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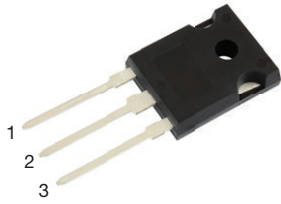
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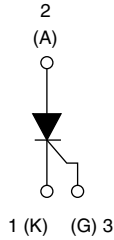




# Thyristor High Voltage, Phase Control SCR, 50 A



TO-247L



### FEATURES

- Designed and qualified according to JEDEC®-JESD 47
- 150 °C maximum operating junction temperature
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### APPLICATIONS

Typical usage is in input rectification crowbar (soft start) and AC switch motor control, UPS, welding, and battery charge.

### DESCRIPTION

The VS-50TPS12 high voltage series of silicon controlled rectifiers are specifically designed for medium power switching, and phase control applications. The glass passivation technology used, has reliable operation up to 150 °C junction temperature.

PRODUCT SUMMARY	
Package	TO-247L
$I_{T(AV)}$	50 A
$V_{DRM}/V_{RRM}$	1200 V
$V_{TM}$ (typ.)	1.1 V
$I_{GT}$ (typ.)	40 mA
$T_J$ max.	150 °C
Diode variation	Single SCR

MAJOR RATINGS AND CHARACTERISTICS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}/V_{DRM}$		1200	V
On-state voltage	$V_T$	50 A, $T_J = 125\text{ °C}$	1.1	
Average rectified forward current	$I_{T(AV)}$		50	A
Maximum continuous RMS on-state current	$I_{RMS}$		79	
Non-repetitive peak surge current	$I_{TSM}$		630	
Maximum rate of rise	dV/dt		1000	V/μs
Operating junction and storage temperature range	$T_J, T_{Stg}$		-40 to +150	°C

VOLTAGE RATINGS			
PART NUMBER	$V_{RRM}/V_{DRM}$ , MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$I_{RRM}/I_{DRM}$ AT 125 °C mA
VS-50TPS12L-M3	1200	1300	10



ABSOLUTE MAXIMUM RATINGS						
PARAMETER	SYMBOL	TEST CONDITIONS		TYP.	MAX.	UNITS
Maximum average on-state current	$I_{T(AV)}$	$T_C = 112\text{ }^\circ\text{C}$ , 180° conduction half sine wave		-	50	A
Maximum continuous RMS on-state current as AC switch	$I_{T(RMS)}$			-	79	
Peak, one-cycle non-repetitive surge current	$I_{TSM}$	10 ms sine pulse, rated $V_{RRM}$ applied	Initial $T_J = T_J$ maximum	-	530	
		10 ms sine pulse, no voltage reapplied		-	630	
$I^2t$ for fusing	$I^2t$	10 ms sine pulse, rated $V_{RRM}$ applied		-	1405	A <sup>2</sup> s
		10 ms sine pulse, no voltage reapplied		-	1986	
$I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1\text{ ms to }10\text{ ms}$ , no voltage reapplied, $T_J = 125\text{ }^\circ\text{C}$		-	19 850	A <sup>2</sup> √s
Low level value of threshold voltage	$V_{T(TO)1}$	$T_J = 125\text{ }^\circ\text{C}$		-	0.89	V
High level value of threshold voltage	$V_{T(TO)2}$			-	0.97	
Low level value of on-state slope resistance	$r_{t1}$			-	6.77	mΩ
High level value of on-state slope resistance	$r_{t2}$			-	6.32	
On-state voltage	$V_T$	50 A, $T_J = 25\text{ }^\circ\text{C}$	1.2	1.32	V	
		100 A, $T_J = 25\text{ }^\circ\text{C}$	1.4	1.6		
Rate of rise of turned-on current	$di/dt$	$T_J = 25\text{ }^\circ\text{C}$		-	150	A/μs
Holding current	$I_H$	Anode supply = 6 V, resistive load, $T_J = 25\text{ }^\circ\text{C}$		-	300	mA
Latching current	$I_L$			-	350	
Reverse and direct leakage current	$I_{RRM}/I_{DRM}$	$T_J = 25\text{ }^\circ\text{C}$		-	0.05	
		$T_J = 125\text{ }^\circ\text{C}$		-	10	
Rate of rise of off-state voltage	$dV/dt$	$T_J = T_J$ maximum, linear to 80 % $V_{DRM}$ , $R_{g-k} = \infty\ \Omega$		-	1000	V/μs

TRIGGERING						
PARAMETER	SYMBOL	TEST CONDITIONS		TYP.	MAX.	UNITS
Peak gate power	$P_{GM}$	10 ms sine pulse, no voltage reapplied		-	10	W
Average gate power	$P_{G(AV)}$			-	2.5	
Peak gate current	$I_{GM}$			-	2.5	A
Peak negative gate voltage	$-V_{GM}$			-	10	V
Required DC gate voltage to trigger	$V_{GT}$	$T_J = -40\text{ }^\circ\text{C}$	Anode supply = 6 V resistive load	-	1.6	
		$T_J = 25\text{ }^\circ\text{C}$		-	1.5	
		$T_J = 150\text{ }^\circ\text{C}$		-	1	
Required DC gate to trigger	$I_{GT}$	$T_J = -40\text{ }^\circ\text{C}$	Anode supply = 6 V resistive load	-	160	mA
		$T_J = 25\text{ }^\circ\text{C}$		45	100	
		$T_J = 150\text{ }^\circ\text{C}$		-	60	
DC gate voltage not to trigger	$V_{GD}$	$T_J = 150\text{ }^\circ\text{C}$ , $V_{DRM} = \text{rated value}$		-	0.2	V
DC gate current not to trigger	$I_{GD}$			-	3	mA

SWITCHING						
PARAMETER	SYMBOL	TEST CONDITIONS		TYP.	MAX.	UNITS
Turn-on time	$t_{gt}$	$I_T = 50\text{ A}$ , $V_D = 50\% V_{DRM}$ , $I_{gt} = 300\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$		1.5	-	μs
Turn-off time	$t_q$	$I_T = 50\text{ A}$ , $V_D = 80\% V_{DRM}$ , $dV/dt = 20\text{ V}/\mu\text{s}$ , $t_p = 200\text{ }\mu\text{s}$ , $I_{gt} = 100\text{ mA}$ , $di/dt = 10\text{ A}/\mu\text{s}$ , $V_R = 100\text{ V}$ , $T_J = 150\text{ }^\circ\text{C}$		92	-	



THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		-40	150	°C
Maximum thermal resistance, junction to case	$R_{thJC}$		-	0.35	°C/W
Maximum thermal resistance, junction to ambient	$R_{thJA}$		-	40	
Typical thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, smooth, and greased	0.2	-	
Mounting torque	minimum		6 (5)		kgf · cm (lbf · in)
	maximum		12 (10)		
Marking device		Case style Super TO-247L	50TPS12L		

$\Delta R_{thJ-HS}$ CONDUCTION PER JUNCTION											
DEVICE	SINE HALF-WAVE CONDUCTION					RECTANGULAR WAVE CONDUCTION					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
VS-50TPS12L-M3	0.143	0.166	0.208	0.299	0.490	0.099	0.168	0.223	0.311	0.494	°C/W

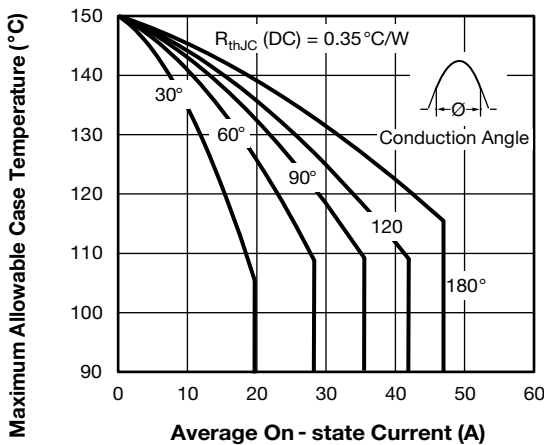


Fig. 1 - Current Rating Characteristics

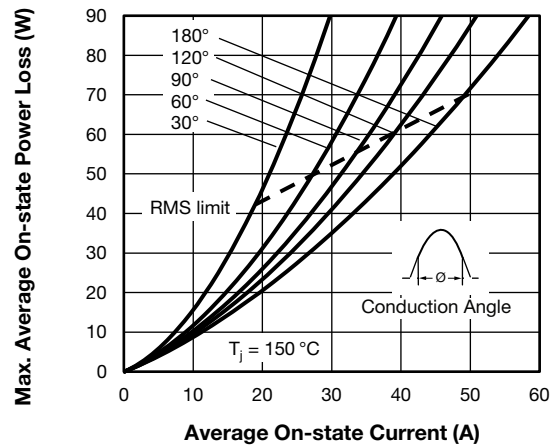


Fig. 3 - On-State Power Loss Characteristics

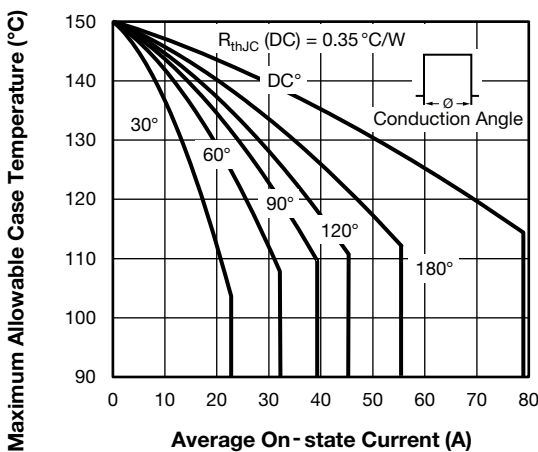


Fig. 2 - Current Rating Characteristics

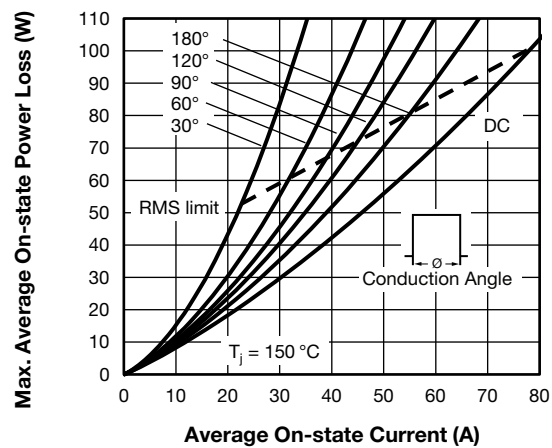


Fig. 4 - On-State Power Loss Characteristics

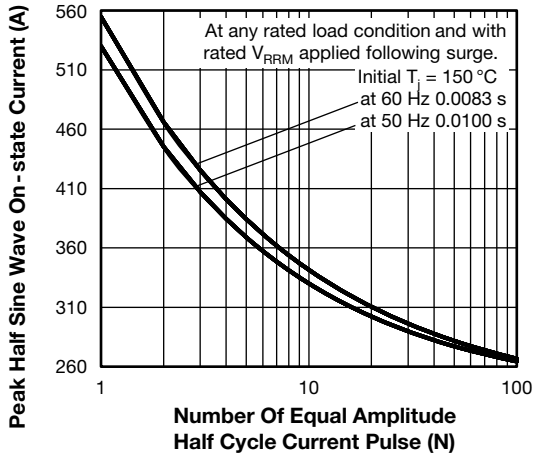


Fig. 5 - Maximum Non-Repetitive Surge Current

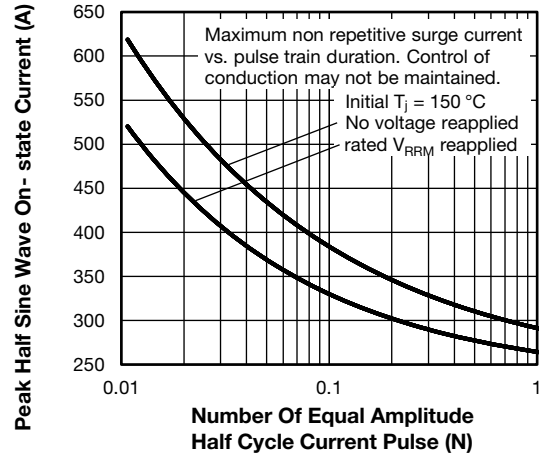


Fig. 6 - Maximum Non-Repetitive Surge Current

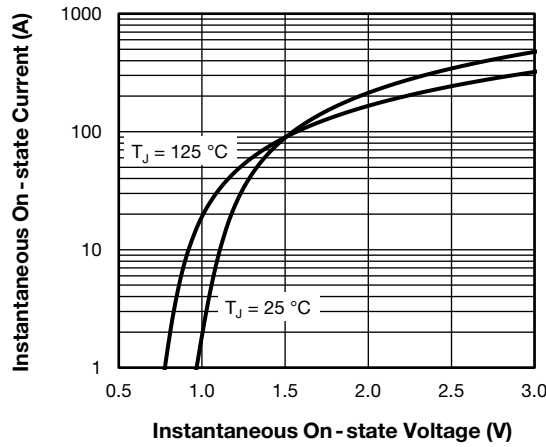


Fig. 7 - On-State Voltage Drop Characteristics

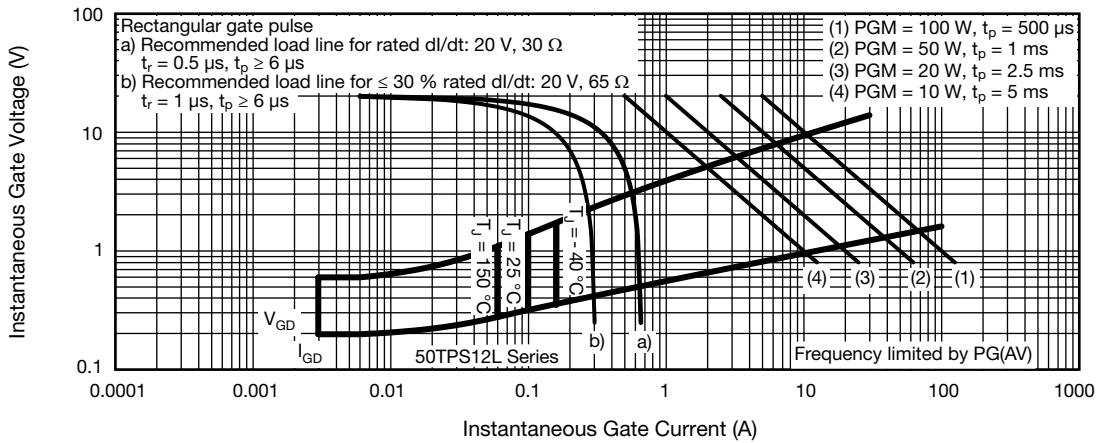


Fig. 8 - Gate Characteristics

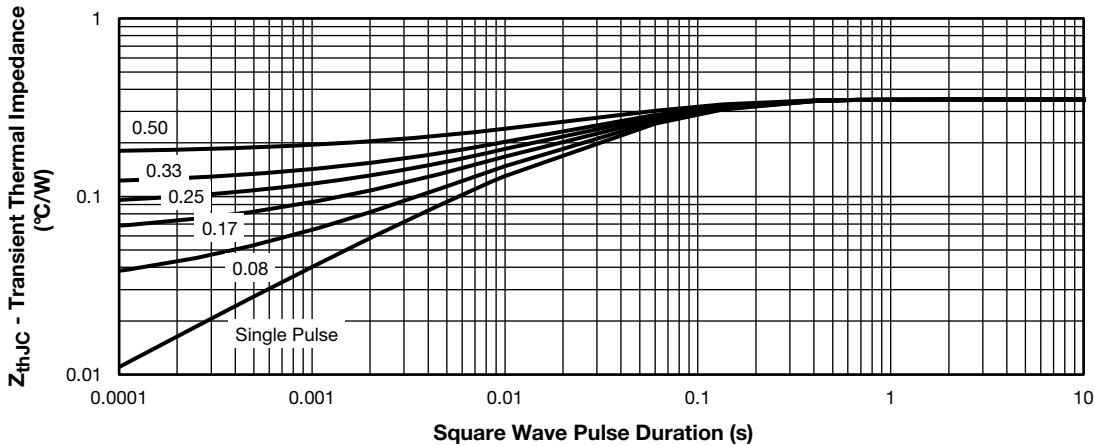


Fig. 9 - Thermal Impedance  $Z_{thJC}$  Characteristics

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>50</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>12</b>	<b>L</b>	<b>-M3</b>
	①	②	③	④	⑤	⑥	⑦	⑧

- 1** - Vishay Semiconductors product
- 2** - Current code (50 = 50 A)
- 3** - Circuit configuration:  
T = thyristor
- 4** - P = TO-247 package
- 5** - Type of silicon:  
S = standard recovery rectifier
- 6** - Voltage code (12 = 1200 V)
- 7** - Package L = long lead
- 8** - -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

<b>ORDERING INFORMATION</b> (example)			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-50TPS12L-M3	25	contact factory	Antistatic plastic tubes

<b>LINKS TO RELATED DOCUMENTS</b>	
Dimensions	<a href="http://www.vishay.com/doc?95626">www.vishay.com/doc?95626</a>
Part marking information	<a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a>



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