) A	200	A/μs
			V _{DRM} ≤ 600 V	
			100	
Typical delay time	t _d	T _C = 25 °C, V _{DM} = Rated V _{DRM} , I _{TM} = 10 A dc resistive circuit Gate pulse = 10 V, 15 Ω source, t _p = 20 μs	0.9	μs
Typical turn-off time	t _q	T _C = 125 °C, I _{TM} = 50 A, reapplied dV/dt = 20 V/μs dI _r /dt = - 10 A/μs, V _R = 50 V	110	

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 100 % rated V _{DRM}	200	V/μs
		T _J = T _J maximum linear to 67 % rated V _{DRM}	500 ⁽¹⁾	

Note

(1) Available with dV/dt = 1000 V/μs, to complete code add S90 i.e. 50RIA120S90

TRIGGERING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak gate power	P _{GM}	T _J = T _J maximum, t _p ≤ 5 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 °C	Maximum required gate trigger current/voltage are the lowest value which will trigger all units 6 V anode to cathode applied	250
		T _J = 25 °C		100
		T _J = 125 °C		50
DC gate voltage required to trigger	V _{GT}	T _J = - 40 °C	3.5	V
		T _J = 25 °C	2.5	
DC gate current not to trigger	I _{GD}	T _J = T _J maximum, V _{DRM} = Rated voltage	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	°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		Non-lubricated threads	3.4 + 0 - 10 % (30)	N · m (lbf · in)
		Lubricated threads	2.3 + 0 - 10 % (20)	
Approximate weight			28	g
			1.0	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 CONDITIONS	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

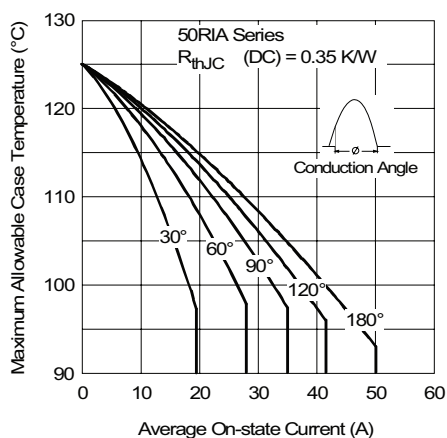


Fig. 1 - Current Ratings Characteristics

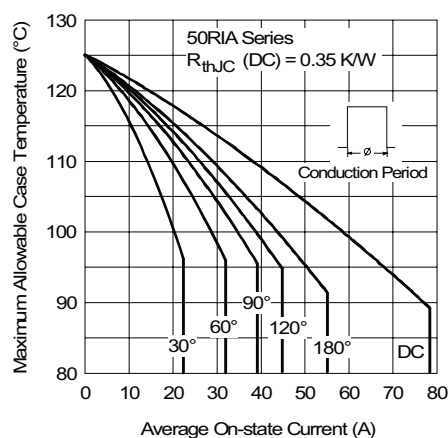


Fig. 2 - Current Ratings Characteristics



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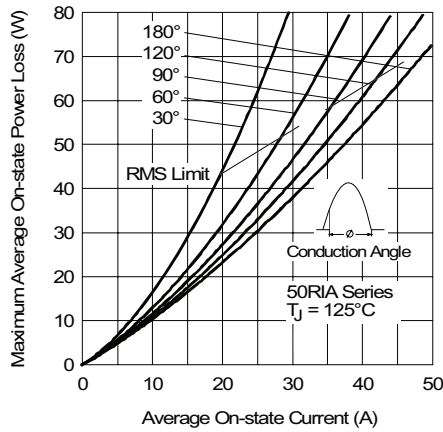


Fig. 3 - On-State Power Loss Characteristics

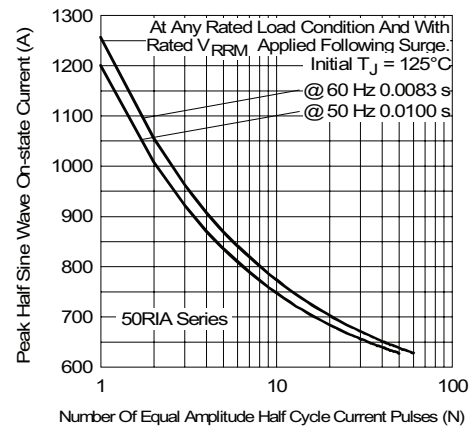


Fig. 5 - Maximum Non-Repetitive Surge Current

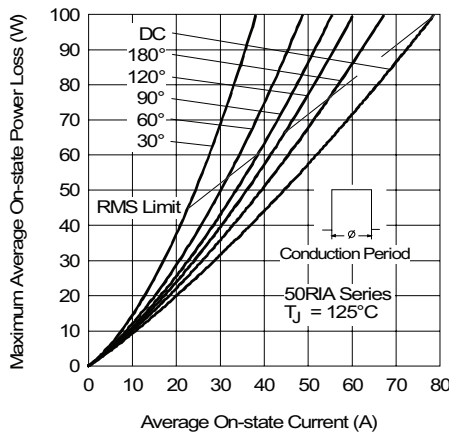


Fig. 4 - On-State Power Loss Characteristics

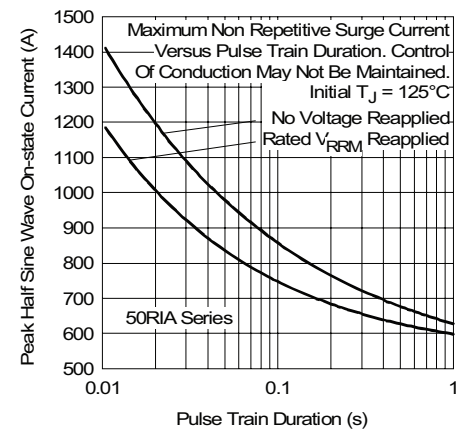


Fig. 6 - Maximum Non-Repetitive Surge Current

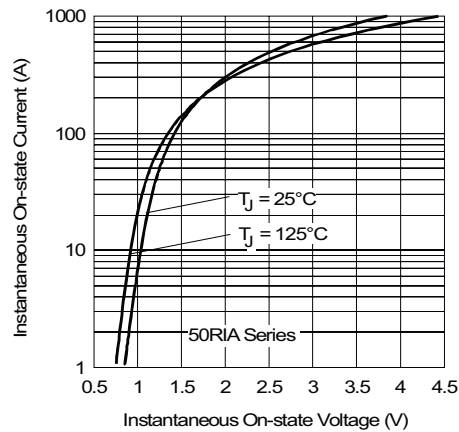


Fig. 7 - Forward Voltage Drop Characteristics

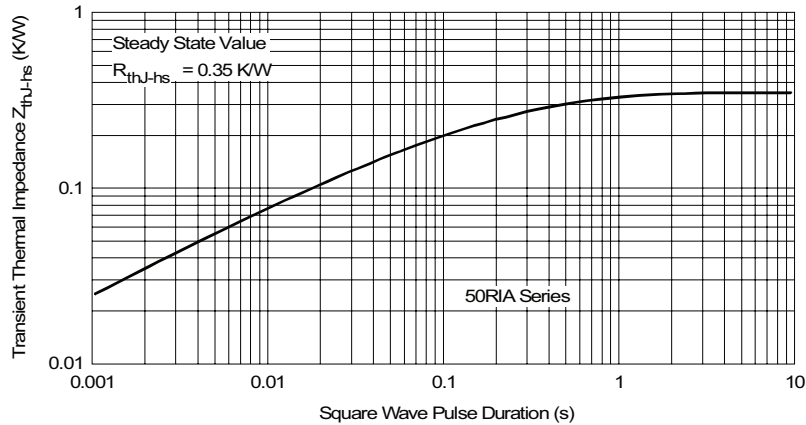


Fig. 8 - Thermal Impedance Z_{thJc} Characteristics

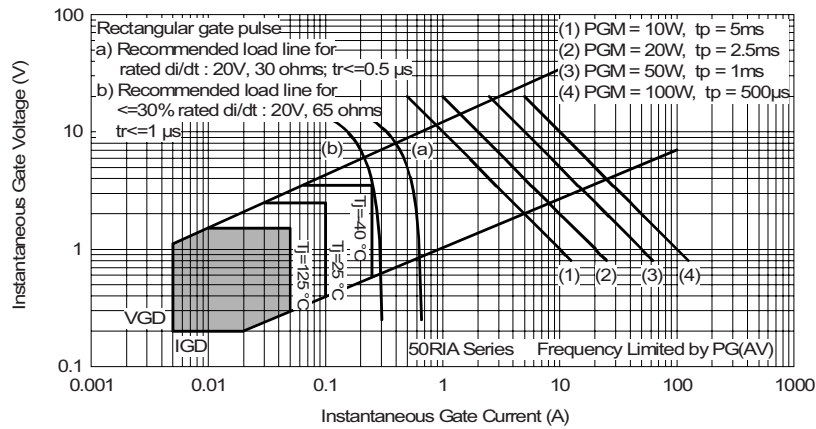


Fig. 9 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code	50	RIA	120	S90	M
	①	②	③	④	⑤

- 1** - Current code
- 2** - Essential part number
- 3** - Voltage code $\times 10 = V_{RRM}$ (see Voltage Ratings table)
- 4** - Critical dV/dt :
 - None = 500 V/ μ s (standard value)
 - S90 = 1000 V/ μ s (special selection)
- 5** -
 - None = Stud base TO-208AC (TO-65) 1/4" 28UNF-2A
 - M = Stud base TO-208AC (TO-65) M6 \times 1

LINKS TO RELATED DOCUMENTS

Dimensions	http://www.vishay.com/doc?95334
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