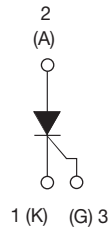


High Voltage Phase Control Thyristor, 16 A



FEATURES

- Designed and qualified for industrial level
- Fully isolated package ($V_{INS} = 2500 V_{RMS}$)
- UL E78996 approved
- 125 °C max. operating junction temperature
- Material categorization:
For definitions of compliance please see www.vishay.com/doc?99912



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..FP... 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	
Package	TO-220AB FP
Diode variation	Single SCR
$I_{T(AV)}$	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

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}		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

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-16TTS08FPPbF, VS-16TTS08FP-M3	800	800	10
VS-16TTS12FPPbF, VS-16TTS12FP-M3	1200	1200	



ABSOLUTE MAXIMUM RATINGS						
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES		UNITS	
			TYP.	MAX.		
Maximum average on-state current	$I_{T(AV)}$	$T_C = 70\text{ }^\circ\text{C}$, 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^2s	
		10 ms sine pulse, no voltage reapplied	200			
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, $T_J = 25\text{ }^\circ\text{C}$	1.4		V	
On-state slope resistance	r_t	$T_J = 125\text{ }^\circ\text{C}$	24.0		$m\Omega$	
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 $I_T = 1$ A 16TTS08FP, 16TTS12FP, $T_J = 25\text{ }^\circ\text{C}$	-	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		$V/\mu s$	
Maximum rate of rise of turned-on current	di/dt		150		$A/\mu s$	

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		



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	2.5	°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
	maximum		12 (10)	(lbf · in)
Marking device		Case style TO-220AB FULL-PAK (94/V0)	16TTS08FP	
			16TTS12FP	

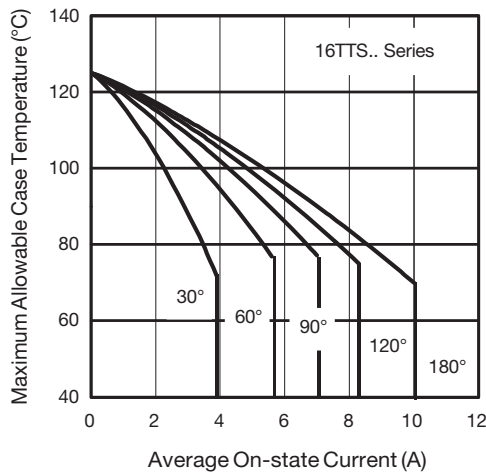


Fig. 1 - Current Rating Characteristics

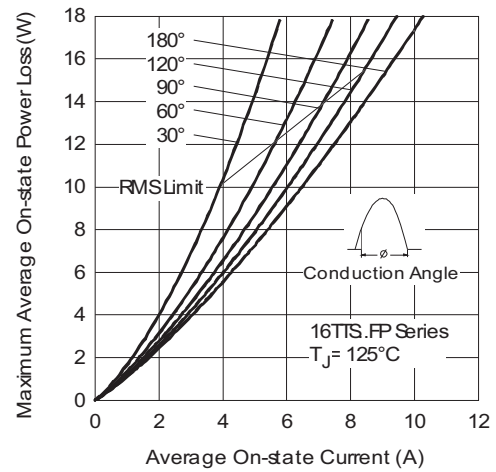


Fig. 3 - On-State Power Loss Characteristics

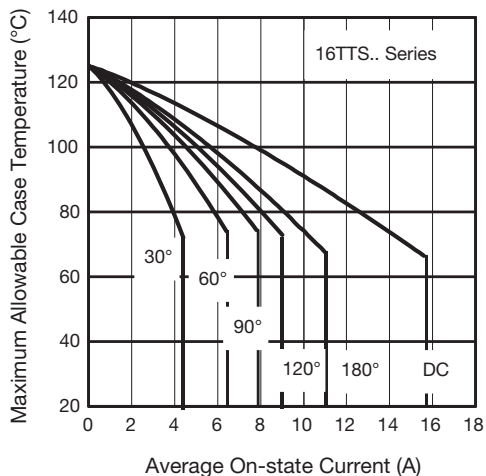


Fig. 2 - Current Rating Characteristics

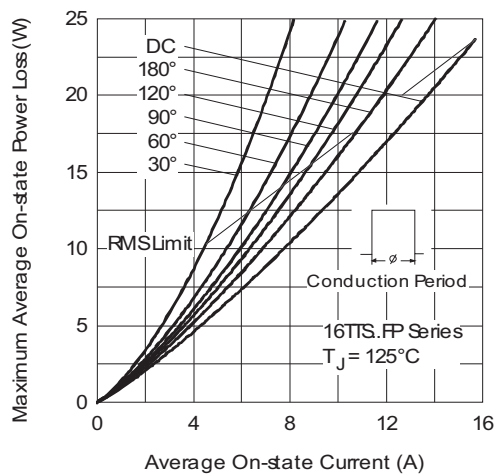


Fig. 4 - On-State Power Loss Characteristics

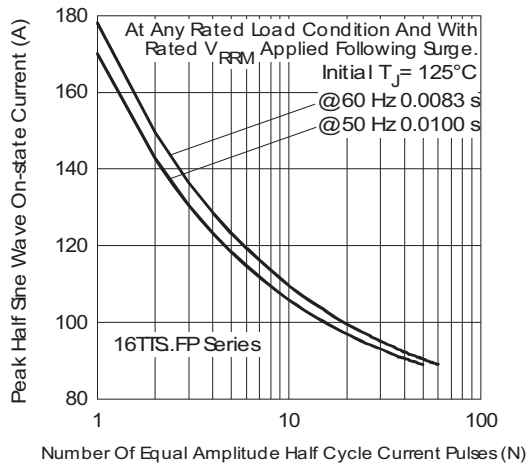


Fig. 5 - Maximum Non-Repetitive Surge Current

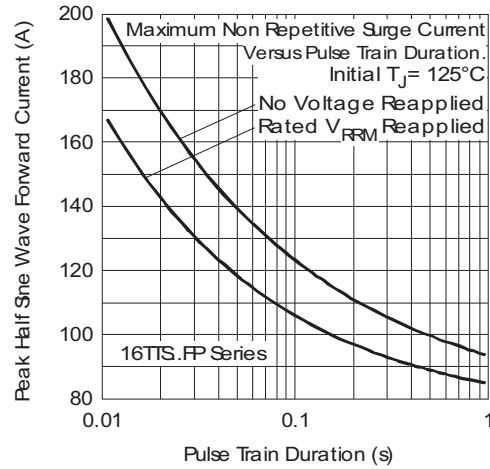


Fig. 6 - Maximum Non-Repetitive Surge Current

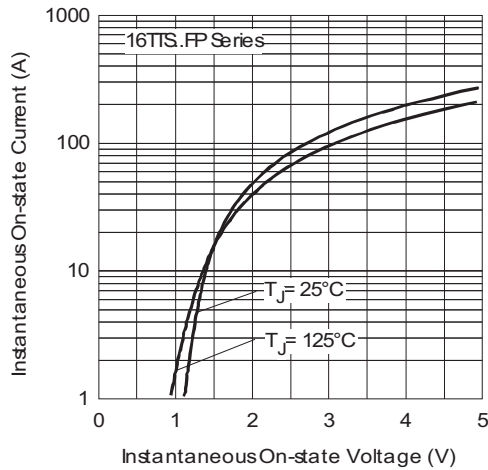


Fig. 7 - On-State Voltage Drop Characteristics

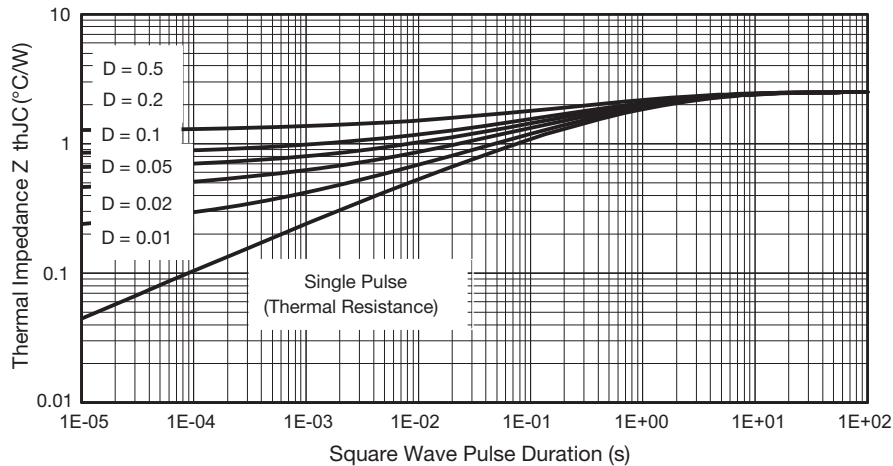
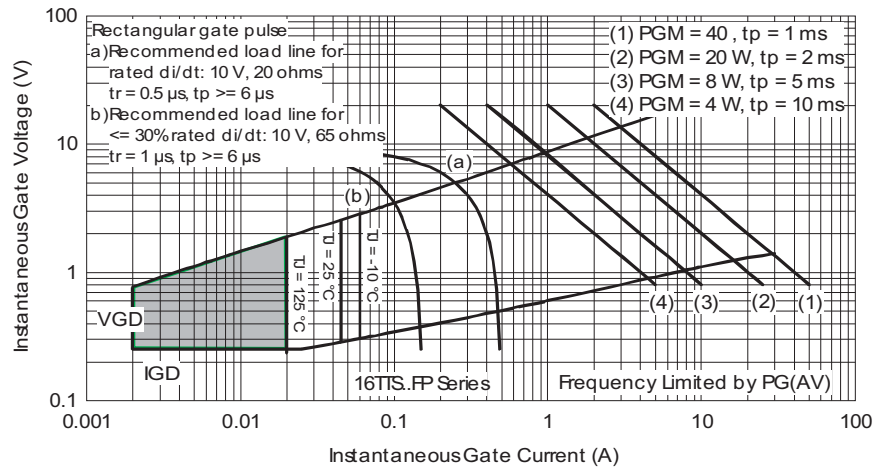


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics



ORDERING INFORMATION TABLE

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

- 1** - Vishay Semiconductors product
- 2** - Current rating, RMS value
- 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}

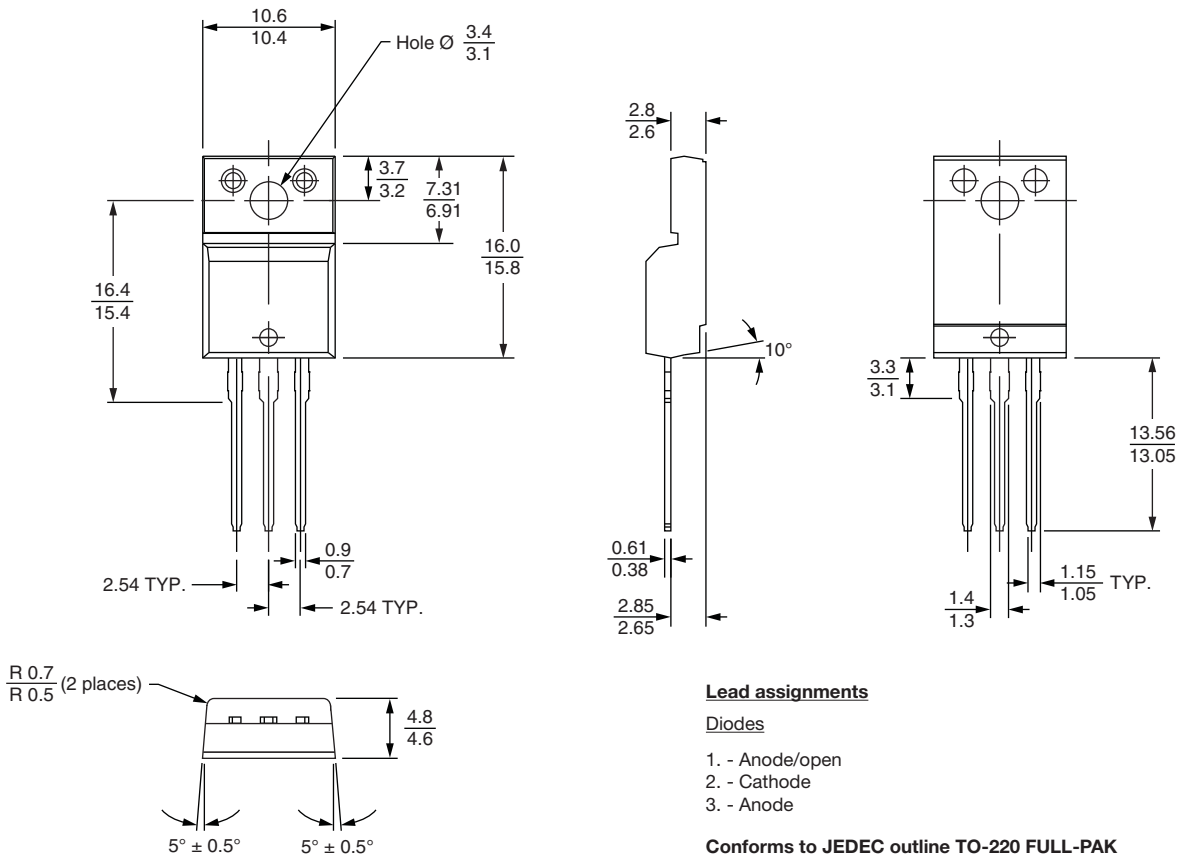
08 = 800 V
12 = 1200 V
- 7** - FULL-PAK
- 8** - Environmental digit:
PbF = Lead (Pb)-free and RoHS compliant
-M3 = Halogen-free, RoHS compliant, and terminations lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-16TTS08FPPbF	50	1000	Antistatic plastic tubes
VS-16TTS08FP-M3	50	1000	Antistatic plastic tubes
VS-16TTS12FPPbF	50	1000	Antistatic plastic tubes
VS-16TTS12FP-M3	50	1000	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95072
Part marking information	TO-220FP PbF www.vishay.com/doc?95069
	TO-220FP -M3 www.vishay.com/doc?95456



DIMENSIONS in millimeters



Lead assignments

Diodes

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

Conforms to JEDEC outline TO-220 FULL-PAK



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