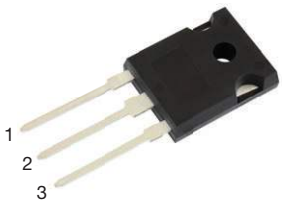
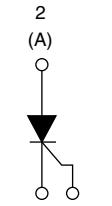
Thyristor High Voltage, Phase Control SCR, 80 A



TO-247AD 3L



FEATURES

- AEC-Q101 qualified, meets JESD 201 class 1A whisker test
- 150 °C maximum operating junction temperature
- Material categorization: for definitions of compliance please see 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-80TPS12L 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.

MECHANICAL DATA

Case: TO-247AD 3L
Molding compound meets UL 94 V-0 flammability rating

Terminals: matte tin plated leads, solderable per J-STD-002

PRIMARY CHARACTERISTICS	
$I_{T(AV)}$	80 A
V_{DRM}/V_{RRM}	1200 V
V_{TM} (typ.)	1.18 V
I_{GT}	100 mA
T_J	-40 °C to +150 °C
Package	TO-247AD 3L
Circuit configuration	Single SCR

LINKS TO ADDITIONAL RESOURCES

3D Models

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	80 A, T_J = 125 °C, typical	1.18	
Average rectified forward current	$I_{T(AV)}$		80	A
Maximum continuous RMS on-state current	I_{RMS}		126	
Non-repetitive peak surge current	I_{TSM}	T_J = 150 °C, 10 ms sine	760	
Maximum rate of rise	dV/dt		1000	V/µs
Maximum 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	TYP. I_{RRM}/I_{DRM} AT 150 °C mA
VS-80TPS12LHM3	1200	1300	20

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS		TYP.	MAX.	UNITS
Maximum average on-state current	$I_{T(AV)}$	T_C = 103 °C, 180° conduction half sine wave		-	80	A
Maximum continuous RMS on-state current as AC switch	$I_{T(RMS)}$			-	126	
Peak, one-cycle non-repetitive surge current	I_{TSM}	10 ms sine pulse, rated V_{RRM} applied	Initial T_J = T_J maximum	-	640	
		10 ms sine pulse, no voltage reapplied		-	760	
I^2t for fusing	I^2t	10 ms sine pulse, rated V_{RRM} applied		-	2048	A^2s
		10 ms sine pulse, no voltage reapplied		-	2890	
$I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied, T_J = 150 °C		-	28 900	$A^2\sqrt{s}$
On-state voltage	V_T	80 A, T_J = 25 °C		1.23	1.38	V
		160 A, T_J = 25 °C		1.48	1.68	
		80 A, T_J = 125 °C		1.18	1.26	
		160 A, T_J = 125 °C		1.50	1.62	
Low level value of threshold voltage	V_{T01}	T_J = 150 °C		-	0.85	V
High level value of threshold voltage	V_{T02}			-	0.96	
Low level value of on-state slope resistance	r_{t1}	T_J = 150 °C		-	4.50	mΩ
High level value of on-state slope resistance	r_{t2}			-	4.00	
Rate of rise of turned-on current	dI/dt	T_J = 150 °C, V_R < 800 V, I_T = 80 A, I_{gt} = 200 mA, V_{GT} = 2.5 V, t_r < 100 ns, repetitive		-	200	A/µs
		T_J = 150 °C, V_R < 1000 V, I_T = 80 A, I_{gt} = 200 mA, V_{GT} = 2.5 V, t_r < 100 ns, non repetitive		-	500	
Holding current	I_H	Anode supply = 6 V, resistive load, T_J = 25 °C		-	350	mA
Latching current	I_L			-	500	
Reverse and direct leakage current	I_{RRM}/I_{DRM}	T_J = 25 °C		25	100	µA
		T_J = 125 °C		6	35	mA
		T_J = 150 °C		20	70	
Rate of rise of off-state voltage	dV/dt	T_J = T_J maximum, linear to 80 % V_{DRM}, R_{g-k} = open		-	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	1.2	1.7	
		T_J = 25 °C	Anode supply = 6 V resistive load	1.0	1.5	
		T_J = 125 °C	Anode supply = 6 V resistive load	0.7	1.2	
		T_J = 150 °C	Anode supply = 6 V resistive load	0.6	1.1	
Required DC gate to trigger	I_{GT}	T_J = -40 °C	Anode supply = 6 V resistive load	110	150	mA
		T_J = 25 °C	Anode supply = 6 V resistive load	60	100	
		T_J = 125 °C	Anode supply = 6 V resistive load	25	50	
		T_J = 150 °C	Anode supply = 6 V resistive load	19	40	
DC gate voltage not to trigger	V_{GD}	T_J = 150 °C, V_{DRM} = 80 % rated value		-	0.20	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 = 80 A, V_D = 50 % V_{DRM}, I_{gt} = 300 mA, T_J = 25 °C	1.5	-	µs
Turn-off time	t_q	I_T = 80 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 = 150 °C	70	-	

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER		SYMBOL	TEST CONDITIONS	MIN.	MAX.	UNITS
Maximum operating junction and storage temperature range		T_J, T_{Stg}		-40	150	°C
Maximum thermal resistance, junction to case		R_{thJC}		-	0.31	°C/W
Maximum thermal resistance, junction to ambient		R_{thJA}		-	40	
Typical thermal resistance, case to heatsink		R_{thCS}	Mounting surface, smooth, and greased	0.20		
Approximate weight				6 (0.21)		g (oz.)
Mounting torque	minimum			6 (5)		kgf · cm (lbf · in)
	maximum			12 (10)		
Marking device			Case style TO-247AD 3L	80TPS12LH		

$\Delta R_{thJ\text{-}HS}$ CONDUCTION PER JUNCTION											
DEVICE	SINE HALF-WAVE CONDUCTION					RECTANGULAR WAVE CONDUCTION					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
VS-80TPS12LHM3	0.042	0.047	0.054	0.057	0.059	0.038	0.049	0.051	0.054	0.057	°C/W

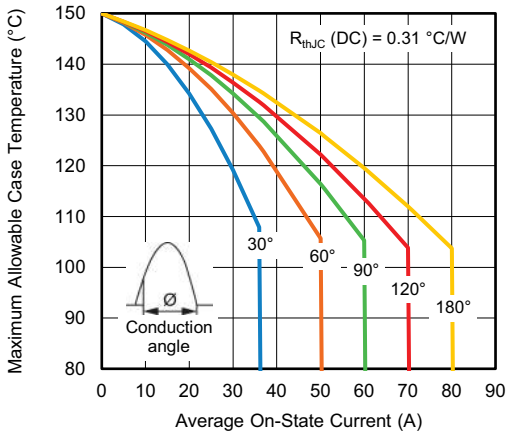


Fig. 1 - Current Rating Characteristics

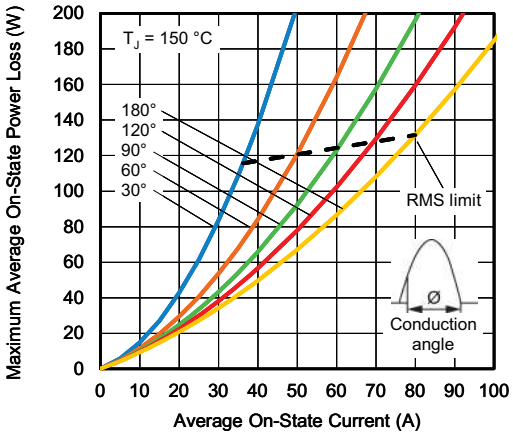


Fig. 3 - On-State Power Loss Characteristics

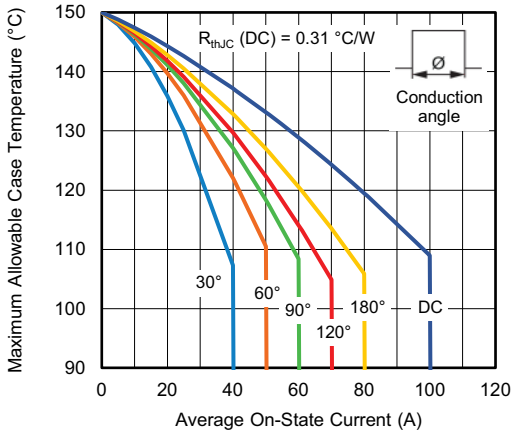


Fig. 2 - Current Rating Characteristics

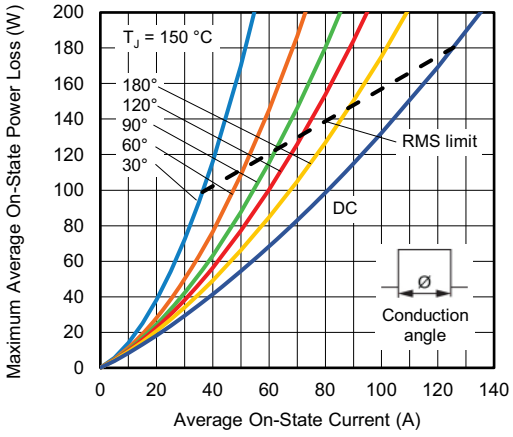


Fig. 4 - On-State Power Loss Characteristics

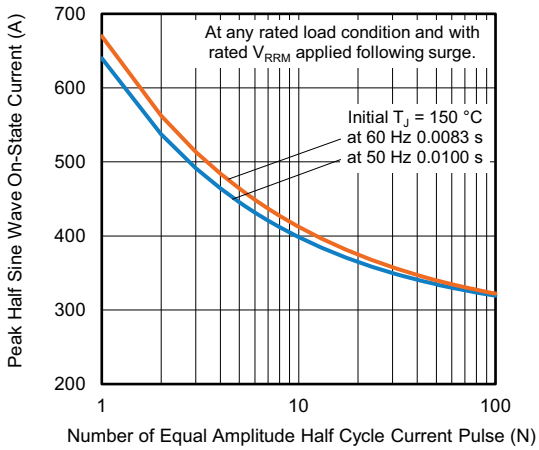


Fig. 5 - Maximum Non-Repetitive Surge Current

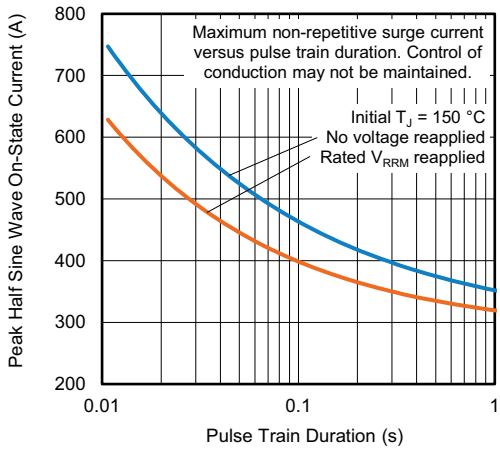


Fig. 6 - Maximum Non-Repetitive Surge Current

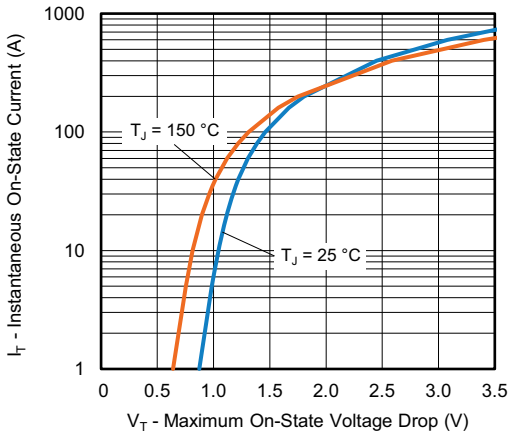


Fig. 7 - On-State Voltage Drop Characteristics

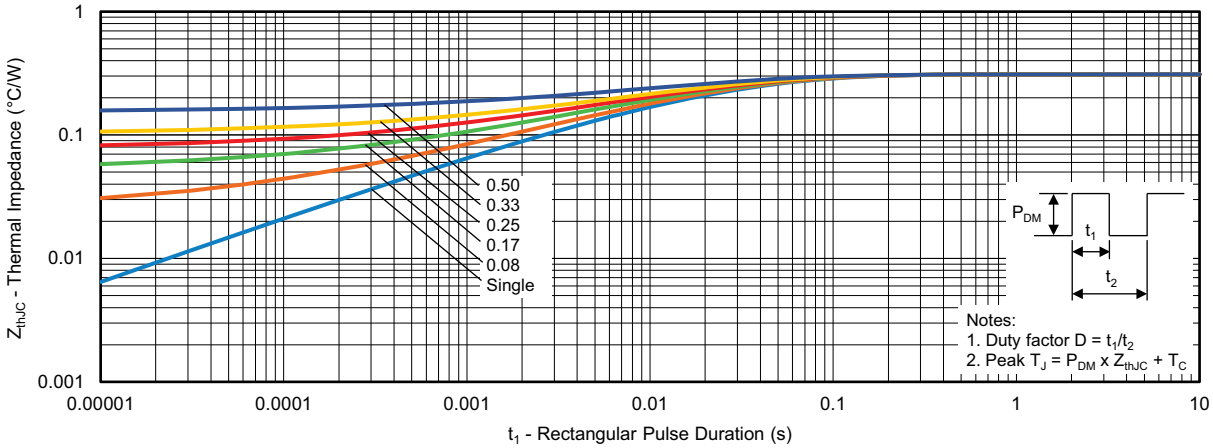
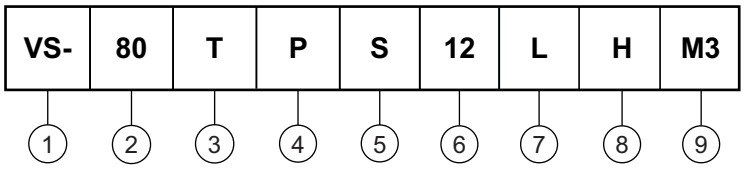


Fig. 8 - Maximum Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product
2 - Current code (80 = 80 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 - 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-80TPS12LHM3	25	500	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95626
Part marking information	www.vishay.com/doc?95007

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.