

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



Double INT-A-PAK

FEATURES

- High short circuit capability, self limiting to $6 \times I_C$
- 10 μ 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


RoHS
COMPLIANT

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

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 ($T_C = 25^\circ\text{C}$ unless otherwise noted)				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	V_{CES}		1200	V
Gate to emitter voltage	V_{GES}		± 20	
Collector current at $T_J = 150^\circ\text{C}$	I_C	$T_C = 25^\circ\text{C}$	650	A
		$T_C = 80^\circ\text{C}$	400	
Pulsed collector current	$I_{CM}^{(1)}$	$T_C = 80^\circ\text{C}$	800	
Diode continuous forward current	I_F		400	
Diode maximum forward current	I_{FM}		800	
Maximum power dissipation	P_D	$T_J = 150^\circ\text{C}$	2500	
Short circuit withstand time	t_{SC}	$T_J = 125^\circ\text{C}$	10	μ s
I^2t -value, diode	I^2t	$V_R = 0\text{ V}$, $t = 10\text{ ms}$, $T_J = 125^\circ\text{C}$	27 500	A^2s
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	$t_{d(on)}$	$V_{CC} = 600\text{ V}, I_C = 400\text{ A}, R_g = 4\text{ }\Omega, V_{GE} = \pm 15\text{ V}, T_J = 25\text{ }^\circ\text{C}$	-	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}	$V_{CC} = 600\text{ V}, I_C = 400\text{ A}, R_g = 4\text{ }\Omega, V_{GE} = \pm 15\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	33	-	mJ
Turn-off switching loss	E_{off}		-	42	-	
Turn-on delay time	$t_{d(on)}$		-	120	-	
Rise time	t_r		-	60	-	
Turn-off delay time	$t_{d(off)}$	$V_{CC} = 600\text{ V}, I_C = 400\text{ A}, R_g = 4\text{ }\Omega, V_{GE} = \pm 15\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	490	-	ns
Fall time	t_f		-	75	-	
Turn-on switching loss	E_{on}		-	35	-	
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}	$t_{sc} \leq 10\text{ }\mu\text{s}, V_{GE} = 15\text{ V}, T_J = 125\text{ }^\circ\text{C}, V_{CC} = 900\text{ V}, V_{CEM} \leq 1200\text{ V}$	-	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 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	$I_F = 400\text{ A}$	$T_J = 25\text{ }^\circ\text{C}$	-	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	-	μC
			$T_J = 125\text{ }^\circ\text{C}$	-	48	-	
Diode peak reverse recovery current	I_{rr}	$I_F = 400\text{ A}, V_R = 600\text{ V}, dI/dt = -4000\text{ A}/\mu\text{s}, V_{GE} = -15\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	320	-	A
			$T_J = 125\text{ }^\circ\text{C}$	-	400	-	
Diode reverse recovery energy	E_{rec}	$I_F = 400\text{ A}, V_R = 600\text{ V}, dI/dt = -4000\text{ A}/\mu\text{s}, V_{GE} = -15\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	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	°C
Storage temperature range	T_{Stg}		-40	-	125	
Junction to case per module	IGBT	R_{thJC}	-	-	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

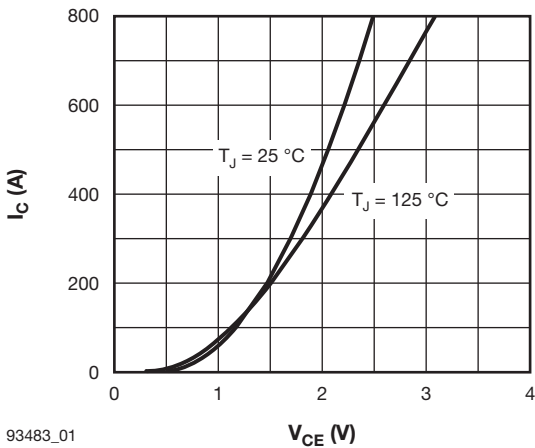


Fig. 1 - Typical Output Characteristics
 $V_{GE} = 15\text{ V}$

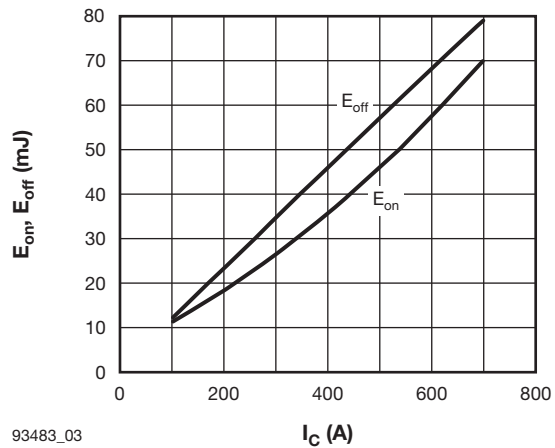


Fig. 3 - Switching Loss vs. Collector Current
 $V_{CC} = 600\text{ V}$, $R_g = 4\ \Omega$, $V_{GE} = \pm 15\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$

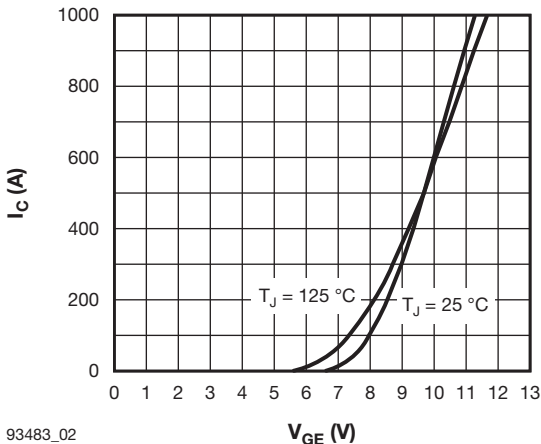


Fig. 2 - Typical Transfer Characteristics
 $V_{CE} = 20\text{ V}$

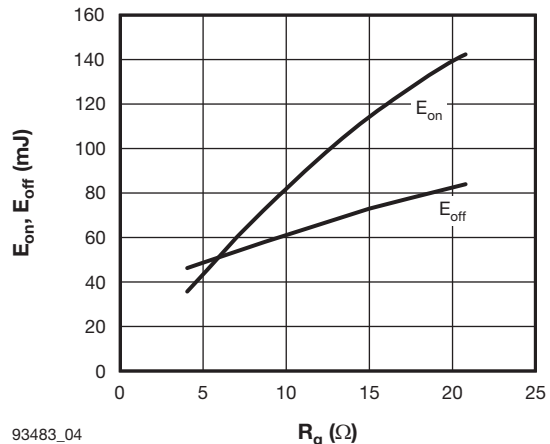
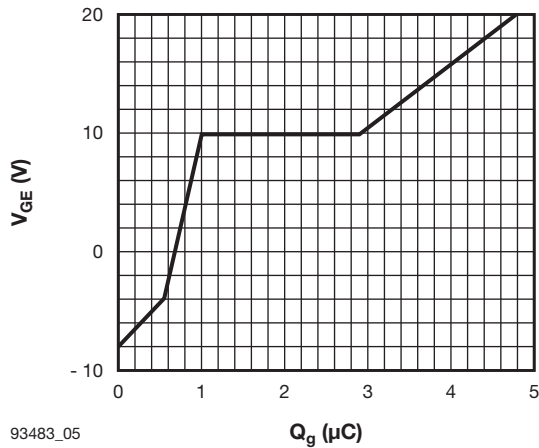
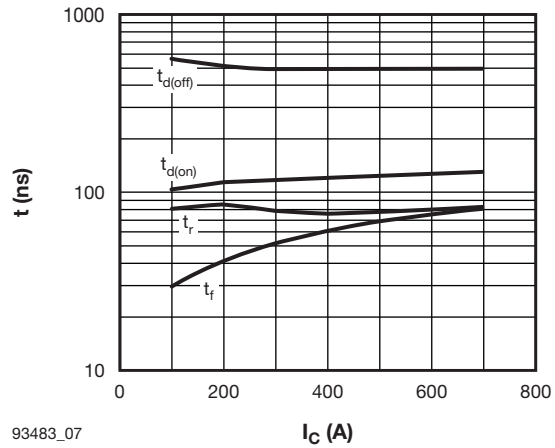


Fig. 4 - Switching Loss vs. Gate Resistor
 $V_{CC} = 600\text{ V}$, $I_C = 400\text{ A}$, $V_{GE} = \pm 15\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$



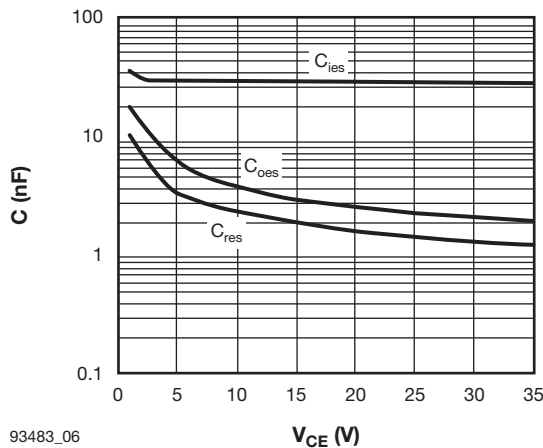
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Fig. 5 - Gate Charge Characteristics
 $V_{CC} = 600\text{ V}$, $I_C = 400\text{ A}$, $T_J = 25\text{ }^\circ\text{C}$



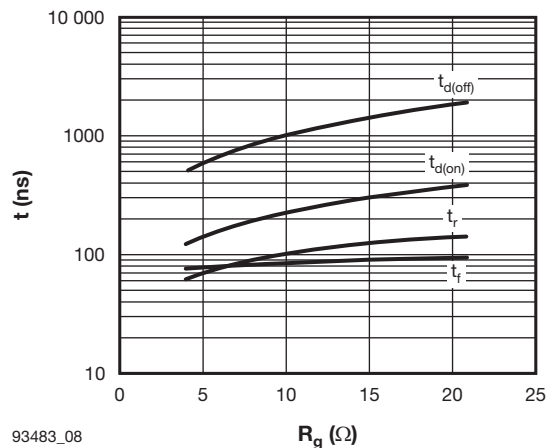
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Fig. 7 - Typical Switching Times vs. I_C
 $V_{CC} = 600\text{ V}$, $R_g = 4\text{ }\Omega$, $V_{GE} = \pm 15\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$



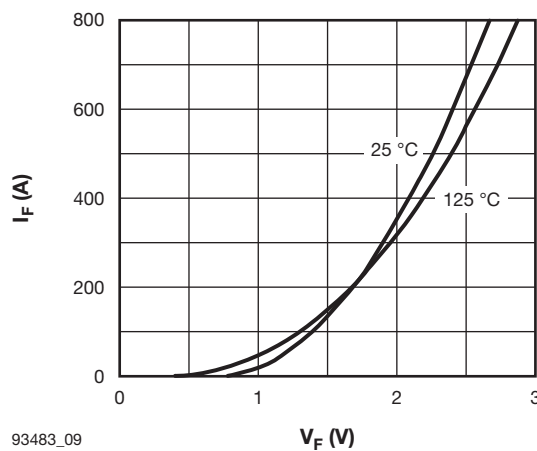
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Fig. 6 - Typical Capacitance vs. Collector to Emitter Voltage



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



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Fig. 9 - Typical Forward Characteristics (Diode)

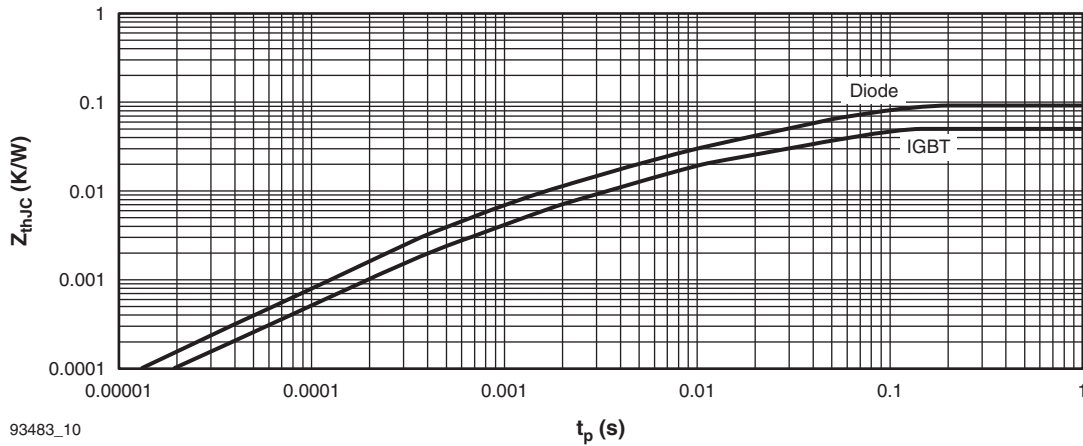
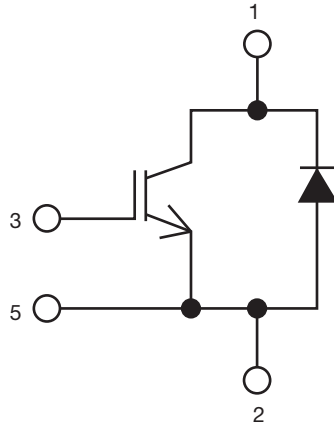


Fig. 10 - Transient Thermal Impedance

CIRCUIT CONFIGURATION

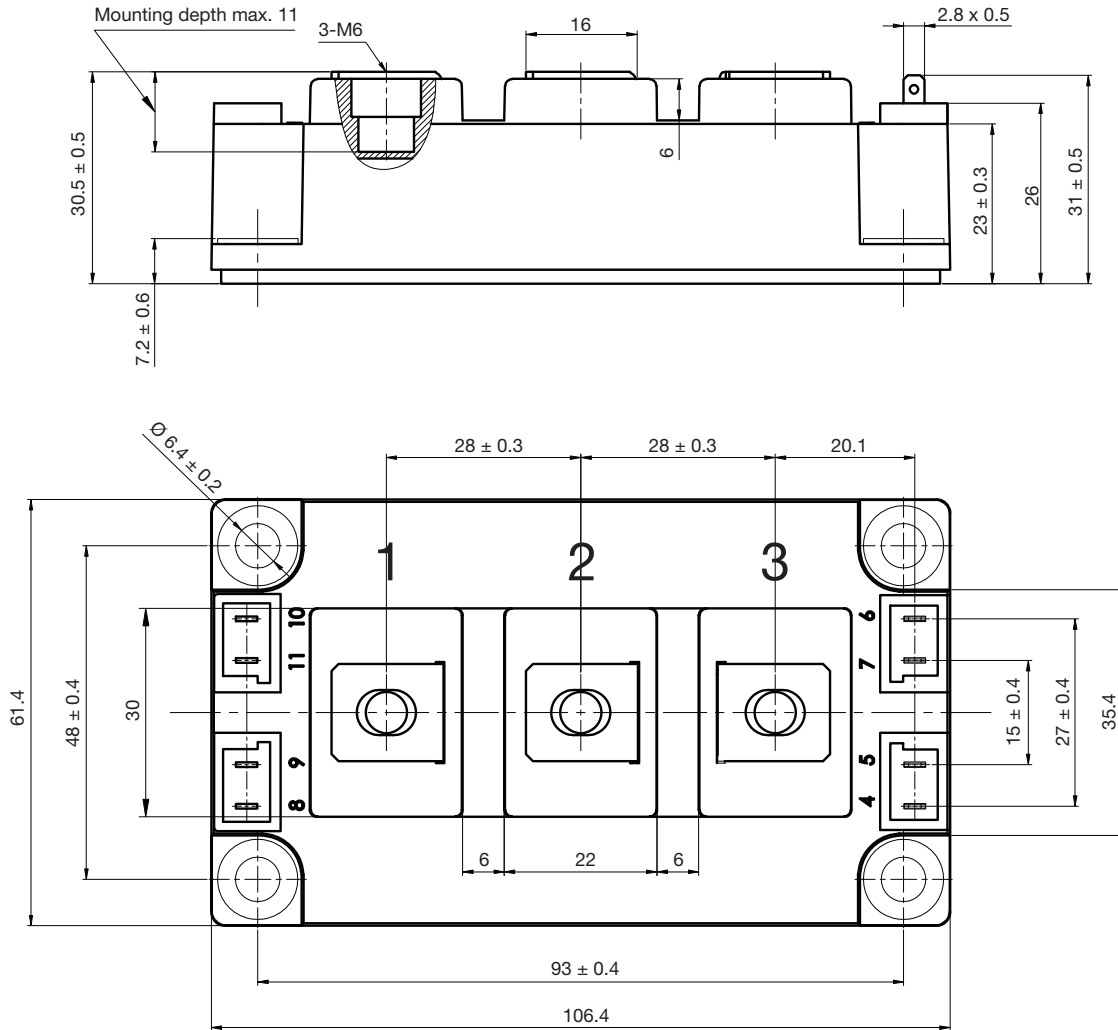


LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95526



Double INT-A-PAK

DIMENSIONS in millimeters (inches)





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