Vishay Semiconductors

# Thyristor High Voltage, Phase Control SCR, 40 A



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PRIMARY CHARACTERISTICS								
I <sub>T(AV)</sub> 35 A								
V <sub>DRM</sub> /V <sub>RRM</sub>	1600 V							
V <sub>TM</sub>	1.45 V							
I <sub>GT</sub>	150 mA							
TJ	-40 °C to +125 °C							
Package	TO-247AC 3L							
Circuit configuration	Single SCR							

## FEATURES

- High voltage (up to 1600 V)
- Designed and qualified according to JEDEC<sup>®</sup>-JESD 47
- 125 °C max. operating junction temperature
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>

### APPLICATIONS

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

#### DESCRIPTION

The VS-40TPS16... 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 125 °C junction temperature.

MAJOR RATINGS AND CHARACTERISTICS									
PARAMETER	TEST CONDITIONS	VALUES	UNITS						
I <sub>T(AV)</sub>	Sinusoidal waveform	35	А						
I <sub>RMS</sub>		55	A						
V <sub>RRM</sub> /V <sub>DRM</sub>		1600	V						
I <sub>TSM</sub>		500	A						
V <sub>T</sub>	40 A, T <sub>J</sub> = 25 °C	1.45	V						
dV/dt		1000	V/µs						
dl/dt		100	A/µs						
TJ		-40 to +125	°C						

VOLTAGE RATINGS			
PART NUMBER	V <sub>RRM</sub> /V <sub>DRM</sub> , MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE V	V <sub>RSM</sub> , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I <sub>RRM</sub> /I <sub>DRM</sub> AT 125 °C mA
VS-40TPS16-M3	1600	1700	10



HALOGEN

FREE

# VS-40TPS16-M3



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ABSOLUTE MAXIMUM RATINGS									
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS				
Maximum average on-state current	I <sub>T(AV)</sub>	$T_C = 79 \ ^{\circ}C$ , 180° conduction half sine wa	ive	35					
Maximum continuous RMS on-state current as AC switch	I <sub>T(RMS)</sub>		55	A					
Maximum peak, one-cycle	<b>L</b>	10 ms sine pulse, rated $V_{\text{RRM}}$ applied		420					
non-repetitive surge current	I <sub>TSM</sub>	10 ms sine pulse, no voltage reapplied							
Maximum I <sup>2</sup> t for fusing	l <sup>2</sup> t	10 ms sine pulse, rated $V_{\text{RRM}}$ applied	Initial T <sub>J</sub> = T <sub>J</sub> maximum	880	A <sup>2</sup> s				
Maximum 1-t for fusing	I <del>^</del> T	10 ms sine pulse, no voltage reapplied		1250	A-S				
Maximum I²√t for fusing	l²√t	t = 0.1 to 10 ms, no voltage reapplied	12 500	A²√s					
Low level value of threshold voltage	V <sub>T(TO)1</sub>		1.02	v					
High level value of threshold voltage	V <sub>T(TO)2</sub>	T.I = 125 °C		1.23	v				
Low level value of on-state slope resistance	r <sub>t1</sub>	1j = 125 0		9.74	mΩ				
High level value of on-state slope resistance	r <sub>t2</sub>			7.50	1115.2				
Maximum peak on-state voltage	$V_{TM}$	110 A, T <sub>J</sub> = 25 °C		1.85	V				
Maximum rate of rise of turned-on current	dl/dt	$T_J = 25 \ ^{\circ}C$		100	A/µs				
Maximum holding current	Ι <sub>Η</sub>	Anode supply = 6 V, resistive load, initial $I_T$ = 1 A, $T_J$ = 25 °C							
Maximum latching current	١L	Anode supply = 6 V, resistive load, $T_J = 25 \text{ °C}$		300	mA				
Maximum reverse and direct leakage current	/	$T_J = 25 \text{ °C}$ $V_B = \text{rated } V_{BBM}/\Lambda$	·	0.5	ша				
waximum reverse and direct leakage current	I <sub>RRM</sub> /I <sub>DRM</sub>	$T_{\rm J} = 125 \ ^{\circ}{\rm C}$	DRM	10					
Maximum rate of rise of off-state voltage	dV/dt	$T_{\rm J}$ = $T_{\rm J}$ maximum, linear to 80 % $V_{\rm DRM},$ I	1000	V/µs					

TRIGGERING									
PARAMETER	SYMBOL	ТІ	TEST CONDITIONS						
Maximum peak gate power	P <sub>GM</sub>				W				
Maximum average gate power	P <sub>G(AV)</sub>			2.5	vv				
Maximum peak gate current	I <sub>GM</sub>			2.5	А				
Maximum peak negative gate voltage	- V <sub>GM</sub>			10					
Maximum required DC gets		T <sub>J</sub> = - 40 °C		4.0	V				
Maximum required DC gate voltage to trigger	V <sub>GT</sub>	T <sub>J</sub> = 25 °C	Anode supply = 6 V resistive load	2.5					
voluge to trigger		T <sub>J</sub> = 125 °C		1.7					
		T <sub>J</sub> = - 40 °C		270	mA				
Maximum required DC gate current to trigger		T <sub>J</sub> = 25 °C	Anode supply = 6 V resistive load	150					
Maximum required DO gate current to trigger	I <sub>GT</sub>	T <sub>J</sub> = 125 °C		80					
		$T_{\rm J} = 25 ^{\circ}{\rm C}$ , for 40	40						
Maximum DC gate voltage not to trigger	$V_{GD}$	T <sub>,I</sub> = 125 °C, V <sub>DBM</sub> = rated value		0.25	V				
Maximum DC gate current not to trigger	I <sub>GD</sub>	$I_J = I_{23} C, V_{DRM}$	6	mA					

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THERMAL AND MECHANICAL SPECIFICATIONS									
PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS				
Maximum junction and storage temperature range		T <sub>J</sub> , T <sub>Stg</sub>		-40 to 125	°C				
Maximum thermal resistance, junction to case		R <sub>thJC</sub>	DC operation						
Maximum thermal resistance, junction to ambient		R <sub>thJA</sub>		40	°C/W				
Maximum thermal resistance, case to heatsink		R <sub>thCS</sub>	Mounting surface, smooth and greased	0.2					
Approximate weight				6	g				
Approximate weight				0.21	oz.				
Mounting torque	minimum			6 (5)	kgf · cm				
Mounting torque	maximum			12 (10)	(lbf ⋅ in)				
Marking device			Case style TO-247AC 3L	40TF	PS16				

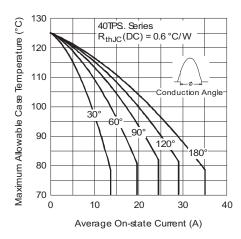


Fig. 1 - Current Rating Characteristics

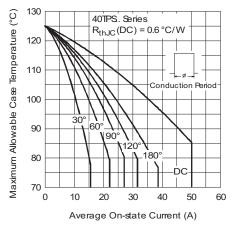


Fig. 2 - Current Rating Characteristics

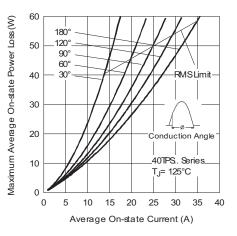


Fig. 3 - On-State Power Loss Characteristics

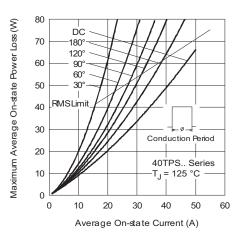
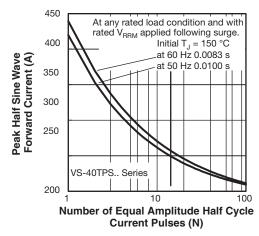


Fig. 4 - On-State Power Loss Characteristics

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Fig. 5 - Maximum Non-Repetitive Surge Current

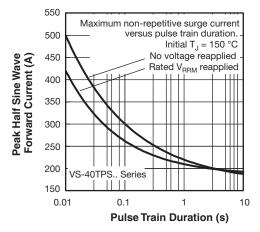


Fig. 6 - Maximum Non-Repetitive Surge Current

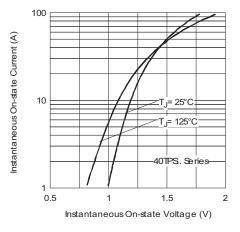


Fig. 7 - On-State Voltage Drop Characteristics

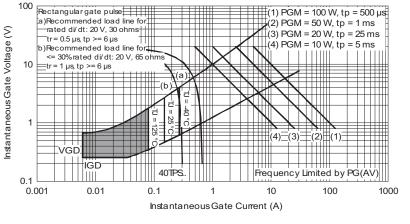


Fig. 8 - Gate Characteristics

# **VS-40TPS16-M3**

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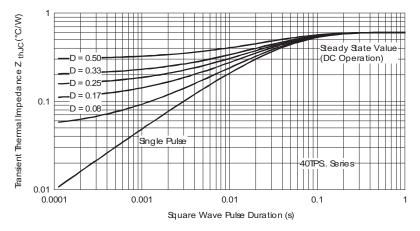


Fig. 9 - Thermal Impedance  $Z_{\text{thJC}}$  Characteristics

## **ORDERING INFORMATION TABLE**

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SHAY

Device code	VS-	40	т	Р	S	16	-M3
		2	(3)	(4)	(5)	6	(7)
	1 - 2 - 3 - 4 - 5 -	<ul> <li>Visł</li> <li>Cur</li> <li>Circ</li> <li>T =</li> <li>Pac</li> <li>P =</li> <li>Typ</li> </ul>	nay Serr rent rati cuit conf thyristo kage: TO-247 e of silio	niconduo ng (40 = figuratio r AC 3L	etors pro	oduct	
	6 - 7 -	Envi	ronmen	ng (16 = tal digit: jen-free,		,	int, and

ORDERING INFORMATION (Example)								
PREFERRED P/N	FERRED P/N QUANTITY PER T/R MINIMUM ORDER QUANTITY PACKAGING DESCRIPTION							
VS-40TPS16-M3	25	500	Antistatic plastic tubes					

LINKS TO RELATED DOCUMENTS						
Dimensions www.vishay.com/doc?96138						
Part marking information	www.vishay.com/doc?95007					

Revision: 26-Feb-2019 Document Number: 94389 For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000



**Vishay Semiconductors** 

TO-247AC 3L

## **DIMENSIONS** in millimeters and inches



SYMBOL	MILLIM	IETERS	INC	HES	NOTES	NOTES		MILLIN	IETERS	INC	HES	NOTES
STWIDOL	MIN.	MAX.	MIN.	MAX.	NOTES		SYMBOL	MIN.	MAX.	MIN.	MAX.	NOTES
A	4.65	5.31	0.183	0.209			D2	0.51	1.35	0.020	0.053	
A1	2.21	2.59	0.087	0.102			E	15.29	15.87	0.602	0.625	3
A2	1.17	1.37	0.046	0.054			E1	13.46	-	0.53	-	
b	0.99	1.40	0.039	0.055			е	5.46	BSC	0.215	5 BSC	
b1	0.99	1.35	0.039	0.053			ØК	0.2	254	0.0	)10	
b2	1.65	2.39	0.065	0.094			L	14.20	16.10	0.559	0.634	
b3	1.65	2.34	0.065	0.092			L1	3.71	4.29	0.146	0.169	
b4	2.59	3.43	0.102	0.135			ØΡ	3.56	3.66	0.14	0.144	
b5	2.59	3.38	0.102	0.133			Ø P1	-	7.39	-	0.291	
С	0.38	0.89	0.015	0.035			Q	5.31	5.69	0.209	0.224	
c1	0.38	0.84	0.015	0.033			R	4.52	5.49	0.178	0.216	
D	19.71	20.70	0.776	0.815	3		S	5.51	BSC	0.217	' BSC	
D1	13.08	-	0.515	-	4							

#### Notes

<sup>(1)</sup> Dimensioning and tolerancing per ASME Y14.5M-1994

(2) Contour of slot optional

(3) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body

(4) Thermal pad contour optional with dimensions D1 and E1

<sup>(5)</sup> Lead finish uncontrolled in L1

<sup>(6)</sup> 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")

<sup>(7)</sup> Outline conforms to JEDEC<sup>®</sup> outline TO-247 with exception of dimension Q

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