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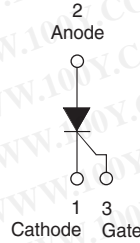
VS-16TTS..SPbF High Voltage Series

Vishay Semiconductors

Surface Mountable Phase Control SCR, 16 A



D²PAK



FEATURES

- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Compliant to RoHS directive 2002/95/EC
- Halogen-free according to IEC 61249-2-21 definition
- Designed and qualified for industrial level



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Input rectification (soft start)
- Vishay input diodes, switches and output rectifiers which are available in identical package outlines

DESCRIPTION

The VS-16TTS..SPbF 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.

PRODUCT SUMMARY

V_T at 10 A	< 1.4 V
I_{TSM}	200 A
V_{RRM}	800 V/1200 V

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, $R_{thCA} = 15 \text{ °C/W}$	6.3	9.5	
Aluminum IMS with heatsink, $R_{thCA} = 5 \text{ °C/W}$	14.0	18.5	

Note

- $T_A = 55 \text{ °C}$, $T_J = 125 \text{ °C}$, footprint 300 mm²

MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{T(AV)}$	Sinusoidal waveform	10	A
I_{RMS}		16	
V_{RRM}/V_{DRM}		800/1200	V
I_{TSM}		200	A
V_T	10 A, $T_J = 25 \text{ °C}$	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-16TTS08SPbF	800	800	10
VS-16TTS12SPbF	1200	1200	

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ABSOLUTE MAXIMUM RATINGS					
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNITS
			TYP.	MAX.	
Maximum average on-state current	$I_{T(AV)}$	$T_C = 98\text{ }^\circ\text{C}$, 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 ² s
		10 ms sine pulse, no voltage reapplied	200		
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1\text{ ms to }10\text{ ms}$, no voltage reapplied	2000		A ² √s
Maximum on-state voltage drop	V_{TM}	10 A, $T_J = 25\text{ }^\circ\text{C}$	1.4		V
On-state slope resistance	r_t	$T_J = 125\text{ }^\circ\text{C}$	24.0		mΩ
Threshold voltage	$V_{T(TO)}$		1.1		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 $I_T = 1\text{ A}$	-	100	
Maximum latching current	I_L	Anode supply = 6 V, resistive load	200		
Maximum rate of rise of off-state voltage	dV/dt		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, $T_J = -10\text{ }^\circ\text{C}$	90	mA
		Anode supply = 6 V, resistive load, $T_J = 25\text{ }^\circ\text{C}$	60	
		Anode supply = 6 V, resistive load, $T_J = 125\text{ }^\circ\text{C}$	35	
Maximum required DC gate voltage to trigger	V_{GT}	Anode supply = 6 V, resistive load, $T_J = -10\text{ }^\circ\text{C}$	3.0	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	mA

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	



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THERMAL - 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)	240	
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 ² PAK (SMD-220)	16TTS08S	
			16TTS12S	

Note

⁽¹⁾ When mounted on 1" square (650 mm²) 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.

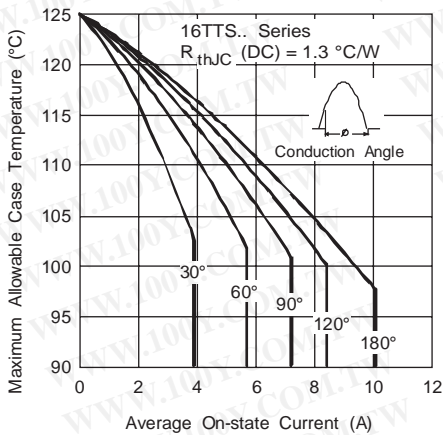


Fig. 1 - Current Rating Characteristics

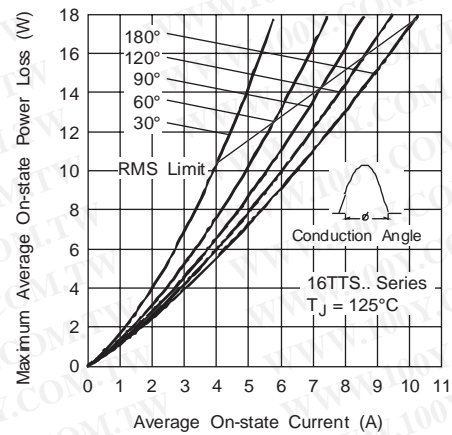


Fig. 3 - On-State Power Loss Characteristics

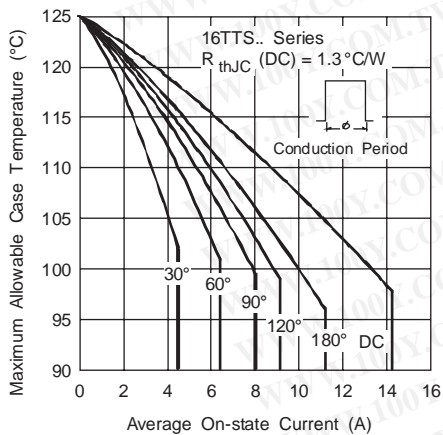


Fig. 2 - Current Rating Characteristics

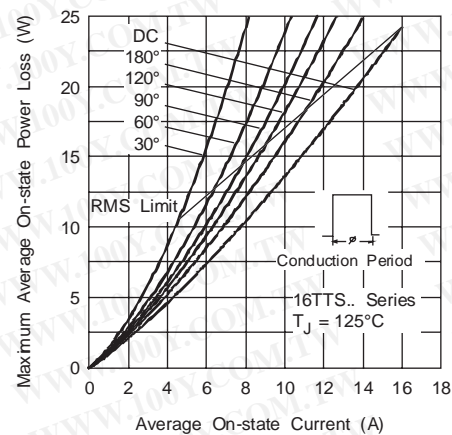


Fig. 4 - On-State Power Loss Characteristics

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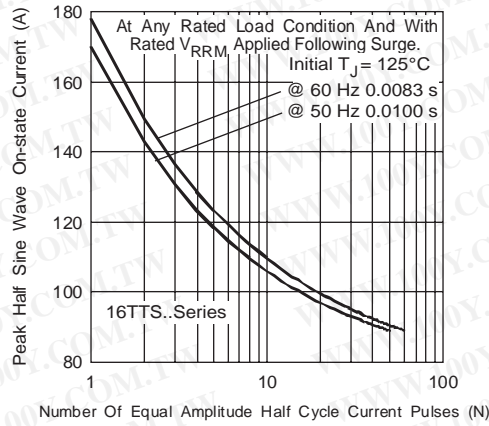


Fig. 5 - Maximum Non-Repetitive Surge Current

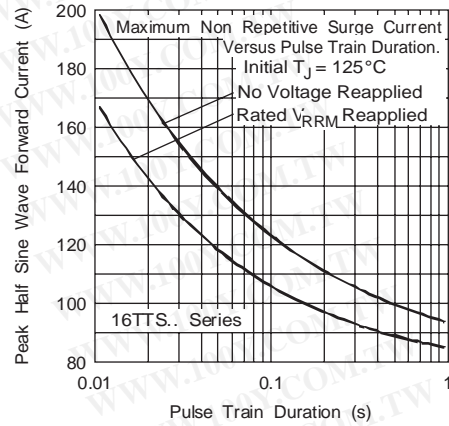


Fig. 6 - Maximum Non-Repetitive Surge Current

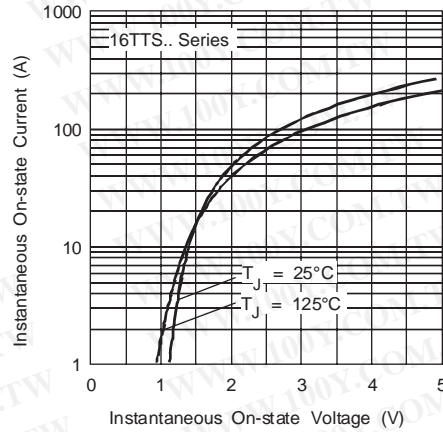


Fig. 7 - On-State Voltage Drop Characteristics

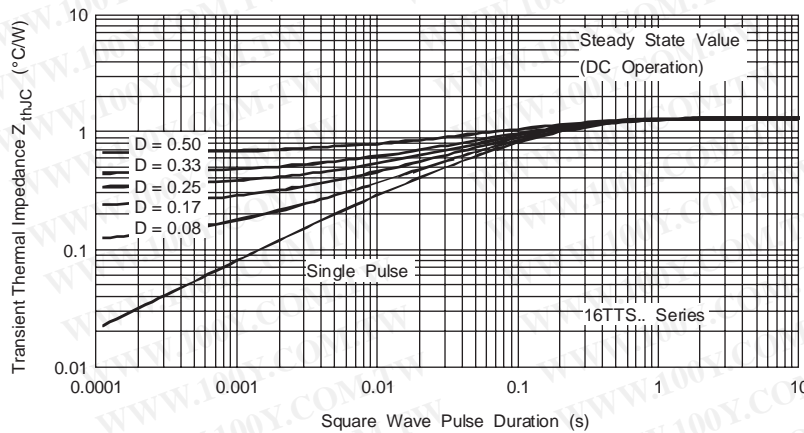


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics



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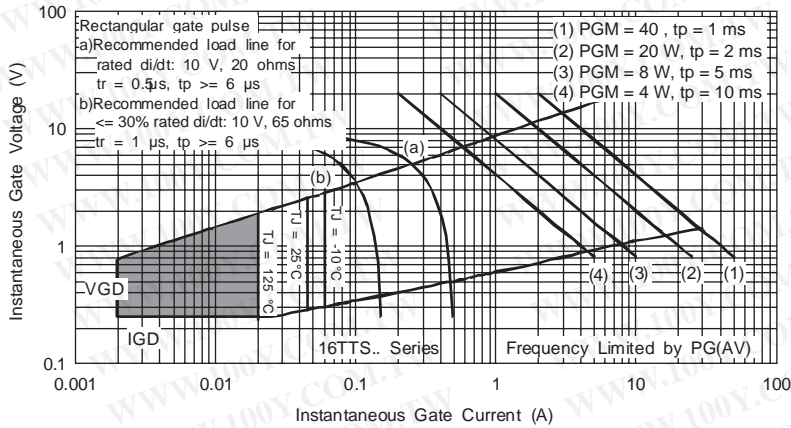


Fig. 9 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code	VS-	16	T	T	S	12	S	TRL	PbF
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- ①
- ②
- ③
- ④
- ⑤
- ⑥
- ⑦
- ⑧
- ⑨

- ① - HPP product suffix
- ② - Current rating
- ③ - Circuit configuration:
T = Single thyristor
- ④ - Package:
T = TO-220AC
- ⑤ - Type of silicon:
S = Standard recovery rectifier
- ⑥ - Voltage rating: Voltage code x 100 = V_{RRM}
- ⑦ - S = TO-220 D²PAK (SMD-220) version
- ⑧ -
 - None = Tube
 - TRL = Tape and reel (left oriented)
 - TRR = Tape and reel (right oriented)
- ⑨ - PbF = Lead (Pb)-free

08 = 800 V
12 = 1200 V

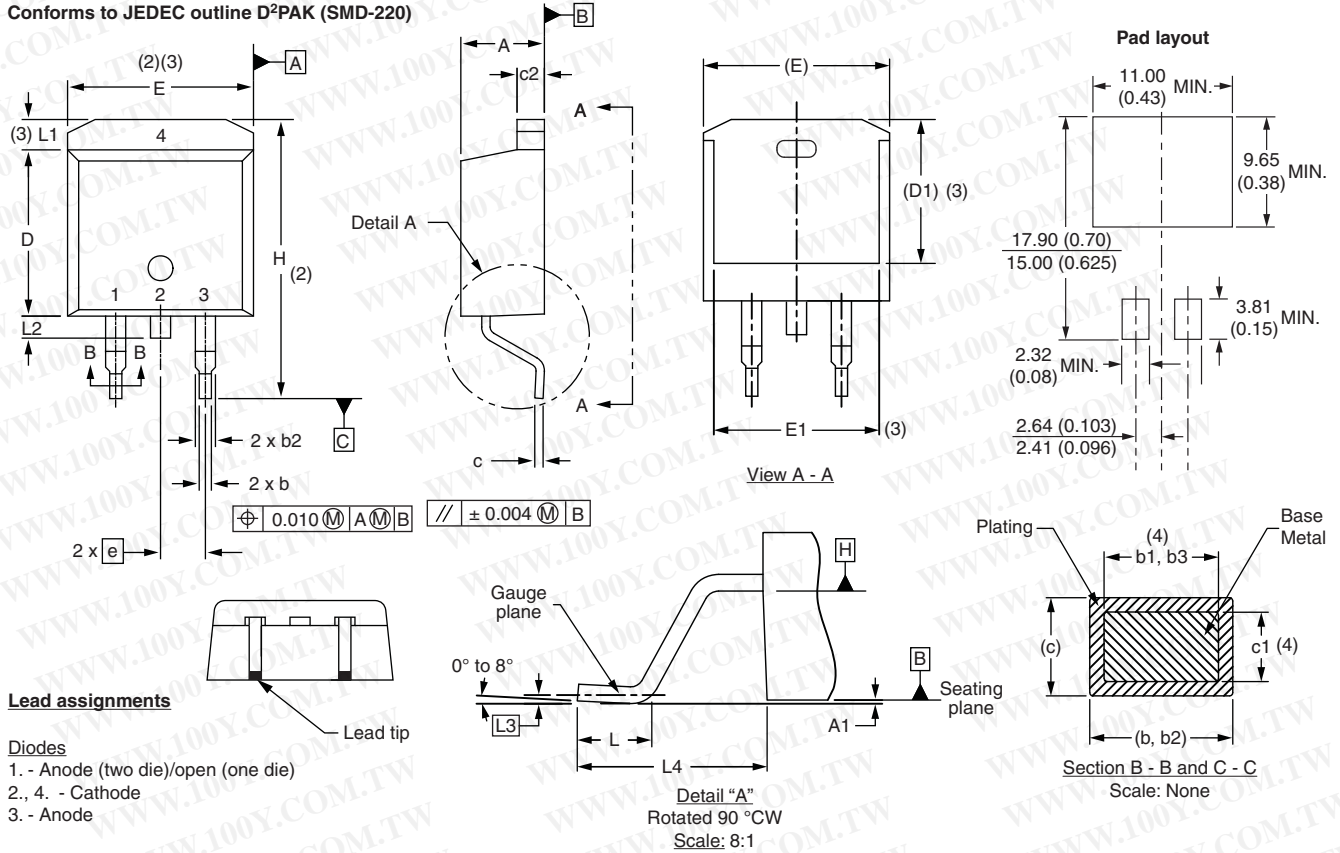
LINKS TO RELATED DOCUMENTS

Dimensions	www.vishay.com/doc?95046
Part marking information	www.vishay.com/doc?95054
Packaging information	www.vishay.com/doc?95032

D²PAK

DIMENSIONS in millimeters and inches

Conforms to JEDEC outline D²PAK (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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