

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



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
$I_{T(AV)}$, $T_C = 75\text{ °C}$	158 A ⁽¹⁾
Package	SOT-227
Circuit	Single thyristor

Note

- ⁽¹⁾ 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 ² s
	60 Hz	8.8	
$I^2\sqrt{t}$		96.6	kA ² √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 ² 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	$I^2\sqrt{t}$ ⁽¹⁾	$t = 0.1\text{ ms to }10\text{ ms}$, no voltage reappplied $T_J = T_J$ maximum			96.6	kA ² √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}	$I_{TM} = 150\text{ A}$	$T_J = 25\text{ }^{\circ}\text{C}$		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 _{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 °C	Anode supply = 6 V resistive load	4.0	
		T _J = 25 °C		2.1	
		T _J = 125 °C		1.7	
Maximum gate current required 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 gate voltage that will not trigger	V _{GD}	T _J = 150 °C, 80 % V _{DRM} applied		0.2	V
Maximum gate current that will not trigger	I _{GD}	T _J = 150 °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/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	

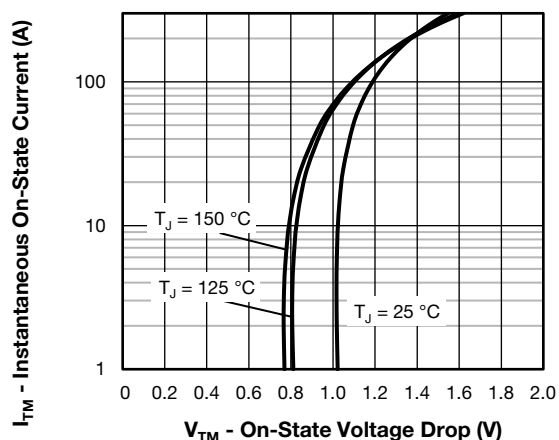
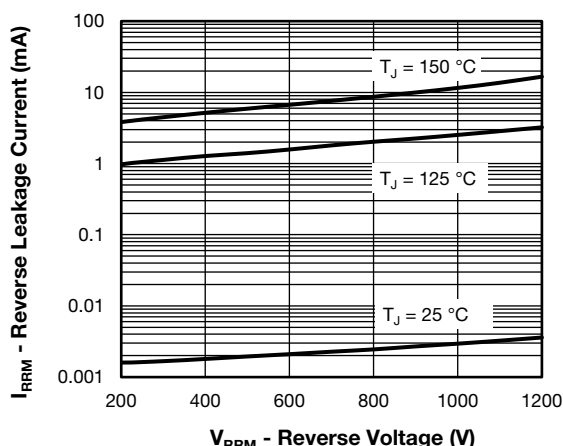
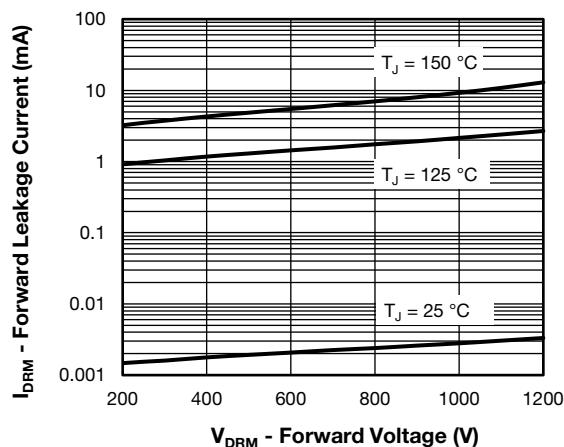
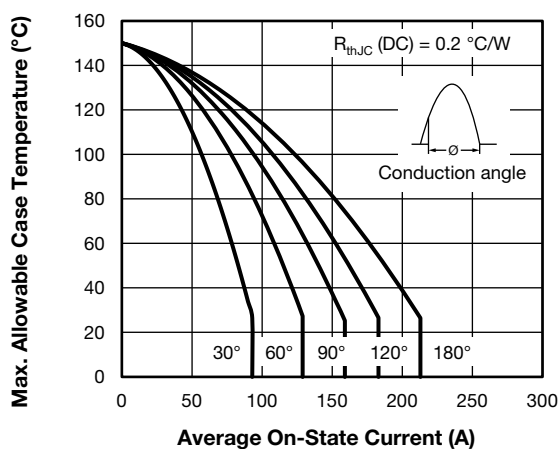
Fig. 1 - I_{TM} vs. V_{TM} (On-State Voltage Drop Characteristics)Fig. 3 - I_{RRM} vs. V_{RRM} (Reverse Leakage Current)Fig. 2 - I_{DRM} vs. V_{DRM} (Forward Leakage Current)

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

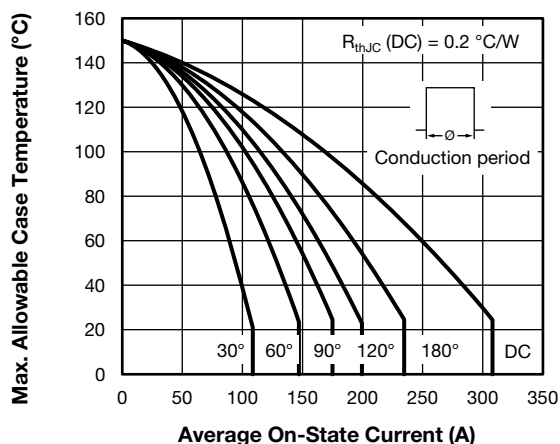


Fig. 5 - Maximum Allowable Case Temperature vs. Average On-State Current (Current Rating Characteristics)

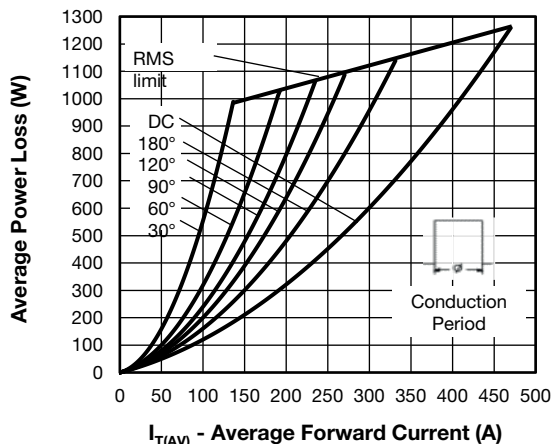


Fig. 7 - Average Power Loss vs. Average Forward Current (Forward Power Loss Characteristics)

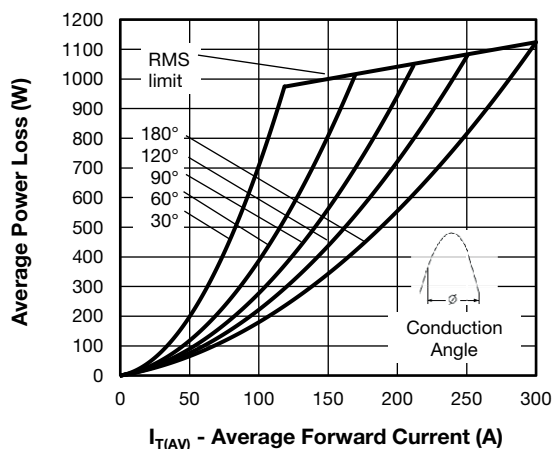


Fig. 6 - Average Power Loss vs. Average Forward Current (Forward Power Loss Characteristics)

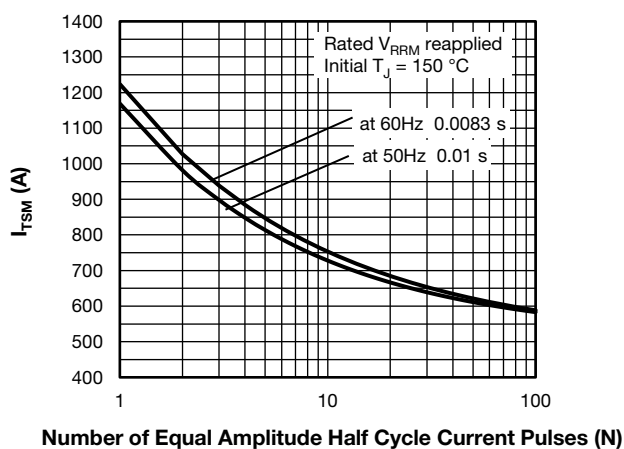


Fig. 8 - I_{TSM} vs. N (Non-Repetitive peak Forward Surge Current vs. Number Pulses)

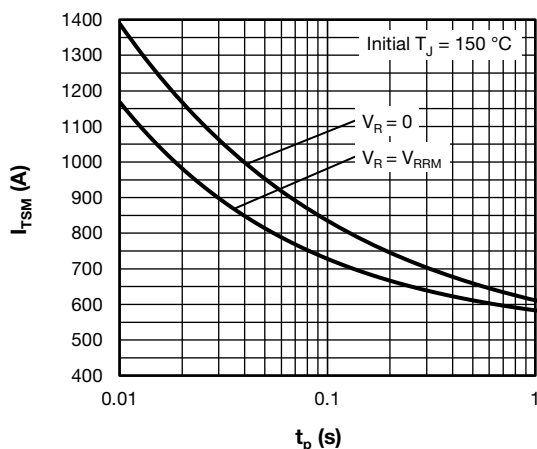


Fig. 9 - I_{TSM} vs. t_p (Non-Repetitive peak Forward Surge Current vs. Pulse Duration)

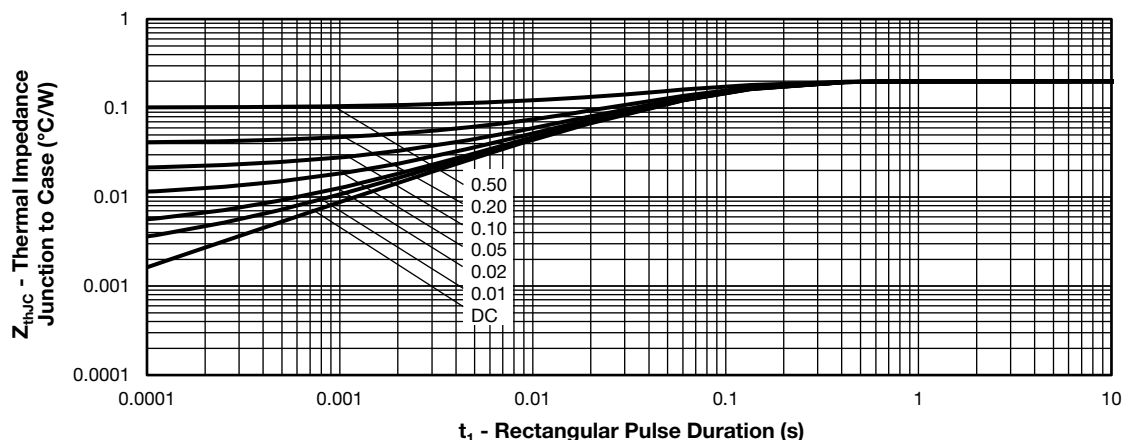
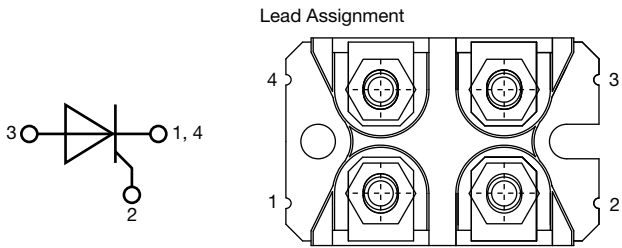


Fig. 10 - Z_{thJC} Thermal Impedance Junction to Case vs. t_1 Rectangular Pulse Duration (Maximum Thermal Impedance Z_{thJC} Characteristics)

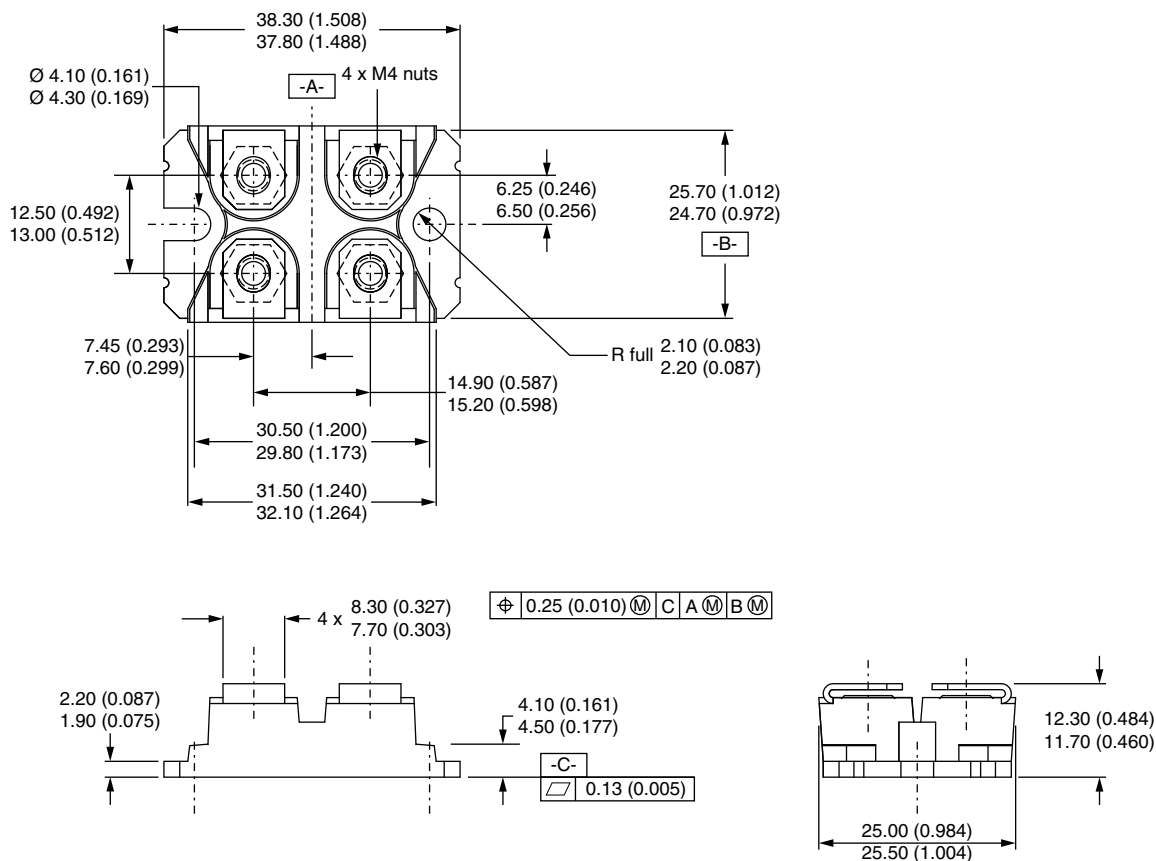
ORDERING INFORMATION TABLE

Device code	VS-	T	A	160	S	A	120
	①	②	③	④	⑤	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	
Dimensions	www.vishay.com/doc?95423
Packaging information	www.vishay.com/doc?95425
Application note	www.vishay.com/doc?95527

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

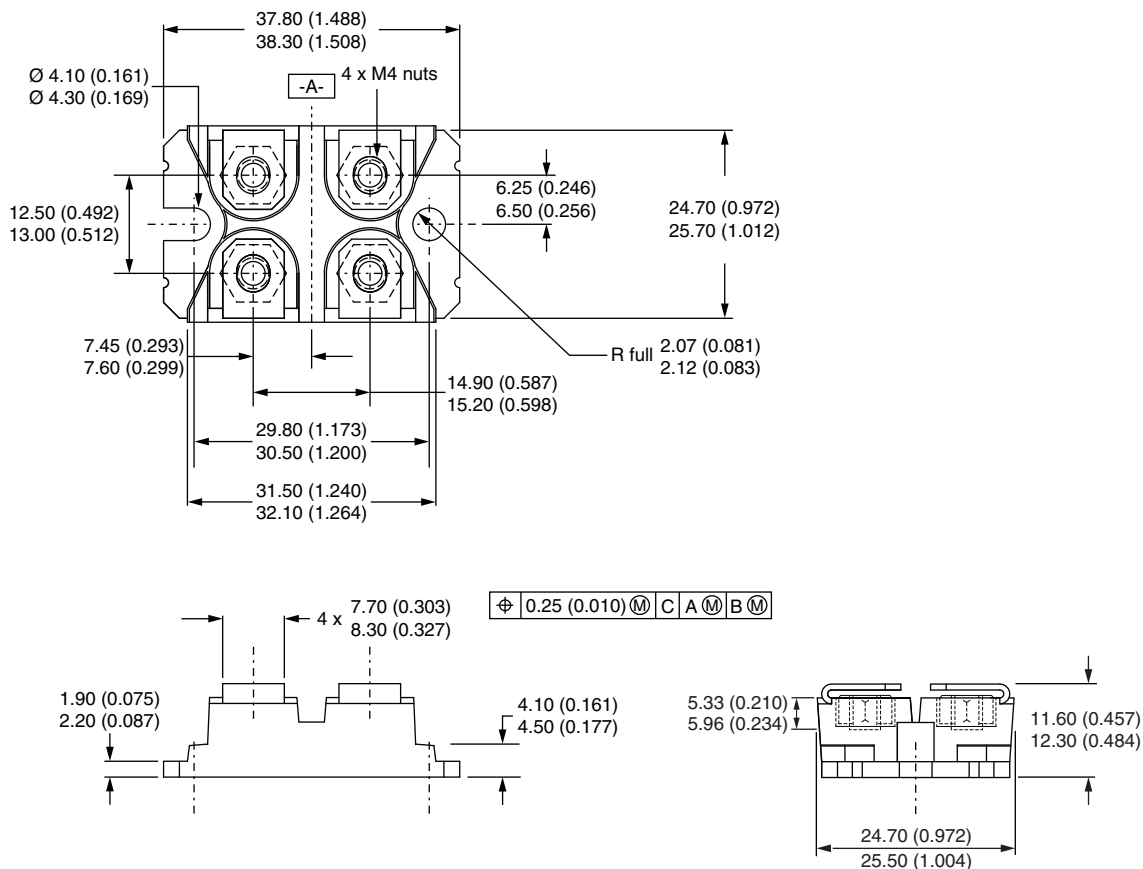


Note

- Controlling dimension: millimeter

SOT-227 Generation 2

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter



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