

# SOT-227 Single Thyristor Power Module, 160 A, 1200 V



SOT-227


**RoHS**  
COMPLIANT

**FEATURES**

- High voltage
- Industrial standard package
- Low thermal resistance
- UL pending
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

**BENEFITS**

- Excellent thermal performances
- High surge capability
- Easy mounting on heatsink
- Thyristor for line frequency

**APPLICATIONS**

Line rectifying 50 Hz / 60 Hz

- Softstart AC motor control
- DC motor control
- Power converter
- AC power control
- Lighting and temperature control

PRIMARY CHARACTERISTICS	
$V_{RRM} / V_{DRM}$	1200 V
$V_{TM}$ (typical) at 150 A, 25 °C	1.3 V
$I_{T(AV)}$ , $T_C = 75\text{ °C}$	158 A <sup>(1)</sup>
Package	SOT-227
Circuit	Single thyristor

**Note**

- <sup>(1)</sup> Maximum continuous collector current admitted 100 A to do not exceed the maximum temperature of terminals

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{T(AV)}$	75 °C	158	A
$I_{TSM}$	50 Hz	1390	
	60 Hz	1455	
$I^2t$	50 Hz	9.6	kA <sup>2</sup> s
	60 Hz	8.8	
$I^2\sqrt{t}$		96.6	kA <sup>2</sup> √s
$V_{RRM} / V_{DRM}$		1200	V
$T_{Stg}$		-40 to +125	°C
$T_J$		-40 to +125	

**ELECTRICAL SPECIFICATIONS**

VOLTAGE RATINGS			
$V_{RRM}$ , MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$V_{DRM}$ , MAXIMUM REPETITIVE PEAK OFF-STATE VOLTAGE, GATE OPEN CIRCUIT V	$I_{RRM}, I_{DRM}$ AT 125 °C mA
1200	1300	1200	10



ON-STATE CONDUCTION					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum average on-state current (thyristors)	$I_{T(AV)}$	180° conduction, half sine wave, $T_C = 75\text{ °C}$		158	
Maximum peak, one-cycle non-repetitive on-state	$I_{TSM}$	t = 10 ms	No voltage reappplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	1390
		t = 8.3 ms			1455
		t = 10 ms	100 % $V_{RRM}$ reappplied		1169
		t = 8.3 ms			1224
Maximum $I^2t$ for fusing	$I^2t$	t = 10 ms	No voltage reappplied	Initial $T_J = T_J$ maximum	9.6
		t = 8.3 ms			8.8
		t = 10 ms	100 % $V_{RRM}$ reappplied		6.8
		t = 8.3 ms			6.2
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$ (1)	t = 0.1 ms to 10 ms, no voltage reappplied $T_J = T_J$ maximum		96.6	$kA^2\sqrt{s}$
Maximum value or threshold voltage	$V_{T(TO)}$ (2)	Low level (3)	$T_J = T_J$ maximum	0.82	V
		High level (4)		0.86	
Maximum value of on-state slope resistance	$r_t$ (2)	Low level (3)	$T_J = T_J$ maximum	3.95	mΩ
		High level (4)		3.91	
Maximum peak on-state voltage	$V_{TM}$	$I_{TM} = 150\text{ A}$	$T_J = 25\text{ °C}$	1.45	V
			$T_J = 150\text{ °C}$	1.41	
Maximum non-repetitive rate of rise of turned on current	$di/dt$	$T_J = 25\text{ °C}$ , from 0.67 $V_{DRM}$ , $I_{TM} = \pi \times I_{T(AV)}$ , $I_g = 500\text{ mA}$ , $t_r < 0.5\text{ }\mu s$ , $t_p > 6\text{ }\mu s$		150	$A/\mu s$
Maximum holding current	$I_H$	$T_J = 25\text{ °C}$ , anode supply = 6 V, resistive load, gate open circuit		250	mA
Maximum latching current	$I_L$	$T_J = 25\text{ °C}$ , anode supply = 6 V, resistive load		400	

**Notes**

- (1)  $I^2t$  for time  $t_x = I^2\sqrt{t} \times \sqrt{t_x}$
- (2) Average power =  $V_{T(TO)} \times I_{T(AV)} + r_t \times (I_{T(RMS)})^2$
- (3)  $16.7\% \times \pi \times I_{AV} < I < \pi \times I_{AV}$
- (4)  $I > \pi \times I_{AV}$

TRIGGERING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak gate power	$P_{GM}$			12	W
Maximum average gate power	$P_{G(AV)}$			3	
Maximum peak gate current	$I_{GM}$			3	A
Maximum peak negative gate voltage	$-V_{GM}$			10	V
Maximum gate voltage required to trigger	$V_{GT}$	$T_J = -40\text{ °C}$		4.0	
		$T_J = 25\text{ °C}$		2.1	
		$T_J = 125\text{ °C}$		1.7	
Maximum gate current required to trigger	$I_{GT}$	$T_J = -40\text{ °C}$		270	mA
		$T_J = 25\text{ °C}$		150	
		$T_J = 125\text{ °C}$		80	
Maximum gate voltage that will not trigger	$V_{GD}$	$T_J = 150\text{ °C}$ , 80 % $V_{DRM}$ applied		0.2	V
Maximum gate current that will not trigger	$I_{GD}$	$T_J = 150\text{ °C}$ , 80 % $V_{DRM}$ applied		10	mA

BLOCKING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak reverse and off-state leakage current at $V_{RRM}$ , $V_{DRM}$	$I_{RRM}$ , $I_{DRM}$	$T_J = 125\text{ °C}$ , gate open circuit		10	mA
Maximum RMS insulation voltage	$V_{INS}$	50 Hz		2500 (1 min)	V
Maximum critical rate of rise of off-state voltage	$dV/dt$	$T_J = 150\text{ °C}$ , linear to 0.8 $V_{DRM}$		1000	$V/\mu s$



THERMAL AND MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Junction operating temperature range	$T_J$		-40 to +125	$^{\circ}\text{C}$
Storage temperature range	$T_{\text{Stg}}$			
Maximum internal thermal resistance, junction to case per leg	$R_{\text{thJC}}$	DC operation	0.2	$^{\circ}\text{C}/\text{W}$
Typical thermal resistance, case to heat sink per module	$R_{\text{thCS}}$	Mounting surface flat, smooth, and greased	0.1	
Mounting torque $\pm 10\%$		to heat sink busbar	1.3	Nm
Approximate weight			30	g
Case style			SOT-227	

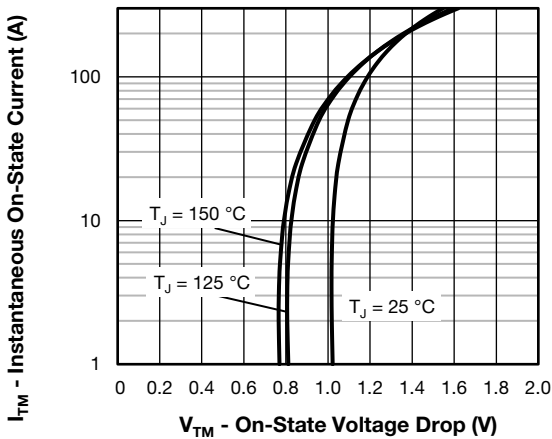


Fig. 1 -  $I_{\text{TM}}$  vs.  $V_{\text{TM}}$  (On-State Voltage Drop Characteristics)

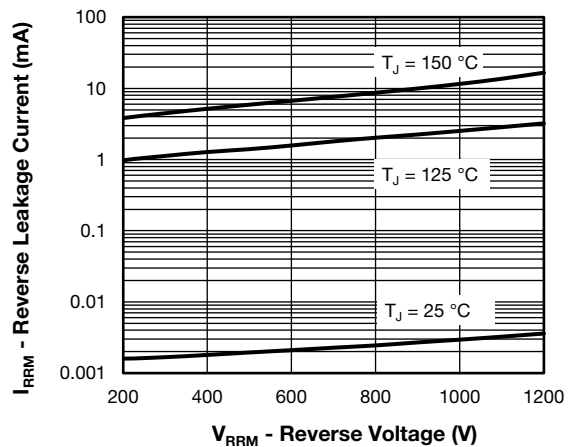


Fig. 3 -  $I_{\text{RRM}}$  vs.  $V_{\text{RRM}}$  (Reverse Leakage Current)

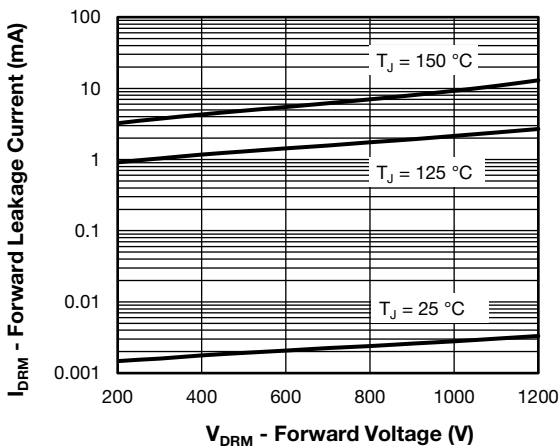


Fig. 2 -  $I_{\text{DRM}}$  vs.  $V_{\text{DRM}}$  (Forward Leakage Current)

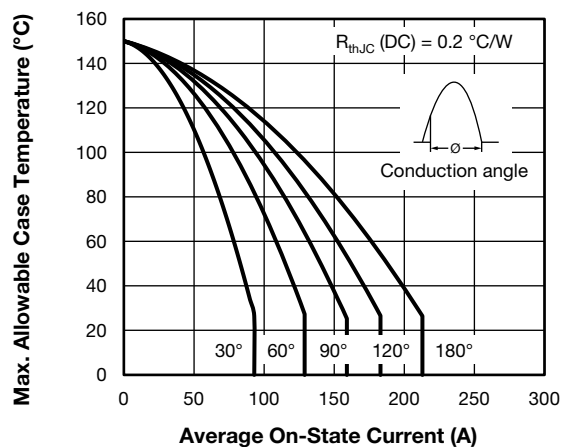


Fig. 4 - Maximum Allowable Case Temperature vs. Average On-State Current (Current Rating Characteristics)

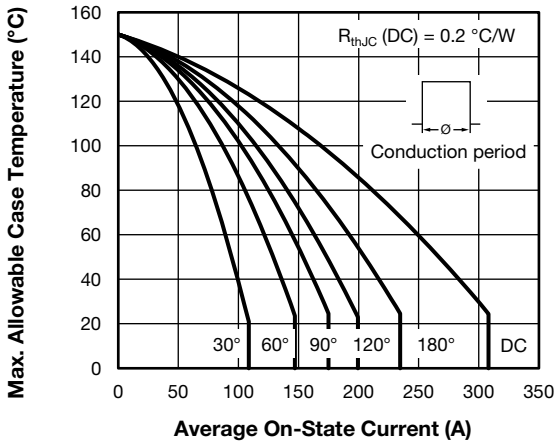


Fig. 5 - Maximum Allowable Case Temperature vs. Average On-State Current (Current Rating Characteristics)

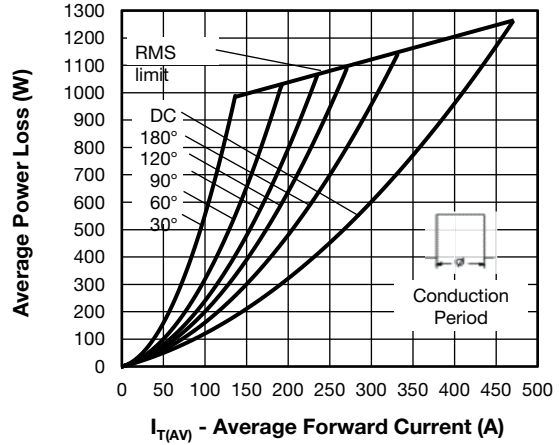


Fig. 7 - Average Power Loss vs. Average Forward Current (Forward Power Loss Characteristics)

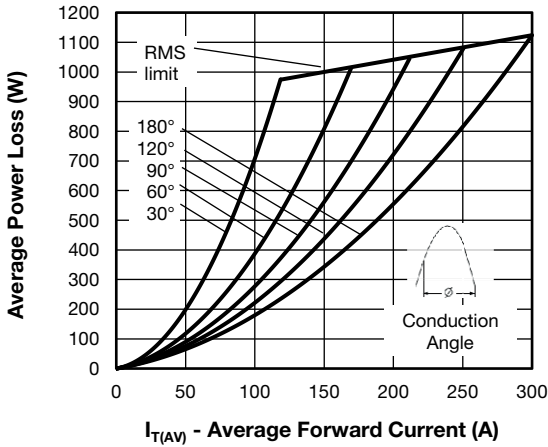


Fig. 6 - Average Power Loss vs. Average Forward Current (Forward Power Loss Characteristics)

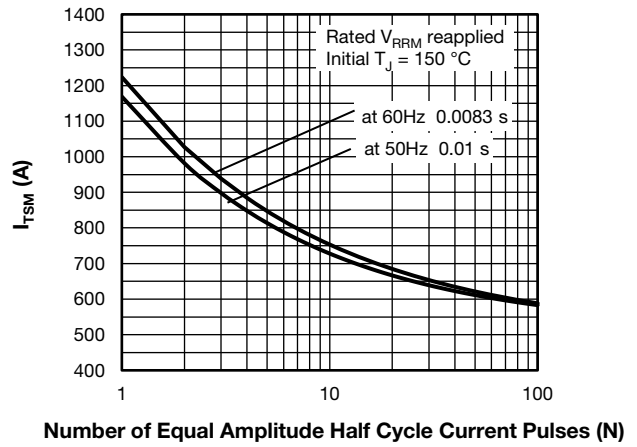


Fig. 8 -  $I_{TSM}$  vs. N (Non-Repetitive peak Forward Surge Current vs. Number Pulses)

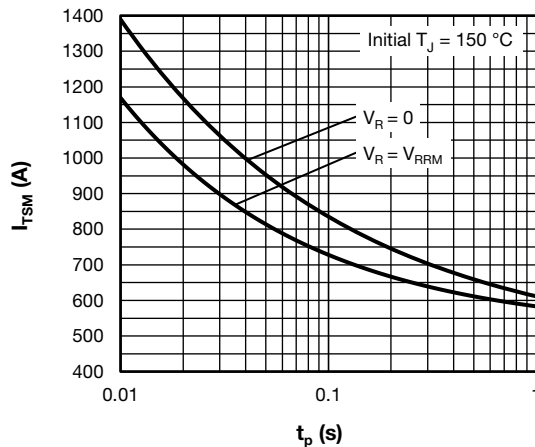


Fig. 9 -  $I_{TSM}$  vs.  $t_p$  (Non-Repetitive peak Forward Surge Current vs. Pulse Duration)

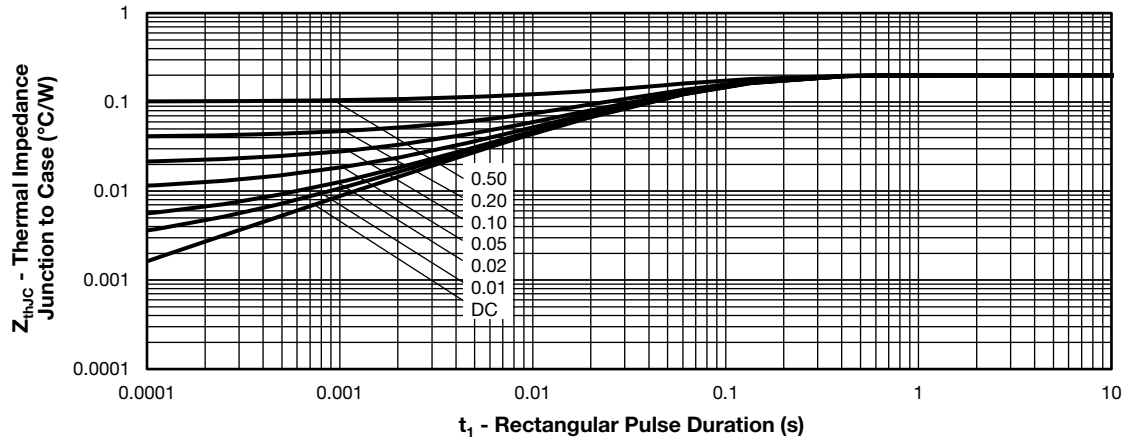


Fig. 10 -  $Z_{thJC}$  Thermal Impedance Junction to Case vs.  $t_1$  Rectangular Pulse Duration (Maximum Thermal Impedance  $Z_{thJC}$  Characteristics)

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>T</b>	<b>A</b>	<b>160</b>	<b>S</b>	<b>A</b>	<b>120</b>
	①	②	③	④	⑤	⑥	⑦
	<b>1</b>	-	-	-	-	-	-
	<b>2</b>	-	-	-	-	-	-
	<b>3</b>	-	-	-	-	-	-
	<b>4</b>	-	-	-	-	-	-
	<b>5</b>	-	-	-	-	-	-
	<b>6</b>	-	-	-	-	-	-
	<b>7</b>	-	-	-	-	-	-

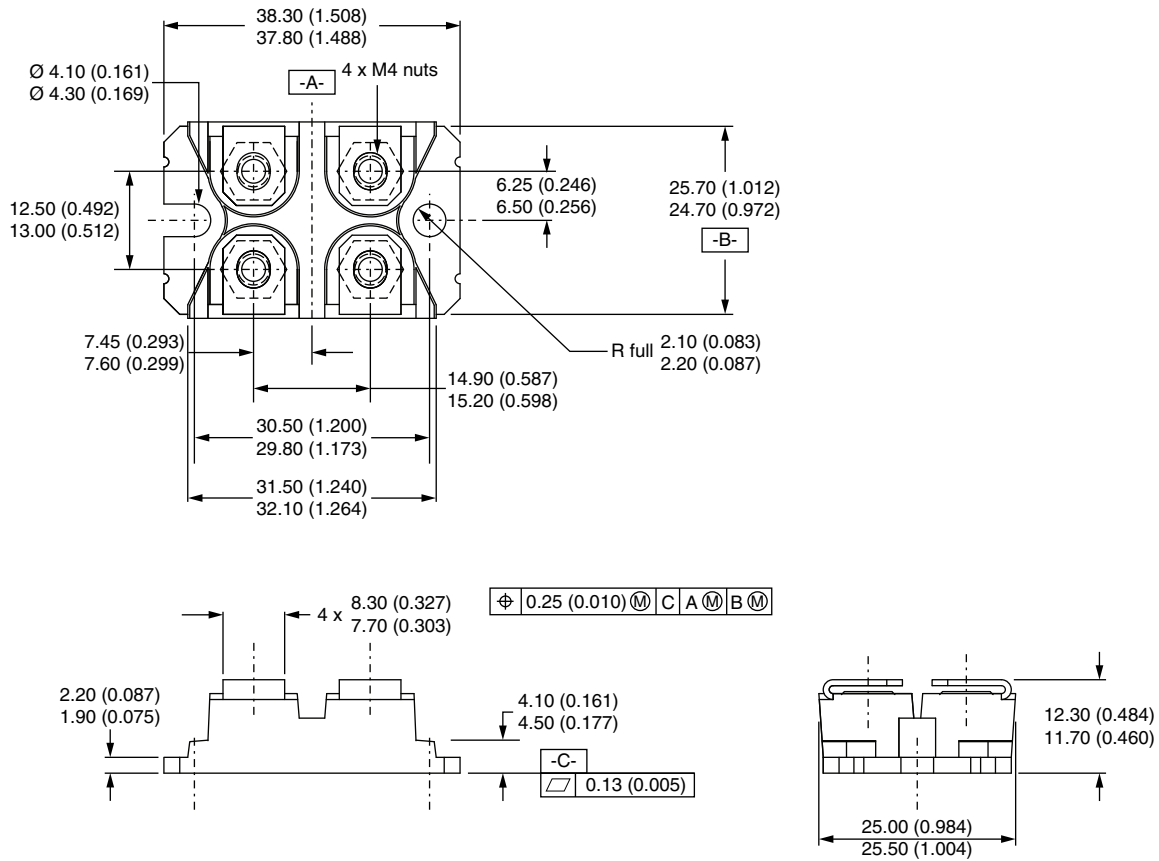
- 1** - Vishay Semiconductors product
- 2** - Thyristor dice
- 3** - Present silicon generation
- 4** - Rating current
- 5** - Single thyristor
- 6** - Isolated SOT-227
- 7** - Voltage rating 120 = 1200 V

CIRCUIT CONFIGURATION		
CIRCUIT DESCRIPTION	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Single thyristor	S	 

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95423">www.vishay.com/doc?95423</a>
Packaging information	<a href="http://www.vishay.com/doc?95425">www.vishay.com/doc?95425</a>
Application note	<a href="http://www.vishay.com/doc?95527">www.vishay.com/doc?95527</a>



**DIMENSIONS** in millimeters (inches): **SOT-227 Gen 2**



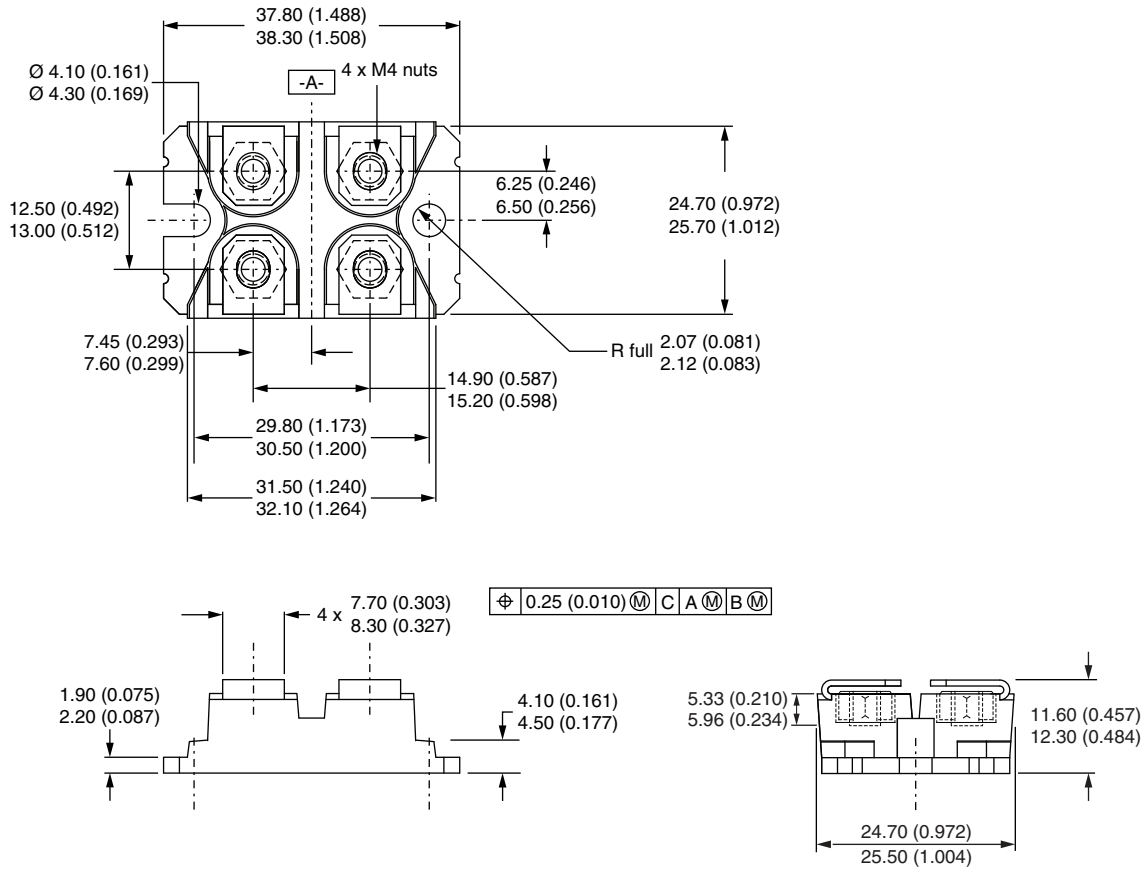
**Note**

- Controlling dimension: millimeter



# SOT-227 Generation 2

**DIMENSIONS** in millimeters (inches)



**Note**

- Controlling dimension: millimeter



## **Disclaimer**

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.