

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



SOT-227

## 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)



**RoHS**  
COMPLIANT

## 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
$I_{T(AV)}$ , $T_C = 75$ °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, $T_C = 75\text{ }^{\circ}\text{C}$			158	A
Maximum peak, one-cycle non-repetitive on-state	$I_{TSM}$	$t = 10\text{ ms}$	No voltage reappplied	Sinusoidal half wave, initial $T_J = T_J$ maximum	1390	
		$t = 8.3\text{ ms}$			1455	
		$t = 10\text{ ms}$	100 % $V_{RRM}$ reappplied		1169	
		$t = 8.3\text{ ms}$			1224	
Maximum $I^2t$ for fusing	$I^2t$	$t = 10\text{ ms}$	No voltage reappplied	Initial $T_J = T_J$ maximum	9.6	kA <sup>2</sup> s
		$t = 8.3\text{ ms}$			8.8	
		$t = 10\text{ ms}$	100 % $V_{RRM}$ reappplied		6.8	
		$t = 8.3\text{ ms}$			6.2	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$ <sup>(1)</sup>	$t = 0.1\text{ ms to }10\text{ ms}$ , no voltage reappplied $T_J = T_J$ maximum			96.6	kA <sup>2</sup> √s
Maximum value or threshold voltage	$V_{T(TO)}$ <sup>(2)</sup>	Low level <sup>(3)</sup>	$T_J = T_J$ maximum	0.82	V	
		High level <sup>(4)</sup>		0.86		
Maximum value of on-state slope resistance	$r_t$ <sup>(2)</sup>	Low level <sup>(3)</sup>	$T_J = T_J$ maximum	3.95	mΩ	
		High level <sup>(4)</sup>		3.91		
Maximum peak on-state voltage	$V_{TM}$	$I_{TM} = 150\text{ A}$	$T_J = 25\text{ }^{\circ}\text{C}$	1.45	V	
			$T_J = 150\text{ }^{\circ}\text{C}$	1.41		
Maximum non-repetitive rate of rise of turned on current	$di/dt$	$T_J = 25\text{ }^{\circ}\text{C}$ , from $0.67\text{ }V_{DRM}$ , $I_{TM} = \pi \times I_{T(AV)}$ , $I_g = 500\text{ mA}$ , $t_r < 0.5\text{ }\mu\text{s}$ , $t_p > 6\text{ }\mu\text{s}$			150	A/μs
Maximum holding current	$I_H$	$T_J = 25\text{ }^{\circ}\text{C}$ , anode supply = 6 V, resistive load, gate open circuit			250	mA
Maximum latching current	$I_L$	$T_J = 25\text{ }^{\circ}\text{C}$ , 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 <sub>GM</sub>			12	W
Maximum average gate power	P <sub>G(AV)</sub>			3	
Maximum peak gate current	I <sub>GM</sub>			3	A
Maximum peak negative gate voltage	-V <sub>GM</sub>			10	V
Maximum gate voltage required to trigger	V <sub>GT</sub>	T <sub>J</sub> = -40 °C	Anode supply = 6 V resistive load	4.0	
		T <sub>J</sub> = 25 °C		2.1	
		T <sub>J</sub> = 125 °C		1.7	
Maximum gate current required to trigger	I <sub>GT</sub>	T <sub>J</sub> = -40 °C	Anode supply = 6 V resistive load	270	mA
		T <sub>J</sub> = 25 °C		150	
		T <sub>J</sub> = 125 °C		80	
Maximum gate voltage that will not trigger	V <sub>GD</sub>	T <sub>J</sub> = 150 °C, 80 % V <sub>DRM</sub> applied		0.2	V
Maximum gate current that will not trigger	I <sub>GD</sub>	T <sub>J</sub> = 150 °C, 80 % V <sub>DRM</sub> 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/μs

**THERMAL AND MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Junction operating temperature range	$T_J$		-40 to +125	°C
Storage temperature range	$T_{Stg}$			
Maximum internal thermal resistance, junction to case per leg	$R_{thJC}$	DC operation	0.2	°C/W
Typical thermal resistance, case to heat sink per module	$R_{thCS}$	Mounting surface flat, smooth, and greased	0.1	
Mounting torque $\pm 10\%$ to heat sink busbar		A mounting compound is recommended and the torque should be rechecked after a period of 3 hours to allow for the spread of the compound.	1.3	Nm
Approximate weight			30	g
Case style			SOT-227	

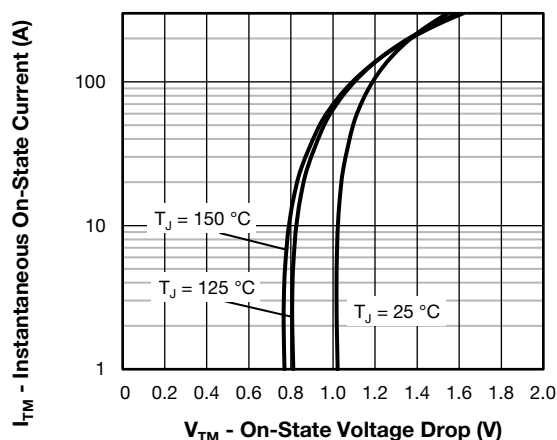
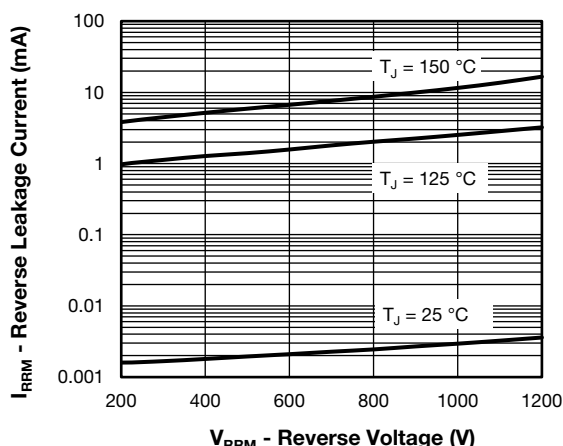
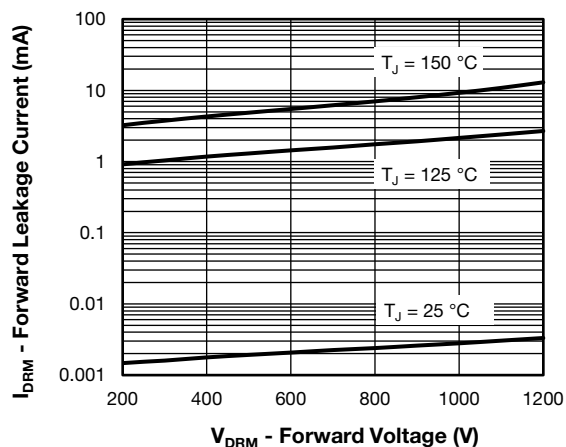
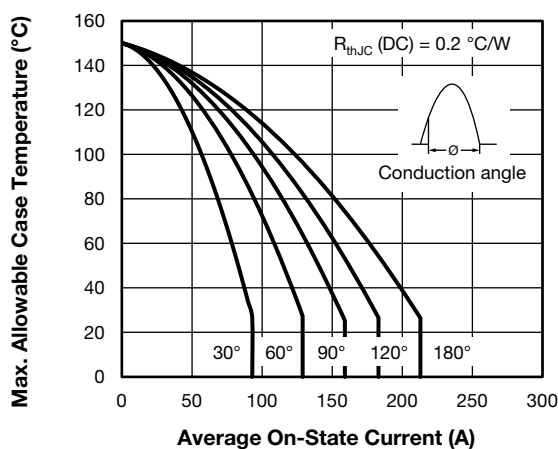
Fig. 1 -  $I_{TM}$  vs.  $V_{TM}$  (On-State Voltage Drop Characteristics)Fig. 3 -  $I_{RRM}$  vs.  $V_{RRM}$  (Reverse Leakage Current)Fig. 2 -  $I_{DRM}$  vs.  $V_{DRM}$  (Forward Leakage Current)

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

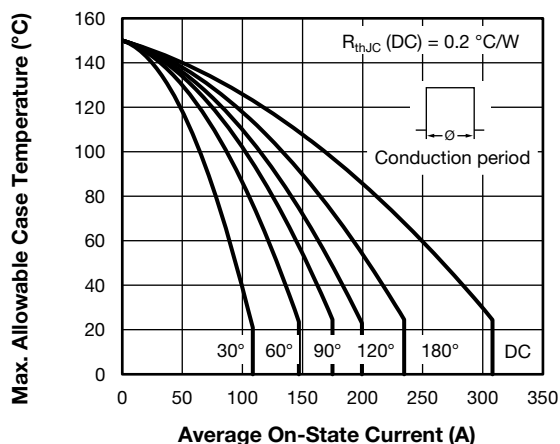


Fig. 5 - Maximum Allowable Case Temperature vs. Average On-State Current (Current Rating Characteristics)

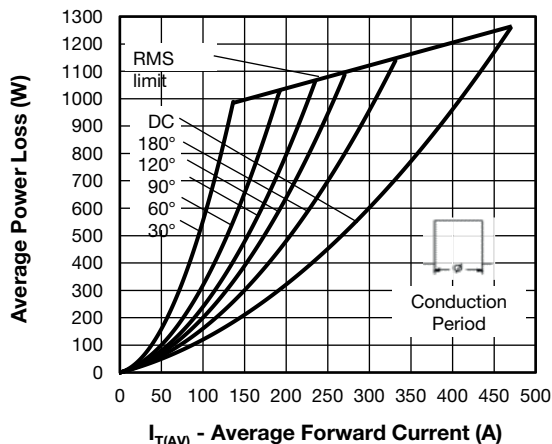


Fig. 7 - Average Power Loss vs. Average Forward Current (Forward Power Loss Characteristics)

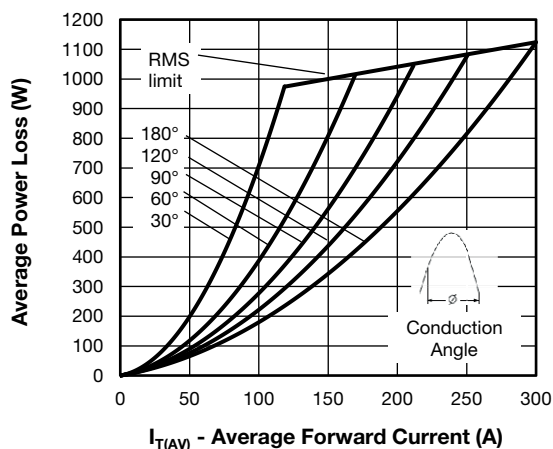


Fig. 6 - Average Power Loss vs. Average Forward Current (Forward Power Loss Characteristics)

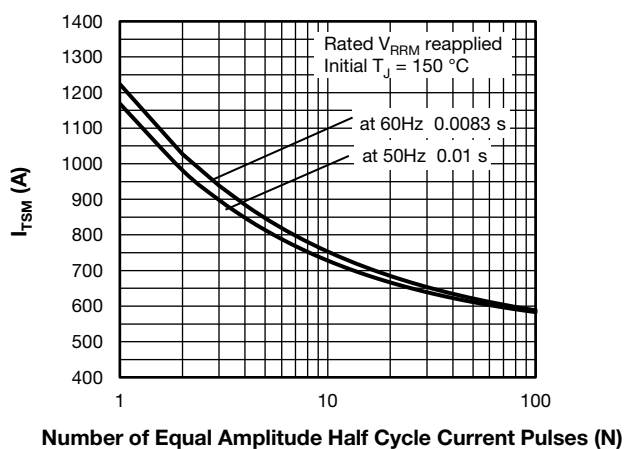


Fig. 8 -  $I_{TSM}$  vs. N (Non-Repetitive peak Forward Surge Current vs. Number Pulses)

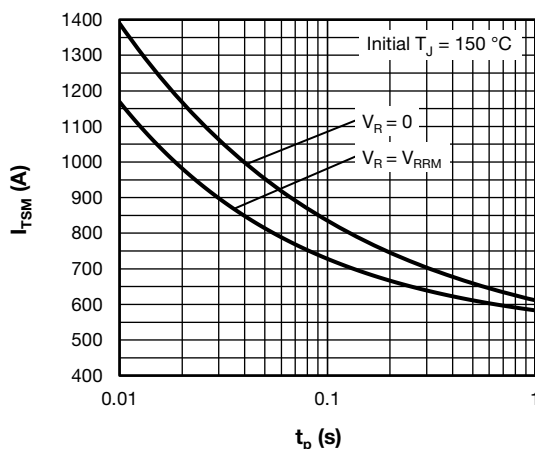


Fig. 9 -  $I_{TSM}$  vs.  $t_p$  (Non-Repetitive peak Forward Surge Current vs. Pulse Duration)

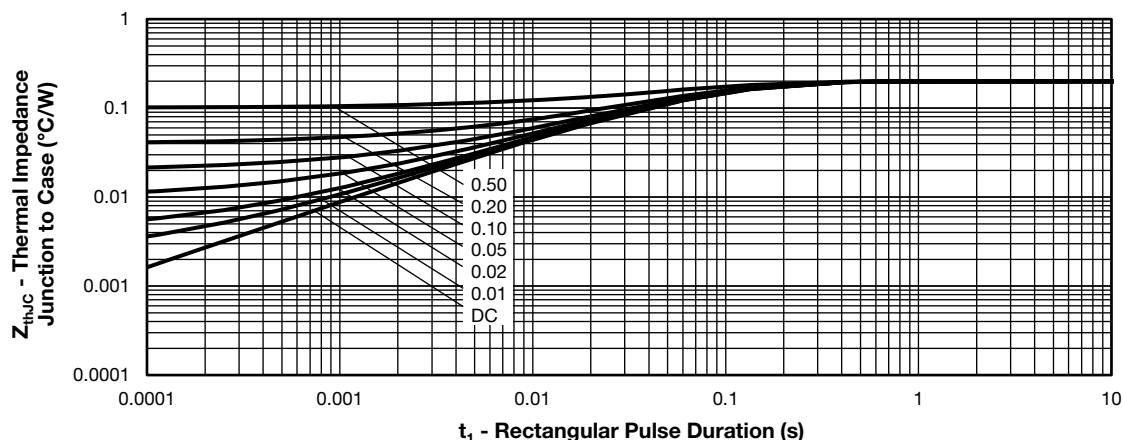


Fig. 10 -  $Z_{thJC}$  Thermal Impedance Junction to Case vs.  $t_1$  Rectangular Pulse Duration (Maximum Thermal Impedance  $Z_{thJC}$  Characteristics)

## 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>
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1

2

3

4

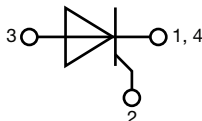
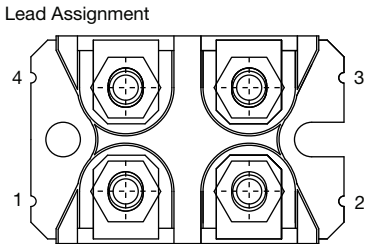
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6

7

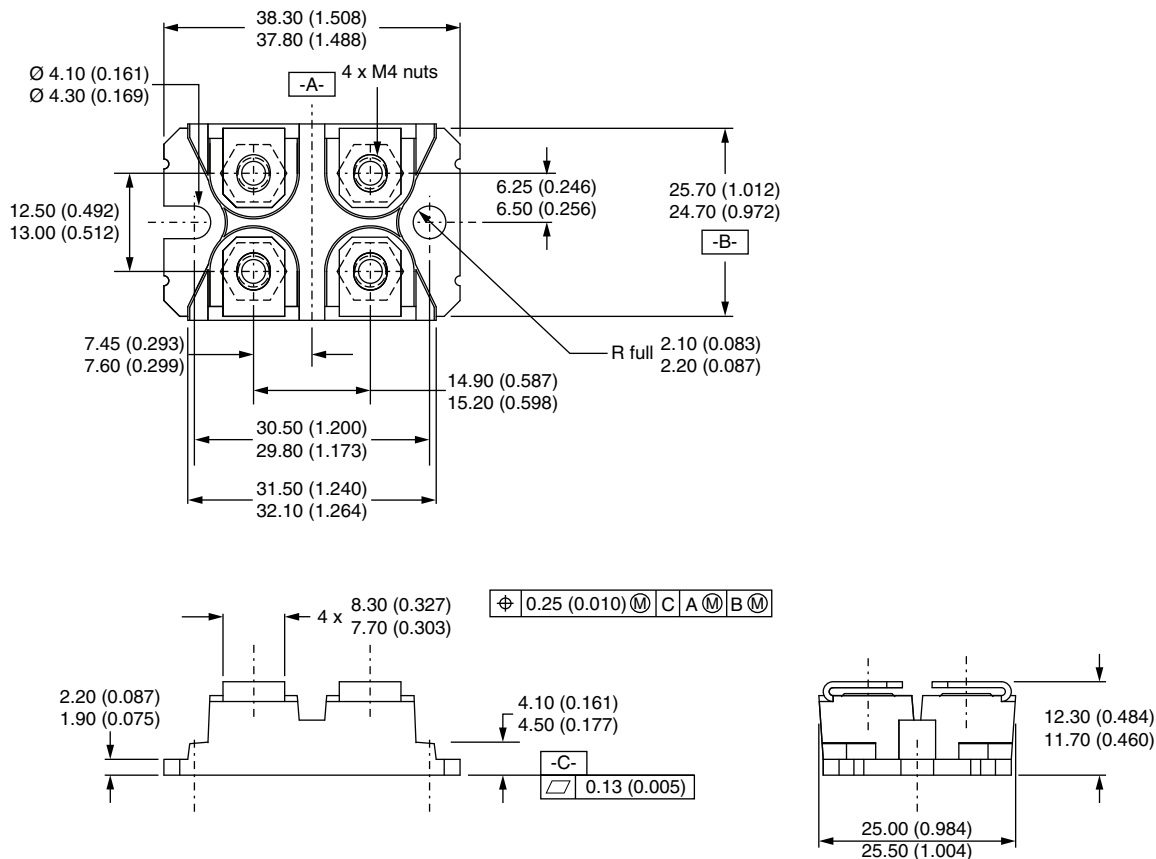
- 1** - Vishay Semiconductors product
- 2** - Thyristor dice
- 3** - Present silicon generation
- 4** - Rating current
- 5** - Single thyristor
- 6** - Isolated SOT-227
- 7** - Voltage rating 120 = 1200 V

## CIRCUIT CONFIGURATION

CIRCUIT DESCRIPTION	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Single thyristor	S	 

## LINKS TO RELATED DOCUMENTS

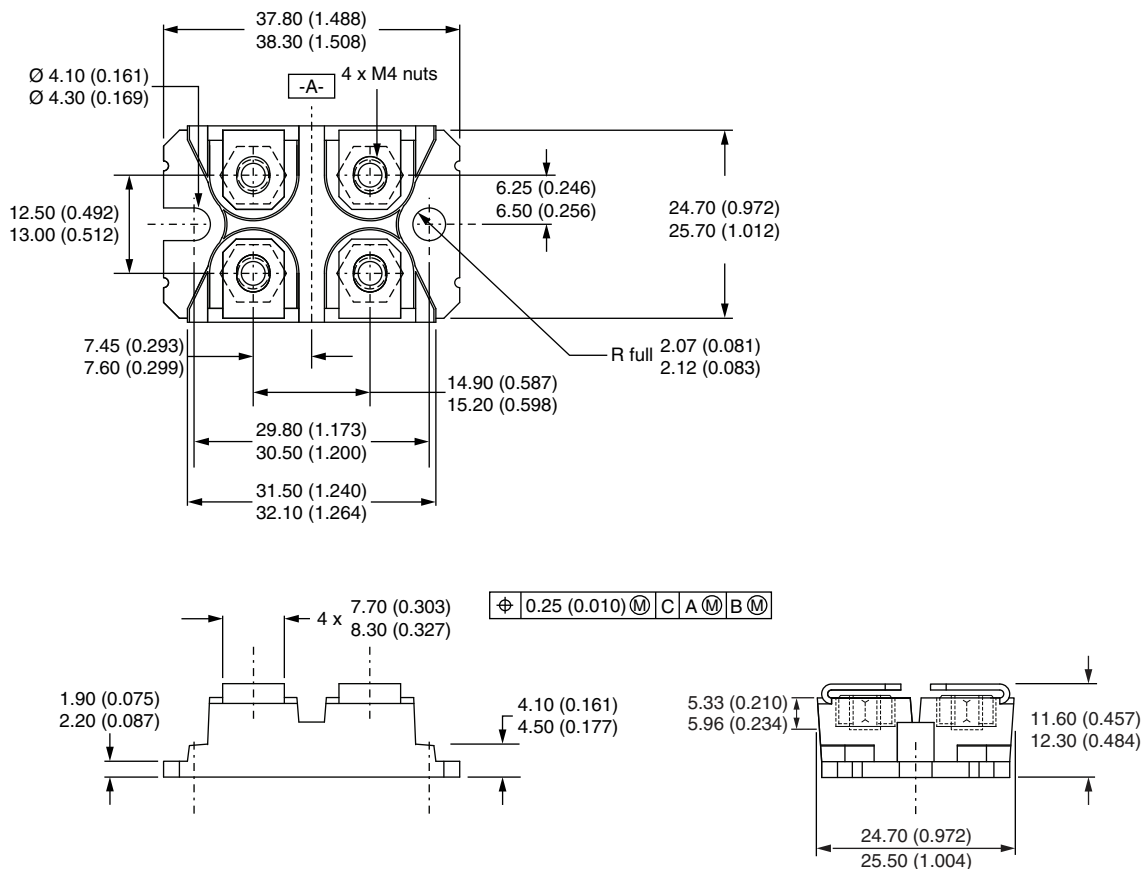
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Packaging information	<a href="http://www.vishay.com/doc?95425">www.vishay.com/doc?95425</a>
Application note	<a href="http://www.vishay.com/doc?95527">www.vishay.com/doc?95527</a>

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

**Note**

- Controlling dimension: millimeter

## SOT-227 Generation 2

**DIMENSIONS** in millimeters (inches)



### Note

- Controlling dimension: millimeter



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