Thyristor High Voltage, Phase Control SCR, 40 A



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PRIMARY CHARACTERISTICS				
I _{T(AV)}	35 A			
V _{DRM} /V _{RRM}	1200 V			
V _{TM}	1.45 V			
I _{GT}	150 mA			
TJ	-40 °C to +150 °C			
Package	TO-247AD 3L			
Circuit configuration	Single SCR			

FEATURES

- AEC-Q101 qualified meets JESD 201 class 1A whisker test
- Flexible solution for reliable AC power rectification



- Easy control peak current at charger power up to reduce passive / electromechanical components
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>

APPLICATIONS

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

DESCRIPTION

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

MAJOR RATINGS AND CHARACTERISTICS							
PARAMETER	TEST CONDITIONS	VALUES	UNITS				
I _{T(AV)}	Sinusoidal waveform	35	Α				
I _{RMS}		55	A				
V _{RRM} /V _{DRM}		1200	V				
I _{TSM}		600	А				
V _T	40 A, T _J = 25 °C	1.45	V				
dv/dt		1000	V/µs				
di/dt		100	A/µs				
TJ		-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-40TPS12LHM3	1200	1300	20			

VS-40TPS12LHM3



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ABSOLUTE MAXIMUM RATINGS	\$				
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum average on-state current	I _{T(AV)}	T_{C} = 104 °C, 180° conduction half sine way	/e	35	
Maximum continuous RMS on-state current as AC switch	I _{T(RMS)}			55	A
Maximum peak, one-cycle	I _{TSM}	10 ms sine pulse, rated V _{RRM} applied		500	
non-repetitive surge current	ISM	10 ms sine pulse, no voltage reapplied	1 - 11 - 1	600	
Maximum I ² t for fusing	l ² t	10 ms sine pulse, rated V_{RRM} applied	Initial T _{.1} = T _{.1} max.	1250	A ² s
	1-1	10 ms sine pulse, no voltage reapplied	1 <u>j</u> = 1 <u>j</u> max.	1760	A-5
Maximum I ² \sqrt{t} for fusing	l²√t	t = 0.1 ms to 10 ms, no voltage reapplied		17 600	A²√s
Low level value of threshold voltage	V _{T(TO)1}			1.02	V
High level value of threshold voltage	V _{T(TO)2}	T 105 %C		1.23	v
Low level value of on-state slope resistance	r _{t1}	T _J = 125 °C		9.74	
High level value of on-state slope resistance	r _{t2}			7.50	mΩ
Maximum peak on-state voltage	V _{TM}	110 A, T _J = 25 °C		1.85	V
Maximum rate of rise of turned-on current	di/dt	T _J = 25 °C		100	A/µs
Maximum holding current	I _H	Anode supply = 6 V, resistive load, initial T_J	= 1 A, I _T = 25 °C	300	
Maximum latching current	١L	Anode supply = 6 V, resistive load, $T_J = 25 \text{ °C}$		350	
		$T_J = 25 \text{ °C}$		0.5	mA
Maximum reverse and direct leakage current	I _{RRM} /I _{DRM}	$T_J = 150 \text{ °C}$ $V_R = \text{rated } V_{RRM}/V_{DF}$	$V_{R} = rated V_{RRM}/V_{DRM}$		
Maximum rate of rise of off-state voltage	dv/dt	T_J = 150 °C, linear to 80 % V _{DRM} , R _g - k = 1	00 Ω	1000	V/µs

TRIGGERING							
PARAMETER	SYMBOL	TEST CO	VALUES	UNITS			
Maximum peak gate power	P_{GM}			10	W		
Maximum average gate power	P _{G(AV)}			2.5	vv		
Maximum peak gate current	I _{GM}			2.5	А		
Maximum peak negative gate voltage	-V _{GM}			10	V		
Maximum required DC gate voltage to trigger	V _{GT}	$T_J = -40 \ ^{\circ}C$	Anode supply = 6 V resistive load	2.0			
		T _J = 25 °C		1.7	V		
		T _J = 150 °C		1.2			
		T _J = -40 °C		200			
Maximum required DC gate current to trigger	I _{GT}	T _J = 25 °C	Anode supply = 6 V resistive load	150	mA		
		T _J = 150 °C		70			
Maximum DC gate voltage not to trigger	V_{GD}			0.25	V		
Maximum DC gate current not to trigger	I _{GD}	$T_J = 125 \text{ °C}, V_{DRM} = \text{rated } v$	alue	6	mA		

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THERMAL AND MECHANICAL SPECIFICATIONS							
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS			
Maximum junction and storage temperature range	T _J , T _{Stg}		-40 to +150	°C			
Maximum thermal resistance, junction to case	R _{thJC}	DC operation	0.6				
Maximum thermal resistance, junction to ambient	R _{thJA}	DC operation	40	°C/W			
Maximum thermal resistance, case to heat sink	R _{thCS}	Mounting surface, smooth and greased	0.2				
Approximate weight			6	g			
Approximate weight			0.21	oz.			
Mounting torgueminimum			6 (5)	kgf · cm			
maximum			12 (10)	(lbf · in)			
Marking device		Case style TO-247AD 3L	40TPS1	2LH			

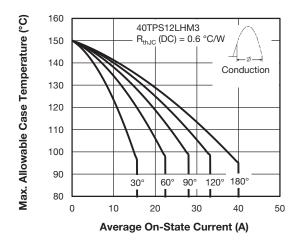


Fig. 1 - Current Rating Characteristics

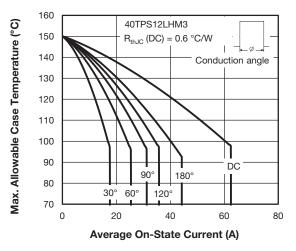


Fig. 2 - Current Rating Characteristics

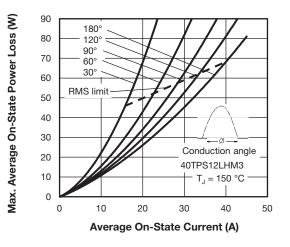
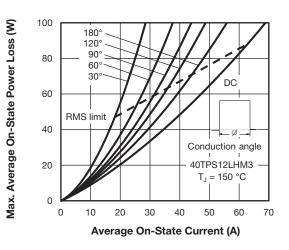
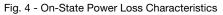


Fig. 3 - On-State Power Loss Characteristics





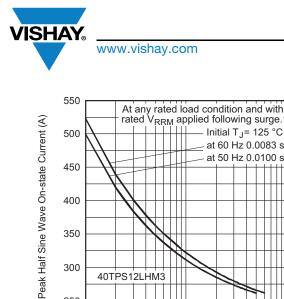
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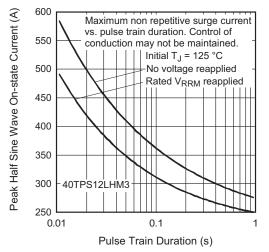
40TPS12LHM3

350

300

250

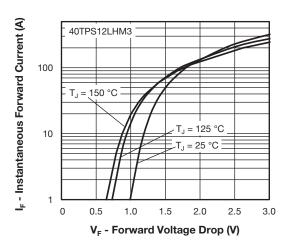
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Number Of Equal Amplitude Half Cycle Current Pulses (N) Fig. 5 - Maximum Non-Repetitive Surge Current

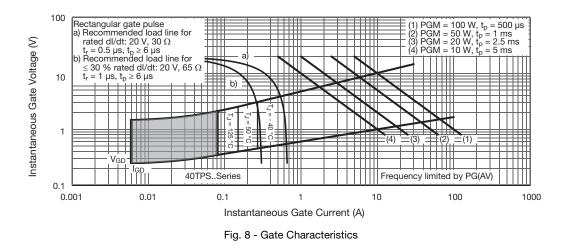
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Fig. 6 - Maximum Non-Repetitive Surge Current



100

Fig. 7 - On-State Voltage Drop Characteristics



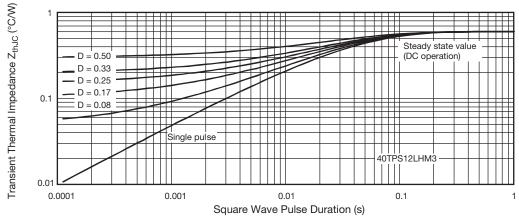


Fig. 9 - Thermal Impedance Z_{thJC} Characteristics

ORDERING INFORMATION TABLE

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SHAY

Device code	VS-	40	т	Р	S	12	Α	L	н	М3
	1	2	3	4	5	6	7	8	9	10
	1 -	Visł	nay Sem	niconduc	ctors pro	duct				
	2 -	Cur	rent rati	ng (40 =	40 A)					
	3 -	Circ	uit conf	guratior	n:					
		T =	thyristo	-						
	4 -	Pac	kage:							
	_	P =	TO-247							
	5 -		e of silio							
					ery rectif	ier	Г			
	6 -	Volt	age rati	ngs —			[12 = 12	200 V	
	7 -			-	tion 40 r		timum			
	_	• N	one = s	tandard	Igt seled	ction				
	8 -	L =	long lea	ds						
	9 -	H =	AEC-Q	101 qua	lified					
	10 -	Env	vironmer	ntal digit:	:					
		M3	= halog	en-free,	RoHS-c	compliar	nt, and t	erminat	ions lea	d (Pb)-fı

ORDERING INFORMATION (Example)						
PREFERRED P/N QUANTITY PER TUBE MINIMUM ORDER QUANTITY PACKAGING DESCRIPTION						
VS-40TPS12LHM3	25	500	Antistatic plastic tubes			

LINKS TO RELATED DOCUMENTS					
Dimensions TO-247AD 3L www.vishay.com/doc?95626					
Part marking information	TO-247AD 3L	www.vishay.com/doc?95007			

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TO-247AD 3L

DIMENSIONS in millimeters and inches



View B

SYMBOL	MILLIN	IETERS	INCHES		NOTES
STIVIBOL	MIN.	MAX.	MIN.	MAX.	NOTES
А	4.65	5.31	0.183	0.209	
A1	2.21	2.59	0.087	0.102	
A2	1.50	2.49	0.059	0.098	
b	0.99	1.40	0.039	0.055	
b1	0.99	1.35	0.039	0.053	
b2	1.65	2.39	0.065	0.094	
b3	1.65	2.34	0.065	0.092	
b4	2.59	3.43	0.102	0.135	
b5	2.59	3.38	0.102	0.133	
с	0.38	0.89	0.015	0.035	
c1	0.38	0.84	0.015	0.033	
D	19.71	20.70	0.776	0.815	3
D1	13.08	-	0.515	-	4

(2, 52, 51) (4) Section C - C, D - D, E - E

SYMBOL	MILLIN	IETERS	INC	INCHES	
STNIBOL	MIN.	MAX.	MIN.	MAX.	NOTES
D2	0.51	1.30	0.020	0.051	
E	15.29	15.87	0.602	0.625	3
E1	13.46	-	0.53	-	
е	5.46	BSC	0.215	5 BSC	
ØК	0.2	254	0.010		
L	19.81	20.32	0.780	0.800	
L1	3.71	4.29	0.146	0.169	
ØР	3.56	3.66	0.14	0.144	
Ø P1	-	6.98	-	0.275	
Q	5.31	5.69	0.209	0.224	
R	4.52	5.49	0.178	0.216	
S	5.51 BSC		0.217	' BSC	

Notes

⁽¹⁾ Dimensioning and tolerancing per ASME Y14.5M-1994

(2) Contour of slot optional

- ⁽³⁾ Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- (4) Thermal pad contour optional with dimensions D1 and E1
- ⁽⁵⁾ Lead finish uncontrolled in L1
- (6) Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- ⁽⁷⁾ Outline conforms to JEDEC[®] outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4

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 1
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