Phase Control Thyristors (Stud Version), 80 A

TO-94 (TO-209AC)

FEATURES

- Hermetic glass-metal seal
- International standard case TO-94 (TO-209AC)
- Designed and qualified for industrial level
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

TYPICAL APPLICATIONS

- DC motor controls
- Controlled DC power supplies
- AC controllers

PRIMARY CHARACTERISTICS	
$I_{T(AV)}$	80 A
V_{DRM}/V_{RRM}	400 V, 800 V, 1200 V
V_{TM}	1.60 V
I_{GT}	120 mA
T_J	-40 °C to +125 °C
Package	TO-94 (TO-209AC)
Circuit configuration	Single SCR

MAJOR RATINGS AND CHARACTERISTICS			
PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		80	A
	T_C	85	°C
$I_{T(RMS)}$		125	A
I_{TSM}	50 Hz	1900	
	60 Hz	1990	
I^2t	50 Hz	18	kA^2s
	60 Hz	16	
V_{DRM}/V_{RRM}		400 to 1200	V
t_q	Typical	110	µs
T_J		-40 to +125	°C

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS				
TYPE NUMBER	VOLTAGE CODE	V_{DRM}/V_{RRM}, MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE V	V_{RSM}, MAXIMUM NON-REPETITIVE PEAK VOLTAGE V	I_{DRM}/I_{RRM} MAXIMUM AT T_J = 125 °C mA
VS-80RIA VS-81RIA	40	400	500	15
	80	800	900	
	120	1200	1300	

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			80	A
					85	°C
Maximum RMS on-state current	$I_{T(RMS)}$	DC at 75 °C case temperature			125	A
Maximum peak, one-cycle non-repetitive surge current	I_{TSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	1900	
		t = 8.3 ms			1990	
		t = 10 ms	100 % V_{RRM} reapplied		1600	
		t = 8.3 ms			1675	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage		18	kA^2s
		t = 8.3 ms			16	
		t = 10 ms	100 % V_{RRM} reapplied		12.7	
		t = 8.3 ms			11.7	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied			180.5	$kA^2\sqrt{s}$
Low level value of threshold voltage	$V_{T(TO)1}$	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ maximum			0.99	V
High level value of threshold voltage	$V_{T(TO)2}$	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum			1.13	
Low level value of on-state slope resistance	r_{t1}	(16.7 % x π x $I_{T(AV)}$ < I < π x $I_{T(AV)}$), $T_J = T_J$ maximum			2.29	mΩ
High level value of on-state slope resistance	r_{t2}	(I > π x $I_{T(AV)}$), $T_J = T_J$ maximum			1.84	
Maximum on-state voltage	V_{TM}	I_{pk} = 250 A, T_J = 25 °C, t_p = 10 ms sine pulse			1.60	V
Maximum holding current	I_H	T_J = 25 °C, anode supply 12 V resistive load			200	mA
Typical latching current	I_L				400	

SWITCHING

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum non-repetitive rate of rise of turned-on current	dI/dt	T_J = 125 °C, V_d = Rated V_{DRM}, I_{TM} = 2 x dI/dt snubber 0.2 µF, 15 Ω, gate pulse: 20 V, 65 Ω, t_p = 6 µs, t_r = 0.5 µs Per JEDEC standard RS-397, 5.2.2.6.	300	A/µs
Typical delay time	t_d	Gate pulse: 10 V, 15 Ω source, t_p = 6 µs, t_r = 0.1 µs, V_d = Rated V_{DRM}, I_{TM} = 50 Adc, T_J = 25 °C	1	µs
Typical turn-off time	t_q	I_{TM} = 50 A, $T_J = T_J$ maximum, dI/dt = -5 A/µs, V_R = 50 V, dV/dt = 20 V/µs, gate bias: 0 V 25 Ω, t_p = 500 µs	110	

BLOCKING

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum critical rate of rise of off-state voltage	dV/dt	T_J = 125 °C exponential to 67 % rated V_{DRM}	500	V/µs
Maximum peak reverse and off-state leakage current	I_{RRM}, I_{DRM}	T_J = 125 °C rated V_{DRM}/V_{RRM} applied	15	mA

TRIGGERING					
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**VALUES**	**UNITS**
Maximum peak gate power	P_{GM}	$T_J = T_J$ maximum, $t_p \leq 5$ ms		12	W
Maximum average gate power	$P_{G(AV)}$	$T_J = T_J$ maximum, f = 50 Hz, d% = 50		3	
Maximum peak positive gate current	I_{GM}	$T_J = T_J$ maximum, $t_p \leq 5$ ms		3	A
Maximum peak positive gate voltage	+ V_{GM}			20	V
Maximum peak negative gate voltage	- V_{GM}			10	
Maximum DC gate current required to trigger	I_{GT}	T_J = - 40 °C	Maximum required gate trigger/ current/voltage are the lowest value which will trigger all units 6 V anode to cathode applied	270	mA
		T_J = 25 °C		120	
		T_J = 125 °C		60	
Maximum DC gate voltage required to trigger	V_{GT}	T_J = - 40 °C		3.5	V
		T_J = 25 °C		2.5	
		T_J = 125 °C		1.5	
DC gate current not to trigger	I_{GD}	$T_J = T_J$ maximum	Maximum gate current/voltage not to trigger is the maximum value which will not trigger any unit with rated V_{DRM} anode to cathode applied	6	mA
DC gate voltage not to trigger	V_{GD}			0.25	V

THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**VALUES**	**UNITS**
Maximum operating junction temperature range	T_J		- 40 to 125	°C
Maximum storage temperature range	T_{Stg}		- 40 to 150	
Maximum thermal resistance, junction to case	R_{thJC}	DC operation	0.30	K/W
Maximum thermal resistance, case to heatsink	R_{thCS}	Mounting surface, smooth, flat and greased	0.1	
Mounting torque, ± 10 %		Non-lubricated threads	15.5 (137)	N · m (lbf · in)
		Lubricated threads	14 (120)	
Approximate weight			130	g
Case style		See dimensions - link at the end of datasheet	TO-94 (TO-209AC)	

ΔR_{thJC} CONDUCTION				
CONDUCTION ANGLE	**SINUSOIDAL CONDUCTION**	**RECTANGULAR CONDUCTION**	**TEST CONDITIONS**	**UNITS**
180°	0.042	0.030	$T_J = T_J$ maximum	K/W
120°	0.050	0.052		
90°	0.064	0.070		
60°	0.095	0.100		
30°	0.164	0.165		

Note

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

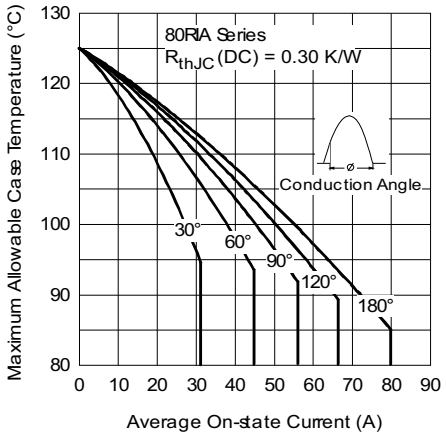

Fig. 1 - Current Ratings Characteristics

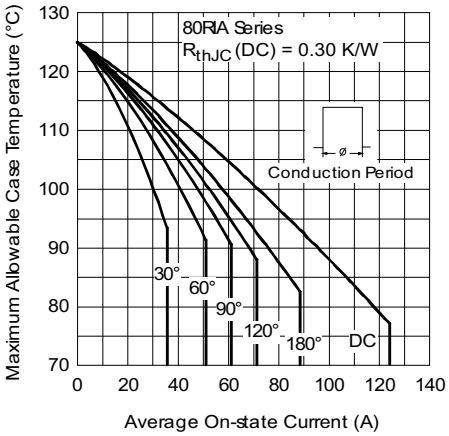

Fig. 2 - Current Ratings Characteristics

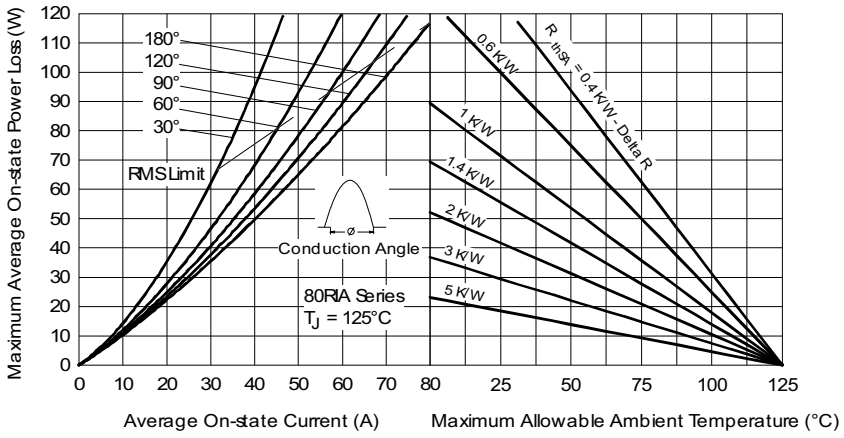

Fig. 3 - On-State Power Loss Characteristics

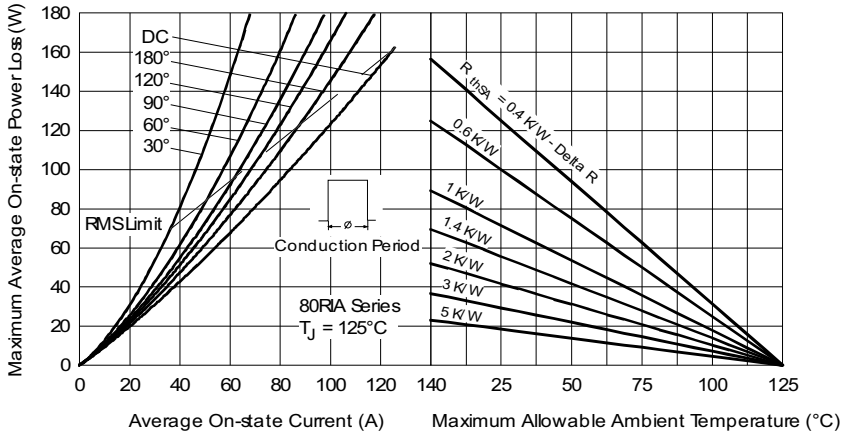

Fig. 4 - On-State Power Loss Characteristics

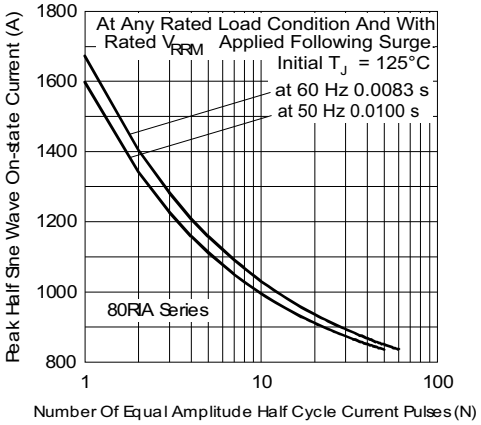

Fig. 5 - Maximum Non-Repetitive Surge Current

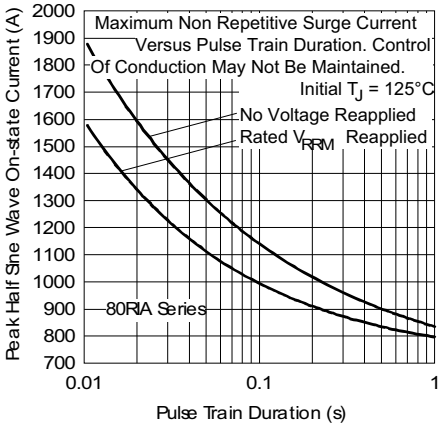

Fig. 6 - Maximum Non-Repetitive Surge Current

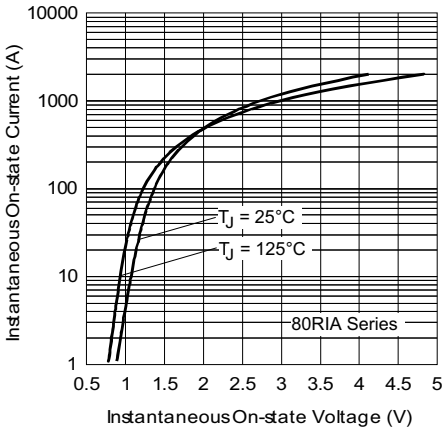

Fig. 7 - On-State Voltage Drop Characteristics

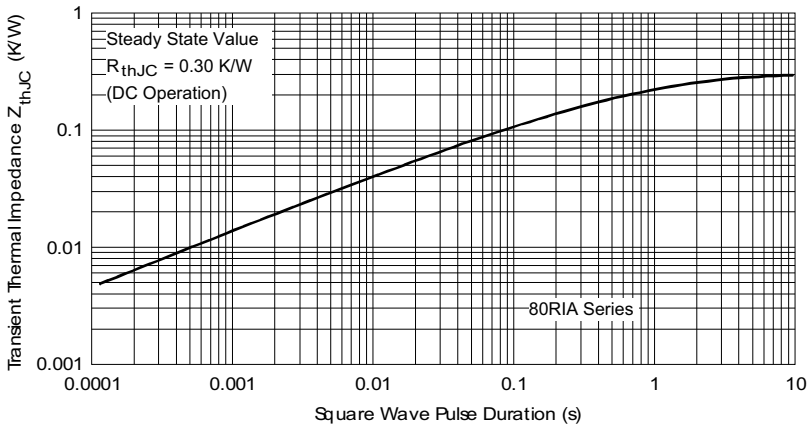

Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

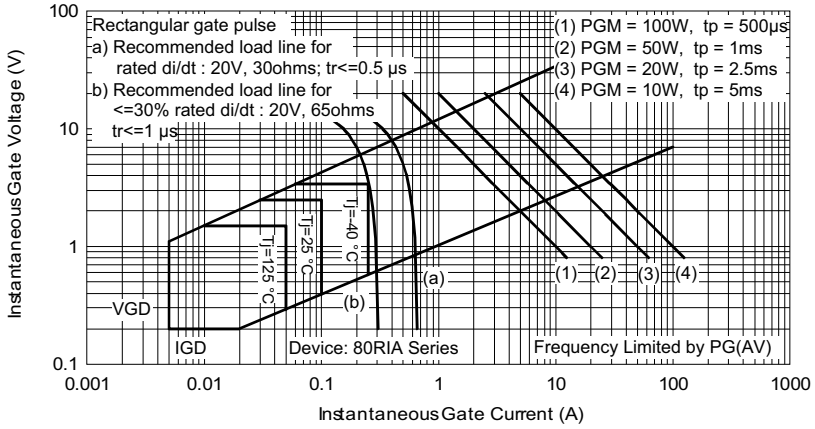

Fig. 9 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code

VS-	8	0	RIA	120	M	PbF
1	2	3	4	5	6	7

1 - Vishay Semiconductors product

2 - I_{TAV} x 10 A

3 - • 0 = eyelet terminals (gate and auxiliary cathode leads)
• 1 = fast-on terminals (gate and auxiliary cathode leads)
• 2 = flag terminals (gate and auxiliary cathode terminals)

4 - RIA = essential part number

5 - Voltage code x 100 = V_{RRM} (see Voltage Ratings table)

6 - • None = stud base 1/2"-20UNF- 2 A threads
• M = stud base metric threads M12 x 1.75 E 6

7 - None = standard production
- PbF = lead (Pb)-free

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95362