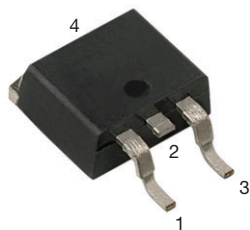
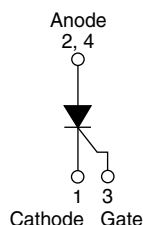


# Thyristor Surface Mount, Phase Control SCR, 16 A


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


## FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- 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**

## APPLICATIONS

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

## DESCRIPTION

The VS-25TTS16SLHM3 of silicon controlled rectifiers is specifically designed for medium power switching and phase control applications.

## PRIMARY CHARACTERISTICS

$I_{T(AV)}$	16 A
$V_{DRM}/V_{RRM}$	1600 V
$V_{TM}$	1.25 V
$I_{GT}$	45 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 G10 glass fabric-based epoxy with 4 oz. (140 µm) copper	3.5	5.5	A
Aluminum IMS, $R_{thCA} = 15$ °C/W	8.5	13.5	
Aluminum IMS with heatsink, $R_{thCA} = 5$ °C/W	16.5	25.0	

### 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	16	A
$I_{RMS}$		25	
$V_{RRM}/V_{DRM}$		1600	V
$I_{TSM}$		350	A
$V_T$	16 A, $T_J = 25$ °C	1.25	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-25TTS16SLHM3	1600	1600	10

**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES		UNITS
				TYP.	MAX.	
Maximum average on-state current	I <sub>T(AV)</sub>	T <sub>C</sub> = 93 °C, 180° conduction half sine wave		16		A
Maximum RMS on-state current	I <sub>RMS</sub>			25		
Maximum peak, one-cycle, non-repetitive surge current	I <sub>TSM</sub>	10 ms sine pulse, rated V <sub>RRM</sub> applied		300		
		10 ms sine pulse, no voltage reapplied		350		
Maximum I <sup>2</sup> t for fusing	I <sup>2</sup> t	10 ms sine pulse, rated V <sub>RRM</sub> applied		450		A <sup>2</sup> s
		10 ms sine pulse, no voltage reapplied		630		
Maximum I <sup>2</sup> √t for fusing	I <sup>2</sup> √t	t = 0.1 ms to 10 ms, no voltage reapplied		6300		A <sup>2</sup> √s
Maximum on-state voltage drop	V <sub>TM</sub>	16 A, T <sub>J</sub> = 25 °C		1.25		V
On-state slope resistance	r <sub>t</sub>	T <sub>J</sub> = 125 °C		12.0		mΩ
Threshold voltage	V <sub>T(TO)</sub>			1.0		V
Maximum reverse and direct leakage current	I <sub>RM</sub> /I <sub>DM</sub>	T <sub>J</sub> = 25 °C	V <sub>R</sub> = Rated V <sub>RRM</sub> /V <sub>DRM</sub>	0.5		mA
		T <sub>J</sub> = 125 °C		10		
Holding current	I <sub>H</sub>	Anode supply = 6 V, resistive load, initial I <sub>T</sub> = 1 A, T <sub>J</sub> = 25 °C		-	150	
Maximum latching current	I <sub>L</sub>	Anode supply = 6 V, resistive load, T <sub>J</sub> = 25 °C		200		
Maximum rate of rise of off-state voltage	dV/dt	T <sub>J</sub> = T <sub>J</sub> max., linear to 80 %, V <sub>DRM</sub> = R <sub>g</sub> - k = Open		500		V/μs
Maximum rate of rise of turned-on current	dI/dt			150		A/μs

**TRIGGERING**

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, $T_J = -10\text{ }^{\circ}\text{C}$	60	mA
		Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$	45	
		Anode supply = 6 V, resistive load, $T_J = 125\text{ }^{\circ}\text{C}$	20	
Maximum required DC gate voltage to trigger	$V_{GT}$	Anode supply = 6 V, resistive load, $T_J = -10\text{ }^{\circ}\text{C}$	2.5	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	mA
Maximum DC gate current not to trigger	$I_{GD}$		2.0	

**SWITCHING**

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



THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		-40 to +125	°C
Soldering temperature	$T_S$	For 10 s (1.6 mm from case)	260	
Maximum thermal resistance, junction to case	$R_{thJC}$	DC operation	1.1	°C/W
Typical thermal resistance, junction to ambient (PCB mount)	$R_{thJA}^{(1)}$		40	
Approximate weight			2	g
			0.07	oz.
Marking device		Case style D <sup>2</sup> PAK (TO-263AB)	25TTS16SH	

Note

(1) 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

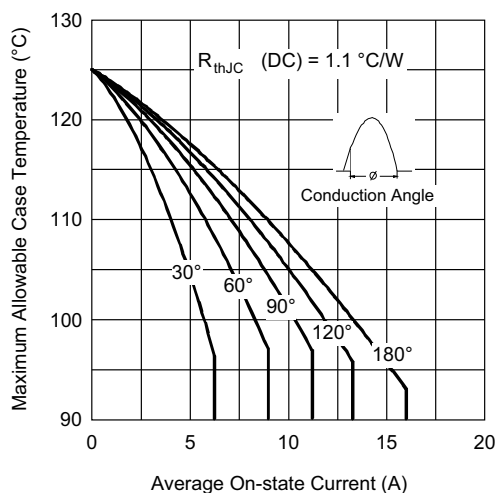


Fig. 1 - Current Rating Characteristics

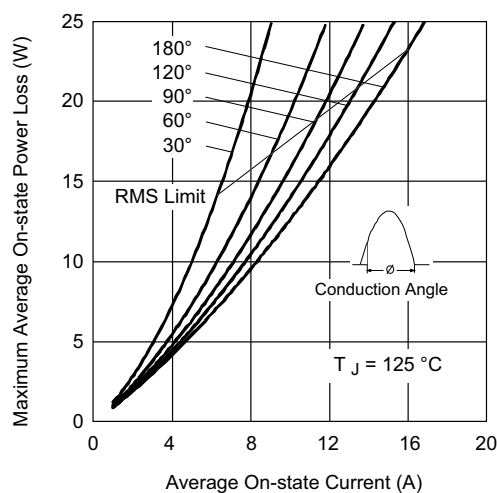


Fig. 3 - On-State Power Loss Characteristics

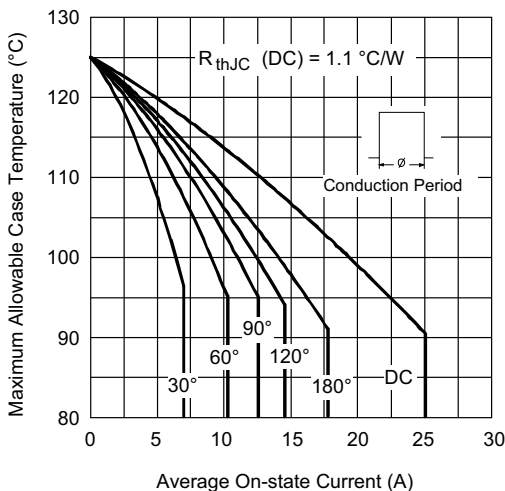


Fig. 2 - Current Rating Characteristics

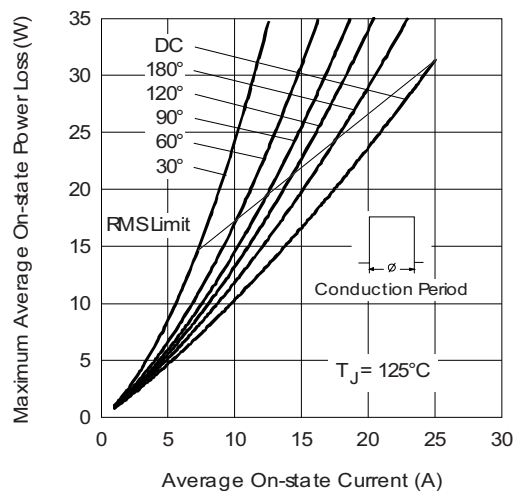


Fig. 4 - On-State Power Loss Characteristics

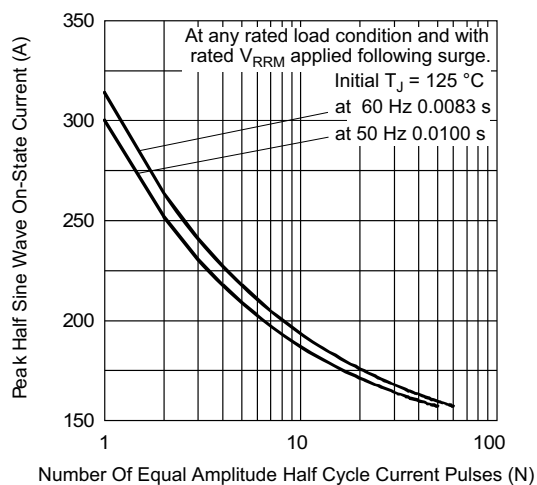


Fig. 5 - Maximum Non-Repetitive Surge Current

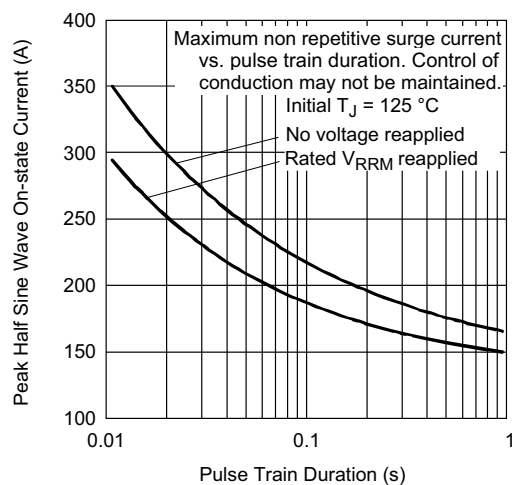


Fig. 6 - Maximum Non-Repetitive Surge Current

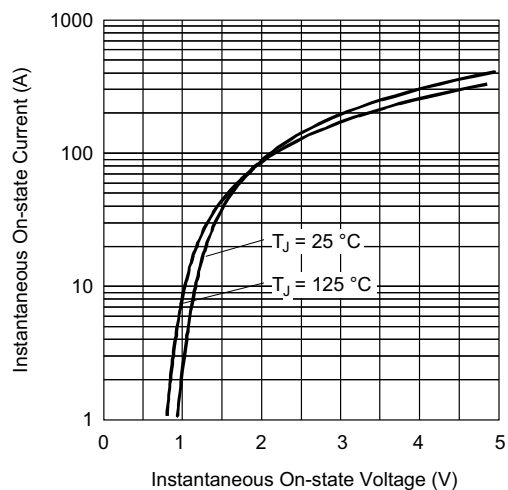


Fig. 7 - On-State Voltage Drop Characteristics

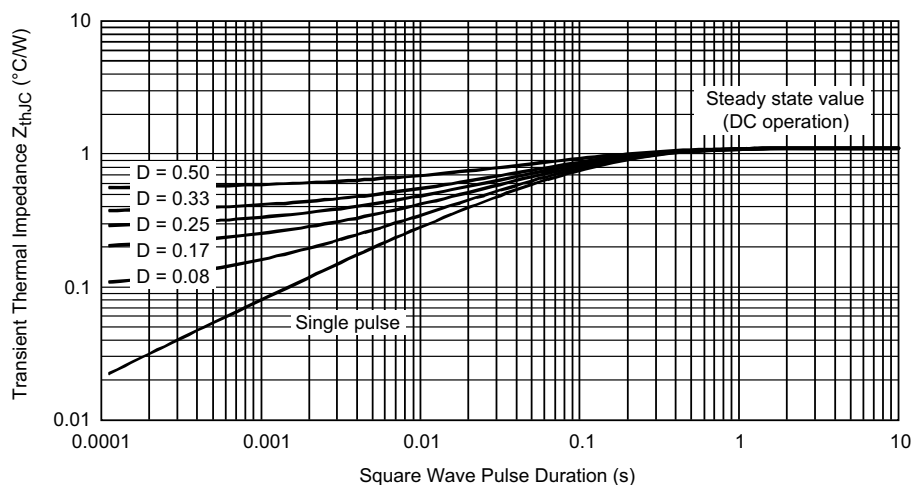
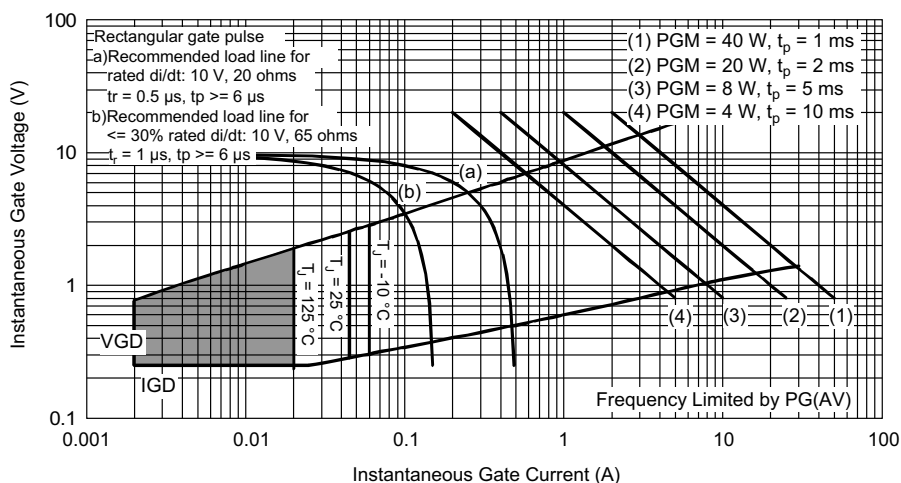


Fig. 8 - Gate Characteristics


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

## ORDERING INFORMATION TABLE

Device code	VS-	25	T	T	S	16	S	L	H	M3
	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

- 1** - Vishay Semiconductors product
- 2** - Current rating (25 = 25 A)
- 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 =  $V_{RRM}$  — **16 = 1600 V**
- 7** - S = surface mountable
- 8** - L = tape and reel (left oriented), for different orientation, contact factory
- 9** - H = AEC-Q101 qualified
- 10** - Environmental digit:  
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-25TTS16SLHM3	800	800	13" diameter reel

## LINKS TO RELATED DOCUMENTS

Dimensions	<a href="http://www.vishay.com/doc?95046">www.vishay.com/doc?95046</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?96317">www.vishay.com/doc?96317</a>

### D<sup>2</sup>PAK

#### DIMENSIONS in millimeters and inches

Conforms to JEDEC® outline D<sup>2</sup>PAK (SMD-220)



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	0.00	0.254	0.000	0.010	
b	0.51	0.99	0.020	0.039	
b1	0.51	0.89	0.020	0.035	4
b2	1.14	1.78	0.045	0.070	
b3	1.14	1.73	0.045	0.068	4
c	0.38	0.74	0.015	0.029	
c1	0.38	0.58	0.015	0.023	4
c2	1.14	1.65	0.045	0.065	
D	8.51	9.65	0.335	0.380	2

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D1	6.86	8.00	0.270	0.315	3
E	9.65	10.67	0.380	0.420	2, 3
E1	7.90	8.80	0.311	0.346	3
e	2.54 BSC		0.100 BSC		
H	14.61	15.88	0.575	0.625	
L	1.78	2.79	0.070	0.110	
L1	-	1.65	-	0.066	3
L2	1.27	1.78	0.050	0.070	
L3	0.25 BSC		0.010 BSC		
L4	4.78	5.28	0.188	0.208	

#### Notes

- Dimensioning and tolerancing per ASME Y14.5 M-1994
- 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 outmost extremes of the plastic body
- Thermal pad contour optional within dimension E, L1, D1 and E1
- Dimension b1 and c1 apply to base metal only
- Datum A and B to be determined at datum plane H
- Controlling dimension: inch
- Outline conforms to JEDEC® outline TO-263AB



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