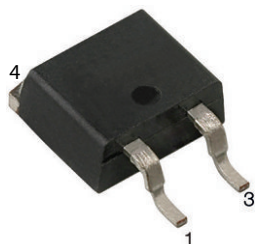
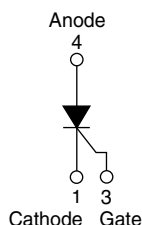


# Thyristor, Surface-Mount, Phase Control SCR, 16 A


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


## FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- AEC-Q101 qualified
- 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



## PRIMARY CHARACTERISTICS

$I_{T(AV)}$	16 A
$V_{DRM}/V_{RRM}$	1200 V
$V_{TM}$	1.25 V
$I_{GT}$	45 mA
$T_J$	-40 to +125 °C
Package	D <sup>2</sup> PAK 2L (TO-263AB 2L)
Circuit configuration	Single SCR

## APPLICATIONS

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

## DESCRIPTION

The VS-25TTS12S2LHM3 high voltage series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications.

## MECHANICAL DATA

**Case:** D<sup>2</sup>PAK 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 mm<sup>2</sup>

## MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$	Sinusoidal waveform	16	A
$I_{RMS}$		25	
$V_{RRM}/V_{DRM}$		1200	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-25TTS12S2LHM3	1200	1200	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 10 ms sine pulse, no voltage reapplied	300 350		
Maximum $I^2t$ for fusing	$I^2t$	10 ms sine pulse, rated $V_{RRM}$ applied 10 ms sine pulse, no voltage reapplied	450 630		$A^2s$
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		mΩ
Threshold voltage	$V_{T(TO)}$		1.0		V
Maximum reverse and direct leakage current	$I_{RM} / I_{DM}$	$T_J = 25\text{ }^{\circ}\text{C}$ $T_J = 125\text{ }^{\circ}\text{C}$	$V_R = \text{Rated } V_{RRM}/V_{DRM}$		mA
			0.5		
			10		
Holding current	$I_H$	VS-25TTS08, VS-25TTS12 $T_J = 25\text{ }^{\circ}\text{C}$ Anode supply = 6 V, resistive load, initial $I_T = 1\text{ A}$	-	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

**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, $T_J = -10\text{ }^{\circ}\text{C}$ Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$ Anode supply = 6 V, resistive load, $T_J = 125\text{ }^{\circ}\text{C}$	60 45 20	mA
Maximum required DC gate voltage to trigger	$V_{GT}$	Anode supply = 6 V, resistive load, $T_J = -10\text{ }^{\circ}\text{C}$ Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$ Anode supply = 6 V, resistive load, $T_J = 125\text{ }^{\circ}\text{C}$	2.5 2.0 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	V
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	μs
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: 2L D <sup>2</sup> PAK (2L TO-263AB)	25TTS12SH	

**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

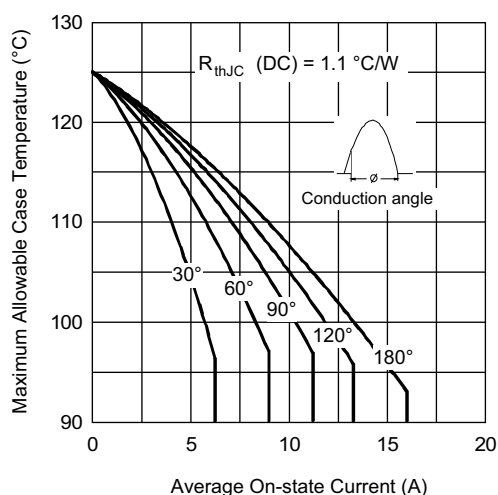


Fig. 1 - Current Rating Characteristics

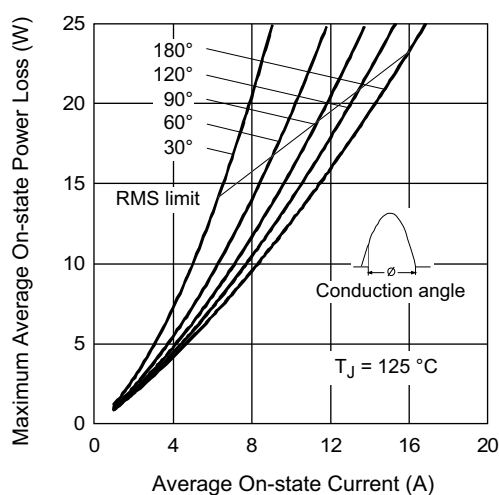


Fig. 3 - On-State Power Loss Characteristics

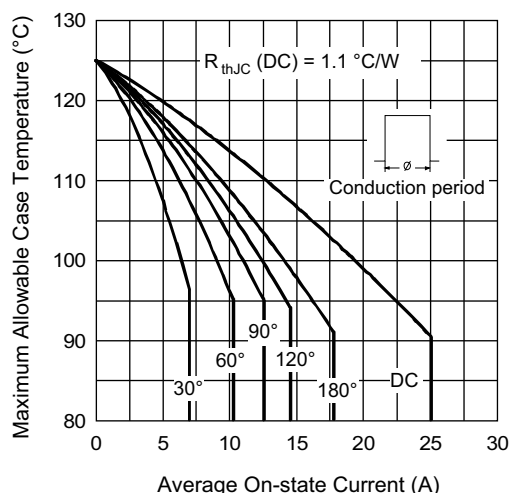


Fig. 2 - Current Rating Characteristics

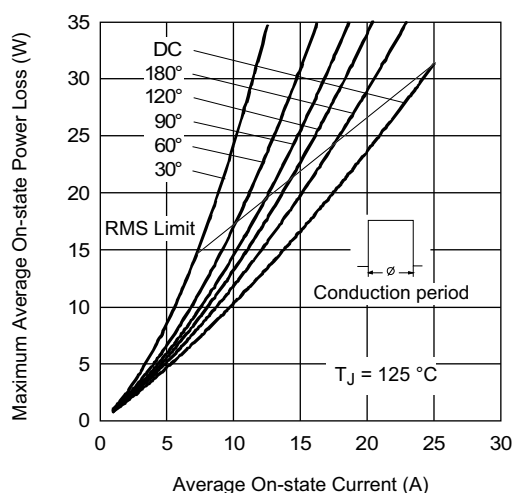


Fig. 4 - On-State Power Loss Characteristics

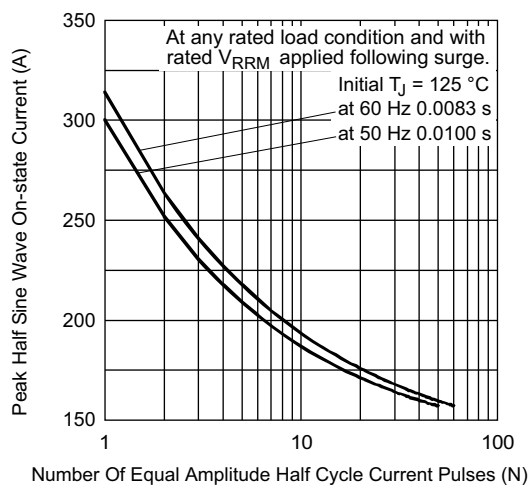


Fig. 5 - Maximum Non-Repetitive Surge Current

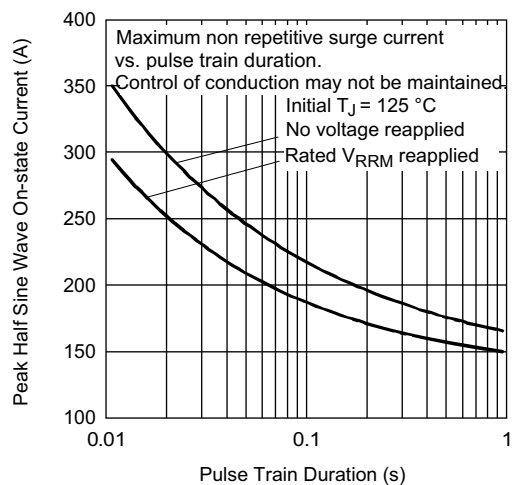


Fig. 6 - Maximum Non-Repetitive Surge Current

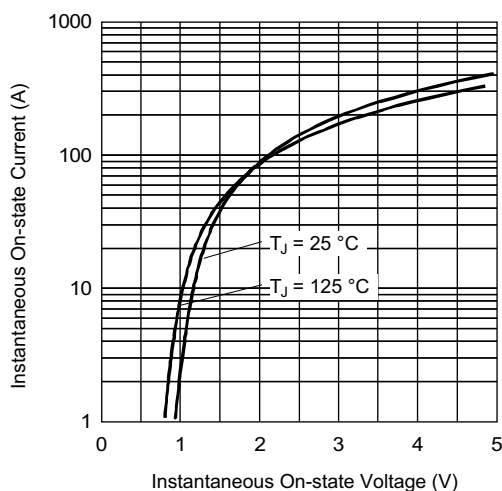


Fig. 7 - On-State Voltage Drop Characteristics

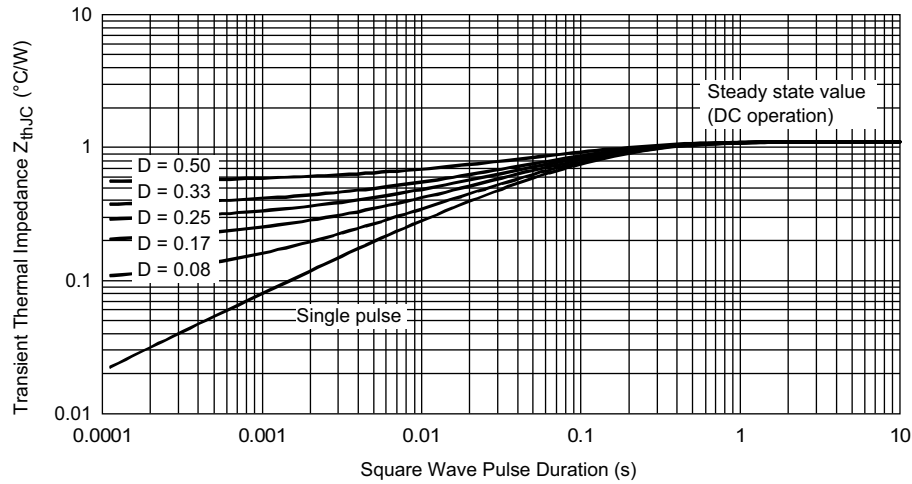


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics

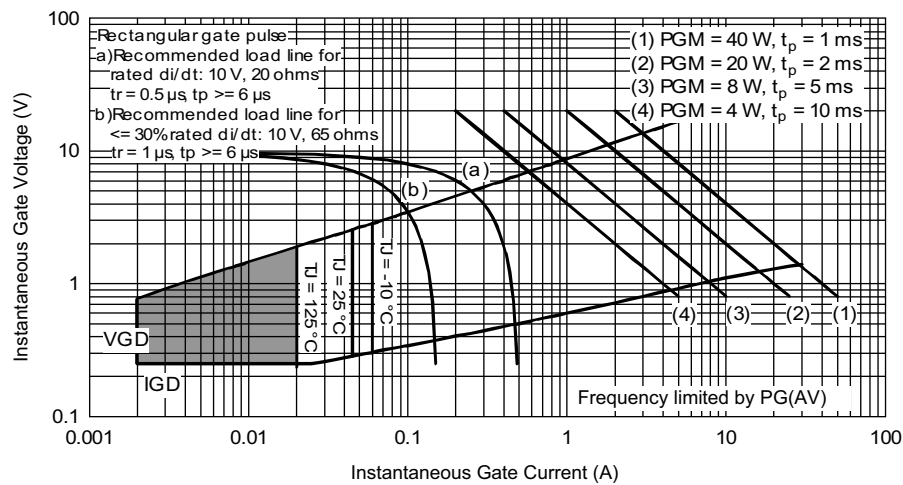


Fig. 9 - Gate Characteristics



## ORDERING INFORMATION TABLE

Device code	VS-	25	T	T	S	12	S	2	L	H	M3
	1	2	3	4	5	6	7	8	9	10	11
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 <sub>RRM</sub> ——— 12 = 1200 V										
7	S = surface mountable										
8	2 = true 2 pin D <sup>2</sup> PAK										
9	L = tape and reel (left oriented), for different orientation contact factory										
10	H = AEC-Q101 qualified										
11	M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free										

### ORDERING INFORMATION (Example)

PREFERRED P/N	QUANTITY PER REEL	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-25TTS12S2LHM3	800	800	13" diameter reel

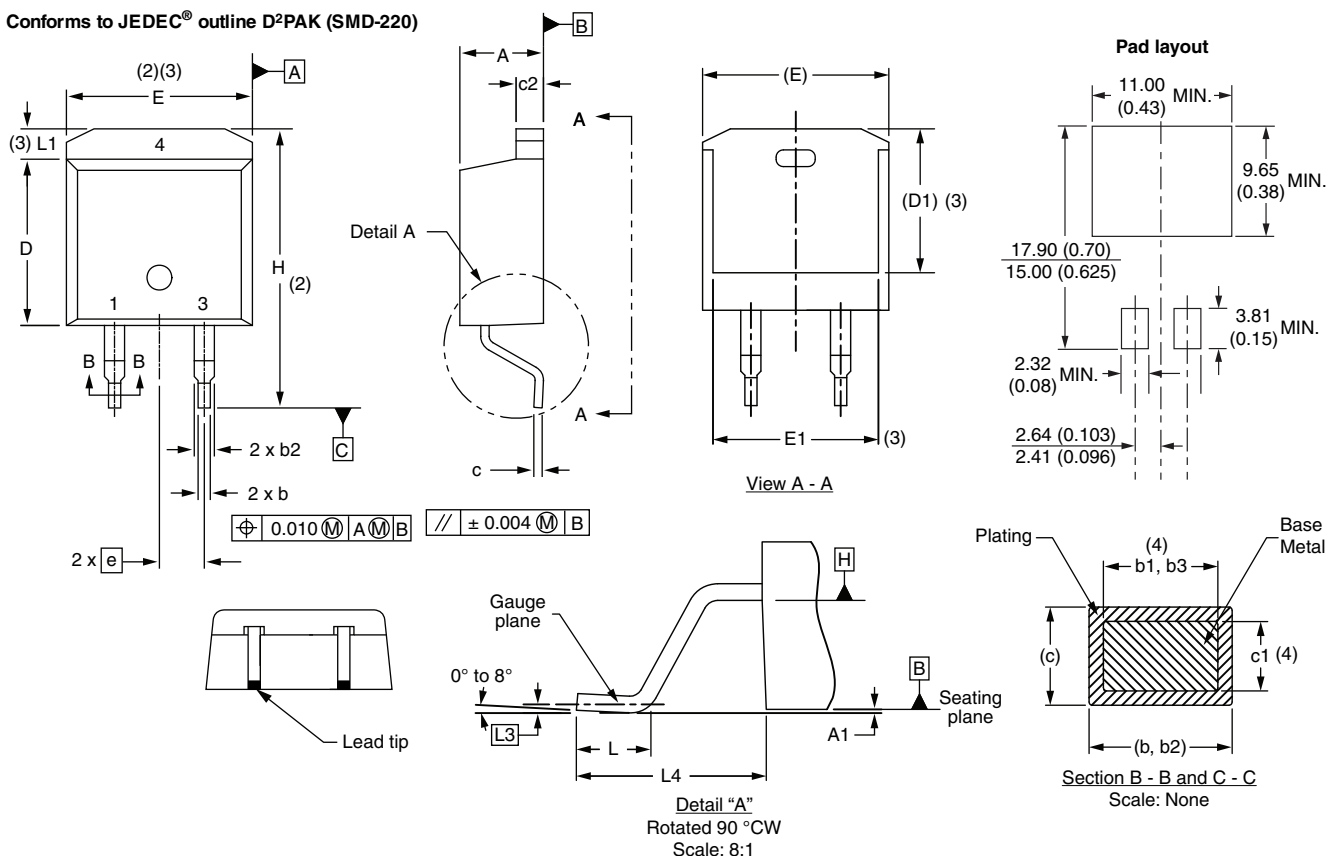
### LINKS TO RELATED DOCUMENTS

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® 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
L3	0.25 BSC		0.010 BSC		
L4	4.78	5.28	0.188	0.208	

#### 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® outline TO-263AB



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