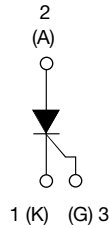
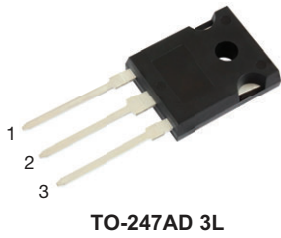




## Thyristor High Voltage, Phase Control SCR, 40 A



### FEATURES

- Low  $I_{GT}$  parts available
- 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](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

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

### DESCRIPTION

The VS-40TPS... high voltage series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications.

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, $T_J = 25\text{ °C}$	1.45	V
dv/dt		1000	V/ $\mu$ s
di/dt		100	A/ $\mu$ s
$T_J$		-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-40TPS12ALHM3	1200	1300	10
VS-40TPS12LHM3	1200	1300	



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

TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak gate power	$P_{GM}$			10	W
Maximum average gate power	$P_{G(AV)}$			2.5	
Maximum peak gate current	$I_{GM}$			2.5	A
Maximum peak negative gate voltage	$-V_{GM}$			10	V
Maximum required DC gate voltage to trigger	$V_{GT}$	$T_J = -40\text{ }^\circ\text{C}$	Anode supply = 6 V resistive load	2.0	V
		$T_J = 25\text{ }^\circ\text{C}$		1.7	
		$T_J = 125\text{ }^\circ\text{C}$		1.3	
Maximum required DC gate current to trigger	$I_{GT}$	$T_J = -40\text{ }^\circ\text{C}$	Anode supply = 6 V resistive load	200	mA
		$T_J = 25\text{ }^\circ\text{C}$		150	
		$T_J = 125\text{ }^\circ\text{C}$		80	
		$T_J = 25\text{ }^\circ\text{C}$ , for 40TPS12A		40	
Maximum DC gate voltage not to trigger for 40TPS12	$V_{GD}$	$T_J = 125\text{ }^\circ\text{C}$ , $V_{DRM} = \text{rated value}$		0.25	V
Maximum DC gate current not to trigger for 40TPS12	$I_{GD}$			6	mA
Maximum DC gate voltage not to trigger for 40TPS12A	$V_{GD}$	$T_J = 125\text{ }^\circ\text{C}$ , $V_{DRM} = \text{rated value}$		0.15	V
Maximum DC gate current not to trigger for 40TPS12A	$I_{GD}$			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	0.2	
Approximate weight			6	g
			0.21	oz.
Mounting torque	minimum maximum		6 (5)	kgf · cm (lbf · in)
			12 (10)	
Marking device		Case style TO-247AD 3L	40TPS12ALH	
			40TPS12LH	

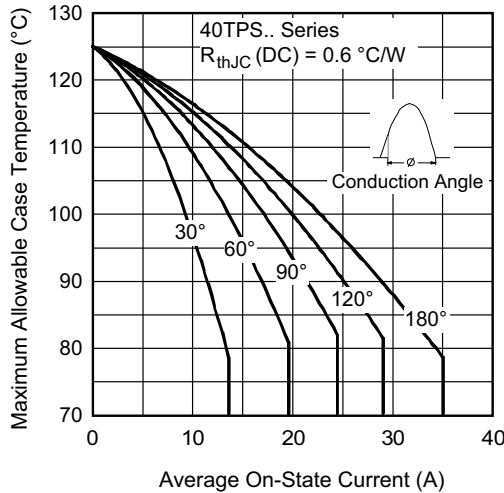


Fig. 1 - Current Rating Characteristics

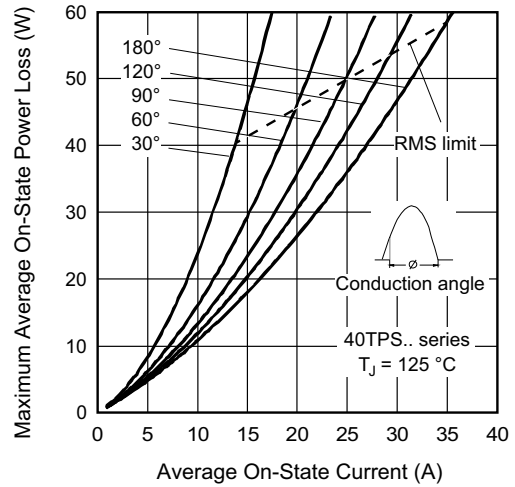


Fig. 3 - On-State Power Loss Characteristics

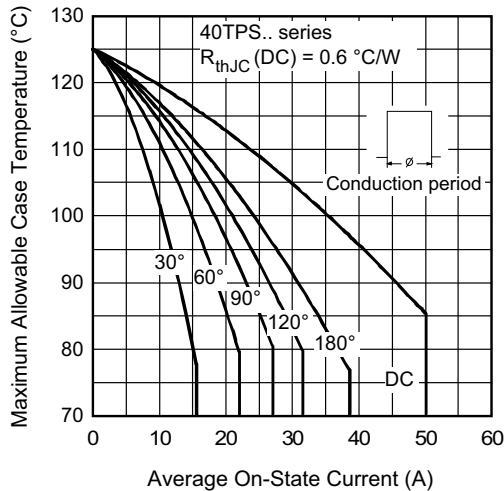


Fig. 2 - Current Rating Characteristics

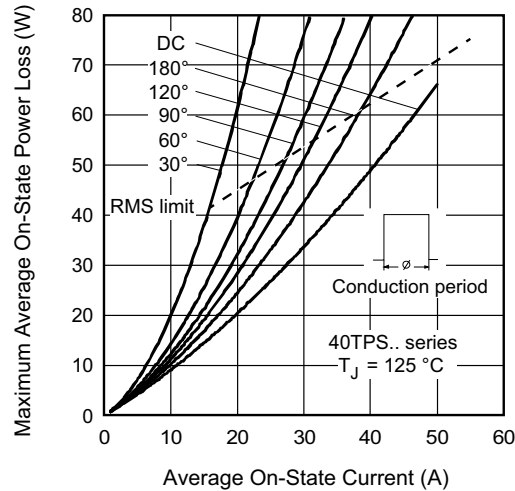


Fig. 4 - On-State Power Loss Characteristics

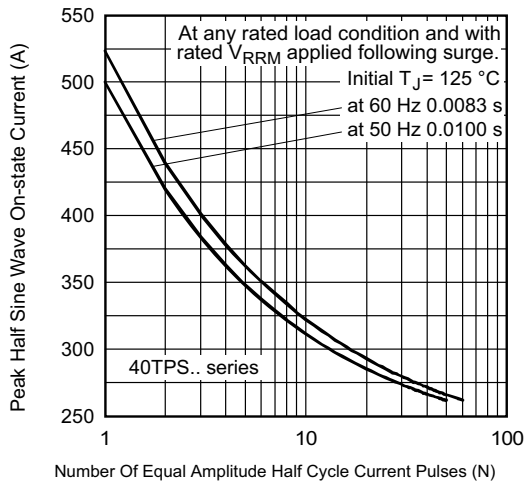


Fig. 5 - Maximum Non-Repetitive Surge Current

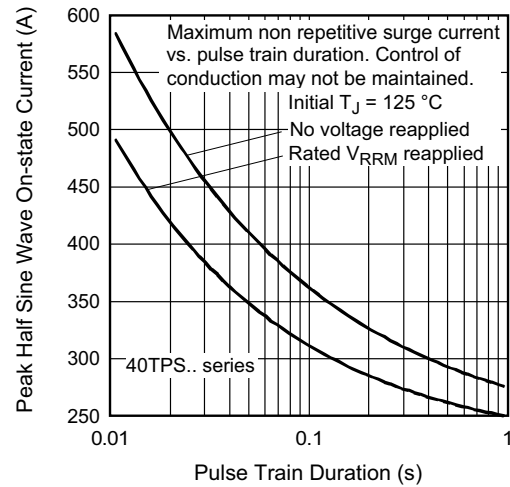


Fig. 6 - Maximum Non-Repetitive Surge Current

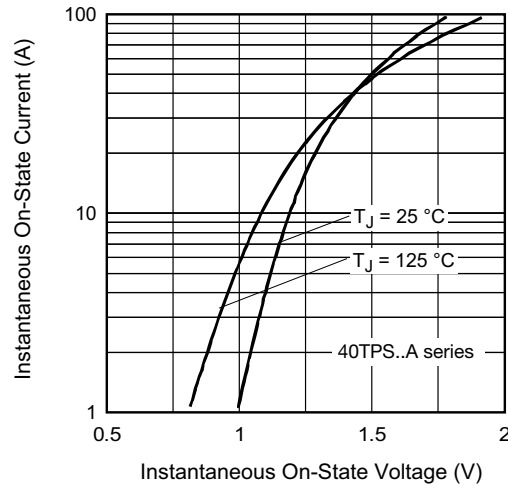


Fig. 7 - On-State Voltage Drop Characteristics

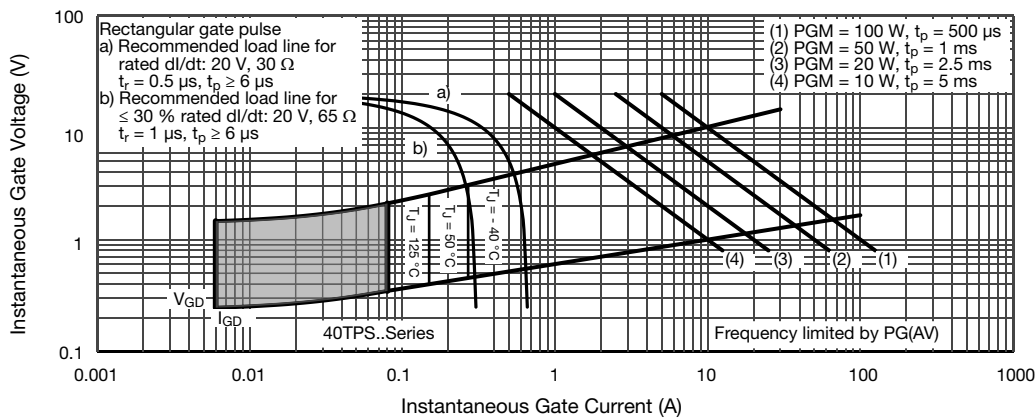


Fig. 8 - Gate Characteristics

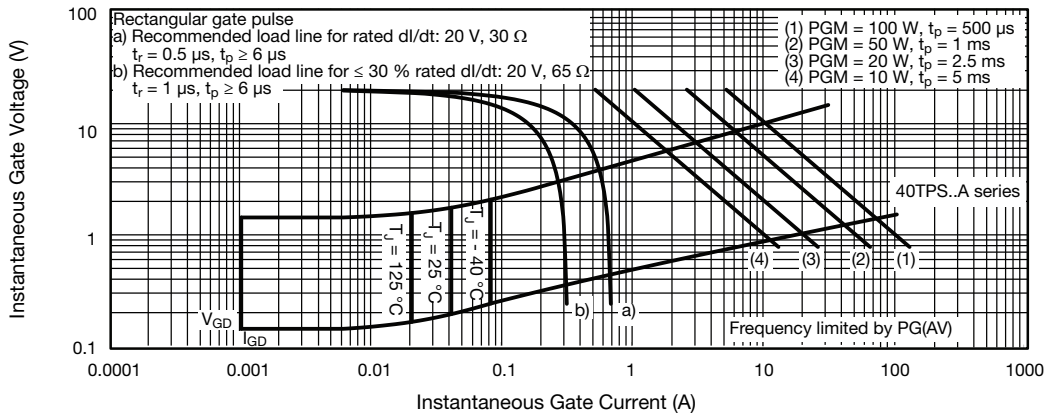


Fig. 9 - Gate Characteristics

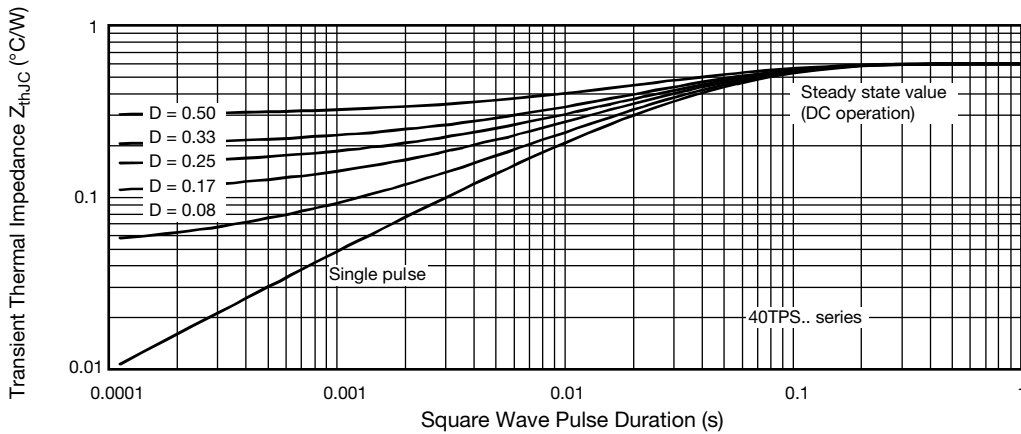


Fig. 10 - Thermal Impedance  $Z_{thJC}$  Characteristics



## ORDERING INFORMATION TABLE

Device code	<b>VS-</b>	<b>40</b>	<b>T</b>	<b>P</b>	<b>S</b>	<b>12</b>	<b>A</b>	<b>L</b>	<b>H</b>	<b>M3</b>	
	1	2	3	4	5	6	7	8	9	10	
	<b>1</b>	-	Vishay Semiconductors product								
	<b>2</b>	-	Current rating (40 = 40 A)								
	<b>3</b>	-	Circuit configuration: T = thyristor								
	<b>4</b>	-	Package: P = TO-247								
	<b>5</b>	-	Type of silicon: S = standard recovery rectifier								
	<b>6</b>	-	Voltage ratings				12 = 1200 V				
	<b>7</b>	-	<ul style="list-style-type: none"> <li>A = Low Igt selection 40 mA maximum</li> <li>None = standard Igt selection</li> </ul>								
	<b>8</b>	-	L = long leads								
	<b>9</b>	-	H = AEC-Q101 qualified								
	<b>10</b>	-	Environmental digit: M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free								

<b>ORDERING INFORMATION</b> (Example)			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-40TPS12ALHM3	25	500	Antistatic plastic tubes
VS-40TPS12LHM3	25	500	Antistatic plastic tubes

<b>LINKS TO RELATED DOCUMENTS</b>		
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>



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