Insulated Gate Bipolar Transistor Ultralow $V_{CE(on)}$, 342 A

SOT-227

PRODUCT SUMMARY	
V_{CES}	600 V
$V_{CE(on)}$ (typical) at 200 A, 25 °C	1.33 V
I_C at T_C = 97 °C [(1)]	200 A

Note

(1) Maximum I_{RMS} current admitted 100 A to do not exceed the maximum temperature of terminals

FEATURES

- Standard: Optimized for minimum saturation voltage and low speed up to 5 kHz
- Lowest conduction losses available
- Fully isolated package (2500 V_{AC})
- Very low internal inductance (5 nH typical)
- Industry standard outline
- UL approved file E78996
- Compliant to RoHS directive 2002/95/EC
- Designed and qualified for industrial level

Pb-free

RoHS COMPLIANT

BENEFITS

- Designed for increased operating efficiency in power conversion: UPS, SMPS, TIG welding, induction heating
- Easy to assemble and parallel
- Direct mounting to heatsink
- Plug-in compatible with other SOT-227 packages

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter breakdown voltage	V_{CES}		600	V
Continuous collector current	I_C [(1)]	T_C = 25 °C	342	A
		T_C = 97 °C	200	
Pulsed collector current	I_{CM}	Repetitive rating; V_{GE} = 20 V, pulse width limited by maximum junction temperature See fig. 15	400	
Clamped Inductive load current	I_{LM}	V_{CC} = 80 % (V_{CES}), V_{GE} = 20 V, L = 10 µH, R_g = 2.0 Ω, See fig. 14	400	
Gate to emitter voltage	V_{GE}		± 20	V
Reverse voltage avalanche energy	E_{ARV}	Repetitive rating; pulse width limited by maximum junction temperature	155	mJ
RMS isolation voltage	V_{ISOL}	Any terminal to case, t = 1 minute	2500	V
Maximum power dissipation	P_D	T_C = 25 °C	781	W
		T_C = 100 °C	312	
Operating junction and storage temperature range	T_J, T_{Stg}		- 55 to + 150	°C
Mounting torque		6-32 or M3 screw	12 (1.3)	lbf · in (N · m)

Note

(1) Maximum I_{RMS} current admitted 100 A to do not exceed the maximum temperature of terminals

THERMAL AND MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TYP.	MAX.	UNITS
Junction to case	R_{thJC}	-	0.16	°C/W
Case to sink, flat, greased surface	R_{thCS}	0.05	-	
Weight of module		30	-	g

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Collector to emitter breakdown voltage	$V_{(BR)CES}$	V_{GE} = 0 V, I_C = 250 μA	600	-	-	V
Emitter to collector breakdown voltage	$V_{(BR)ECS}$ (1)	V_{GE} = 0 V, I_C = 1.0 A	18	-	-	
Temperature coeff. of breakdown voltage	$\Delta V_{(BR)CES}/\Delta T_J$	V_{GE} = 0 V, I_C = 1.0 mA	-	0.62	-	V/°C
Collector to emitter saturation voltage	$V_{CE(on)}$	I_C = 100 A; V_{GE} = 15 V, See fig. 2, 5	-	1.10	1.3	V
		I_C = 200 A	-	1.33	-	
		I_C = 100 A, T_J = 150 °C	-	1.02	-	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 250 μA	3.0	-	6.0	
Temperature coeff. of threshold voltage	$\Delta V_{GE(th)}/\Delta T_J$	V_{CE} = V_{GE}, I_C = 2 mA	-	- 10	-	mV/°C
Forward transconductance	g_{fe} (2)	V_{CE} = 100 V, I_C = 100 A	90	150	-	S
Zero gate voltage collector current	I_{CES}	V_{GE} = 0 V, V_{CE} = 600 V	-	-	1.0	mA
		V_{GE} = 0 V, V_{CE} = 10 V, T_J = 150 °C	-	-	10	
Gate to emitter leakage current	I_{GES}	V_{GE} = ± 20 V	-	-	± 250	nA

Notes

(1) Pulse width ≤ 80 μs; duty factor ≤ 0.1 %

(2) Pulse width 5.0 μs, single shot

SWITCHING CHARACTERISTICS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Total gate charge (turn-on)	Q_g	I_C = 100 A V_{CC} = 400 V V_{GE} = 15 V; See fig. 8	-	770	1200	nC
Gate emitter charge (turn-on)	Q_{ge}		-	100	150	
Gate collector charge (turn-on)	Q_{gc}		-	260	380	
Turn-on delay time	$t_{d(on)}$	T_J = 25 °C I_C = 100 A V_{CC} = 480 V V_{GE} = 15 V R_g = 2.0 Ω Energy losses include “tail” See fig. 9, 10, 13	-	78	-	ns
Rise time	t_r		-	56	-	
Turn-off delay time	$t_{d(off)}$		-	890	1300	
Fall time	t_f		-	390	580	
Turn-on switching loss	E_{on}		-	0.98	-	mJ
Turn-off switching loss	E_{off}		-	17.4	-	
Total switching loss	E_{ts}		-	18.4	25.5	
Turn-on delay time	$t_{d(on)}$	T_J = 150 °C I_C = 100 A, V_{CC} = 480 V V_{GE} = 15 V, R_g = 2.0 Ω Energy losses include “tail” See fig. 10, 11, 13	-	72	-	ns
Rise time	t_r		-	60	-	
Turn-off delay time	$t_{d(off)}$		-	1500	-	
Fall time	t_f		-	660	-	
Total switching loss	E_{ts}		-	35.7	-	mJ
Internal emitter inductance	L_E	Between lead, and center of the die contact	-	5.0	-	nH
Input capacitance	C_{ies}	V_{GE} = 0 V V_{CC} = 30 V f = 1.0 MHz; See fig. 7	-	16 250	-	pF
Output capacitance	C_{oes}		-	1040	-	
Reverse transfer capacitance	C_{res}		-	190	-	

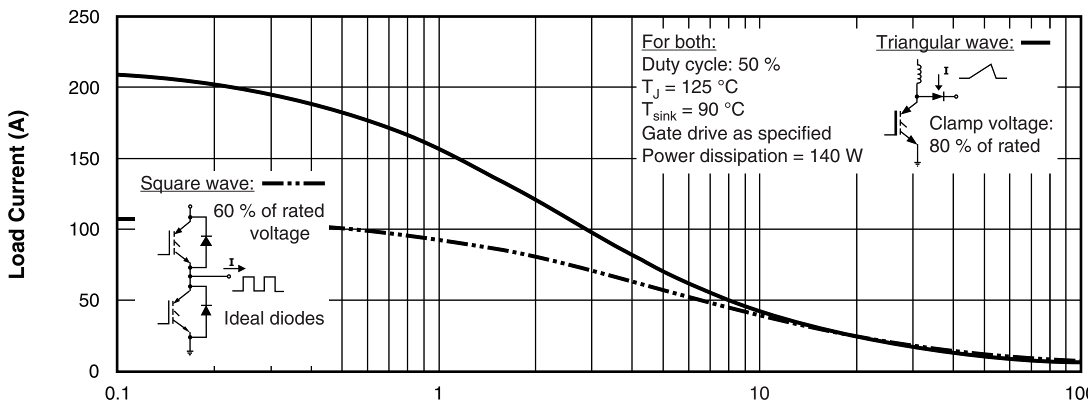


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of Fundamental)

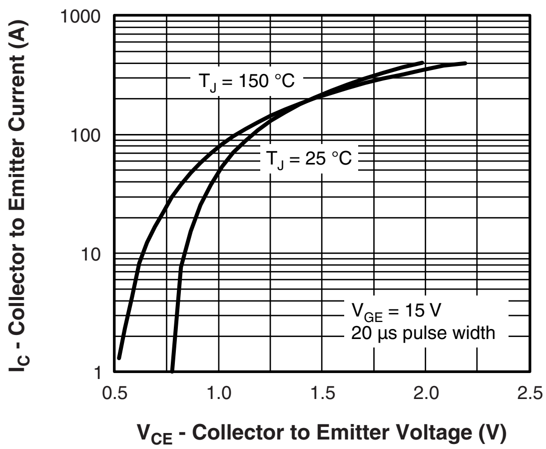


Fig. 2 - Typical Output Characteristics

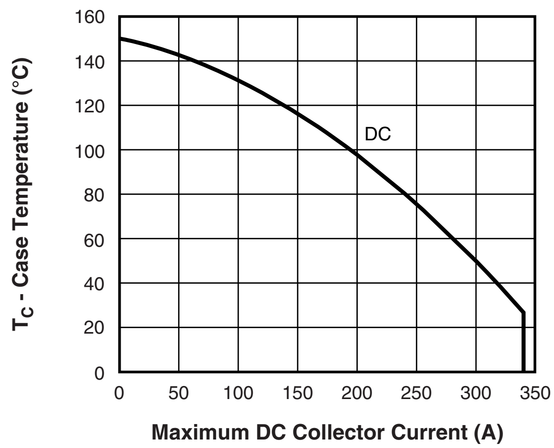


Fig. 4 - Maximum Collector Current vs. Case Temperature

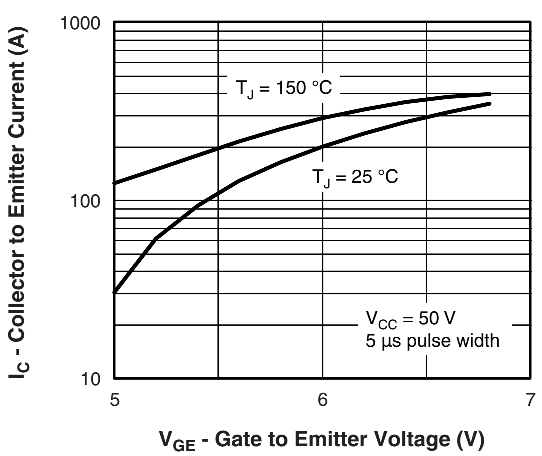


Fig. 3 - Typical Transfer Characteristics

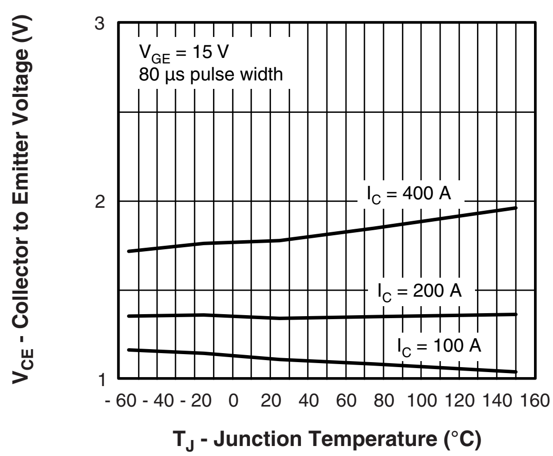


Fig. 5 - Typical Collector to Emitter Voltage vs.
Junction Temperature

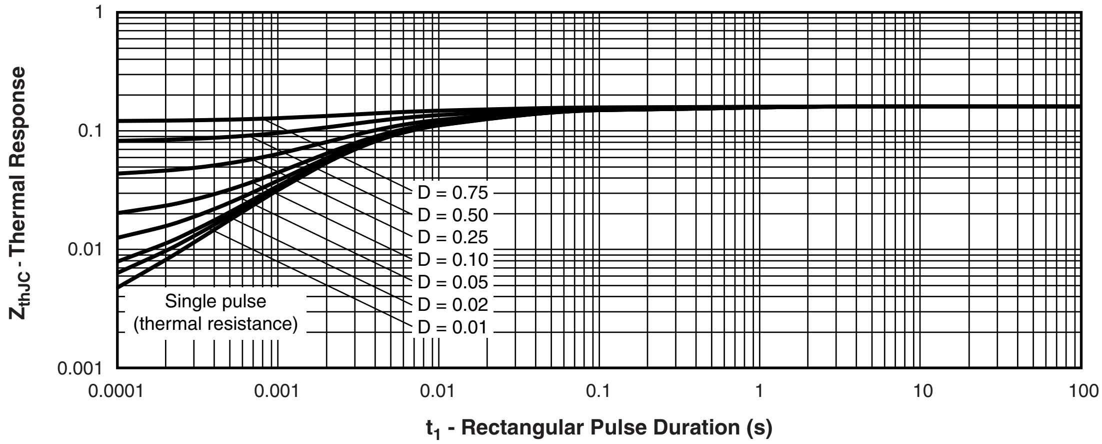


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction to Case

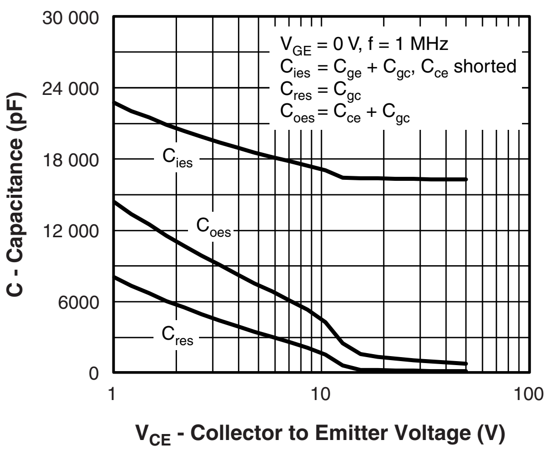


Fig. 7 - Typical Capacitance vs. Collector to Emitter Voltage

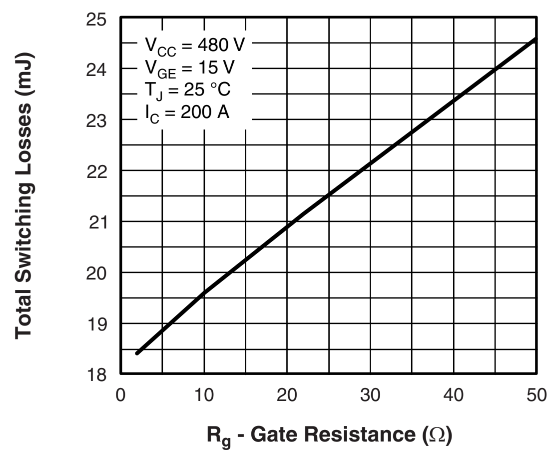


Fig. 9 - Typical Switching Losses vs. Gate Resistance

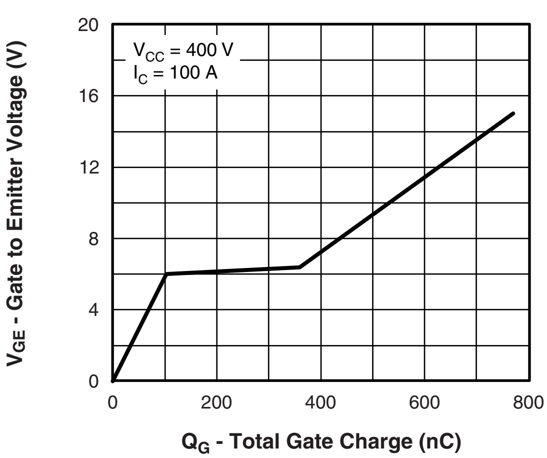


Fig. 8 - Typical Gate Charge vs. Gate to Emitter Voltage

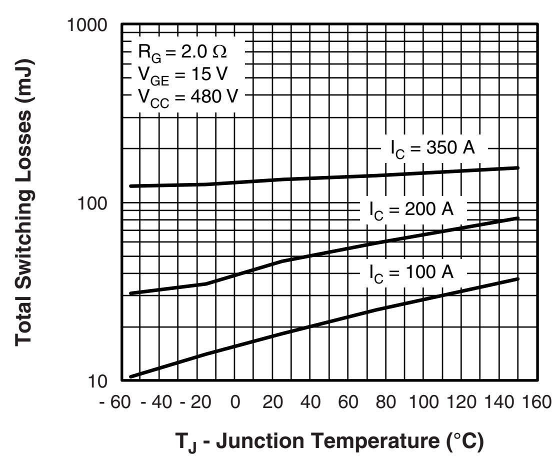


Fig. 10 - Typical Switching Losses vs. Junction Temperature

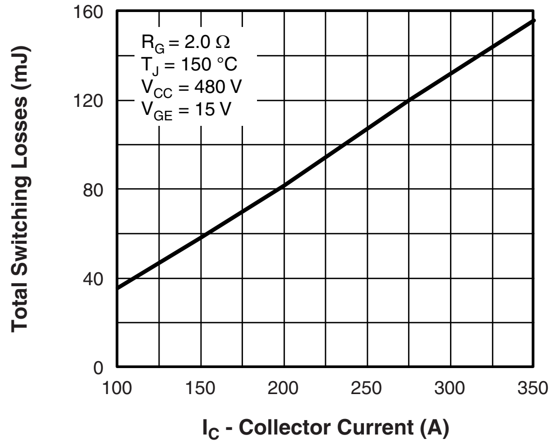


Fig. 11 - Typical Switching Losses vs. Collector Current

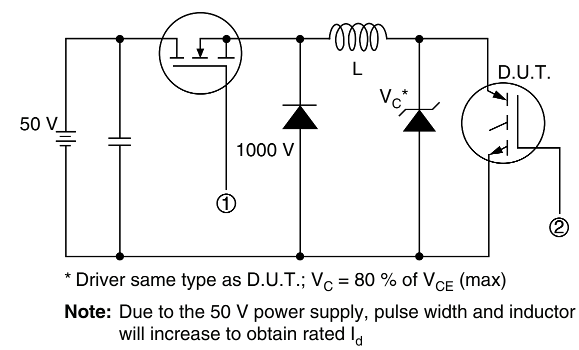


Fig. 13a - Clamped Inductive Load Test Circuit

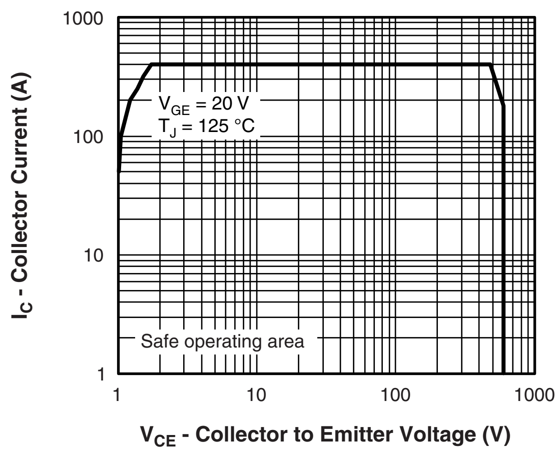


Fig. 12 - Turn-Off SOA

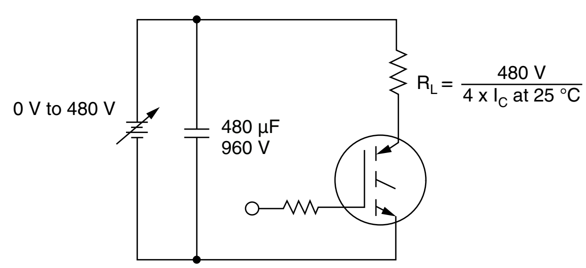


Fig. 13b - Pulsed Collector Current Test Circuit

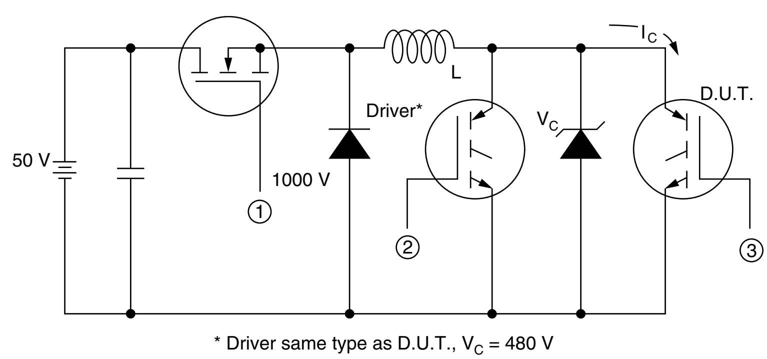


Fig. 14a - Switching Lost Test Circuit

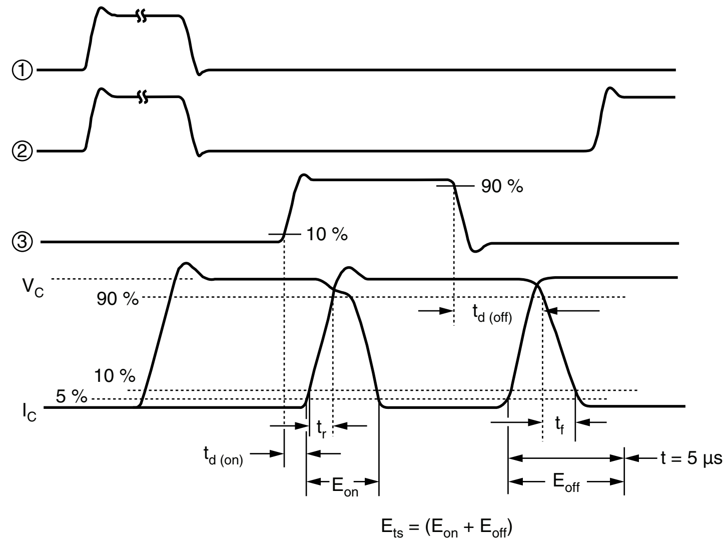


Fig. 14b - Switching Loss Waveforms

ORDERING INFORMATION TABLE

Device code

G	A	200	S	A	60	S	P
1	2	3	4	5	6	7	8

1 - Insulated Gate Bipolar Transistor (IGBT)

2 - Generation 4, IGBT silicon, DBC construction

3 - Current rating (200 = 200 A)

4 - Single switch, no diode

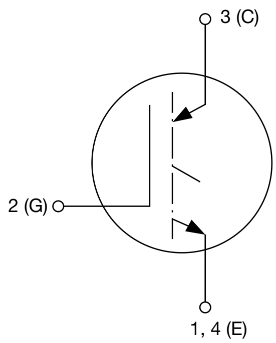
5 - SOT-227

6 - Voltage rating (60 = 600 V)

7 - Speed/type (S = Standard speed)

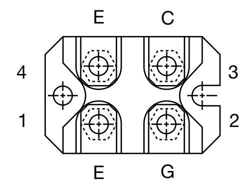
8 - • None = Standard production
• P = Lead (Pb)-free

CIRCUIT CONFIGURATION



N-channel

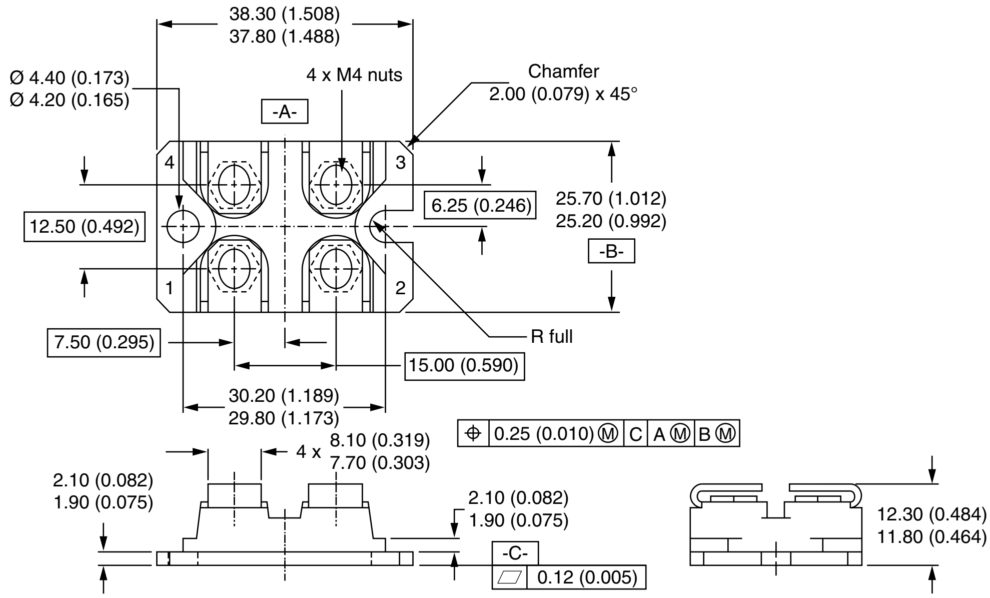
Lead assignment



LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95036
Packaging information	www.vishay.com/doc?95037

SOT-227

DIMENSIONS in millimeters (inches)



Notes

- Dimensioning and tolerancing per ANSI Y14.5M-1982
- Controlling dimension: millimeter

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