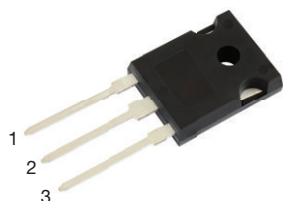
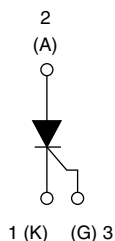


Thyristor High Voltage, Phase Control SCR, 50 A



TO-247AD 3L



FEATURES

- AEC-Q101 qualified, meets JESD 201 class 1A whisker test
- Flexible solution for reliable AC power rectification
- Easy control peak current at charger power up to reduce passive / electromechanical components
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- On-board and off-board EV / HEV battery chargers
- Renewable energy inverters

DESCRIPTION

The VS-50TPS12 high voltage series of silicon controlled rectifiers are specifically designed for medium power switching, and phase control applications.

PRIMARY CHARACTERISTICS

$I_{T(AV)}$	50 A
V_{DRM}/V_{RRM}	1200 V
V_{TM} (typ.)	1.2 V
I_{GT} (typ.)	45 mA
T_J max.	150 °C
Package	TO-247AD 3L
Circuit configuration	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, $T_J = 125$ °C	1.2	
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/ μ s
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 150 °C mA
VS-50TPS12LHM3	1200	1300	70



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	-	530	
		10 ms sine pulse, no voltage reapplied	-	630	A ² 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 ² √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	
		$T_J = 150\text{ }^{\circ}\text{C}$	-	70	
Rate of rise of off-state voltage	dv/dt	$T_J = T_J$ maximum, linear to 80 % V_{DRM} , $R_g\text{-k} = 100\text{ }^{\circ}\Omega$	-	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	TYP.	MAX.	UNITS
Turn-on time	t_{gt}	$I_T = 50\text{ A}$, $V_D = 50\text{ }^{\circ}\text{V}_{DRM}$, $I_{gt} = 300\text{ mA}$, $T_J = 25\text{ }^{\circ}\text{C}$	1.5	-	μs
Turn-off time	t_q	$I_T = 50\text{ A}$, $V_D = 80\text{ }^{\circ}\text{V}_{DRM}$, $dV/dt = 20\text{ V}/\mu\text{s}$, $t_p = 200\text{ }^{\circ}\mu\text{s}$, $I_{gt} = 100\text{ mA}$, $dI/dt = 10\text{ A}/\mu\text{s}$, $V_R = 100\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$	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-247AD 3L	50TPS12LH		

 ΔR_{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-50TPS12LHM3	0.143	0.166	0.208	0.299	0.490	0.099	0.168	0.223	0.311	0.494	°C/W

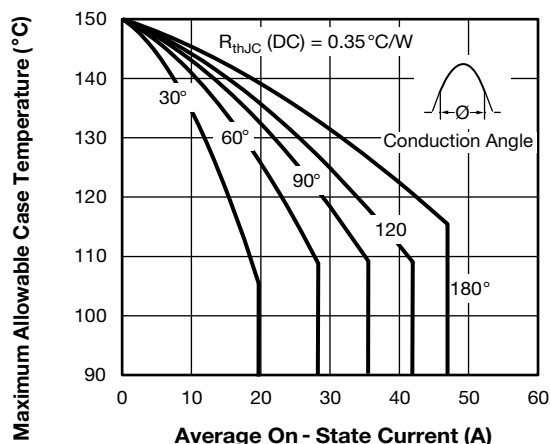


Fig. 1 - Current Rating Characteristics

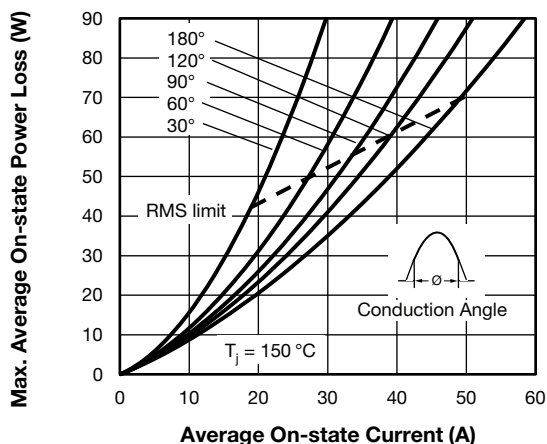


Fig. 3 - On-State Power Loss Characteristics

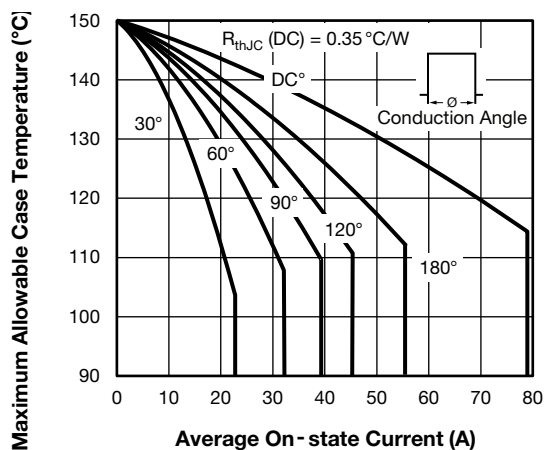


Fig. 2 - Current Rating Characteristics

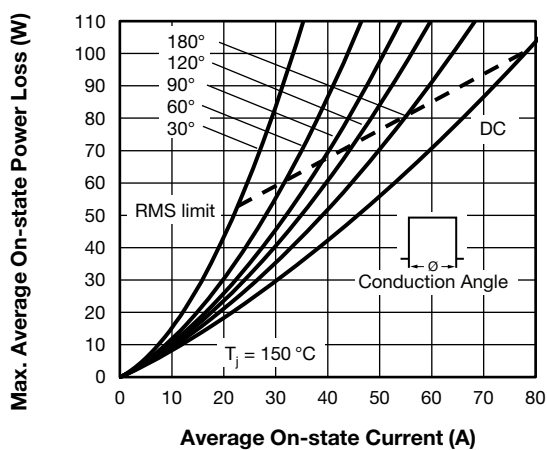


Fig. 4 - On-State Power Loss Characteristics

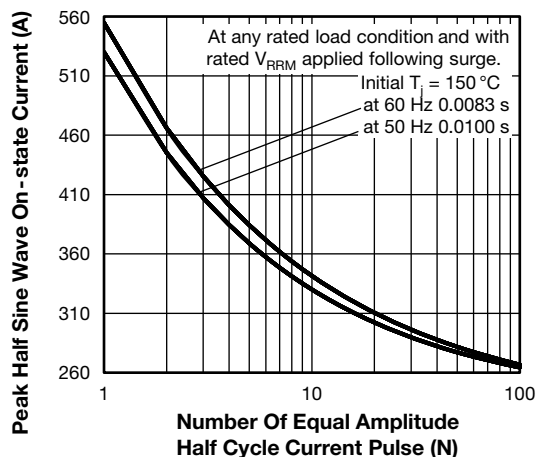


Fig. 5 - Maximum Non-Repetitive Surge Current

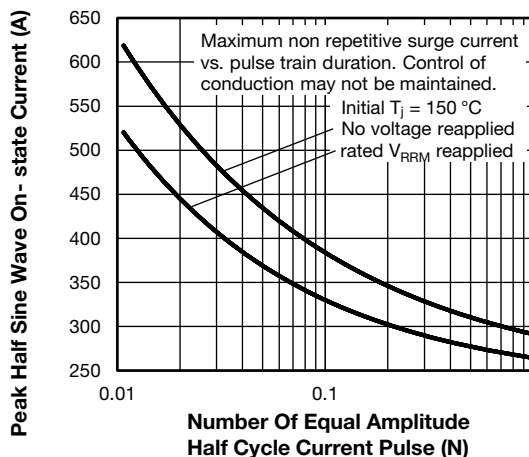


Fig. 6 - Maximum Non-Repetitive Surge Current

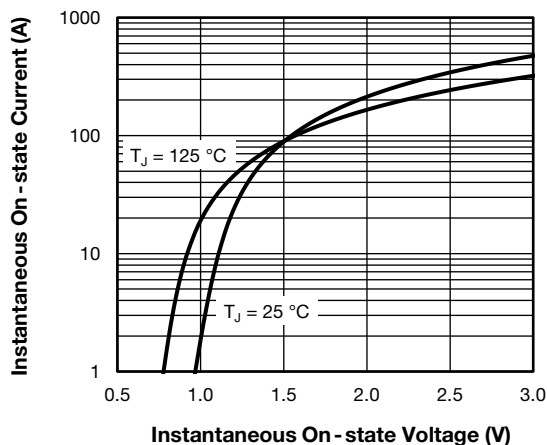


Fig. 7 - On-State Voltage Drop Characteristics

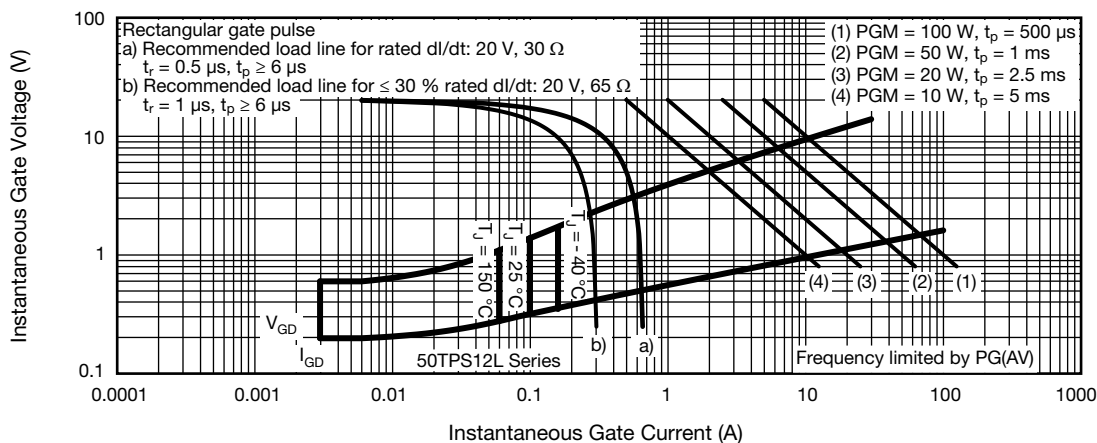
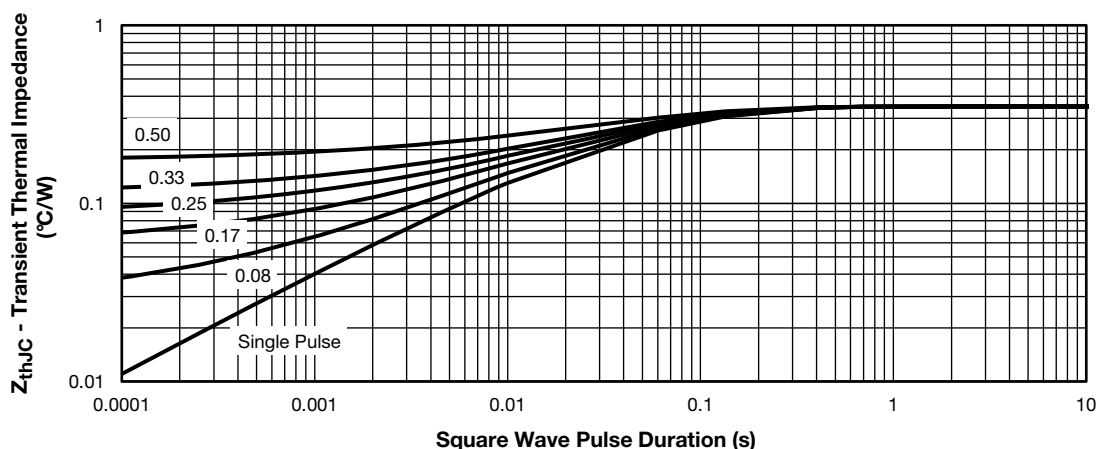


Fig. 8 - Gate Characteristics


Fig. 9 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

Device code

VS-	50	T	P	S	12	L	H	M3
1	2	3	4	5	6	7	8	9

- 1** - Vishay Semiconductors product
- 2** - Current code (50 = 50 A)
- 3** - Circuit configuration:
T = thyristor
- 4** - P = TO-247AD package
- 5** - Type of silicon:
S = standard recovery rectifier
- 6** - Voltage code (12 = 1200 V)
- 7** - Package L = long lead
- 8** - H = AEC-Q101 qualified
- 9** - 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-50TPS12LHM3	25	contact factory	Antistatic plastic tubes

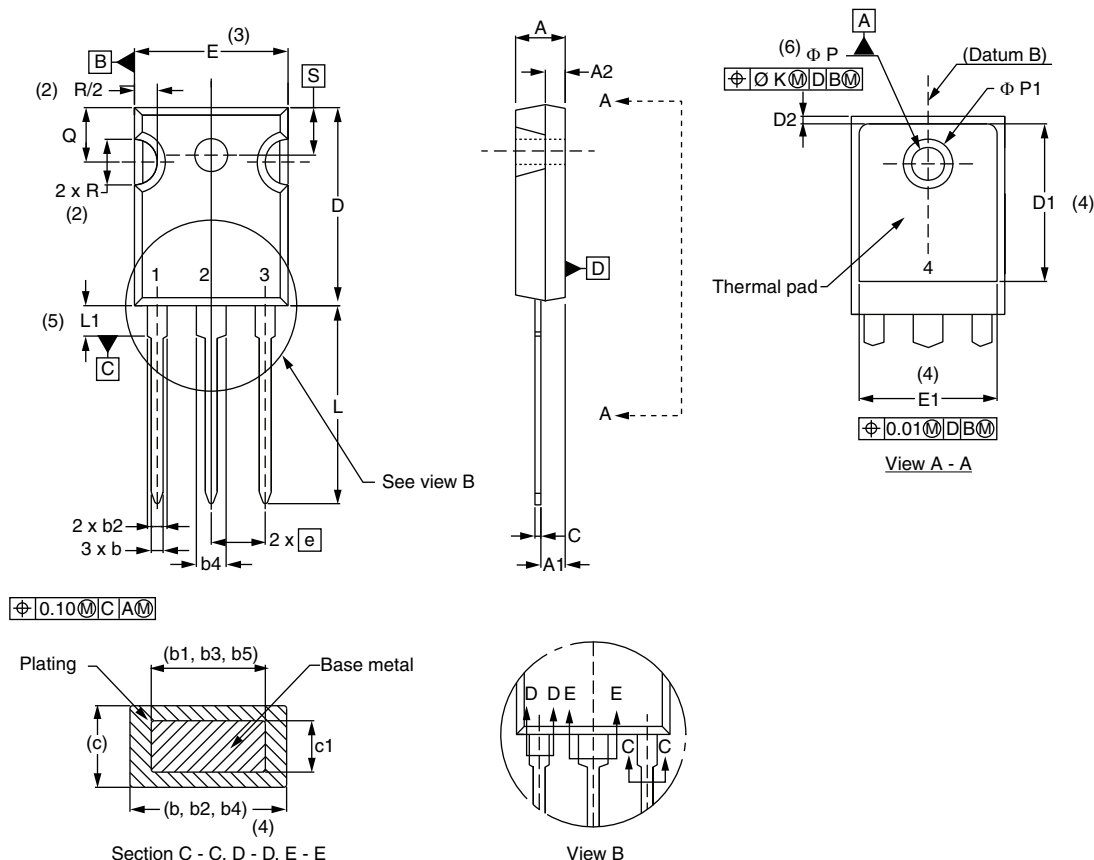
LINKS TO RELATED DOCUMENTS

Dimensions	TO-247AD 3L	www.vishay.com/doc?95626
Part marking information	TO-247AD 3L	www.vishay.com/doc?95007



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		
ΦK	0.254		0.010		
L	19.81	20.32	0.780	0.800	
L1	3.71	4.29	0.146	0.169	
ΦP	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
- ΦP 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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