

Insulated Gate Bipolar Transistor (Ultrafast IGBT), 90 A


SOT-227
FEATURES

- NPT Gen 5 IGBT technology
- Square RBSOA
- HEXFRED® low Q_{rr} , low switching energy
- Positive $V_{CE(on)}$ temperature coefficient
- 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


**RoHS
COMPLIANT**

PRODUCT SUMMARY	
V_{CES}	1200 V
I_C DC	90 A at 90 °C
$V_{CE(on)}$ typical at 75 A, 25 °C	3.3 V
Speed	8 kHz to 30 kHz
Package	SOT-227
Circuit	Single switch diode

BENEFITS

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

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	V_{CES}		1200	V
Continuous collector current	$I_C^{(1)}$	$T_C = 25\text{ °C}$	149	A
		$T_C = 90\text{ °C}$	90	
Pulsed collector current	I_{CM}		200	
Clamped inductive load current	I_{LM}		200	
Diode continuous forward current	I_F	$T_C = 25\text{ °C}$	76	
		$T_C = 90\text{ °C}$	46	
Gate to emitter voltage	V_{GE}		± 20	V
Power dissipation, IGBT	P_D	$T_C = 25\text{ °C}$	862	W
		$T_C = 90\text{ °C}$	414	
Power dissipation, diode	P_D	$T_C = 25\text{ °C}$	357	
		$T_C = 90\text{ °C}$	171	
Isolation voltage	V_{ISOL}	Any terminal to case, $t = 1$ min	2500	V

Note

⁽¹⁾ Maximum collector current admitted is 100 A, to do exceed the maximum temperature of terminals



ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Collector to emitter breakdown voltage	$V_{BR(CEs)}$	$V_{GE} = 0\text{ V}, I_C = 250\text{ }\mu\text{A}$	1200	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	$V_{GE} = 15\text{ V}, I_C = 75\text{ A}$	-	3.3	3.8	
		$V_{GE} = 15\text{ V}, I_C = 75\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	3.6	3.9	
		$V_{GE} = 15\text{ V}, I_C = 75\text{ A}, T_J = 150\text{ }^\circ\text{C}$	-	3.7	-	
Gate threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 250\text{ }\mu\text{A}$	4	5	6	
		$V_{CE} = V_{GE}, I_C = 250\text{ }\mu\text{A}, T_J = 125\text{ }^\circ\text{C}$	-	3.2	-	
Temperature coefficient of threshold voltage	$V_{GE(th)}/\Delta T_J$	$V_{CE} = V_{GE}, I_C = 1\text{ mA}$ ($25\text{ }^\circ\text{C}$ to $125\text{ }^\circ\text{C}$)	-	-12	-	mV/ $^\circ\text{C}$
Collector to emitter leakage current	I_{CES}	$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}$	-	7	250	μA
		$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	1.4	10	mA
		$V_{GE} = 0\text{ V}, V_{CE} = 1200\text{ V}, T_J = 150\text{ }^\circ\text{C}$	-	6.5	20	
Forward voltage drop, diode	V_{FM}	$V_{GE} = 0\text{ V}, I_F = 75\text{ A}$	-	3.4	5.0	V
		$V_{GE} = 0\text{ V}, I_F = 75\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	3.2	5.2	
		$V_{GE} = 0\text{ V}, I_F = 75\text{ A}, T_J = 150\text{ }^\circ\text{C}$	-	3.05	-	
Gate to emitter leakage current	I_{GES}	$V_{GE} = \pm 20\text{ V}$	-	-	± 250	nA

SWITCHING CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Total gate charge (turn-on)	Q_g	$I_C = 50\text{ A}, V_{CC} = 600\text{ V}, V_{GE} = 15\text{ V}$		-	690	-	nC
Gate to emitter charge (turn-on)	Q_{ge}			-	65	-	
Gate to collector charge (turn-on)	Q_{gc}			-	250	-	
Turn-on switching loss	E_{on}	$I_C = 75\text{ A}, V_{CC} = 600\text{ V}, V_{GE} = 15\text{ V}, R_g = 5\text{ }\Omega, L = 500\text{ }\mu\text{H}, T_J = 25\text{ }^\circ\text{C}$	Energy losses include tail and diode recovery Diode used HFA16PB120	-	1.2	-	mJ
Turn-off switching loss	E_{off}			-	2.1	-	
Total switching loss	E_{tot}			-	3.3	-	
Turn-on delay time	$t_{d(on)}$			-	250	-	ns
Rise time	t_r			-	38	-	
Turn-off delay time	$t_{d(off)}$			-	280	-	
Fall time	t_f	-	90	-			
Turn-on switching loss	E_{on}	$I_C = 75\text{ A}, V_{CC} = 600\text{ V}, V_{GE} = 15\text{ V}, R_g = 5\text{ }\Omega, L = 500\text{ }\mu\text{H}, T_J = 125\text{ }^\circ\text{C}$	Energy losses include tail and diode recovery Diode used HFA16PB120	-	1.7	-	mJ
Turn-off switching loss	E_{off}			-	4.08	-	
Total switching loss	E_{tot}			-	5.78	-	
Turn-on delay time	$t_{d(on)}$			-	245	-	ns
Rise time	t_r			-	48	-	
Turn-off delay time	$t_{d(off)}$			-	280	-	
Fall time	t_f	-	140	-			
Reverse bias safe operating area	RBSOA	$T_J = 150\text{ }^\circ\text{C}, I_C = 200\text{ A}, R_g = 22\text{ }\Omega, V_{GE} = 15\text{ V to } 0\text{ V}, V_{CC} = 900\text{ V}, V_P = 1200\text{ V}, L = 500\text{ }\mu\text{H}$		Fullsquare			
Diode reverse recovery time	t_{rr}	$I_F = 50\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}, V_R = 200\text{ V}$		-	140	-	ns
Diode peak reverse current	I_{rr}			-	13	-	A
Diode recovery charge	Q_{rr}			-	860	-	nC
Diode reverse recovery time	t_{rr}	$I_F = 50\text{ A}, di_F/dt = 200\text{ A}/\mu\text{s}, V_R = 200\text{ V}, T_J = 125\text{ }^\circ\text{C}$		-	210	-	ns
Diode peak reverse current	I_{rr}			-	19	-	A
Diode recovery charge	Q_{rr}			-	1880	-	nC



THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Junction and storage temperature range	T_J, T_{Stg}		-40	-	150	°C
Junction to case	IGBT		-	-	0.145	°C/W
	Diode		-	-	0.35	
Case to heatsink	R_{thCS}	Flat, greased surface	-	0.05	-	
Weight			-	30	-	g
Mounting torque			-	-	1.3	Nm
Case style	SOT-227					

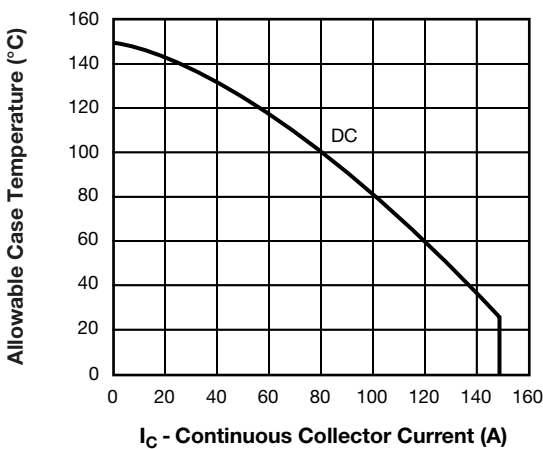


Fig. 1 - Maximum DC IGBT Collector Current vs. Case Temperature

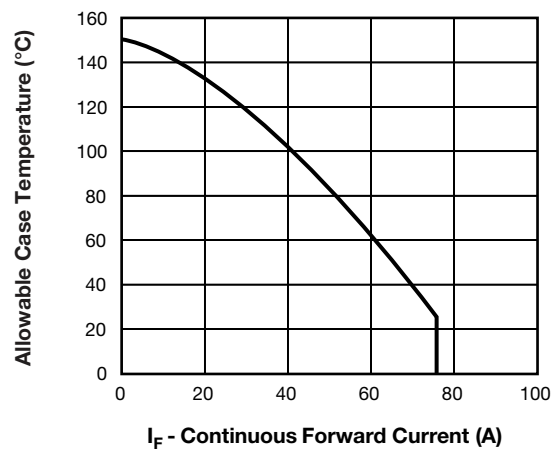


Fig. 3 - Allowable Forward Current vs. Case Temperature Diode Leg

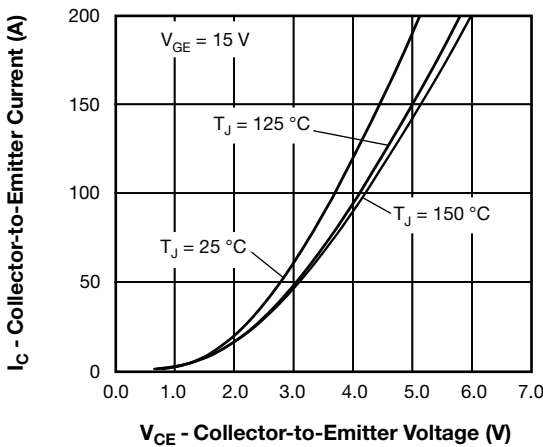


Fig. 2 - Typical Collector to Emitter Current Output Characteristics of IGBT

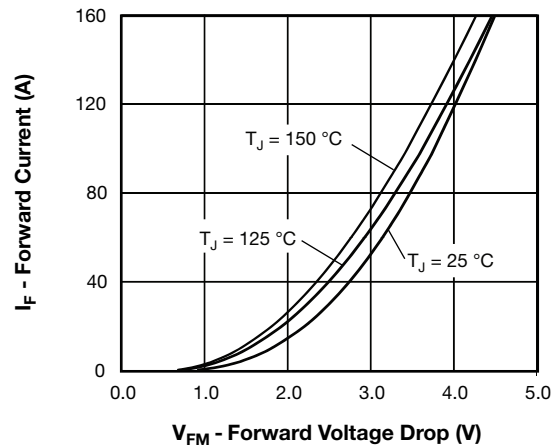


Fig. 4 - Typical Diode Forward Voltage Drop Characteristics

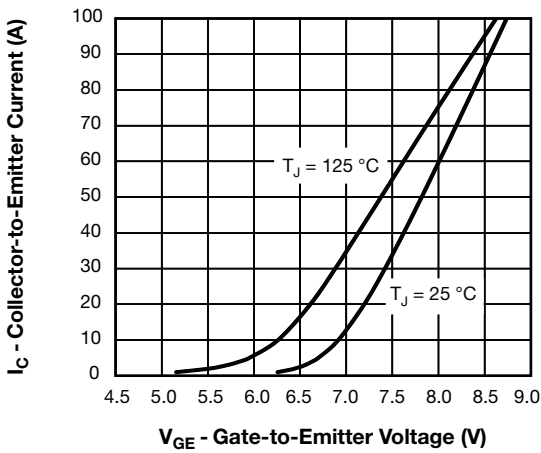


Fig. 5 - Typical IGBT Transfer Characteristics

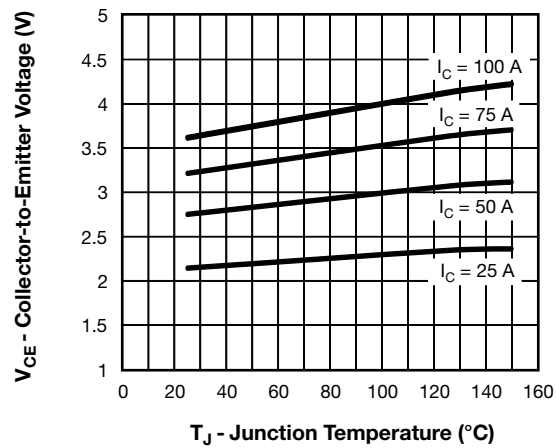


Fig. 8 - Typical IGBT Collector to Emitter Voltage vs. Junction Temperature, $V_{GE} = 15\text{ V}$

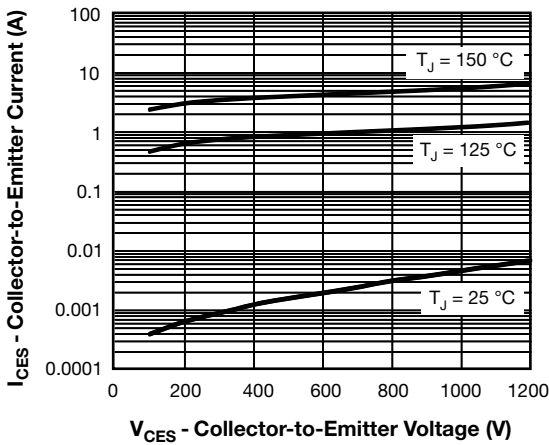


Fig. 6 - Typical IGBT Zero Gate Voltage Collector Current

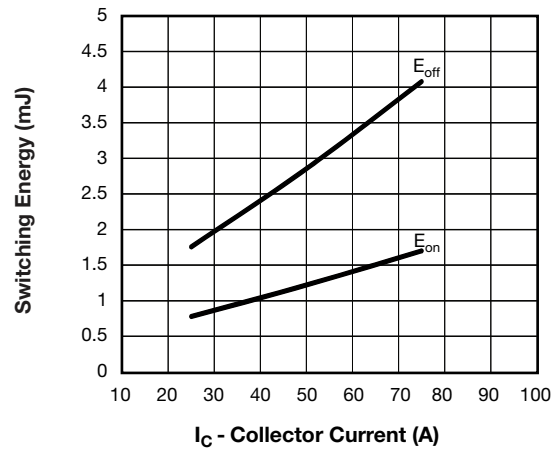


Fig. 9 - Typical IGBT Energy Losses vs. I_C
 $T_J = 125\text{ }^\circ\text{C}$, $L = 500\text{ }\mu\text{H}$, $V_{CC} = 600\text{ V}$,
 $R_g = 5\text{ }\Omega$, $V_{GE} = 15\text{ V}$, Diode used HFA16PB120

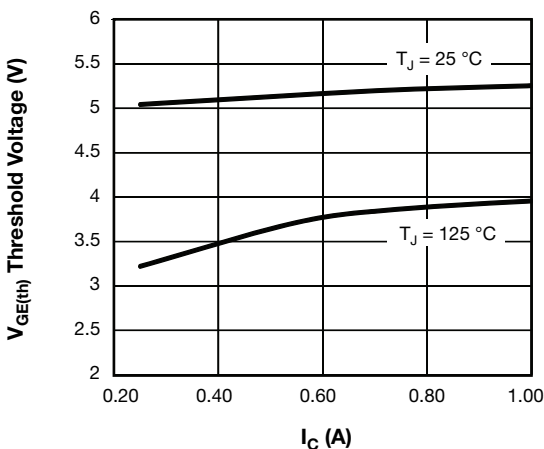


Fig. 7 - Typical IGBT Threshold Voltage

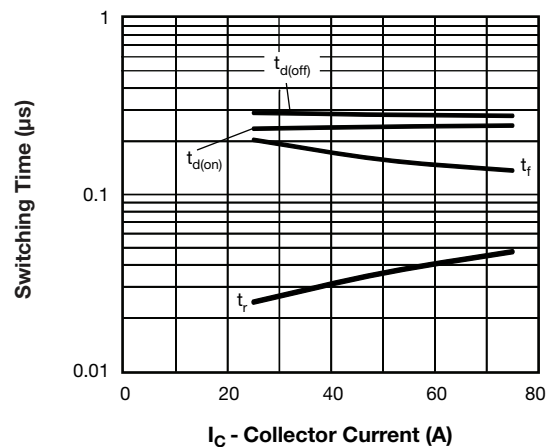


Fig. 10 - Typical IGBT Switching Time vs. I_C
 $T_J = 125\text{ }^\circ\text{C}$, $L = 500\text{ }\mu\text{H}$, $V_{CC} = 600\text{ V}$,
 $R_g = 5\text{ }\Omega$, $V_{GE} = 15\text{ V}$, Diode used HFA16PB120

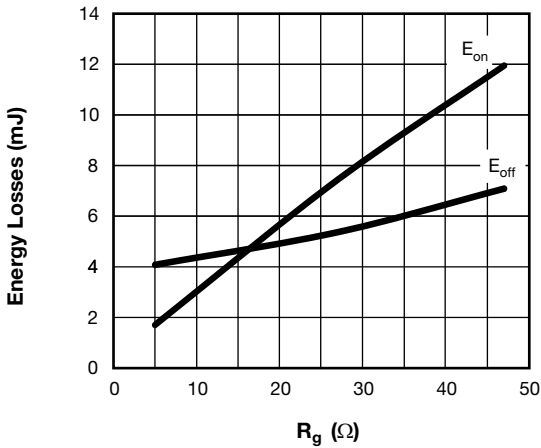


Fig. 11 - Typical IGBT Energy Loss vs. R_g ,
 $T_J = 125\text{ }^\circ\text{C}$, $I_C = 75\text{ A}$, $L = 500\text{ }\mu\text{H}$,
 $V_{CC} = 600\text{ V}$, $V_{GE} = 15\text{ V}$, Diode used HFA16PB120

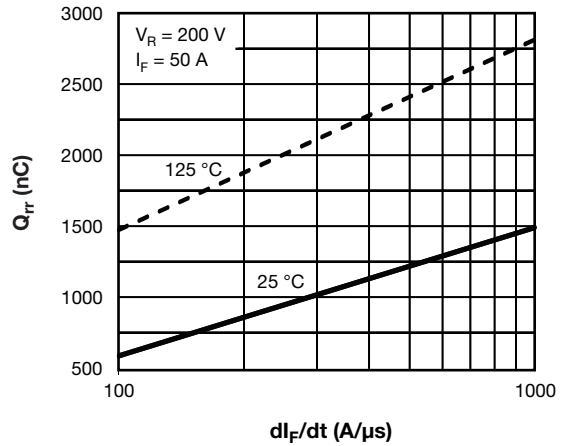


Fig. 14 - Stored Charge vs. di_F/dt of Diode

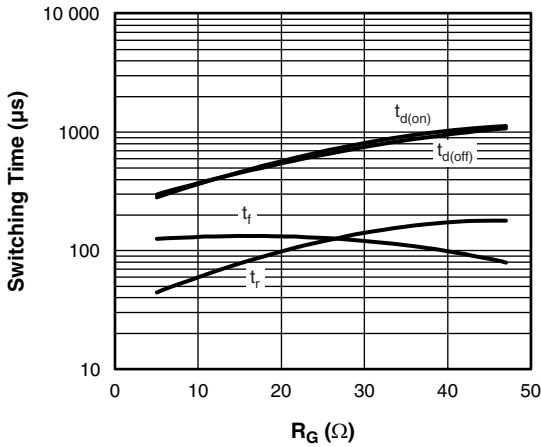


Fig. 12 - Typical IGBT Switching Time vs. R_g ,
 $T_J = 125\text{ }^\circ\text{C}$, $L = 500\text{ }\mu\text{H}$, $V_{CC} = 600\text{ V}$,
 $R_g = 5\text{ }\Omega$, $V_{GE} = 15\text{ V}$

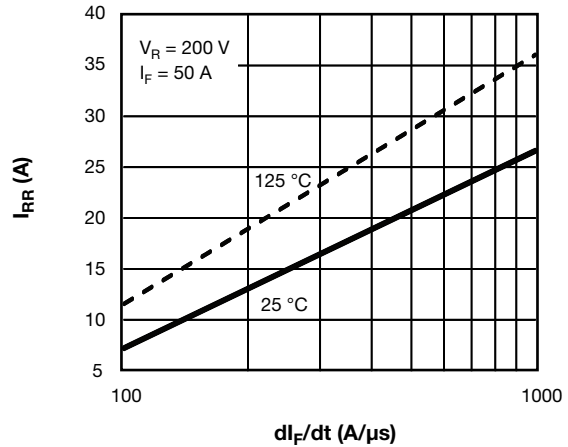


Fig. 15 - Typical Reverse Recovery Current vs. di_F/dt of Diode

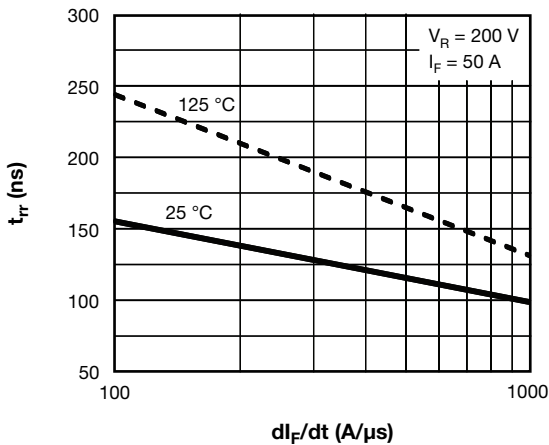


Fig. 13 - Typical t_{rr} Diode vs. di_F/dt
 $V_{RR} = 200\text{ V}$, $I_F = 50\text{ A}$

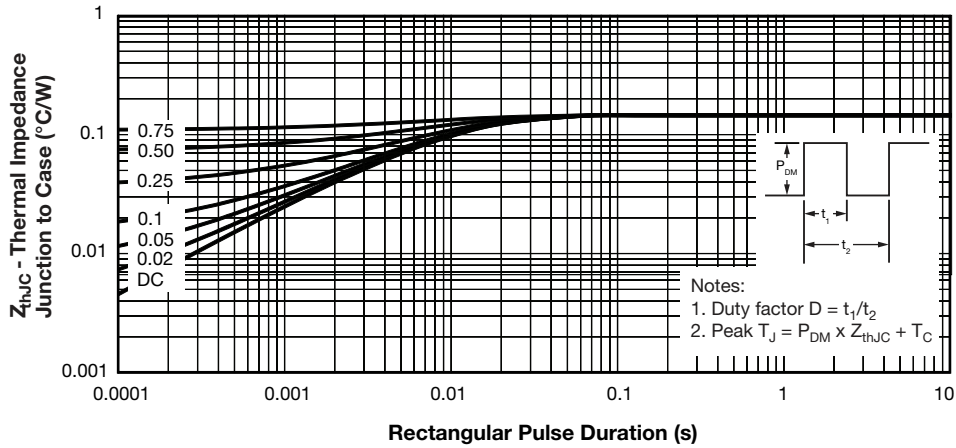


Fig. 16 - Maximum Thermal Impedance Z_{thJC} Characteristics (IGBT)

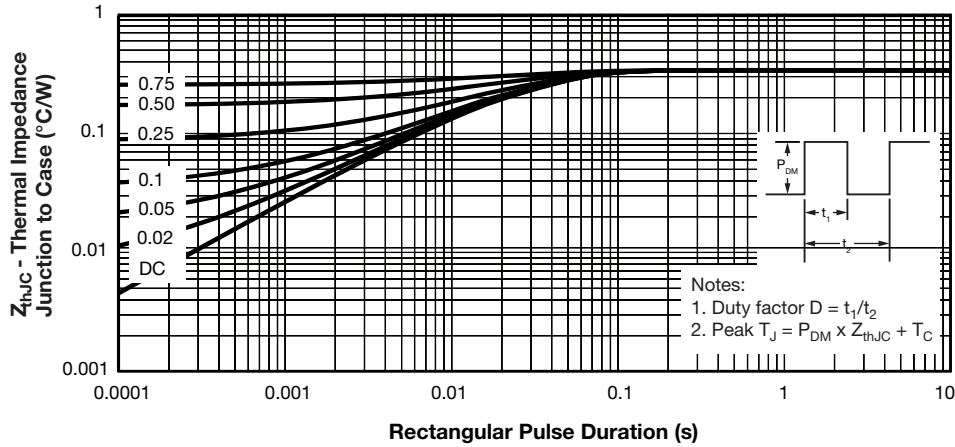


Fig. 17 - Maximum Thermal Impedance Z_{thJC} Characteristics (Diode)

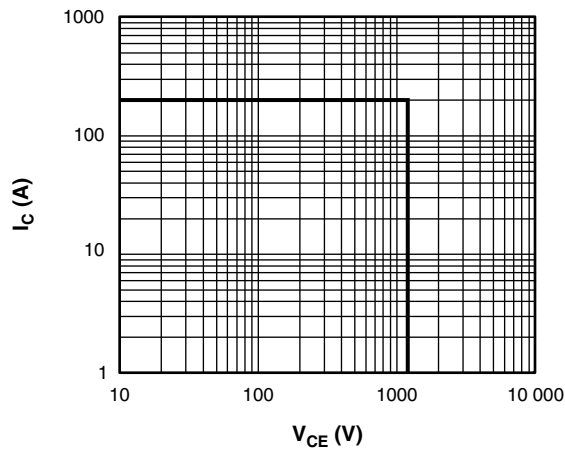


Fig. 18 - IGBT Reverse Bias SOA, $T_J = 150\text{ }^\circ\text{C}$, $V_{GE} = 15\text{ V}$,

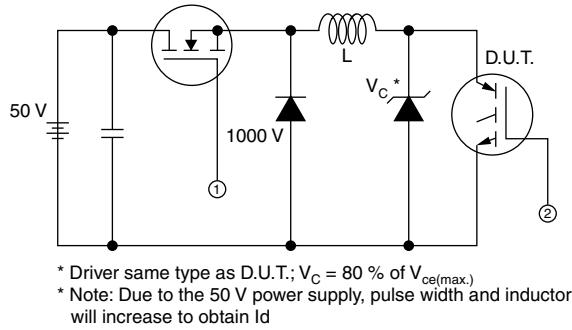


Fig. 19a - Clamped Inductive Load Test Circuit

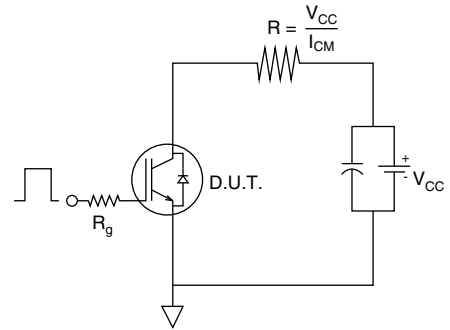


Fig. 19b - Pulsed Collector Current Test Circuit

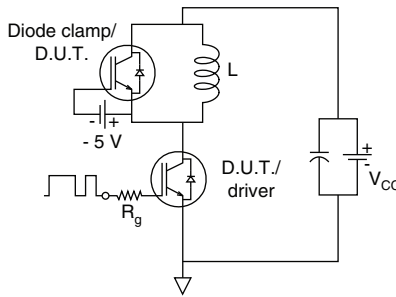


Fig. 20a - Switching Loss Test Circuit

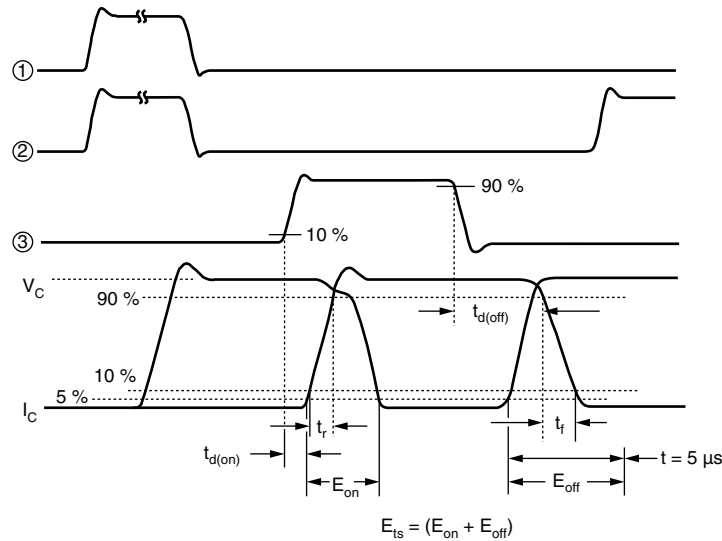


Fig. 20b - Switching Loss Waveforms Test Circuit

ORDERING INFORMATION TABLE

Device code	VS-	G	B	90	D	A	120	U
	①	②	③	④	⑤	⑥	⑦	⑧

- 1** - Vishay Semiconductors product
- 2** - Insulated Gate Bipolar Transistor (IGBT)
- 3** - B = IGBT Generation 5
- 4** - Current rating (90 = 90 A)
- 5** - Circuit configuration (D = Single switch with antiparallel diode)
- 6** - Package indicator (A = SOT-227)
- 7** - Voltage rating (120 = 1200 V)
- 8** - Speed/type (U = Ultrafast IGBT)

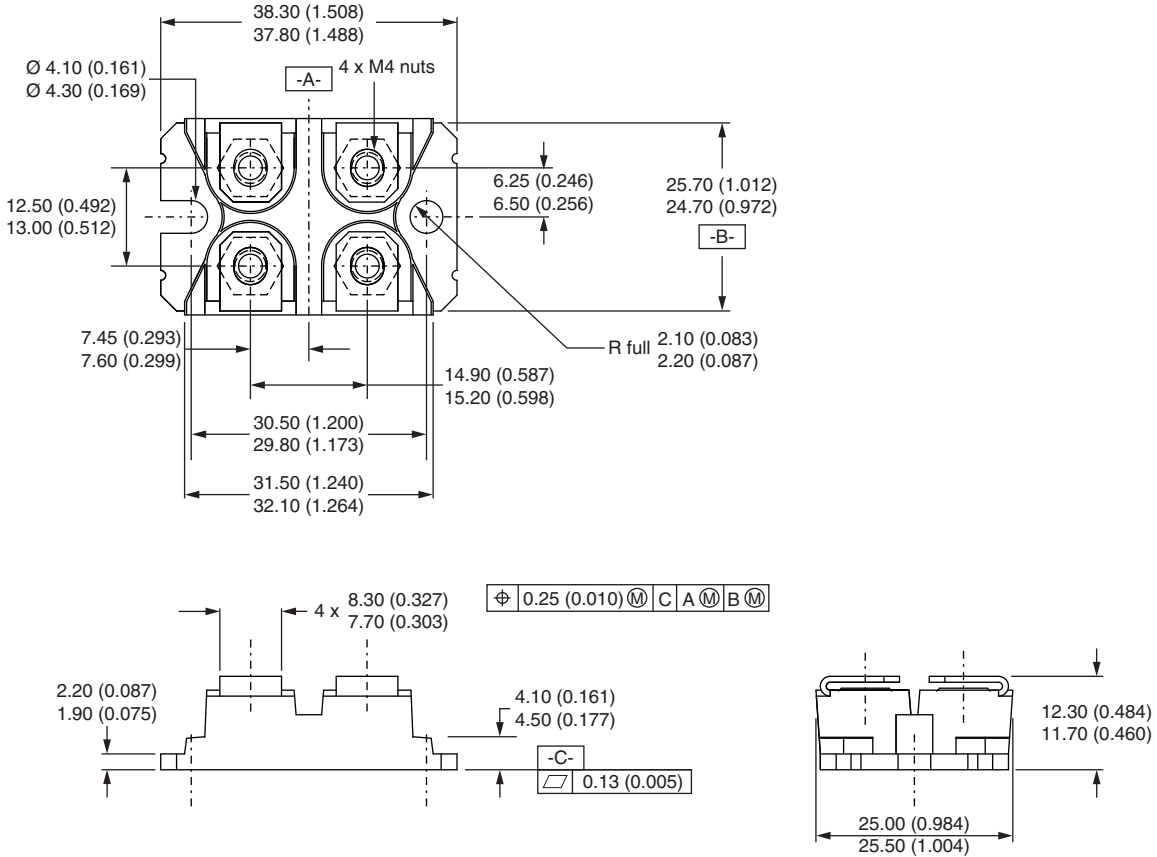
CIRCUIT CONFIGURATION		
CIRCUIT	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Single switch with antiparallel diode	D	

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



SOT-227 Generation II

DIMENSIONS in millimeters (inches)



Note

- Controlling dimension: millimeter



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.