S40RIA

Medium Power Thyristors

STUD VERSION

Liujing rectifier co., Ltd.

FEATURES

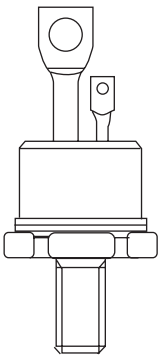
1). High current rating
2). Excellent dynamic characteristics
3). dv/dt = 1000V/ μ s option
4). Superior surge capabilities
5). Standard package
6). Metric threads version available
7). Types up to 1600V V_{DRM}/ V_{RRM}

TYPICAL APPLICATIONS

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

MAJOR RATINGS AND CHARACTERISTICS

Parameters		S40RIA		Unit
		10 to 120	140 to 160	
$I_{F(AV)}$		40	40	A
	@ T_C	94	90	℃
$I_{F(RMS)}$		80	80	A
I_{FSM}	@ 50Hz	1430	1200	A
	@ 60Hz	1490	1257	A
I^2t	@ 50Hz	10.18	7.21	KA^2s
	@ 60Hz	9.30	6.58	A^2s
V_{DRM}/V_{RRM}		100 to 1200	1400 to 1600	V
T_q	typical	110		μ s
T_J		- 40 to 125		℃



ELECTRICAL SPECIFICATIONS

1). Voltage Ratings

Type number	Voltage Code	V_{DRM}/V_{RRM}, maximum repetitive peak reverse voltage *(1)	V_{RSM}, maximum non-repetitive peak reverse voltage *(2)	I_{DRM}/I_{RRM} max. @ $T_J = T_J$ max
		V	V	mA
S40RIA	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/ μ s
*(2) For voltage pulses with tp ≤ 5ms

2). Forward Conduction

Parameters		S40RIA		Unit	Conditions		
		10 to 120	140 to 160				
$I_{T(AV)}$	Max. average forward current	40	40	A	180° conduction, half sine wave		
	@ Case temperature	94	90	℃			
$I_{T(RMS)}$	Max. RMS forward current	80	80	A			
I_{TSM}	Max. peak, one-cycle forward, non-repetitive surge current	1430	1200	A	t = 10ms	No voltage reapplied	Sinusoidal half wave, Initial $T_J = T_J$ max.
		1490	1257		t = 8.3ms		
		1200	1010		t = 10ms	100% V_{RRM} reapplied	
		1255	1057		t = 8.3ms		
I^2t	Maximum I^2t for fusing	10.18	7.21	KA^2s	t = 10ms	No voltage reapplied	
		9.30	6.58		t = 8.3ms		
		7.20	5.10		t = 10ms	100% V_{RRM} reapplied	
		6.56	4.65		t = 8.3ms		
$I^2\surd t$	Maximum $I^2\surd t$ for fusing	101.8	72.1	$KA^2\surd s$	t = 0.1 to 10ms, no voltage reapplied		
$V_{T(TO)1}$	Low level value of threshold voltage	0.94	1.02	V	(16.7%x π x $I_{F(AV)}$<I< π x $I_{F(AV)}$), $T_J=T_J$ max.		
$V_{T(TO)2}$	High level value of threshold voltage	1.08	1.17		(I > π x $I_{F(AV)}$), $T_J = T_J$ max.		
r_{t1}	Low level value of forward slope resistance	4.08	4.78	mΩ	(16.7% x π x $I_{F(AV)}$<I< π x$I_{F(AV)}$), $T_J=T_J$ max.		
r_{t2}	High level value of forward slope resistance	3.34	3.97		(I > π x $I_{F(AV)}$), $T_J = T_J$ max.		
V_{TM}	Max. forward voltage drop	1.60	1.78	V	I_{pk}= 50A, T_J = 25℃ t_p = 10ms sine pulse		
I_H	Maximum holding current	200		mA	T_J = 25° C, anode supply 12V resistive load		
I_L	Typical latching current	400					
di/dt	Max. rate of rise of turned-on current			A/μs	T_C = 125℃, V_{DM} = rated V_{DRM} Gate pulse = 20V, 15Ω, t_p = 6μs, tr = 0.1μs max. I_{TM} = (2x rated di/dt) A		
	VDRM ≤ 600V	200					
	VDRM ≤ 1600V	100					
t_d	Typical delay time	0.9		μs	T_C = 25℃ V_{DM} = rated V_{DRM} I_{TM} = 10A dc resistive circuit Gate pulse = 10V, 15Ω source, t_p = 20μs		
t_q	Typical turn-off time	110			TC = 125℃, ITM = 50A, reapplied dv/dt = 20V/μs dir/dt = -10A/μs, VR=50V		
dv/dt	Max. critical rate of rise of off-state voltage	200		V/μs	$T_J = T_J$ max. linear to 100% rated V_{DRM}		
		500(*)			$T_J = T_J$ max. linear to 67% rated V_{DRM}		

(*) Available with: dv/dt = 1000V/μs, to complete code add S90 i.e. S40RIA120S90.

3). Triggering

Parameters			S40RIA	Unit	Conditions	
P_{GM}	Maximum peak gate power		10	W	$T_J = T_J$ max.	
$P_{G(AV)}$	Maximum average gate power		2.5			
I_{GM}	Max. peak positive gate current		2.5	A	$T_J = T_J$ max.	
$+V_{GM}$	Max. peak positive gate current		20	V	$T_J = T_J$ max.	
$-V_{GM}$	Maximum peak positive gate voltage		10			
I_{GT}	DC gate current required to trigger		250	mA	T_J = - 40℃	Max. required gate trigger current/voltage are the lowest value which will trigger all units 6V anode-to-cathode applied
			100		T_J = 25℃	
			50		T_J = 125℃	
V_{GT}	DC gate voltage required to trigger		3.5	V	T_J = - 40℃	
			2.5		T_J = 25℃	
I_{GD}	DC gate current not to trigger		5.0	mA	$T_J = T_J$ 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
V_{GD}	DC gate voltage not to trigger		0.2	V	$T_J = T_J$ max.	
T_J	Max. operating temperature range		- 40 to 125	℃		
T_{stg}	Max. storage temperature range		- 40 to 125	℃		
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	Non-lubricated threads	
		Max.	3.4 (30)	lbf-in		
wt	Approximate weight		28 (1.0)	g (oz)		
	Case style		TO-65		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°	0.078	0.057	K/W	$T_J = T_J$ max.
120°	0.094	0.098		
90°	0.120	0.130		
60°	0.176	0.183		
30°	0.294	0.296		

PERFORMANCE CURVES FIGURE

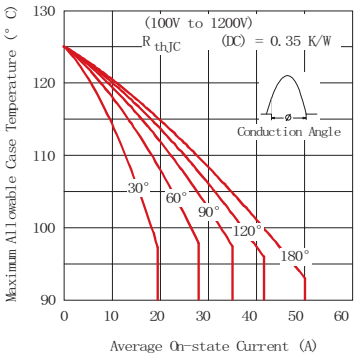


Fig. 1 - Current Ratings Characteristic

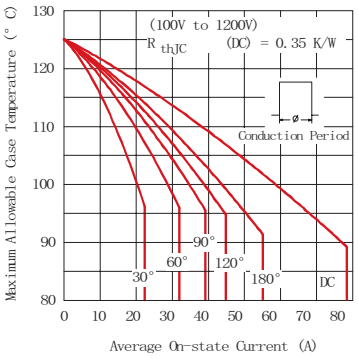


Fig. 2 - Current Ratings Characteristic

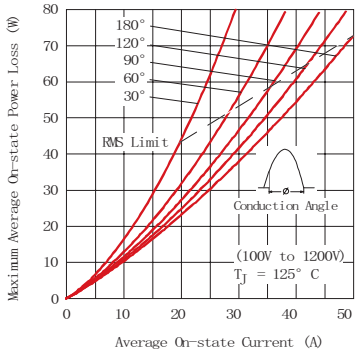


Fig. 3 - On-state Power Loss Characteristics

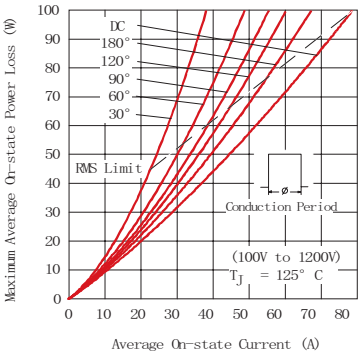


Fig. 4 - On-state Power Loss Characteristics

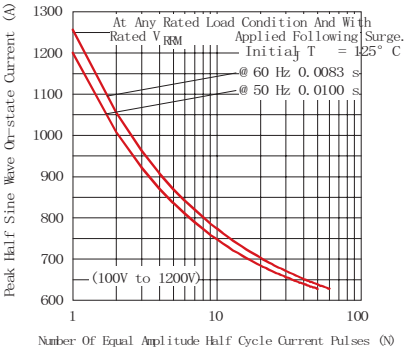


Fig.5 -Maximum Non-Repetitive Surge Current

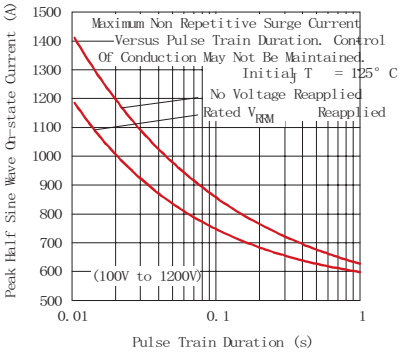


Fig.6 -Maximum Non-Repetitive Surge Current

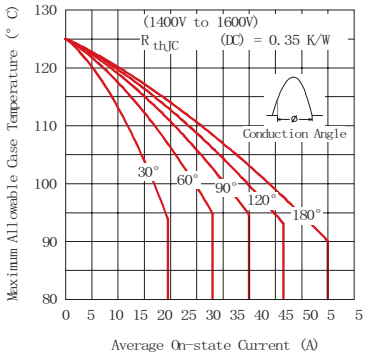


Fig. 7 - Current Ratings Characteristics

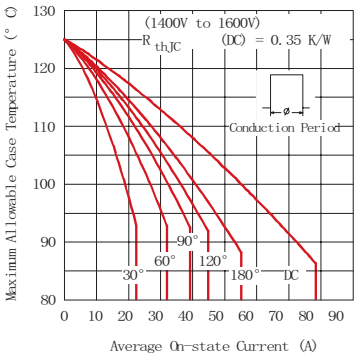


Fig. 8 - Current Ratings Characteristics

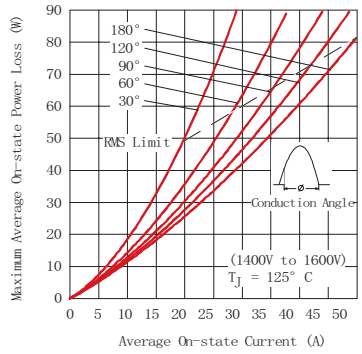


Fig. 9 - On-state Power Loss Characteristics

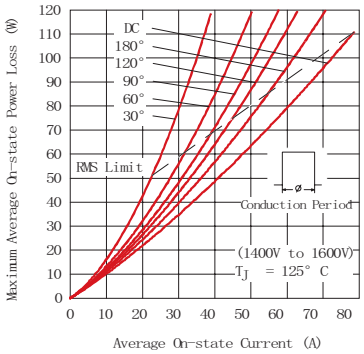


Fig. 10 - On-state Power Loss Characteristics

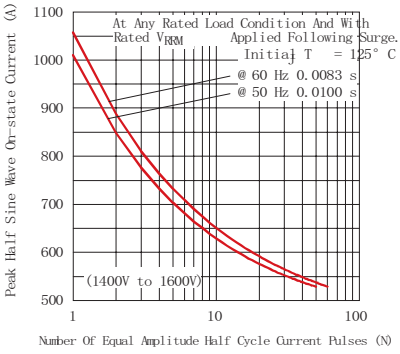


Fig. 11 - Maximum Non-Repetitive Surge Current

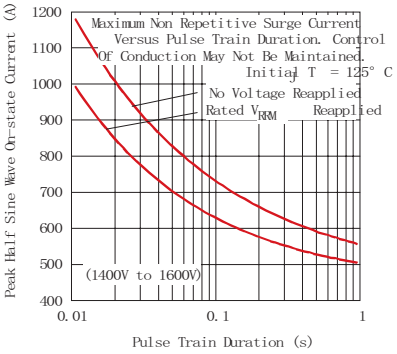


Fig. 12 - Maximum Non-Repetitive Surge Current

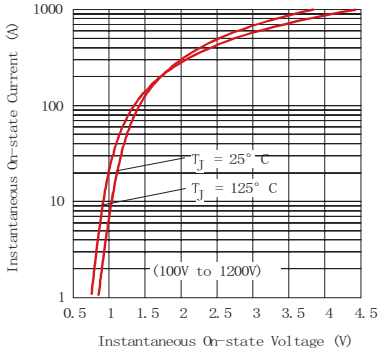


Fig. 13 - Forward Voltage Drop Characteristics

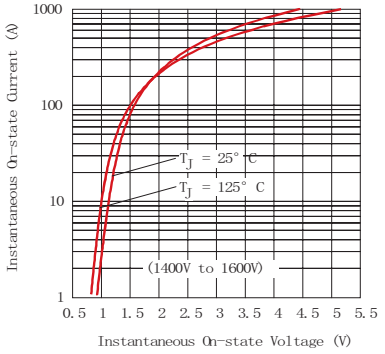


Fig. 14 - Forward Voltage Drop Characteristics

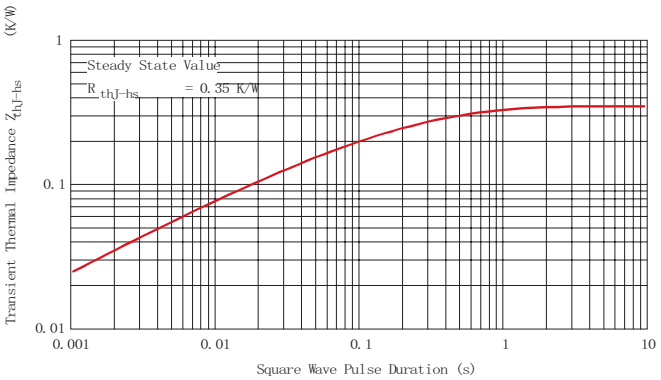


Fig. 15 - Thermal Impedance Z_{thJC} Characteristics

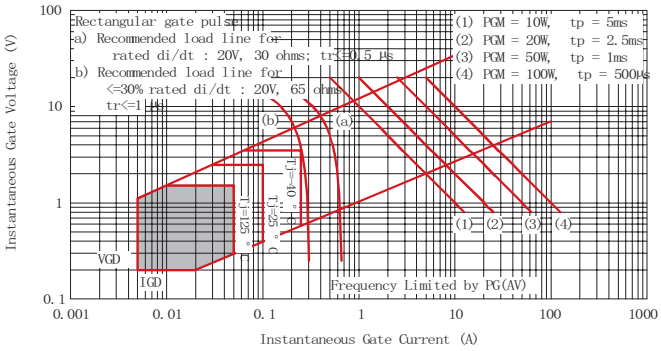
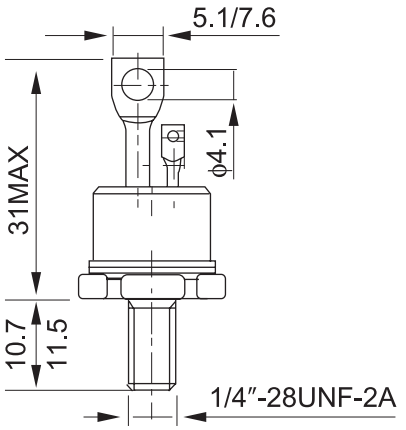
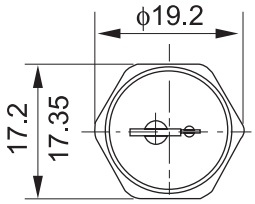


Fig. 16 - Gate Characteristics

OUTLINE





*FOR METRIC DEVICE:M6×1

Case Style TO-65

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