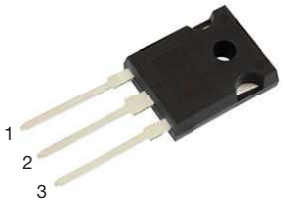
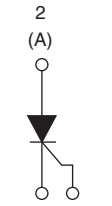
Thyristor High Voltage, Phase Control SCR, 50 A



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.)	40 mA
T_J max.	125 °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/µs
Operating junction and storage temperature range	T_J, T_{Stg}		-40 to +125	°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-50TPS12LHM3	1200	1300	10

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS		TYP.	MAX.	UNITS
Maximum average on-state current	$I_{T(AV)}$	T_C = 82 °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^2s
		10 ms sine pulse, no voltage reapplied		-	1986	
$I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied, T_J = 125 °C		-	19 850	$A^2\sqrt{s}$
Low level value of threshold voltage	$V_{T(TO)1}$	T_J = 125 °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 °C		1.2	1.32	V
		100 A, T_J = 25 °C		1.4	1.6	
Rate of rise of turned-on current	di/dt	T_J = 25 °C		-	150	A/µs
Holding current	I_H	Anode supply = 6 V, resistive load, T_J = 25 °C		-	300	mA
Latching current	I_L			-	350	
Reverse and direct leakage current	I_{RRM}/I_{DRM}	T_J = 25 °C		-	0.05	
		T_J = 125 °C		-	10	
Rate of rise of off-state voltage	dv/dt	$T_J = T_J$ maximum, linear to 80 % V_{DRM}, R_g-k = ∞ Ω		-	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 °C	Anode supply = 6 V resistive load	-	1.6	
		T_J = 25 °C		-	1.5	
		T_J = 125 °C		-	1.1	
Required DC gate to trigger	I_{GT}	T_J = -40 °C	Anode supply = 6 V resistive load	-	160	mA
		T_J = 25 °C		45	100	
		T_J = 125 °C		-	70	
DC gate voltage not to trigger	V_{GD}	T_J = 125 °C, V_{DRM} = rated value		-	0.25	V
DC gate current not to trigger	I_{GD}			-	4.5	mA

SWITCHING

PARAMETER	SYMBOL	TEST CONDITIONS	TYP.	MAX.	UNITS
Turn-on time	t_{gt}	I_T = 50 A, V_D = 50 % V_{DRM}, I_{gt} = 300 mA, T_J = 25 °C	1.5	-	µs
Turn-off time	t_q	I_T = 50 A, V_D = 80 % V_{DRM}, dV/dt = 20 V/µs, t_p = 200 µs I_{gt} = 100 mA, dI/dt = 10 A/µs, V_R = 100 V, T_J = 125 °C	85	-	

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER		SYMBOL	TEST CONDITIONS	TYP.	MAX.	UNITS
Maximum junction and storage temperature range		T_J, T_{Stg}		-40	125	°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		

$\Delta R_{thJ\text{-}HS}$ 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

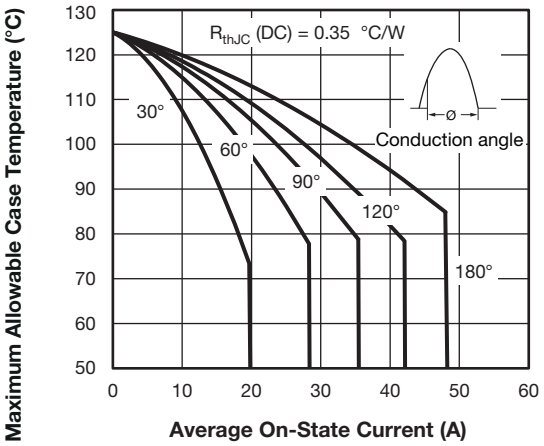


Fig. 1 - Current Rating Characteristics

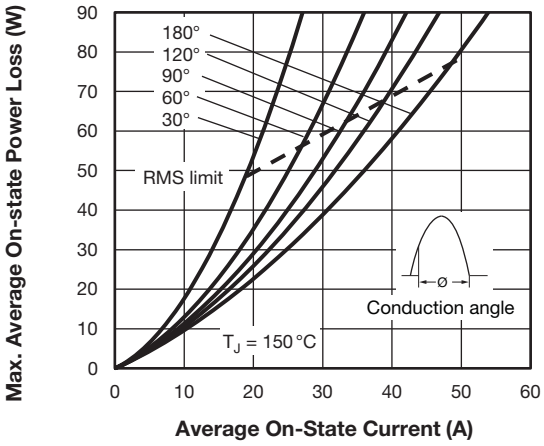


Fig. 3 - On-State Power Loss Characteristics

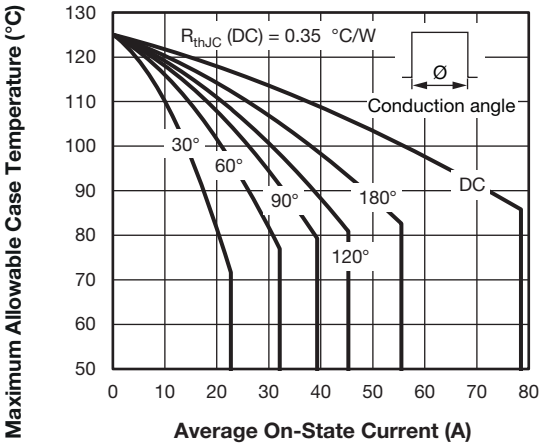


Fig. 2 - Current Rating Characteristics

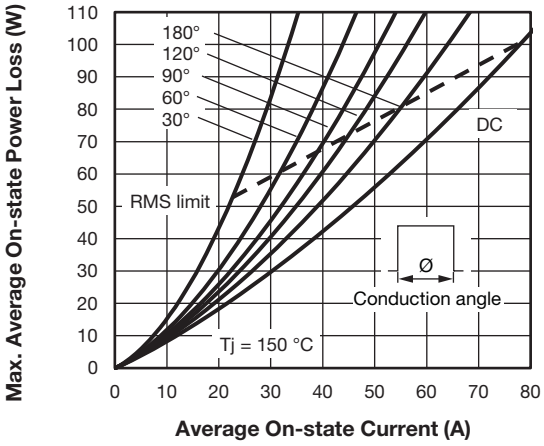


Fig. 4 - On-State Power Loss Characteristics

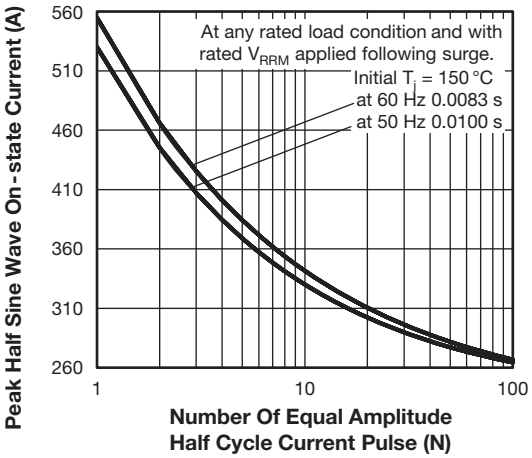


Fig. 5 - Maximum Non-Repetitive Surge Current

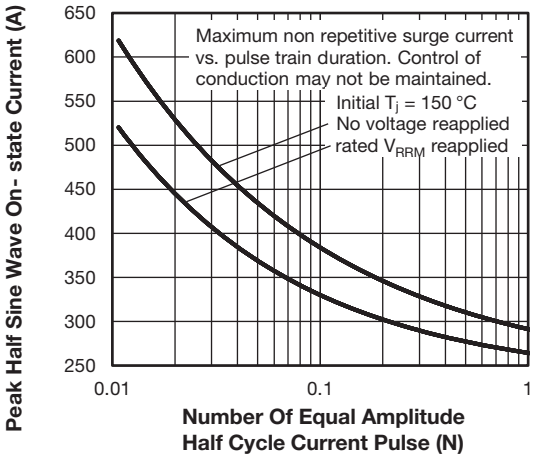


Fig. 6 - Maximum Non-Repetitive Surge Current

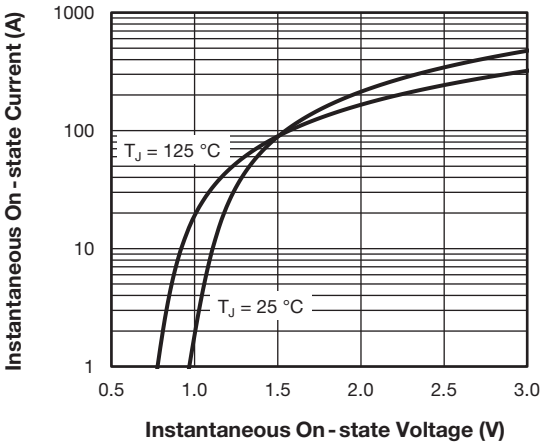


Fig. 7 - On-State Voltage Drop Characteristics

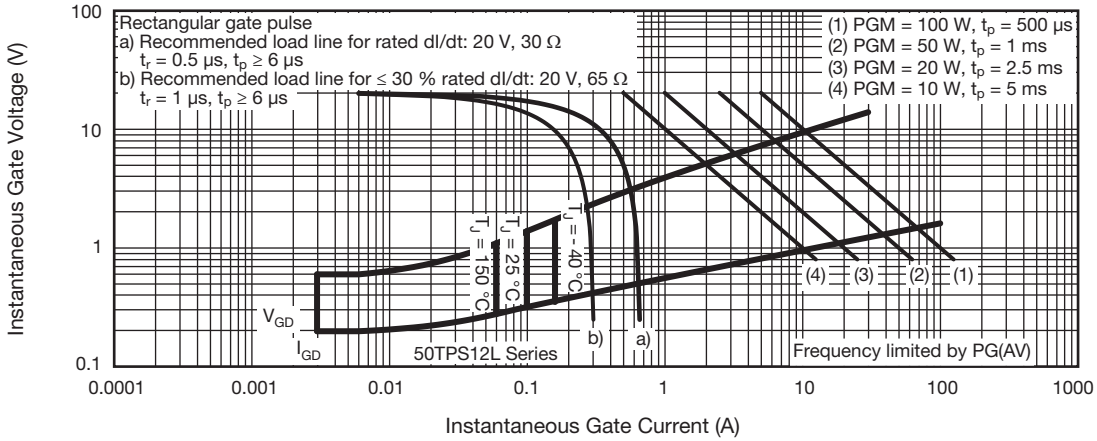


Fig. 8 - Gate Characteristics

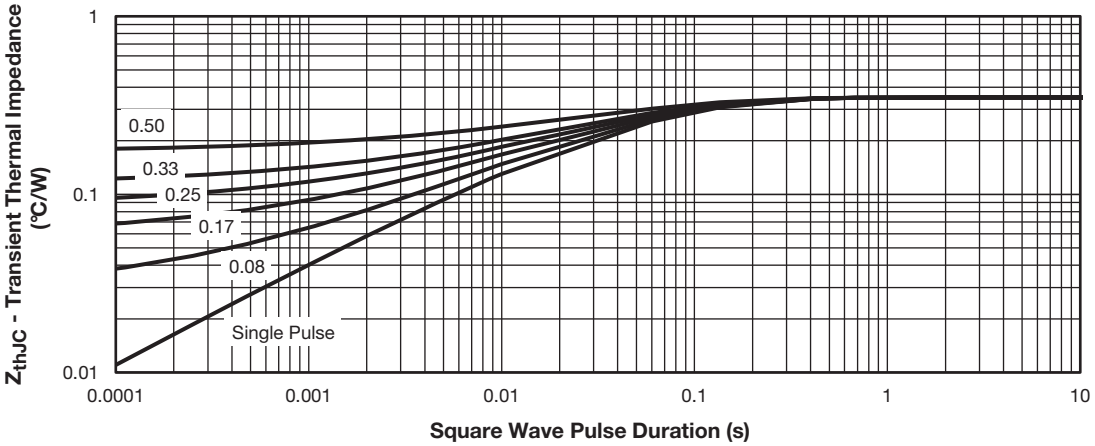


Fig. 9 - Thermal Impedance Z_{thJC} Characteristics

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

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