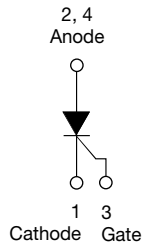


## Thyristor Surface Mount Phase Control SCR, 16 A


**D<sup>2</sup>PAK (TO-263AB)**


### FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Designed and qualified according JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


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

### APPLICATIONS

- Input rectification (soft start)
- Vishay input diodes, switches and output rectifiers which are in identical package outlines

### DESCRIPTION

The VS-16TTS16S-M3 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.

### PRIMARY CHARACTERISTICS

$I_{T(AV)}$	10 A
$V_{DRM}/V_{RRM}$	1600 V
$V_{TM}$	1.4 V
$I_{GT}$	60 mA
$T_J$	-40 °C to +125 °C
Package	D <sup>2</sup> PAK (TO-263AB)
Circuit configuration	Single SCR

### OUTPUT CURRENT IN TYPICAL APPLICATIONS

APPLICATIONS	SINGLE-PHASE BRIDGE	THREE-PHASE BRIDGE	UNITS
NEMA FR-4 or G-10 glass fabric-based epoxy with 4 oz. (140 μm) copper	2.5	3.5	A
Aluminum IMS, $R_{thCA} = 15$ °C/W	6.3	9.5	
Aluminum IMS with heatsink, $R_{thCA} = 5$ °C/W	14.0	18.5	

#### Note

- $T_A = 55$  °C,  $T_J = 125$  °C, footprint 300 mm<sup>2</sup>

### MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$	Sinusoidal waveform	10	A
$I_{RMS}$		16	
$V_{RRM}/V_{DRM}$		1600	V
$I_{TSM}$		200	A
$V_T$	10 A, $T_J = 25$ °C	1.4	V
dV/dt		500	V/μs
dI/dt		150	A/μs
$T_J$		-40 to +125	°C

### VOLTAGE RATINGS

PART NUMBER	$V_{RRM}$ , MAXIMUM PEAK REVERSE VOLTAGE V	$V_{DRM}$ , MAXIMUM PEAK DIRECT VOLTAGE V	$I_{RRM}/I_{DRM}$ AT 125 °C mA
VS-16TTS16S-M3	1600	1600	10



<b>ABSOLUTE MAXIMUM RATINGS</b>						
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNITS	
			TYP.	MAX.		
Maximum average on-state current	$I_{T(AV)}$	$T_C = 93\text{ }^\circ\text{C}$ , 180° conduction, half sine wave	10		A	
Maximum RMS on-state current	$I_{RMS}$		16			
Maximum peak, one-cycle, non-repetitive surge current	$I_{TSM}$	10 ms sine pulse, rated $V_{RRM}$ applied	170			
		10 ms sine pulse, no voltage reapplied	200			
Maximum $I^2t$ for fusing	$I^2t$	10 ms sine pulse, rated $V_{RRM}$ applied	144		A <sup>2</sup> s	
		10 ms sine pulse, no voltage reapplied	200			
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1\text{ ms to }10\text{ ms}$ , no voltage reapplied	2000		A <sup>2</sup> √s	
Maximum on-state voltage drop	$V_{TM}$	10 A, $T_J = 25\text{ }^\circ\text{C}$	1.4		V	
On-state slope resistance	$r_t$	$T_J = 125\text{ }^\circ\text{C}$	24.0		mΩ	
Threshold voltage	$V_{T(TO)}$		1.1		V	
Maximum reverse and direct leakage current	$I_{RM}/I_{DM}$	$T_J = 25\text{ }^\circ\text{C}$	$V_R = \text{rated } V_{RRM}/V_{DRM}$	0.5		mA
		$T_J = 125\text{ }^\circ\text{C}$		10		
Holding current	$I_H$	Anode supply = 6 V, resistive load, initial $I_T = 1\text{ A}$ , $T_J = 25\text{ }^\circ\text{C}$	100	150		
Maximum latching current	$I_L$	Anode supply = 6 V, resistive load, $T_J = 25\text{ }^\circ\text{C}$	200			
Maximum rate of rise of off-state voltage	$dV/dt$	$T_J = T_J \text{ max. linear to } 80\% V_{DRM} = R_g - k = \text{open}$	500		V/μs	
Maximum rate of rise of turned-on current	$dI/dt$		150		A/μs	

<b>TRIGGERING</b>					
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Maximum peak gate power	$P_{GM}$		8.0	W	
Maximum average gate power	$P_{G(AV)}$		2.0		
Maximum peak positive gate current	$+ I_{GM}$		1.5	A	
Maximum peak negative gate voltage	$- V_{GM}$		10	V	
Maximum required DC gate current to trigger	$I_{GT}$	Anode supply = 6 V, resistive load, $T_J = -10\text{ }^\circ\text{C}$	90		mA
		Anode supply = 6 V, resistive load, $T_J = 25\text{ }^\circ\text{C}$	60		
		Anode supply = 6 V, resistive load, $T_J = 125\text{ }^\circ\text{C}$	35		
Maximum required DC gate voltage to trigger	$V_{GT}$	Anode supply = 6 V, resistive load, $T_J = -10\text{ }^\circ\text{C}$	3.0		V
		Anode supply = 6 V, resistive load, $T_J = 25\text{ }^\circ\text{C}$	2.0		
		Anode supply = 6 V, resistive load, $T_J = 125\text{ }^\circ\text{C}$	1.0		
Maximum DC gate voltage not to trigger	$V_{GD}$	$T_J = 125\text{ }^\circ\text{C}$ , $V_{DRM} = \text{rated value}$	0.25		
Maximum DC gate current not to trigger	$I_{GD}$		2.0		mA

<b>SWITCHING</b>				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Typical turn-on time	$t_{gt}$	$T_J = 25\text{ }^\circ\text{C}$	0.9	μs
Typical reverse recovery time	$t_{rr}$	$T_J = 125\text{ }^\circ\text{C}$	4	
Typical turn-off time	$t_q$		110	

THERMAL - 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	1.3	°C/W
Typical thermal resistance, junction to ambient	$R_{thJA}$	PCB mount <sup>(1)</sup>	40	
Approximate weight			2	g
			0.07	oz.
Marking device		Case style D <sup>2</sup> PAK (TO-263AB)	16TTS16S	

**Note**

<sup>(1)</sup> When mounted on 1" square (650 mm<sup>2</sup>) PCB of FR-4 or G-10 material 4 oz. (140 μm) copper 40 °C/W. For recommended footprint and soldering techniques refer to application note #AN-994

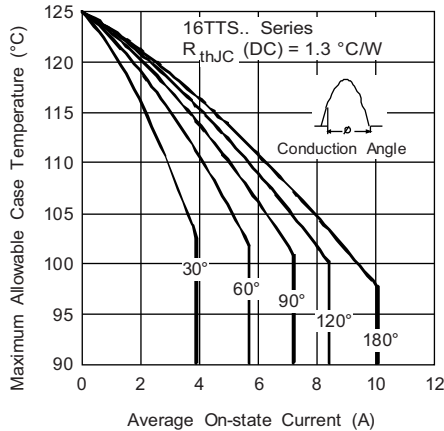


Fig. 1 - Current Rating Characteristics

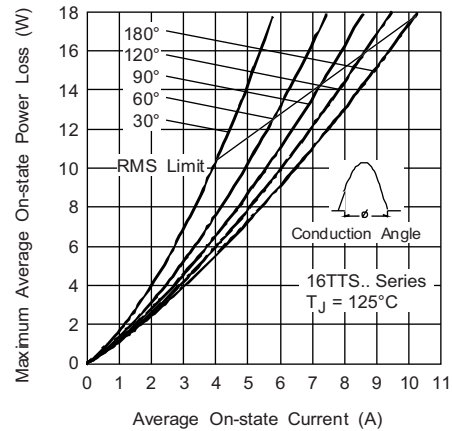


Fig. 3 - On-State Power Loss Characteristics

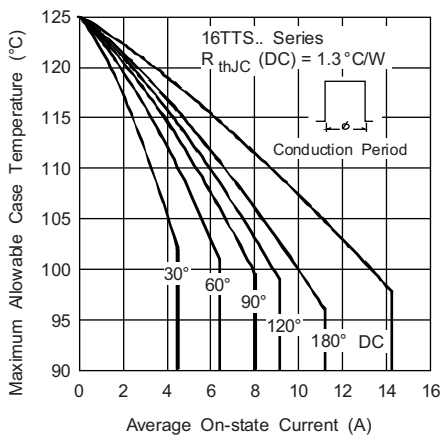


Fig. 2 - Current Rating Characteristics

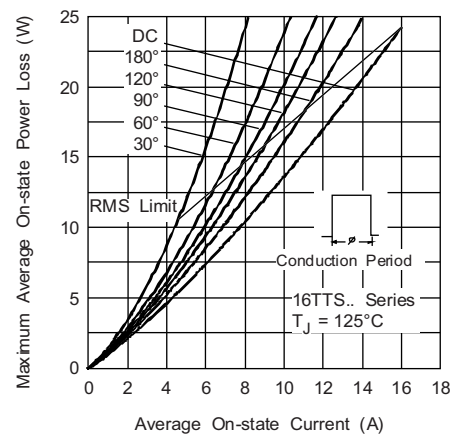


Fig. 4 - On-State Power Loss Characteristics

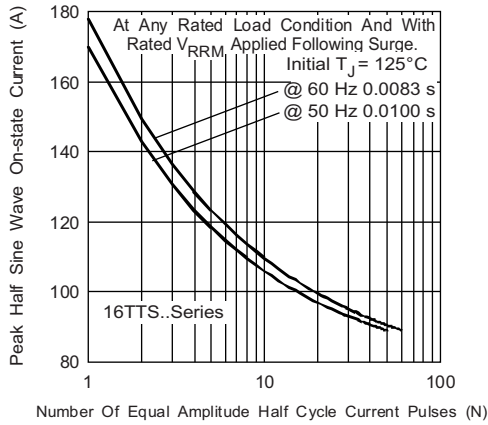


Fig. 5 - Maximum Non-Repetitive Surge Current

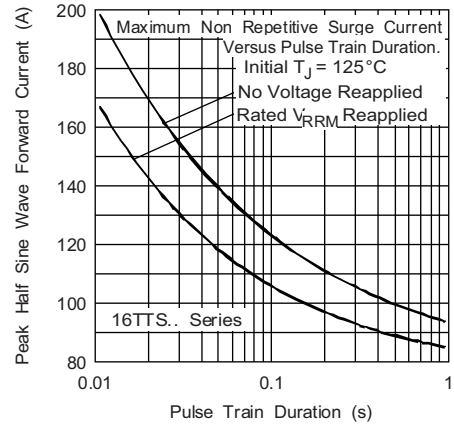


Fig. 6 - Maximum Non-Repetitive Surge Current

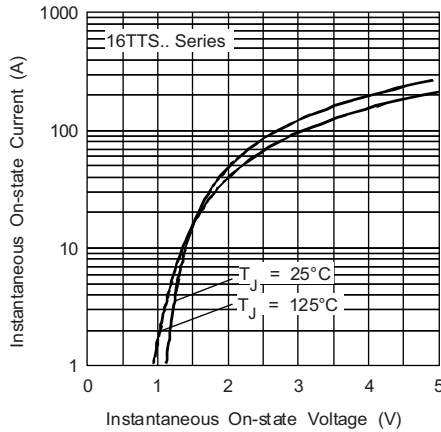


Fig. 7 - On-State Voltage Drop Characteristics

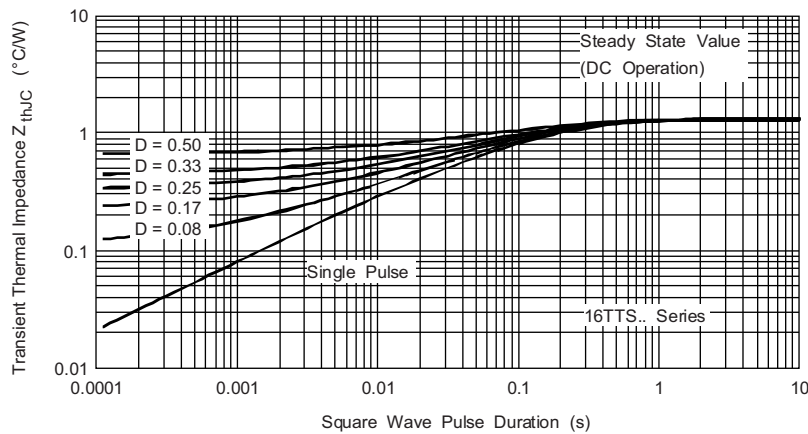
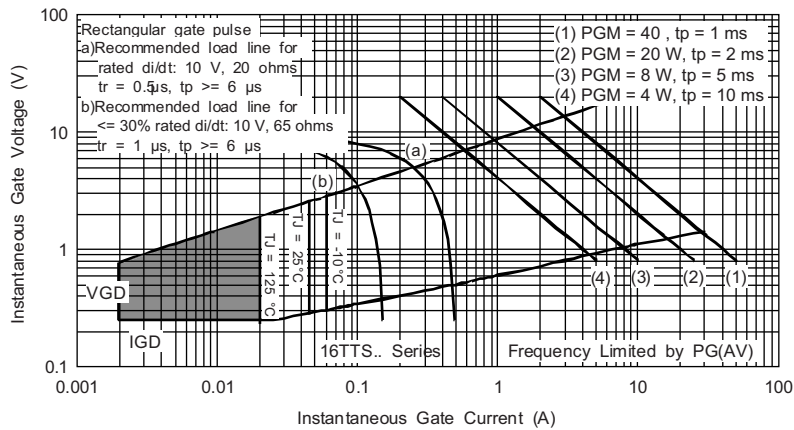


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics



### ORDERING INFORMATION TABLE

Device code	<b>VS-</b>	<b>16</b>	<b>T</b>	<b>T</b>	<b>S</b>	<b>16</b>	<b>S</b>	<b>TRL</b>	<b>-M3</b>
	①	②	③	④	⑤	⑥	⑦	⑧	⑨

- ① - Vishay Semiconductors product
- ② - Current rating
- ③ - Circuit configuration:  
T = single thyristor
- ④ - Package:  
T = D<sup>2</sup>PAK (TO-263AB)
- ⑤ - Type of silicon:  
S = standard recovery rectifier
- ⑥ - Voltage rating: Voltage code x 100 = V<sub>RRM</sub> (16 = 1600 V)
- ⑦ - S = surface mountable
- ⑧ - • None = tube  
• TRL = tape and reel (left oriented)  
• TRR = tape and reel (right oriented)
- ⑨ - -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

ORDERING INFORMATION (Example)		
PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-16TTS16S-M3	50	Antistatic plastic tubes
VS-16TTS16STRL-M3	800	13" diameter plastic tape and reel
VS-16TTS16STRR-M3	800	13" diameter plastic tape and reel

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?96164">www.vishay.com/doc?96164</a>
Part marking information	<a href="http://www.vishay.com/doc?95444">www.vishay.com/doc?95444</a>
Packaging information	<a href="http://www.vishay.com/doc?96424">www.vishay.com/doc?96424</a>





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