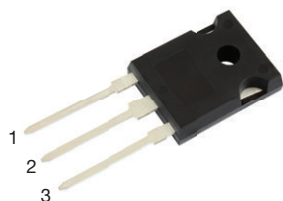
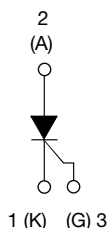


## Thyristor High Voltage, Phase Control SCR, 40 A



TO-247AD 3L



### FEATURES

- Low  $I_{GT}$  parts available
- Designed and qualified according to JEDEC® - JESD 47
- 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](http://www.vishay.com/doc?99912)



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

### PRIMARY CHARACTERISTICS

$I_{T(AV)}$	35 A
$V_{DRM}/V_{RRM}$	1200 V
$V_{TM}$	1.45 V
$I_{GT}$	150 mA
$T_J$	-40 °C to +125 °C
Package	TO-247AD 3L
Circuit configuration	Single SCR

### APPLICATIONS

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

### DESCRIPTION

The VS-40TPS12.. high voltage series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications. AEC-Q101 qualified P/N available (VS-40TPS12LHM3, VS-40TPS12ALHM3).

### MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$	Sinusoidal waveform	35	A
$I_{RMS}$		55	
$V_{RRM}/V_{DRM}$		1200	V
$I_{TSM}$		600	A
$V_T$	40 A, $T_J = 25$ °C	1.45	V
dv/dt		1000	V/μs
di/dt		100	A/μs
$T_J$		-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-40TPS12AL-M3	1200	1300	10
VS-40TPS12L-M3	1200	1300	



ABSOLUTE MAXIMUM RATINGS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum average on-state current	I <sub>T(AV)</sub>	T <sub>C</sub> = 79 °C, 180° conduction half sine wave		35	A
Maximum continuous RMS on-state current as AC switch	I <sub>T(RMS)</sub>			55	
Maximum peak, one-cycle non-repetitive surge current	I <sub>TSM</sub>	10 ms sine pulse, rated V <sub>RRM</sub> applied	Initial T <sub>J</sub> = T <sub>J</sub> max.	500	
		10 ms sine pulse, no voltage reapplied		600	
Maximum I <sup>2</sup> t for fusing	I <sup>2</sup> t	10 ms sine pulse, rated V <sub>RRM</sub> applied		1250	A <sup>2</sup> √s
		10 ms sine pulse, no voltage reapplied		1760	
Maximum I <sup>2</sup> √t for fusing	I <sup>2</sup> √t	t = 0.1 ms to 10 ms, no voltage reapplied		17 600	A <sup>2</sup> √s
Low level value of threshold voltage	V <sub>T(TO)1</sub>	T <sub>J</sub> = 125 °C		1.02	V
High level value of threshold voltage	V <sub>T(TO)2</sub>			1.23	
Low level value of on-state slope resistance	r <sub>t1</sub>			9.74	mΩ
High level value of on-state slope resistance	r <sub>t2</sub>			7.50	
Maximum peak on-state voltage	V <sub>TM</sub>	110 A, T <sub>J</sub> = 25 °C		1.85	V
Maximum rate of rise of turned-on current	di/dt	T <sub>J</sub> = 25 °C		100	A/μs
Maximum holding current	I <sub>H</sub>	Anode supply = 6 V, resistive load, initial T <sub>J</sub> = 1 A, I <sub>T</sub> = 25 °C		300	mA
Maximum latching current	I <sub>L</sub>	Anode supply = 6 V, resistive load, T <sub>J</sub> = 25 °C		350	
Maximum reverse and direct leakage current	I <sub>RRM</sub> /I <sub>DRM</sub>	T <sub>J</sub> = 25 °C	V <sub>R</sub> = rated V <sub>RRM</sub> /V <sub>DRM</sub>	0.5	
		T <sub>J</sub> = 125 °C		10	
Maximum rate of rise of off-state voltage 40TPS12A	dv/dt	T <sub>J</sub> = T <sub>J</sub> maximum, linear to 80 % V <sub>DRM</sub> , R <sub>g</sub> - k = 100 Ω		500	V/μs
Maximum rate of rise of off-state voltage 40TPS12				1000	

TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak gate power	P <sub>GM</sub>			10	W
Maximum average gate power	P <sub>G(AV)</sub>			2.5	
Maximum peak gate current	I <sub>GM</sub>			2.5	A
Maximum peak negative gate voltage	-V <sub>GM</sub>			10	V
Maximum required DC gate voltage to trigger	V <sub>GT</sub>	T <sub>J</sub> = -40 °C	Anode supply = 6 V resistive load	2.0	V
		T <sub>J</sub> = 25 °C		1.7	
		T <sub>J</sub> = 125 °C		1.3	
Maximum required DC gate current to trigger	I <sub>GT</sub>	T <sub>J</sub> = -40 °C	Anode supply = 6 V resistive load	200	mA
		T <sub>J</sub> = 25 °C		150	
		T <sub>J</sub> = 125 °C		80	
		T <sub>J</sub> = 25 °C, for 40TPS12A		40	
Maximum DC gate voltage not to trigger for 40TPS12	V <sub>GD</sub>	T <sub>J</sub> = 125 °C, V <sub>DRM</sub> = rated value		0.25	V
Maximum DC gate current not to trigger for 40TPS12	I <sub>GD</sub>			6	mA
Maximum DC gate voltage not to trigger for 40TPS12A	V <sub>GD</sub>	T <sub>J</sub> = 125 °C, V <sub>DRM</sub> = rated value		0.15	V
Maximum DC gate current not to trigger for 40TPS12A	I <sub>GD</sub>			1	mA



THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		-40 to +125	°C
Maximum thermal resistance, junction to case	$R_{thJC}$	DC operation	0.6	°C/W
Maximum thermal resistance, junction to ambient	$R_{thJA}$		40	
Maximum thermal resistance, case to heat sink	$R_{thCS}$	Mounting surface, smooth and greased	0.25	
Approximate weight			6	g
			0.21	oz.
Mounting torque	minimum		6 (5)	kgf · cm
	maximum		12 (10)	(lbf · in)
Marking device		Case style TO-247AD 3L	40TPS12AL	
			40TPS12L	

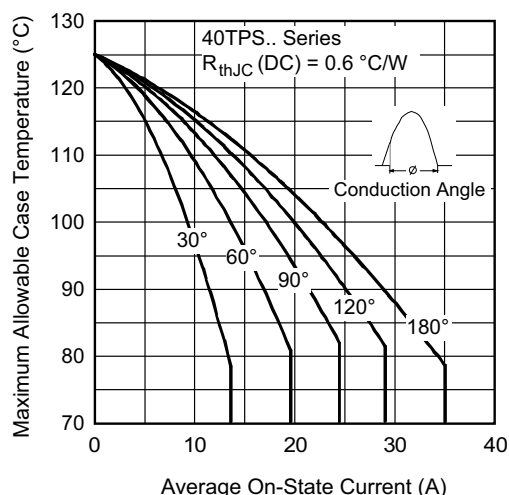


Fig. 1 - Current Rating Characteristics

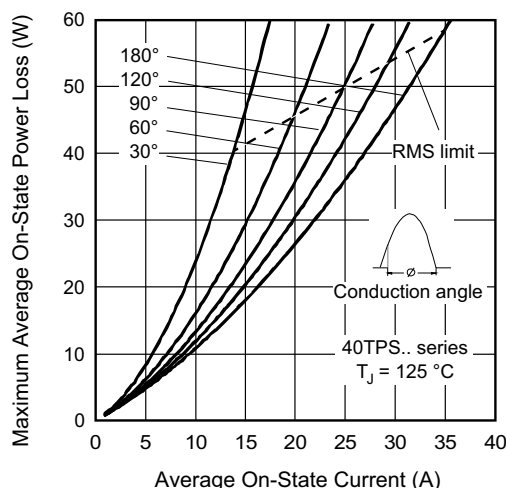


Fig. 3 - On-State Power Loss Characteristics

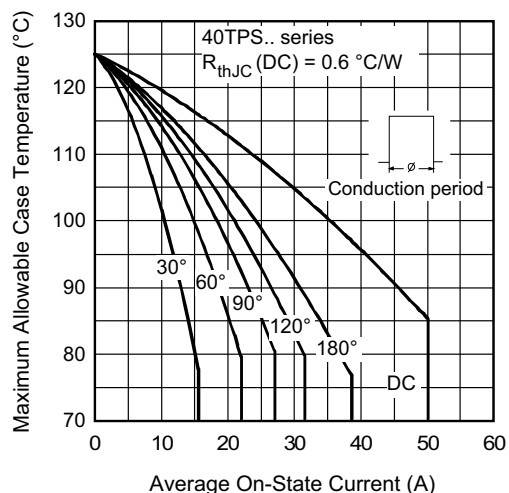


Fig. 2 - Current Rating Characteristics

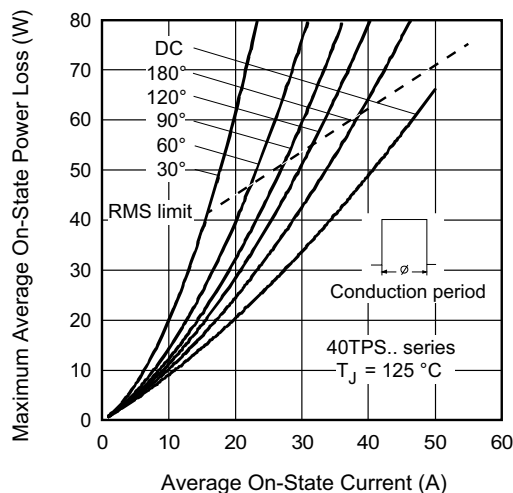


Fig. 4 - On-State Power Loss Characteristics

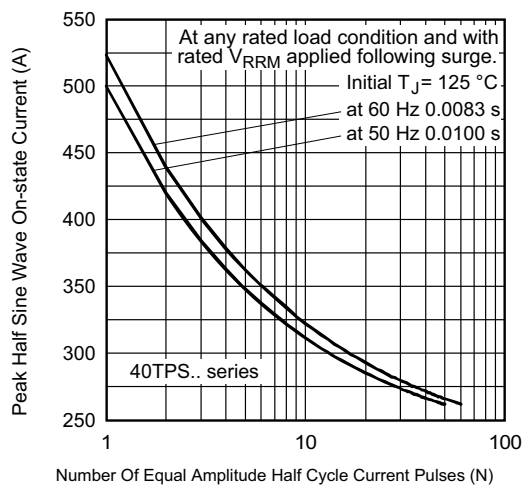


Fig. 5 - Maximum Non-Repetitive Surge Current

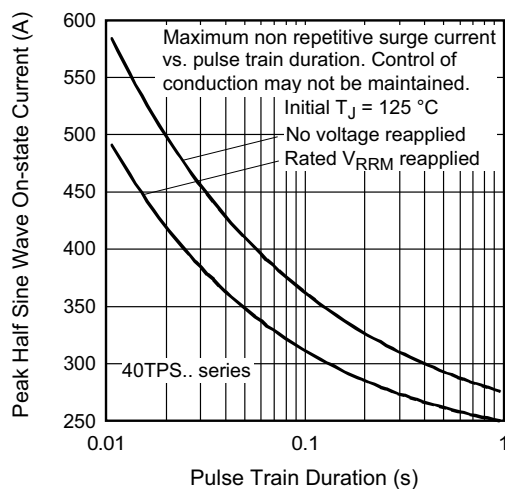


Fig. 6 - Maximum Non-Repetitive Surge Current

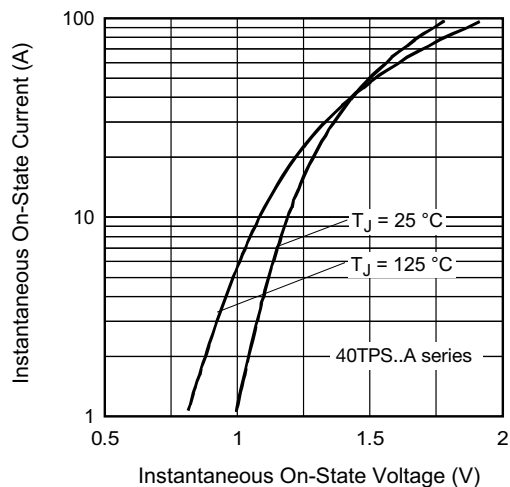


Fig. 7 - On-State Voltage Drop Characteristics

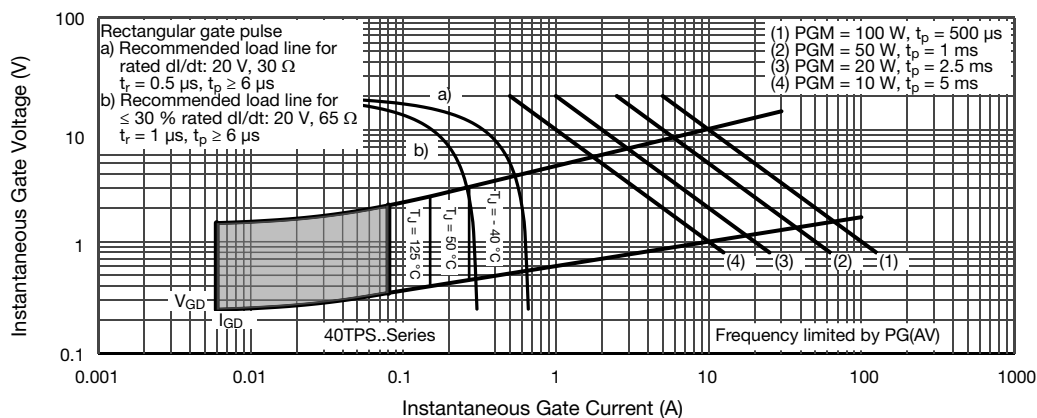


Fig. 8 - Gate Characteristics

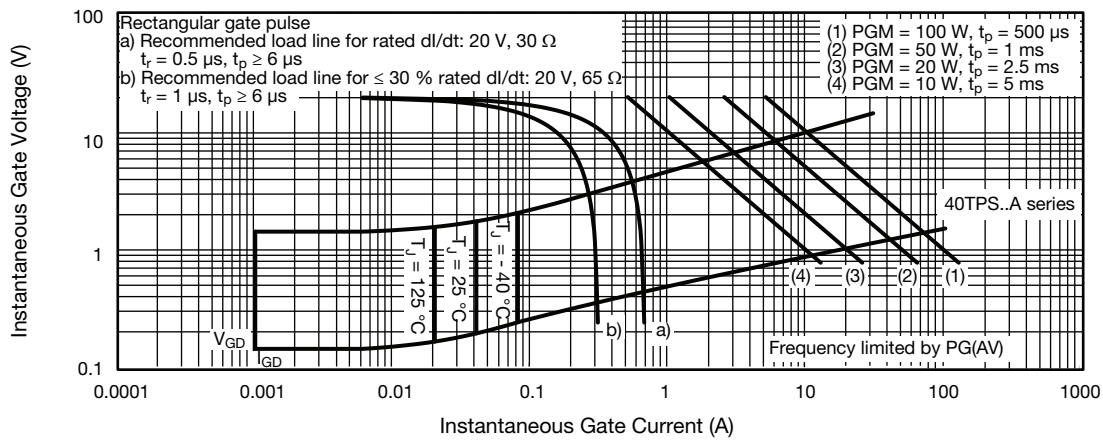
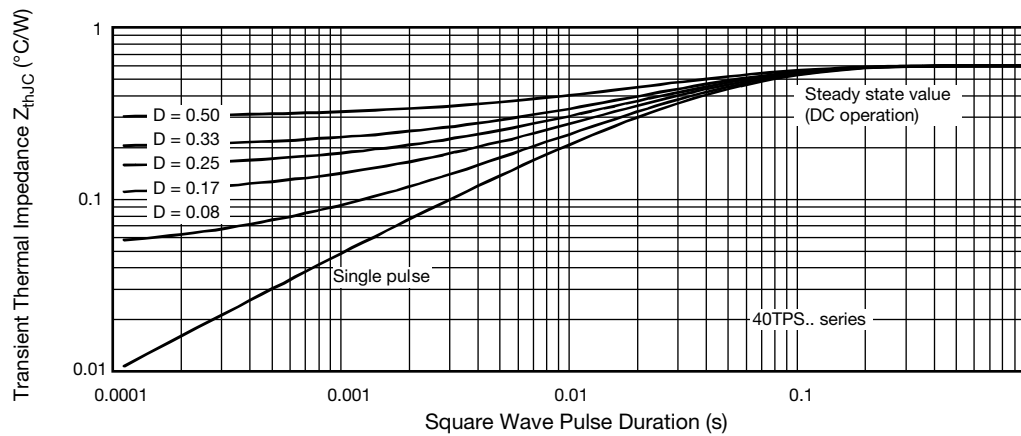


Fig. 9 - Gate Characteristics


Fig. 10 - Thermal Impedance  $Z_{thJC}$  Characteristics



## ORDERING INFORMATION TABLE

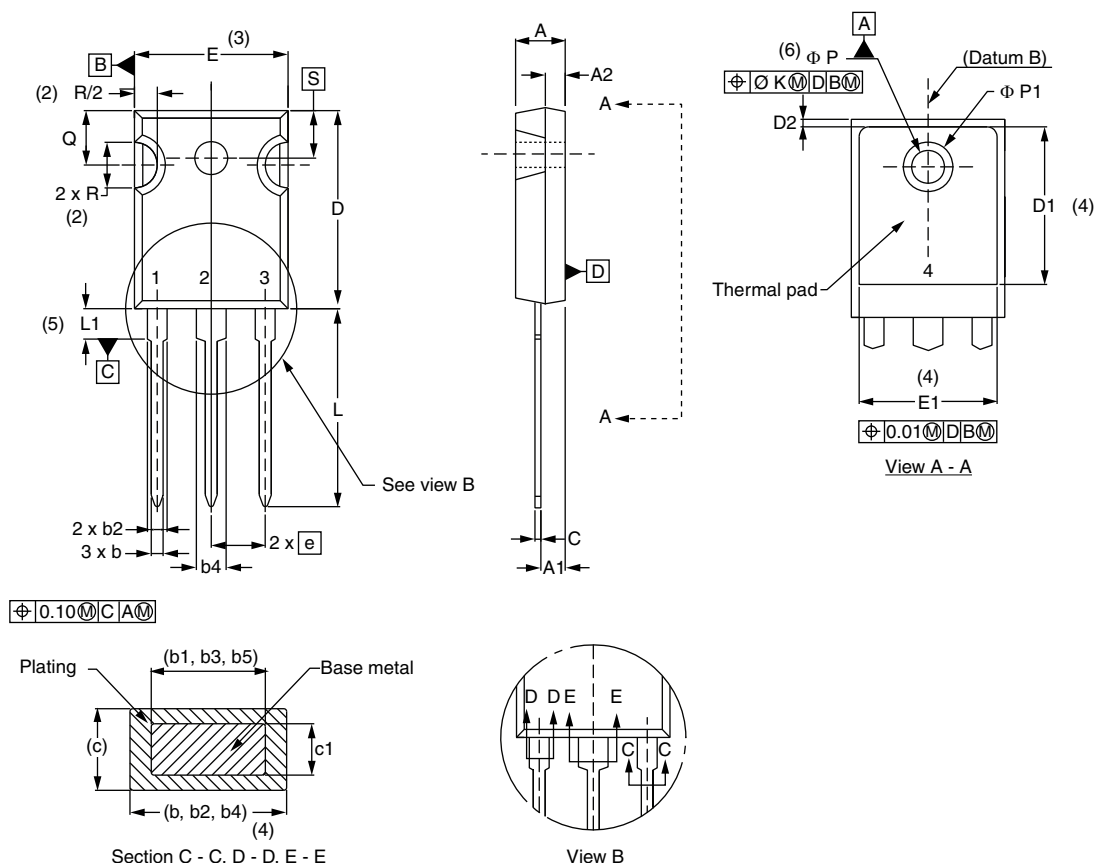
Device code	VS-	40	T	P	S	12	A	L	-M3
	1	2	3	4	5	6	7	8	9
1	Vishay Semiconductors product								
2	Current rating (40 = 40 A)								
3	Circuit configuration: T = thyristor								
4	Package: P = TO-247								
5	Type of silicon: S = standard recovery rectifier								
6	Voltage ratings <span style="border: 1px solid black; padding: 2px;">12 = 1200 V</span>								
7	• A = Low Igt selection 40 mA maximum • None = standard Igt selection								
8	L = long leads								
9	Environmental digit: -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-40TPS12AL-M3	25	500	Antistatic plastic tubes
VS-40TPS12L-M3	25	500	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS		
Dimensions	TO-247AD 3L	<a href="http://www.vishay.com/doc?95626">www.vishay.com/doc?95626</a>
Part marking information	TO-247AD 3L	<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		
Ø K	0.254		0.010		
L	19.81	20.32	0.780	0.800	
L1	3.71	4.29	0.146	0.169	
Ø P	3.56	3.66	0.14	0.144	
Ø 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
- Ø 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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