SOT-227 AC Switch Full Controlled Thyristor Power Module, 60 A, 1600 V

SOT-227

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

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

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^2s
	60 Hz	3.3	
$I^2\sqrt{t}$		36.1	$kA^2\sqrt{s}$
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 °C			60	A
Maximum peak, one-cycle non-repetitive on-state	I_{TSM}	t = 10 ms	No voltage reapplied	Sinusoidal half wave, initial T_J = 150 °C	850	
		t = 8.3 ms			890	
		t = 10 ms	100 % V_{RRM} reapplied		715	
		t = 8.3 ms			748	
Maximum I^2t for fusing	I^2t	t = 10 ms	No voltage reapplied	Initial T_J = 150 °C	3.6	kA^2s
		t = 8.3 ms			3.3	
		t = 10 ms	100 % V_{RRM} reapplied		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 reapplied T_J = T_J maximum			36.1	$kA^2\sqrt{s}$
Maximum value or threshold voltage	$V_{T(TO)}$ (2)	Low level (3)	T_J = 150 °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 °C		9.17	mΩ
		High level (4)			9.01	
Maximum peak on-state voltage	V_{TM}	I_{TM} = 60 A	T_J = 25 °C		1.50	V
			T_J = 150 °C		1.41	
Maximum non-repetitive rate of rise of turned on current	dI/dt	T_J = 125 °C, I_T = 100 A, I_{gt} = 450 mA, V_{GT} = 2.5 V			500	A/µs
Maximum holding current	I_H	T_J = 25 °C, anode supply = 6 V, resistive load, gate open circuit			200	mA
Maximum latching current	I_L	T_J = 25 °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 % x π x I_{AV} < I < π x I_{AV}

(4) I > π x 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 °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 °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	°C/W
Typical thermal resistance, case to heat sink per module	R_{thCS}	Mounting surface flat, smooth and greased	0.1	°C/W
Mounting torque ± 10 % — to heat sink		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
Mounting torque ± 10 % — 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	

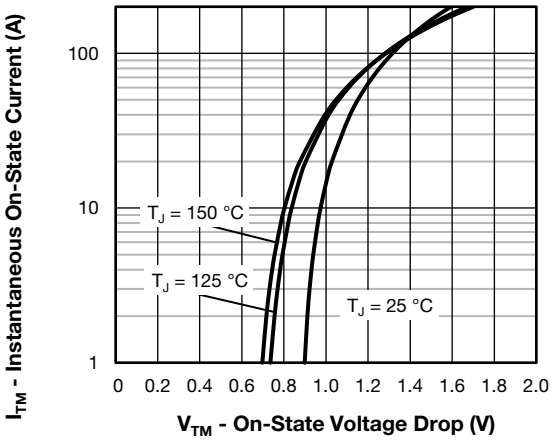


Fig. 1 - I_{TM} vs. V_{TM}
(On-State Voltage Drop Characteristics)

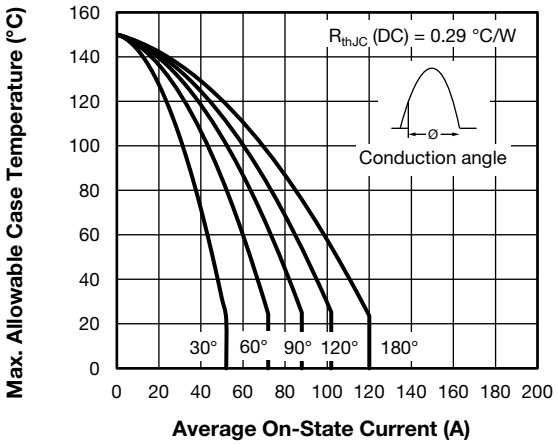


Fig. 3 - Maximum Allowable Case Temperature vs.
Average On-State Current
(Current Rating Characteristics)

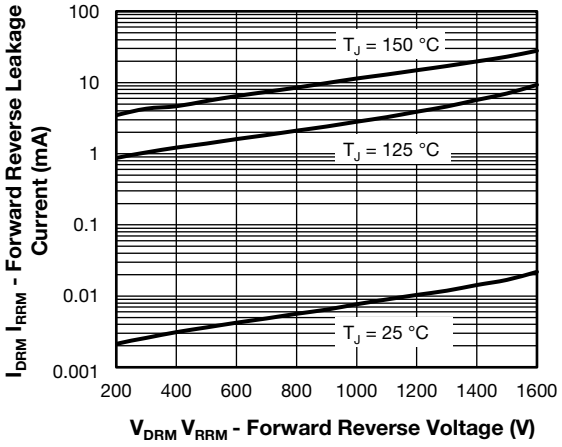


Fig. 2 - I_{DRM} I_{RRM} vs. V_{DRM} V_{RRM}
(Forward Reverse Leakage Current)

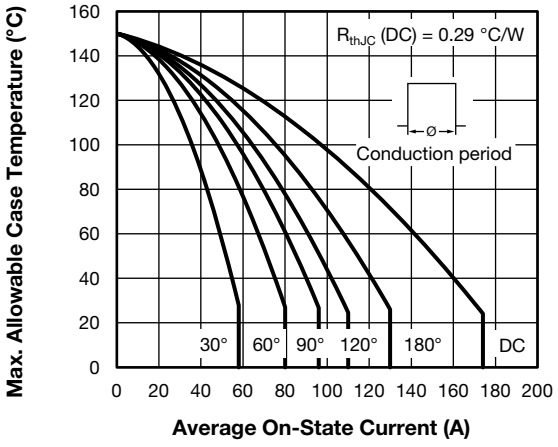


Fig. 4 - Maximum Allowable Case Temperature vs.
Average On-State Current
(Current Rating Characteristics)

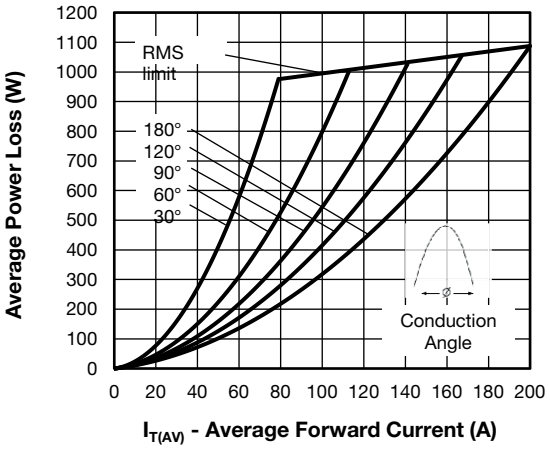


Fig. 5 - Average Power Loss vs. Average Forward Current
(Forward Power Loss Characteristics)

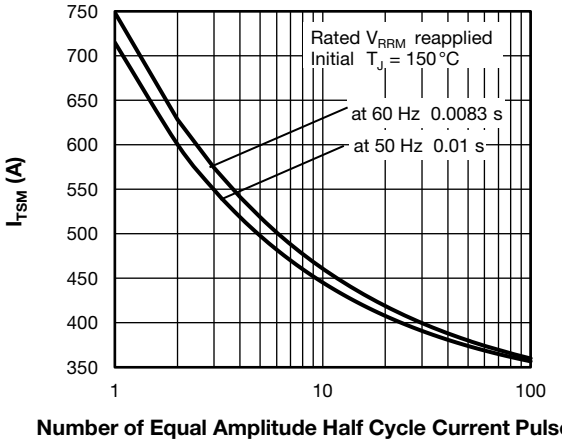


Fig. 7 - I_{TSM} vs. N
(Non-Repetitive Peak Forward Surge Current vs. Number Pulses)

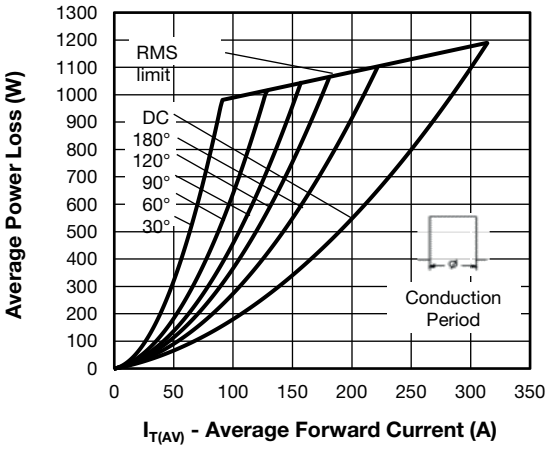


Fig. 6 - Average Power Loss vs. Average Forward Current
(Forward Power Loss Characteristics)

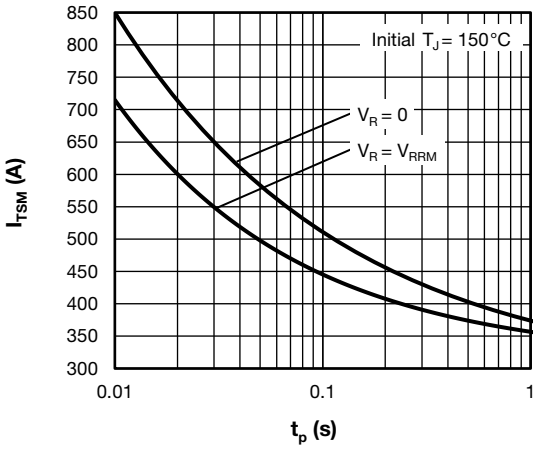


Fig. 8 - I_{TSM} vs. t_p
(Non-Repetitive Peak Forward Surge Current vs. Pulse Duration)

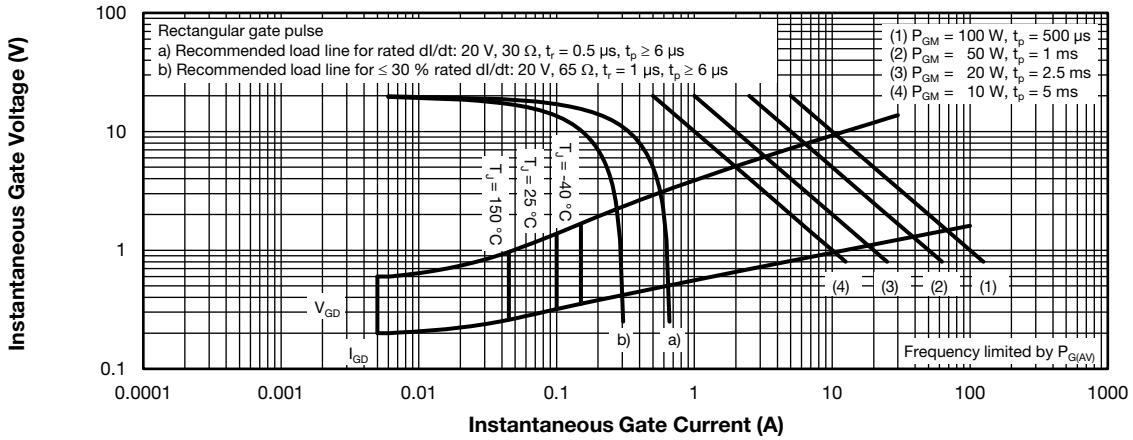


Fig. 9 - Gate Characteristics

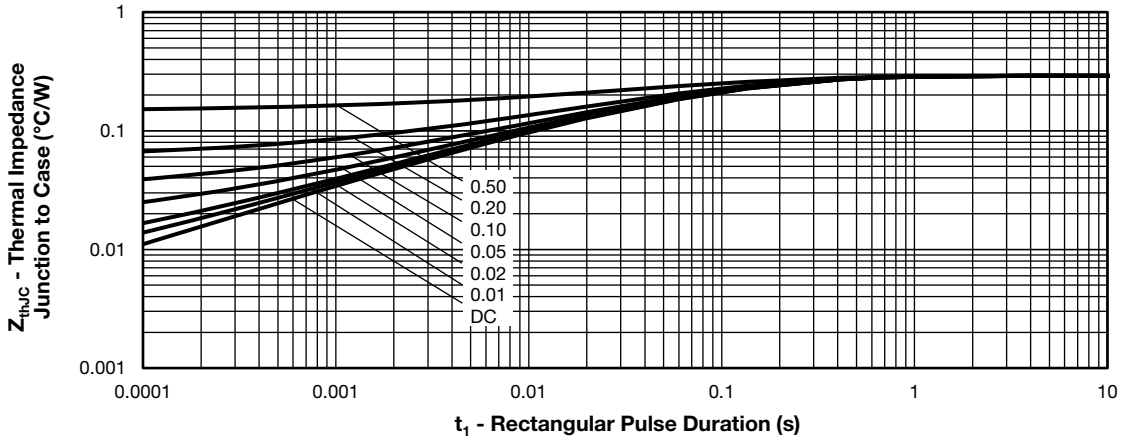


Fig. 10 - Z_{thJC} Thermal Impedance Junction to Case vs. t_1 Rectangular Pulse Duration
(Maximum Thermal Impedance Z_{thJC} Characteristics)

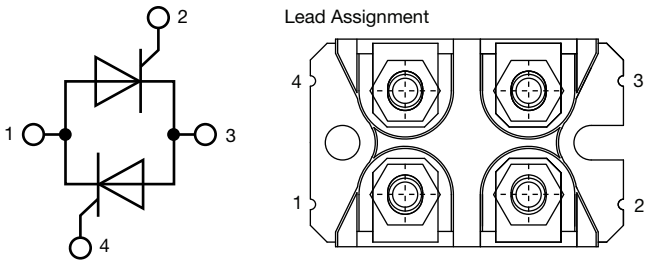
ORDERING INFORMATION TABLE

Device code

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

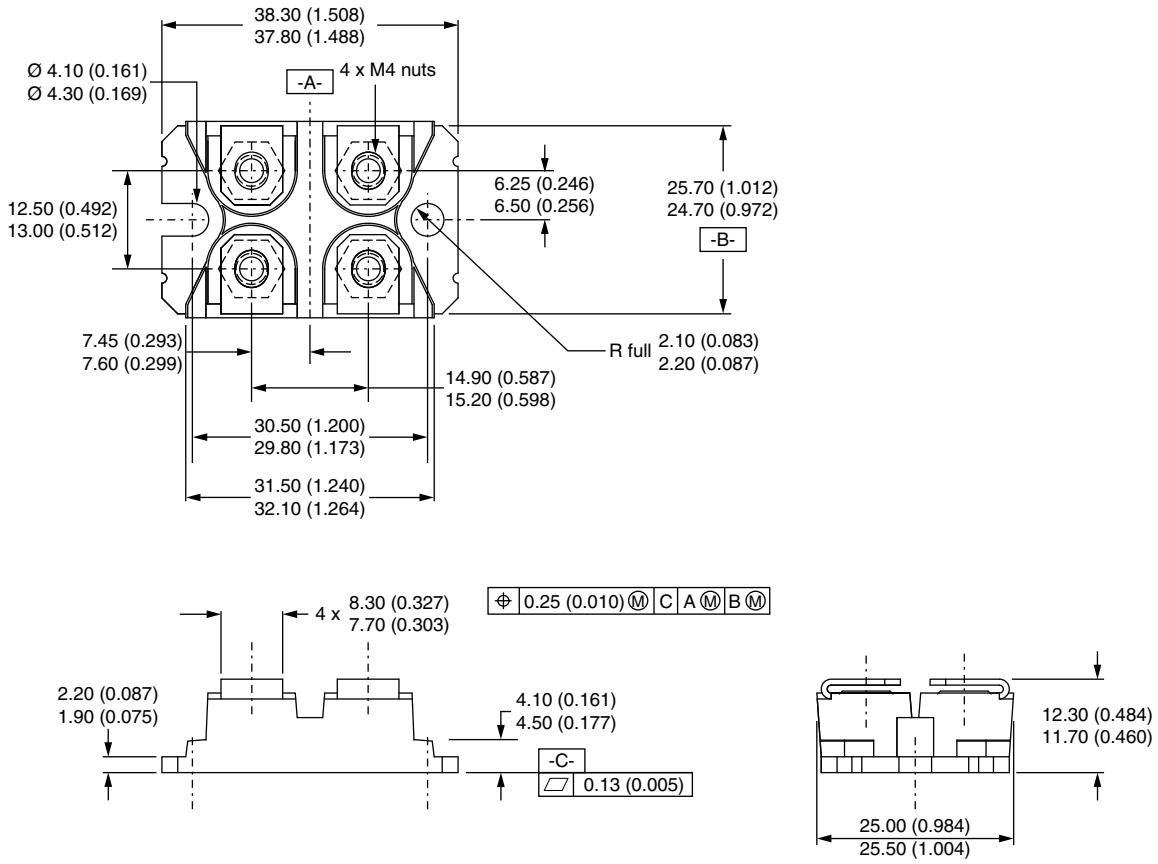
1	-	Vishay Semiconductors product
2	-	Thyristor dice
3	-	Present silicon generation
4	-	Rating current
5	-	Two thyristors, back to back
6	-	Isolated SOT-227
7	-	Voltage rating 160 = 1600 V

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**

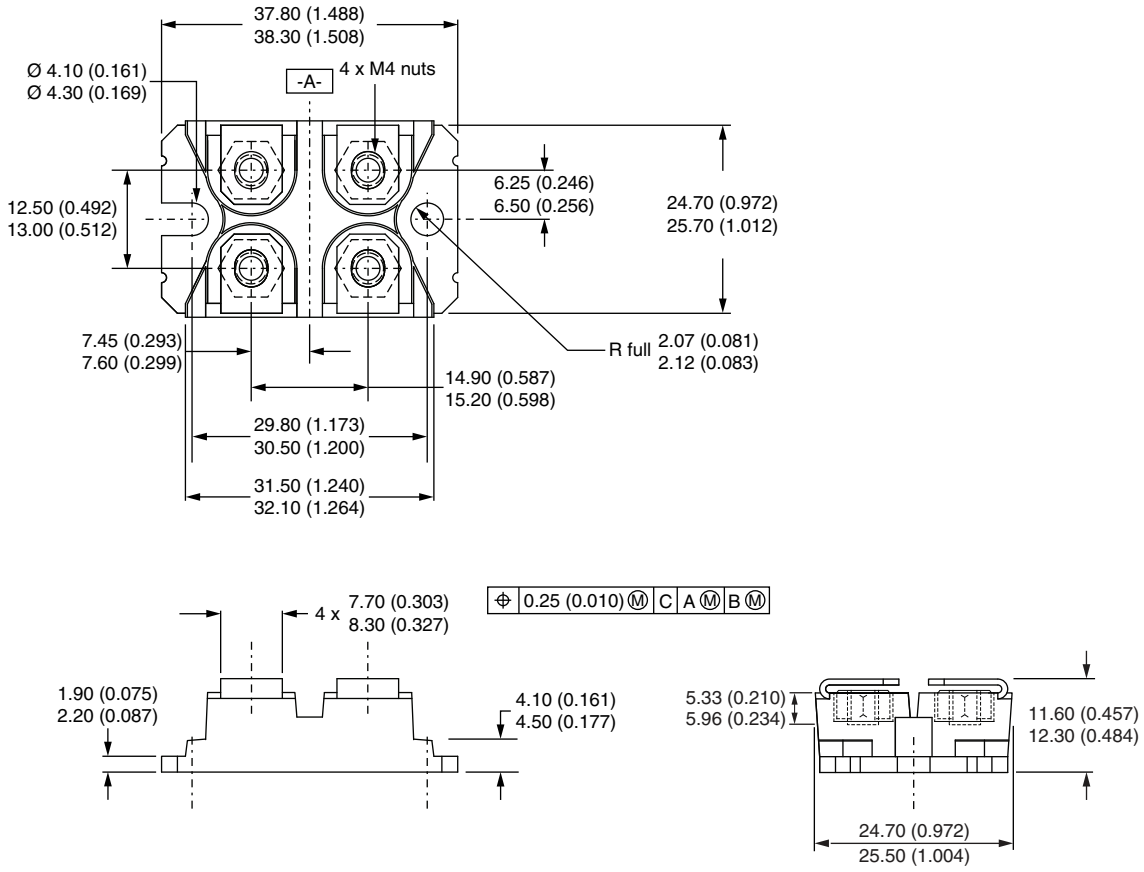


Note

- Controlling dimension: millimeter

SOT-227 Generation 2

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter

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