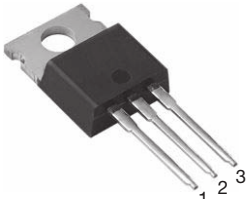
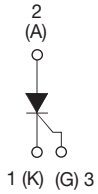
Thyristor High Voltage, Phase Control SCR, 16 A



TO-220AB



FEATURES

- Designed and qualified according to JEDEC®-JESD 47
- 125 °C max. operating junction temperature
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb
e3
RoHS COMPLIANT
HALOGEN FREE Available

APPLICATIONS

- Typical usage is in input rectification crowbar (soft start) and AC switch in motor control, UPS, welding, and battery charge

DESCRIPTION

The VS-16TTS... 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 operating up to 125 °C junction temperature.

PRIMARY CHARACTERISTICS	
$I_{T(AV)}$	10 A
V_{DRM}/V_{RRM}	800 V, 1200 V
V_{TM}	1.4 V
I_{GT}	60 mA
T_J	-40 °C to 125 °C
Package	TO-220AB
Circuit configuration	Single SCR

OUTPUT CURRENT IN TYPICAL APPLICATIONS			
APPLICATIONS	SINGLE-PHASE BRIDGE	THREE-PHASE BRIDGE	UNITS
Capacitive input filter T_A = 55 °C, T_J = 125 °C, common heatsink of 1 °C/W	13.5	17	A

MAJOR RATINGS AND CHARACTERISTICS			
PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$	Sinusoidal waveform	10	A
I_{RMS}		16	
V_{DRM}/V_{RRM}	Range (1)	800/1200	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	Range	-40 to 125	°C

Note

(1) For higher voltage up to 1600 V contact factory

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-16TTS08PbF, VS-16TTS08-M3	800	800	10
VS-16TTS12PbF, VS-16TTS12-M3	1200	1200	

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES TYP.	VALUES MAX.	UNITS
Maximum average on-state current	$I_{T(AV)}$	T_C = 98 °C, 180° conduction, half sine wave	10		A
Maximum RMS on-state current	I_{RMS}		16		A
Maximum peak, one-cycle, non-repetitive surge current	I_{TSM}	10 ms sine pulse, rated V_{RRM} applied	170		A
		10 ms sine pulse, no voltage reapplied	200		A
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		A^2s
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 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	$V_{T(TO)}$	T_J = 125 °C	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, V_R = Rated V_{RRM}/V_{DRM}	10		mA
Holding current	I_H	Anode supply = 6 V, resistive load, initial I_T = 1 A 16TTS08PbF, 16TTS12PbF, T_J = 25 °C	-	150	mA
Maximum latching current	I_L	Anode supply = 6 V, resistive load, T_J = 25 °C	200		mA
Maximum rate of rise of off-state voltage	dV/dt	T_J = T_J max., linear to 80 °C, 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	W
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 = - 65 °C	90	mA
		Anode supply = 6 V, resistive load, T_J = 25 °C	60	mA
		Anode supply = 6 V, resistive load, T_J = 125 °C	35	mA
Maximum required DC gate voltage to trigger	V_{GT}	Anode supply = 6 V, resistive load, T_J = - 65 °C	3.0	V
		Anode supply = 6 V, resistive load, T_J = 25 °C	2.0	V
		Anode supply = 6 V, resistive load, T_J = 125 °C	1.0	V
Maximum DC gate voltage not to trigger	V_{GD}	T_J = 125 °C, V_{DRM} = Rated value	0.25	V
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	µs
Typical turn-off time	t_q	T_J = 125 °C	110	µs

THERMAL AND 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
Maximum thermal resistance, junction to ambient		R_{thJA}		62	
Typical thermal resistance, case to heatsink		R_{thCS}	Mounting surface, smooth and greased	0.5	
Approximate weight				2	g
				0.07	oz.
Mounting torque	minimum			6 (5)	kgf · cm (lbf · in)
	maximum			12 (10)	
Marking device			Case style TO-220AB	16TTS08	
				16TTS12	

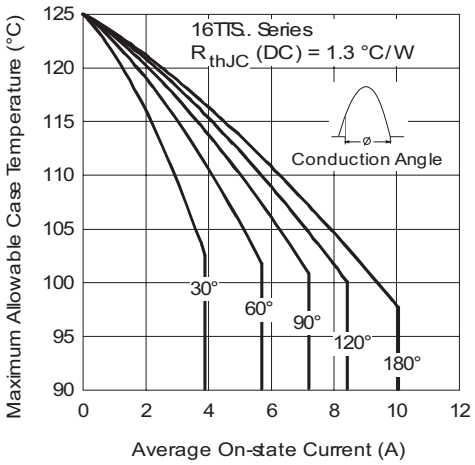


Fig. 1 - Current Rating Characteristics

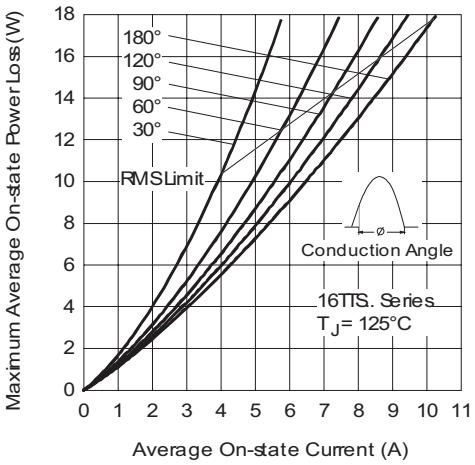


Fig. 3 - On-State Power Loss Characteristics

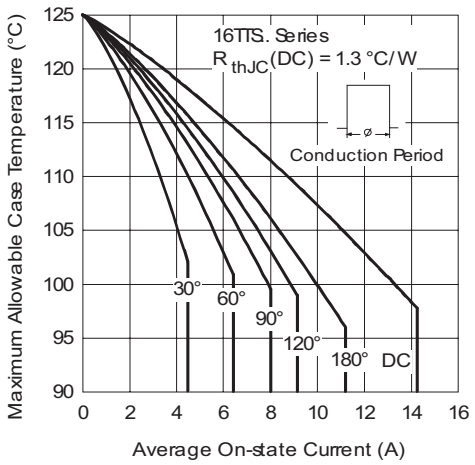


Fig. 2 - Current Rating Characteristics

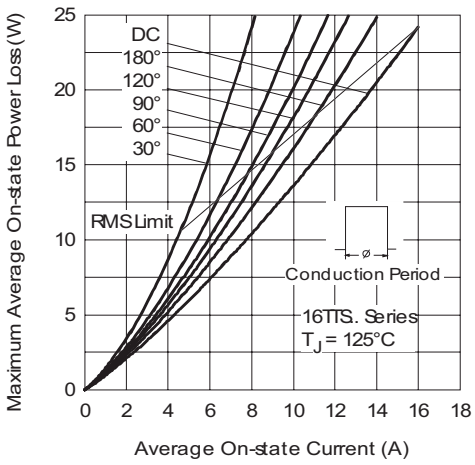


Fig. 4 - On-State Power Loss Characteristics

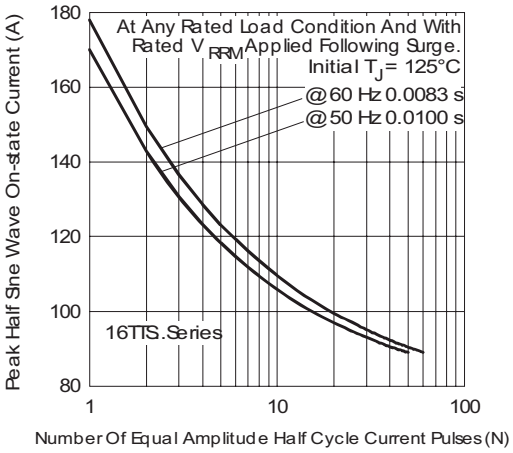


Fig. 5 - Maximum Non-Repetitive Surge Current

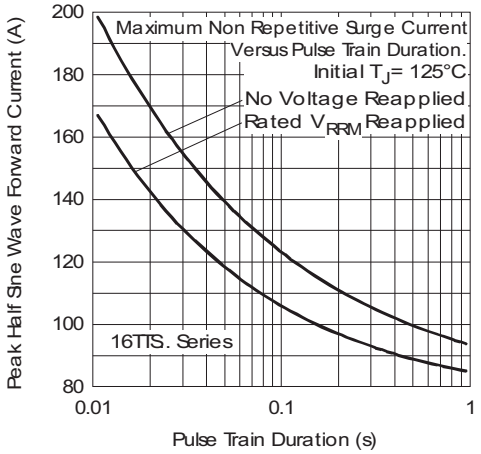


Fig. 6 - Maximum Non-Repetitive Surge Current

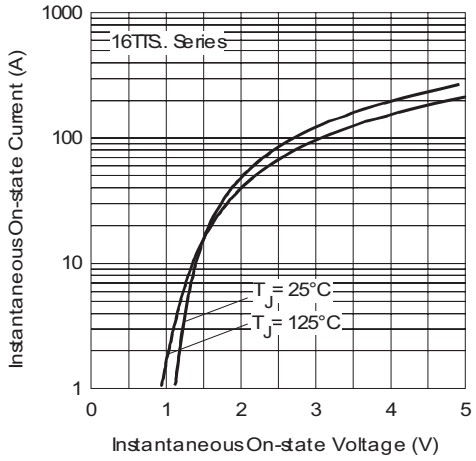


Fig. 7 - On-State Voltage Drop Characteristics

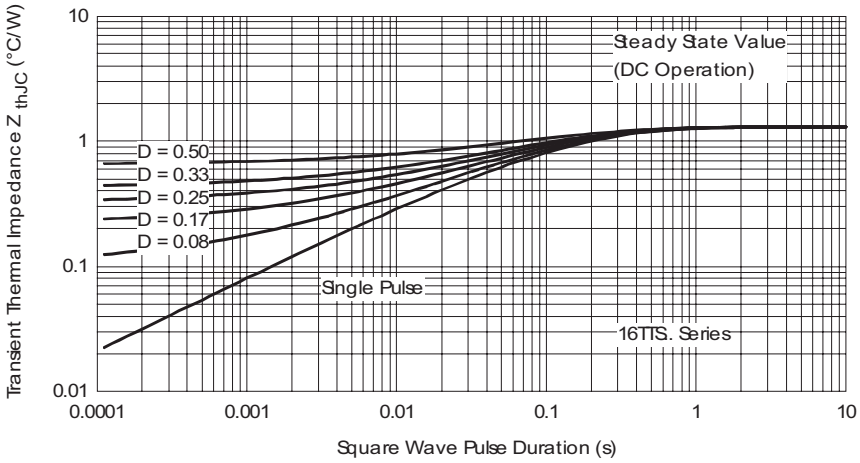


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

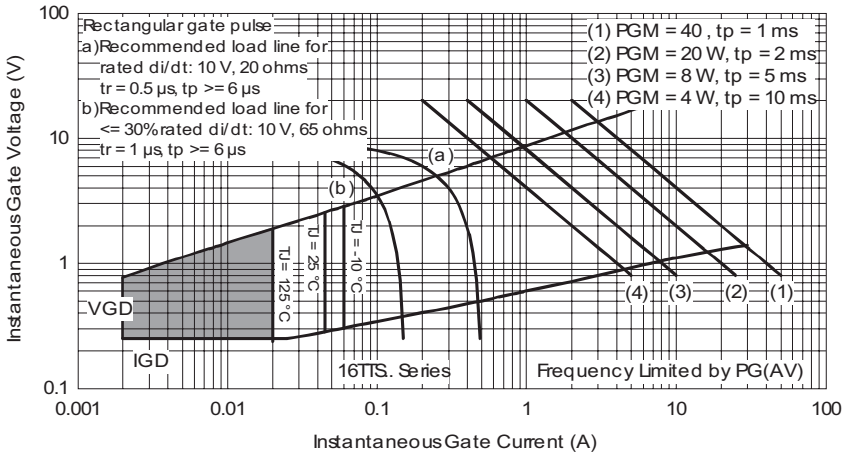


Fig. 9 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code

VS-	16	T	T	S	12	PbF
1	2	3	4	5	6	7

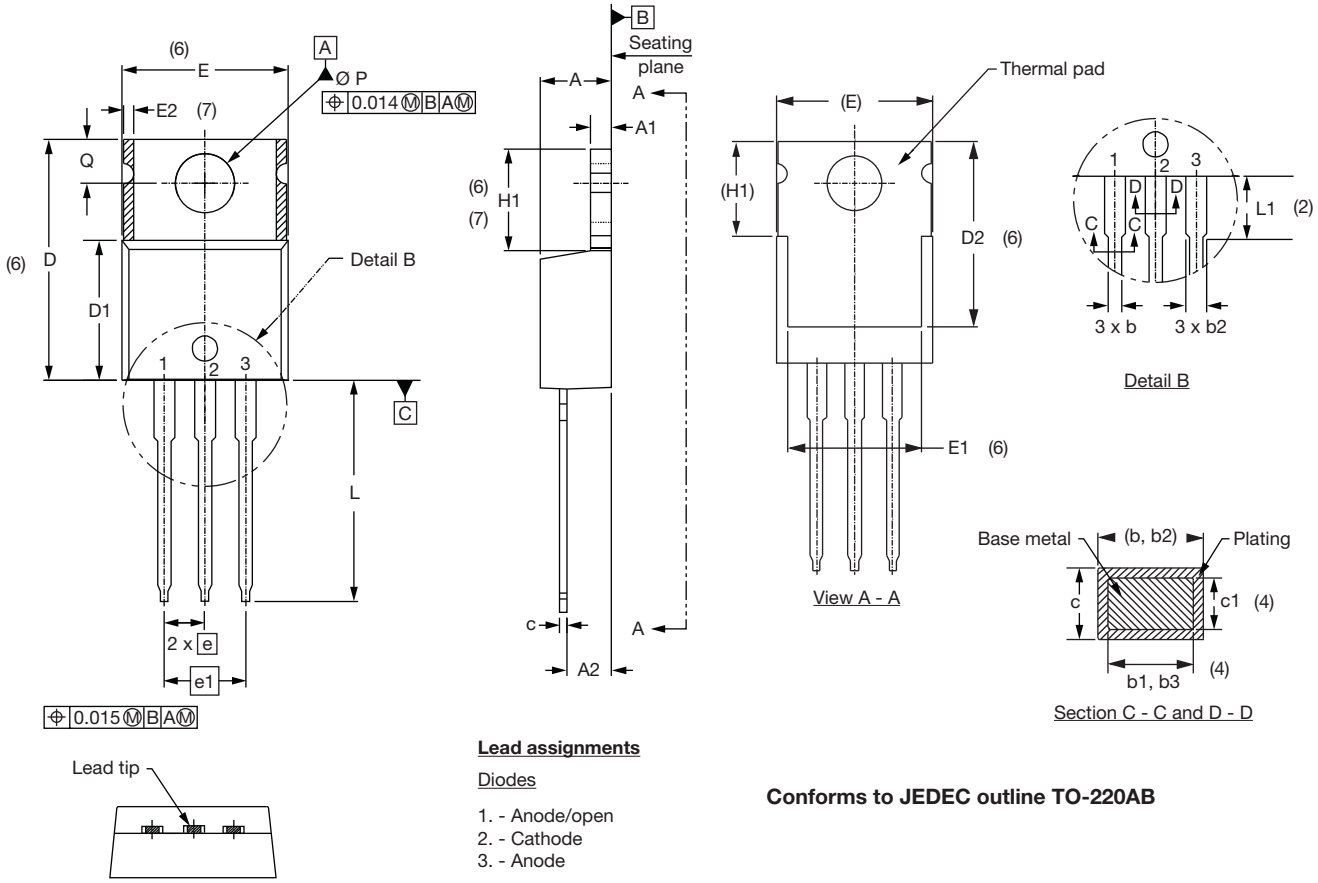
- 1 - Vishay Semiconductors product
- 2 - Current rating
- 3 - Circuit configuration:
  T = Single thyristor
- 4 - Package:
  T = TO-220AB
- 5 - Type of silicon:
  S = Converter grade
- 6 - Voltage code x 100 = V_{RRM} — 08 = 800 V, 12 = 1200 V
- 7 - Environmental digit:
  PbF = Lead (Pb)-free and RoHS compliant
  -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-16TTS08PbF	50	1000	Antistatic plastic tubes
VS-16TTS08-M3	50	1000	Antistatic plastic tubes
VS-16TTS12PbF	50	1000	Antistatic plastic tubes
VS-16TTS12-M3	50	1000	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS		
Dimensions		www.vishay.com/doc?95222
Part marking information	TO-220AB PbF	www.vishay.com/doc?95225
	TO-220AB -M3	www.vishay.com/doc?95028

TO-220AB

DIMENSIONS in millimeters and inches



Lead tip

Lead assignments

Diodes

1. - Anode/open
2. - Cathode
3. - Anode

Conforms to JEDEC outline TO-220AB

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183	
A1	1.14	1.40	0.045	0.055	
A2	2.56	2.92	0.101	0.115	
b	0.69	1.01	0.027	0.040	
b1	0.38	0.97	0.015	0.038	4
b2	1.20	1.73	0.047	0.068	
b3	1.14	1.73	0.045	0.068	4
c	0.36	0.61	0.014	0.024	
c1	0.36	0.56	0.014	0.022	4
D	14.85	15.25	0.585	0.600	3
D1	8.38	9.02	0.330	0.355	
D2	11.68	12.88	0.460	0.507	6

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E	10.11	10.51	0.398	0.414	3, 6
E1	6.86	8.89	0.270	0.350	6
E2	-	0.76	-	0.030	7
e	2.41	2.67	0.095	0.105	
e1	4.88	5.28	0.192	0.208	
H1	6.09	6.48	0.240	0.255	6, 7
L	13.52	14.02	0.532	0.552	
L1	3.32	3.82	0.131	0.150	2
Ø P	3.54	3.73	0.139	0.147	
Q	2.60	3.00	0.102	0.118	
θ	90° to 93°		90° to 93°		

Notes

(1) Dimensioning and tolerancing as per ASME Y14.5M-1994
(2) Lead dimension and finish uncontrolled in L1
(3) Dimension D, D1 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 outermost extremes of the plastic body
(4) Dimension b1, b3 and c1 apply to base metal only
(5) Controlling dimensions: inches
(6) Thermal pad contour optional within dimensions E, H1, D2 and E1
(7) Dimensions E2 x H1 define a zone where stamping and singulation irregularities are allowed
(8) Outline conforms to JEDEC TO-220, except A2 (maximum) and D2 (minimum) where dimensions are derived from the actual package outline

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