"Low Side Chopper" IGBT SOT-227, 650 V, 50 A



SOT-227

FEATURES

- Trench IGBT technology
- Higher switching frequency up to 150 kHz
- Square RBSOA
- Low $V_{CE(on)}$
- FRED Pt® Gen 4 clamping diode
- Fully isolated package
- Very low internal inductance (≤ 5 nH typical)
- Industry standard outline
- UL approved file E78996
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

BENEFITS

- Designed for increased operating efficiency in power conversion: UPS, SMPS, welding, induction heating
- Easy to assemble and parallel
- Direct mounting to heatsink
- Plug-in compatible with other SOT-227 packages
- Lower conduction losses and switching losses
- Low EMI, requires less snubbing

PRIMARY CHARACTERISTICS	
V_{CES}	650 V
I_C DC	50 A at 59 °C
$V_{CE(on)}$ typical at 50 A, 25 °C	1.70 V
I_F DC	50 A at 25 °C
Package	SOT-227
Circuit configuration	Low side chopper

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	V_{CES}		650	V
Continuous collector current	I_C	T_C = 25 °C	59	A
		T_C = 80 °C	44	
Pulsed collector current	I_{CM}	V_{GE} = 15 V	135	
Clamped inductive load current	I_{LM}		125	
Diode continuous forward current	I_F	T_C = 25 °C	50	
		T_C = 80 °C	38	
Single pulse forward current	I_{FSM}	10 ms sine or 6 ms rectangular pulse, T_J = 25 °C	234	
Gate to emitter voltage	V_{GE}		± 20	V
Power dissipation, IGBT	P_D	T_C = 25 °C	163	W
		T_C = 80 °C	103	
Power dissipation, diode	P_D	T_C = 25 °C	127	
		T_C = 80 °C	81	
RMS isolation voltage	V_{ISOL}	Any terminal to case, t = 1 min	2500	V

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ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Collector to emitter breakdown voltage	$V_{BR(CES)}$	V_{GE} = 0 V, I_C = 0.2 mA	650	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	V_{GE} = 15 V, I_C = 50 A	-	1.70	2.10	
		V_{GE} = 15 V, I_C = 50 A, T_J = 125 °C	-	2.01	-	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 0.5 mA	2.8	4.0	5.3	
Temperature coefficient of threshold voltage	$\Delta V_{GE(th)}/\Delta T_J$	V_{CE} = V_{GE}, I_C = 0.5 mA (25 °C to 125 °C)	-	-9.8	-	mV/°C
Transfer characteristics	V_{GE}	V_{CE} = 20 V, I_C = 50 A	-	6.4	-	V
Collector to emitter leakage current	I_{CES}	V_{GE} = 0 V, V_{CE} = 650 V	-	0.3	40	µA
		V_{GE} = 0 V, V_{CE} = 650 V, T_J = 125 °C	-	20	-	
Diode reverse breakdown voltage	V_{BR}	I_R = 0.5 mA	650	-	-	V
Diode forward voltage drop	V_{FM}	I_F = 50 A, V_{GE} = 0 V	-	1.96	3.01	V
		I_F = 50 A, V_{GE} = 0 V, T_J = 125 °C	-	1.64	-	
Diode reverse leakage current	I_{RM}	V_R = 650 V	-	0.3	80	µA
		T_J = 125 °C, V_R = 650 V	-	50	-	
Gate to emitter leakage current	I_{GES}	V_{GE} = ± 20 V	-	-	± 200	nA

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 = 50 A, V_{CC} = 520 V, V_{GE} = 15 V		-	123	-	nC
Gate to emitter charge (turn-on)	Q_{ge}			-	19	-	
Gate to collector charge (turn-on)	Q_{gc}			-	35	-	
Turn-on switching loss	E_{on}	I_C = 50 A, V_{CC} = 325 V, V_{GE} = 15 V, R_g = 4.7 Ω, L = 500 µH, T_J = 25 °C	Energy losses include tail and diode recovery	-	0.53	-	mJ
Turn-off switching loss	E_{off}			-	0.19	-	
Total switching loss	E_{tot}			-	0.72	-	
Turn-on delay time	$t_{d(on)}$			-	11	-	
Rise time	t_r			-	44	-	
Turn-off delay time	$t_{d(off)}$			-	80	-	
Fall time	t_f			-	13	-	
Turn-on switching loss	E_{on}	I_C = 50 A, V_{CC} = 325 V, V_{GE} = 15 V, R_g = 4.7 Ω, L = 500 µH, T_J = 125 °C		-	0.68	-	
Turn-off switching loss	E_{off}			-	0.27	-	
Total switching loss	E_{tot}			-	0.95	-	
Turn-on delay time	$t_{d(on)}$			-	45	-	ns
Rise time	t_r			-	13	-	
Turn-off delay time	$t_{d(off)}$			-	88	-	
Fall time	t_f			-	19	-	
Reverse bias safe operating area	RBSOA	T_J = 175°C, I_C = 125 A, R_g = 4.7 Ω, V_{GE} = 15 V to 0 V, V_{CC} = 325 V, V_P = 650 V		Fullsquare			
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 500 A/µs, V_R = 400 V		-	89	-	ns
Diode peak reverse current	I_{rr}			-	7.3	-	A
Diode recovery charge	Q_{rr}			-	294	-	nC
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 500 A/µs, V_R = 400 V, T_J = 125 °C		-	149	-	ns
Diode peak reverse current	I_{rr}			-	16	-	A
Diode recovery charge	Q_{rr}			-	1196	-	nC

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THERMAL AND MECHANICAL SPECIFICATIONS							
PARAMETER		SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Junction and storage temperature range		T_J, T_{Stg}		-40	-	175	°C
Junction to case	IGBT	R_{thJC}		-	-	0.92	°C/W
	Diode			-	-	1.18	
Case to heatsink		R_{thCS}	Flat, greased surface	-	0.05	-	
Weight				-	30	-	g
Mounting torque			Torque to terminal	-	-	1.1 (9.7)	Nm (lbf.in)
			Torque to heatsink	-	-	1.8 (15.9)	Nm (lbf.in)
Case style		SOT-227					

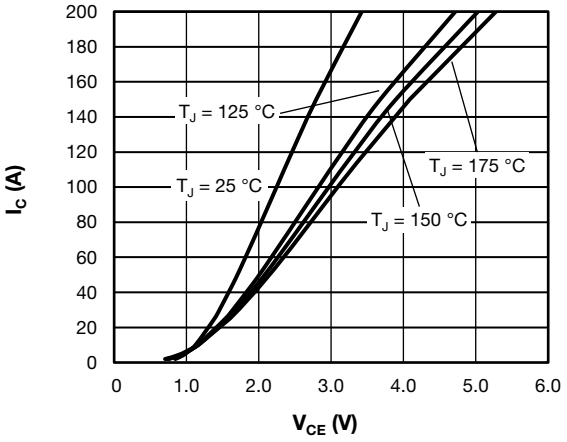


Fig. 1 - Typical Trench IGBT Output Characteristics, V_{GE} = 15 V

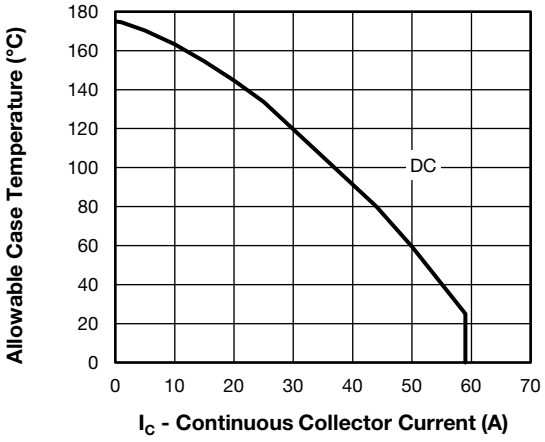


Fig. 3 - Maximum Trench IGBT Continuous Collector Current vs. Case Temperature

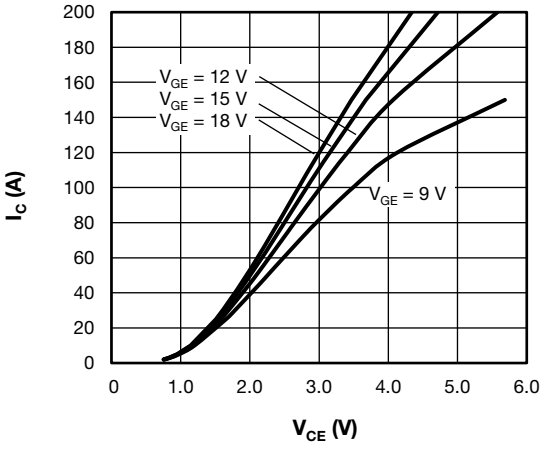


Fig. 2 - Typical Trench IGBT Output Characteristics, T_J = 125 °C

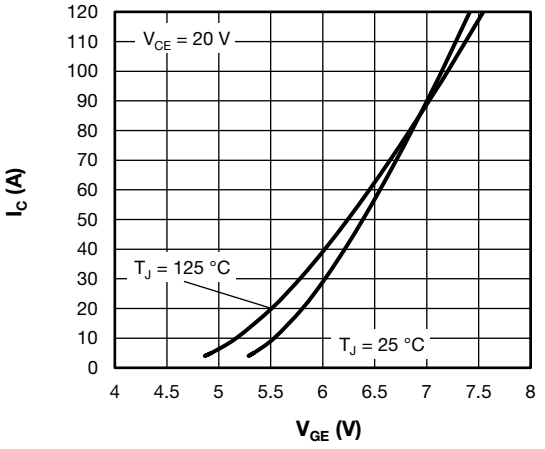


Fig. 4 - Typical Trench IGBT Transfer Characteristics

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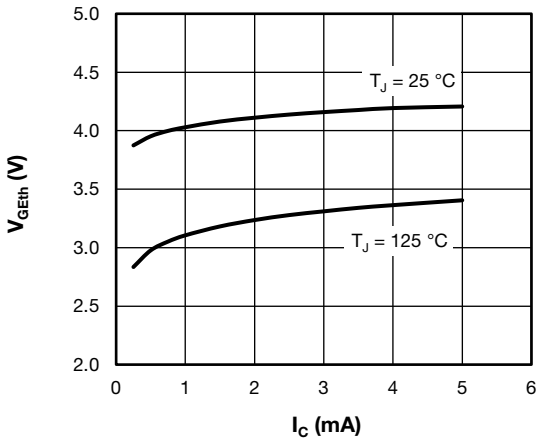


Fig. 5 - Typical Trench IGBT Gate Threshold Voltage

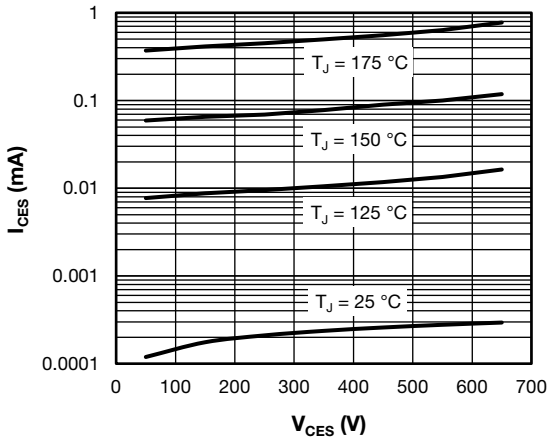


Fig. 6 - Typical Trench IGBT Zero Gate Voltage Collector Current

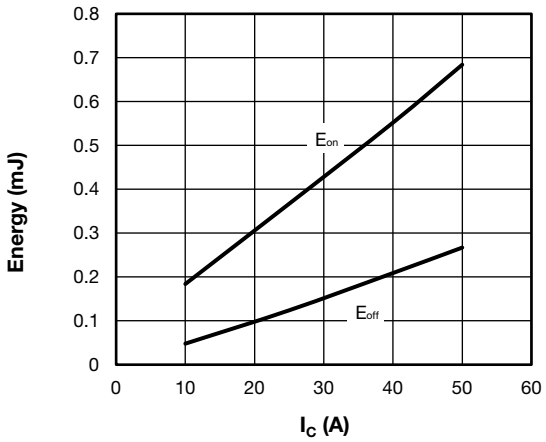


Fig. 7 - Typical Trench IGBT Energy Loss vs. I_C
(with Antiparallel Diode)
T_J = 125 °C, V_{CC} = 325 V, R_g = 4.7 Ω, V_{GE} = +15 V/-15 V, L = 500 µH

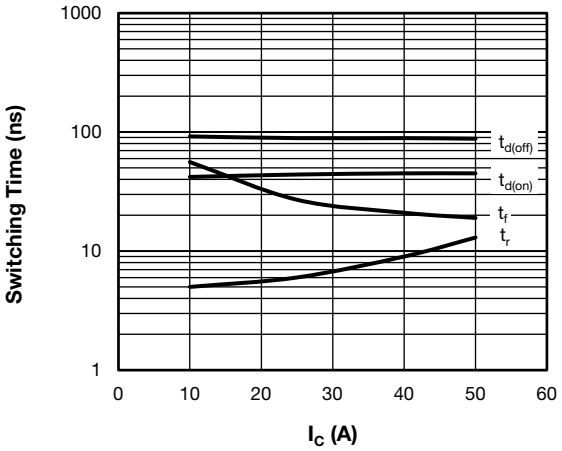


Fig. 8 - Typical Trench IGBT Switching Time vs. I_C
(with Antiparallel Diode)
T_J = 125 °C, V_{CC} = 325 V, R_g = 4.7 Ω, V_{GE} = +15 V/-15 V, L = 500 µH

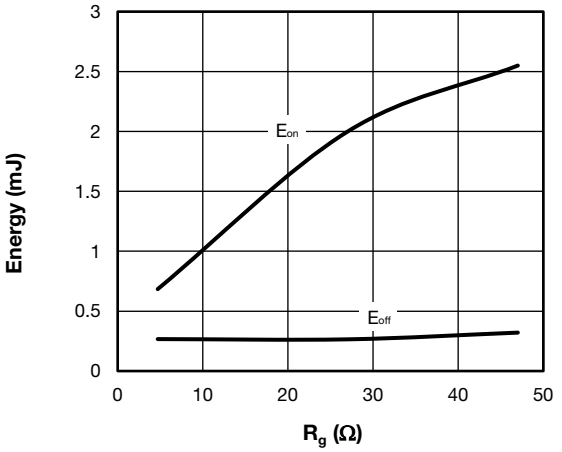


Fig. 9 - Typical Trench IGBT Energy Loss vs. R_g
(with Antiparallel Diode)
T_J = 125 °C, V_{CC} = 325 V, I_C = 50 A, V_{GE} = +15 V/-15 V, L = 500 µH

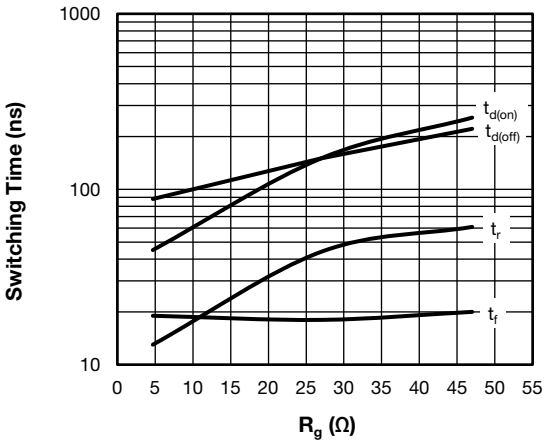


Fig. 10 - Typical Trench IGBT Switching Time vs. R_g
(with Antiparallel Diode)
T_J = 125 °C, V_{CC} = 325 V, I_C = 50 A, V_{GE} = +15 V/-15 V, L = 500 µH

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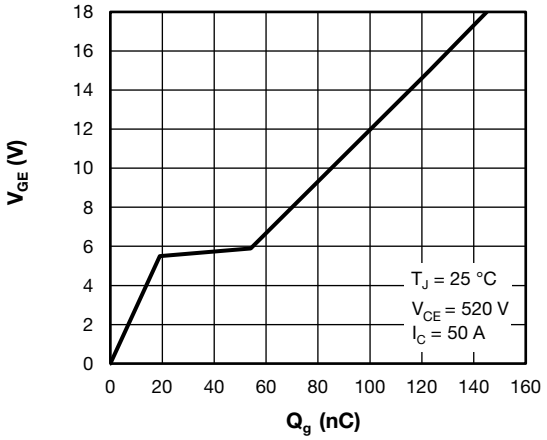


Fig. 11 - Typical Trench IGBT Gate Charge vs. Gate to Emitter Voltage

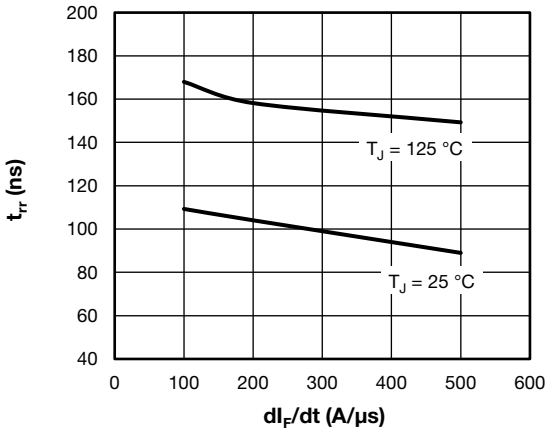


Fig. 14 - Typical Diode Reverse Recovery Time vs. dI_F/dt
I_F = 50 A, V_{CC} = 400 V

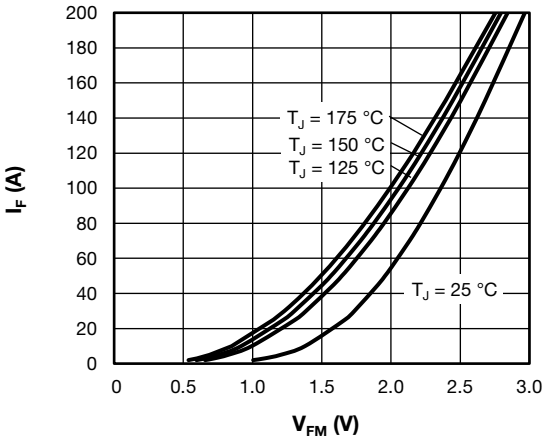


Fig. 12 - Typical Diode Forward Characteristics

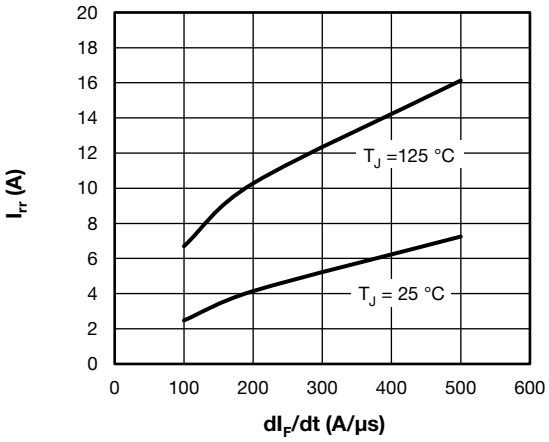


Fig. 15 - Typical Diode Reverse Recovery Current vs. dI_F/dt
I_F = 50 A, V_{CC} = 400 V

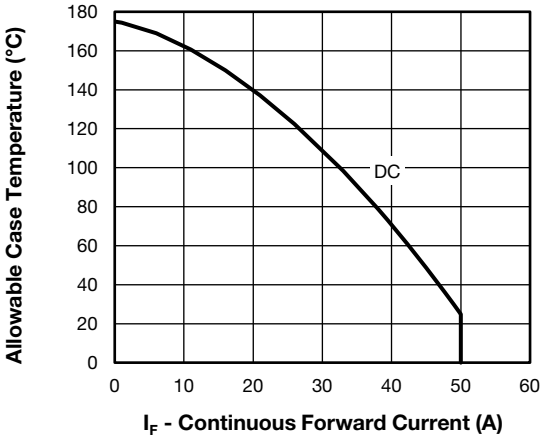


Fig. 13 - Maximum Diode Continuous Forward Current vs. Case Temperature

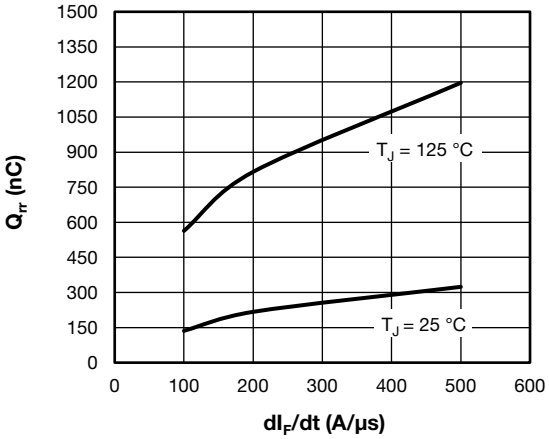


Fig. 16 - Typical Diode Reverse Recovery Charge vs. dI_F/dt
I_F = 50 A, V_{CC} = 400 V

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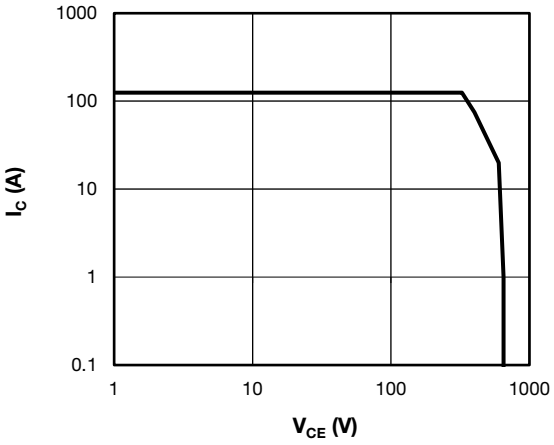


Fig. 17 - Trench IGBT Reverse BIAS SOA
T_J = 175 °C, I_C = 125 A, R_g = 4.7 Ω, V_{GE} = +15 V/0 V, V_{CC} = 325 V, V_p = 650 V

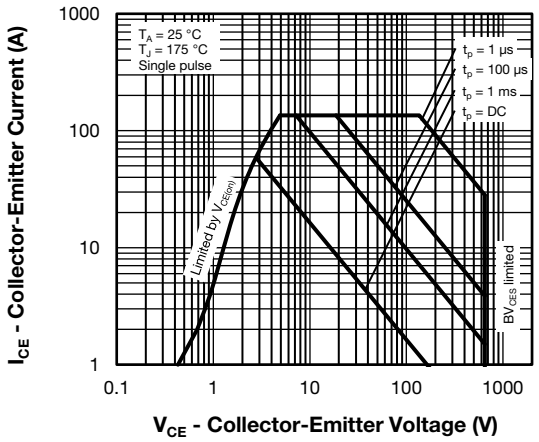


Fig. 18 - Trench IGBT Safe Operating Area

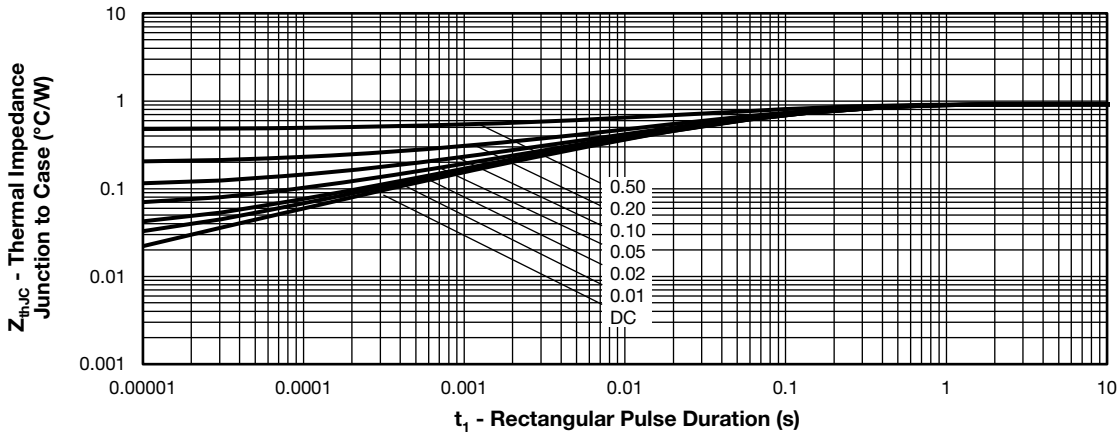


Fig. 19 - Maximum Trench IGBT Thermal Impedance Z_{thJC} Characteristics

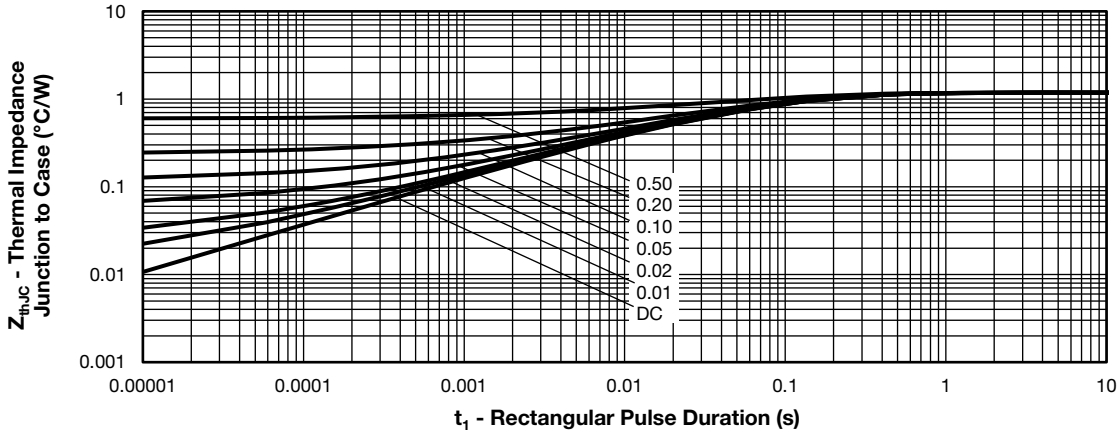


Fig. 20 - Maximum Diode Thermal Impedance Z_{thJC} Characteristics

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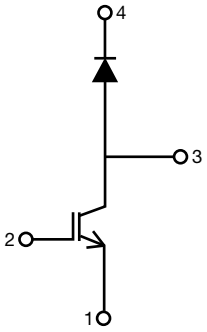
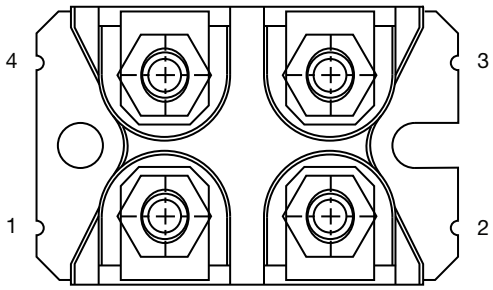
ORDERING INFORMATION TABLE

Device code

VS-	G	T	50	L	A	65	U	F
1	2	3	4	5	6	7	8	9

1 - Vishay Semiconductors product
2 - Insulated gate bipolar transistor (IGBT)
3 - T = Trench IGBT technology
4 - Current rating (50 = 50 A)
5 - Circuit configuration (L = low side chopper)
6 - Package indicator (A = SOT-227)
7 - Voltage rating (65 = 650 V)
8 - Speed/type (U = ultrafast IGBT)
9 - Diode (F = FRED Pt® diode)

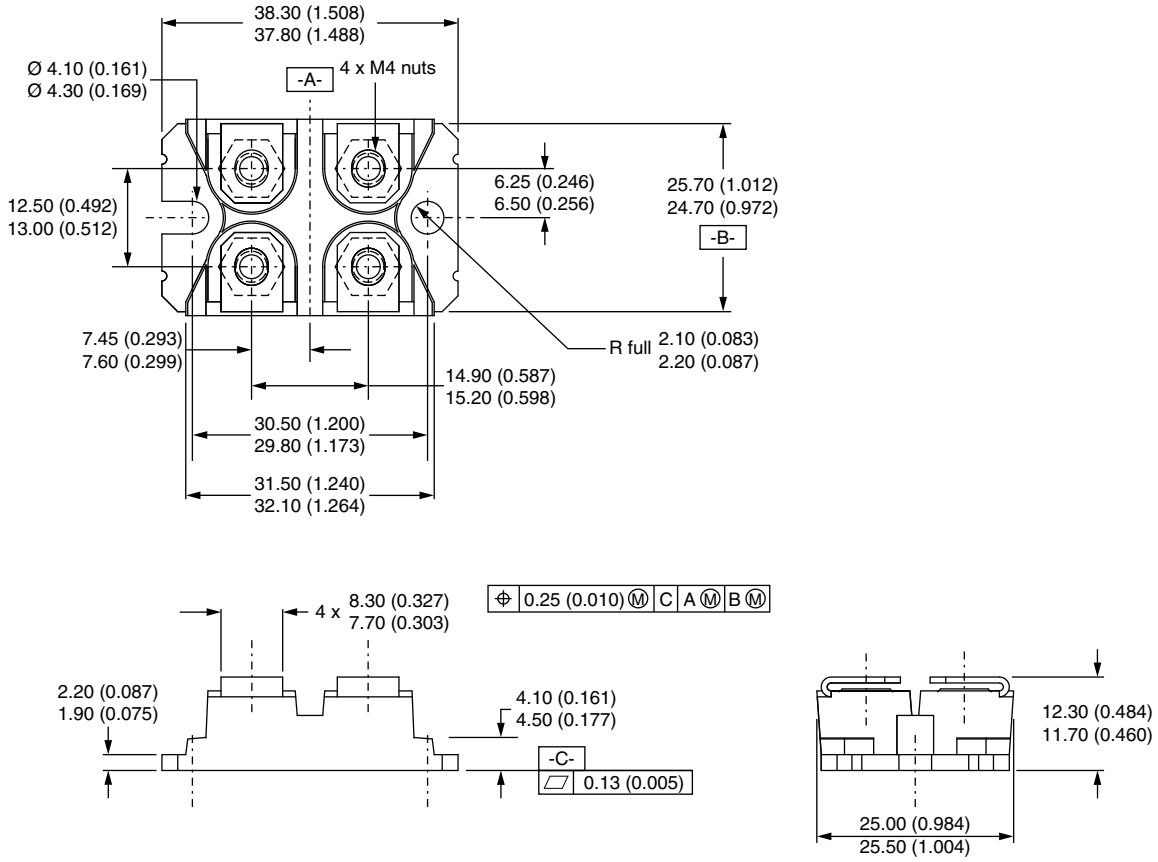
CIRCUIT CONFIGURATION

CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING	
Low side chopper	L		Lead Assignment 

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95423
Packaging information	www.vishay.com/doc?95425

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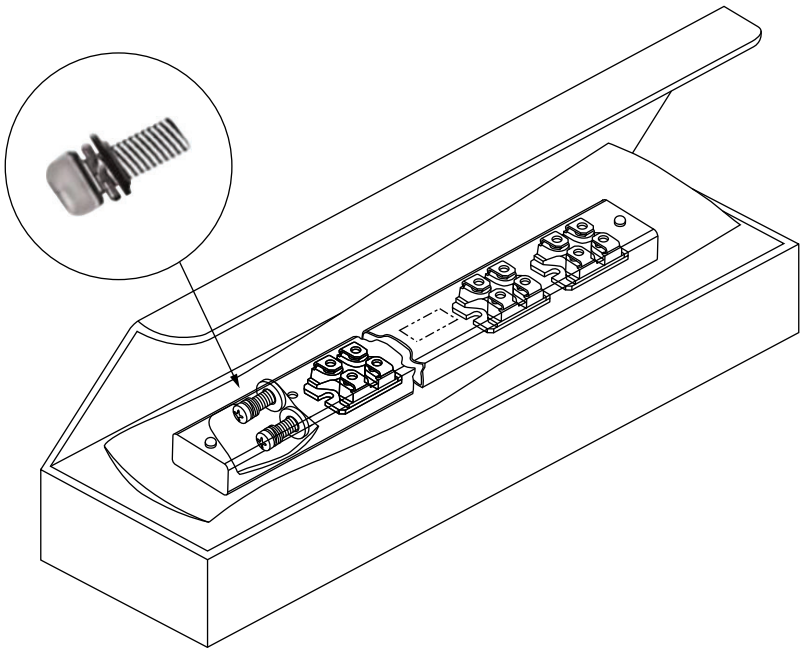
DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter

PACKAGING INFORMATION

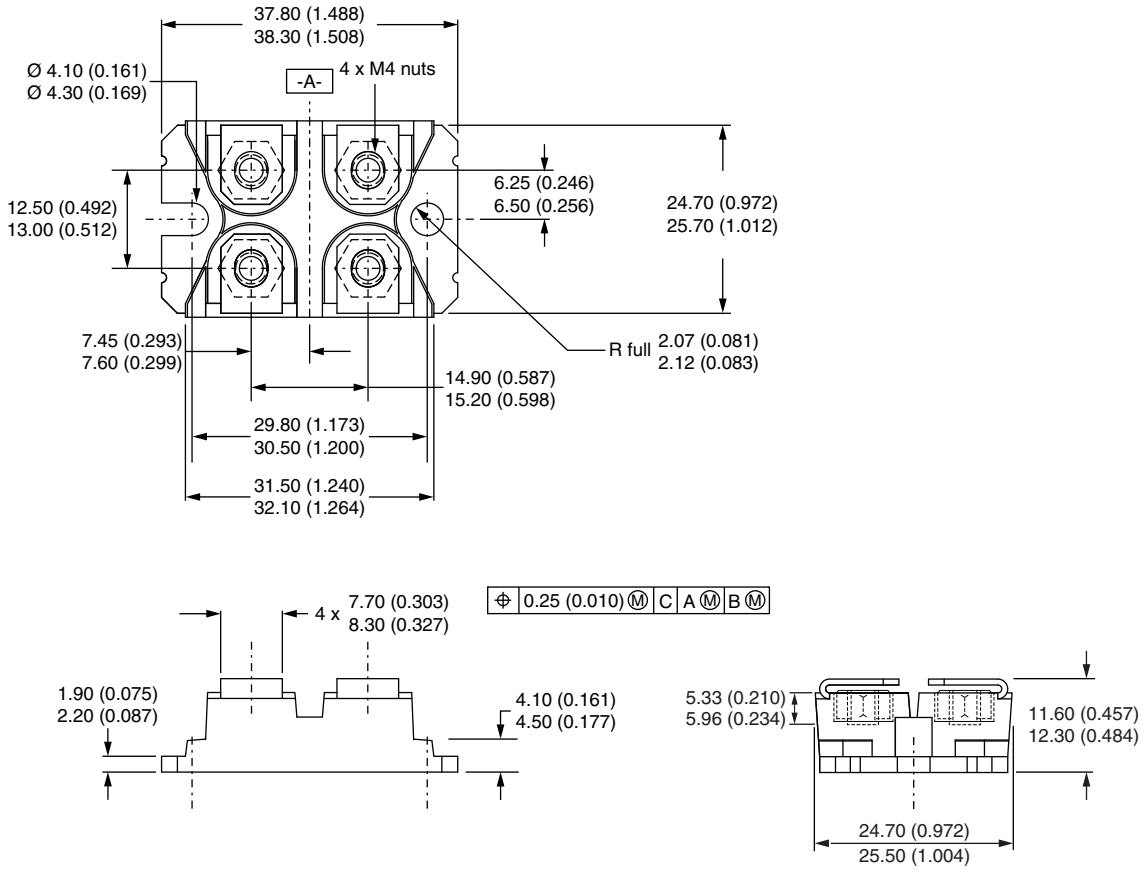


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SOT-227 Generation 2

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter

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Elektronik komponent tedarikinde Entegreci

Entegreci, Eskişehir merkezli, Türkiye geneline satış yapan bir elektronik komponent mağazasıdır. Entegreler (IC), mikrodenetleyiciler, transistörler, diyotlar, pasif elemanlar, konnektörler, modüller ve geliştirme kartları tek adetten seri üretim adetlerine kadar satılır. Ürün sayfalarında güncel stok durumunu, fiyatı ve datasheet bağlantısını bulabilirsiniz.

Parça koduyla arama

Üretici parça numarasını yazın; stok ve fiyatı hemen görün.

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Ürün kategorileri

Entegreden kapasitöre tüm elektronik komponent kategorileri.

Kategorilere göz atın

Üreticiler

Aradığınız üreticinin ürünlerini tek sayfada inceleyin.

Üreticileri görün

Toplu alım ve teklif

Listede olmayan ya da yüksek adetli parçalar için teklif isteyin.

Teklif isteyin

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Entegreci is an online electronic components store based in Türkiye. Search by manufacturer part number to see stock, prices and datasheets for integrated circuits, microcontrollers, transistors, passive components and connectors, or request a quote for parts that are not listed.

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