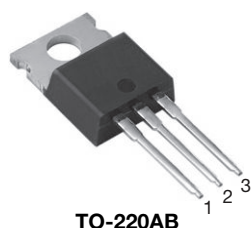
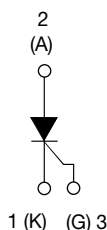


Thyristor High Voltage, Phase Control SCR, 40 A



TO-220AB



FEATURES

- Easy control peak current at charger power up to reduce passive / electromechanical components
- Flexible solution for reliable AC power rectification
- Meets JESD 201 class 1A whisker test
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- On-board and off-board EV/HEV battery chargers
- Renewable energy inverters

DESCRIPTION

The VS-40TTS12HM3 high voltage series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications.

PRIMARY CHARACTERISTICS

$I_{T(AV)}$	25 A
V_{DRM}/V_{RRM}	1200 V
V_{TM}	1.6 V
I_{GT}	35 mA
T_J	-40 °C to 140 °C
Package	TO-220AB
Circuit configuration	Single SCR

MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$	Sinusoidal waveform	25	A
I_{RMS}		40	
V_{RRM}/V_{DRM}		1200	V
I_{TSM}		350	A
V_T	$T_J = 25\text{ °C}$	1.6	V
dV/dt		500	V/ μ s
dI/dt		150	A/ μ s
T_J		-40 to +140	°C

VOLTAGE RATINGS

PART NUMBER	V_{RRM} , MAXIMUM PEAK REVERSE VOLTAGE V	V_{DRM} , MAXIMUM PEAK DIRECT VOLTAGE V	T_J °C
VS-40TTS12HM3	1200	1200	-25 to +140

**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average on-state current	$I_{T(AV)}$	$T_C = 93\text{ }^{\circ}\text{C}$, 180° conduction half sine wave	25	A
Maximum RMS on-state current	I_{RMS}		40	
Maximum peak, one-cycle non-repetitive surge current	I_{TSM}	10 ms sine pulse, rated V_{RRM} applied	300	
		10 ms sine pulse, no voltage reapplied	350	
Maximum I^2t for fusing	I^2t	10 ms sine pulse, rated V_{RRM} applied	450	A^2s
		10 ms sine pulse, no voltage reapplied	630	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1$ to 10 ms, no voltage reapplied	6300	$A^2\sqrt{s}$
Maximum on-state voltage	V_{TM}	80 A, $T_J = 25\text{ }^{\circ}\text{C}$	1.6	V
Low level value of on-state slope resistance	r_t	$T_J = 140\text{ }^{\circ}\text{C}$	11.4	$m\Omega$
Low level value of threshold voltage	$V_{T(TO)}$		0.96	V
Maximum reverse and direct leakage current	I_{RRM}/I_{DRM}	$T_J = 25\text{ }^{\circ}\text{C}$	0.5	mA
		$T_J = 140\text{ }^{\circ}\text{C}$	12	
Holding current	I_H	Anode supply = 6 V, resistive load, initial $I_T = 1$ A, $T_J = 25\text{ }^{\circ}\text{C}$	100	
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/ 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, $T_J = 25\text{ }^{\circ}\text{C}$	35	mA
Maximum required DC gate voltage to trigger	V_{GT}	Anode supply = 6 V, resistive load, $T_J = 25\text{ }^{\circ}\text{C}$	1.3	V
Maximum DC gate voltage not to trigger	V_{GD}	$T_J = 140\text{ }^{\circ}\text{C}$, $V_{DRM} = \text{Rated value}$	0.2	
Maximum DC gate current not to trigger	I_{GD}		1.5	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}	$T_J = 140\text{ }^{\circ}\text{C}$	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 140	°C
Maximum thermal resistance, junction to case	R _{thJC}	DC operation	0.8	°C/W
Maximum thermal resistance, junction to ambient	R _{thJA}		60	
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	40TTS12H	

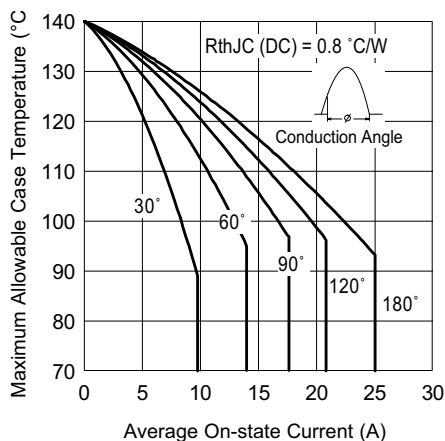


Fig. 1 - Current Rating Characteristics

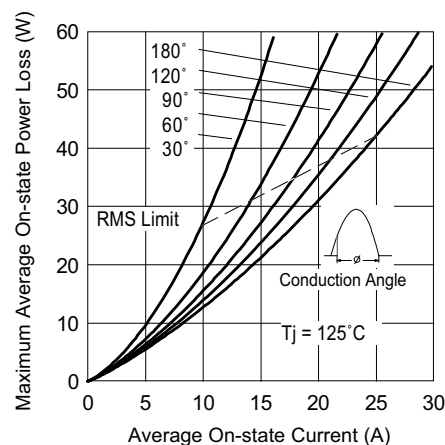


Fig. 3 - On-State Power Loss Characteristics

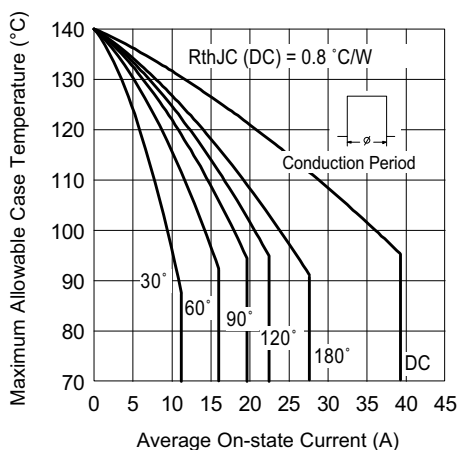


Fig. 2 - Current Rating Characteristics

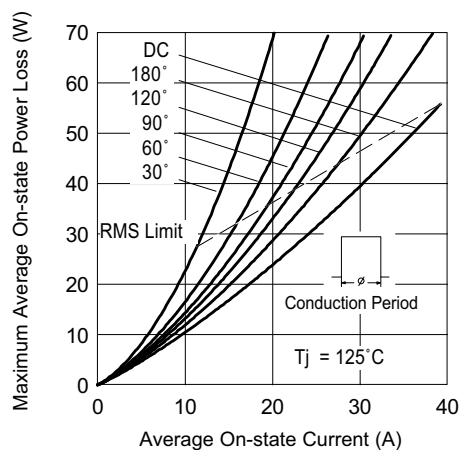


Fig. 4 - On-State Power Loss Characteristics

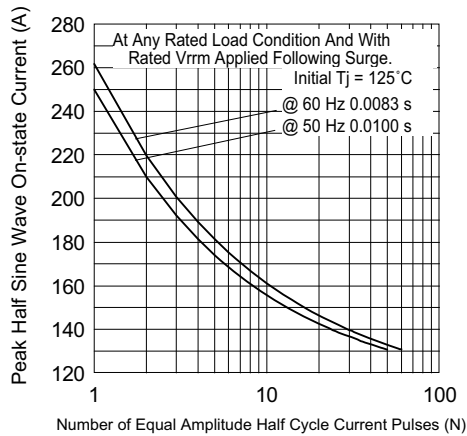


Fig. 5 - Maximum Non-Repetitive Surge Current

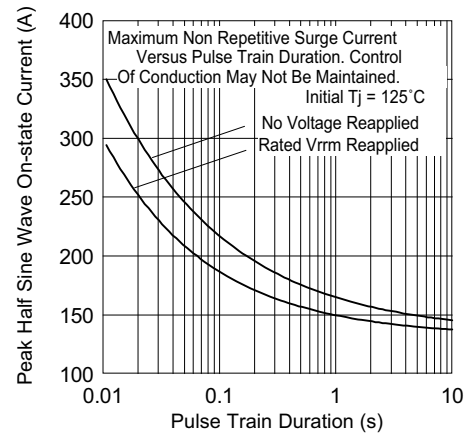


Fig. 6 - Maximum Non-Repetitive Surge Current

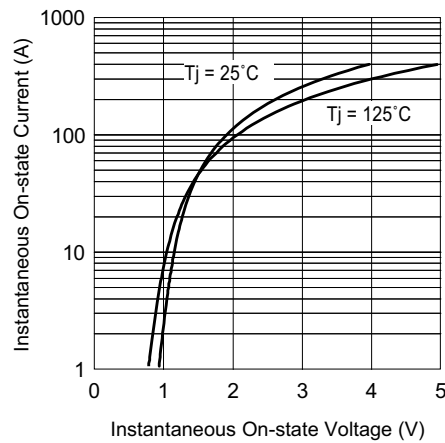


Fig. 7 - On-State Voltage Drop Characteristics

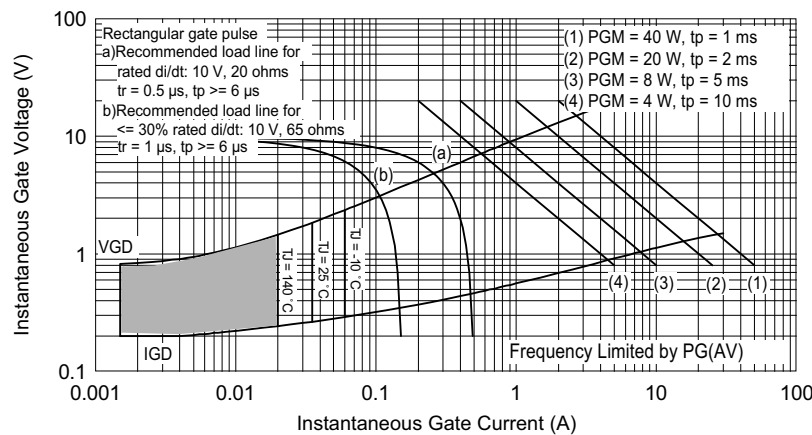


Fig. 8 - Gate Characteristics

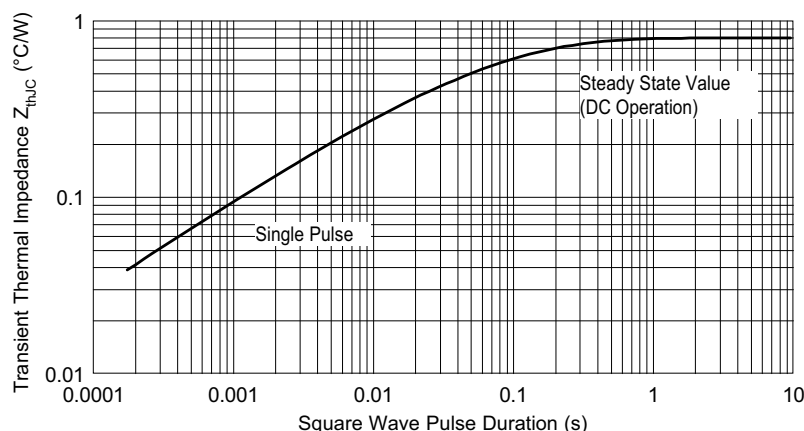


Fig. 9 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

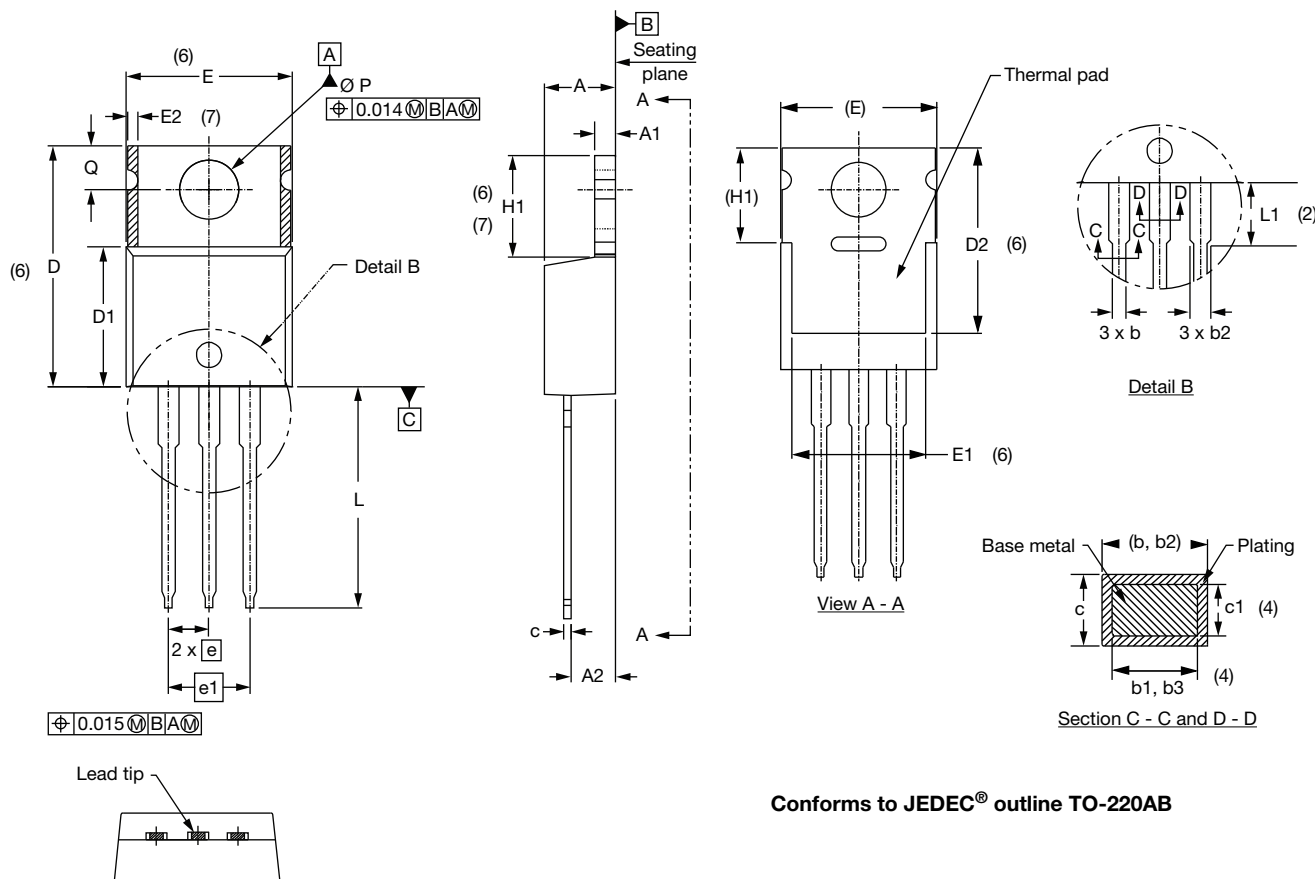
Device code	VS-	40	T	T	S	12	H	M3
	1	2	3	4	5	6	7	8
	1	2	3	4	5	6	7	8
	1 - Vishay Semiconductors product 2 - Current rating, RMS value 3 - Circuit configuration: T = single thyristor 4 - Package: T = TO-220 5 - Type of silicon: S = standard recovery rectifier 6 - Voltage rating (12 = 1200 V) 7 - H = AEC-Q101 qualified 8 - Environmental digit: 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-40TTS12HM3	50	1000	Antistatic plastic tubes

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

TO-220AB

DIMENSIONS in millimeters and inches



Conforms to JEDEC® outline TO-220AB

SYMBOL	MILLIMETERS		INCHES		NOTES		SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.				MIN.	MAX.			
A	4.25	4.65	0.167	0.183			D2	11.68	12.88	0.460	0.507	6
A1	1.14	1.40	0.045	0.055			E	10.11	10.51	0.398	0.414	3, 6
A2	2.56	2.92	0.101	0.115			E1	6.86	8.89	0.270	0.350	6
b	0.69	1.01	0.027	0.040			E2	-	0.76	-	0.030	7
b1	0.38	0.97	0.015	0.038	4		e	2.41	2.67	0.095	0.105	
b2	1.20	1.73	0.047	0.068			e1	4.88	5.28	0.192	0.208	
b3	1.14	1.73	0.045	0.068	4		H1	5.84	6.86	0.230	0.270	6, 7
c	0.36	0.61	0.014	0.024			L	13.52	14.02	0.532	0.552	
c1	0.36	0.56	0.014	0.022	4		L1	3.32	3.82	0.131	0.150	2
D	14.85	15.25	0.585	0.600	3		Ø P	3.54	3.73	0.139	0.147	
D1	8.38	9.02	0.330	0.355			Q	2.60	3.00	0.102	0.118	

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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