

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 μ s 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	μ s
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

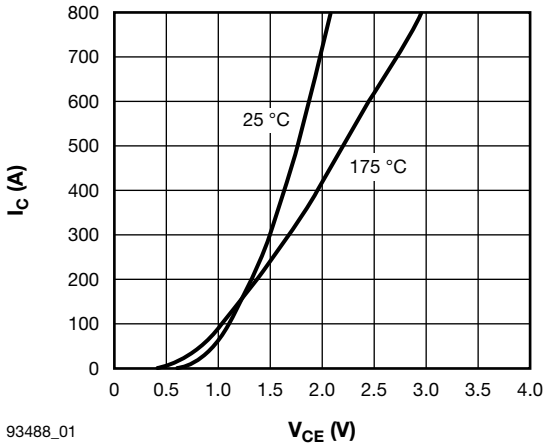
IGBT ELECTRICAL SPECIFICATIONS ($T_C = 25$ °C unless otherwise noted)						
Collector to emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE} = 0$ V, $I_C = 2$ mA, $T_J = 25$ °C	600	-	-	V
Collector to emitter saturation voltage	$V_{CE(on)}$	$V_{GE} = 15$ V, $I_C = 400$ A, $T_J = 25$ °C	-	1.6	2.05	
		$V_{GE} = 15$ 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



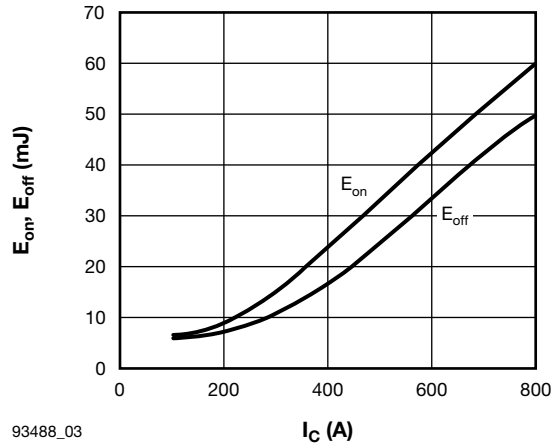
SWITCHING CHARACTERISTICS							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 400\text{ V}, I_C = 400\text{ A}, R_g = 1.3\ \Omega,$ $V_{GE} = \pm 15\text{ V}, T_J = 25\text{ }^\circ\text{C}$	-	35	-	ns	
Rise time	t_r		-	70	-		
Turn-off delay time	$t_{d(off)}$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

DIODE ELECTRICAL SPECIFICATIONS ($T_C = 25\text{ }^\circ\text{C}$ unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Diode forward voltage	V_F	$I_F = 400\text{ A}$	$T_J = 25\text{ }^\circ\text{C}$	-	1.38	1.80	V
			$T_J = 125\text{ }^\circ\text{C}$	-	1.41	-	
Diode reverse recovery charge	Q_{rr}	$I_F = 400\text{ A}, V_R = 300\text{ V},$ $dI/dt = -7000\text{ A}/\mu\text{s},$ $V_{GE} = -15\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	15.5	-	μC
			$T_J = 125\text{ }^\circ\text{C}$	-	28.5	-	
Diode peak reverse recovery current	I_{rr}	$I_F = 400\text{ A}, V_R = 300\text{ V},$ $dI/dt = -7000\text{ A}/\mu\text{s},$ $V_{GE} = -15\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	265	-	A
			$T_J = 125\text{ }^\circ\text{C}$	-	335	-	
Diode reverse recovery energy	E_{rec}	$I_F = 400\text{ A}, V_R = 300\text{ V},$ $dI/dt = -7000\text{ A}/\mu\text{s},$ $V_{GE} = -15\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	3.5	-	mJ
			$T_J = 125\text{ }^\circ\text{C}$	-	7.5	-	

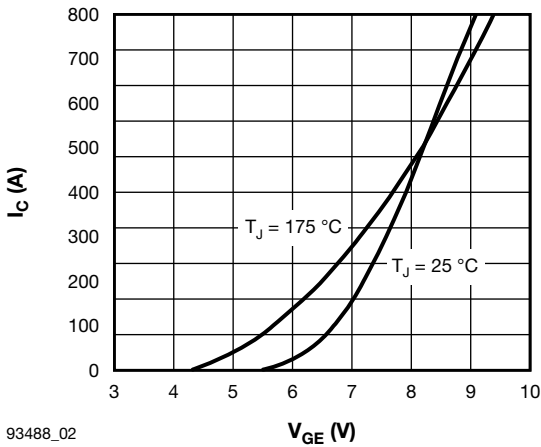
THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating junction temperature range	T_J		-	-	175	$^\circ\text{C}$
Storage temperature range	T_{Stg}		-40	-	125	
Junction to case per 1/2 module	R_{thJC}	IGBT	-	-	0.094	K/W
		Diode	-	-	0.158	
Case to sink	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



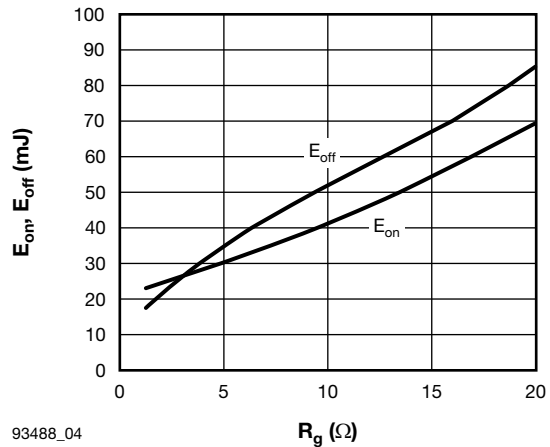
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Fig. 1 - IGBT Typical Output Characteristics
 $V_{GE} = 15\text{ V}$



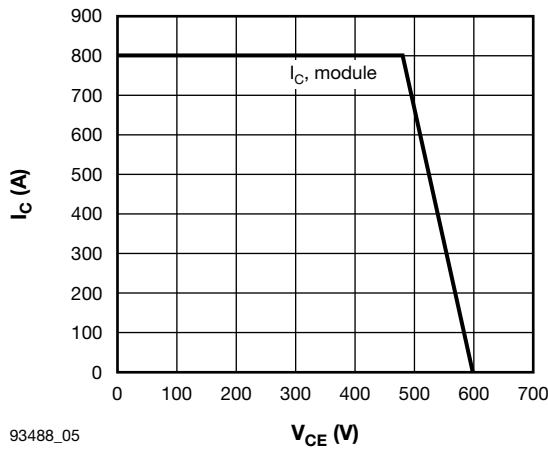
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Fig. 3 - IGBT Switching Loss vs. Collector Current
 $V_{CC} = 600\text{ V}$, $R_g = 1.3\ \Omega$, $V_{GE} = \pm 15\text{ V}$, $T_J = 175\text{ }^\circ\text{C}$



93488_02
Fig. 2 - IGBT Typical Transfer Characteristics
 $V_{CE} = 20\text{ V}$



93488_04
Fig. 4 - Switching Loss vs. Gate Resistor
 $V_{CE} = 600\text{ V}$, $I_C = 400\text{ A}$, $V_{GE} = \pm 15\text{ V}$, $T_J = 175\text{ }^\circ\text{C}$



93488_05
Fig. 5 - RBSOA
 $R_g = 1.3\ \Omega$, $V_{GE} = \pm 15\text{ V}$, $T_J = 175\text{ }^\circ\text{C}$

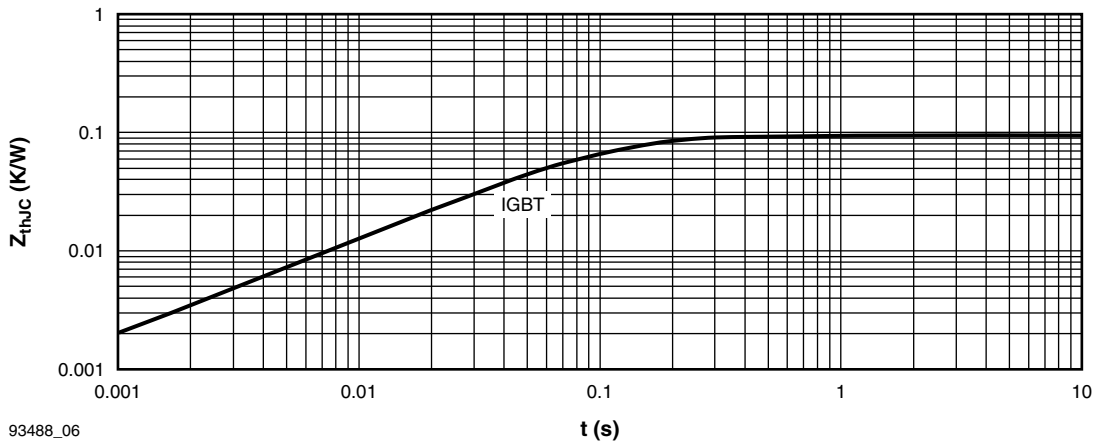


Fig. 6 - IGBT Transient Thermal Impedance

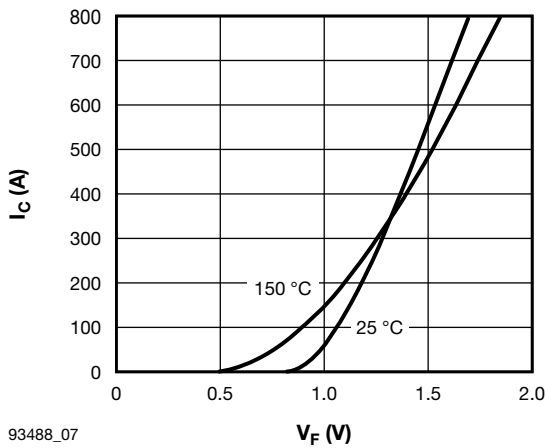


Fig. 7 - Forward Characteristics of Diode

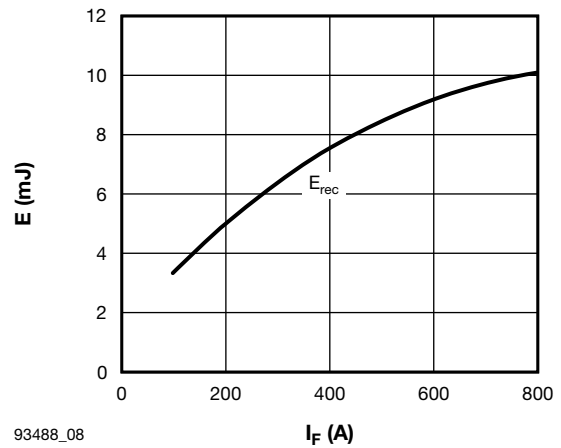


Fig. 8 - Diode Switching Loss vs. I_F
 $V_{CC} = 600\text{ V}$, $R_g = 1.3\ \Omega$, $V_{GE} = -15\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$

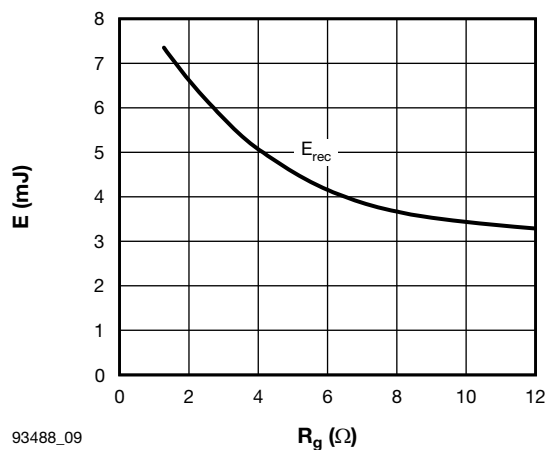


Fig. 9 - Diode Switching Loss vs. Gate Resistance
 $V_{CC} = 600\text{ V}$, $I_C = 400\text{ A}$, $V_{GE} = -15\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$

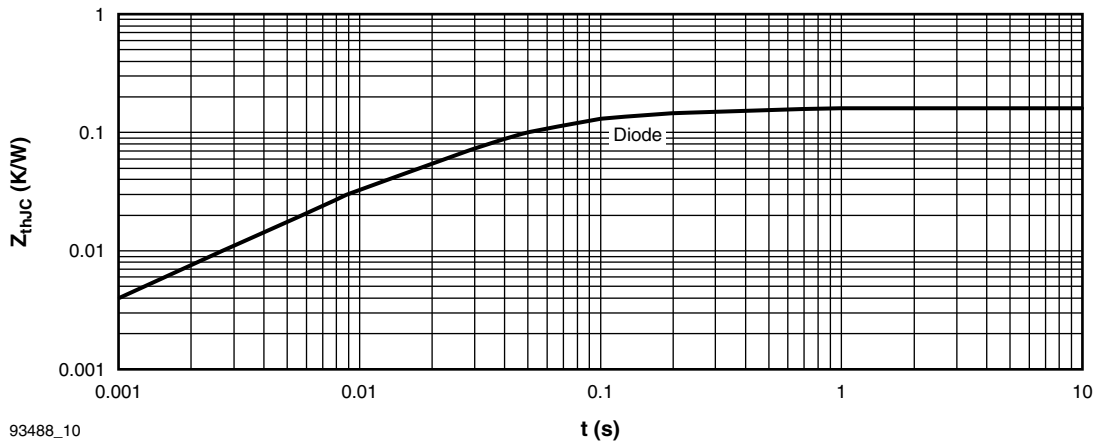
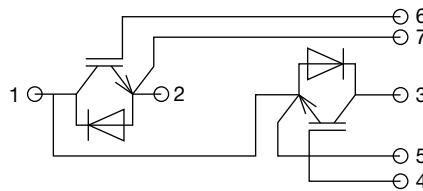


Fig. 10 - Diode Transient Thermal Impedance

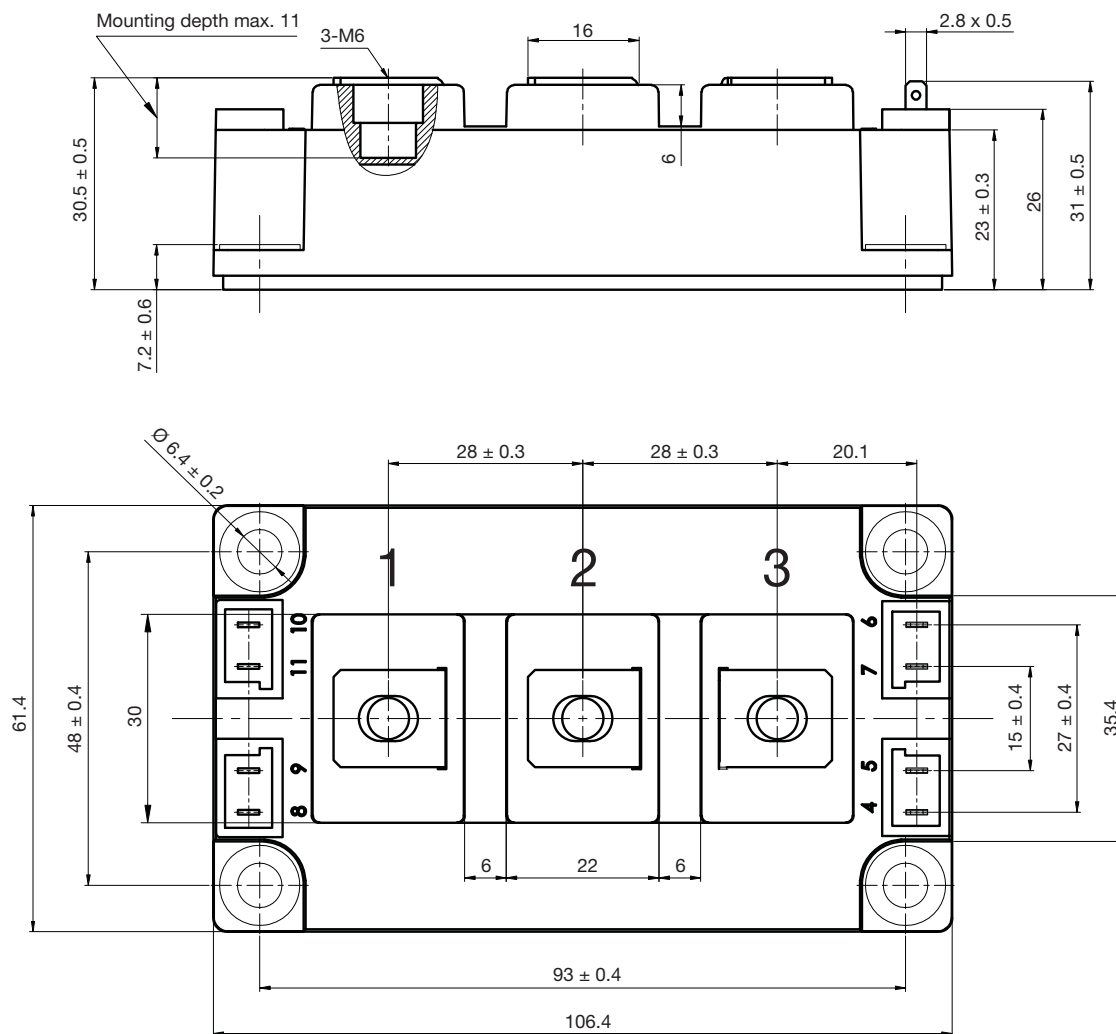
CIRCUIT CONFIGURATION



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

Double INT-A-PAK

DIMENSIONS in millimeters (inches)





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