

## Molding Type Module IGBT, 2 in 1 Package, 1200 V and 400 A



Double INT-A-PAK


**RoHS**  
COMPLIANT

### FEATURES

- 10  $\mu$ s short circuit capability
- Low switching losses
- Rugged with ultrafast performance
- $V_{CE(on)}$  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)

### TYPICAL APPLICATIONS

- Inductive heating
- Switching mode power supplies
- Electronic welder

### DESCRIPTION

Vishay's IGBT power module provides ultrafast switching speed as well as short circuit ruggedness. It is designed for applications such as electronic welder and inductive heating.

PRODUCT SUMMARY	
$V_{CES}$	1200 V
$I_C$ at $T_C = 80\text{ }^\circ\text{C}$	400 A
$V_{CE(on)}$ (typical) at $I_C = 400\text{ A}$ , $T_J = 25\text{ }^\circ\text{C}$	3.10 V
Speed	8 kHz to 30 kHz
Package	Double INT-A-PAK
Circuit	Half bridge

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	$I_C$	$T_C = 25\text{ }^\circ\text{C}$	660	A
		$T_C = 80\text{ }^\circ\text{C}$	400	
Pulsed collector current	$I_{CM}^{(1)}$	$t_p = 1\text{ ms}$	800	
Diode continuous forward current	$I_F$	$T_C = 80\text{ }^\circ\text{C}$	400	
Diode maximum forward current	$I_{FM}^{(1)}$	$t_p = 1\text{ ms}$	800	
Maximum power dissipation	$P_D$	$T_J = 150\text{ }^\circ\text{C}$	2660	W
Short circuit withstand time	$T_{SC}$	$T_J = 125\text{ }^\circ\text{C}$	10	$\mu$ s
RMS isolation voltage	$V_{ISOL}$	$f = 50\text{ Hz}$ , $t = 1\text{ min}$	2500	V

#### Note

<sup>(1)</sup> Repetitive rating: pulse width limited by maximum junction temperature.



<b>IGBT ELECTRICAL SPECIFICATIONS</b> ( $T_C = 25\text{ }^\circ\text{C}$ 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 voltage	$V_{CE(on)}$	$V_{GE} = 15\text{ V}, I_C = 400\text{ A}, T_J = 25\text{ }^\circ\text{C}$	-	3.10	3.60	
		$V_{GE} = 15\text{ V}, I_C = 400\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	3.45	-	
Gate to emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 4.0\text{ mA}, T_J = 25\text{ }^\circ\text{C}$	4.4	4.9	6.0	
Collector cut-off 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

<b>SWITCHING CHARACTERISTICS</b>						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 600\text{ V}, I_C = 400\text{ A}, R_g = 2.2\text{ }\Omega, V_{GE} = \pm 15\text{ V}, T_J = 25\text{ }^\circ\text{C}$	-	680	-	ns
Rise time	$t_r$		-	142	-	
Turn-off delay time	$t_{d(off)}$		-	638	-	
Fall time	$t_f$		-	99	-	
Turn-on switching loss	$E_{on}$		-	19.0	-	
Turn-off switching loss	$E_{off}$	-	32.5	-		
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 600\text{ V}, I_C = 400\text{ A}, R_g = 2.2\text{ }\Omega, V_{GE} = \pm 15\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	690	-	ns
Rise time	$t_r$		-	146	-	
Turn-off delay time	$t_{d(off)}$		-	669	-	
Fall time	$t_f$		-	108	-	
Turn-on switching loss	$E_{on}$		-	26.1	-	
Turn-off switching loss	$E_{off}$	-	36.7	-		
Input capacitance	$C_{ies}$	$V_{GE} = 0\text{ V}, V_{CE} = 30\text{ V}, f = 1.0\text{ MHz}$	-	33.7	-	nF
Output capacitance	$C_{oes}$		-	2.99	-	
Reverse transfer capacitance	$C_{res}$		-	1.21	-	
SC data	$I_{SC}$	$t_p \leq 10\text{ }\mu\text{s}, V_{GE} = 15\text{ V}, T_J = 25\text{ }^\circ\text{C}, V_{CC} = 600\text{ V}, V_{CEM} \leq 1200\text{ V}$	-	2600	-	A
Internal gate resistance	$R_g$		-	0.5	-	$\Omega$
Stray inductance	$L_{CE}$		-	-	18	nH
Module lead resistance, terminal to chip	$R_{CC'+EE'}$	$T_C = 25\text{ }^\circ\text{C}$	-	0.32	-	m $\Omega$

<b>DIODE ELECTRICAL SPECIFICATIONS</b> ( $T_C = 25\text{ }^\circ\text{C}$ unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Forward voltage	$V_F$	$I_F = 400\text{ A}$	$T_J = 25\text{ }^\circ\text{C}$	-	1.95	2.25	V
			$T_J = 125\text{ }^\circ\text{C}$	-	1.85	-	
Reverse recovery charge	$Q_{rr}$	$I_F = 400\text{ A}, V_R = 600\text{ V}, dI_F/dt = -2850\text{ A}/\mu\text{s}, V_{GE} = -15\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	24.1	-	$\mu\text{C}$
			$T_J = 125\text{ }^\circ\text{C}$	-	44.3	-	
Peak reverse recovery current	$I_{rr}$	$I_F = 400\text{ A}, V_R = 600\text{ V}, dI_F/dt = -2850\text{ A}/\mu\text{s}, V_{GE} = -15\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	220	-	A
			$T_J = 125\text{ }^\circ\text{C}$	-	295	-	
Reverse recovery energy	$E_{rec}$	$I_F = 400\text{ A}, V_R = 600\text{ V}, dI_F/dt = -2850\text{ A}/\mu\text{s}, V_{GE} = -15\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	13.9	-	mJ
			$T_J = 125\text{ }^\circ\text{C}$	-	24.8	-	



THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction temperature range	$T_J$		-	-	150	$^{\circ}\text{C}$
Storage temperature range	$T_{Stg}$		-40	-	125	$^{\circ}\text{C}$
Junction to case	IGBT	$R_{\theta JC}$	-	-	0.047	K/W
	Diode		-	-	0.096	
Case to sink (Conductive grease applied)	$R_{\theta CS}$		-	0.035	-	
Mounting torque		Power terminal screw: M5	2.5 to 5.0			Nm
		Mounting screw: M6	3.0 to 6.0			
Weight		Weight of module	-	350	-	g

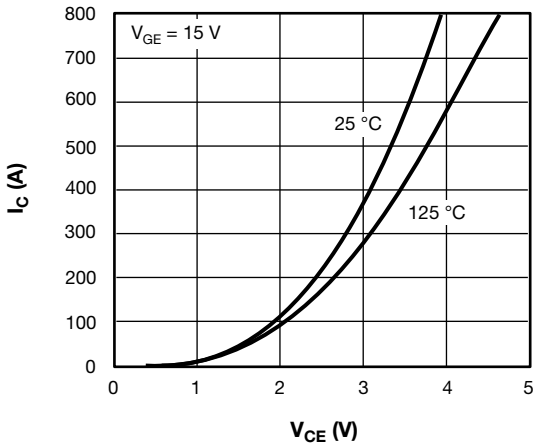


Fig. 1 - IGBT Typical Output Characteristics

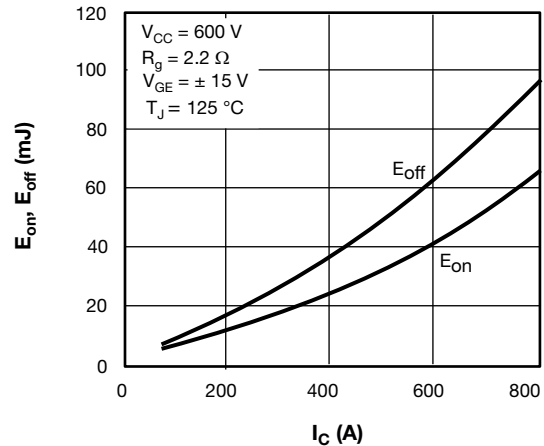


Fig. 3 - IGBT Switching Loss vs.  $I_C$

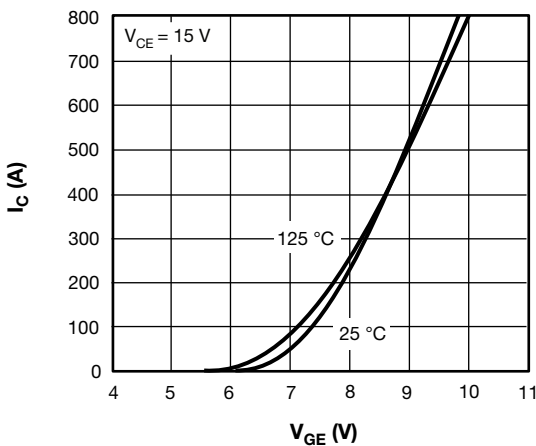


Fig. 2 - IGBT Typical Transfer Characteristics

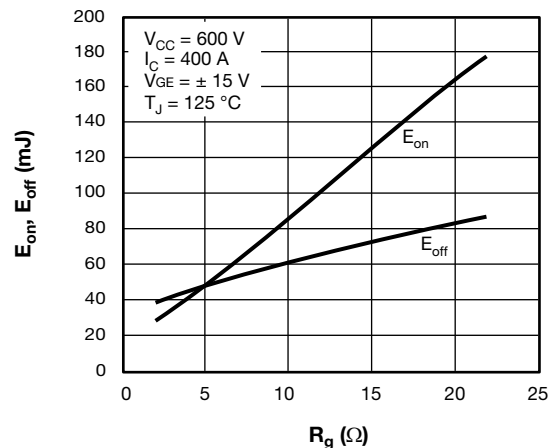


Fig. 4 - IGBT Switching Loss vs.  $R_g$

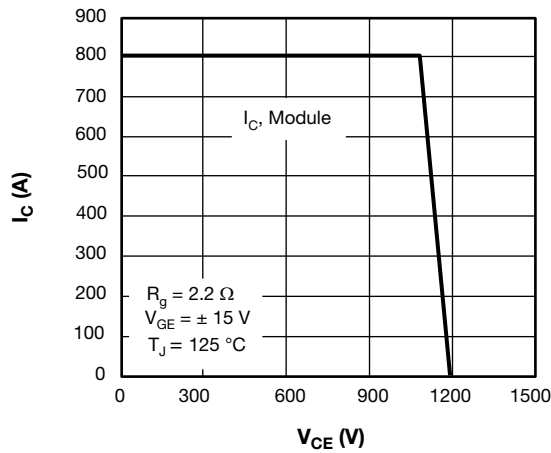


Fig. 5 - RBSOA

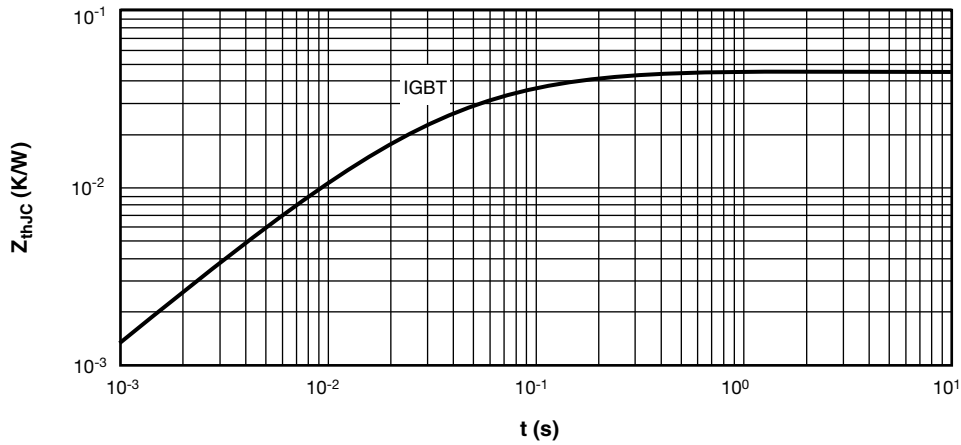


Fig. 6 - IGBT Transient Thermal Impedance

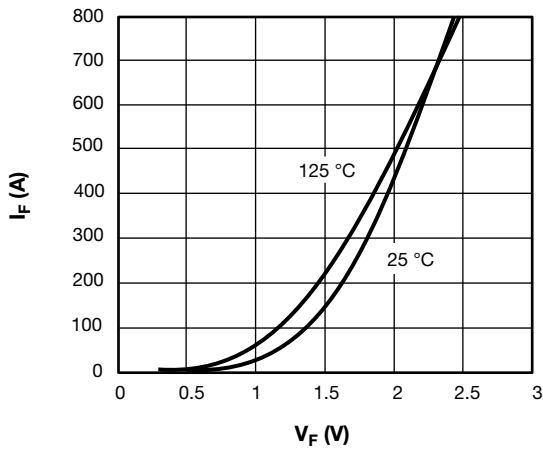


Fig. 7 - Diode Typical Forward Characteristics

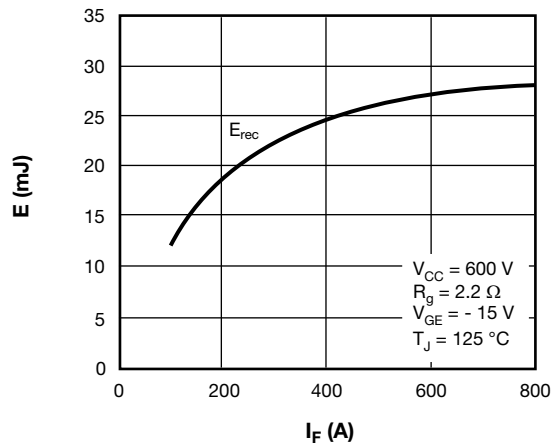


Fig. 8 - Diode Switching Loss vs.  $I_C$

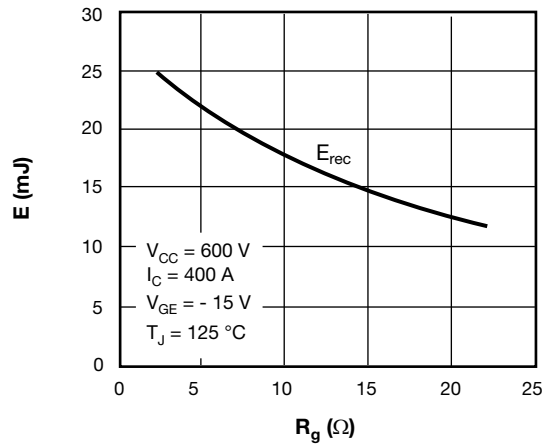


Fig. 9 - Diode Switching Loss vs.  $R_g$

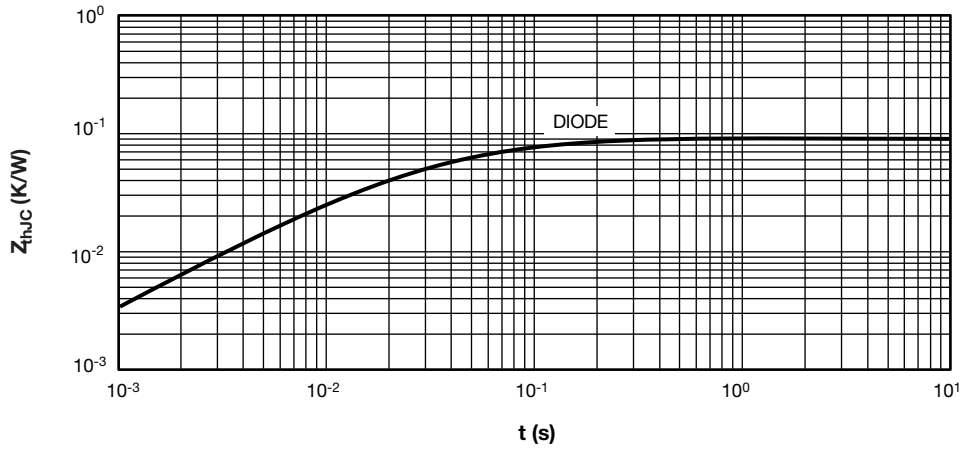
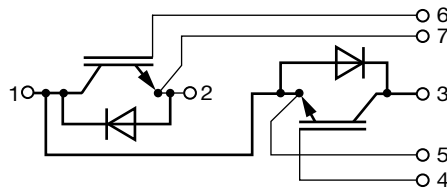


Fig. 10 - Diode Transient Thermal Impedance

**CIRCUIT CONFIGURATION**

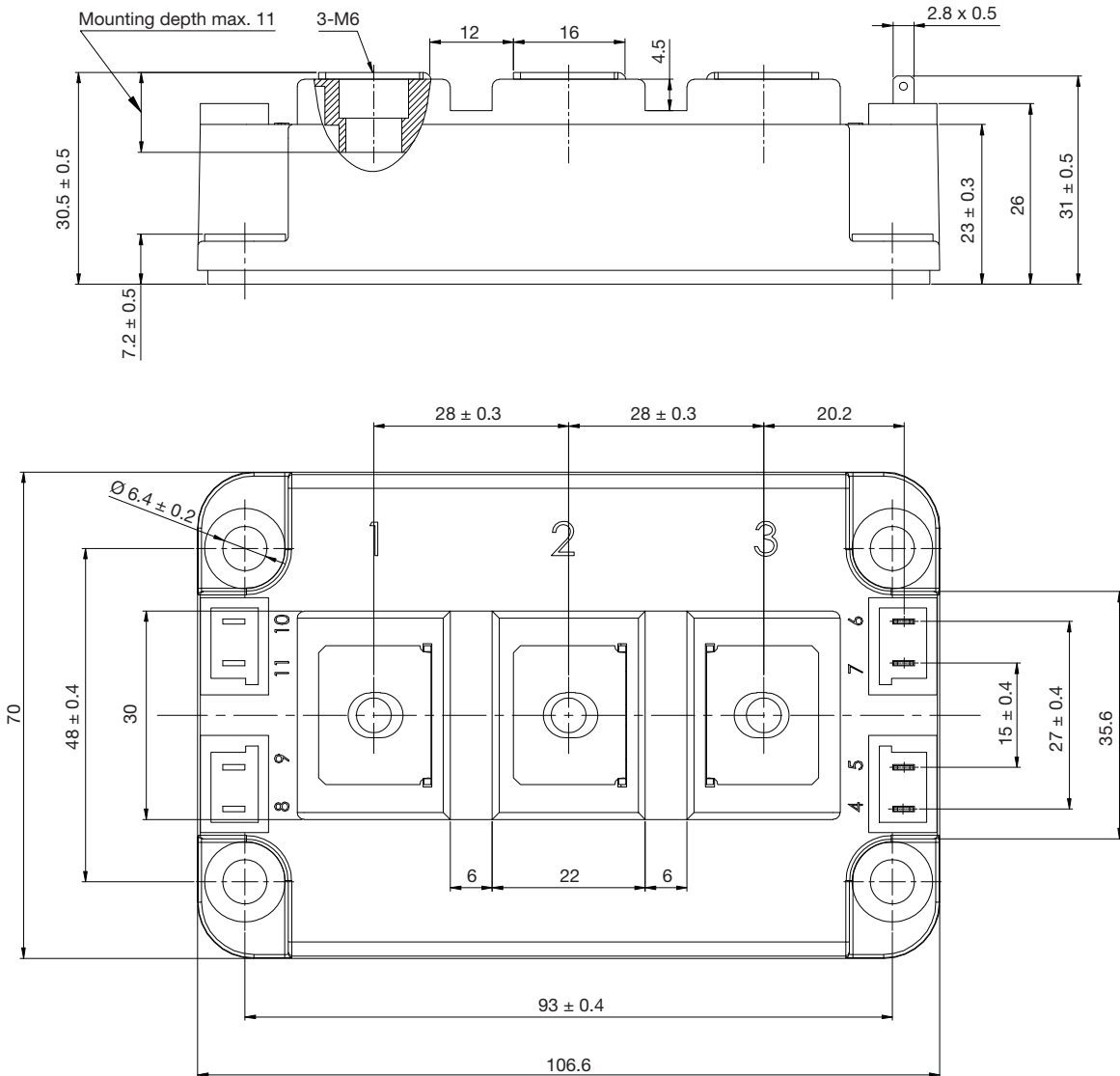


LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95538">www.vishay.com/doc?95538</a>



## Double INT-A-PAK

**DIMENSIONS** in millimeters (inches)





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