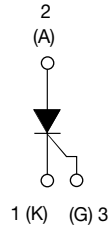


## High Voltage Phase Control Thyristor, 16 A


**TO-220AB FULL-PAK**


### FEATURES

- Designed and qualified for industrial level
- Fully isolated package ( $V_{INS} = 2500 V_{RMS}$ )
- UL E78996 approved
- Compliant to RoHS Directive 2002/95/EC
- 125 °C max. operating junction temperature
- Halogen-free according to IEC 61249-2-21 definition (-M3 only)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

PRODUCT SUMMARY	
Package	TO-220FP
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

### 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.

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	$I_{T(AV)}$	$T_C = 95\text{ }^\circ\text{C}$ , 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	-	100		
Maximum latching current	$I_L$	Anode supply = 6 V, resistive load	200			
Maximum rate of rise of off-state voltage	$dV/dt$		500		$V/\mu s$	
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	$V_{GD}$	$T_J = 125\text{ }^\circ\text{C}$ , $V_{DRM} = \text{Rated value}$	0.2		
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	$\mu s$	
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	1.5	°C/W
Maximum thermal resistance, junction to ambient	$R_{thJA}$		62	
Typical thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, smooth and greased	1.5	
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	

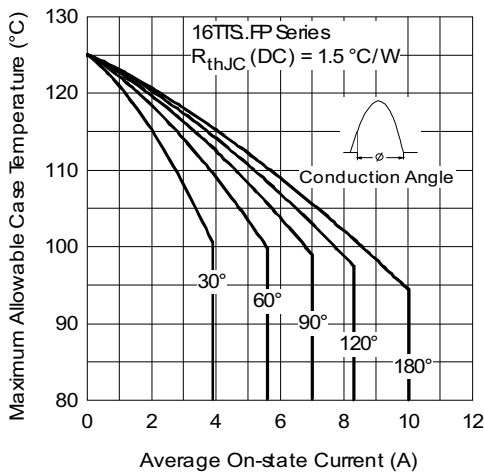


Fig. 1 - Current Rating Characteristics

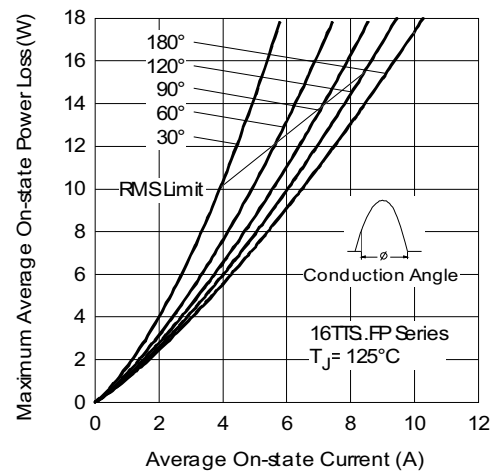


Fig. 3 - On-State Power Loss Characteristics

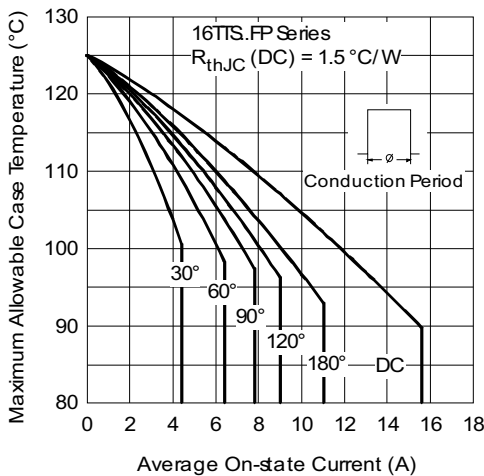


Fig. 2 - Current Rating Characteristics

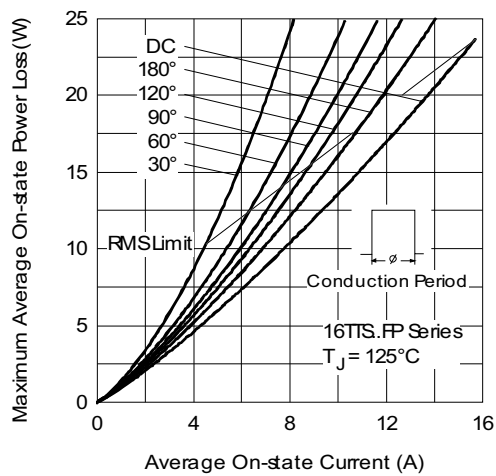


Fig. 4 - On-State Power Loss Characteristics

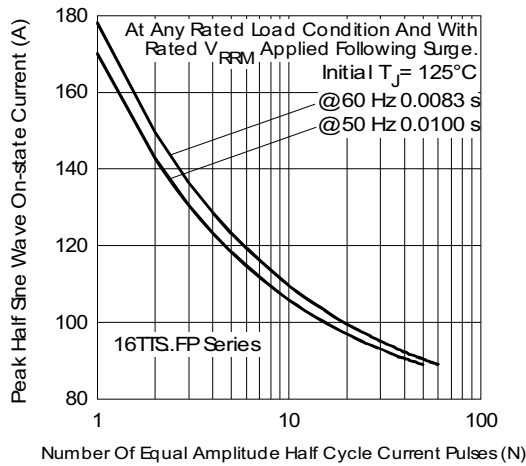


Fig. 5 - Maximum Non-Repetitive Surge Current

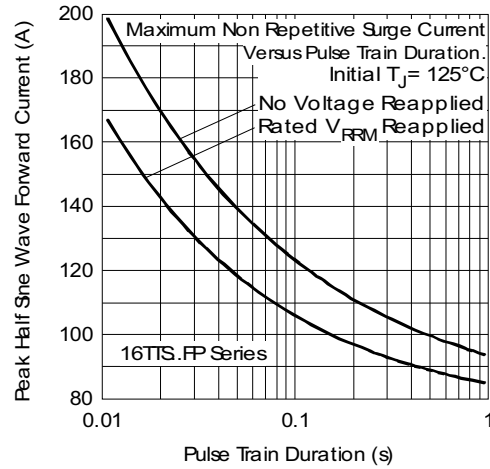


Fig. 6 - Maximum Non-Repetitive Surge Current

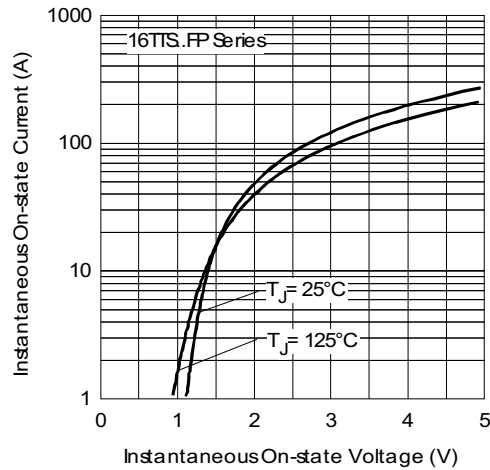


Fig. 7 - On-State Voltage Drop Characteristics

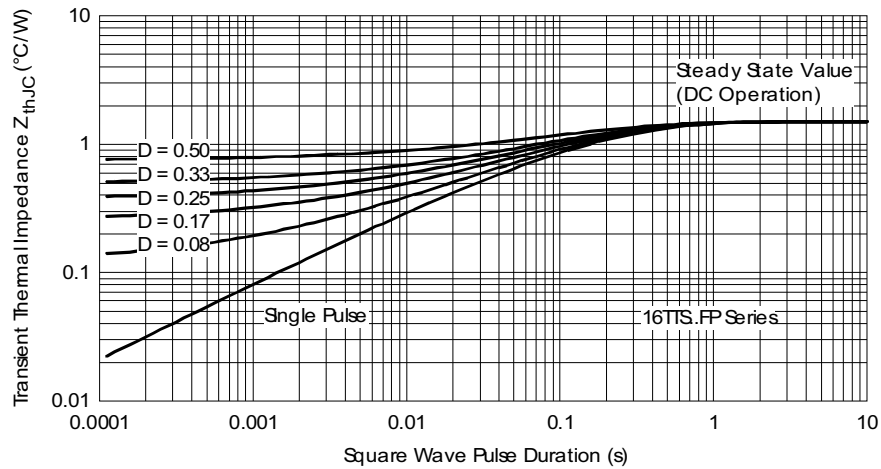


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics

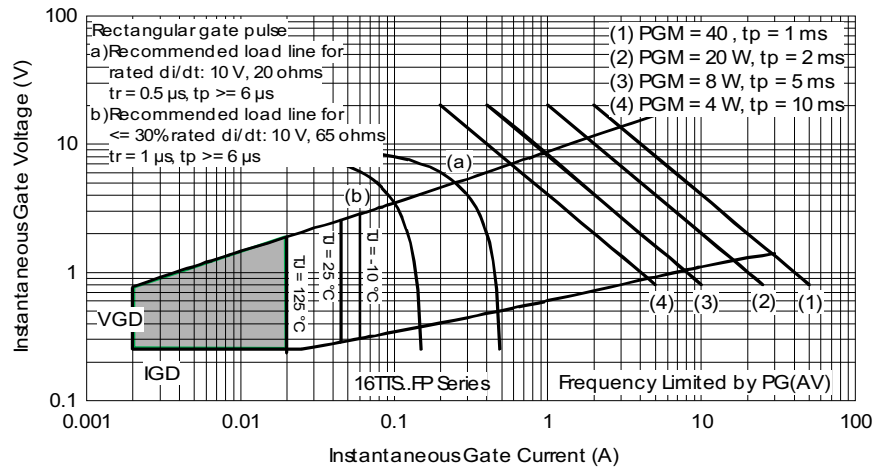


Fig. 9 - Gate Characteristics

**ORDERING INFORMATION TABLE**

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

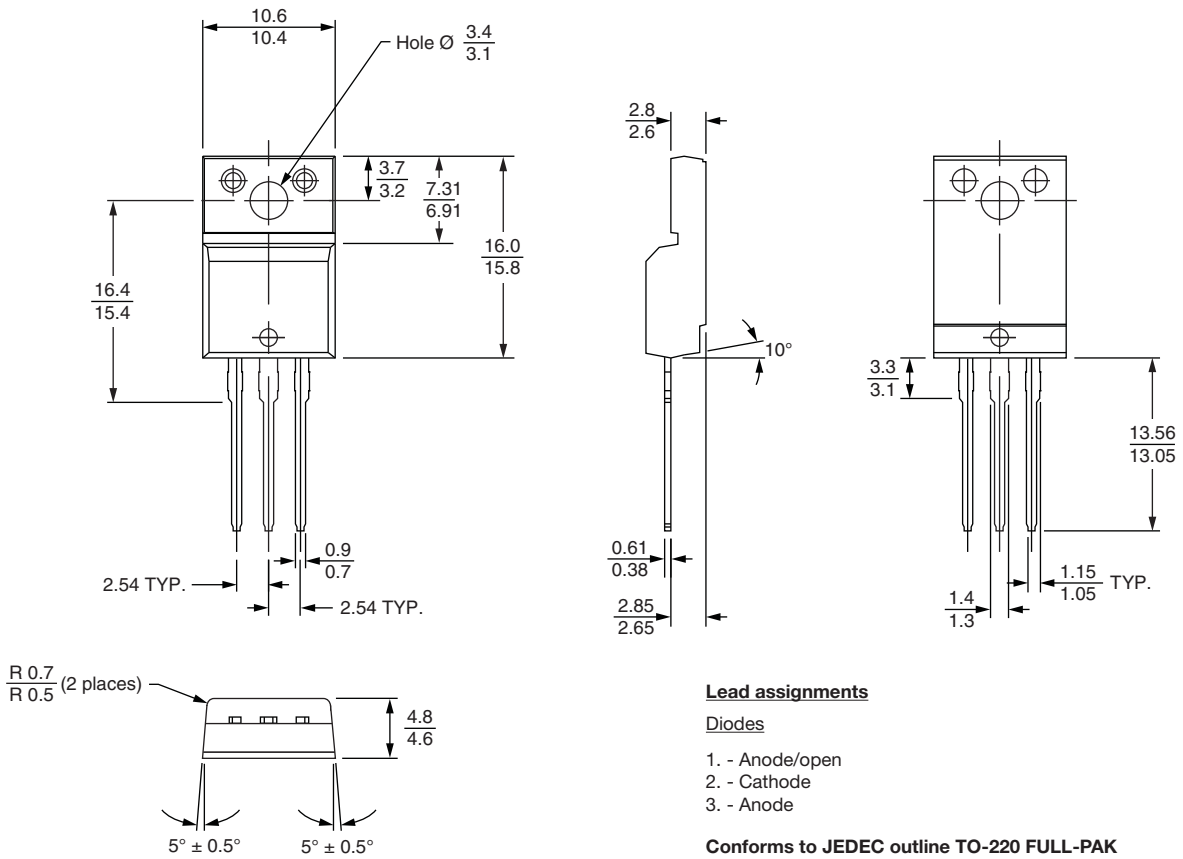
- 1** - Vishay Semiconductors product
- 2** - Current rating, RMS value
- 3** - Circuit configuration:  
T = Single thyristor
- 4** - Package:  
T = TO-220AB
- 5** - Type of silicon:  
S = Converter grade
- 6** - Voltage code x 100 =  $V_{RRM}$  — 08 = 800 V  
12 = 1200 V
- 7** - FULL-PAK
- 8** - Environmental digit:  
PbF = Lead (Pb)-free and RoHS compliant  
-M3 = Halogen-free, RoHS compliant, and terminations lead (Pb)-free

<b>ORDERING INFORMATION (Example)</b>			
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

<b>LINKS TO RELATED DOCUMENTS</b>	
Dimensions	<a href="http://www.vishay.com/doc?95072">www.vishay.com/doc?95072</a>
Part marking information	TO-220FP PbF <a href="http://www.vishay.com/doc?95069">www.vishay.com/doc?95069</a>
	TO-220FP -M3 <a href="http://www.vishay.com/doc?95456">www.vishay.com/doc?95456</a>



**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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