

SOT-227 AC Switch Full Controlled Thyristor Power Module, 60 A, 1600 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}	1600 V
V_{TM} (typical) at 60 A, 25 °C	1.2 V
$I_{T(AV)}$, $T_C = 110$ °C	60 A
T_{VJ}	150 °C
$T_{operative}$	125 °C
Package	SOT-227
Circuit	Two thyristors, back to back

MAJOR RATINGS AND CHARACTERISTICS (T_J max. 150 °C)			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{T(AV)}$	110 °C	60	A
I_{TSM}	50 Hz	850	
	60 Hz	890	
I^2t	50 Hz	3.6	kA ² s
	60 Hz	3.3	
$I^2\sqrt{t}$		36.1	kA ² √s
V_{RRM} / V_{DRM}		1600	V
T_{op}	Operating temperature	-40 to +125	°C
T_{Stg}		-40 to +150	
T_J	Virtual junction temperature	-40 to +150	

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
1600	1700	1600	25

**ON-STATE CONDUCTION**

PARAMETER	SYMBOL	TEST CONDITIONS			VALUES	UNITS
Maximum average on-state current (thyristors)	$I_{T(AV)}$	180° conduction, half sine wave, $T_C = 110\text{ °C}$			60	A
Maximum peak, one-cycle non-repetitive on-state	I_{TSM}	t = 10 ms	No voltage reappplied	Sinusoidal half wave, initial $T_J = 150\text{ °C}$	850	
		t = 8.3 ms			890	
		t = 10 ms	100 % V_{RRM} reappplied		715	
		t = 8.3 ms			748	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reappplied	Initial $T_J = 150\text{ °C}$	3.6	kA ² s
		t = 8.3 ms			3.3	
		t = 10 ms	100 % V_{RRM} reappplied		2.5	
		t = 8.3 ms			2.3	
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			36.1	kA ² √s
Maximum value or threshold voltage	$V_{T(TO)}^{(2)}$	Low level ⁽³⁾	$T_J = 150\text{ °C}$		0.89	V
		High level ⁽⁴⁾			1.02	
Maximum value of on-state slope resistance	$r_t^{(2)}$	Low level ⁽³⁾	$T_J = 150\text{ °C}$		9.17	mΩ
		High level ⁽⁴⁾			9.01	
Maximum peak on-state voltage	V_{TM}	$I_{TM} = 60\text{ A}$	$T_J = 25\text{ °C}$		1.50	V
			$T_J = 150\text{ °C}$		1.41	
Maximum non-repetitive rate of rise of turned on current	dI/dt	$T_J = 125\text{ °C}$, $I_T = 100\text{ A}$, $I_{gt} = 450\text{ mA}$, $V_{GT} = 2.5\text{ V}$			500	A/μs
Maximum holding current	I_H	$T_J = 25\text{ °C}$, anode supply = 6 V, resistive load, gate open circuit			200	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}	10 ms sine pulse, no voltage reapplied		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 gate voltage required to trigger	V _{GT}	T _J = -40 °C	Anode supply = 6 V resistive load	1.6	
		T _J = 25 °C		1.5	
		T _J = 150 °C		1	
Maximum gate current required to trigger	I _{GT}	T _J = -40 °C	Anode supply = 6 V resistive load	150	mA
		T _J = 25 °C		100	
		T _J = 150 °C		45	
Maximum gate voltage that will not trigger	V _{GD}	T _J = 150 °C, 67 % V _{DRM} applied		0.2	V
Maximum gate current that will not trigger	I _{GD}	T _J = 150 °C, 67 % V _{DRM} applied		5	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	25	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 0.67 V_{DRM}	1000	V/μs

**THERMAL AND MECHANICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum internal thermal resistance, junction to case per leg	R_{thJC}	DC operation	0.29	$^{\circ}\text{C}/\text{W}$
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	

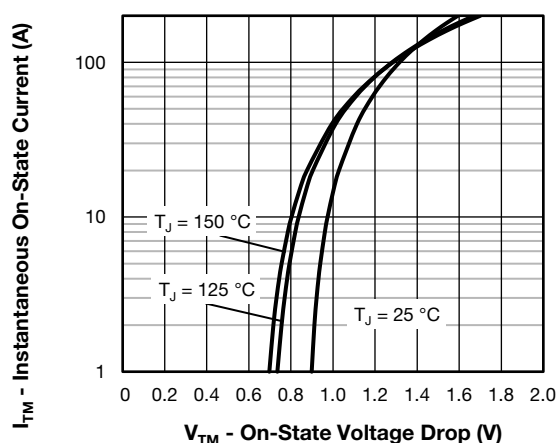


Fig. 1 - I_{TM} vs. V_{TM}
(On-State Voltage Drop Characteristics)

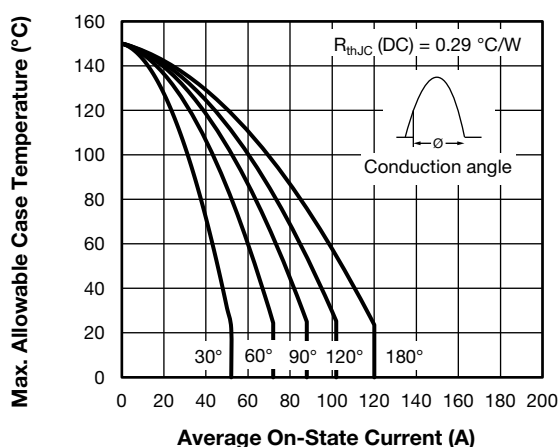


Fig. 3 - Maximum Allowable Case Temperature vs.
Average On-State Current
(Current Rating Characteristics)

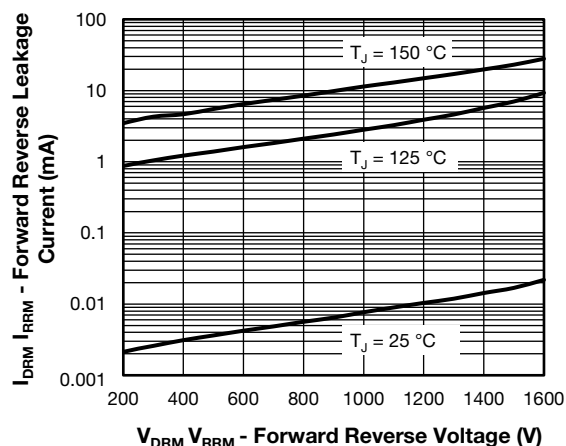


Fig. 2 - I_{DRM} I_{RRM} vs. V_{DRM} V_{RRM}
(Forward Reverse Leakage Current)

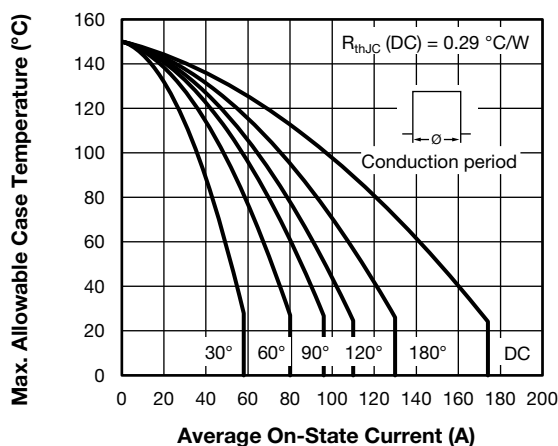


Fig. 4 - Maximum Allowable Case Temperature vs.
Average On-State Current
(Current Rating Characteristics)

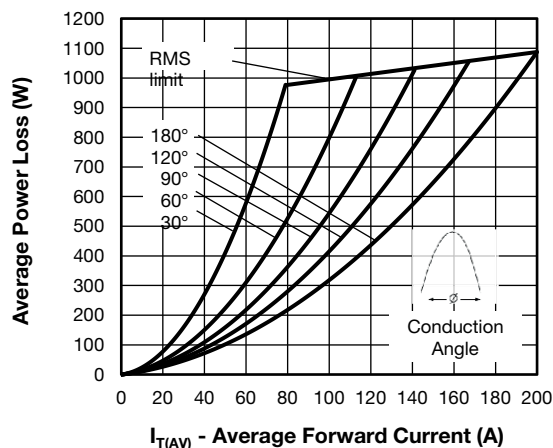


Fig. 5 - Average Power Loss vs. Average Forward Current
(Forward Power Loss Characteristics)

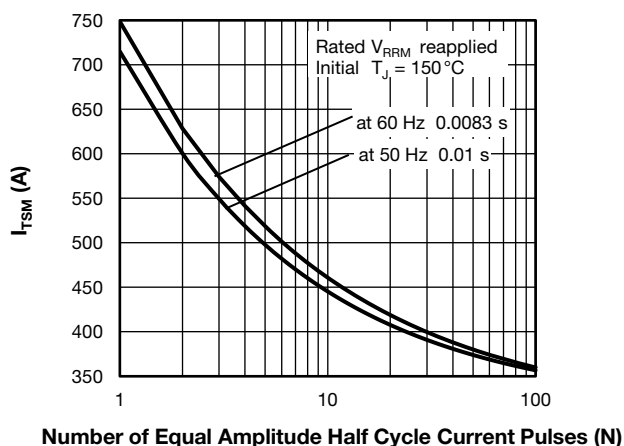


Fig. 7 - I_{TSM} vs. N
(Non-Repetitive Peak Forward Surge Current vs. Number Pulses)

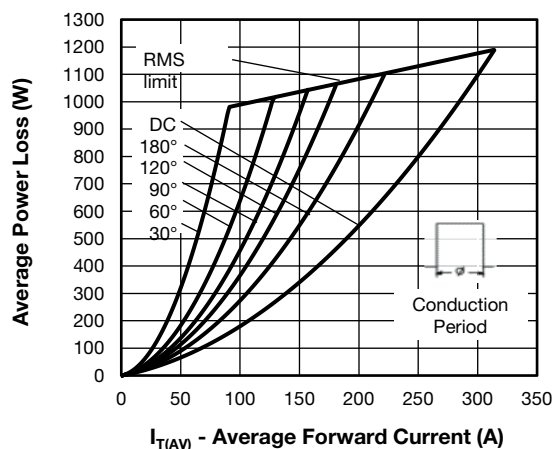


Fig. 6 - Average Power Loss vs. Average Forward Current
(Forward Power Loss Characteristics)

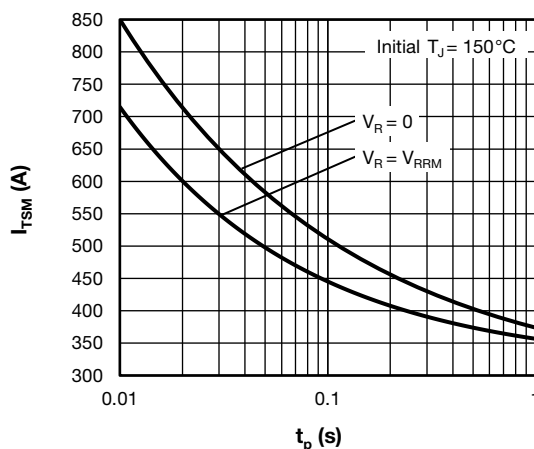


Fig. 8 - I_{TSM} vs. t_p
(Non-Repetitive Peak Forward Surge Current vs. Pulse Duration)

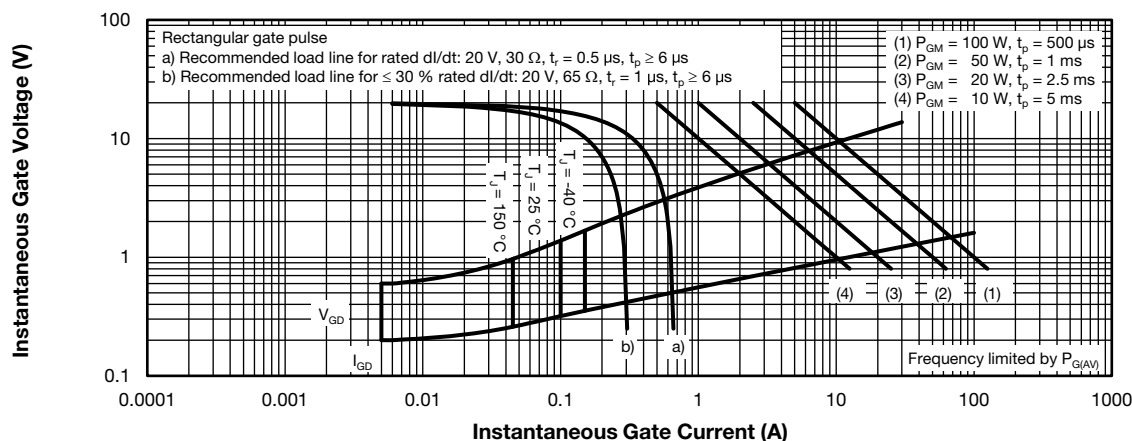


Fig. 9 - Gate Characteristics

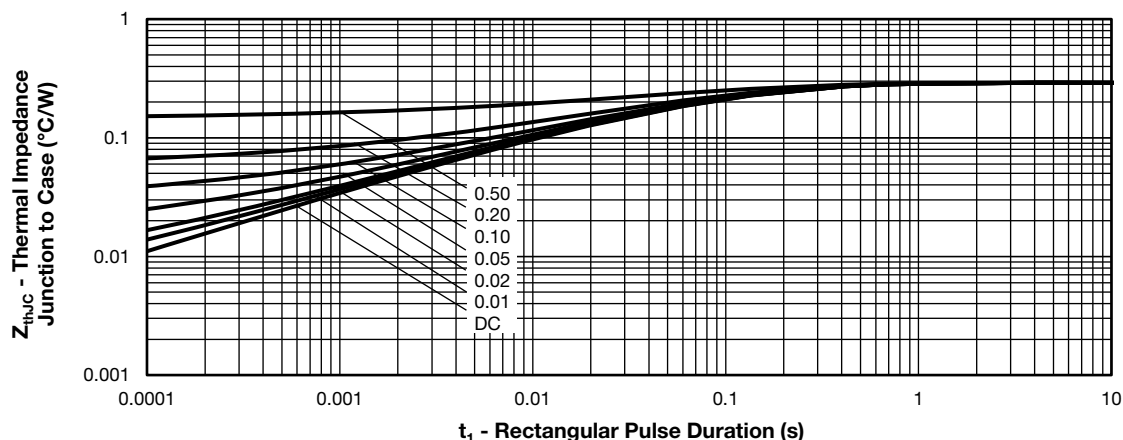
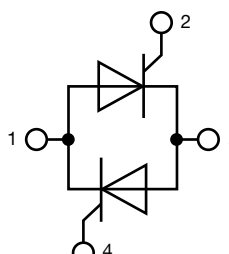
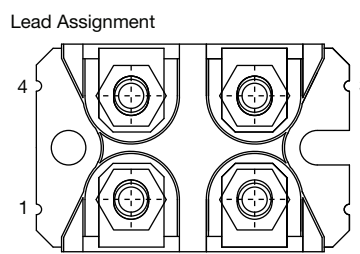


Fig. 10 - Z_{thJC} Thermal Impedance Junction to Case vs. t_1 Rectangular Pulse Duration
(Maximum Thermal Impedance Z_{thJC} Characteristics)

ORDERING INFORMATION TABLE

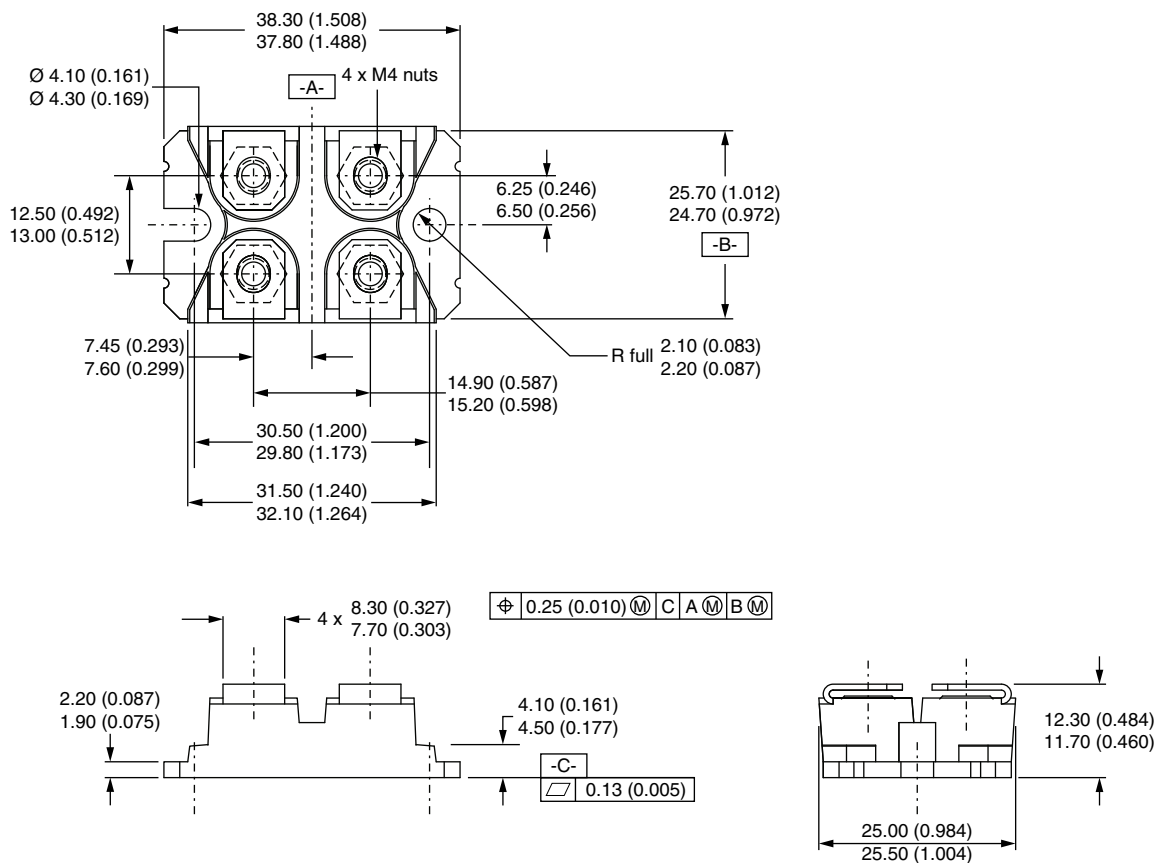
Device code	VS-	T	A	60	D	A	160
	1	2	3	4	5	6	7
	1	2	3	4	5	6	7
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-
	-	-	-	-	-	-	-

- 1 - Vishay Semiconductors product
- 2 - Thyristor dice
- 3 - Present silicon generation
- 4 - Rating current
- 5 - Two thyristors, back to back
- 6 - Isolated SOT-227
- 7 - Voltage rating 160 = 1600 V

CIRCUIT CONFIGURATION		
CIRCUIT DESCRIPTION	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Two thyristors, back to back	D	 

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**

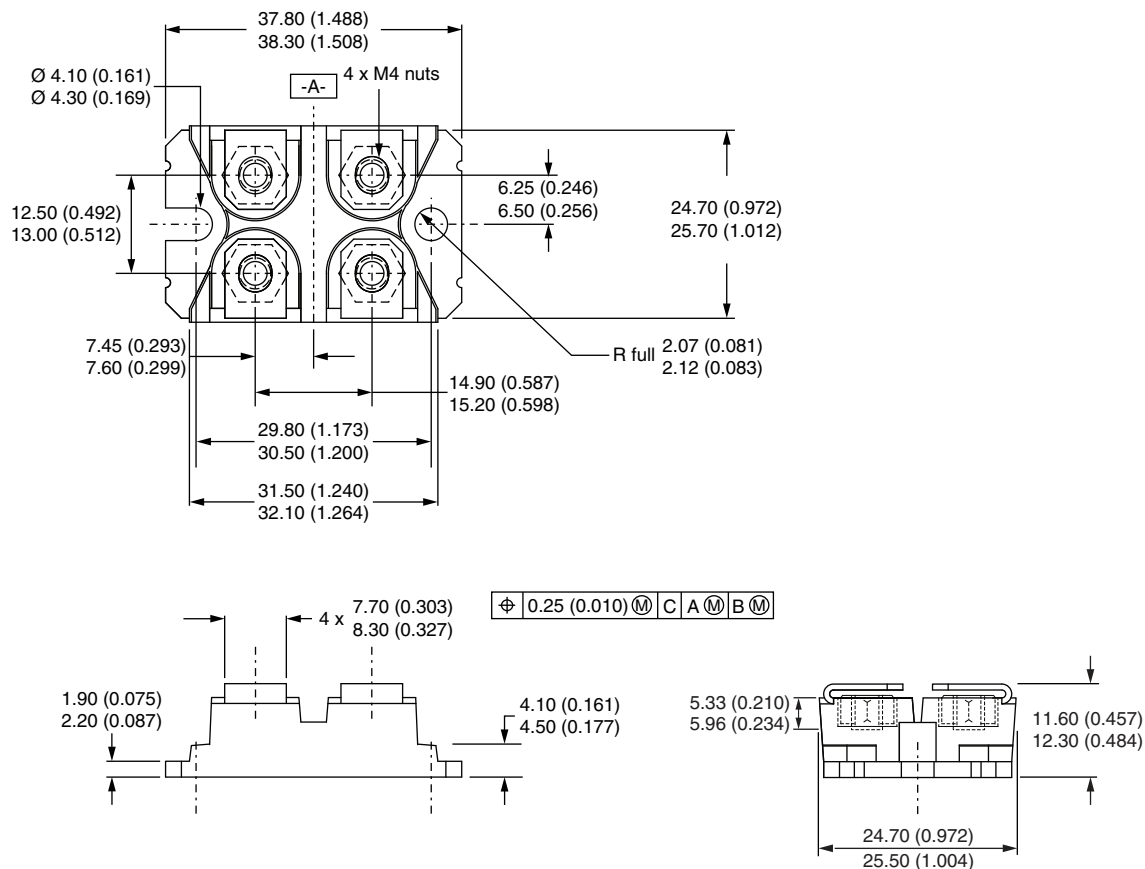


Note

- Controlling dimension: millimeter

SOT-227 Generation 2

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter



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