

Medium Power Thyristors (Stud Version), 10 A



TO-208AA (TO-48)

FEATURES

- Improved glass passivation for high reliability and exceptional stability at high temperature
- High di/dt and dV/dt capabilities
- Standard package
- Low thermal resistance
- Metric threads version available
- Types up to 1200 V V_{DRM}/V_{RRM}
- RoHS compliant
- Designed and qualified for industrial and consumer level



TYPICAL APPLICATIONS

- Medium power switching
- Phase control applications
- Can be supplied to meet stringent military, aerospace and other high reliability requirements

MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		10	A
	T_C	85	°C
$I_{T(RMS)}$		25	A
I_{TSM}	50 Hz	225	A
	60 Hz	240	
I^2t	50 Hz	255	A^2s
	60 Hz	233	
V_{DRM}/V_{RRM}		100 to 1200	V
t_q	Typical	110	μs
T_J		- 65 to 125	°C

10RIA Series

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(Stud Version), 10 A



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
10RIA	10	100	150	20
	20	200	300	10
	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° conduction, half sine wave		10	A	
				85	°C	
Maximum RMS on-state current	I _{T(RMS)}			25	A	
Maximum peak, one-cycle non-repetitive surge current	I _{TSM}	t = 10 ms	No voltage reapplied	225	A	
		t = 8.3 ms	100 % V _{RRM} reapplied	240		
		t = 10 ms		190		
		t = 8.3 ms		200		
Maximum I ² t for fusing	I ² t	t = 10 ms	No voltage reapplied	255	A ² s	
		t = 8.3 ms	100 % V _{RRM} reapplied	233		
		t = 10 ms		180		
		t = 8.3 ms		165		
Maximum I ² \sqrt{t} for fusing	I ² \sqrt{t}	t = 0.1 to 10 ms, no voltage reapplied		2550	A ² \sqrt{s}	
Low level value of threshold voltage	V _{T(TO)1}	(16.7 % \times π \times I _{T(AV)} < I < π \times I _{T(AV)}), T _J = T _J maximum		1.10	V	
High level value of threshold voltage	V _{T(TO)2}	(I > π \times I _{T(AV)}), T _J = T _J maximum		1.39		
Low level value of on-state slope resistance	r _{t1}	(16.7 % \times π \times I _{T(AV)} < I < π \times I _{T(AV)}), T _J = T _J maximum		24.3	mΩ	
High level value of on-state slope resistance	r _{t2}	(I > π \times I _{T(AV)}), T _J = T _J maximum		16.7		
Maximum on-state voltage	V _{TM}	I _{pk} = 32 A, T _J = 25 °C, t _p = 10 ms sine pulse		1.75	V	
Maximum holding current	I _H	T _J = 25 °C, anode supply 12 V resistive load		130	mA	
Typical latching current	I _L			200		



SWITCHING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum rate of rise of turned-on current	dI/dt	$T_J = T_J$ maximum, V_{DM} = Rated V_{DRM} Gate pulse = 20 V, 15 Ω , $t_p = 6 \mu s$, $t_r = 0.1 \mu s$ maximum $I_{TM} = (2 \times \text{rated dI/dt}) A$	200	A/ μs
			180	
			160	
			150	
Typical turn-on time	t_{gt}	$T_J = 25^\circ C$, at rated V_{DRM}/V_{RRM} , $T_J = 125^\circ C$	0.9	μs
Typical reverse recovery time	t_{rr}	$T_J = T_J$ maximum, $I_{TM} = I_{T(AV)}$, $t_p > 200 \mu s$, $dI/dt = -10 A/\mu s$	4	
Typical turn-off time	t_q	$T_J = T_J$ maximum, $I_{TM} = I_{T(AV)}$, $t_p > 200 \mu s$, $V_R = 100 V$, $dI/dt = -10 A/\mu s$, $dV/dt = 20 V/\mu s$ linear to 67 % V_{DRM} , gate bias 0 V to 100 W	110	

Note

- $t_q = 10 \mu s$ up to 600 V, $t_q = 30 \mu s$ up to 1600 V available on special request

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}	100	V/ μs
		$T_J = T_J$ maximum linear to 67 % rated V_{DRM}	300 ⁽¹⁾	

Note

⁽¹⁾ Available with: $dV/dt = 1000 V/\mu s$, to complete code add S90 i.e. 10RIA120S90

TRIGGERING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum peak gate power	P_{GM}	$T_J = T_J$ maximum	8.0	W
Maximum average gate power	$P_{G(AV)}$		2.0	
Maximum peak positive gate current	I_{GM}	$T_J = T_J$ maximum	1.5	A
Maximum peak negative gate voltage	$-V_{GM}$	$T_J = T_J$ maximum	10	V
DC gate current required to trigger	I_{GT}	$T_J = -65^\circ C$	90	mA
		$T_J = 25^\circ C$	60	
		$T_J = 125^\circ C$	35	
DC gate voltage required to trigger	V_{GT}	$T_J = -65^\circ C$	3.0	V
		$T_J = 25^\circ C$	2.0	
		$T_J = 125^\circ C$	1.0	
DC gate current not to trigger	I_{GD}	$T_J = T_J$ maximum, V_{DRM} = Rated value	2.0	mA
DC gate voltage not to trigger	V_{GD}	$T_J = T_J$ maximum, V_{DRM} = Rated value	0.2	V

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THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum operating junction and storage temperature range	T_J, T_{Sg}		- 65 to 125	°C
Maximum thermal resistance, junction to case	R_{thJC}	DC operation	1.85	K/W
Maximum thermal resistance, case to heatsink	R_{thCS}	Mounting surface, smooth, flat and greased	0.35	
			TO NUT TO DEVICE	
Mounting torque		Lubricated threads (Non-lubricated threads)	20 (27.5)	25
			0.23 (0.32)	0.29
			2.3 (3.1)	2.8
Approximate weight			14	g
			0.49	oz.
Case style		See dimensions - link at the end of datasheet	TO-208AA (TO-48)	

ΔR_{thJC} CONDUCTION				
CONDUCTION ANGLE	SINUSOIDAL CONDUCTION	RECTANGULAR CONDUCTION	TEST CONDITIONS	UNITS
180°	0.44	0.32	$T_J = T_{J\ maximum}$	K/W
120°	0.53	0.56		
90°	0.68	0.75		
60°	1.01	1.05		
30°	1.71	1.73		

Note

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

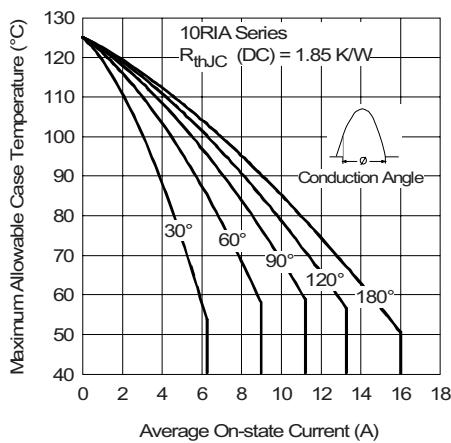


Fig. 1 - Current Ratings Characteristics

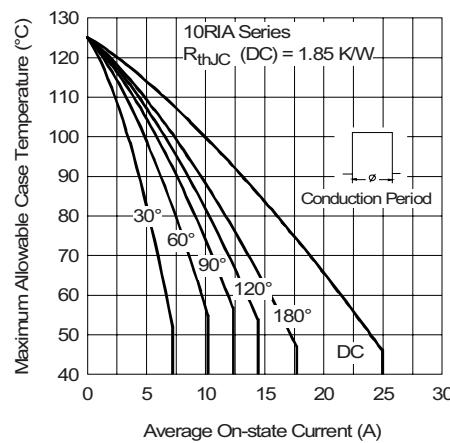
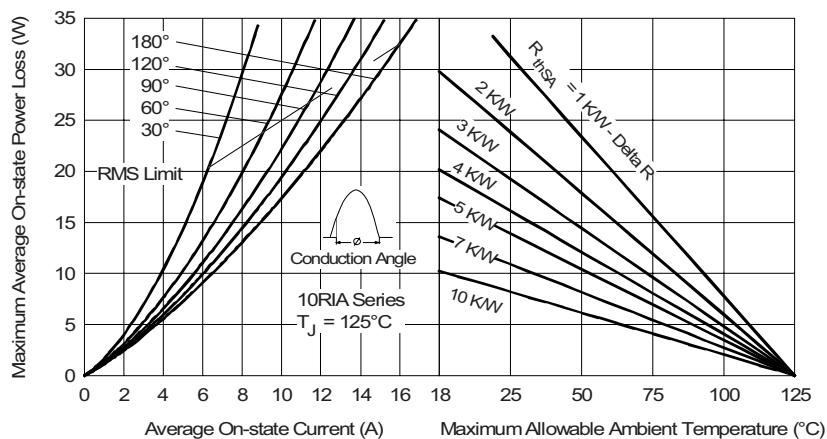
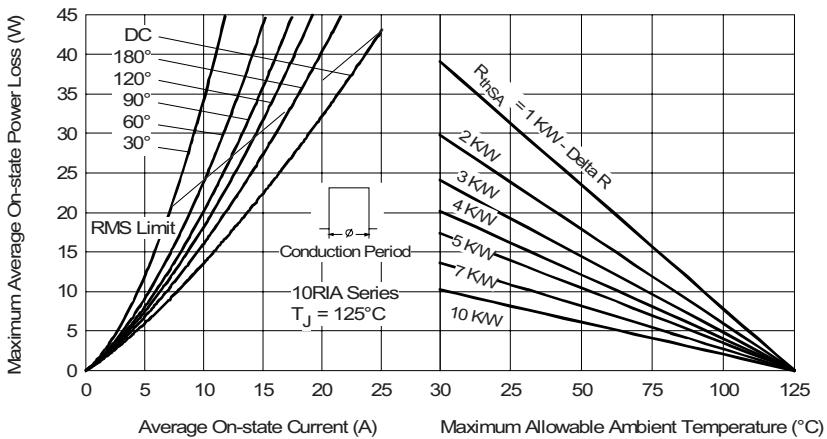
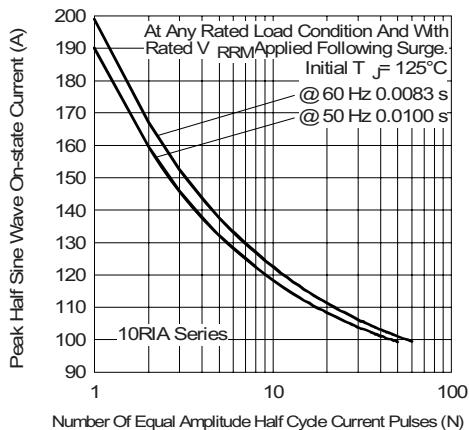
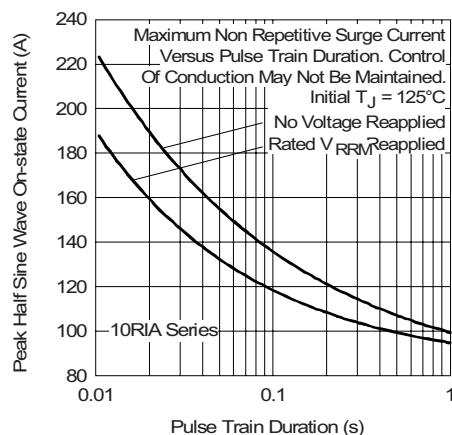


Fig. 2 - Current Ratings Characteristics

**Medium Power Thyristors Vishay High Power Products
(Stud Version), 10 A**

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

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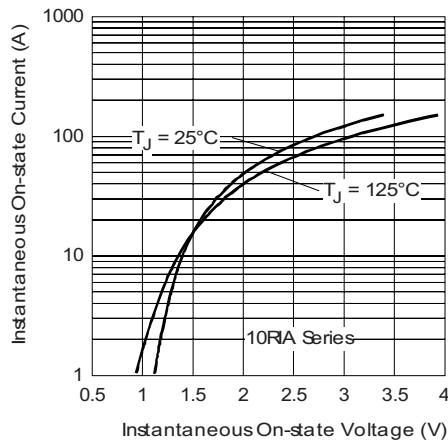


Fig. 7 - Forward Voltage Drop Characteristics

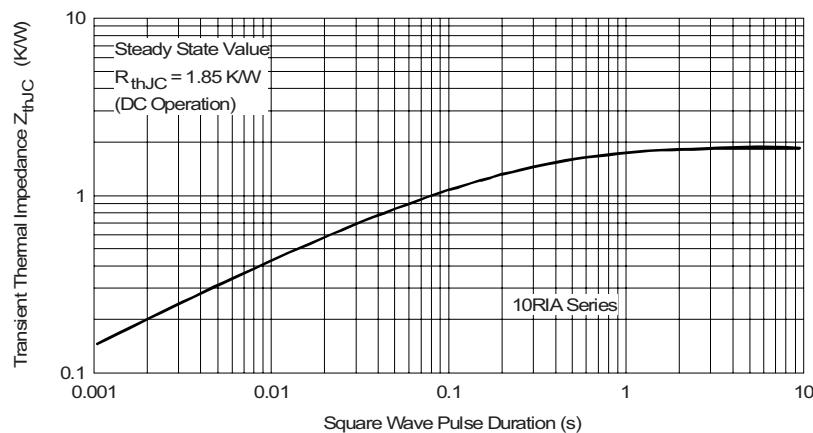


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

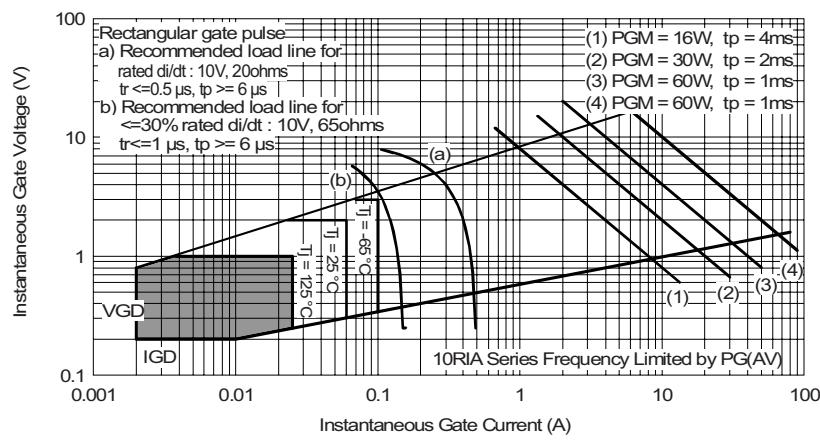


Fig. 9 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code	10	RIA	120	M	S90
	1	2	3	4	5
	1	- Current code			
	2	- Essential part number			
	3	- Voltage code x 10 = V_{RRM} (see Voltage Ratings table)			
	4	- None = Stud base TO-208AA (TO-48) 1/4" 28UNF-2A M = Stud base TO-208AA (TO-48) M6 x 1			
	5	- Critical dV/dt: None = 300 V/μs (standard value) S90 = 1000 V/μs (special selection)			

LINKS TO RELATED DOCUMENTS	
Dimensions	http://www.vishay.com/doc?95333

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