

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



Dual 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

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.

| PRIMARY CHARACTERISTICS | |
|--|-----------------------------|
| 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 | Dual INT-A-PAK |
| Circuit configuration | Single switch with AP diode |

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

**SWITCHING CHARACTERISTICS**

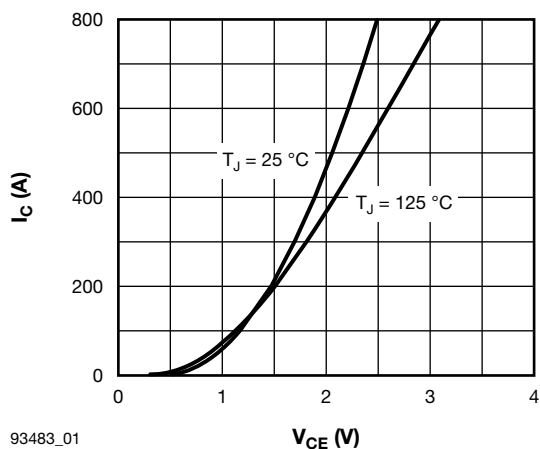
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|--|---------------|--|------|------|------|------------|
| Turn-on delay time | $t_{d(on)}$ | $V_{CC} = 600\text{ V}$, $I_C = 400\text{ A}$, $R_g = 4\ \Omega$, $V_{GE} = \pm 15\text{ V}$, $T_J = 25\text{ }^\circ\text{C}$ | - | 100 | - | 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 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 A | T _J = 25 °C | - | 2.1 | 2.2 | V |
| | | | T _J = 125 °C | - | 2.2 | 2.3 | |
| Diode reverse recovery charge | Q _{rr} | I _F = 400 A, V _R = 600 V, dI/dt = -4000 A/μs, V _{GE} = -15 V | T _J = 25 °C | - | 40 | - | μC |
| | T _J = 125 °C | | - | 48 | - | | |
| Diode peak reverse recovery current | I _{rr} | | T _J = 25 °C | - | 320 | - | A |
| | | | T _J = 125 °C | - | 400 | - | |
| Diode reverse recovery energy | E _{rec} | | T _J = 25 °C | - | 12 | - | mJ |
| | | | T _J = 125 °C | - | 20 | - | |

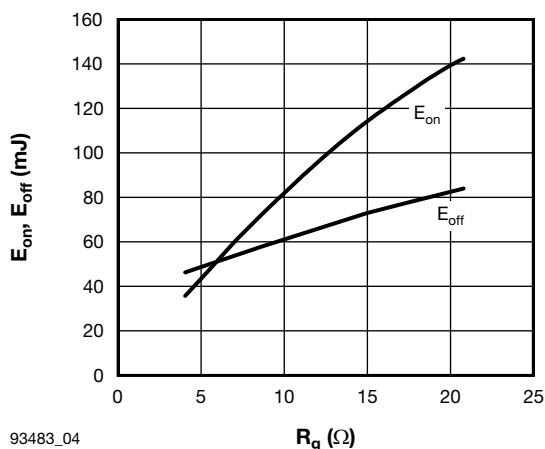
THERMAL AND MECHANICAL SPECIFICATIONS

| 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 | R _{thJC} | | - | - | 0.05 | K/W |
| | | | - | - | 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 |



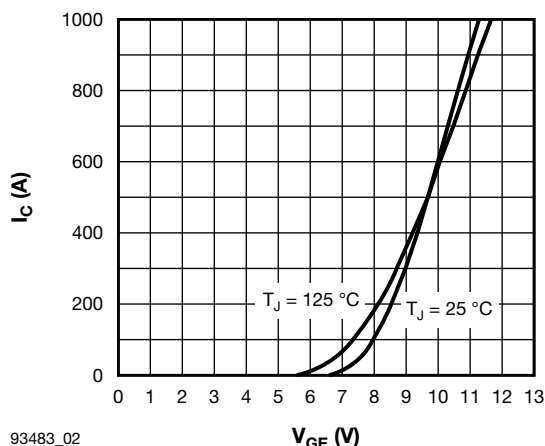
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Fig. 1 - Typical Output Characteristics
 $V_{GE} = 15 \text{ V}$



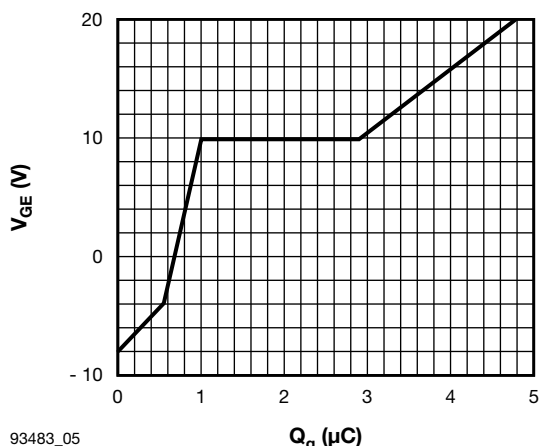
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Fig. 4 - Switching Loss vs. Gate Resistor
 $V_{CC} = 600 \text{ V}$, $I_C = 400 \text{ A}$, $V_{GE} = \pm 15 \text{ V}$, $T_J = 125 \text{ °C}$



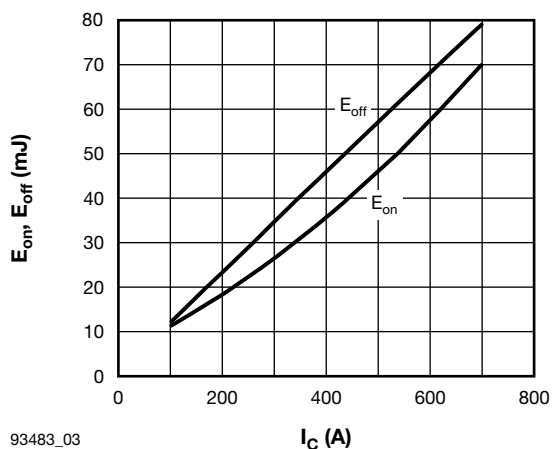
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Fig. 2 - Typical Transfer Characteristics
 $V_{CE} = 20 \text{ V}$



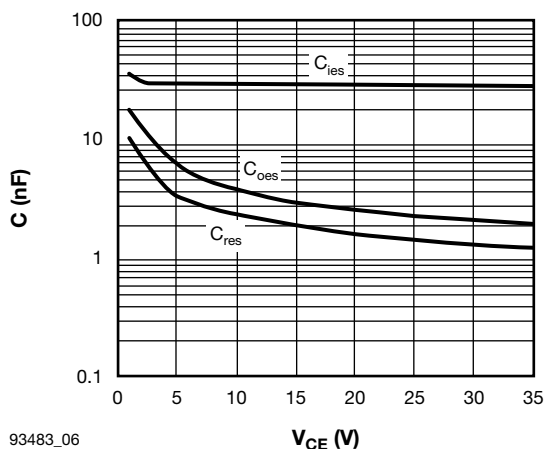
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Fig. 5 - Gate Charge Characteristics
 $V_{CC} = 600 \text{ V}$, $I_C = 400 \text{ A}$, $T_J = 25 \text{ °C}$



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



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

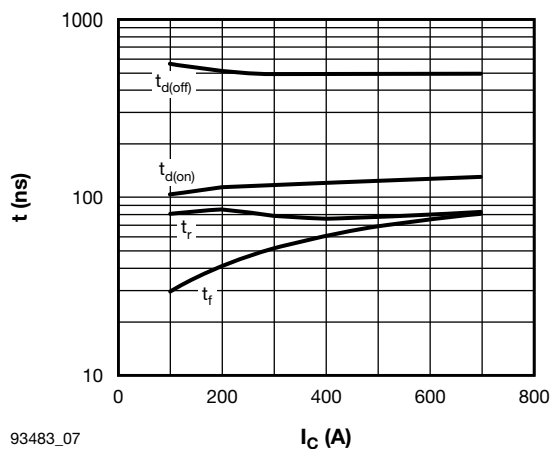


Fig. 7 - Typical Switching Times vs. I_C
 $V_{CC} = 600$ V, $R_g = 4$ Ω , $V_{GE} = \pm 15$ V, $T_J = 125$ $^{\circ}$ C

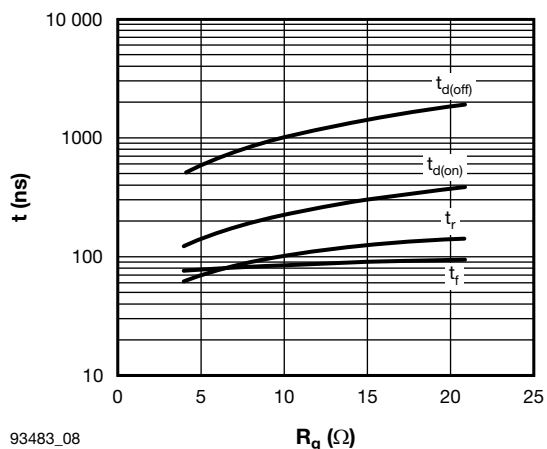


Fig. 8 - Typical Switching Times vs. Gate Resistance
 $V_{CC} = 600$ V, $I_C = 400$ A, $V_{GE} = \pm 15$ V, $T_J = 125$ $^{\circ}$ C

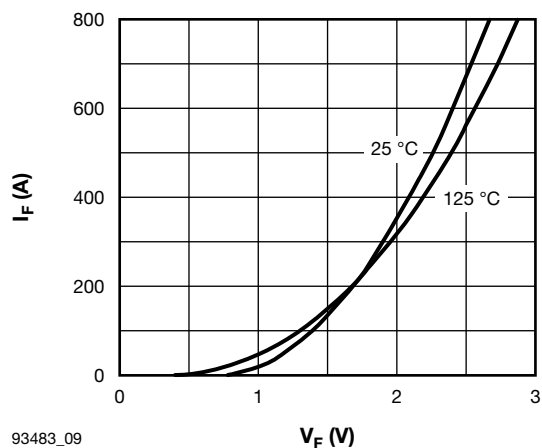


Fig. 9 - Typical Forward Characteristics (Diode)

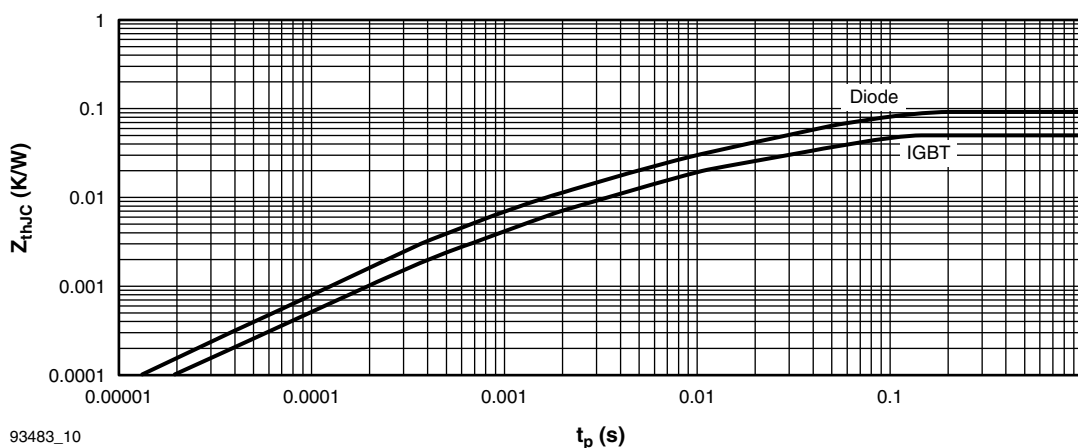
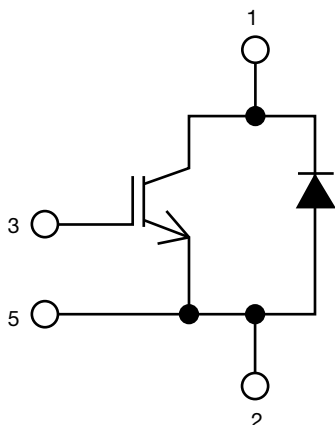


Fig. 10 - Transient Thermal Impedance



CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS

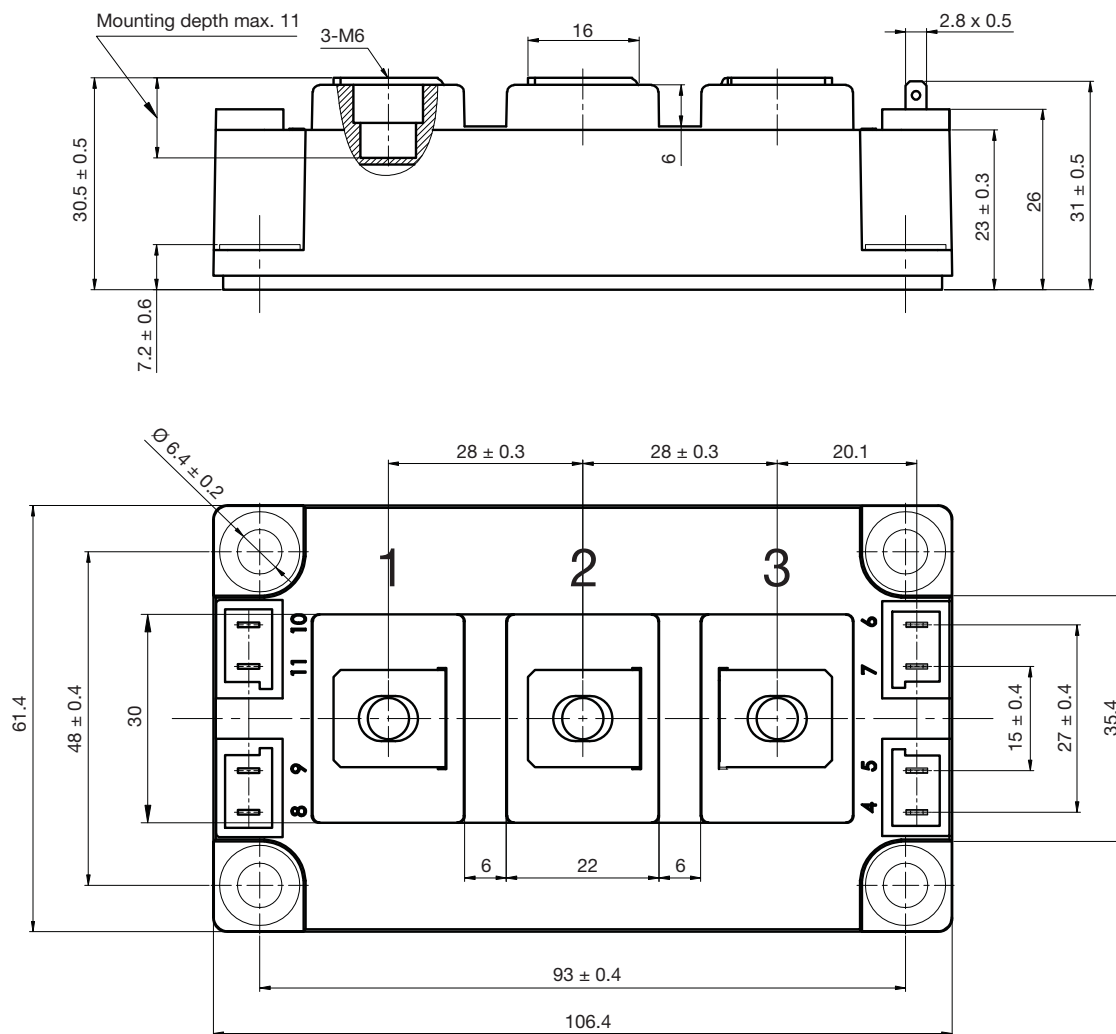
Dimensions

www.vishay.com/doc?95526



Double INT-A-PAK

DIMENSIONS in millimeters (inches)





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