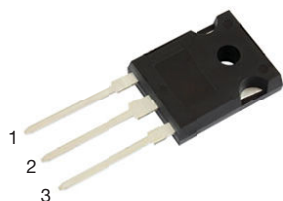
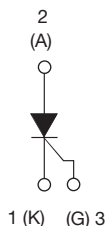


Thyristor High Voltage, Phase Control SCR, 40 A



TO-247AD 3L



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 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-40TPS16LHM3 high voltage series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications.

PRIMARY CHARACTERISTICS

$I_{T(AV)}$	35 A
V_{DRM}/V_{RRM}	1600 V
V_{TM}	1.45 V
I_{GT}	150 mA
T_J	-40 °C to +125 °C
Package	TO-247AD 3L
Circuit configuration	Single SCR

MAJOR RATINGS AND CHARACTERISTICS

PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$	Sinusoidal waveform	35	A
I_{RMS}		55	
V_{RRM}/V_{DRM}		1600	V
I_{TSM}		500	A
V_T	40 A, $T_J = 25\text{ °C}$	1.45	V
dv/dt		1000	V/μs
di/dt		100	A/μs
T_J		-40 to +125	°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 125 °C mA
VS-40TPS16LHM3	1600	1700	10

**ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum average on-state current	I _{T(AV)}	T _C = 79 °C, 180° conduction half sine wave		35	A
Maximum continuous RMS on-state current as AC switch	I _{T(RMS)}			55	
Maximum peak, one-cycle non-repetitive surge current	I _{TSM}	10 ms sine pulse, rated V _{RRM} applied	Initial T _J = T _J max.	420	
		10 ms sine pulse, no voltage reapplied		500	
Maximum I ² t for fusing	I ² t	10 ms sine pulse, rated V _{RRM} applied		880	A ² s
		10 ms sine pulse, no voltage reapplied		1250	
Maximum I ² √t for fusing	I ² √t	t = 0.1 ms to 10 ms, no voltage reapplied		12 500	A ² √s
Low level value of threshold voltage	V _{T(TO)1}	T _J = 125 °C		1.02	V
High level value of threshold voltage	V _{T(TO)2}			1.23	
Low level value of on-state slope resistance	r _{t1}			9.74	mΩ
High level value of on-state slope resistance	r _{t2}			7.50	
Maximum peak on-state voltage	V _{TM}	110 A, T _J = 25 °C		1.92	V
		90 A, T _J = 25 °C		1.82	
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	mA
Maximum latching current	I _L	Anode supply = 6 V, resistive load, T _J = 25 °C		350	
Maximum reverse and direct leakage current	I _{RRM} /I _{DRM}	T _J = 25 °C	V _R = rated V _{RRM} /V _{DRM}	0.5	
		T _J = 125 °C		10	
Maximum rate of rise of off-state voltage	dV/dt	T _J = T _J maximum, linear to 80 % V _{DRM} , R _g - k = open		1000	V/μs

TRIGGERING

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak gate power	P _{GM}			10	W
Maximum average gate power	P _{G(AV)}			2.5	
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	4.0	V
		T _J = 25 °C		2.5	
		T _J = 125 °C		1.7	
Maximum required DC gate current to trigger	I _{GT}	T _J = -40 °C	Anode supply = 6 V resistive load	270	mA
		T _J = 25 °C		150	
		T _J = 125 °C		80	
Maximum DC gate voltage not to trigger	V _{GD}	T _J = 125 °C, V _{DRM} = rated value		0.25	V
Maximum DC gate current not to trigger	I _{GD}			6	mA



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	0.6	°C/W
Maximum thermal resistance, junction to ambient	R _{thJA}		40	
Maximum thermal resistance, case to heat sink	R _{thCS}	Mounting surface, smooth, and greased	0.2	
Approximate weight			6	g
			0.21	oz.
Mounting torque	minimum		6 (5)	kgf · cm (lbf · in)
	maximum		12 (10)	
Marking device		Case style TO-247AD 3L	40TPS16LH	

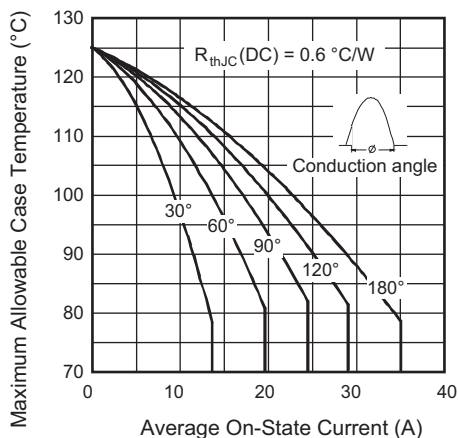


Fig. 1 - Current Rating Characteristics

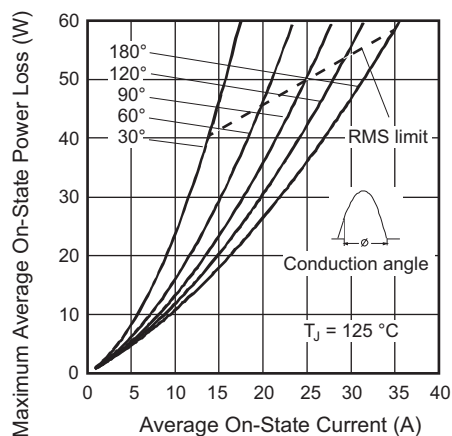


Fig. 3 - On-State Power Loss Characteristics

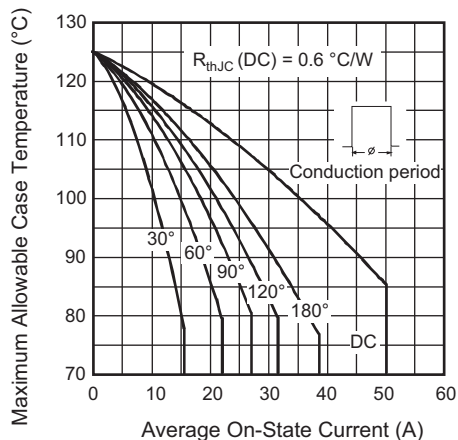


Fig. 2 - Current Rating Characteristics

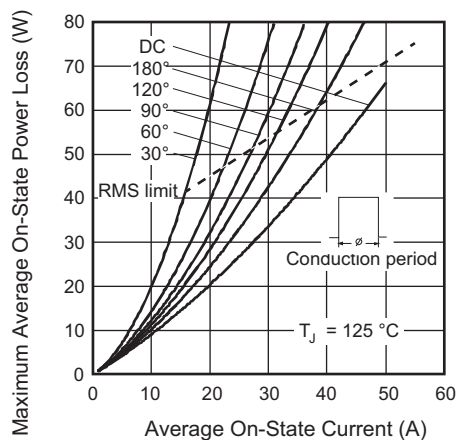


Fig. 4 - On-State Power Loss Characteristics

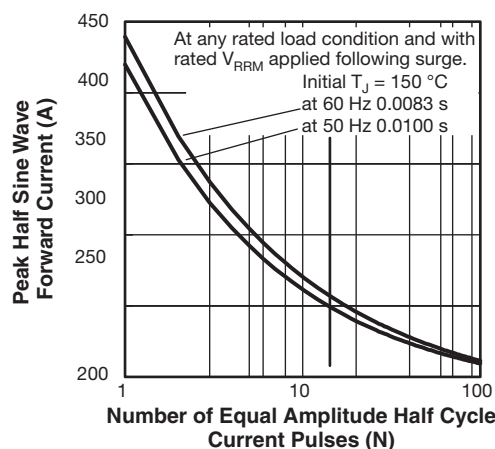


Fig. 5 - Maximum Non-Repetitive Surge Current

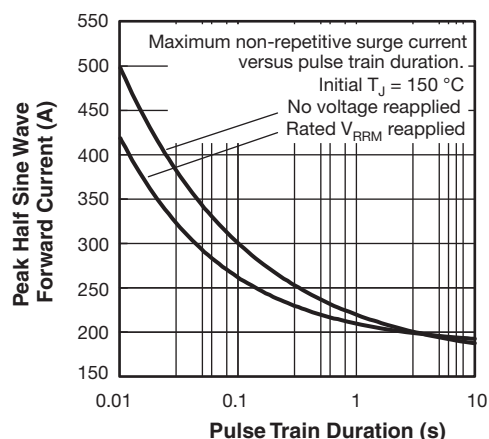


Fig. 6 - Maximum Non-Repetitive Surge Current

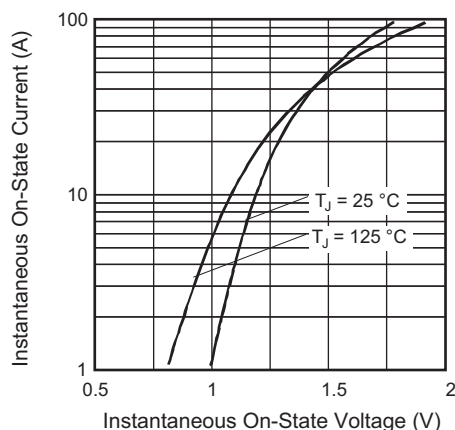


Fig. 7 - On-State Voltage Drop Characteristics

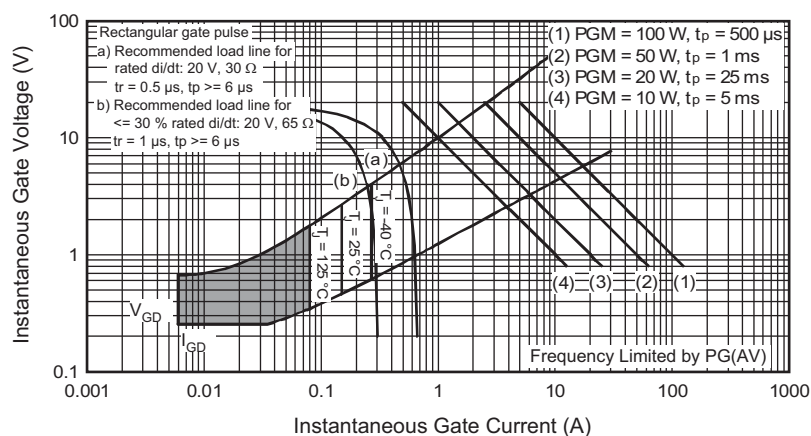


Fig. 8 - Gate Characteristics

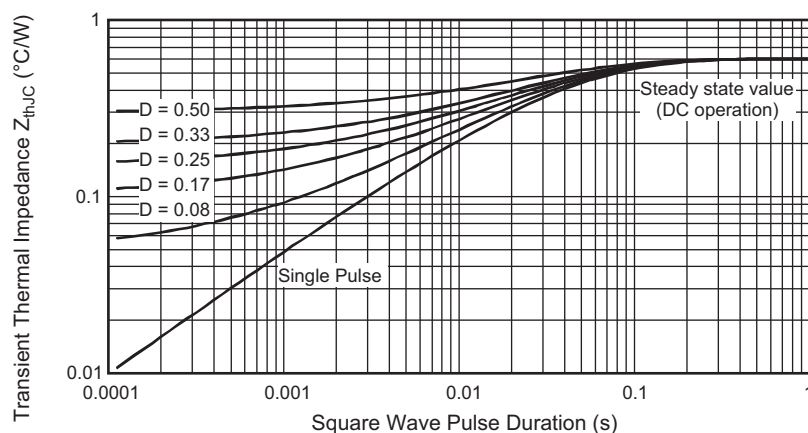


Fig. 9 - Gate Characteristics

ORDERING INFORMATION TABLE

Device code	VS-	40	T	P	S	16	L	H	M3
	1	2	3	4	5	6	7	8	9

1	-	Vishay Semiconductors product							
2	-	Current rating (40 = 40 A)							
3	-	Circuit configuration: T = thyristor							
4	-	Package: P = TO-247							
5	-	Type of silicon: S = standard recovery rectifier							
6	-	Voltage ratings					16 = 1600 V		
7	-	L = long leads							
8	-	H = AEC-Q101 qualified							
9	-	Environmental digit: M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free							

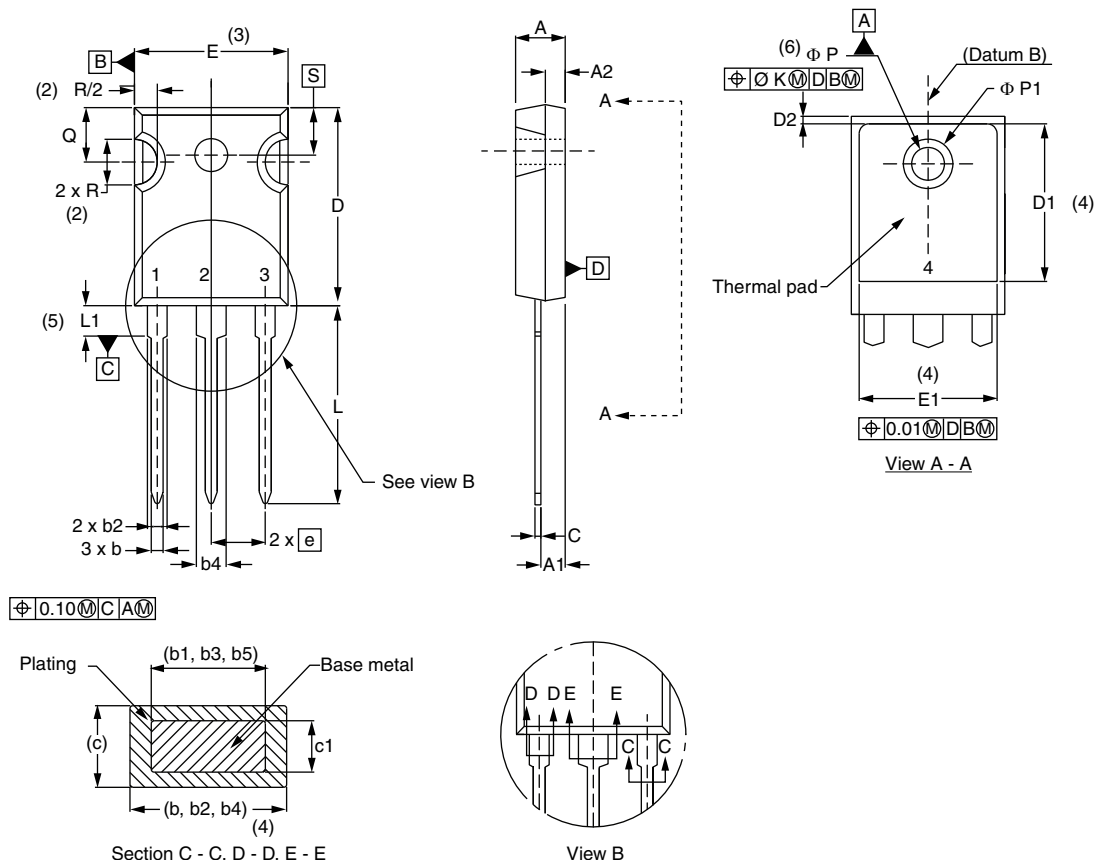
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER TUBE	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-40TPS16LHM3	25	500	Antistatic plastic tubes

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



TO-247AD 3L

DIMENSIONS in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	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	
c	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

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D2	0.51	1.30	0.020	0.051	
E	15.29	15.87	0.602	0.625	3
E1	13.46	-	0.53	-	
e	5.46 BSC		0.215 BSC		
ϕK	0.254		0.010		
L	19.81	20.32	0.780	0.800	
L1	3.71	4.29	0.146	0.169	
ϕP	3.56	3.66	0.14	0.144	
$\phi P1$	-	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

- Dimensioning and tolerancing per ASME Y14.5M-1994
- Contour of slot optional
- Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- Thermal pad contour optional with dimensions D1 and E1
- Lead finish uncontrolled in L1
- ϕP 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")
- 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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