

## Molding Type Module IGBT, 1-in-1 Package, 1200 V and 400 A



Dual INT-A-PAK

PRIMARY CHARACTERISTICS	
$V_{CES}$	1200 V
$I_C$ at $T_C = 80\text{ }^\circ\text{C}$	400 A
$V_{CE(on)}$ (typical) at $I_C = 400\text{ A}$ , $25\text{ }^\circ\text{C}$	1.90 V
Speed	8 kHz to 30 kHz
Package	Dual INT-A-PAK
Circuit configuration	Single switch with AP diode

### FEATURES

- High short circuit capability, self limiting to  $6 \times I_C$
- 10  $\mu\text{s}$  short circuit capability
- $V_{CE(on)}$  with positive temperature coefficient
- 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](http://www.vishay.com/doc?99912)


**RoHS  
COMPLIANT**

### TYPICAL APPLICATIONS

- Switching mode power supplies
- AC inverter drives
- Electronic welders at  $f_{sw}$  up to 20 kHz

### DESCRIPTION

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

ABSOLUTE MAXIMUM RATINGS ( $T_C = 25\text{ }^\circ\text{C}$ unless otherwise noted)				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	$V_{CES}$		1200	V
Gate to emitter voltage	$V_{GES}$		$\pm 20$	
Collector current at $T_J = 150\text{ }^\circ\text{C}$	$I_C$	$T_C = 25\text{ }^\circ\text{C}$	650	A
		$T_C = 80\text{ }^\circ\text{C}$	400	
Pulsed collector current	$I_{CM}^{(1)}$	$T_C = 80\text{ }^\circ\text{C}$	800	
Diode continuous forward current	$I_F$		400	
Diode maximum forward current	$I_{FM}$		800	
Maximum power dissipation	$P_D$	$T_J = 150\text{ }^\circ\text{C}$	2500	W
Short circuit withstand time	$t_{SC}$	$T_J = 125\text{ }^\circ\text{C}$	10	$\mu\text{s}$
$I^2t$ -value, diode	$I^2t$	$V_R = 0\text{ V}$ , $t = 10\text{ ms}$ , $T_J = 125\text{ }^\circ\text{C}$	27 500	$\text{A}^2\text{s}$
RMS isolation voltage	$V_{ISOL}$	$f = 50\text{ Hz}$ , $t = 1\text{ min}$	2500	V

#### Note

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

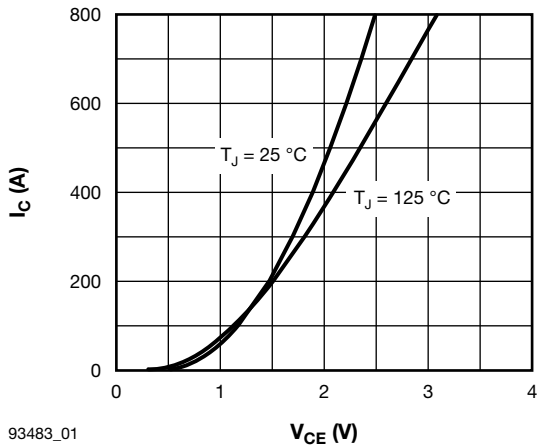
IGBT ELECTRICAL SPECIFICATIONS ( $T_C = 25\text{ }^\circ\text{C}$ unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Collector to emitter breakdown voltage	$V_{(BR)CES}$	$T_J = 25\text{ }^\circ\text{C}$	1200	-	-	V
Collector to emitter saturation voltage	$V_{CE(on)}$	$V_{GE} = 15\text{ V}$ , $I_C = 400\text{ A}$ , $T_J = 25\text{ }^\circ\text{C}$	-	1.9	-	
		$V_{GE} = 15\text{ V}$ , $I_C = 400\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$	-	2.1	-	
Gate to emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$ , $I_C = 8\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$	5.0	6.2	7.0	
Zero gate voltage collector current	$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$	-	-	5.0	mA
Gate to emitter leakage current	$I_{GES}$	$V_{GE} = V_{GES}$ , $V_{CE} = 0\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$	-	-	400	nA



SWITCHING CHARACTERISTICS							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 600\text{ V}, I_C = 400\text{ A}, R_g = 4\ \Omega,$ $V_{GE} = \pm 15\text{ V}, T_J = 25\text{ }^\circ\text{C}$	-	100	-	ns	
Rise time	$t_r$		-	60	-		
Turn-off delay time	$t_{d(off)}$		-	420	-		
Fall time	$t_f$		-	60	-		
Turn-on switching loss	$E_{on}$			-	33	-	mJ
Turn-off switching loss	$E_{off}$			-	42	-	
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 600\text{ V}, I_C = 400\text{ A}, R_g = 4\ \Omega,$ $V_{GE} = \pm 15\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	120	-	ns	
Rise time	$t_r$		-	60	-		
Turn-off delay time	$t_{d(off)}$		-	490	-		
Fall time	$t_f$		-	75	-		
Turn-on switching loss	$E_{on}$			-	35	-	mJ
Turn-off switching loss	$E_{off}$			-	46	-	
Input capacitance	$C_{ies}$	$V_{GE} = 0\text{ V}, V_{CE} = 25\text{ V}, f = 1.0\text{ MHz}$	-	30	-	nF	
Output capacitance	$C_{oes}$		-	4	-		
Reverse transfer capacitance	$C_{res}$		-	3	-		
SC data	$I_{SC}$	$t_{sc} \leq 10\ \mu\text{s}, V_{GE} = 15\text{ V}, T_J = 125\text{ }^\circ\text{C},$ $V_{CC} = 900\text{ V}, V_{CEM} \leq 1200\text{ V}$	-	1900	-	A	
Stray inductance	$L_{CE}$		-	-	20	nH	
Module lead resistance, terminal to chip	$R_{CC'+EE'}$	$T_C = 25\text{ }^\circ\text{C}$	-	0.18	-	m $\Omega$	

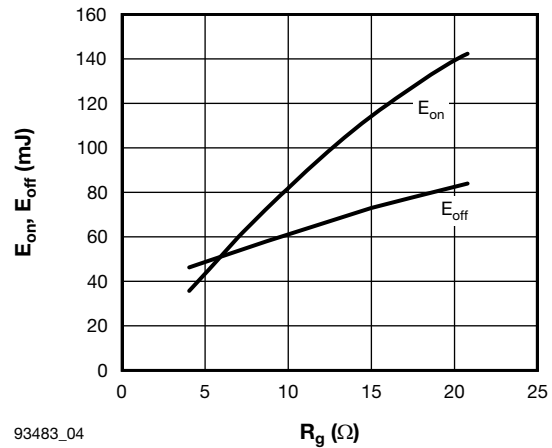
DIODE ELECTRICAL SPECIFICATIONS ( $T_C = 25\text{ }^\circ\text{C}$ unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Diode forward voltage	$V_F$	$I_F = 400\text{ A}$	$T_J = 25\text{ }^\circ\text{C}$	-	2.1	2.2	V
			$T_J = 125\text{ }^\circ\text{C}$	-	2.2	2.3	
Diode reverse recovery charge	$Q_{rr}$	$I_F = 400\text{ A}, V_R = 600\text{ V},$ $di/dt = -4000\text{ A}/\mu\text{s},$ $V_{GE} = -15\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	40	-	$\mu\text{C}$
			$T_J = 125\text{ }^\circ\text{C}$	-	48	-	
Diode peak reverse recovery current	$I_{rr}$		$T_J = 25\text{ }^\circ\text{C}$	-	320	-	A
			$T_J = 125\text{ }^\circ\text{C}$	-	400	-	
Diode reverse recovery energy	$E_{rec}$		$T_J = 25\text{ }^\circ\text{C}$	-	12	-	mJ
			$T_J = 125\text{ }^\circ\text{C}$	-	20	-	

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Operating junction temperature range	$T_J$		-40	-	150	$^\circ\text{C}$
Storage temperature range	$T_{Stg}$		-40	-	125	
Junction to case per module	$R_{thJC}$	IGBT	-	-	0.05	K/W
		Diode	-	-	0.09	
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 6.0			
Weight			310			g



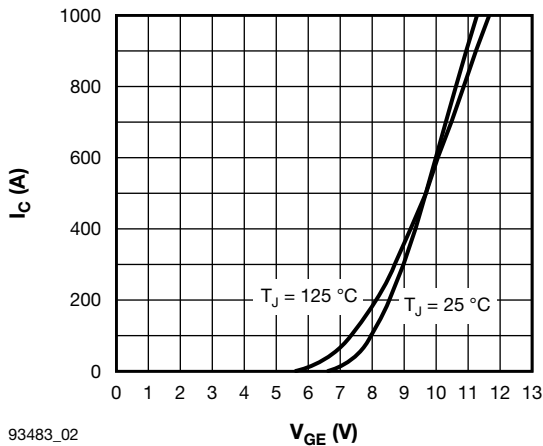
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Fig. 1 - Typical Output Characteristics  
 $V_{GE} = 15\text{ V}$



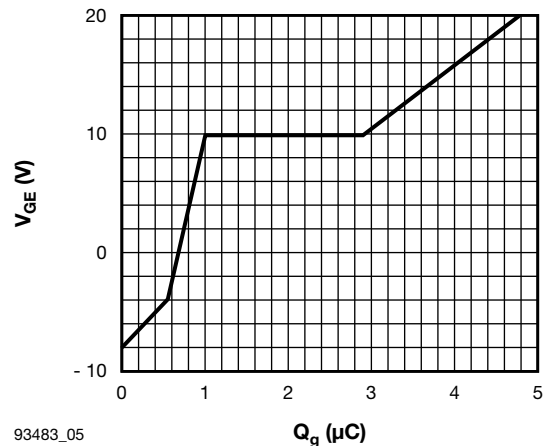
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Fig. 4 - Switching Loss vs. Gate Resistor  
 $V_{CC} = 600\text{ V}, I_C = 400\text{ A}, V_{GE} = \pm 15\text{ V}, T_J = 125\text{ }^\circ\text{C}$



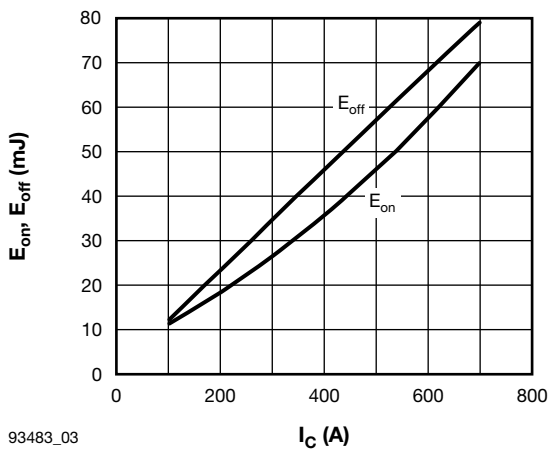
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Fig. 2 - Typical Transfer Characteristics  
 $V_{CE} = 20\text{ V}$



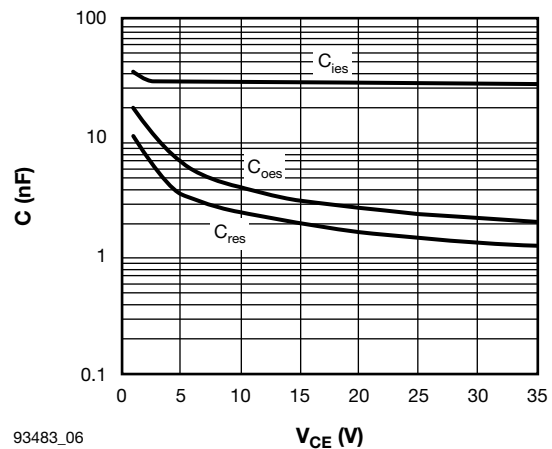
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Fig. 5 - Gate Charge Characteristics  
 $V_{CC} = 600\text{ V}, I_C = 400\text{ A}, T_J = 25\text{ }^\circ\text{C}$



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Fig. 3 - Switching Loss vs. Collector Current  
 $V_{CC} = 600\text{ V}, R_g = 4\text{ }^\Omega, V_{GE} = \pm 15\text{ V}, T_J = 125\text{ }^\circ\text{C}$



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Fig. 6 - Typical Capacitance vs. Collector to Emitter Voltage

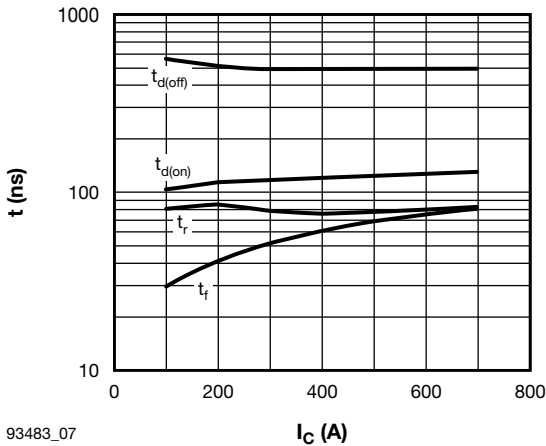


Fig. 7 - Typical Switching Times vs.  $I_C$   
 $V_{CC} = 600\text{ V}$ ,  $R_g = 4\ \Omega$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $T_J = 125\text{ }^\circ\text{C}$

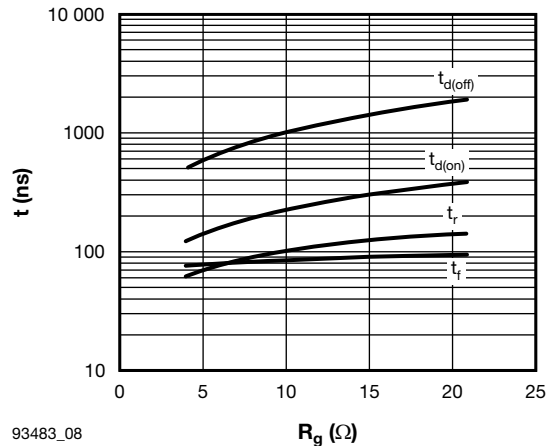


Fig. 8 - Typical Switching Times vs. Gate Resistance  
 $V_{CC} = 600\text{ V}$ ,  $I_C = 400\text{ A}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $T_J = 125\text{ }^\circ\text{C}$

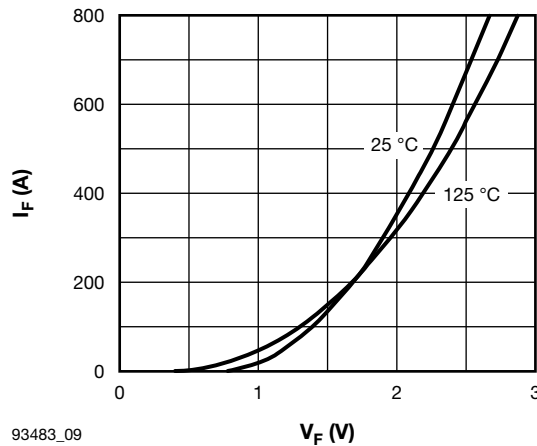


Fig. 9 - Typical Forward Characteristics (Diode)

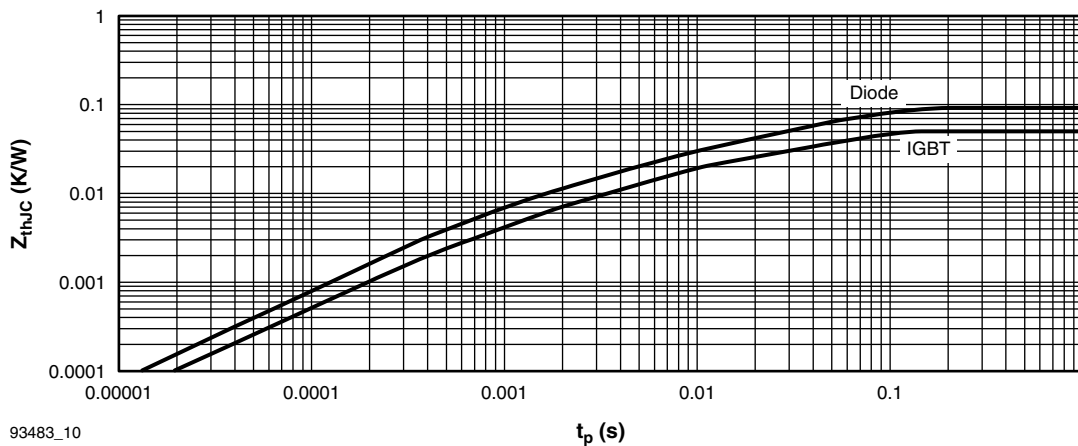
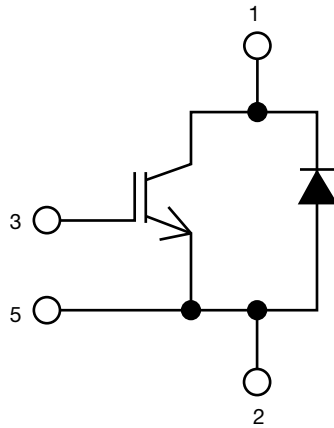


Fig. 10 - Transient Thermal Impedance



**CIRCUIT CONFIGURATION**



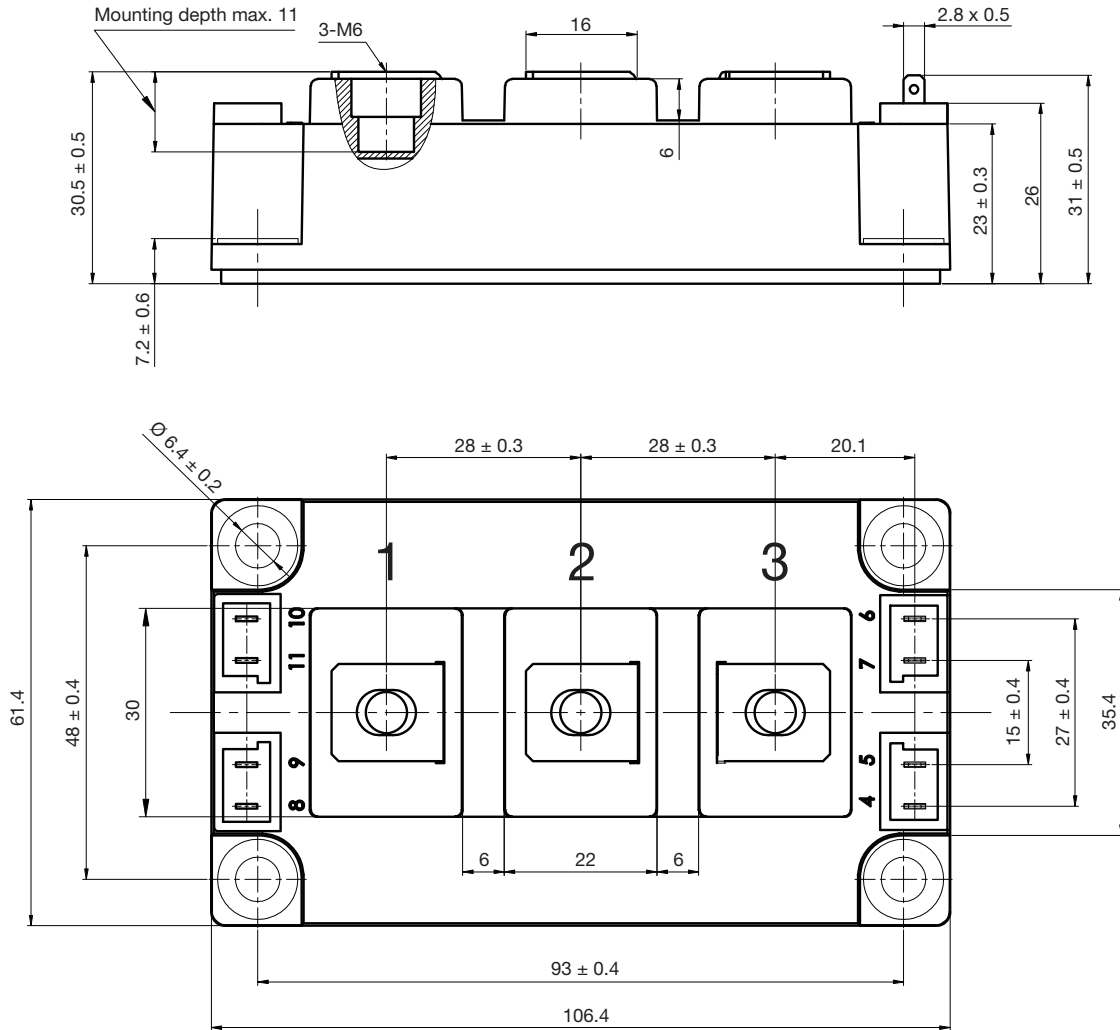
**LINKS TO RELATED DOCUMENTS**

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95526">www.vishay.com/doc?95526</a>



## Double INT-A-PAK

**DIMENSIONS** in millimeters (inches)





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