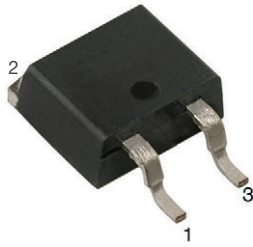
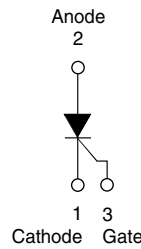


# Thyristor Surface-Mount, Phase Control SCR, 16 A


**D²PAK 2L (TO-263AB 2L)**

**FEATURES**

- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Designed and qualified according JEDEC®-JESD 47
- Meets JESD 201 class 2 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**
**LINKS TO ADDITIONAL RESOURCES**


3D Models

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	D²PAK 2L (TO-263AB 2L)
Circuit configuration	Single SCR

**APPLICATIONS**

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

**DESCRIPTION**

The VS-25TTS16S2L-M3 high voltage series of silicon controlled rectifiers is specifically designed for medium power switching and phase control applications.

**MECHANICAL DATA**

**Case:** D²PAK 2L (TO-263AB 2L)

Molding compound meets UL 94 V-0 flammability rating

**Terminals:** matte tin plated leads, solderable per J-STD-002

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 mm²

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-25TTS16SL-M3	1600	1600	10



ABSOLUTE MAXIMUM RATINGS						
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	16		A	
Maximum RMS on-state current	$I_{RMS}$		25			
Maximum peak, one-cycle, non-repetitive surge current	$I_{TSM}$	10 ms sine pulse, rated $V_{RRM}$ applied	300			
		10 ms sine pulse, no voltage reapplied	350			
Maximum $I^2t$ for fusing	$I^2t$	10 ms sine pulse, rated $V_{RRM}$ applied	450		$A^2s$	
		10 ms sine pulse, no voltage reapplied	630			
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1\text{ ms to }10\text{ ms}$ , no voltage reapplied	6300		$A^2\sqrt{s}$	
Maximum on-state voltage drop	$V_{TM}$	16 A, $T_J = 25\text{ }^\circ\text{C}$	1.25		V	
On-state slope resistance	$r_t$	$T_J = 125\text{ }^\circ\text{C}$	12.0		$m\Omega$	
Threshold voltage	$V_{T(TO)}$		1.0		V	
Maximum reverse and direct leakage current	$I_{RM}/I_{DM}$	$V_R = \text{Rated } V_{RRM}/V_{DRM}$	$T_J = 25\text{ }^\circ\text{C}$	0.5		mA
			$T_J = 125\text{ }^\circ\text{C}$	10		
Holding current	$I_H$	Anode supply = 6 V, resistive load, initial $I_T = 1\text{ A}$ , $T_J = 25\text{ }^\circ\text{C}$	-	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		$V/\mu s$	
Maximum rate of rise of turned-on current	$dI/dt$		150		$A/\mu s$	

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	
Maximum DC gate current not to trigger	$I_{GD}$		2.0	

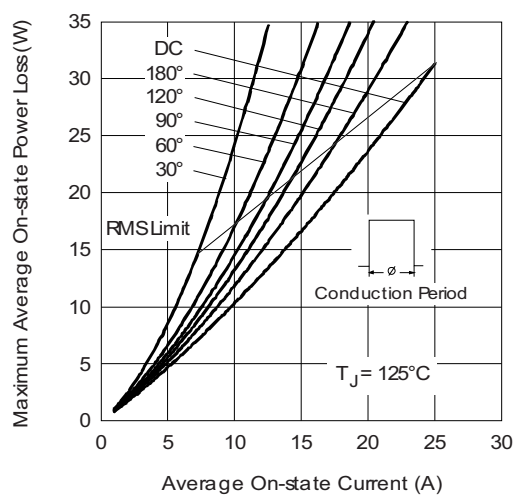
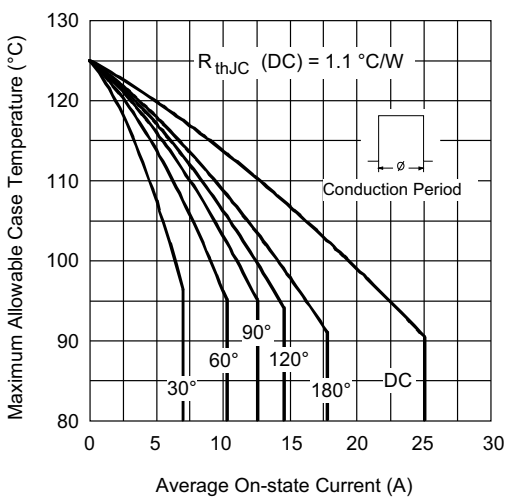
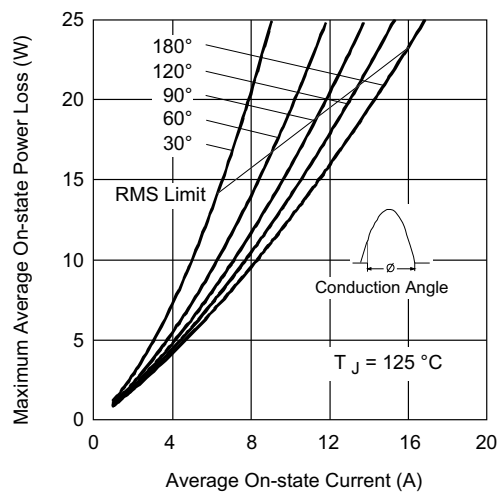
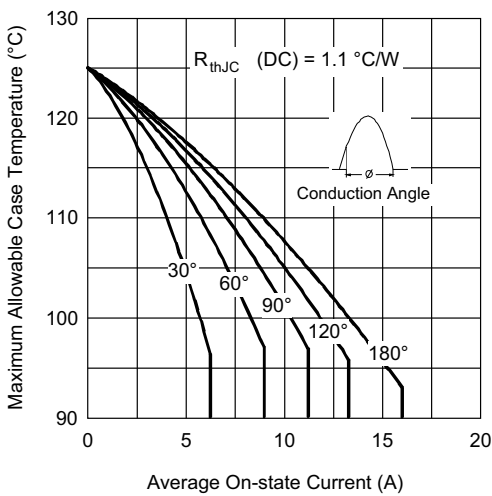
SWITCHING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Typical turn-on time	$t_{gt}$	$T_J = 25\text{ }^\circ\text{C}$	0.9	$\mu s$
Typical reverse recovery time	$t_{rr}$	$T_J = 125\text{ }^\circ\text{C}$	4	
Typical turn-off time	$t_q$		110	



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 2L (TO-263AB 2L)	25TTS16S	

**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



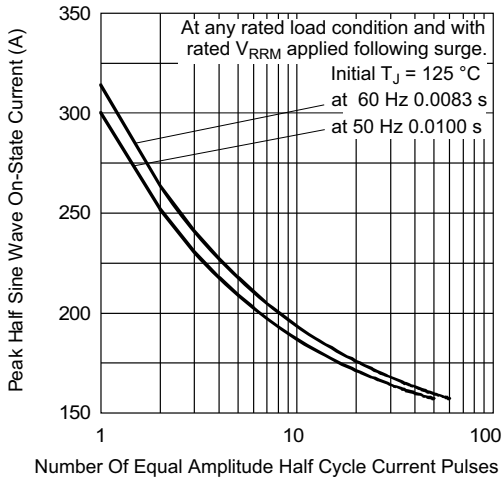


Fig. 5 - Maximum Non-Repetitive Surge Current

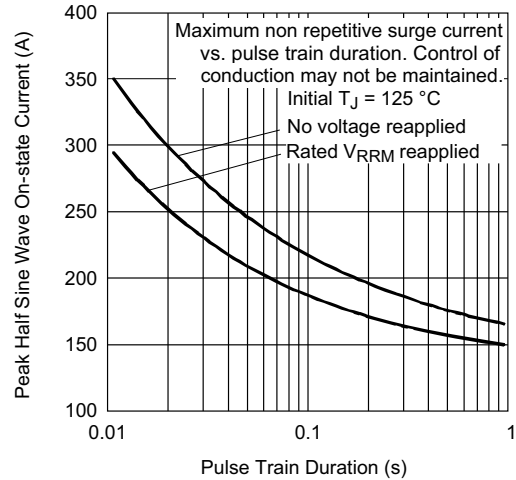


Fig. 6 - Maximum Non-Repetitive Surge Current

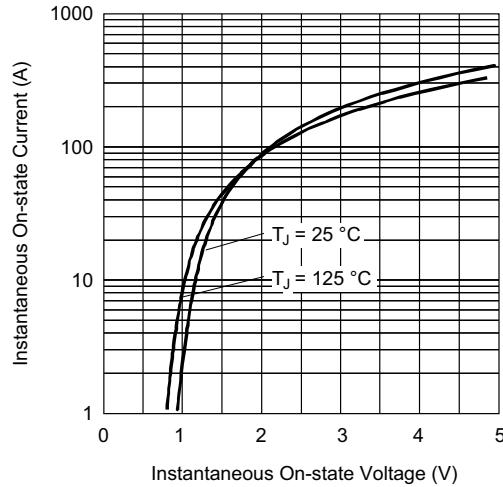


Fig. 7 - On-State Voltage Drop Characteristics

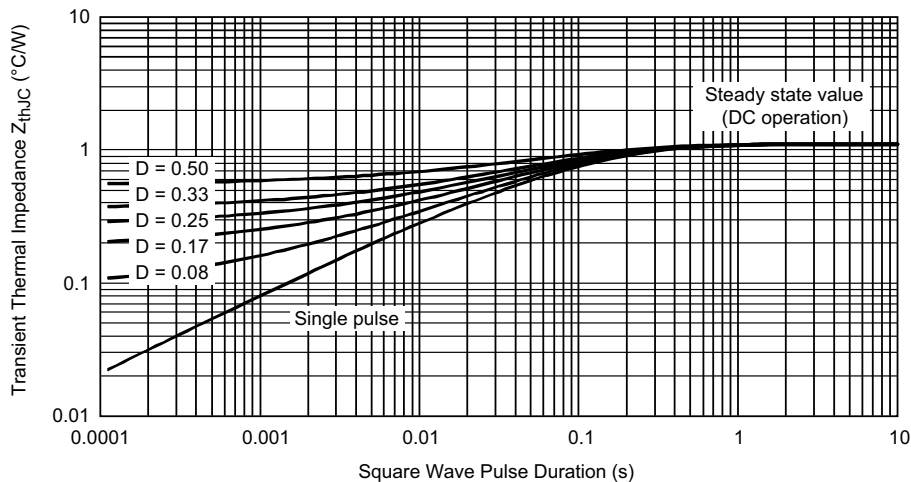


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics

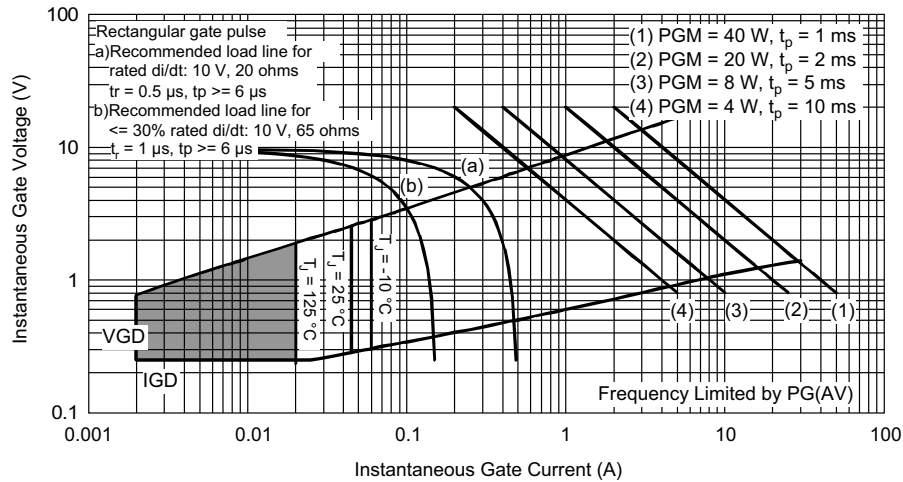


Fig. 9 - Gate Characteristics

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>25</b>	<b>T</b>	<b>T</b>	<b>S</b>	<b>16</b>	<b>S</b>	<b>2</b>	<b>L</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 (25 = 25 A)	<b>3</b>	-	Circuit configuration: T = single thyristor	<b>4</b>	-	Package: T = D <sup>2</sup> PAK (TO-263AB)	<b>5</b>	-	Type of silicon: S = standard recovery rectifier	<b>6</b>	-	Voltage rating: Voltage code x 100 = V <sub>RRM</sub> — <b>16 = 1600 V</b>	<b>7</b>	-	S = surface mountable	<b>8</b>	-	2 = true 2 pin D <sup>2</sup> PAK	<b>9</b>	-	L = tape and reel (left oriented), for different orientation contact factory	<b>10</b>	-	Environmental digit: -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

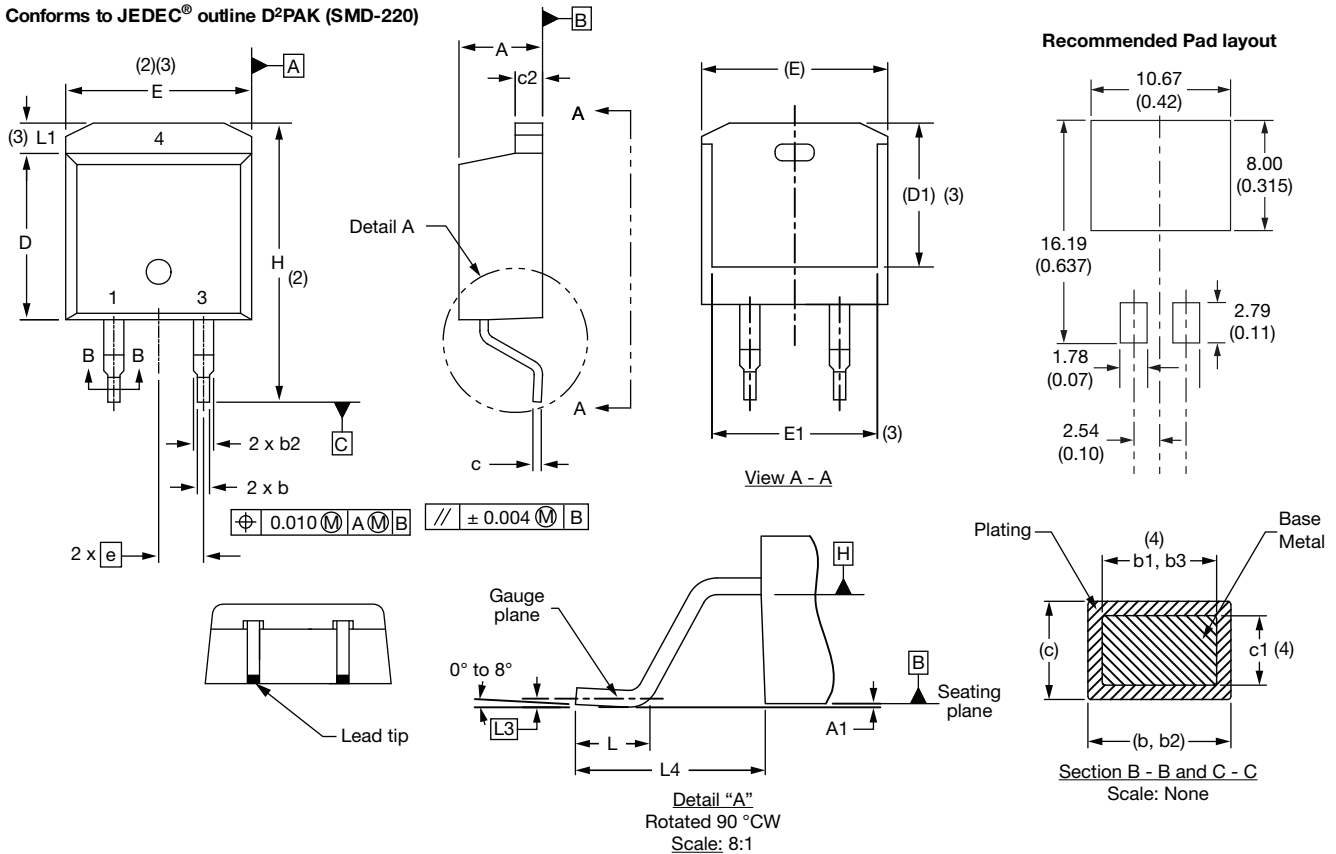
<b>ORDERING INFORMATION</b> (Example)			
PREFERRED P/N	QUANTITY PER REEL	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-25TTS16S2L-M3	800	800	13" diameter reel

<b>LINKS TO RELATED DOCUMENTS</b>	
Dimensions	<a href="http://www.vishay.com/doc?96683">www.vishay.com/doc?96683</a>
Part marking information	<a href="http://www.vishay.com/doc?96693">www.vishay.com/doc?96693</a>
Packaging information	<a href="http://www.vishay.com/doc?96317">www.vishay.com/doc?96317</a>

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

**DIMENSIONS** in millimeters and inches

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



SYMBOL	MILLIMETERS		INCHES		NOTES	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190		D1	6.86	8.00	0.270	0.315	3
A1	0.00	0.254	0.000	0.010		E	9.65	10.67	0.380	0.420	2, 3
b	0.51	0.99	0.020	0.039		E1	7.90	8.80	0.311	0.346	3
b1	0.51	0.89	0.020	0.035	4	e	2.54 BSC		0.100 BSC		
b2	1.14	1.78	0.045	0.070		H	14.61	15.88	0.575	0.625	
b3	1.14	1.73	0.045	0.068	4	L	1.78	2.79	0.070	0.110	
c	0.38	0.74	0.015	0.029		L1	-	1.65	-	0.066	3
c1	0.38	0.58	0.015	0.023	4	L3	0.25 BSC		0.010 BSC		
c2	1.14	1.65	0.045	0.065		L4	4.78	5.28	0.188	0.208	
D	8.51	9.65	0.335	0.380	2						

**Notes**

- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) 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
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inch
- (7) Outline conforms to JEDEC<sup>®</sup> outline TO-263AB



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