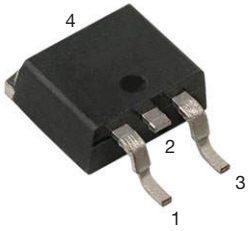
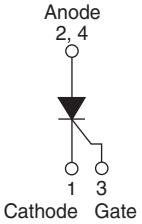
Thyristor, Surface Mount, Phase Control SCR, 16 A



D²PAK (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

RoHS COMPLIANT
HALOGEN FREE

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	D²PAK (TO-263AB)
Circuit configuration	Single SCR

APPLICATIONS

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

DESCRIPTION

The VS-25TTS12SLHM3 high voltage series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications.

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}		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-25TTS12SLHM3	1200	1200	10

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ABSOLUTE MAXIMUM RATINGS						
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES		UNITS
				TYP.	MAX.	
Maximum average on-state current	$I_{T(AV)}$	T_C = 93 °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 ms to 10 ms, no voltage reapplied		6300		$A^2\sqrt{s}$
Maximum on-state voltage drop	V_{TM}	16 A, T_J = 25 °C		1.25		V
On-state slope resistance	r_t	T_J = 125 °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 °C	V_R = Rated V_{RRM}/V_{DRM}	0.5		mA
		T_J = 125 °C		10		
Holding current	I_H	VS-25TTS08, VS-25TTS12	Anode supply = 6 V, resistive load, initial I_T = 1 A, T_J = 25 °C	-	150	
Maximum latching current	I_L	Anode supply = 6 V, resistive load, T_J = 25 °C		200		
Maximum rate of rise of off-state voltage	dV/dt	T_J = T_J max., linear to 80 %, V_{DRM} = R_g - 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 °C	60	mA
		Anode supply = 6 V, resistive load, T_J = 25 °C	45	
		Anode supply = 6 V, resistive load, T_J = 125 °C	20	
Maximum required DC gate voltage to trigger	V_{GT}	Anode supply = 6 V, resistive load, T_J = -10 °C	2.5	V
		Anode supply = 6 V, resistive load, T_J = 25 °C	2.0	
		Anode supply = 6 V, resistive load, T_J = 125 °C	1.0	
Maximum DC gate voltage not to trigger	V_{GD}	T_J = 125 °C, V_{DRM} = rated value	0.25	
Maximum DC gate current not to trigger	I_{GD}		2.0	mA

SWITCHING				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Typical turn-on time	t_{gt}	T_J = 25 °C	0.9	µs
Typical reverse recovery time	t_{rr}	T_J = 125 °C	4	
Typical turn-off time	t_q		110	

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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^2PAK (TO-263AB)	25TTS12SH	

Note

(1) When mounted on 1" square (650 mm^2) PCB of FR-4 or G-10 material 4 oz. (140 µm] copper 40 °C/W

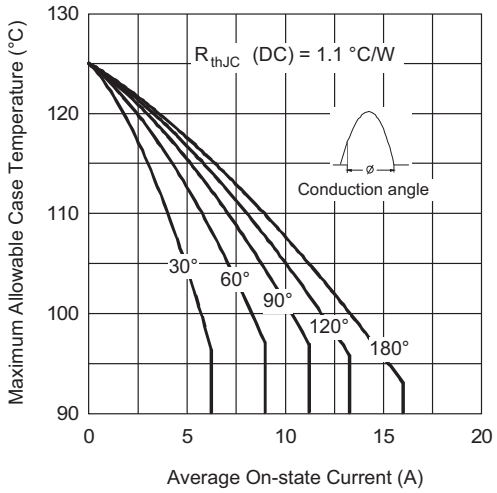

Fig. 1 - Current Rating Characteristics

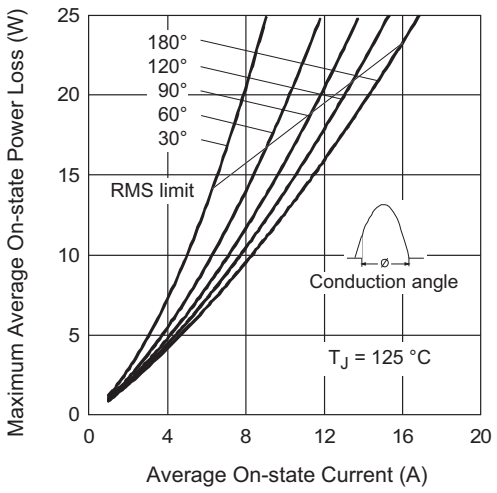

Fig. 3 - On-State Power Loss Characteristics

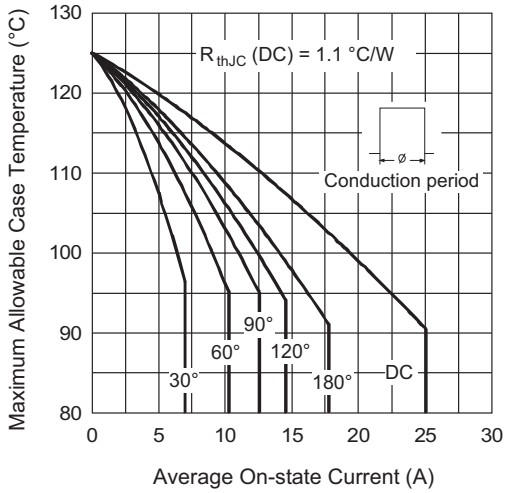

Fig. 2 - Current Rating Characteristics

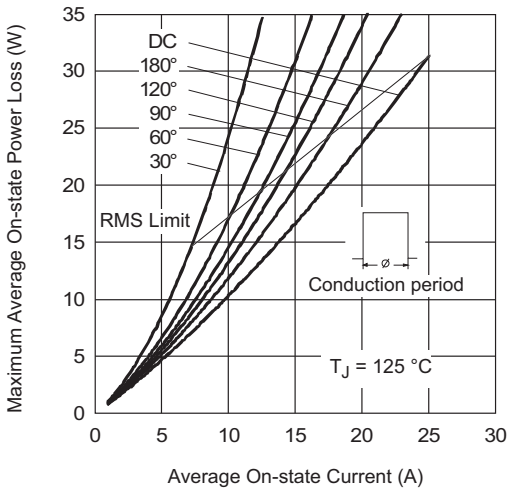

Fig. 4 - On-State Power Loss Characteristics

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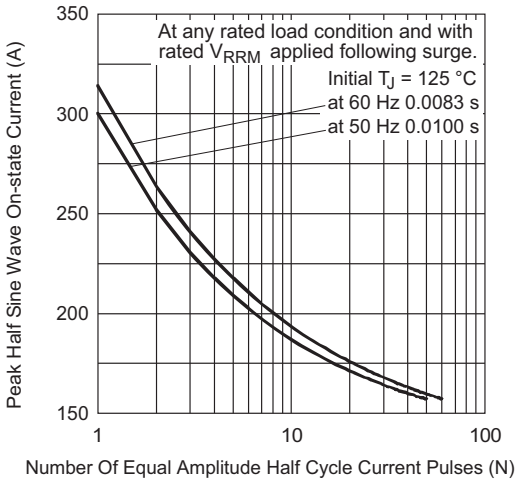

Fig. 5 - Maximum Non-Repetitive Surge Current

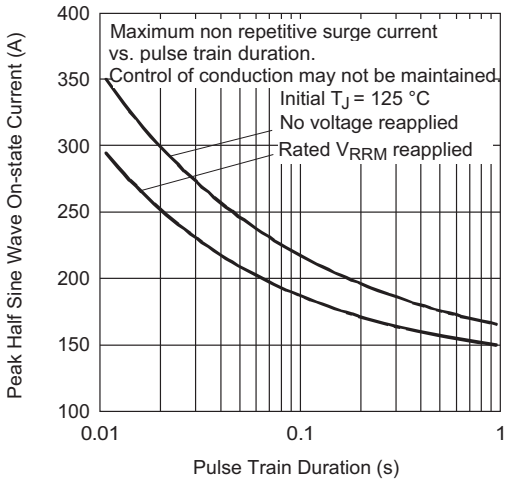

Fig. 6 - Maximum Non-Repetitive Surge Current

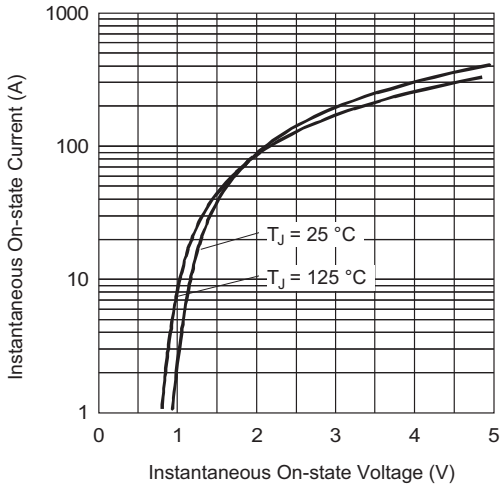

Fig. 7 - On-State Voltage Drop Characteristics

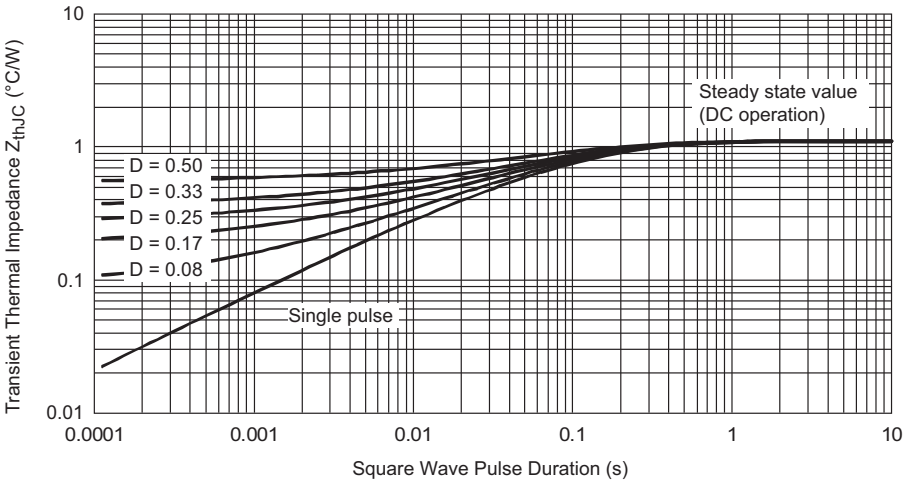

Fig. 8 - Gate Characteristics

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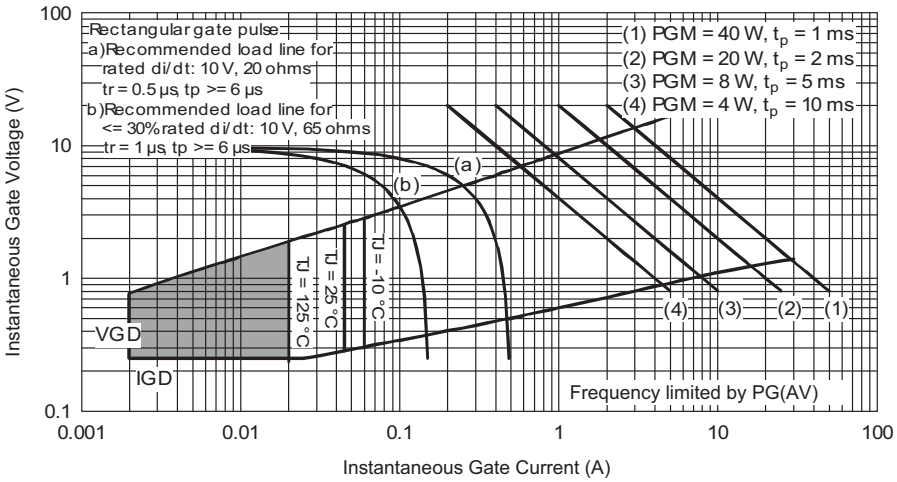

Fig. 9 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

Device code

VS-	25	T	T	S	12	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^2PAK (TO-263AB)

5 - Type of silicon:
S = standard recovery rectifier

6 - Voltage rating: voltage code x 100 = V_{RRM} — 12 = 1200 V

7 - S = surface mountable

8 - L = tape and reel (left oriented), for different orientation contact factory

9 - H = AEC-Q101 qualified

10 - 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-25TTS12SLHM3	800	800	13" diameter reel

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95046
Part marking information	www.vishay.com/doc?95444
Packaging information	www.vishay.com/doc?96317

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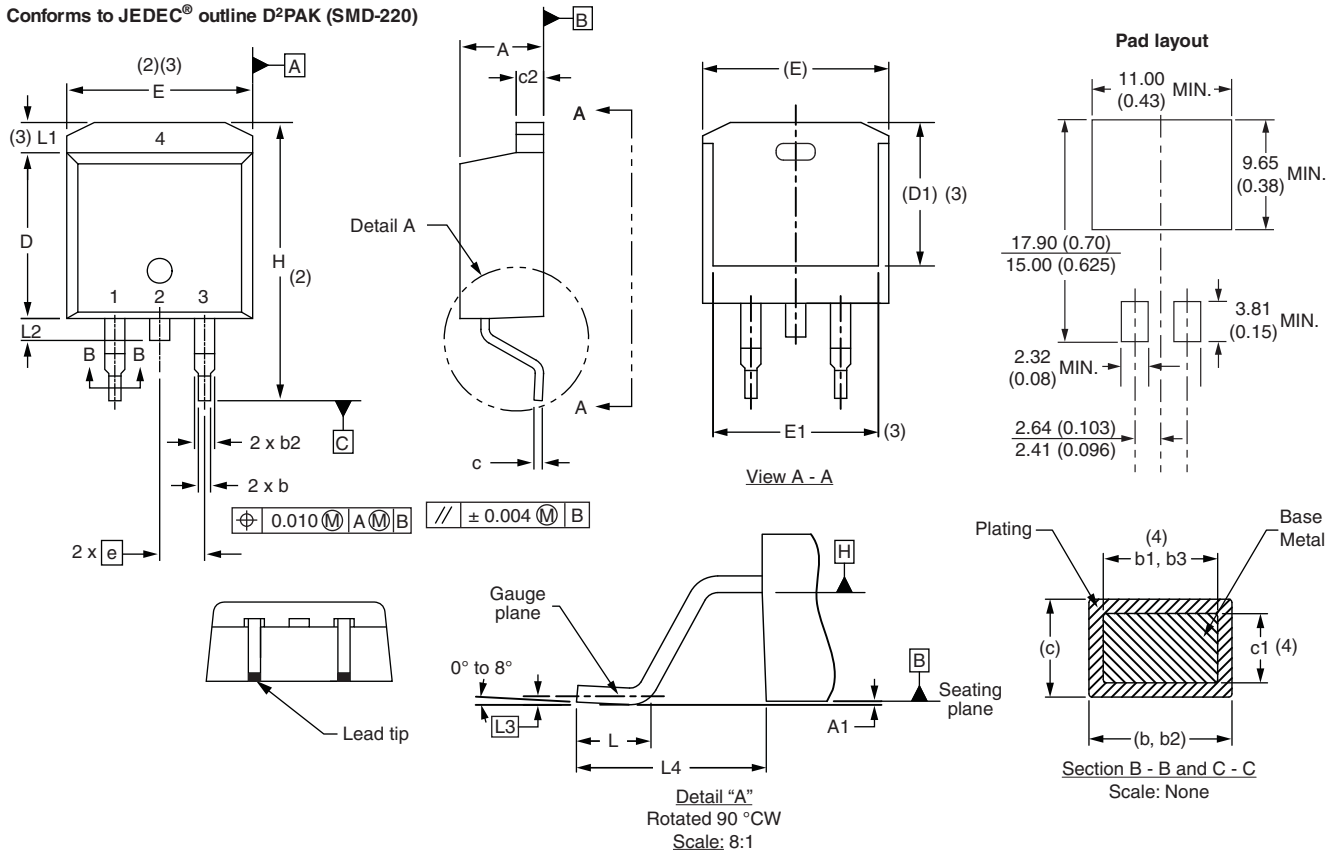
D²PAK

DIMENSIONS in millimeters and inches



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		L2	1.27	1.78	0.050	0.070	
c2	1.14	1.65	0.045	0.065			L3	0.25 BSC		0.010 BSC		
D	8.51	9.65	0.335	0.380	2		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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