Bulletin I2404 rev. A 07/00

International
IOR Rectifier

16RIA SERIES

MEDIUM POWER THYRISTORS

Stud Version

16A

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 1600V 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		16RIA		Units
		10 to 120	140 to 160	
$I_{T(AV)}$		16	16	A
	@ T_C	85	85	°C
$I_{T(RMS)}$		35	35	A
I_{TSM}	@50Hz	340	225	A
	@60Hz	360	235	A
I^2t	@50Hz	574	255	A^2s
	@60Hz	524	235	A^2s
V_{DRM}/V_{RRM}		100 to 1200	1400 to 1600	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
16RIA	10	100	150	20
	20	200	300	10
	40	400	500	
	60	600	700	
	80	800	900	
	100	1000	1100	
	120	1200	1300	
	140	1400	1500	
	160	1600	1700	

(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 $t_p \le 5ms$

On-state Conduction

	Parameter	16RIA 10 to 120	16RIA 140 to 160	Units	Conditions		
$I_{T(AV)}$	Max. average on-state current	16	16	A	180° sinusoidal conduction		
	@ Case temperature	85	85	°C			
$I_{T(RMS)}$	Max. RMS on-state current	35	35	A			
I_{TSM}	Max. peak, one-cycle non-repetitive surge current	340	225	A	t = 10ms	No voltage reapplied	Sinusoidal half wave, Initial $T_J = T_J$ max.
		360	235		t = 8.3ms		
		285	190		t = 10ms	100% V_{RRM} reapplied	
		300	200		t = 8.3ms		
I^2t	Maximum I^2t for fusing	574	255	A^2s	t = 10ms	No voltage reapplied	
		524	235		t = 8.3ms		
		405	180		t = 10ms	100% V_{RRM} reapplied	
		375	165		t = 8.3ms		
$I^2\sqrt{t}$	Maximum $I^2\sqrt{t}$ for fusing	5740	2550	$A^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied, $T_J = T_J$ max.		
$V_{T(TO)1}$	Low level value of threshold voltage	0.97	1.14	V	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ max.		
$V_{T(TO)2}$	High level value of threshold voltage	1.24	1.31		$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max.		
r_{t1}	Low level value of on-state slope resistance	17.9	14.83	mΩ	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)})$, $T_J = T_J$ max.		
r_{t2}	High level value of on-state slope resistance	13.6	12.03		$(I > \pi \times I_{T(AV)})$, $T_J = T_J$ max.		
V_{TM}	Max. on-state voltage	1.75 ---	--- 1.80	V	I_{pk} = 50 A, T_J = 25°C		
I_H	Maximum holding current	130		mA	T_J = 25°C. Anode supply 6V, resistive load,		
I_L	Latching current	200					

Switching

	Parameter	16RIA	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	16RIA	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. 16RIA160S90.

Triggering

	Parameter	16RIA	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	mA	T_J = - 65°C	Max. required gate trigger current/ voltage are the lowest value which will trigger all units 6V anode-to-cathode applied
		60		T_J = 25°C	
		35		T_J = 125°C	
V_{GT}	DC gate voltage required to trigger	3.0		T_J = - 65°C	
		2.0	V	T_J = 25°C	
		1.0	V	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	16RIA		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	0.86		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

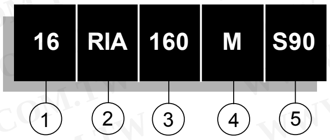
ΔR_{thJC} Conduction

(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°	0.21	0.15	K/W	$T_J = T_J$ max.
120°	0.25	0.25		
90°	0.31	0.34		
60°	0.45	0.47		
30°	0.76	0.76		

Ordering Information Table

Device Code



1 - Current code

2 - Essential part number

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

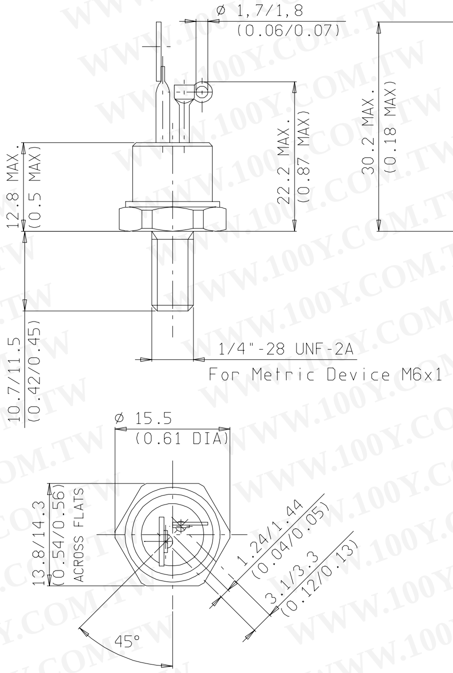
4 - None = Stud base TO-208AA (TO-48) 1/4" 28UNF-2A

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



Case Style TO-208AA (TO-48)

All dimensions in millimeters (inches)

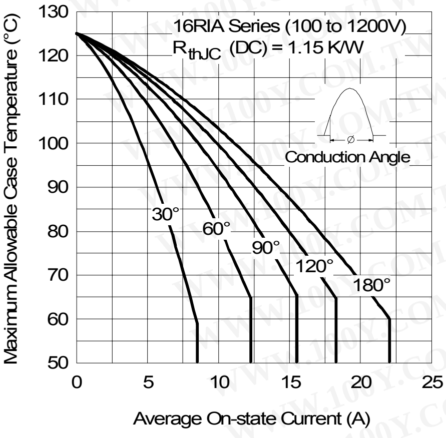


Fig. 1 - Current Ratings Characteristic

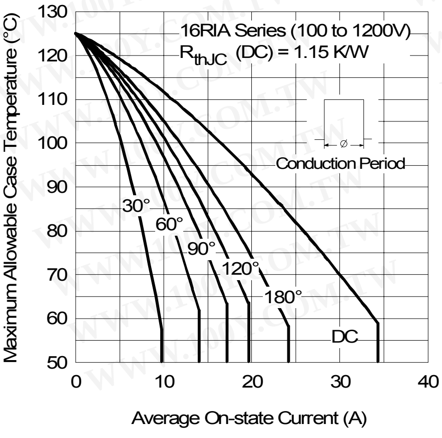


Fig. 2 - Current Ratings Characteristic

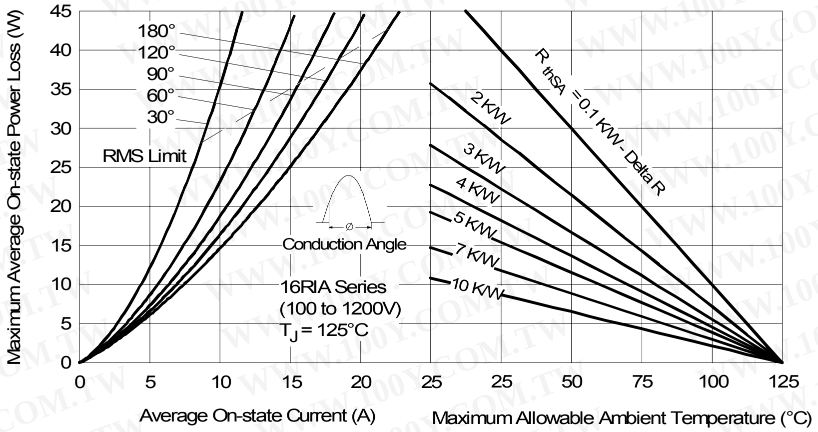


Fig. 3 - On-state Power Loss Characteristics

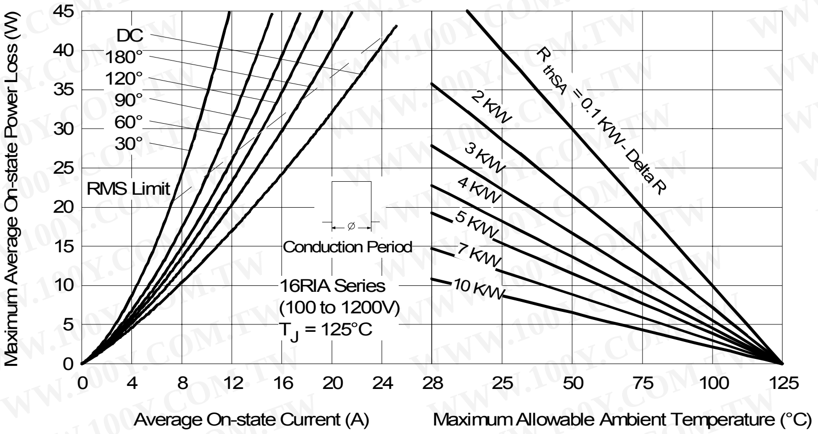


Fig. 4 - On-state Power Loss Characteristics

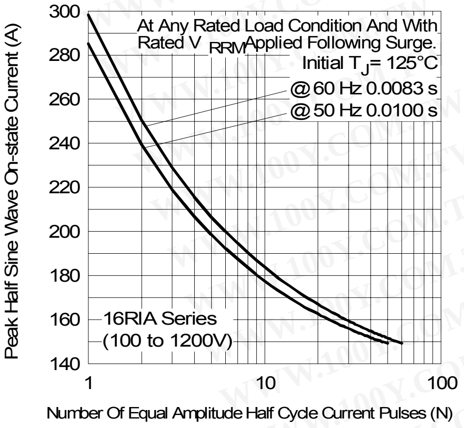


Fig. 5 - Maximum Non-Repetitive Surge Current

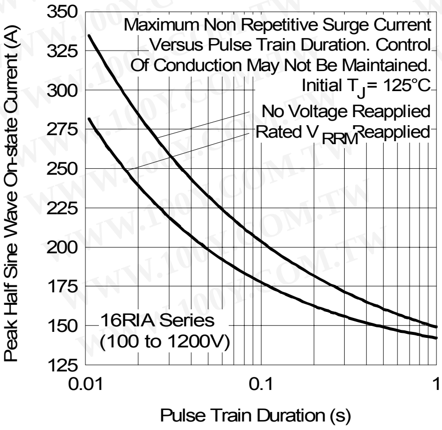


Fig. 6 - Maximum Non-Repetitive Surge Current

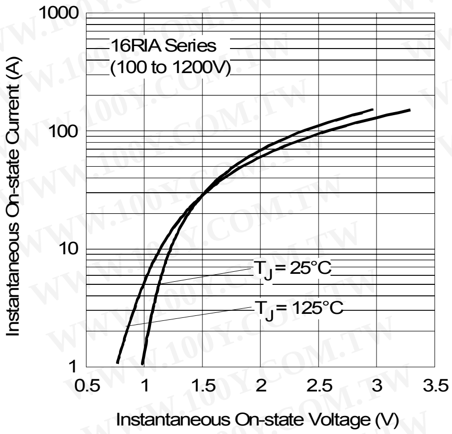


Fig. 7 - Forward Voltage Drop Characteristics

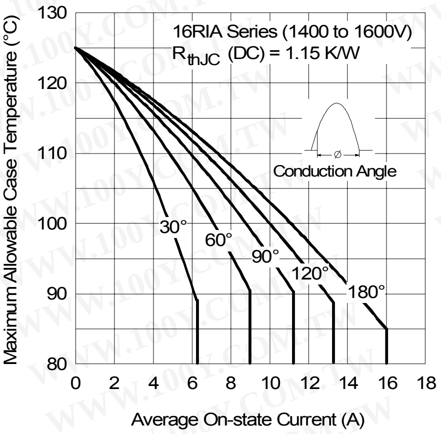


Fig. 8 - Current Ratings Characteristics

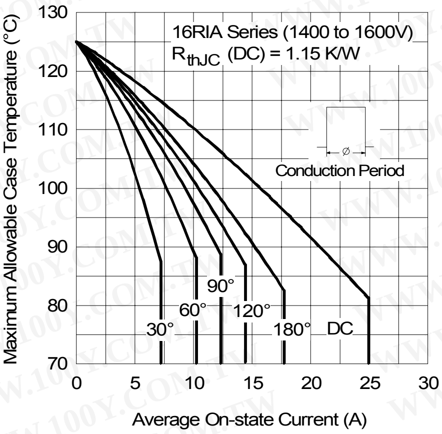


Fig. 9 - Current Ratings Characteristics

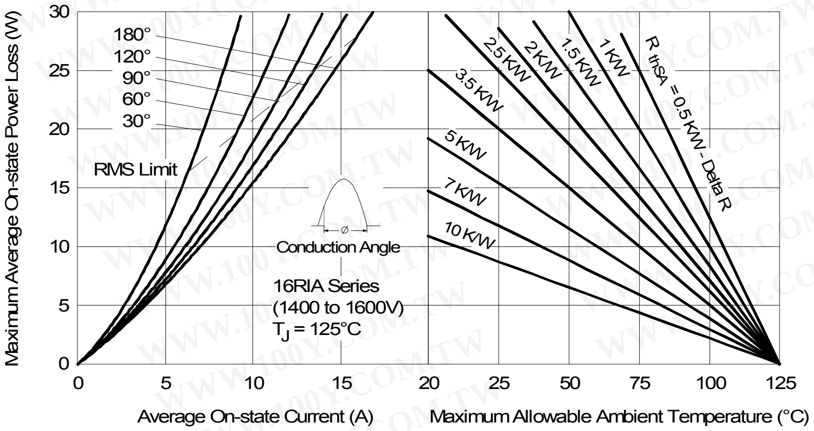


Fig. 10 - On-state Power Loss Characteristics

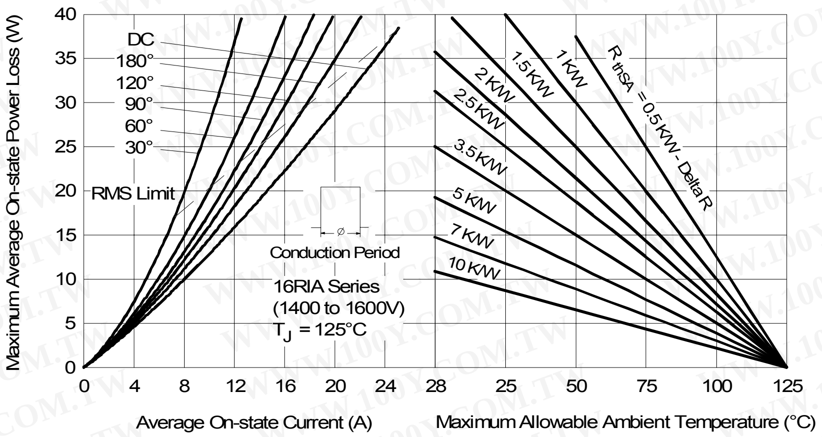


Fig. 11 - On-state Power Loss Characteristics

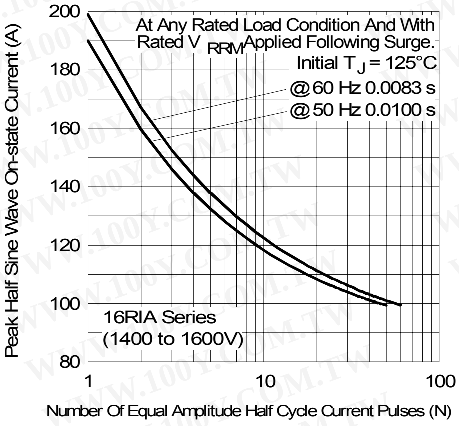


Fig. 12 - Maximum Non-Repetitive Surge Current

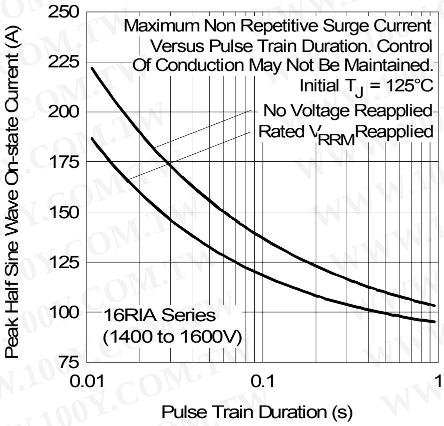


Fig. 13 - Maximum Non-Repetitive Surge Current

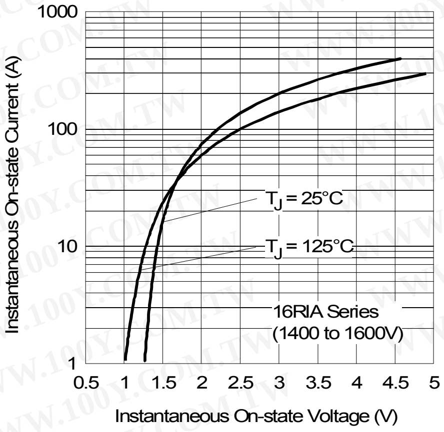


Fig. 14 - Forward Voltage Drop Characteristics

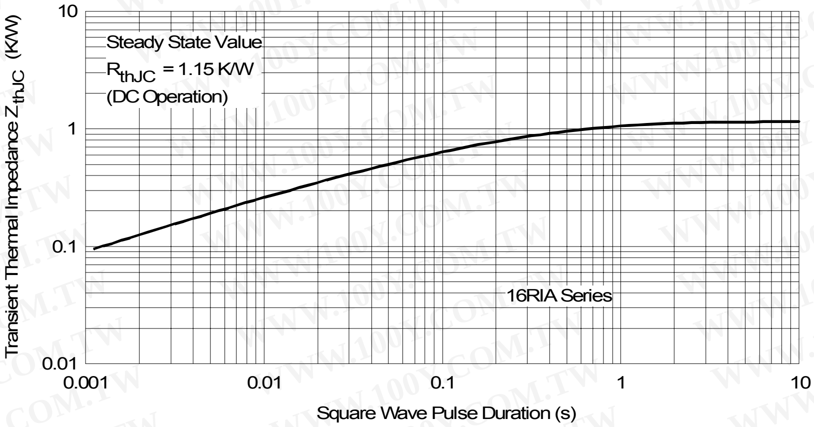


Fig. 15 - Thermal Impedance Z_{thJC} Characteristics

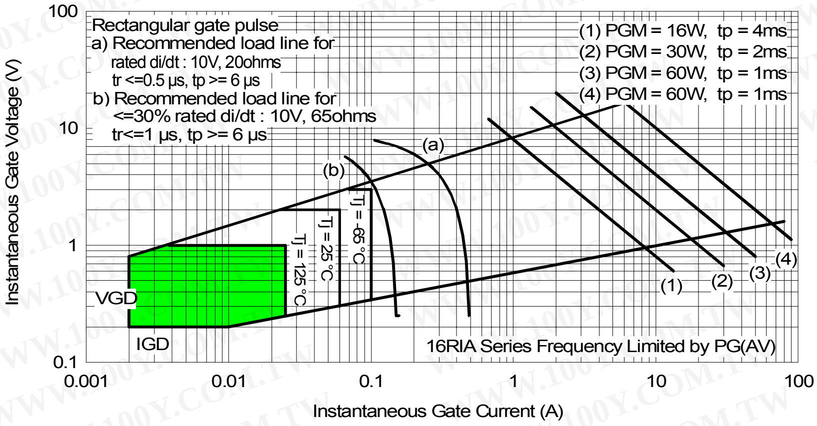


Fig. 16 - Gate Characteristics

International
IOR Rectifier

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