Molding Type Module IGBT, 2-in-1 Package, 600 V and 400 A

Dual INT-A-PAK

FEATURES

- Low $V_{CE(on)}$ trench IGBT technology
- Low switching losses
- 5 μs short circuit capability
- $V_{CE(on)}$ with positive temperature coefficient
- Maximum junction temperature 175 °C
- Low inductance case
- Fast and soft reverse recovery antiparallel FWD
- Isolated copper baseplate using DCB (Direct Copper Bonding) technology
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT

PRIMARY CHARACTERISTICS	
V_{CES}	600 V
I_C at T_C = 80 °C	400 A
$V_{CE(on)}$ (typical) at I_C = 400 A, 25 °C	1.60 V
Speed	8 kHz to 30 kHz
Package	Dual INT-A-PAK
Circuit configuration	Half bridge

TYPICAL APPLICATIONS

- UPS
- Switching mode power supplies
- Electronic welders

DESCRIPTION

Vishay's IGBT power module provides ultralow conduction loss as well as short circuit ruggedness. It is designed for applications such as UPS and SMPS.

ABSOLUTE MAXIMUM RATINGS (T_C = 25 °C unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	V_{CES}		600	V
Gate to emitter voltage	V_{GES}		± 20	
Collector current	I_C	T_C = 25 °C	530	A
		T_C = 80 °C	400	
Pulsed collector current	I_{CM} (1)	t_p = 1 ms	800	
Diode continuous forward current	I_F		400	
Diode maximum forward current	I_{FM}		800	
Maximum power dissipation	P_D	T_J = 175 °C	1600	W
Short circuit withstand time	t_{SC}	T_J = 125 °C	5	μs
I^2t-value, diode	I^2t	V_R = 0 V, t = 10 ms, T_J = 125 °C	10 900	A^2s
RMS isolation voltage	V_{ISOL}	f = 50 Hz, t = 1 min	2500	V

Note

(1) Repetitive rating: pulse width limited by maximum junction temperature

IGBT ELECTRICAL SPECIFICATIONS (T_C = 25 °C unless otherwise noted)

Collector to emitter breakdown voltage	$V_{(BR)CES}$	V_{GE} = 0 V, I_C = 2 mA, T_J = 25 °C	600	-	-	V
Collector to emitter saturation voltage	$V_{CE(on)}$	V_{GE} = 15 V, I_C = 400 A, T_J = 25 °C	-	1.6	2.05	
		V_{GE} = 15 V, I_C = 400 A, T_J = 175 °C	-	2.0	-	
Gate to emitter threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 4 mA, T_J = 25 °C	4.0	-	6.5	
Zero gate voltage collector current	I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0 V, T_J = 25 °C	-	-	5.0	mA
Gate to emitter leakage current	I_{GES}	V_{GE} = V_{GES}, V_{CE} = 0 V, T_J = 25 °C	-	-	400	nA

SWITCHING CHARACTERISTICS

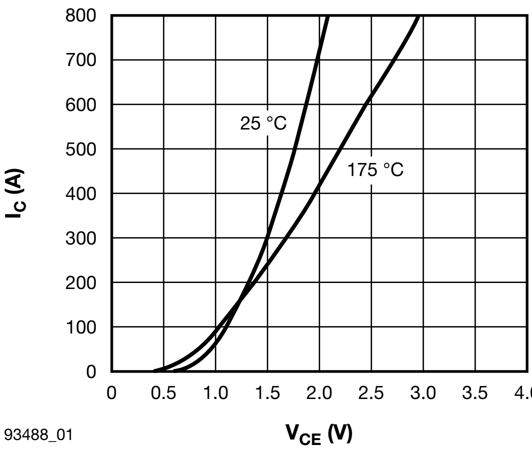
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Turn-on delay time	$t_{d(on)}$	V_{CC} = 400 V, I_C = 400 A, R_g = 1.3 Ω, V_{GE} = ± 15 V, T_J = 25 °C	-	35	-	ns
Rise time	t_r		-	70	-	
Turn-off delay time	$t_{d(off)}$		-	180	-	
Fall time	t_f		-	75	-	
Turn-on switching loss	E_{on}		-	14.1	-	mJ
Turn-off switching loss	E_{off}		-	10.0	-	
Turn-on delay time	$t_{d(on)}$	V_{CC} = 400 V, I_C = 400 A, R_g = 1.3 Ω, V_{GE} = ± 15 V, T_J = 175 °C	-	37	-	ns
Rise time	t_r		-	72	-	
Turn-off delay time	$t_{d(off)}$		-	220	-	
Fall time	t_f		-	84	-	
Turn-on switching loss	E_{on}		-	23.2	-	mJ
Turn-off switching loss	E_{off}		-	16.8	-	
Input capacitance	C_{ies}	V_{GE} = 0 V, V_{CE} = 30 V, f = 1.0 MHz	-	30.8	-	nF
Output capacitance	C_{oes}		-	2.12	-	
Reverse transfer capacitance	C_{res}		-	0.92	-	
SC data	I_{SC}	t_{sc} ≤ 5 μs, V_{GE} = 15 V, T_J = 125 °C, V_{CC} = 360 V, V_{CEM} ≤ 600 V	-	TBD	-	A
Internal gate resistance	R_{gint}		-	1.3	-	Ω
Stray inductance	L_{CE}		-	-	20	nH
Module lead resistance, terminal to chip	$R_{CC'+EE'}$	T_C = 25 °C	-	0.35	-	mΩ

DIODE ELECTRICAL SPECIFICATIONS (T_C = 25 °C unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Diode forward voltage	V_F	I_F = 400 A	T_J = 25 °C	-	1.38	1.80	V
			T_J = 125 °C	-	1.41	-	
Diode reverse recovery charge	Q_{rr}	I_F = 400 A, V_R = 300 V, dI/dt = -7000 A/μs, V_{GE} = -15 V	T_J = 25 °C	-	15.5	-	μC
			T_J = 125 °C	-	28.5	-	
Diode peak reverse recovery current	I_{rr}		T_J = 25 °C	-	265	-	A
			T_J = 125 °C	-	335	-	
Diode reverse recovery energy	E_{rec}		T_J = 25 °C	-	3.5	-	mJ
			T_J = 125 °C	-	7.5	-	

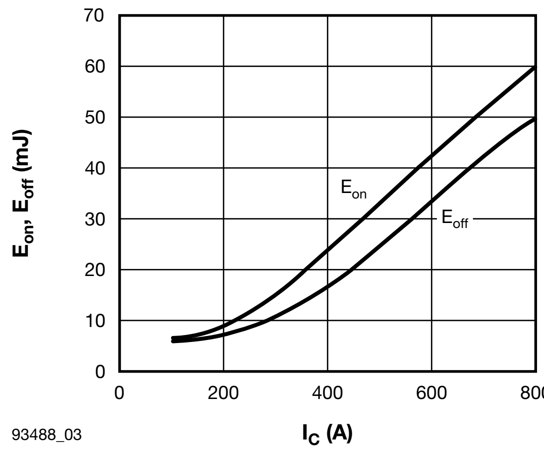
THERMAL AND MECHANICAL SPECIFICATIONS

PARAMETER		SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating junction temperature range		T_J		-	-	175	°C
Storage temperature range		T_{Stg}		-40	-	125	
Junction to case per ½ module	IGBT	R_{thJC}		-	-	0.094	K/W
	Diode			-	-	0.158	
Case to sink		R_{thCS}	Conductive grease applied	-	0.035	-	
Mounting torque			Power terminal screw: M6	2.5 to 5.0			Nm
			Mounting screw: M6	3.0 to 5.0			
Weight				300			g



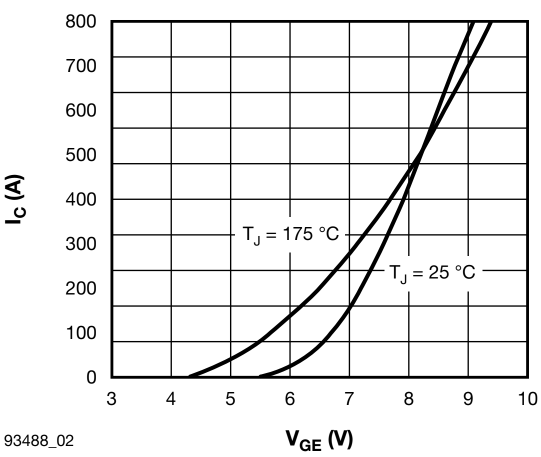
93488_01

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



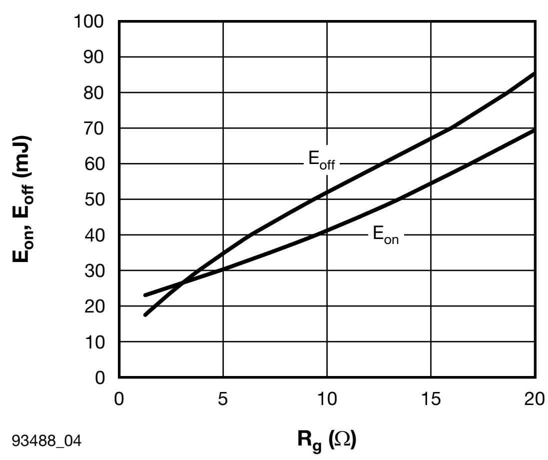
93488_03

Fig. 3 - IGBT Switching Loss vs. Collector Current
V_{CC} = 600 V, R_g = 1.3 Ω, V_{GE} = ± 15 V, T_J = 175 °C



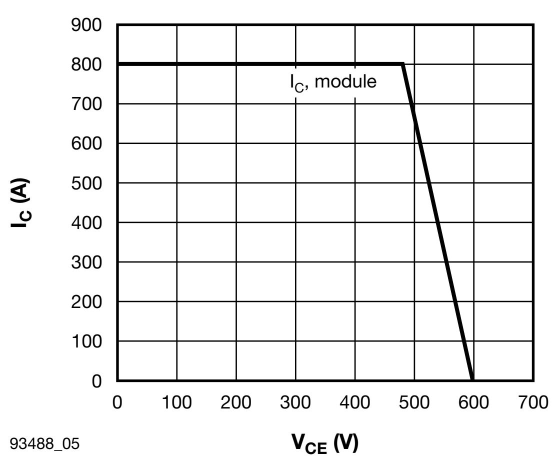
93488_02

Fig. 2 - IGBT Typical Transfer Characteristics
V_{CE} = 20 V



93488_04

Fig. 4 - Switching Loss vs. Gate Resistor
V_{CE} = 600 V, I_C = 400 A, V_{GE} = ± 15 V, T_J = 175 °C



93488_05

Fig. 5 - RBSOA
R_g = 1.3 Ω, V_{GE} = ± 15 V, T_J = 175 °C

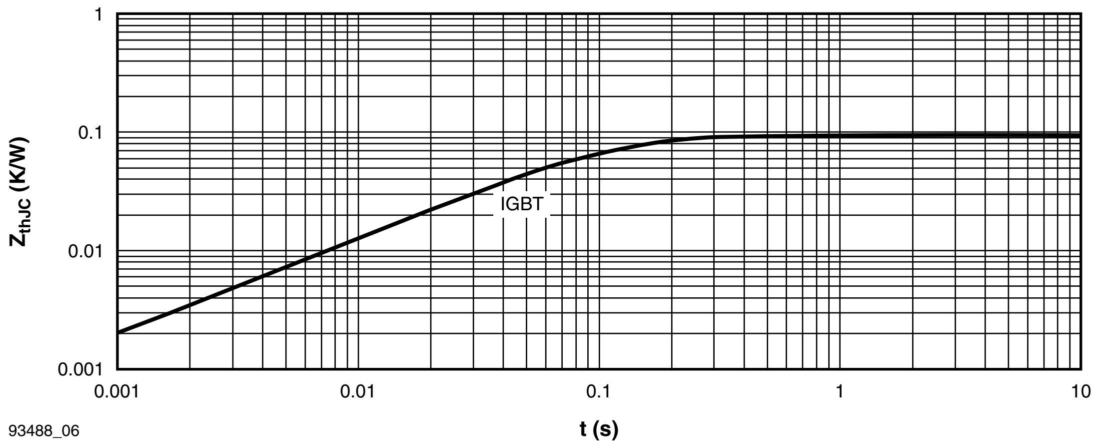


Fig. 6 - IGBT Transient Thermal Impedance

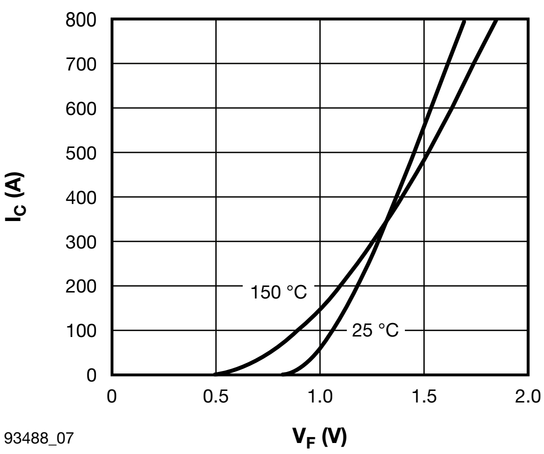


Fig. 7 - Forward Characteristics of Diode

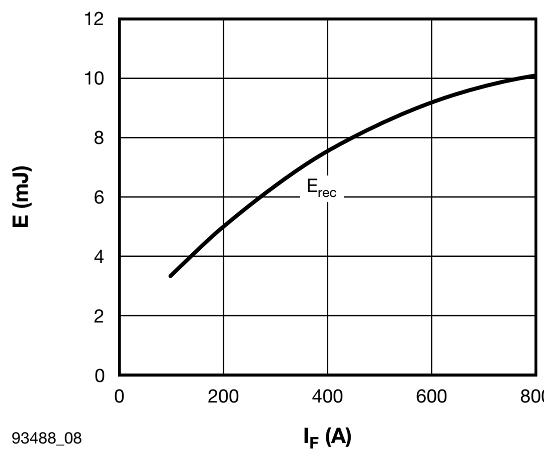


Fig. 8 - Diode Switching Loss vs. I_F
V_{CC} = 600 V, R_g = 1.3 Ω, V_{GE} = - 15 V, T_J = 125 °C

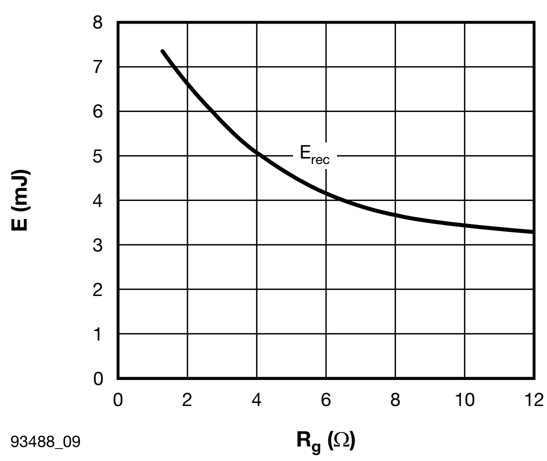


Fig. 9 - Diode Switching Loss vs. Gate Resistance
V_{CC} = 600 V, I_C = 400 A, V_{GE} = - 15 V, T_J = 125 °C

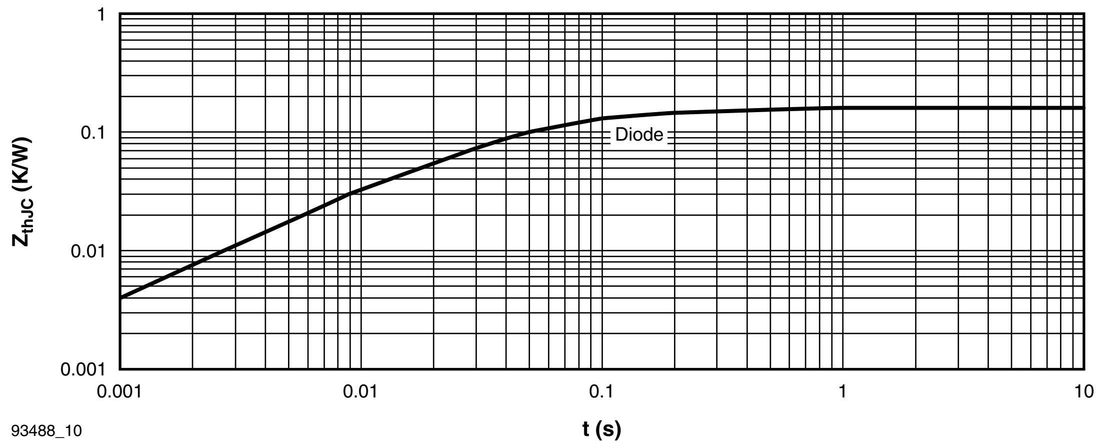
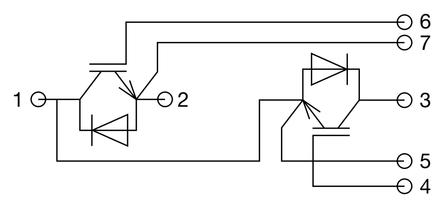


Fig. 10 - Diode Transient Thermal Impedance

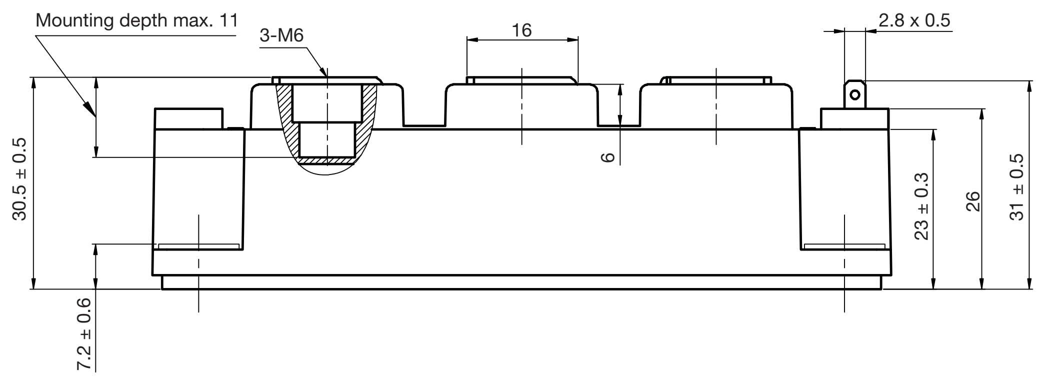
CIRCUIT CONFIGURATION

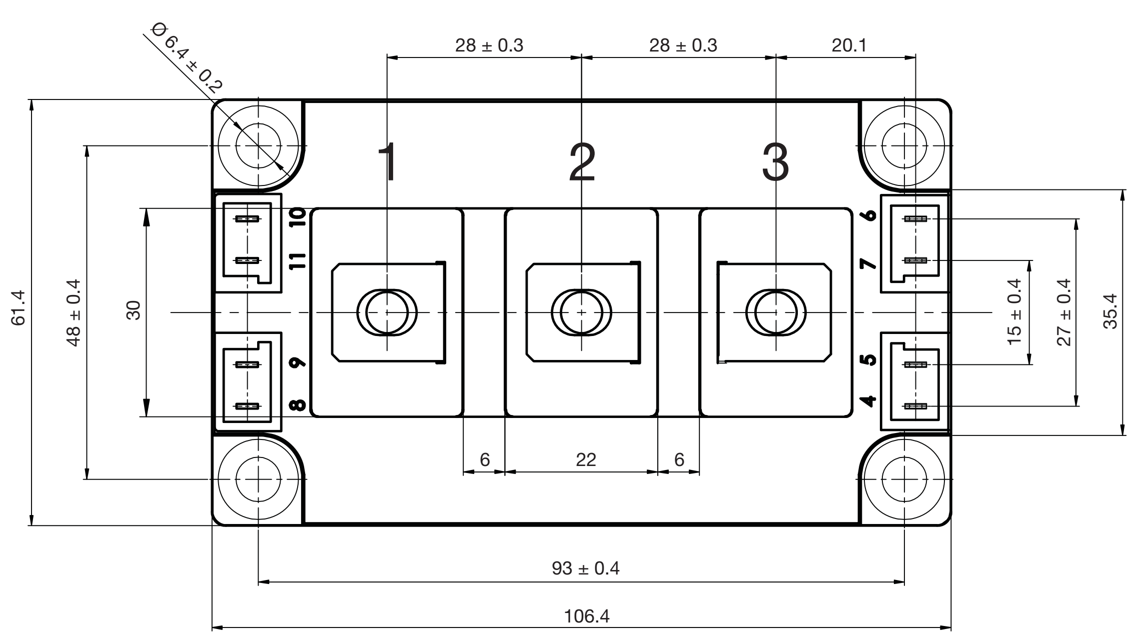


LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95525

Double INT-A-PAK

DIMENSIONS in millimeters (inches)





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.

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.