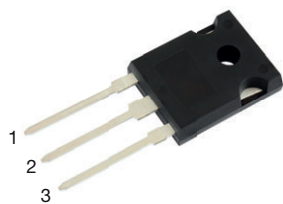
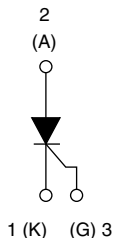


# Thyristor High Voltage, Phase Control SCR, 50 A



TO-247AD 3L



## 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.

## PRIMARY CHARACTERISTICS

$I_{T(AV)}$	50 A
$V_{DRM}/V_{RRM}$	1200 V
$V_{TM}$ (typ.)	1.1 V
$I_{GT}$ (typ.)	40 mA
$T_J$	-40 °C to +150 °C
Package	TO-247AD 3L
Circuit configuration	Single SCR

## MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$V_{RRM}/V_{DRM}$		1200	V
$V_T$	50 A, $T_J = 125$ °C	1.1	
$I_{T(AV)}$		50	A
$I_{RMS}$		79	
$I_{TSM}$		630	
$dV/dt$		1000	V/ $\mu$ s
$T_J, T_{Stg}$		-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	VALUES		UNITS
			TYP.	MAX.	
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	-	530	
		10 ms sine pulse, no voltage reapplied	-	630	A <sup>2</sup> s
$I^2t$ for fusing	$I^2t$	10 ms sine pulse, rated $V_{RRM}$ applied	-	1405	
		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	$dV/dt$	$T_J = T_J\text{ maximum}$ , linear to 80 % $V_{DRM}$ , $R_g-k = \infty\text{ }\Omega$	-	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	$V_{GT}$	$T_J = -40\text{ }^{\circ}\text{C}$	-	1.6	
		$T_J = 25\text{ }^{\circ}\text{C}$	-	1.5	
		$T_J = 150\text{ }^{\circ}\text{C}$	-	1	
Required DC gate to trigger	$I_{GT}$	$T_J = -40\text{ }^{\circ}\text{C}$	-	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	VALUES	UNITS
Turn-on time	$t_{gt}$	$I_T = 50\text{ A}$ , $V_D = 50\text{ }\%$ $V_{DRM}$ , $I_{gt} = 300\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$	1.5	μs
Turn-off time	$t_q$	$I_T = 50\text{ A}$ , $V_D = 80\text{ }\%$ $V_{DRM}$ , $dV/dt = 20\text{ V}/\mu\text{s}$ , $t_p = 200\text{ }\mu\text{s}$ , $I_{gt} = 100\text{ mA}$ , $di/dt = 10\text{ A}/\mu\text{s}$ , $V_R = 100\text{ V}$ , $T_J = 150\text{ }^{\circ}\text{C}$	92	

**THERMAL AND MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T <sub>J</sub> , T <sub>Stg</sub>		-40	150	°C
Maximum thermal resistance, junction to case	R <sub>thJC</sub>		-	0.35	°C/W
Maximum thermal resistance, junction to ambient	R <sub>thJA</sub>		-	40	
Typical thermal resistance, case to heatsink	R <sub>thCS</sub>	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-247AD 3L	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

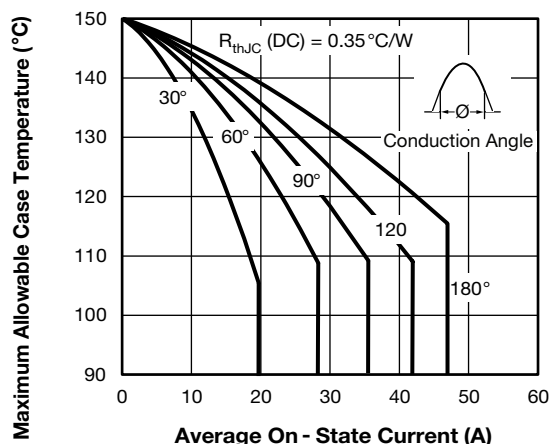


Fig. 1 - Current Rating Characteristics

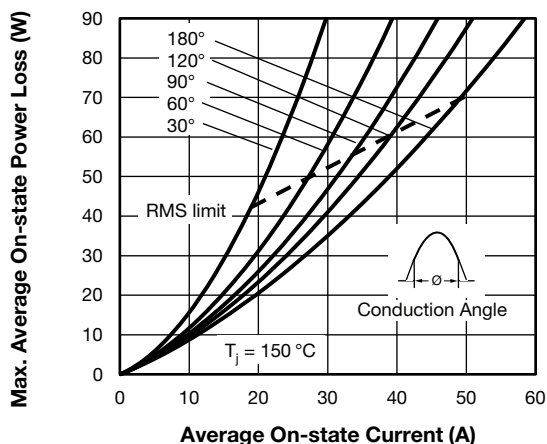


Fig. 3 - On-State Power Loss Characteristics

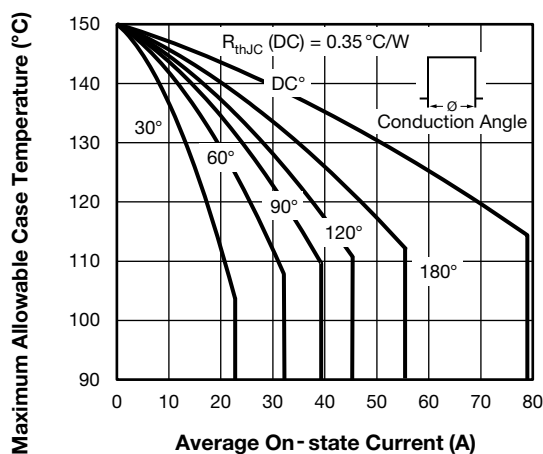


Fig. 2 - Current Rating Characteristics

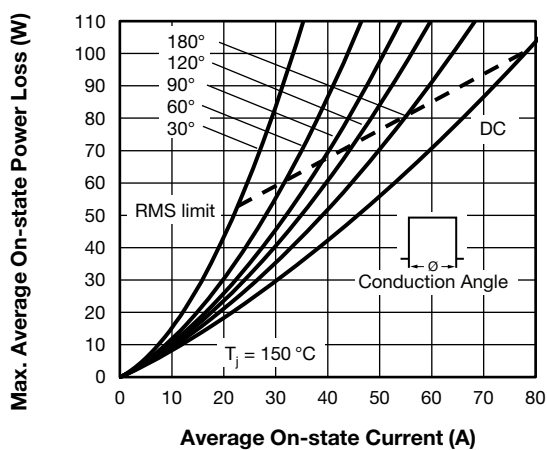


Fig. 4 - On-State Power Loss Characteristics

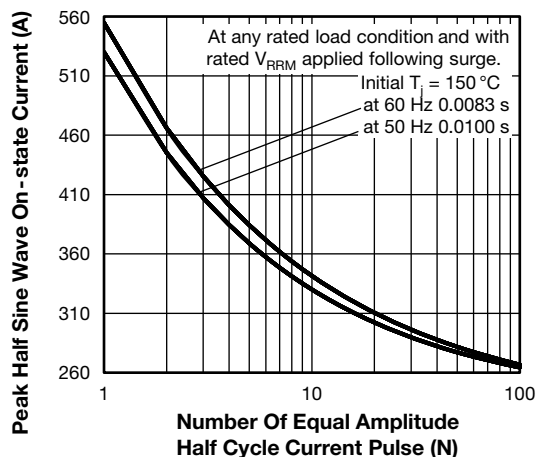


Fig. 5 - Maximum Non-Repetitive Surge Current

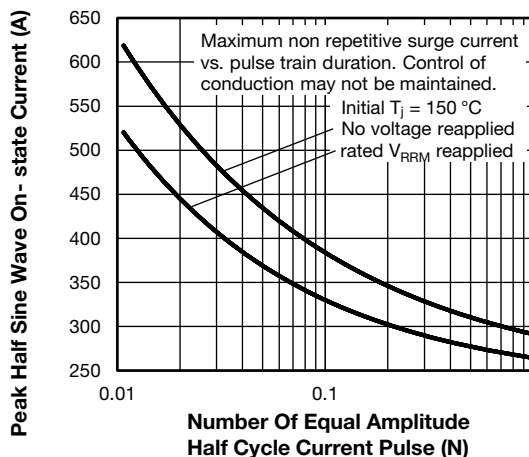


Fig. 6 - Maximum Non-Repetitive Surge Current

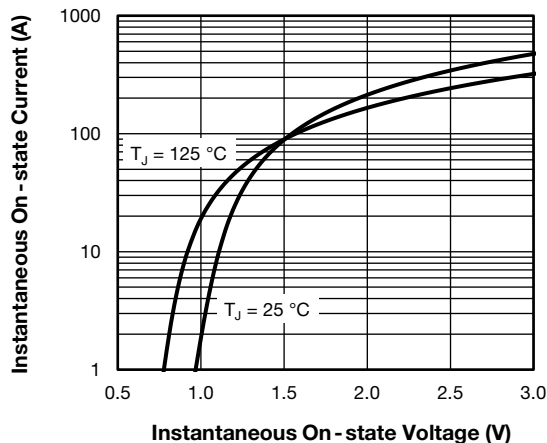


Fig. 7 - On-State Voltage Drop Characteristics

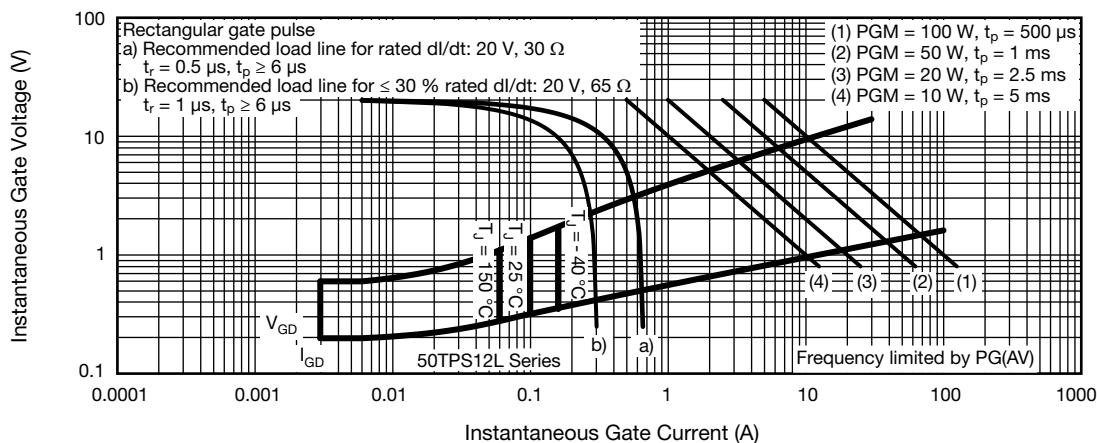


Fig. 8 - Gate Characteristics

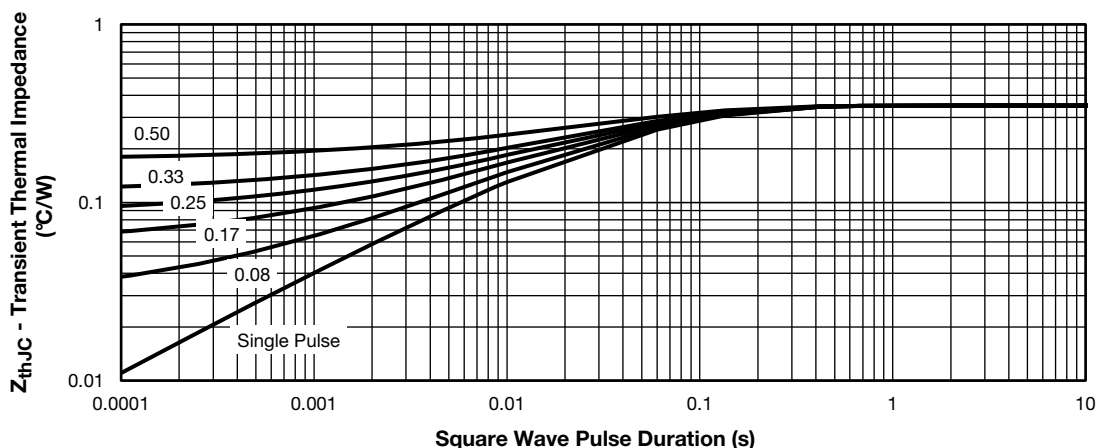


Fig. 9 - Thermal Impedance  $Z_{th,JC}$  Characteristics

## ORDERING INFORMATION TABLE

Device code: VS-50T-P-S-12-L-M3

Position numbers: 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-247AD 3L 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

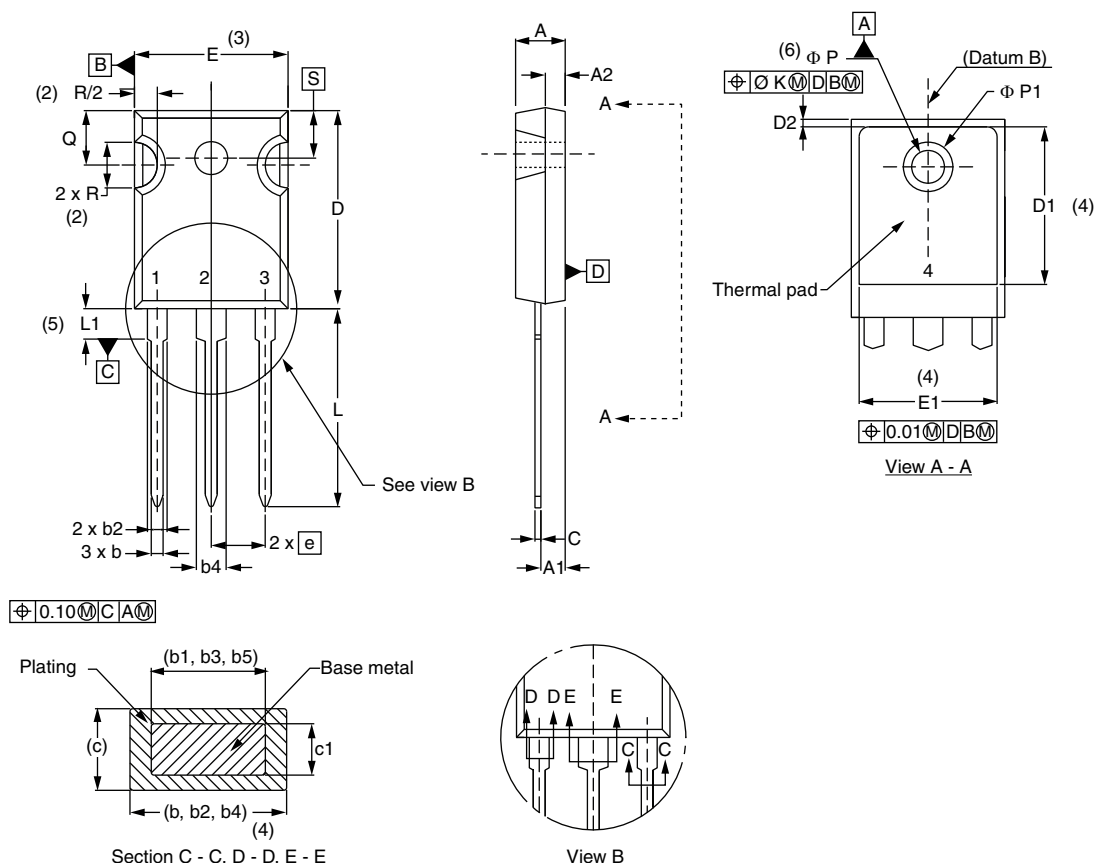
ORDERING INFORMATION (example)			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-50TPS12L-M3	25	contact factory	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS	
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>



### TO-247AD 3L

**DIMENSIONS** in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	0.183	0.209	
A1	2.21	2.59	0.087	0.102	
A2	1.50	2.49	0.059	0.098	
b	0.99	1.40	0.039	0.055	
b1	0.99	1.35	0.039	0.053	
b2	1.65	2.39	0.065	0.094	
b3	1.65	2.34	0.065	0.092	
b4	2.59	3.43	0.102	0.135	
b5	2.59	3.38	0.102	0.133	
c	0.38	0.89	0.015	0.035	
c1	0.38	0.84	0.015	0.033	
D	19.71	20.70	0.776	0.815	3
D1	13.08	-	0.515	-	4

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D2	0.51	1.30	0.020	0.051	
E	15.29	15.87	0.602	0.625	3
E1	13.46	-	0.53	-	
e	5.46 BSC		0.215 BSC		
$\phi K$	0.254		0.010		
L	19.81	20.32	0.780	0.800	
L1	3.71	4.29	0.146	0.169	
$\phi P$	3.56	3.66	0.14	0.144	
$\phi P1$	-	6.98	-	0.275	
Q	5.31	5.69	0.209	0.224	
R	4.52	5.49	0.178	0.216	
S	5.51 BSC		0.217 BSC		

#### Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
- Contour of slot optional
- Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- Thermal pad contour optional with dimensions D1 and E1
- Lead finish uncontrolled in L1
- $\phi P$  to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4



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