Bulletin I2405 rev. A 07/00

International
IOR Rectifier

10RIA SERIES

MEDIUM POWER THYRISTORS **Stud Version**

10A

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 1200V V_{DRM}/ V_{RRM}

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

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

Case Style
TO-208AA (TO-48)

ELECTRICAL SPECIFICATIONS

Voltage Ratings

Type number	Voltage Code	V_{DRM}/V_{RRM}, max. repetitive peak and off-state voltage (1) V	V_{RSM}, maximum non-repetitive peak voltage (2) V	I_{DRM}/I_{RRM} max. @ $T_J = T_J$ max. mA
10RIA	10	100	150	10
	20	200	300	
	40	400	500	
	60	600	700	
	80	800	900	
	100	1000	1100	
	120	1200	1300	

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

On-state Conduction

Parameter		10RIA	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	10	A	180° conduction, half sine wave		
	@ Case temperature	85	°C			
$I_{T(RMS)}$	Max. RMS on-state current	25	A			
I_{TSM}	Max. peak, one-cycle non-repetitive surge current	225	A	t = 10ms	No voltage reapplied	Sinusoidal half wave, Initial $T_J = T_J$ max.
		240		t = 8.3ms		
		190		t = 10ms	100% V_{RRM} reapplied	
		200		t = 8.3ms		
I^2t	Maximum I^2t for fusing	255	A^2s	t = 10ms	No voltage reapplied	
		233		t = 8.3ms		
		180		t = 10ms	100% V_{RRM} reapplied	
		165		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	2550	$A^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied		
$V_{T(TO)1}$	Low level value of threshold voltage	1.10	V	(16.7% x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ max.		
$V_{T(TO)2}$	High level value of threshold voltage	1.39		(I > π x $I_{T(AV)}$), $T_J = T_J$ max.		
r_{t1}	Low level value of on-state slope resistance	24.3	mΩ	(16.7% x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ max.		
r_{t2}	High level value of on-state slope resistance	16.7		(I > π x $I_{T(AV)}$), $T_J = T_J$ max.		
V_{TM}	Max. on-state voltage	1.75	V	I_{pk} = 32A, T_J = 25°C t_p = 10ms sine pulse		
I_H	Maximum holding current	130	mA	T_J = 25°C, anode supply 12V resistive load		
I_L	Typical latching current	200				

Switching

	Parameter		10RIA	Units	Conditions
di/dt	Max. rate of rise of turned-on current	$V_{DRM} \leq 600V$	200	A/µs	$T_J = T_J$ max., V_{DM} = rated V_{DRM} Gate pulse = 20V, 15Ω, t_p = 6µs, t_r = 0.1µs max. I_{TM} = (2x rated di/dt) A
		$V_{DRM} \leq 800V$	180		
		$V_{DRM} \leq 1000V$	160		
		$V_{DRM} \leq 1600V$	150		
t_{gt}	Typical turn-on time		0.9	µs	T_J = 25°C, at = rated V_{DRM}/V_{RRM}, T_J = 125°C
t_{rr}	Typical reverse recovery time		4		$T_J = T_J$ max., $I_{TM} = I_{T(AV)}$, t_p > 200µs, di/dt = -10A/µs
t_q	Typical turn-off time		110		$T_J = T_J$ max., $I_{TM} = I_{T(AV)}$, t_p > 200µs, V_R = 100V, di/dt = -10A/µs, dv/dt = 20V/µs linear to 67% V_{DRM}, gate bias 0V-100W

(*) t_q = 10µsup to 600V, t_q = 30µs up to 1600V available on special request.

Blocking

	Parameter	10RIA	Units	Conditions
dv/dt	Max. critical rate of rise of off-state voltage	100	V/µs	$T_J = T_J$ max. linear to 100% rated V_{DRM}
		300 (*)		$T_J = T_J$ max. linear to 67% rated V_{DRM}

(**) Available with: dv/dt = 1000V/µs, to complete code add S90 i.e. 10RIA120S90.

Triggering

	Parameter	10RIA	Units	Conditions
P_{GM}	Maximum peak gate power	8.0	W	$T_J = T_J$ max.
$P_{G(AV)}$	Maximum average gate power	2.0		
I_{GM}	Max. peak positive gate current	1.5	A	$T_J = T_J$ max.
$-V_{GM}$	Maximum peak negative gate voltage	10	V	$T_J = T_J$ max.
I_{GT}	DC gate current required to trigger	90 60 35	mA	T_J = - 65°C T_J = 25°C T_J = 125°C Max. required gate trigger current/ voltage are the lowest value which will trigger all units 6V anode-to-cathode applied
V_{GT}	DC gate voltage required to trigger	3.0 2.0 1.0	V V	T_J = - 65°C T_J = 25°C T_J = 125°C
I_{GD}	DC gate current not to trigger	2.0	mA	$T_J = T_J$ max., V_{DRM} = rated value
V_{GD}	DC gate voltage not to trigger	0.2	V	$T_J = T_J$ max. V_{DRM} = rated value Max. gate current/ voltage not to trigger is the max. value which will not trigger any unit with rated V_{DRM} anode-to-cathode applied

Thermal and Mechanical Specification

	Parameter	10RIA		Units	Conditions
T_J	Max. operating temperature range	- 65 to 125		°C	
T_{stg}	Max. storage temperature range	- 65 to 125		°C	
R_{thJC}	Max. thermal resistance, junction to case	1.85		K/W	DC operation
R_{thCS}	Max. thermal resistance, case to heatsink	0.35		K/W	Mounting surface, smooth, flat and greased
T	Mounting torque	to nut	to device		
		20(27.5)	25	lbf-in	Lubricated threads
		0.23(0.32)	0.29	kgf.m	(Non-lubricated threads)
		2.3(3.1)	2.8	Nm	
wt	Approximate weight	14 (0.49)		g (oz)	
	Case style	TO-208AA (TO-48)			See Outline Table

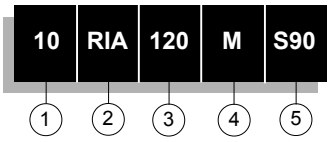
ΔR_{thJC} Conduction

(The following table shows the increment of thermal resistence R_{thJC} when devices operate at different conduction angles than DC)

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.44	0.32	K/W	$T_J = T_J$ max.
120°	0.53	0.56		
90°	0.68	0.75		
60°	1.01	1.05		
30°	1.71	1.73		

Ordering Information Table

Device Code



1 - Current code

2 - Essential part number

3 - Voltage code: Code x 10 = V_{RRM} (See Voltage Rating Table)

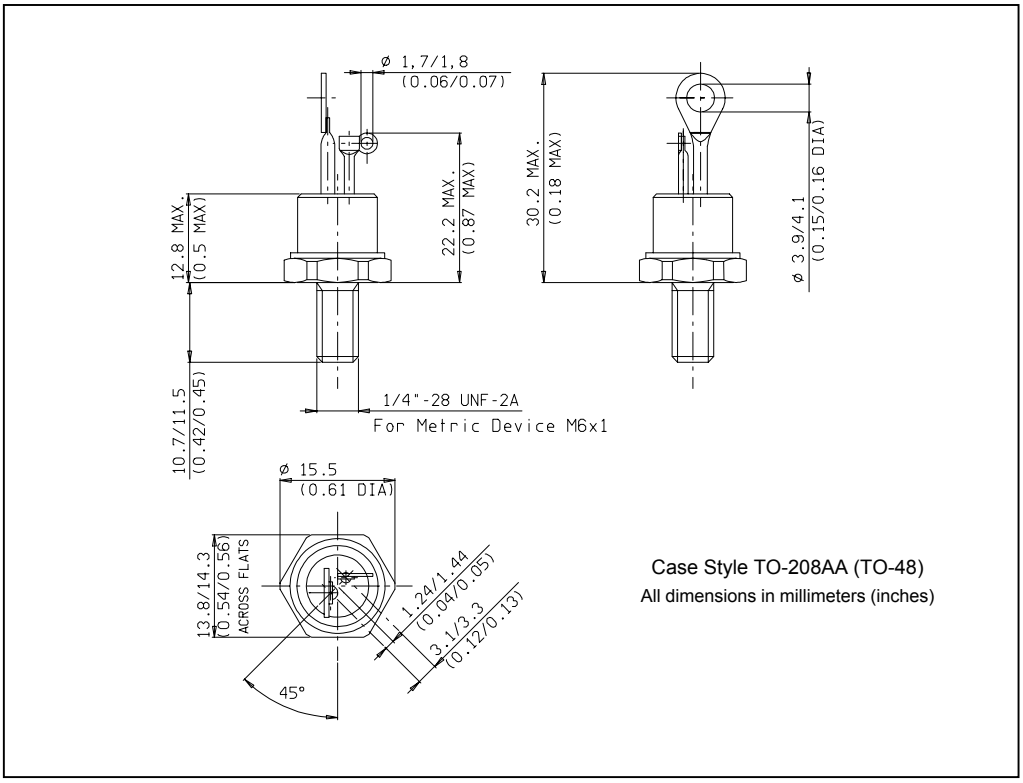
4 - None = Stud base TO-208AA (TO-48) 1/4" 28UNF-2A

M = Stud base TO-208AA (TO-48) M6 X 1

5 - Critical dv/dt: None = 300V/µs (Standard value)

S90 = 1000V/µs (Special selection)

Outline Table



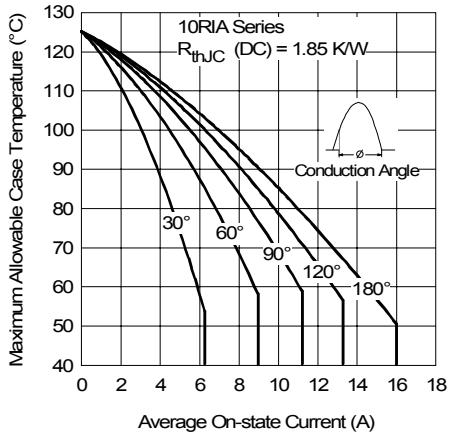


Fig. 1 - Current Ratings Characteristic

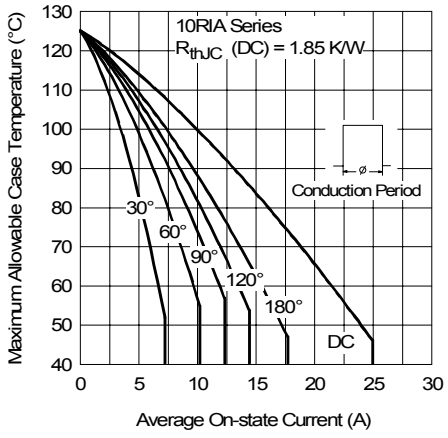


Fig. 2 - Current Ratings Characteristic

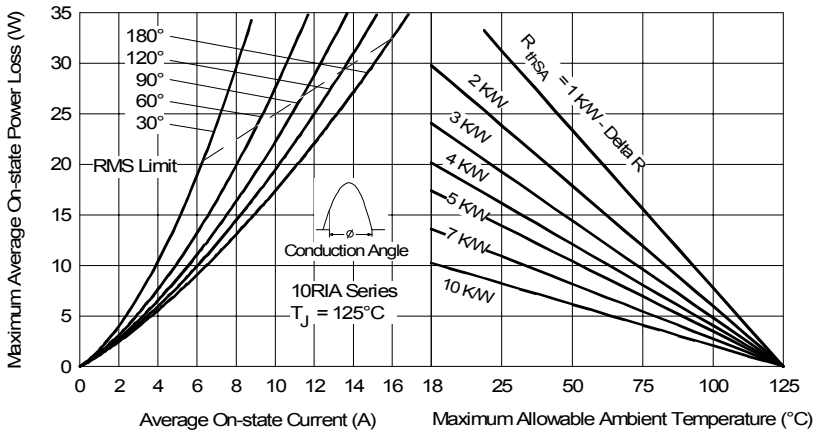


Fig. 3 - On-state Power Loss Characteristics

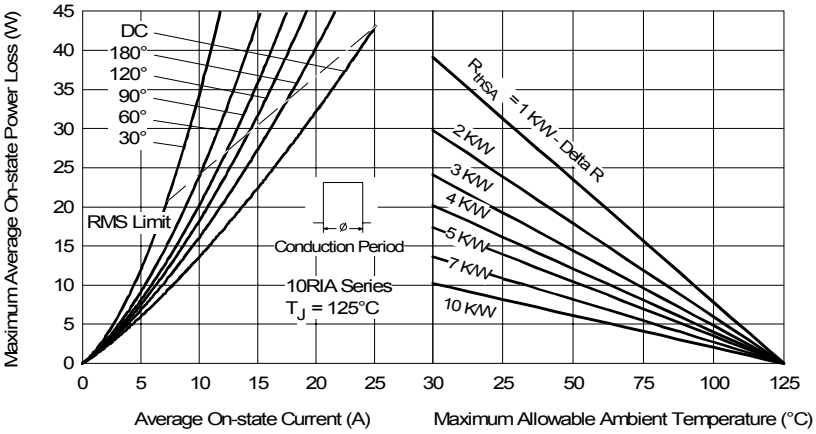


Fig. 4 - On-state Power Loss Characteristics

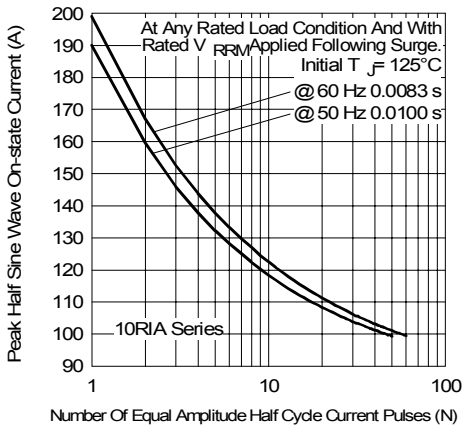


Fig. 5 - Maximum Non-Repetitive Surge Current

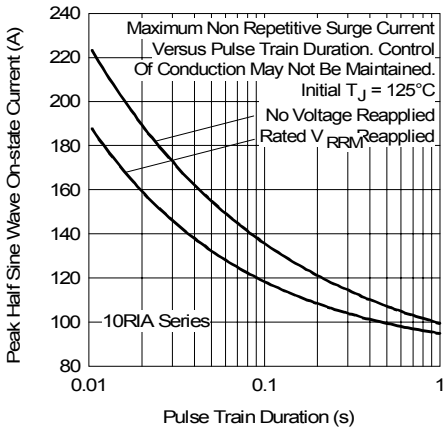


Fig. 6 - Maximum Non-Repetitive Surge Current

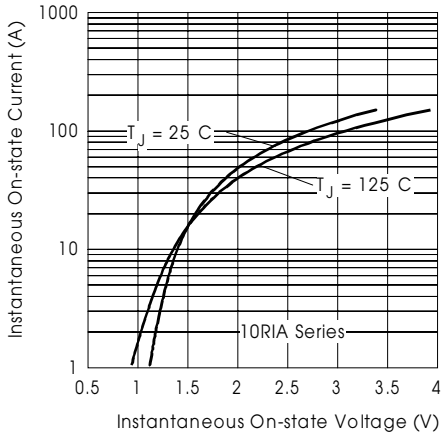


Fig. 7 - Forward Voltage Drop Characteristics

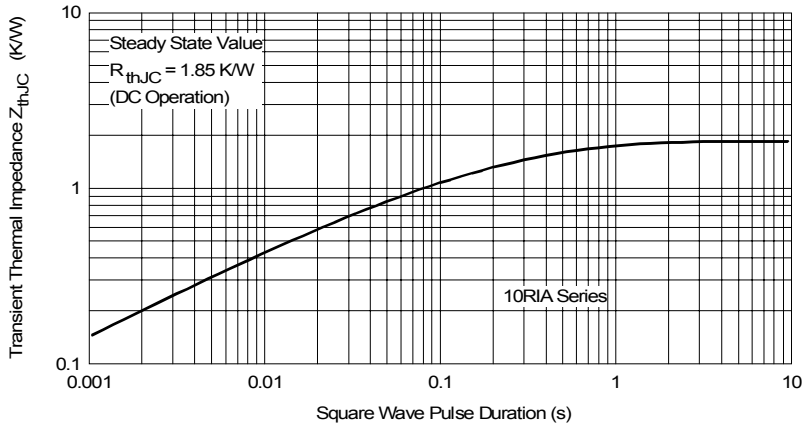


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

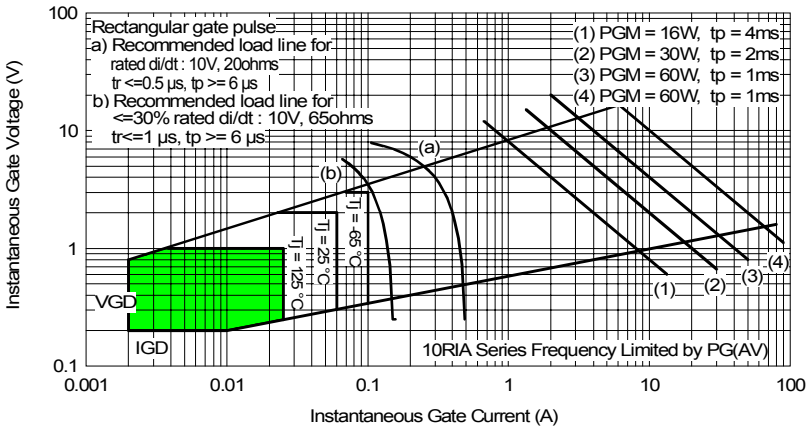


Fig. 9 - Gate Characteristics

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