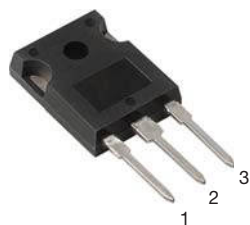
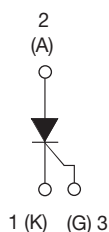




## Thyristor High Voltage, Phase Control SCR, 40 A



TO-247AC



## FEATURES

- High voltage (up to 1600 V)
- Designed and qualified according to JEDEC®-JESD47
- 125 °C max. operating junction temperature
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS  
COMPLIANT  
HALOGEN  
FREE  
Available

## 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.

## PRODUCT SUMMARY

Package	TO-247AC
Diode variation	Single SCR
$I_{T(AV)}$	35 A
$V_{DRM}/V_{RRM}$	1600 V
$V_{TM}$	1.45 V
$I_{GT}$	150 mA
$T_J$	-40 °C to 125 °C

## MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$	Sinusoidal waveform	35	A
$I_{RMS}$		55	
$V_{RRM}/V_{DRM}$		1600	V
$I_{TSM}$		500	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-40TPS16PbF, VS-40TPS16-M3	1600	1700	10



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 $T_J = T_J$ maximum	420	
		10 ms sine pulse, no voltage reapplied		500	
Maximum $I^2t$ for fusing	$I^2t$	10 ms sine pulse, rated $V_{RRM}$ applied		880	$A^2s$
		10 ms sine pulse, no voltage reapplied		1250	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1$ to 10 ms, no voltage reapplied		12 500	$A^2\sqrt{s}$
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 $I_T = 1$ A, $T_J = 25\text{ }^{\circ}\text{C}$		200	mA
Maximum latching current	$I_L$	Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$		300	
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	$dV/dt$	$T_J = T_J$ maximum, linear to 80 % $V_{DRM}$ , $R_g - k = \text{Open}$		1000	V/μs

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	4.0	
		T <sub>J</sub> = 25 °C		2.5	
		T <sub>J</sub> = 125 °C		1.7	
Maximum required DC gate current to trigger	I <sub>GT</sub>	T <sub>J</sub> = - 40 °C	Anode supply = 6 V resistive load	270	mA
		T <sub>J</sub> = 25 °C		150	
		T <sub>J</sub> = 125 °C		80	
		T <sub>J</sub> = 25 °C, for 40TPS08A		40	
Maximum DC gate voltage not to trigger	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	I <sub>GD</sub>			6	mA



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	0.6	°C/W
Maximum thermal resistance, junction to ambient	R <sub>thJA</sub>		40	
Maximum thermal resistance, case to heatsink	R <sub>thCS</sub>	Mounting surface, smooth and greased	0.2	
Approximate weight			6	g
			0.21	oz.
Mounting torque	minimum		6 (5)	kgf · cm (lbf · in)
	maximum		12 (10)	
Marking device		Case style TO-247AC	40TPS16	

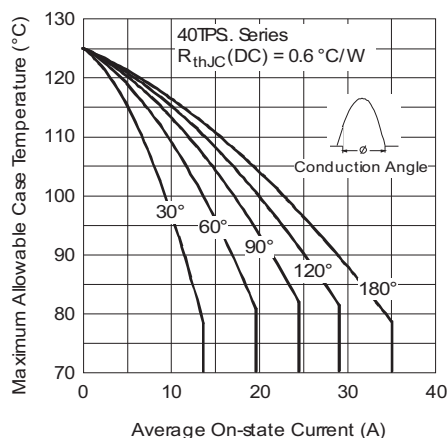


Fig. 1 - Current Rating Characteristics

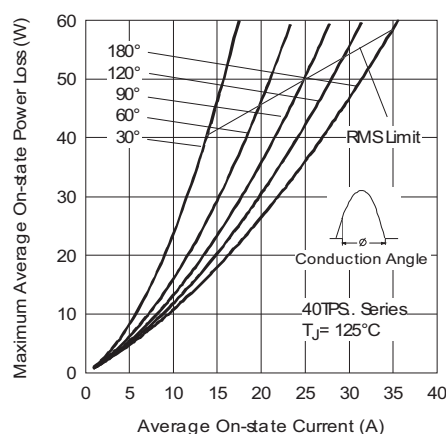


Fig. 3 - On-State Power Loss Characteristics

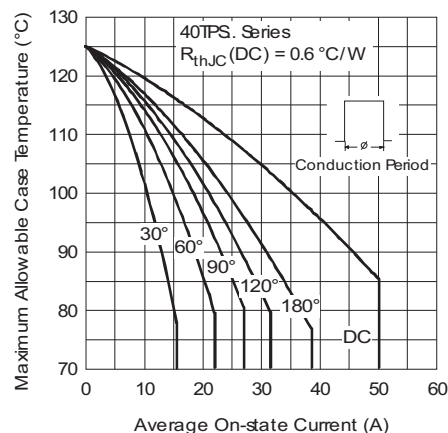


Fig. 2 - Current Rating Characteristics

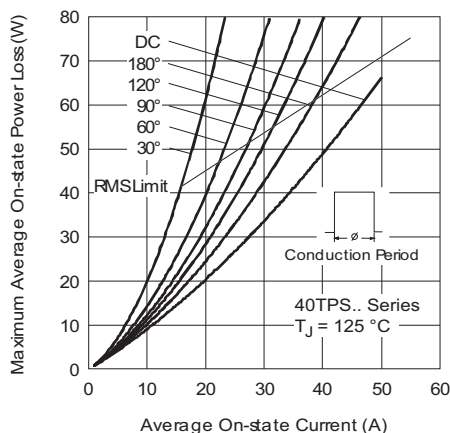


Fig. 4 - On-State Power Loss Characteristics

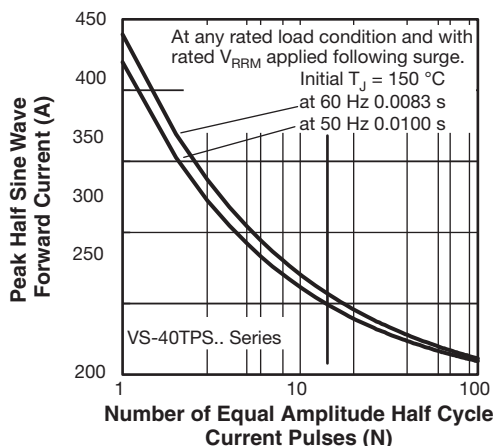


Fig. 5 - Maximum Non-Repetitive Surge Current

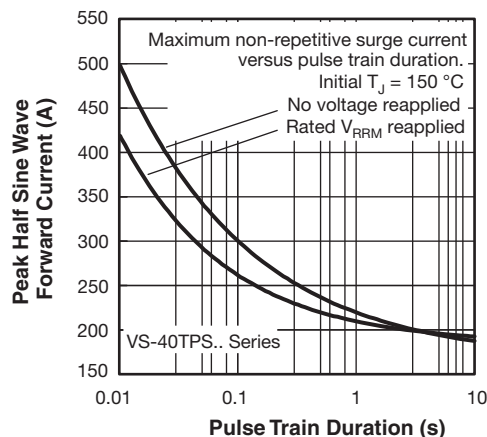


Fig. 6 - Maximum Non-Repetitive Surge Current

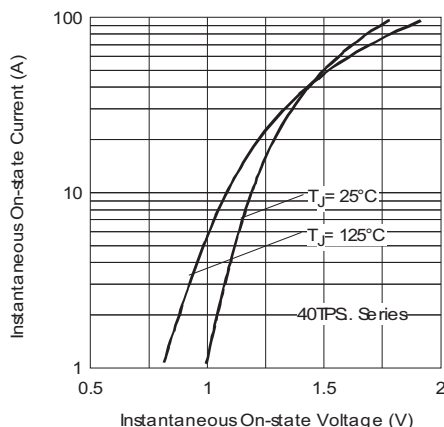


Fig. 7 - On-State Voltage Drop Characteristics

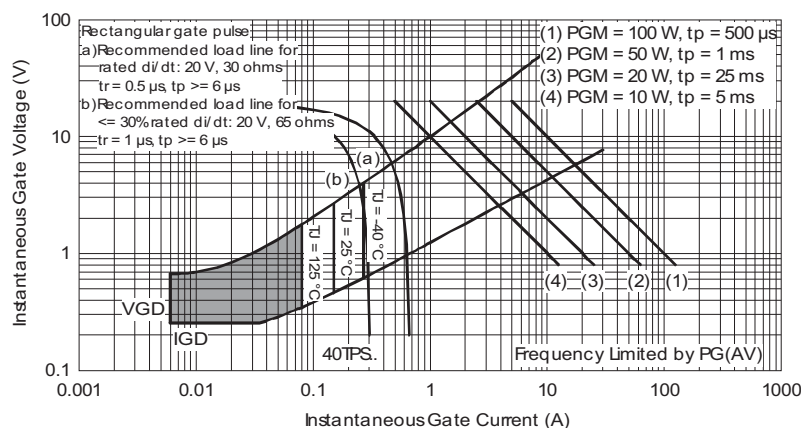
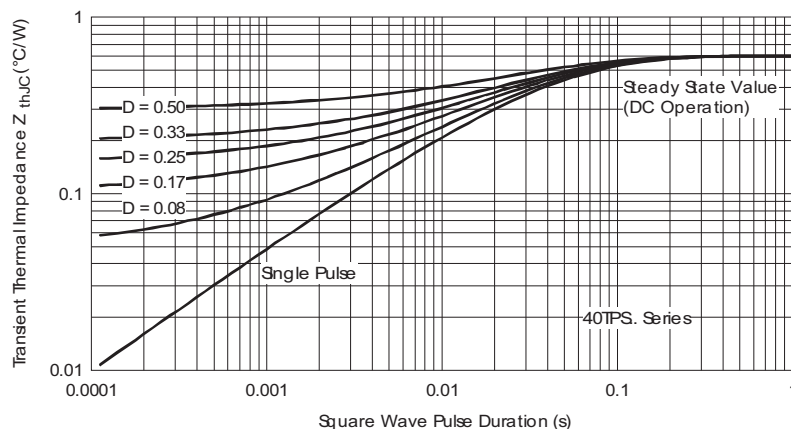


Fig. 8 - Gate Characteristics


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

## ORDERING INFORMATION TABLE

Device code	VS-	40	T	P	S	16	PbF
	1	2	3	4	5	6	7

- 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 rating (16 = 1600 V)
- 7** - Environmental digit:  
PbF = Lead (Pb)-free and RoHS compliant  
-M3 = Halogen-free, RoHS compliant, and terminations lead (Pb)-free

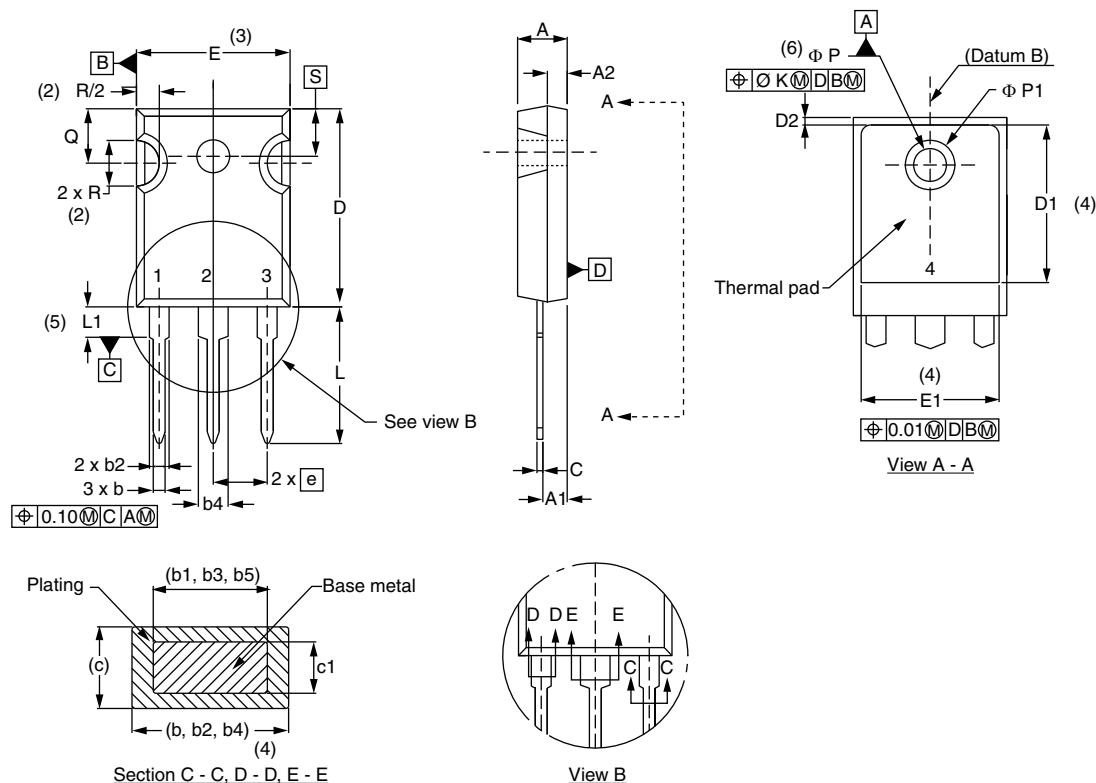
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-40TPS16PbF	25	500	Antistatic plastic tubes
VS-40TPS16-M3	25	500	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS		
Dimensions		<a href="http://www.vishay.com/doc?95542">www.vishay.com/doc?95542</a>
Part marking information	TO-247AC PbF	<a href="http://www.vishay.com/doc?95226">www.vishay.com/doc?95226</a>
	TO-247AC -M3	<a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a>



## TO-247AC - 50 mils L/F

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	1.17	1.37	0.046	0.054	
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	1.35	0.020	0.053	
E	15.29	15.87	0.602	0.625	3
E1	13.46	-	0.53	-	
e	5.46 BSC		0.215 BSC		
$\Phi K$	0.254		0.010		
L	14.20	16.10	0.559	0.634	
L1	3.71	4.29	0.146	0.169	
$\Phi P$	3.56	3.66	0.14	0.144	
$\Phi P1$	-	7.39	-	0.291	
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

- (1) 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
- (5) Lead finish uncontrolled in L1
- (6)  $\Phi P$  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")
- (7) Outline conforms to JEDEC® outline TO-247 with exception of dimension c and Q



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