

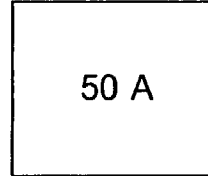
## 50RIA SERIES

### MEDIUM POWER THYRISTORS

Stud Version

#### Features

- High current rating
- Excellent dynamic characteristics
- $dv/dt = 1000V/\mu s$  option
- Superior surge capabilities
- Standard package
- Metric threads version available
- Types up to  $1600V V_{DRM}/V_{RRM}$

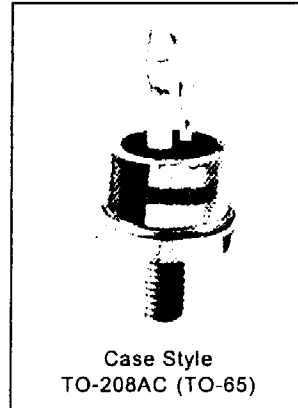


#### Typical Applications

- 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

#### Major Ratings and Characteristics

Parameters	50RIA		Units	
	10 to 120	140 to 160		
$I_{T(AV)}$	50	50	A	
@ $T_C$	94	90	°C	
$I_{T(RMS)}$	80	80	A	
$I_{TSM}$	@ 50Hz	1430	1200	A
	@ 60Hz	1490	1257	A
$I^2t$	@ 50Hz	10.18	7.21	KA <sup>2</sup> s
	@ 60Hz	9.30	6.58	KA <sup>2</sup> s
$V_{DRM}/V_{RRM}$	100 to 1200	1400 to 1600	V	
$t_q$	typical	110	$\mu s$	
$T_J$		- 40 to 125	°C	

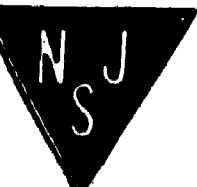


#### EXTRINSICATION

##### 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
50RIA	10	100	150	15
	20	200	300	
	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/ $\mu s$   
 (2) For voltage pulses with  $t_p \leq 5ms$



### On-state Conduction

Parameter	50RIA		Units	Conditions
	10 to 120	140 to 160		
$I_{T(AV)}$ Max. average on-state current @ Case temperature	50	50	A	180° sinusoidal conduction
	94	90	°C	
$I_{T(RMS)}$ Max. RMS on-state current	80	80	A	
$I_{TSM}$ Max. peak, one-cycle non-repetitive surge current	1430	1200	A	t = 10ms No voltage reappplied
	1490	1257		t = 8.3ms reappplied
	1200	1010		t = 10ms 100% $V_{RRM}$ reappplied
	1255	1057		t = 8.3ms reappplied
$I^2t$ Maximum $I^2t$ for fusing	10.18	7.21	$KA^2s$	t = 10ms No voltage reappplied
	9.30	6.58		t = 8.3ms reappplied
	7.20	5.10		t = 10ms 100% $V_{RRM}$ reappplied
	6.56	4.65		t = 8.3ms reappplied
$I^2t$ Maximum $I^2t$ for fusing	101.8	72.1	$KA^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reappplied, $T_J = T_J \text{ max.}$
$V_{T(TO)1}$ Low level value of threshold voltage	0.94	1.02	V	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
$V_{T(TO)2}$ High level value of threshold voltage	1.08	1.17		$(\pi \times I_{T(AV)} < I < 20 \times \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
$r_{\theta 1}$ Low level value of on-state slope resistance	4.08	4.78	m $\Omega$	$(16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
$r_{\theta 2}$ High level value of on-state slope resistance	3.34	3.97		$(\pi \times I_{T(AV)} < I < 20 \times \pi \times I_{T(AV)}, T_J = T_J \text{ max.}$
$V_{TM}$ Max. on-state voltage	1.60	1.78	V	$I_{pk} = 157 \text{ A}, T_J = 25^\circ\text{C}$
$I_H$ Maximum holding current	200		mA	$T_J = 25^\circ\text{C}$ . Anode supply 22V, resistive load, Initial $I_T = 2 \text{ A}$
$I_L$ Latching current	400			Anode supply 6V, resistive load

### Switching

Parameter	50RIA	Units	Conditions
$di/dt$ Max. rate of rise of turned-on current	$V_{DRM} \leq 600V$ 200 $V_{DRM} \leq 1600V$ 100	A/ $\mu s$	$T_C = 125^\circ\text{C}$ , $V_{DM} = \text{rated } V_{DRM}$ Gate pulse = 20V, 15 $\Omega$ , $t_p = 6\mu s$ , $t_r = 0.1\mu s \text{ max.}$ $I_{TM} = (2x \text{ rated } di/dt) \text{ A}$
$t_d$ Typical delay time	0.9		$\mu s$
$t_q$ Typical turn-off time	110	$T_C = 125^\circ\text{C}$ , $I_{TM} = 50 \text{ A}$ , reappplied $dv/dt = 20 \text{ V}/\mu s$ $dir/dt = -10 \text{ A}/\mu s$ , $V_R = 50 \text{ V}$	

### Blocking

Parameter	50RIA	Units	Conditions
$dv/dt$ Max. critical rate of rise of off-state voltage	200	V/ $\mu s$	$T_J = T_J \text{ max.}$ linear to 100% rated $V_{DRM}$
	500 (*)		$T_J = T_J \text{ max.}$ linear to 67% rated $V_{DRM}$

(\*) Available with  $dv/dt = 1000 \text{ V}/\mu s$ , to complete code add S90 i.e. 50RIA160S90.

### Triggering

Parameter	50RIA	Units	Conditions
$P_{GM}$ Maximum peak gate power	10	W	$T_J = T_J \text{ max}$ , $t_p \leq 5\text{ms}$
$P_{G(AV)}$ Maximum average gate power	2.5		
$I_{GM}$ Max. peak positive gate current	2.5	A	
$+V_{GM}$ Maximum peak positive gate voltage	20	V	
$-V_{GM}$ Maximum peak negative gate voltage	10		
$I_{GT}$ DC gate current required to trigger	250 100 50	mA	$T_J = -40^\circ\text{C}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$ 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	3.5 2.5		
$I_{GD}$ DC gate current not to trigger	5.0	mA	$T_J = T_J \text{ max}$ $V_{DRM} = \text{rated voltage}$ 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
$V_{GD}$ DC gate voltage not to trigger	0.2		

### Thermal and Mechanical Specification

Parameter	50RIA	Units	Conditions
$T_J$ Max. operating temperature range	-40 to 125	$^\circ\text{C}$	
$T_{stg}$ Max. storage temperature range	-40 to 125	$^\circ\text{C}$	
$R_{thJC}$ Max. thermal resistance, junction to case	0.35	K/W	DC operation
$R_{thCS}$ Max. thermal resistance, case to heatsink	0.25	K/W	Mounting surface, smooth, flat and greased
T Mounting torque	Min. 2.8 (25)	Nm (lbf-in)	Non-lubricated threads
	Max. 3.4 (30)		
wt Approximate weight	28 (1.0)	g (oz)	
Case style	TO-208AC (TO-65)		See Outline Table

### $\Delta R_{thJC}$ Conduction

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

Conduction angle	Sinusoidal conduction	Rectangular conduction	Units	Conditions
180°	0.078	0.057	K/W	$T_J = T_J \text{ max}$
120°	0.094	0.098		
90°	0.120	0.130		
60°	0.176	0.183		
30°	0.294	0.296		

### Ordering Information Table

Device code				
50	RIA	0	S0	M
1	2	3	4	5
■	- Current code			
■	- Essential part number			
■	- Voltage code: Code x 10 = $V_{RRM}$ (See Voltage Rating Table)			
■	- Critical dv/dt: None = 500V/ $\mu\text{s}$ (Standard value) S90 = 1000V/ $\mu\text{s}$ (Special selection)			
■	- None = Stud base TO-208AC (TO-65) 1/4" 28UNF-2A			
■	- M = Stud base TO-208AC (TO-65) M6 X 1			

Outline Table

