Insulated Gate Bipolar Transistor (Ultrafast IGBT), 100 A

SOT-227

FEATURES

- Trench IGBT high speed
- 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

Pb Pb-free RoHS COMPLIANT

PRIMARY CHARACTERISTICS	
V_{CES}	1200 V
I_C DC	100 A at 108 °C
$V_{CE(on)}$ typical at 100 A, 25 °C	1.93 V
Speed	8 kHz to 30 kHz
Package	SOT-227
Circuit configuration	Single switch with AP 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	T_C = 25 °C	187	A
		T_C = 90 °C	123	
Pulsed collector current	I_{CM}		240	
Clamped inductive load current	I_{LM}		250	
Gate to emitter voltage	V_{GE}		± 20	V
Diode continuous forward current	I_F	T_C = 25 °C	97	A
		T_C = 90 °C	61	
Single pulse forward current	I_{FSM}	10 ms sine or 6 ms rectangular pulse, T_J = 25 °C	350	
Power dissipation, IGBT	P_D	T_C = 25 °C	890	W
		T_C = 90 °C	500	
Power dissipation, diode	P_D	T_C = 25 °C	429	
		T_C = 90 °C	194	
Isolation voltage	V_{ISOL}	Any terminal to case, t = 1 min	2500	V

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

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 = 3.8 mA	1200	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	V_{GE} = 15 V, I_C = 100 A	-	1.93	2.55	
		V_{GE} = 15 V, I_C = 100 A, T_J = 125 °C	-	2.26	-	
		V_{GE} = 15 V, I_C = 100 A, T_J = 150 °C	-	2.35	-	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 3.8 mA	4.5	5.8	7.0	
		V_{CE} = V_{GE}, I_C = 3.8 mA, T_J = 125 °C	-	4.6	-	
Temperature coefficient of threshold voltage	$V_{GE(th)}/\Delta T_J$	V_{CE} = V_{GE}, I_C = 3.8 mA (25 °C to 125 °C)	-	-12	-	mV/°C
Collector to emitter leakage current	I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V	-	1.0	100	μA
		V_{GE} = 0 V, V_{CE} = 1200 V, T_J = 125 °C	-	0.9	-	mA
		V_{GE} = 0 V, V_{CE} = 1200 V, T_J = 150 °C	-	3.4	-	
Forward voltage drop, diode	V_{FM}	V_{GE} = 0 V, I_F = 80 A	-	2.8	3.5	V
		V_{GE} = 0 V, I_F = 80 A, T_J = 125 °C	-	3.0	-	
		V_{GE} = 0 V, I_F = 80 A, T_J = 150 °C	-	3.0	-	
Gate to emitter leakage current	I_{GES}	V_{GE} = ± 20 V	-	-	± 220	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	V_{GE} = -15 V, V_{GE} = +15 V		-	800	-	nC
Input capacitance	C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V*f* = 1 MHz		-	6150	-	pF
Reverse transfer capacitance	C_{res}			-	345	-	
Turn-on switching loss	E_{on}	I_C = 75 A, V_{CC} = 600 V, V_{GE} = 15 V, R_g = 1.0 Ω, L = 500 μH, T_J = 25 °C	Energy losses include tail and diode recovery Diode used HFA16PB120	-	2.2	-	mJ
Turn-off switching loss	E_{off}			-	3.0	-	
Total switching loss	E_{tot}			-	5.2	-	
Turn-on delay time	$t_{d(on)}$			-	131	-	ns
Rise time	t_r			-	55	-	
Turn-off delay time	$t_{d(off)}$			-	244	-	
Fall time	t_f			-	118	-	
Turn-on switching loss	E_{on}	I_C = 75 A, V_{CC} = 600 V, V_{GE} = 15 V, R_g = 1.0 Ω, L = 500 μH, T_J = 125 °C		-	2.9	-	mJ
Turn-off switching loss	E_{off}			-	5.3	-	
Total switching loss	E_{tot}			-	8.2	-	
Turn-on delay time	$t_{d(on)}$			-	147	-	ns
Rise time	t_r			-	61	-	
Turn-off delay time	$t_{d(off)}$			-	358	-	
Fall time	t_f			-	132	-	
Turn-on switching loss	E_{on}	I_C = 100 A, V_{CC} = 600 V, V_{GE} = 15 V, R_g = 1.0 Ω, L = 500 μH, T_J = 25 °C	Energy losses include tail and diode recovery Diode used HFA16PB120	-	3.0	-	mJ
Turn-off switching loss	E_{off}			-	4.0	-	
Total switching loss	E_{tot}			-	7.0	-	
Turn-on delay time	$t_{d(on)}$			-	134	-	ns
Rise time	t_r			-	66	-	
Turn-off delay time	$t_{d(off)}$			-	242	-	
Fall time	t_f			-	108	-	

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

SWITCHING CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Turn-on switching loss	E_{on}	I_C = 100 A, V_{CC} = 600 V, V_{GE} = 15 V, R_g = 1.0 Ω, L = 500 μH, T_J = 125 °C	Energy losses include tail and diode recovery Diode used HFA16PB120	-	3.9	-	mJ
Turn-off switching loss	E_{off}			-	7.1	-	
Total switching loss	E_{tot}			-	11.0	-	
Turn-on delay time	$t_{d(on)}$			-	154	-	ns
Rise time	t_r			-	72	-	
Turn-off delay time	$t_{d(off)}$			-	346	-	
Fall time	t_f			-	120	-	
Reverse bias safe operating area	RBSOA	T_J = 150 °C, I_C = 250 A, R_g = 1.0 Ω, V_{GE} = 15 V to 0 V, V_{CC} = 800 V, V_P = 1200 V, L = 500 μH		Fullsquare			
Short circuit safe operating area	SCSOA	V_{GE} = 15 V, V_{CC} = 800 V, V_{CE} max. = 1200 V, T_{VJ} = 150 °C		-	-	10	μs
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 200 A/μs, V_R = 400 V		-	183	-	ns
Diode peak reverse current	I_{rr}			-	12	-	A
Diode recovery charge	Q_{rr}			-	1093	-	nC
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 200 A/μs, V_R = 400 V, T_J = 125 °C		-	278	-	ns
Diode peak reverse current	I_{rr}			-	18.2	-	A
Diode recovery charge	Q_{rr}			-	2541	-	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	R_{thJC}		-	-	0.14	°C/W
	Diode			-	-	0.31	
Case to heatsink		R_{thCS}	Flat, greased surface	-	0.1	-	
Weight				-	30	-	g
Mounting torque			Torque to terminal	-	-	1.1 (9.7)	Nm (lbf. in)
			Torque to heatsink	-	-	1.3 (11.5)	Nm (lbf. in)
Case style		SOT-227					

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

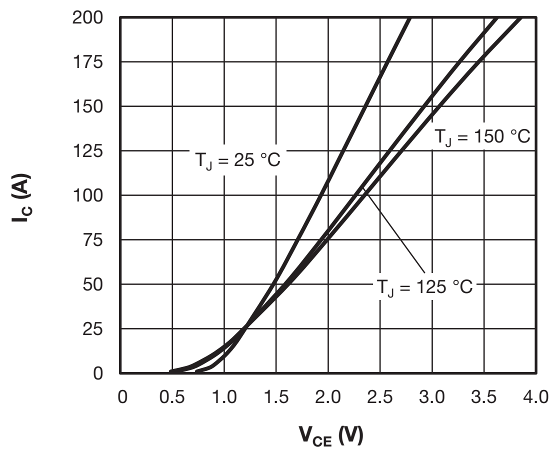


Fig. 1 - Typical IGBT Output Characteristics, V_{GE} = 15 V

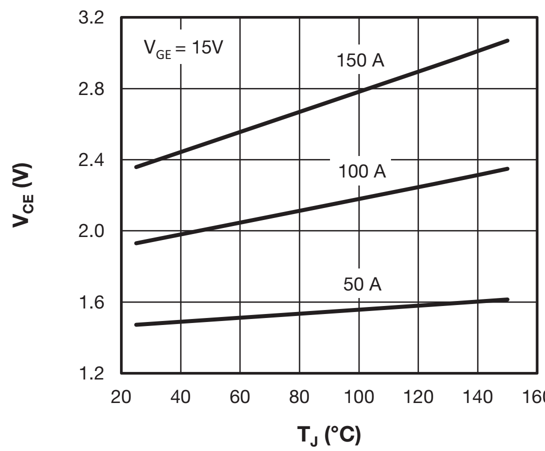


Fig. 4 - Collector to Emitter Voltage vs. Junction Temperature

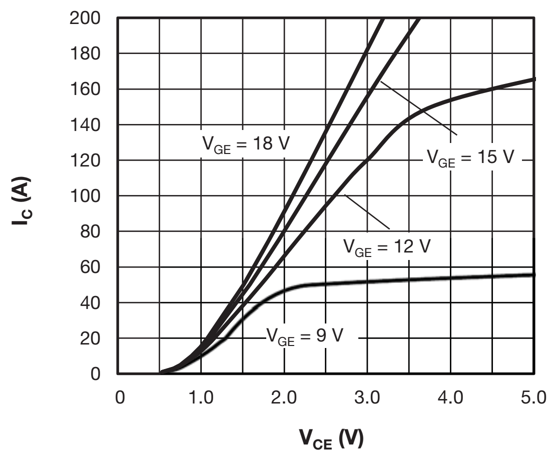


Fig. 2 - Typical IGBT Output Characteristics, T_J = 125 °C

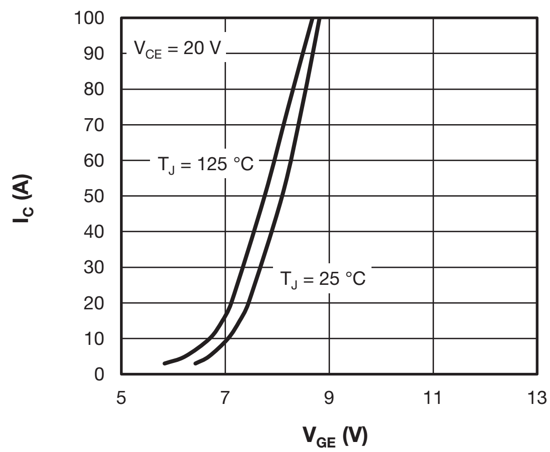


Fig. 5 - Typical IGBT Transfer Characteristics

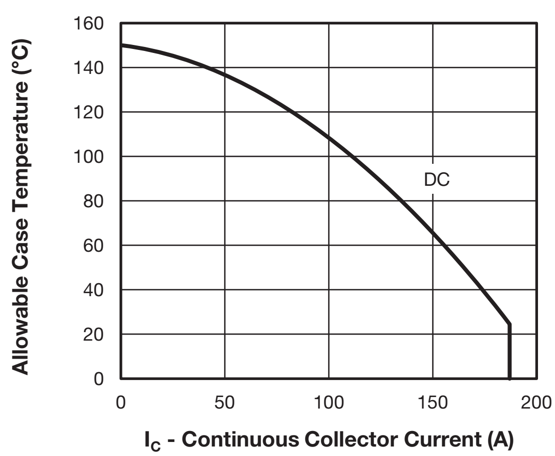


Fig. 3 - Maximum IGBT Continuous Collector Current vs.
Case Temperature

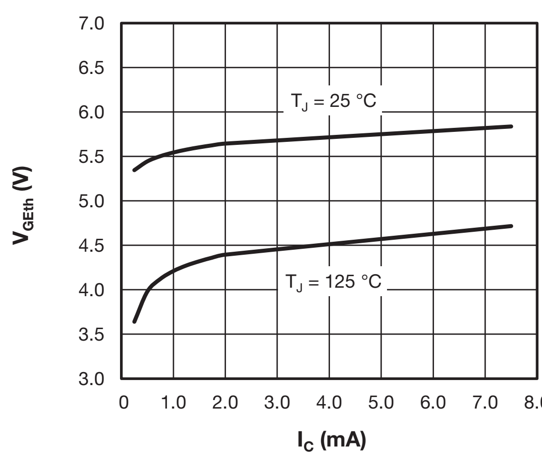


Fig. 6 - Typical IGBT Gate Threshold Voltage

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT
ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

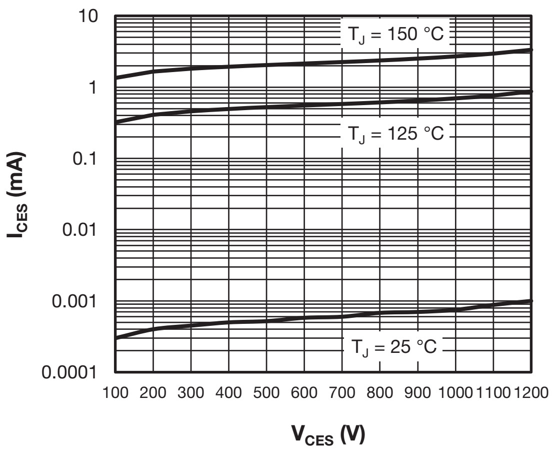


Fig. 7 - Typical IGBT Zero Gate Voltage Collector Current

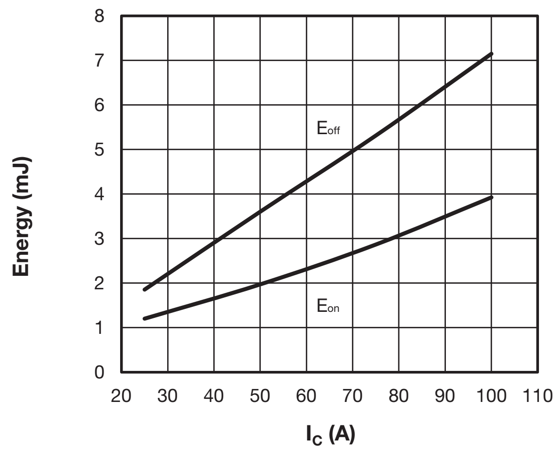


Fig. 10 - Typical IGBT Energy Loss vs. I_C
T_J = 125 °C, V_{CC} = 600 V, R_g = 1.0 Ω, V_{GE} = 15 V, L = 500 μH

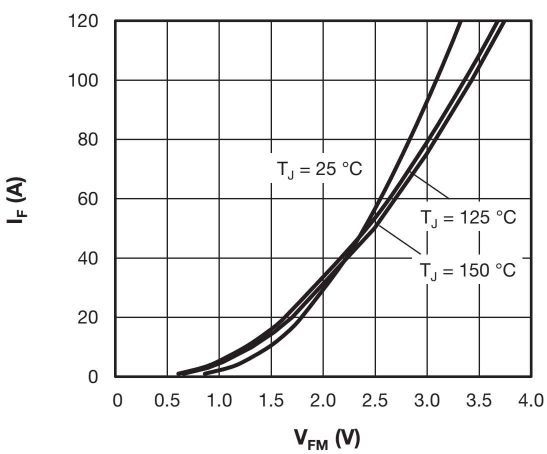


Fig. 8 - Typical Diode Forward Characteristics

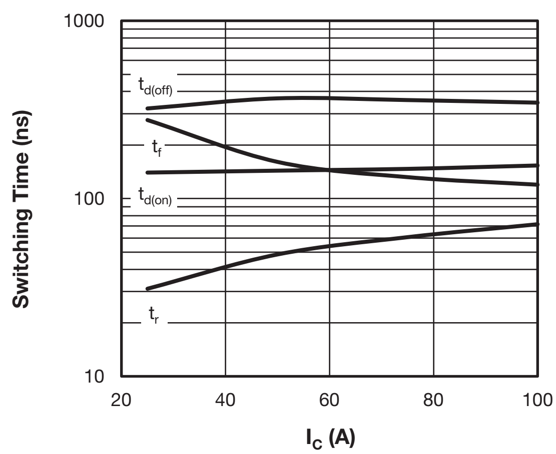


Fig. 11 - Typical IGBT Switching Time vs. I_C
T_J = 125 °C, V_{CC} = 600 V, R_g = 1.0 Ω, V_{GE} = 15 V, L = 500 μH

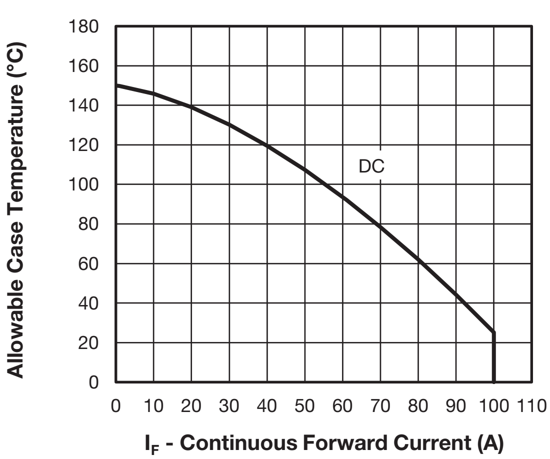


Fig. 9 - Maximum Diode Continuous Forward Current vs. Case Temperature

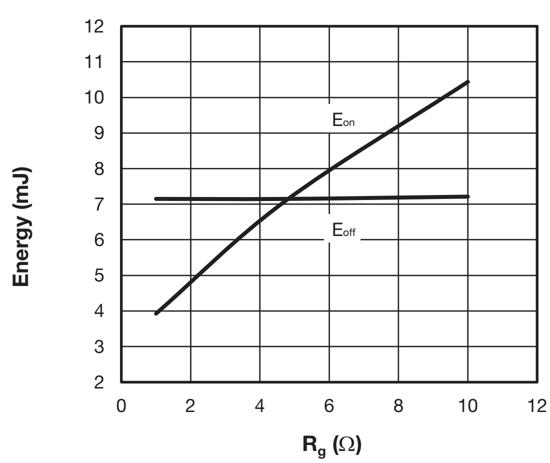


Fig. 12 - Typical IGBT Energy Loss vs. R_g
T_J = 125 °C, V_{CC} = 600 V, I_C = 100 A, V_{GE} = 15 V, L = 500 μH

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

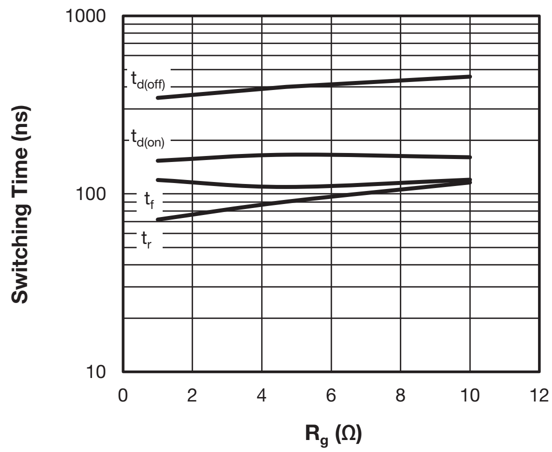


Fig. 13 - Typical IGBT Switching Time vs. R_g
T_J = 125 °C, V_{CC} = 600 V, I_C = 100 A, V_{GE} = 15 V, L = 500 µH

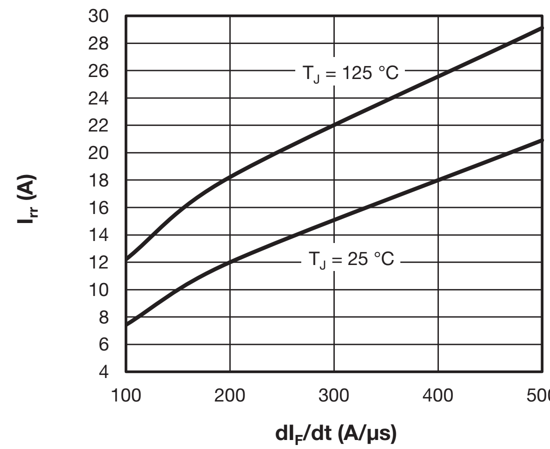


Fig. 15 - Typical Diode Reverse Recovery Current vs. dI_F/dt
V_{rr} = 400 V, I_F = 50 A

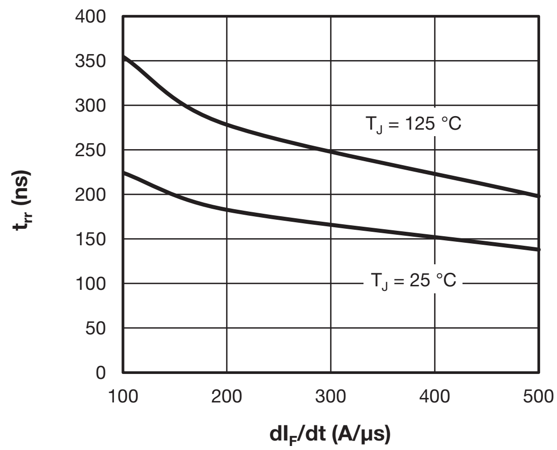


Fig. 14 - Typical Diode Reverse Recovery Time vs. dI_F/dt
V_{rr} = 400 V, I_F = 50 A

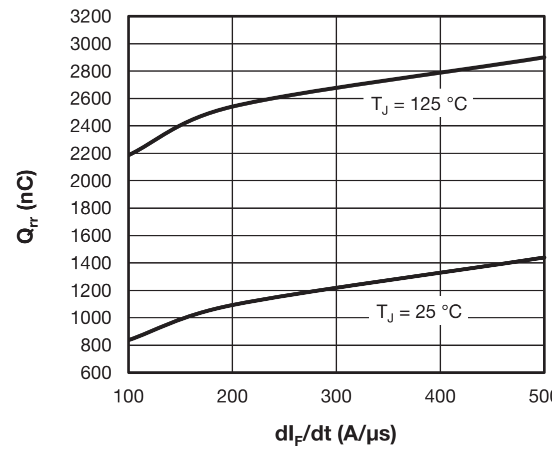


Fig. 16 - Typical Diode Reverse Recovery Charge vs. dI_F/dt
V_{rr} = 400 V, I_F = 50 A

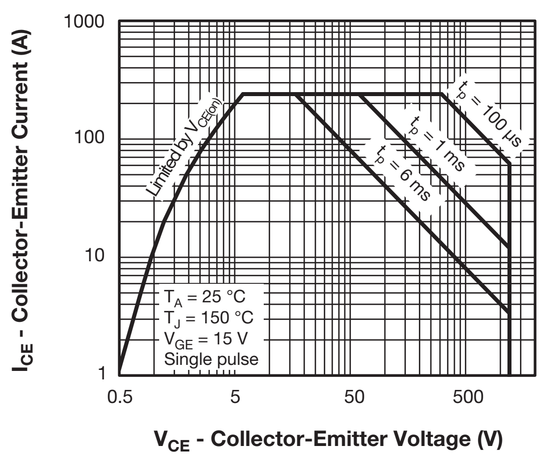


Fig. 17 - IGBT Safe Operating Area

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

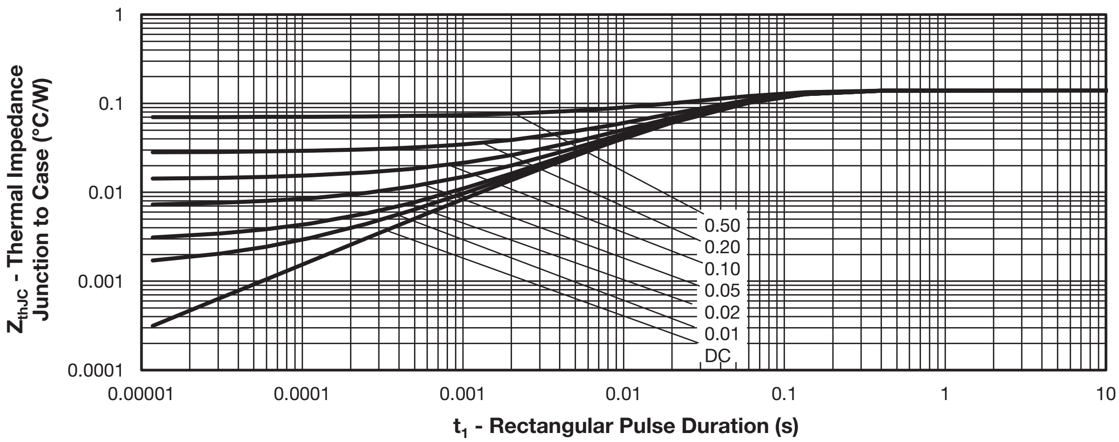


Fig. 18 - Maximum Thermal Impedance Z_{thJC} Characteristics - (IGBT)

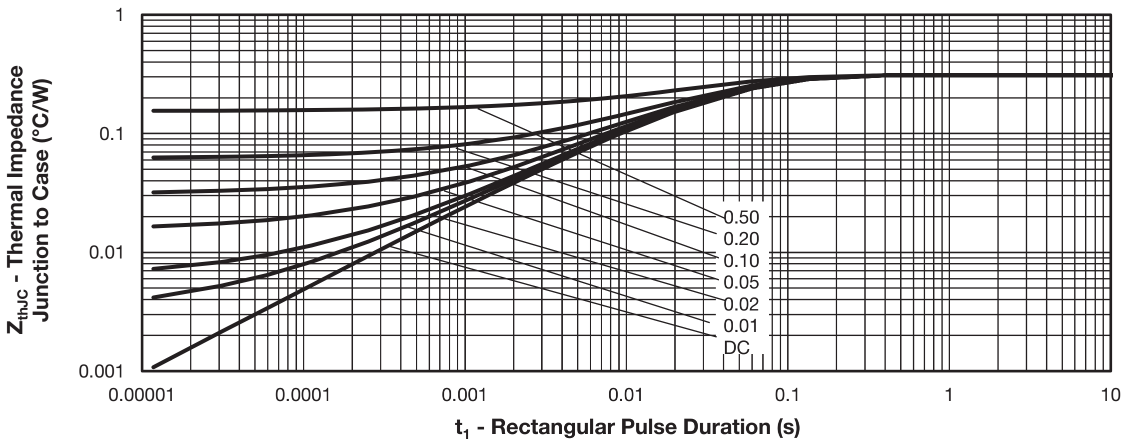


Fig. 19 - Maximum Thermal Impedance Z_{thJC} Characteristics - (Diode)

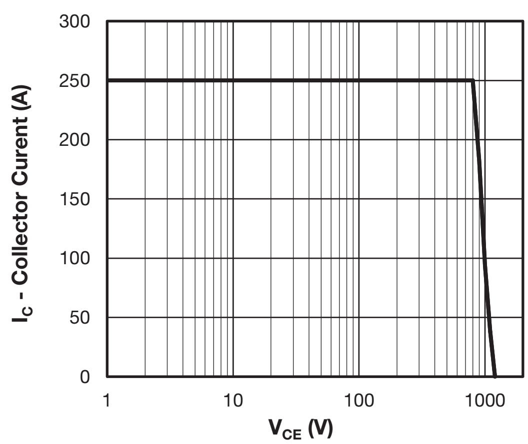


Fig. 20 - IGBT Reverse Bias SOA
V_{GE} = 15 V, T_J = 150°C

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

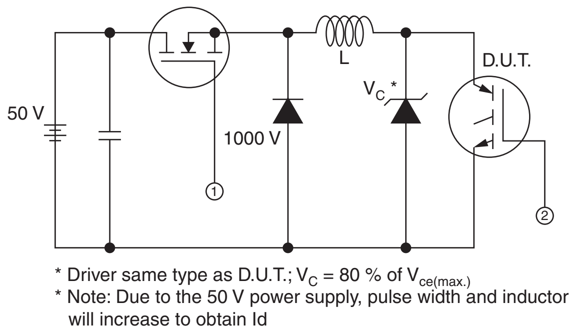


Fig. 21 - Clamped Inductive Load Test Circuit

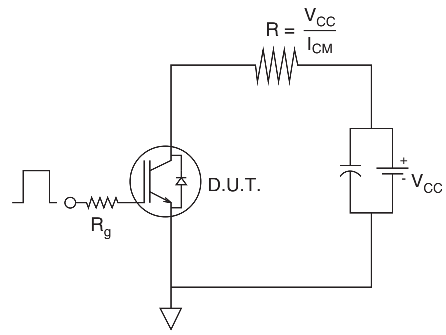


Fig. 22 - Pulsed Collector Current Test Circuit

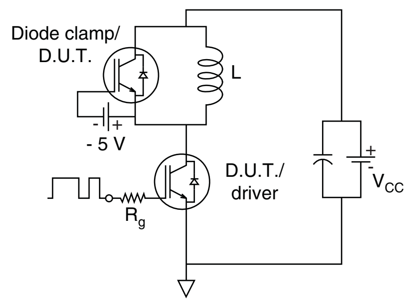


Fig. 23 - Switching Loss Test Circuit

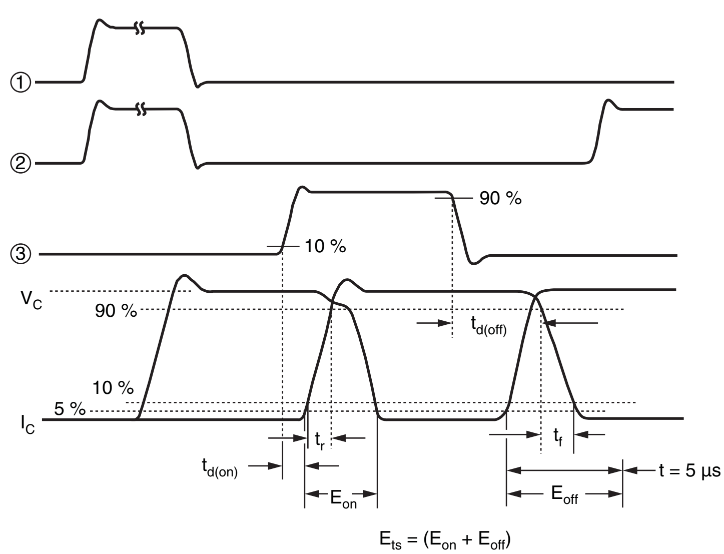


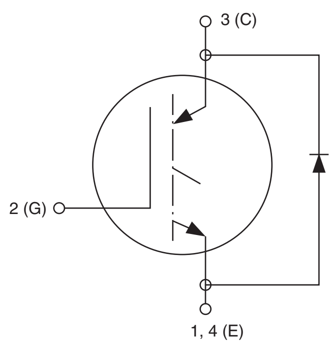
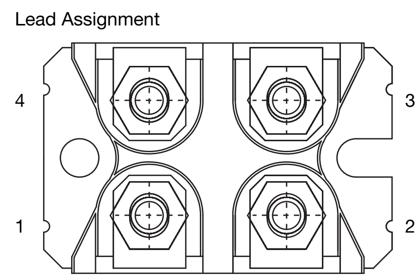
Fig. 24 - Switching Loss Waveforms Test Circuit

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

ORDERING INFORMATION TABLE

Device code	VS-	G	T	100	D	A	120	UF
	1	2	3	4	5	6	7	8

- **1** - Vishay Semiconductors product
- **2** - Insulated Gate Bipolar Transistor (IGBT)
- **3** - Trench IGBT technology
- **4** - Current rating (100 = 100 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 (UF = Trench ultrafast IGBT)

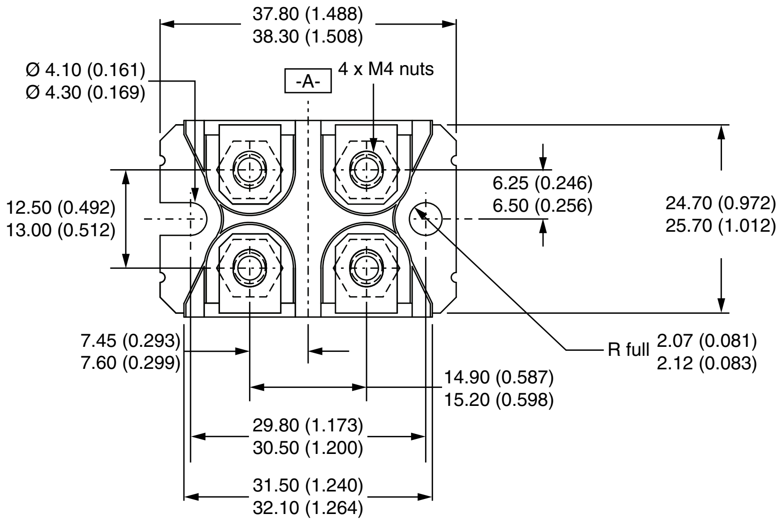
CIRCUIT CONFIGURATION		
CIRCUIT	**CIRCUIT CONFIGURATION CODE**	**CIRCUIT DRAWING**
Single switch with AP diode	D	 

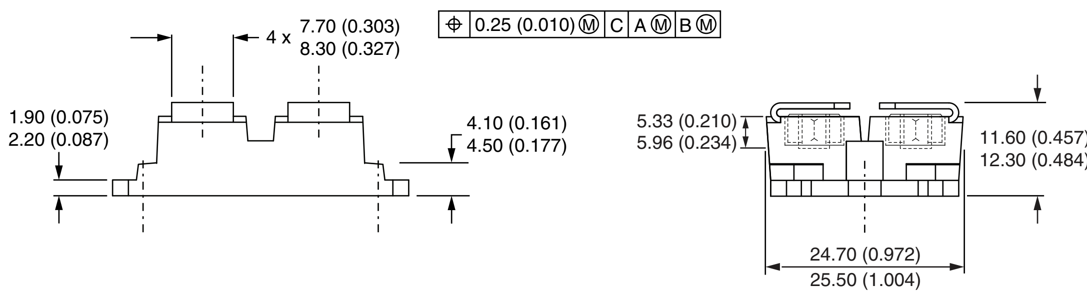
LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95423
Packaging information	www.vishay.com/doc?95425

For technical questions within your region: DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

SOT-227 Generation 2

DIMENSIONS in millimeters (inches)





Note

- Controlling dimension: millimeter

For technical questions, contact: DiodesAmericas@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT
ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

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.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. 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.

© 2025 VISHAY INTERTECHNOLOGY, INC. ALL RIGHTS RESERVED

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000