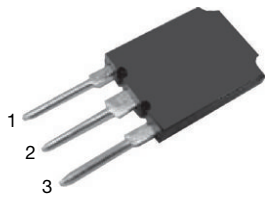
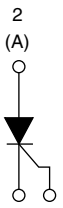
Thyristor High Voltage, Phase Control SCR, 70 A



Super TO-247



FEATURES

- High surge capability
- High voltage input rectification
- 150 °C maximum operating junction temperature
- Designed and qualified according to JEDEC®-JESD 47
- Halogen-free
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

- AC switches
- High voltage input rectification (soft start)
- High current crow-bar
- Other phase-control circuits
- Designed to be used with Vishay input diodes, switches, and output rectifiers which are available in identical package outlines

DESCRIPTION

The VS-70TPS..-M3 high voltage series of silicon controlled rectifiers are specifically designed for high and medium power switching, and phase control applications.

MECHANICAL DATA

Case: Super TO-247
Molding compound meets UL 94 V-0 flammability rating

Terminal: matte tin plated leads, solderable per J-STD-002

LINKS TO ADDITIONAL RESOURCES

3D Models

PRIMARY CHARACTERISTICS	
$I_{T(AV)}$	70 A
V_{DRM}/V_{RRM}	1200 V, 1600 V
V_{TM}	1.40 V
I_{GT}	100 mA
T_J	-40 °C to 150 °C
Circuit configuration	Single SCR
Package	Super TO-247

MAJOR RATINGS AND CHARACTERISTICS			
PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$	Sinusoidal waveform	70	A
I_{RMS}	Lead current limitation	75	
V_{RRM}/V_{DRM}	Range	1200 to 1600	V
I_{TSM}		930	A
V_{TM}	100 A, T_J = 25 °C	1.40	V
dV/dt		500	V/µs
dI/dt		150	A/µs
T_J		-40 to +150	°C

VOLTAGE RATINGS			
PART NUMBER	V_{RRM}/V_{DRM}, MAXIMUM REPETITIVE PEAK AND OFF-STATE VOLTAGE V	V_{RSM}, MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I_{RRM}/I_{DRM} AT 150 °C mA
VS-70TPS12-M3	1200	1300	42
VS-70TPS16-M3	1600	1700	42

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum average on-state current	$I_{T(AV)}$	T_C = 109 °C, 180° conduction half sine wave		70	A
Maximum continuous RMS on-state current as AC switch	$I_{T(RMS)}$	Lead current limitation		75	A
Maximum peak, one-cycle non-repetitive surge current	I_{TSM}	10 ms sine pulse, rated V_{RRM} applied	Initial T_J = T_J maximum	780	A
		10 ms sine pulse, no voltage reapplied		930	A
Maximum I^2t for fusing	I^2t	10 ms sine pulse, rated V_{RRM} applied		3060	A^2s
		10 ms sine pulse, no voltage reapplied		4325	A^2s
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied		43250	$A^2\sqrt{s}$
Low level value of threshold voltage	$V_{T(TO)1}$	T_J = 150 °C		0.95	V
High level value of threshold voltage	$V_{T(TO)2}$			1.05	V
Low level value of on-state slope resistance	r_{t1}			4.15	mΩ
High level value of on-state slope resistance	r_{t2}			3.65	mΩ
Maximum peak on-state voltage	V_{TM}	100 A, T_J = 25 °C		1.4	V
Maximum rate of rise of turned-on current	dI/dt	T_J = 25 °C		150	A/µs
Maximum holding current	I_H	Anode supply = 6 V, resistive load, initial I_T = 1 A, T_J = 25 °C		250	mA
Maximum latching current	I_L	Anode supply = 6 V, resistive load, T_J = 25 °C		400	mA
Maximum reverse and direct leakage current	I_{RRM}/I_{DRM}	T_J = 25 °C	V_R = rated V_{RRM}/V_{DRM} (T_J = T_J max., linear to 80 % V_{DRM} = R_g-k = Open)	1.0	mA
		T_J = 150 °C		42	mA
Maximum rate of rise of off-state voltage	dV/dt	T_J = 150 °C		500	V/µs

TRIGGERING

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak gate power	P_{GM}	T = 30 µs		10	W
Maximum average gate power	$P_{G(AV)}$			2.5	W
Maximum peak gate current	I_{GM}			2.5	A
Maximum peak negative gate voltage	$-V_{GM}$			10	V
Maximum required DC gate voltage to trigger	V_{GT}	T_J = - 40 °C	Anode supply = 6 V resistive load	1.8	V
		T_J = 25 °C		1.5	V
		T_J = 150 °C		1.0	V
Maximum required DC gate current to trigger	I_{GT}	T_J = - 40 °C	Anode supply = 6 V resistive load	150	mA
		T_J = 25 °C		100	mA
		T_J = 150 °C		65	mA
Maximum DC gate voltage not to trigger	V_{GD}	T_J = 150 °C, V_{DRM} = rated value		0.14	V
Maximum DC gate current not to trigger	I_{GD}			3.0	mA

SWITCHING

PARAMETER	SYMBOL	TEST CONDITIONS	TYP.	MAX.	UNITS
Turn-on time	t_{gt}	I_R = 70 A, V_D = 50 % V_{DRM}, I_{gt} = 300 mA, T_J = 25 °C	2	-	µs
Turn-off time	t_q	I_R = 70 A, V_D = 80 % V_{DRM}, dV/dt = 20 V/µs, t_p = 200 µs I_{gt} = 100 mA, dI/dt = 10 A/µs, V_R = 100 V, T_J = 150 °C	170	-	µs

THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction temperature range		T_J		-40 to +150	°C
Maximum storage temperature range		T_{Stg}		-40 to +150	
Maximum thermal resistance, junction to case		R_{thJC}	DC operation	0.27	°C/W
Maximum thermal resistance, junction to ambient		R_{thJA}		40	
Typical thermal resistance, case to heatsink		R_{thCS}	Mounting surface, smooth and greased	0.2	
Approximate weight				6	g
Mounting torque	minimum			6 (5)	kgf · cm (lbf · in)
	maximum			12 (10)	
Marking device			Case style Super TO-247	70TPS12	
				70TPS16	

$\Delta R_{thJ\text{-}hs}$ CONDUCTION PER JUNCTION											
DEVICE	SINE HALF WAVE CONDUCTION					RECTANGULAR WAVE CONDUCTION					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
VS-70TPS..-M3	0.078	0.092	0.117	0.172	0.302	0.053	0.092	0.125	0.180	0.306	°C/W

Note

- The table above shows the increment of thermal resistance $R_{thJ\text{-}hs}$ when devices operate at different conduction angles than DC

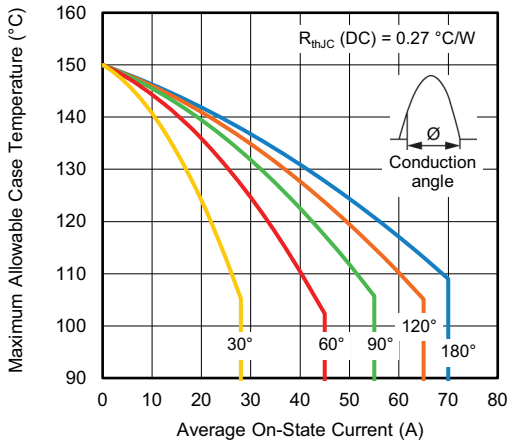


Fig. 1 - Current Rating Characteristics

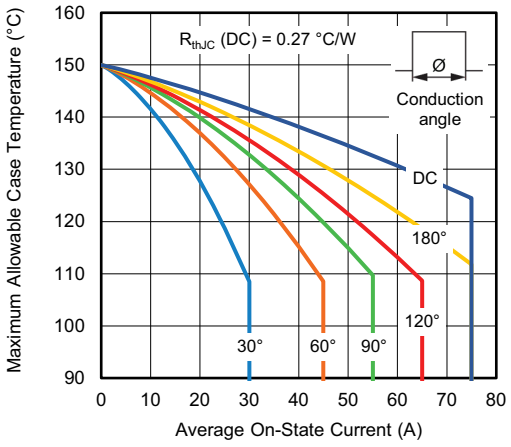


Fig. 2 - Current Rating Characteristics

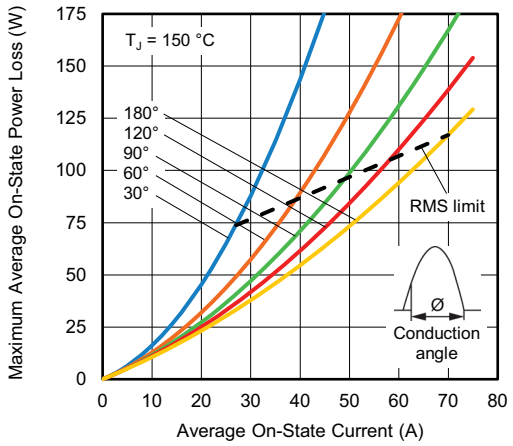


Fig. 3 - On-State Power Loss Characteristics

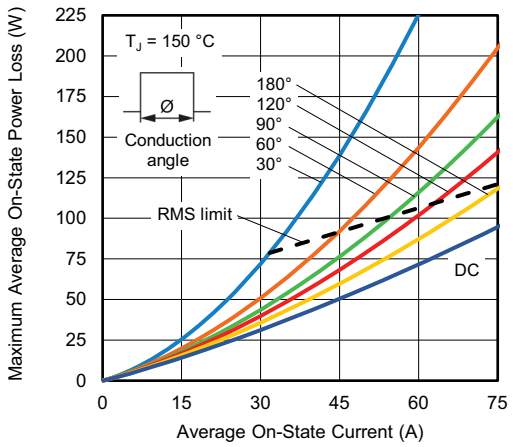


Fig. 4 - On-State Power Loss Characteristic

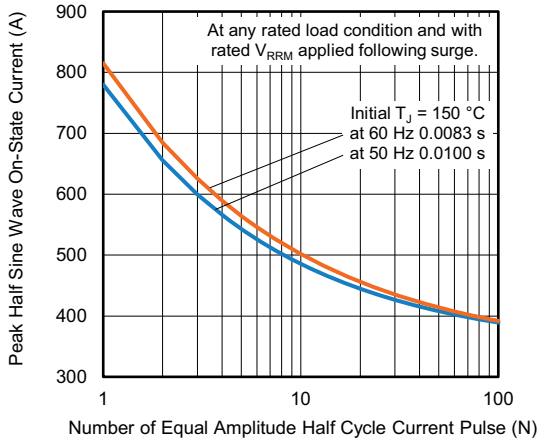


Fig. 5 - Maximum Non-Repetitive Surge Current

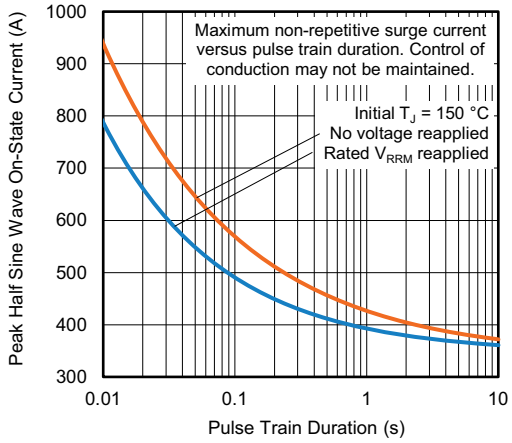


Fig. 6 - Maximum Non-Repetitive Surge Current

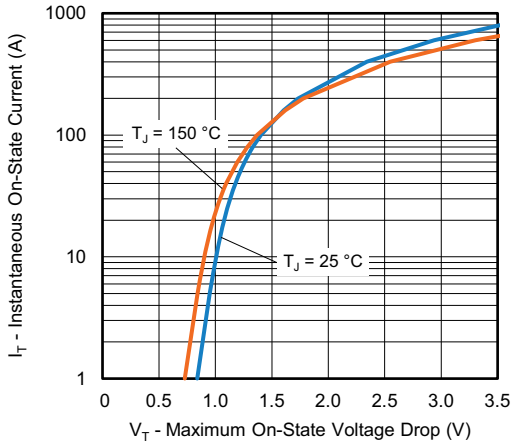


Fig. 7 - On-State Voltage Drop Characteristics

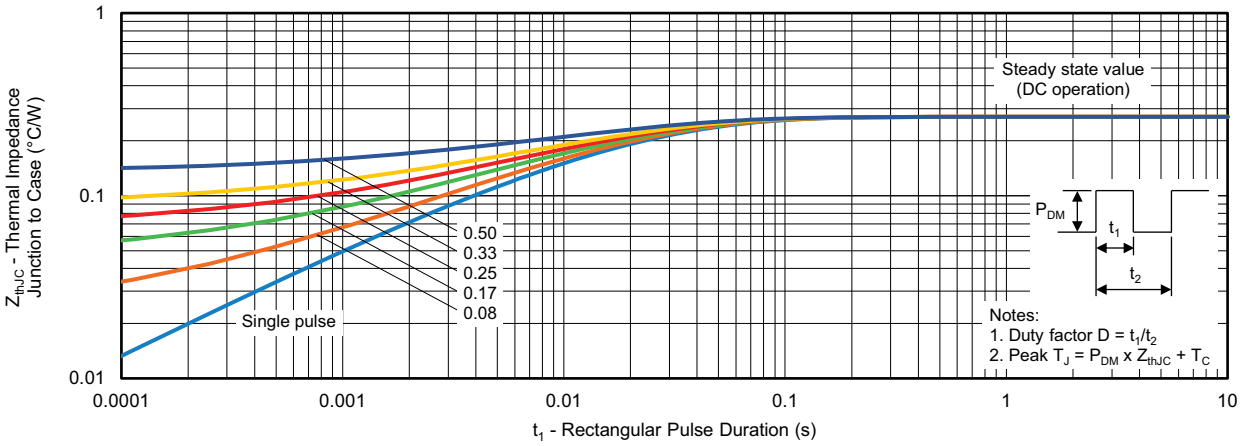


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

Device code	VS-	70	T	P	S	16	-M3
	1	2	3	4	5	6	7

1 - Vishay Semiconductors product

2 - Current rating (70 = 70 A)

3 - Circuit configuration:
T = Thyristor

4 - Package:
P = Super TO-247

5 - Type of silicon:
S = Standard recovery rectifier

6 - Voltage code x 100 = V_{RRM} (12 = 1200 V, 16 = 1600 V)

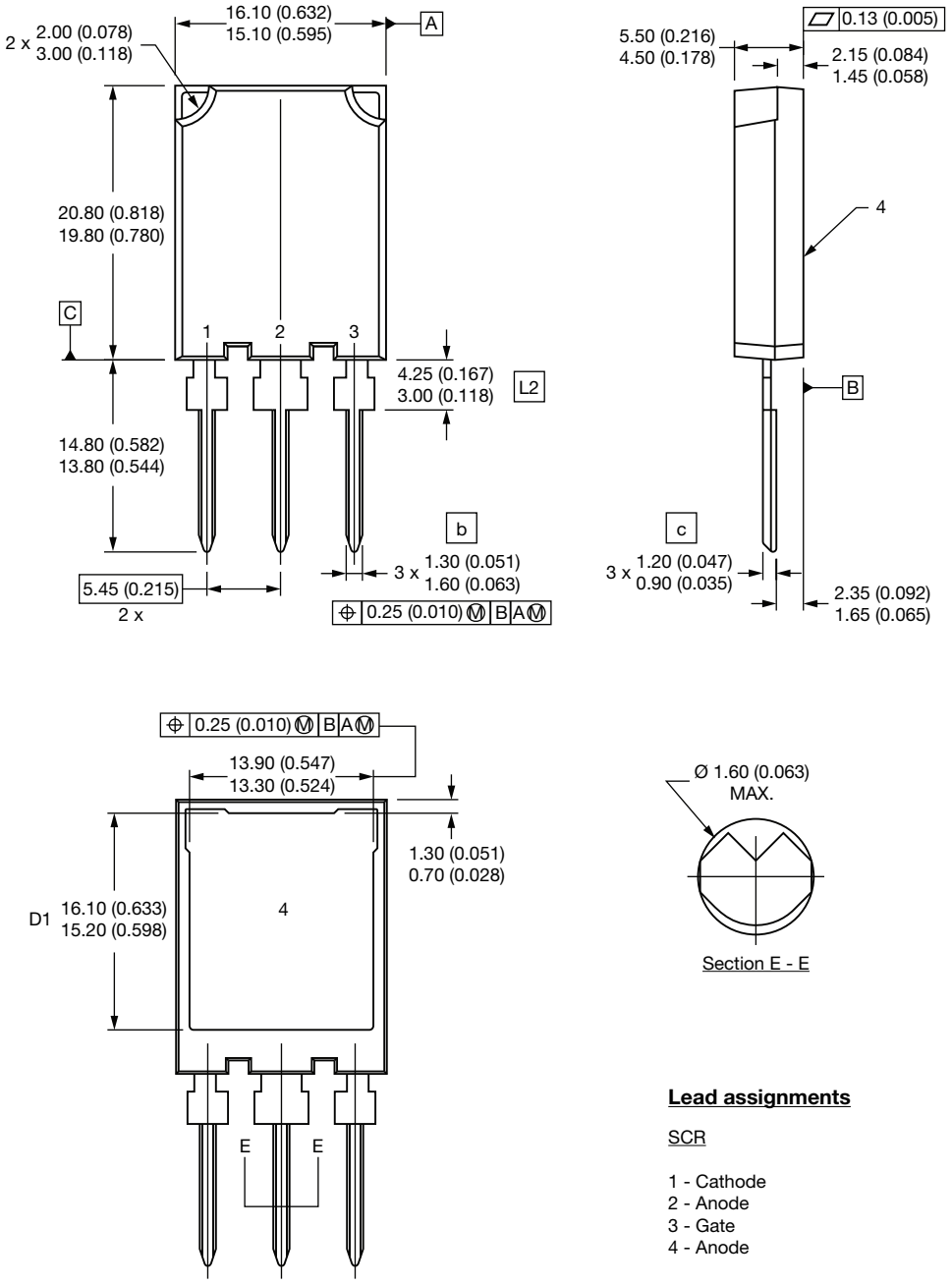
7 - -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

ORDERING INFORMATION (example)			
PREFERRED P/N	**QUANTITY PER TUBE**	**MINIMUM ORDER QUANTITY**	**PACKAGING DESCRIPTION**
VS-70TPS12-M3	25	500	Antistatic plastic tube
VS-70TPS16-M3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?97136
Part marking information	www.vishay.com/doc?95683

Super TO-247

DIMENSIONS in millimeters (inches)



Lead assignments

SCR

1 - Cathode
2 - Anode
3 - Gate
4 - Anode

Notes

(1) Dimension and tolerancing per ASME Y14.5M-1994
(2) Controlling dimension: millimeter
(3) Outline conforms to JEDEC® outline TO-274AA, except D1, b min., c min., L2 min.

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