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

Double 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

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.

PRODUCT SUMMARY	
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	Double INT-A-PAK
Circuit	Half bridge

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)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
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

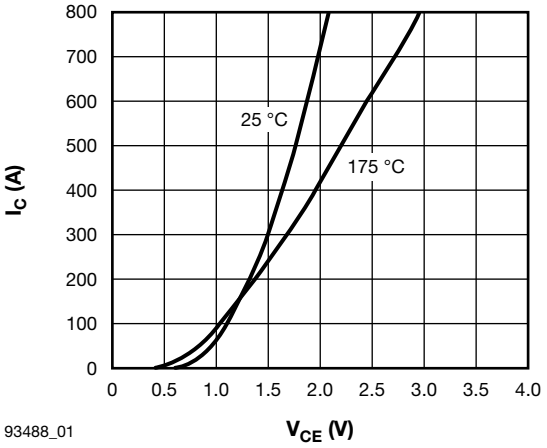


Fig. 1 - IGBT Typical Output Characteristics
V_{GE} = 15 V

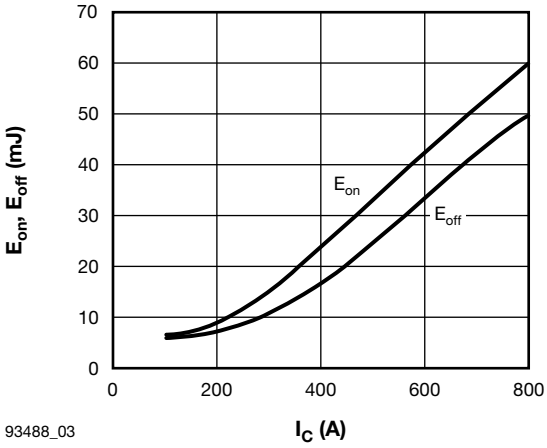


Fig. 3 - IGBT Switching Loss vs. Collector Current
V_{CC} = 600 V, R_g = 1.3 Ω, V_{GE} = ± 15 V, T_J = 175 °C

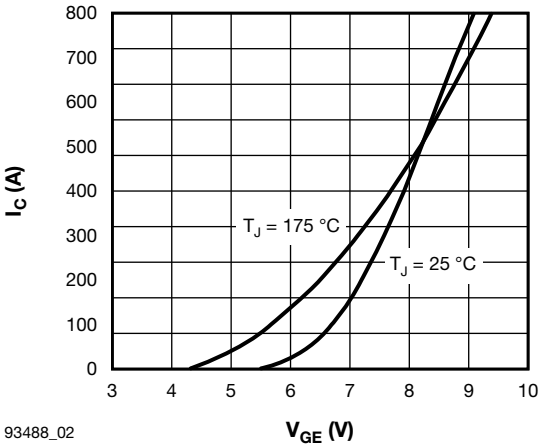


Fig. 2 - IGBT Typical Transfer Characteristics
V_{CE} = 20 V

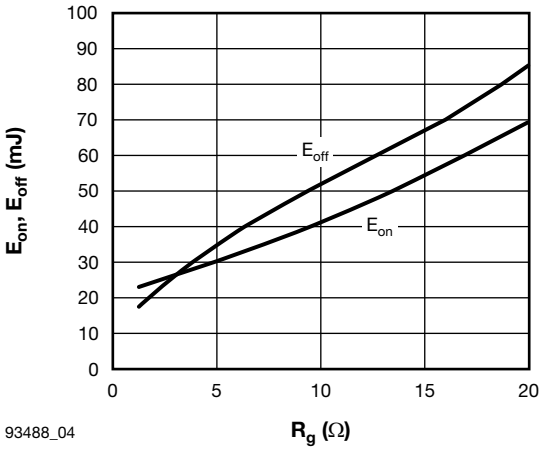


Fig. 4 - Switching Loss vs. Gate Resistor
V_{CE} = 600 V, I_C = 400 A, V_{GE} = ± 15 V, T_J = 175 °C

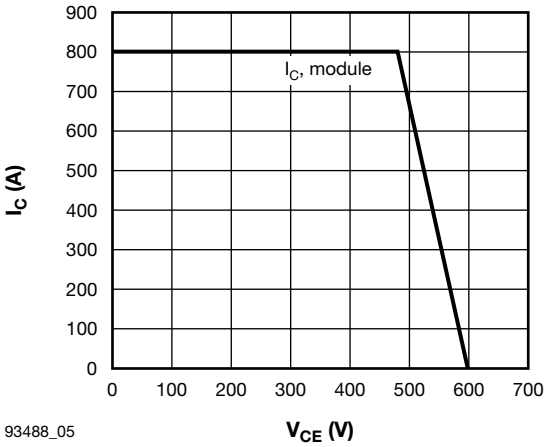


Fig. 5 - RBSOA
R_g = 1.3 Ω, V_{GE} = ± 15 V, T_J = 175 °C

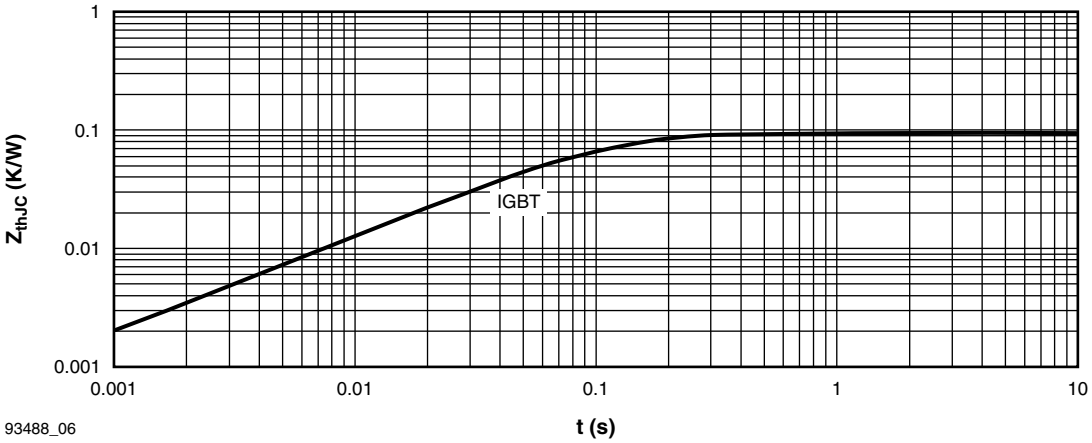


Fig. 6 - IGBT Transient Thermal Impedance

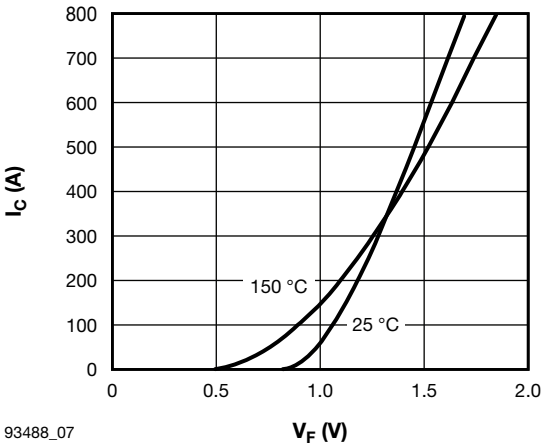


Fig. 7 - Forward Characteristics of Diode

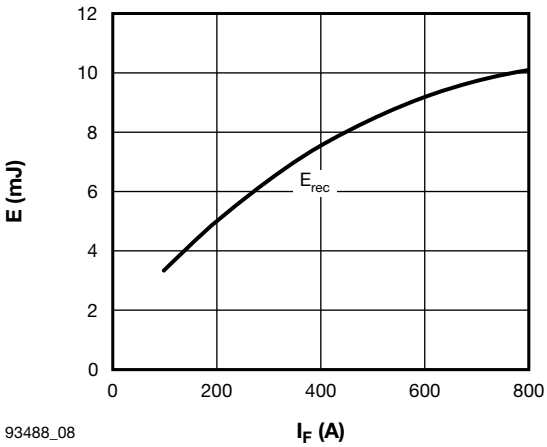


Fig. 8 - Diode Switching Loss vs. I_F
V_{CC} = 600 V, R_g = 1.3 Ω, V_{GE} = - 15 V, T_J = 125 °C

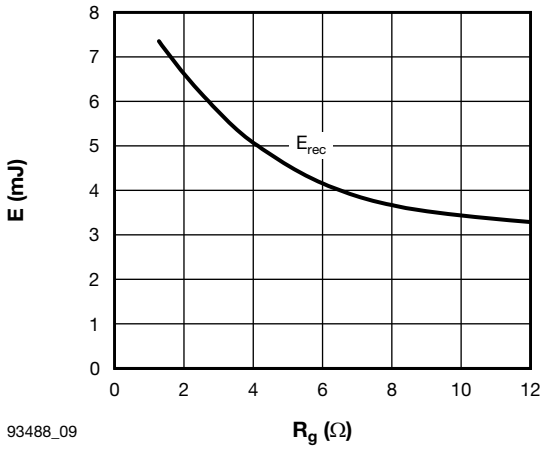


Fig. 9 - Diode Switching Loss vs. Gate Resistance
V_{CC} = 600 V, I_C = 400 A, V_{GE} = - 15 V, T_J = 125 °C

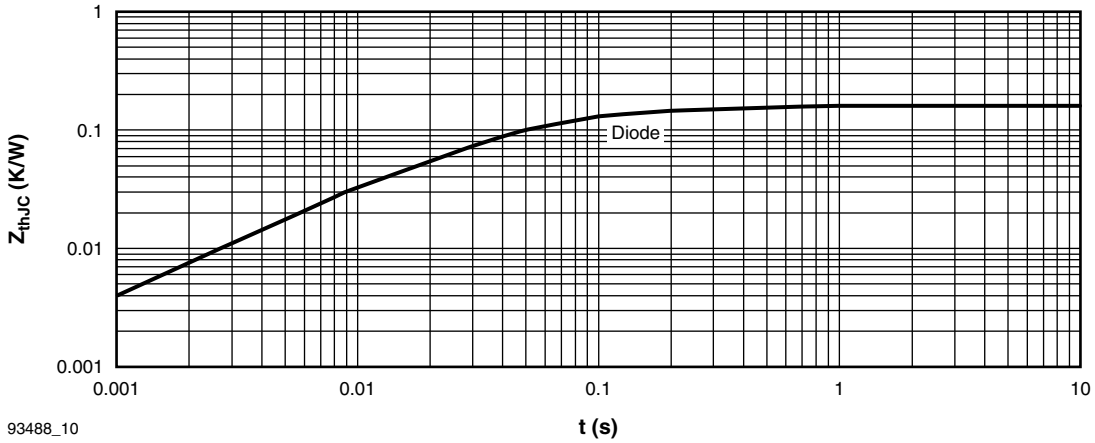
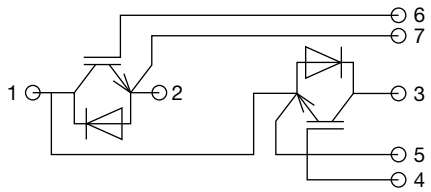


Fig. 10 - Diode Transient Thermal Impedance

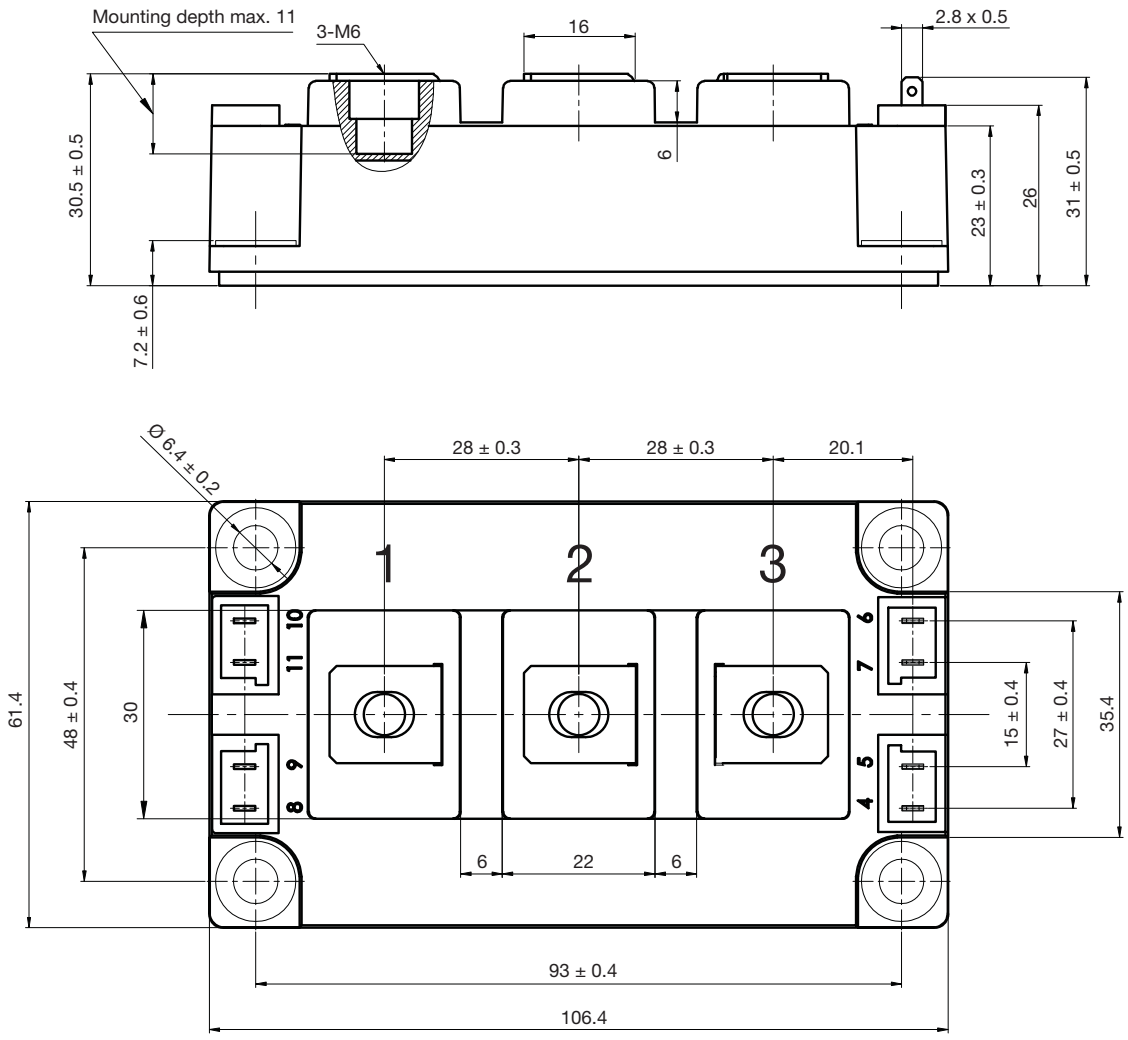
CIRCUIT CONFIGURATION



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

Double INT-A-PAK

DIMENSIONS in millimeters (inches)



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