



## Half Bridge IGBT Power Module, 600 V, 50 A



New INT-A-PAK

### FEATURES

- Low  $V_{CE(sat)}$  trench IGBT technology
- 5  $\mu$ s short circuit capability
- $V_{CE(sat)}$  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
- Compliant to RoHS Directive 2002/95/EC

RoHS  
COMPLIANT

### PRODUCT SUMMARY

$V_{CES}$	600 V
$I_C$ at $T_C = 80\text{ °C}$	50 A
$V_{CE(sat)}$ (typical) at $I_C = 50\text{ A}$ , $25\text{ °C}$	1.65 V

### TYPICAL APPLICATIONS

- UPS (Uninterruptable Power Supply)
- Electronic welders
- Switching mode power supplies

### DESCRIPTION

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

### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25\text{ °C}$ unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	$V_{CES}$		600	V
Gate to emitter voltage	$V_{GES}$		$\pm 20$	
Collector current	$I_C$	$T_C = 25\text{ °C}$	85	A
		$T_C = 80\text{ °C}$	50	
Pulsed collector current	$I_{CM}^{(1)}$	$t_p = 1\text{ ms}$	100	
Diode continuous forward current	$I_F$	$T_C = 80\text{ °C}$	50	
Diode maximum forward current	$I_{FM}^{(1)}$	$t_p = 1\text{ ms}$	100	
Maximum power dissipation	$P_D$	$T_J = 175\text{ °C}$	208	
RMS isolation voltage	$V_{ISOL}$	$f = 50\text{ Hz}$ , $t = 1\text{ min}$	4000	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	$V_{(BR)CES}$	$T_J = 25\text{ }^\circ\text{C}$	600	-	-	V
Collector to emitter saturation voltage	$V_{CE(sat)}$	$V_{GE} = 15\text{ V}, I_C = 50\text{ A}, T_J = 25\text{ }^\circ\text{C}$	-	1.65	2.10	
		$V_{GE} = 15\text{ V}, I_C = 50\text{ A}, T_J = 175\text{ }^\circ\text{C}$	-	2.05	-	
Gate to emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 1.4\text{ mA}, T_J = 25\text{ }^\circ\text{C}$	4.0	4.9	6.5	
Collector cut-off current	$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0\text{ V}, T_J = 25\text{ }^\circ\text{C}$	-	-	1.0	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	$t_{d(on)}$	$V_{CC} = 300\text{ V}, I_C = 50\text{ A}, R_g = 3.3\text{ }\Omega,$ $V_{GE} = \pm 15\text{ V}, T_J = 25\text{ }^\circ\text{C}$	-	58	-	ns
Rise time	$t_r$		-	31	-	
Turn-off delay time	$t_{d(off)}$		-	80	-	
Fall time	$t_f$		-	100	-	
Turn-on switching loss	$E_{on}$		-	0.41	-	
Turn-off switching loss	$E_{off}$	-	0.42	-		
Turn-on delay time	$t_{d(on)}$	$V_{CC} = 300\text{ V}, I_C = 50\text{ A}, R_g = 3.3\text{ }\Omega,$ $V_{GE} = \pm 15\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	64	-	ns
Rise time	$t_r$		-	37	-	
Turn-off delay time	$t_{d(off)}$		-	90	-	
Fall time	$t_f$		-	117	-	
Turn-on switching loss	$E_{on}$		-	0.69	-	
Turn-off switching loss	$E_{off}$	-	0.69	-		
Input capacitance	$C_{ies}$	$V_{GE} = 0\text{ V}, V_{CE} = 30\text{ V}, f = 1.0\text{ MHz}$	-	3.03	-	nF
Output capacitance	$C_{oes}$		-	0.25	-	
Reverse transfer capacitance	$C_{res}$		-	0.09	-	
SC data	$I_{SC}$	$t_p \leq 5\text{ }\mu\text{s}, V_{GE} = 15\text{ V}, T_J = 125\text{ }^\circ\text{C},$ $V_{CC} = 360\text{ V}, V_{CEM} \leq 600\text{ V}$	-	450	-	A
Stray inductance	$L_{CE}$		-	-	30	nH
Module lead resistance, terminal to chip	$R_{CC'+EE'}$		-	0.75	-	m $\Omega$

DIODE ELECTRICAL SPECIFICATIONS ( $T_C = 25\text{ }^\circ\text{C}$ unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS	
Forward voltage	$V_F$	$I_F = 50\text{ A}$	$T_J = 25\text{ }^\circ\text{C}$	-	1.35	1.75	V
			$T_J = 125\text{ }^\circ\text{C}$	-	1.37	-	
Reverse recovery charge	$Q_{rr}$	$I_F = 50\text{ A}, V_R = 300\text{ V},$ $R_G = 3.3\text{ }\Omega,$ $V_{GE} = -15\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	2.3	-	$\mu\text{C}$
			$T_J = 125\text{ }^\circ\text{C}$	-	4.3	-	
Peak reverse recovery current	$I_{rr}$	$I_F = 50\text{ A}, V_R = 300\text{ V},$ $R_G = 3.3\text{ }\Omega,$ $V_{GE} = -15\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	33	-	A
			$T_J = 125\text{ }^\circ\text{C}$	-	58	-	
Reverse recovery energy	$E_{rec}$	$I_F = 50\text{ A}, V_R = 300\text{ V},$ $R_G = 3.3\text{ }\Omega,$ $V_{GE} = -15\text{ V}$	$T_J = 25\text{ }^\circ\text{C}$	-	0.56	-	mJ
			$T_J = 125\text{ }^\circ\text{C}$	-	1.11	-	



THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction temperature range	$T_J$		-	-	175	$^{\circ}\text{C}$
Storage temperature range	$T_{Stg}$		- 40	-	125	$^{\circ}\text{C}$
Junction to case per 1/2 module	IGBT	$R_{thJC}$	-	-	0.72	K/W
	Diode		-	-	1.02	
Case to sink (Conductive grease applied)	$R_{thCS}$		-	0.05	-	
Mounting torque		Power terminal screw: M5	2.5 to 5.0			Nm
		Mounting screw: M6	3.0 to 5.0			
Weight		Weight of module	-	150	-	g

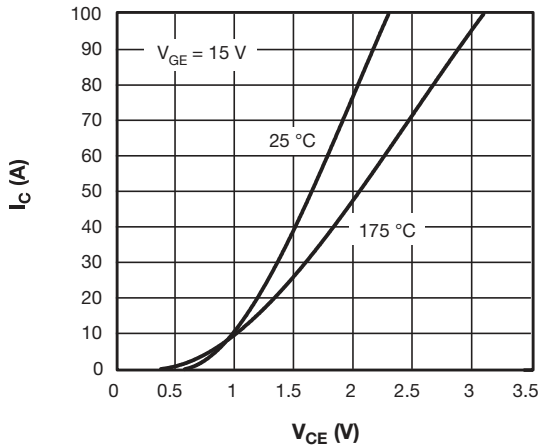


Fig. 1 - IGBT Typical Output Characteristics

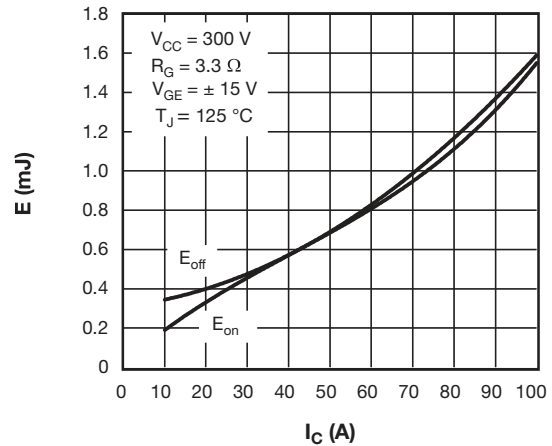


Fig. 3 - IGBT Switching Loss vs.  $I_C$

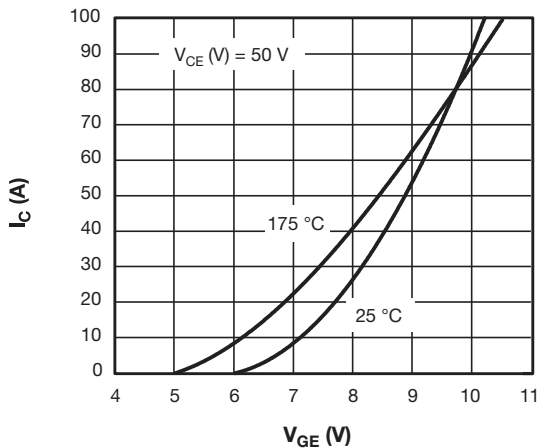


Fig. 2 - IGBT Transfer Characteristics

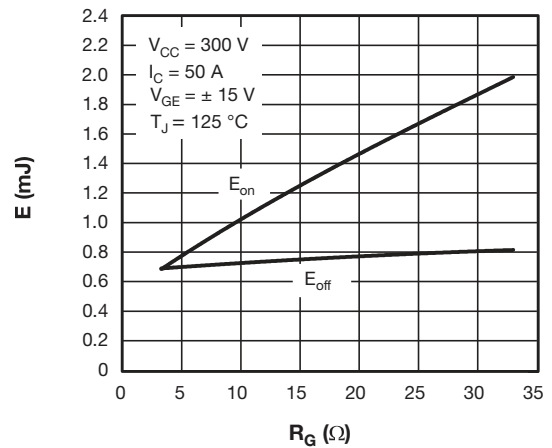


Fig. 4 - IGBT Switching Loss vs.  $R_G$

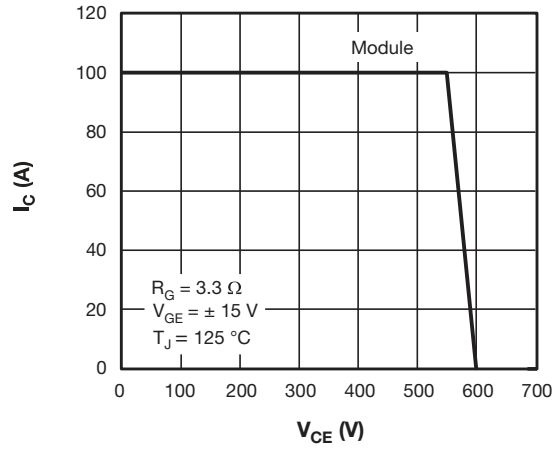


Fig. 5 - RBSOA

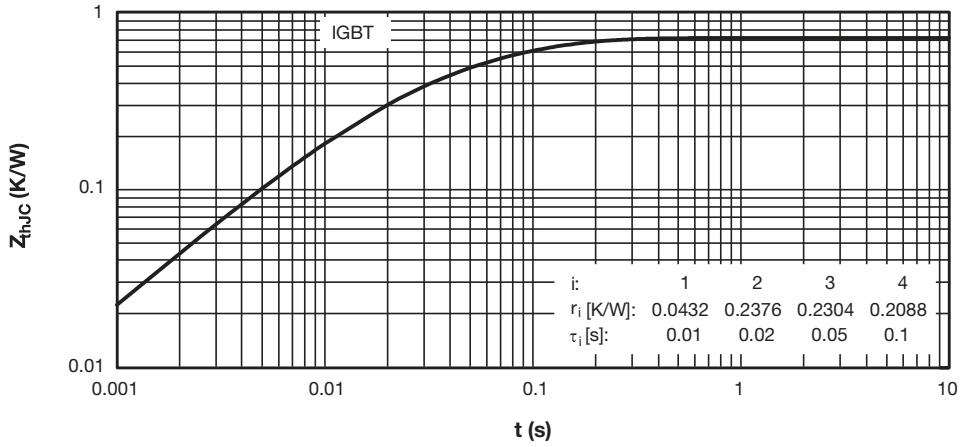


Fig. 6 - IGBT Transient Thermal Impedance

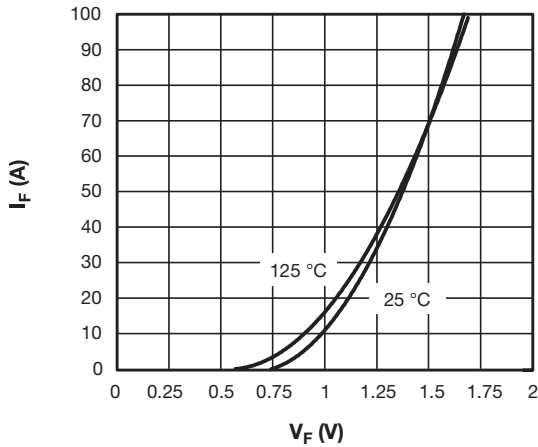


Fig. 7 - Diode Forward Characteristics

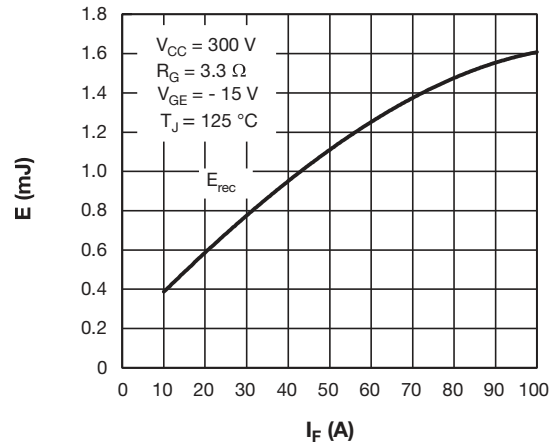


Fig. 8 - Diode Switching Loss vs.  $I_F$

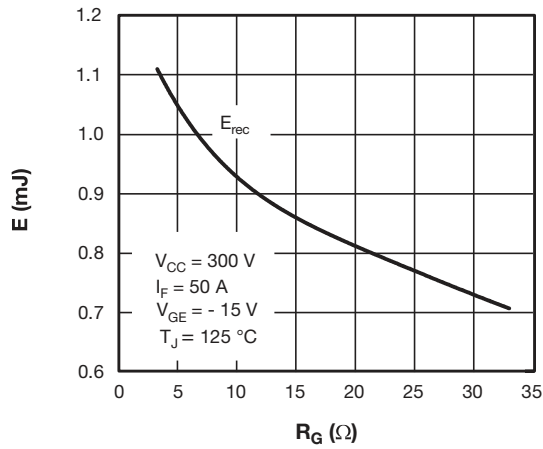


Fig. 9 - Diode Switching Loss vs.  $R_G$

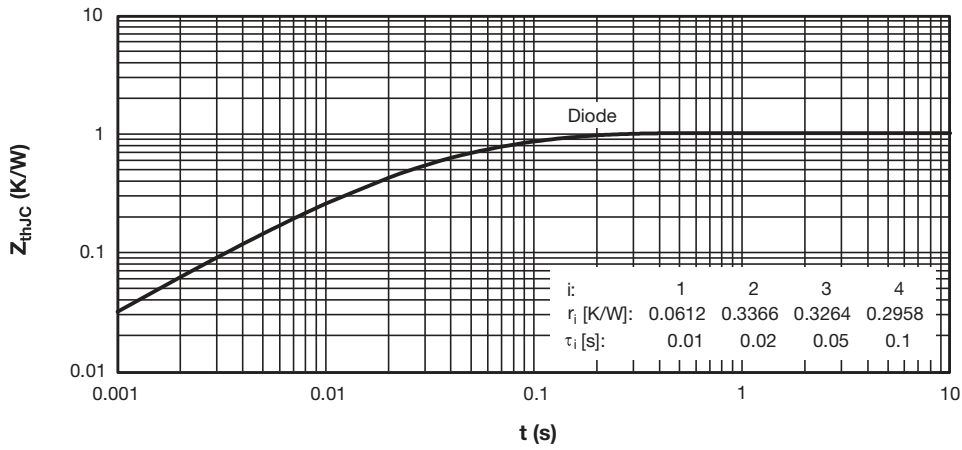
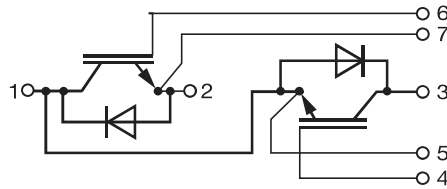


Fig. 10 - Diode Transient Thermal Impedance

**CIRCUIT CONFIGURATION**





**DIMENSIONS** in millimeters

