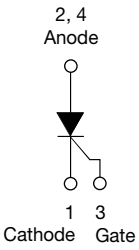
Thyristor Surface Mount Phase Control SCR, 16 A

D²PAK (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

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	D²PAK (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 mm²

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

ABSOLUTE MAXIMUM RATINGS					
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES TYP.	VALUES MAX.	UNITS
Maximum average on-state current	$I_{T(AV)}$	T_C = 93 °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^2s
		10 ms sine pulse, no voltage reapplied	200		
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied	2000		$A^2\sqrt{s}$
Maximum on-state voltage drop	V_{TM}	10 A, T_J = 25 °C	1.4		V
On-state slope resistance	r_t	T_J = 125 °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 °C, V_R = rated V_{RRM}/V_{DRM}	0.5		mA
		T_J = 125 °C	10		
Holding current	I_H	Anode supply = 6 V, resistive load, initial I_T = 1 A, T_J = 25 °C	100	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	90	mA
		Anode supply = 6 V, resistive load, T_J = 25 °C	60	
		Anode supply = 6 V, resistive load, T_J = 125 °C	35	
Maximum required DC gate voltage to trigger	V_{GT}	Anode supply = 6 V, resistive load, T_J = - 10 °C	3.0	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	

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 (1)	40	
Approximate weight			2	g
			0.07	oz.
Marking device		Case style D^2PAK (TO-263AB)	16TTS16S	

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.
For recommended footprint and soldering techniques refer to application note #AN-994

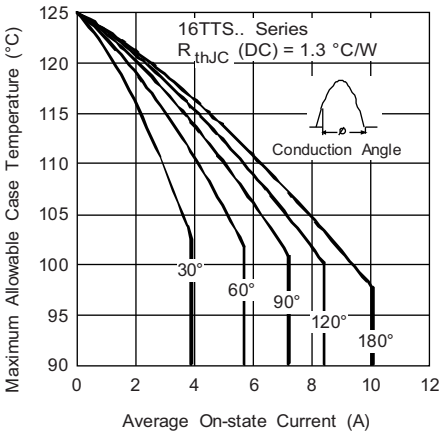


Fig. 1 - Current Rating Characteristics

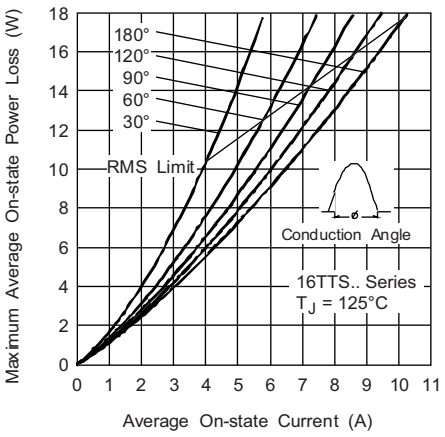


Fig. 3 - On-State Power Loss Characteristics

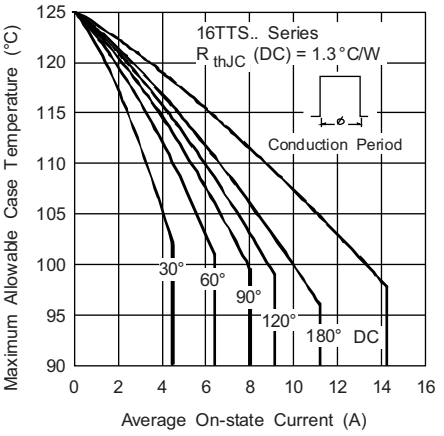


Fig. 2 - Current Rating Characteristics

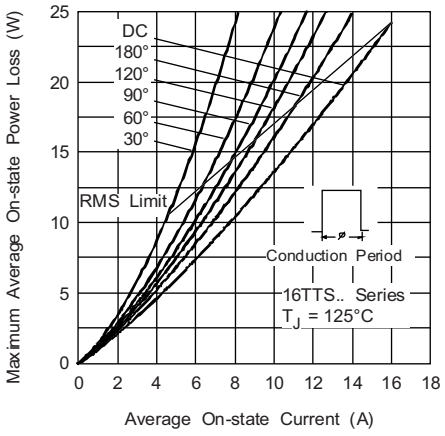


Fig. 4 - On-State Power Loss Characteristics

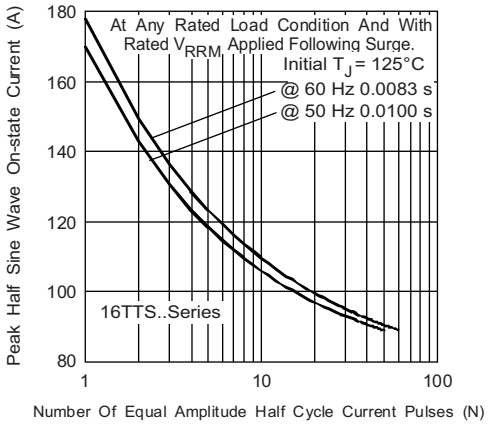


Fig. 5 - Maximum Non-Repetitive Surge Current

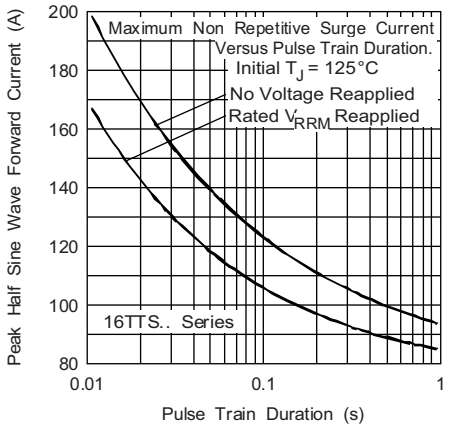


Fig. 6 - Maximum Non-Repetitive Surge Current

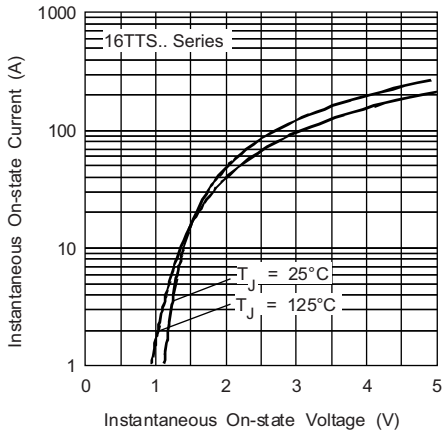


Fig. 7 - On-State Voltage Drop Characteristics

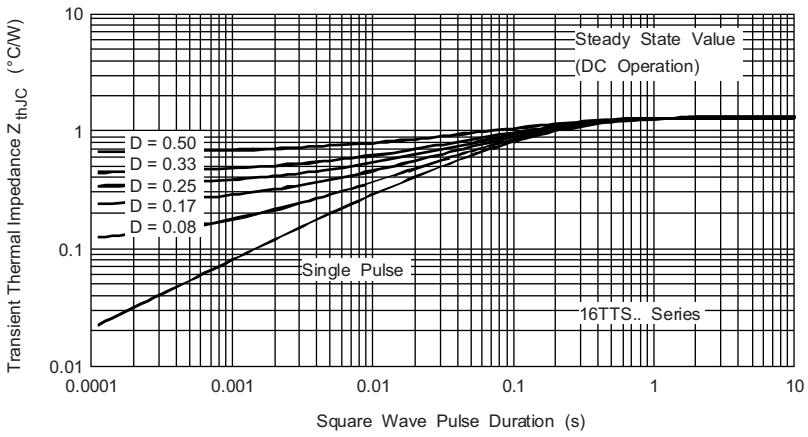


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

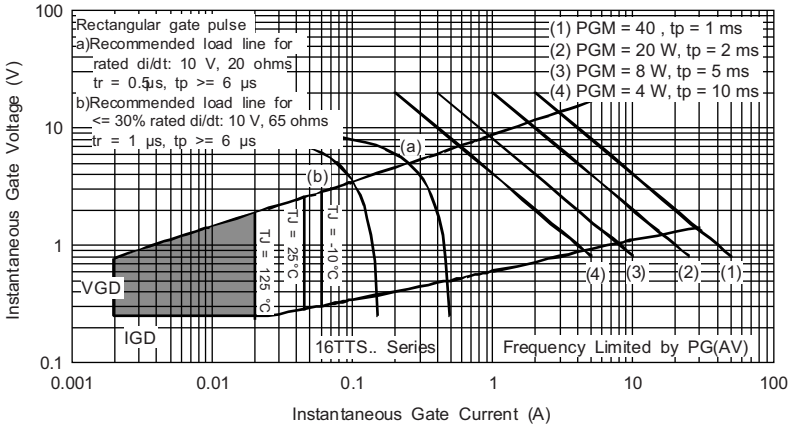


Fig. 9 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code

VS-	16	T	T	S	16	S	TRL	-M3
1	2	3	4	5	6	7	8	9

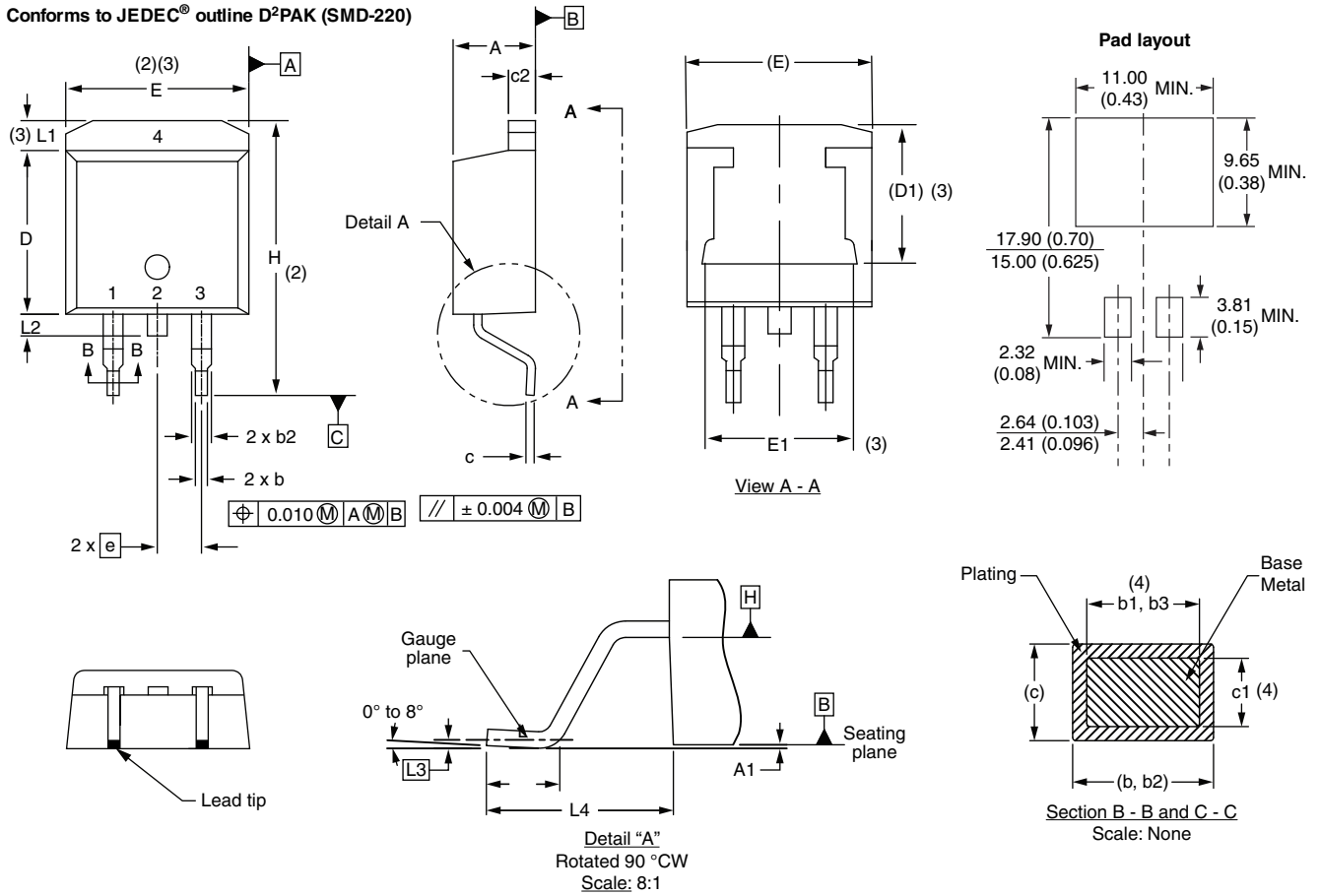
- 1 - Vishay Semiconductors product
- 2 - Current rating
- 3 - Circuit configuration:
  T = single thyristor
- 4 - Package:
  T = D^2PAK (TO-263AB)
- 5 - Type of silicon:
  S = standard recovery rectifier
- 6 - Voltage rating: Voltage code x 100 = V_{RRM} (16 = 1600 V)
- 7 - S = surface mountable
- 8 - • 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	www.vishay.com/doc?96164
Part marking information	www.vishay.com/doc?95444
Packaging information	www.vishay.com/doc?96424

D^2PAK

DIMENSIONS in millimeters and inches



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

(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: inches

(7) Outline conforms to JEDEC® outline TO-263AB

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