# Molding Type Module IGBT, Chopper in 1 Package, 1200 V and 100 A

INT-A-PAK

## FEATURES

- High short circuit capability, self limiting to 6 x $I_C$
- 10 µs short circuit capability
- $V_{CE(on)}$ with positive temperature coefficient
- Maximum junction temperature 150 °C
- 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

- AC inverter drives
- Switching mode power supplies
- Electronic welders

## DESCRIPTION

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

| PRODUCT SUMMARY | |
|---|---|
| $V_{CES}$ | 1200 V |
| $I_C$ at $T_C$ = 80 °C | 100 A |
| $V_{CE(on)}$ (typical) at $I_C$ = 100 A, 25 °C | 1.8 V |
| Speed | 8 kHz to 30 kHz |
| Package | INT-A-PAK |
| Circuit | Chopper low side switch |

**ABSOLUTE MAXIMUM RATINGS** ($T_C$ = 25 °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 | $I_C$ | $T_C$ = 25 °C | 200 | A |
| | | $T_C$ = 80 °C | 100 | |
| Pulsed collector current | $I_{CM}$ (1) | $t_p$ = 1 ms | 200 | |
| Diode continuous forward current | $I_F$ | | 100 | |
| Diode maximum forward current | $I_{FM}$ | | 200 | |
| Maximum power dissipation | $P_D$ | $T_J$ = 150 °C | 658 | W |
| Short circuit withstand time | $t_{SC}$ | $T_J$ = 125 °C | 10 | µs |
| RMS isolation voltage | $V_{ISOL}$ | f = 50 Hz, t = 1 min | 2500 | V |
| $I^2t$-value, diode | $I^2t$ | $V_R$= 0 V, t = 10 ms, $T_J$ = 125 °C | 1700 | $A^2s$ |
| Operating junction temperature range | $T_J$ | | -40 to +150 | °C |

**Note**

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

| IGBT ELECTRICAL SPECIFICATIONS ($T_C$ = 25 °C unless otherwise noted) | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **MIN.** | **TYP.** | **MAX.** | **UNITS** |
| Collector to emitter breakdown voltage | $V_{(BR)CES}$ | $T_J$ = 25 °C | 1200 | - | - | V |
| Collector to emitter voltage | $V_{CE(on)}$ | $V_{GE}$ = 15 V, $I_C$ = 100 A, $T_J$ = 25 °C | - | 1.8 | - | |
| | | $V_{GE}$ = 15 V, $I_C$ = 100 A, $T_J$ = 125 °C | - | 2.0 | - | |
| Gate to emitter threshold voltage | $V_{GE(th)}$ | $V_{CE}$ = $V_{GE}$, $I_C$ = 2 mA, $T_J$ = 25 °C | 5.0 | 6.1 | 7.0 | |
| Collector cut-off current | $I_{CES}$ | $V_{CE}$ = $V_{CES}$, $V_{GE}$ = 0 V, $T_J$ = 25 °C | - | - | 1.0 | mA |
| Gate to emitter leakage current | $I_{GES}$ | $V_{GE}$ = $V_{GES}$, $V_{CE}$ = 0 V, $T_J$ = 25 °C | - | - | 400 | nA |

| SWITCHING CHARACTERISTICS | | | | | | |
|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | **MIN.** | **TYP.** | **MAX.** | **UNITS** |
| Turn-on delay time | $t_{d(on)}$ | $V_{CC}$ = 600 V, $I_C$ = 100 A, $R_g$ = 3 Ω, $V_{GE}$ = ± 15 V, $T_J$ = 25 °C | - | 95 | - | ns |
| Rise time | $t_r$ | | - | 38 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 360 | - | |
| Fall time | $t_f$ | | - | 45 | - | |
| Turn-on switching loss | $E_{on}$ | | - | 6.5 | - | mJ |
| Turn-off switching loss | $E_{off}$ | | - | 5.7 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{CC}$ = 600 V, $I_C$ = 100 A, $R_g$ = 3 Ω, $V_{GE}$ = ± 15 V, $T_J$ = 125 °C | - | 110 | - | ns |
| Rise time | $t_r$ | | - | 45 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 420 | - | |
| Fall time | $t_f$ | | - | 60 | - | |
| Turn-on switching loss | $E_{on}$ | | - | 9.8 | - | mJ |
| Turn-off switching loss | $E_{off}$ | | - | 8.7 | - | |
| Input capacitance | $C_{ies}$ | $V_{GE}$ = 0 V, $V_{CE}$ = 25 V, f = 1.0 MHz | - | 7.43 | - | nF |
| Output capacitance | $C_{oes}$ | | - | 0.52 | - | |
| Reverse transfer capacitance | $C_{res}$ | | - | 0.34 | - | |
| SC data | $I_{SC}$ | $t_{sc}$ ≤ 10 µs, $V_{GE}$ = 15 V, $T_J$ = 125 °C, $V_{CC}$ = 900 V, $V_{CEM}$ ≤ 1200 V | - | 470 | - | A |
| Internal gate resistance | $R_{gint}$ | | - | 2 | - | Ω |
| Stray inductance | $L_{CE}$ | | - | - | 30 | nH |
| Module lead resistance, terminal to chip | $R_{CC'+EE'}$ | $T_C$ = 25 °C | - | 0.75 | - | mΩ |

| DIODE ELECTRICAL SPECIFICATIONS ($T_C$ = 25 °C unless otherwise noted) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **TEST CONDITIONS** | | **MIN.** | **TYP.** | **MAX.** | **UNITS** |
| Diode forward voltage | $V_F$ | $I_F$ = 100 A | $T_J$ = 25 °C | - | 2.0 | 2.3 | V |
| | | | $T_J$ = 125 °C | - | 2.2 | 2.5 | |
| Diode reverse recovery charge | $Q_{rr}$ | $I_F$ = 100 A, $V_R$ = 600 V, $dI_F/dt$ = -3600 A/µs, $V_{GE}$ = -15 V | $T_J$ = 25 °C | - | 10 | - | µC |
| | | | $T_J$ = 125 °C | - | 16 | - | |
| Diode peak reverse recovery current | $I_{rr}$ | | $T_J$ = 25 °C | - | 90 | - | A |
| | | | $T_J$ = 125 °C | - | 120 | - | |
| Diode reverse recovery energy | $E_{rec}$ | | $T_J$ = 25 °C | - | 3.5 | - | mJ |
| | | | $T_J$ = 125 °C | - | 6.0 | - | |

| 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, IGBT (per 1/2 module) | $R_{thJC}$ | | - | - | 0.19 | K/W |
| Junction to case, Diode (per 1/2 module) | | | - | - | 0.28 | |
| Case to sink | $R_{thCS}$ | Conductive grease applied | - | 0.05 | - | |
| Mounting torque | | Power terminal screw: M5 | 2.5 to 5.0 | | | Nm |
| | | Mounting screw: M6 | 3.0 to 6.0 | | | |
| Weight of module | | | 150 | | | g |

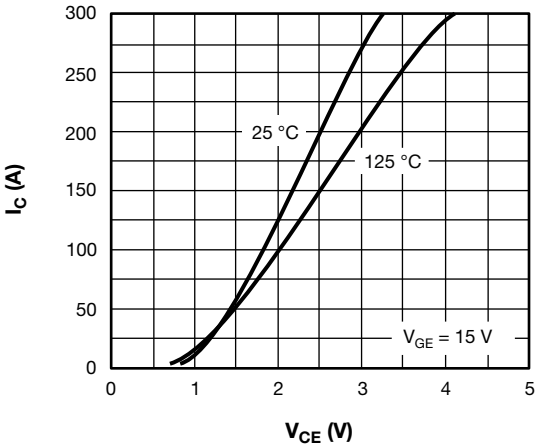



Fig. 1 - Typical Output Characteristics

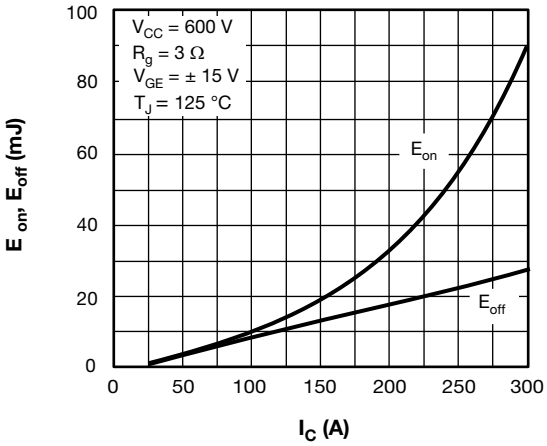



Fig. 3 - Switching Loss vs. Collector Current

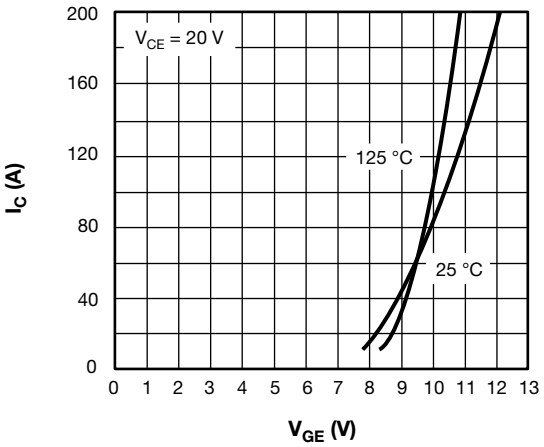



Fig. 2 - Typical Transfer Characteristics

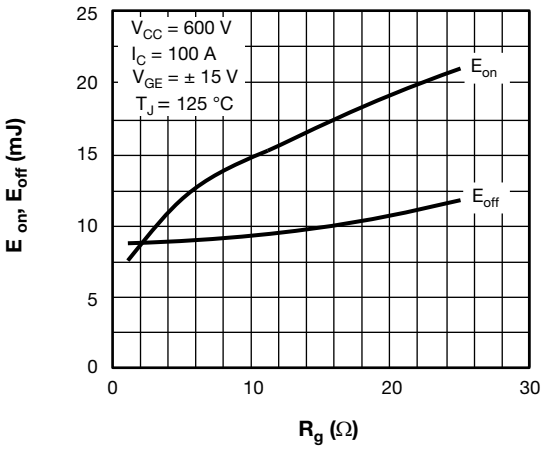



Fig. 4 - Switching Loss vs. Gate Resistor

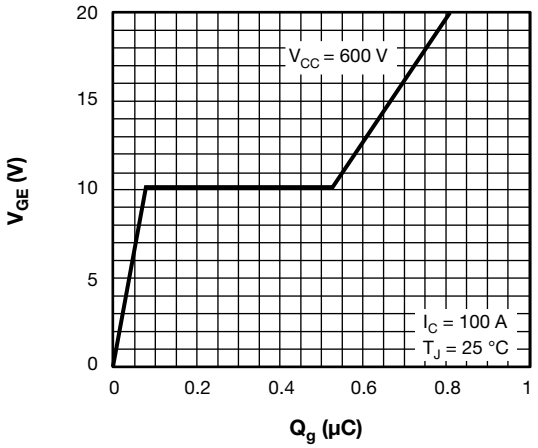



Fig. 5 - Gate Charge Characteristics

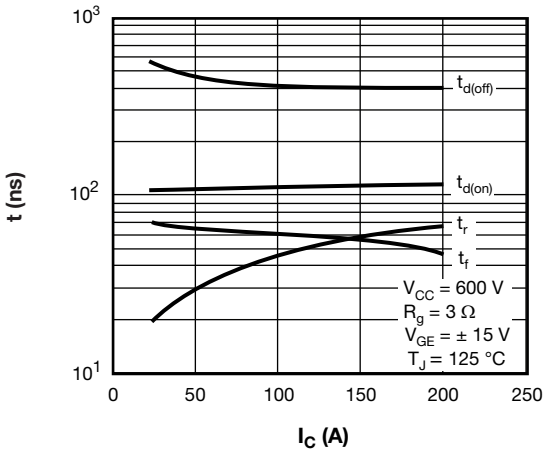



Fig. 7 - Typical Switching Time vs. $I_C$

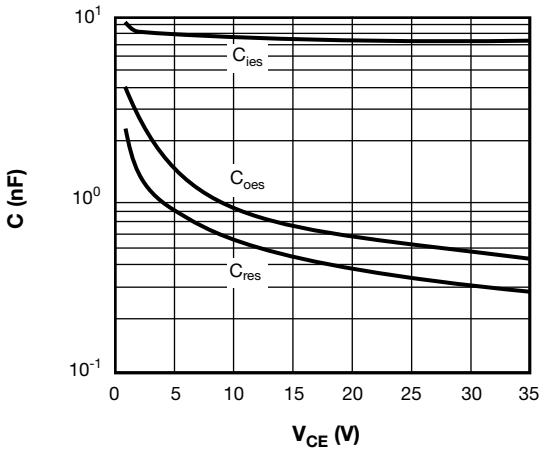



Fig. 6 - Typical Capacitance vs. Collector to Emitter Voltage

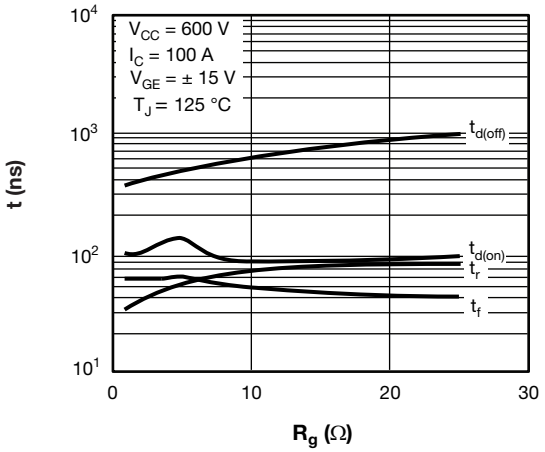



Fig. 8 - Typical Switching Time vs. Gate Resistance $R_g$

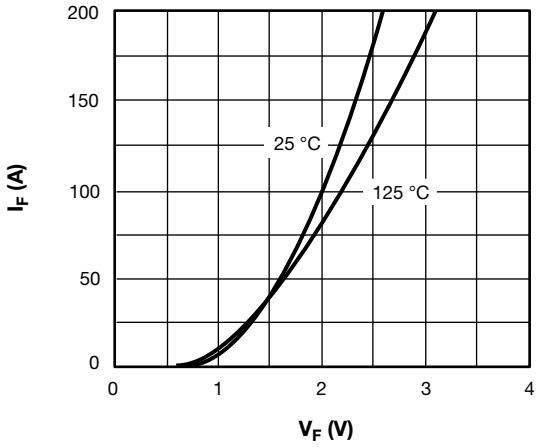



Fig. 9 - Diode Typical Forward Characteristics

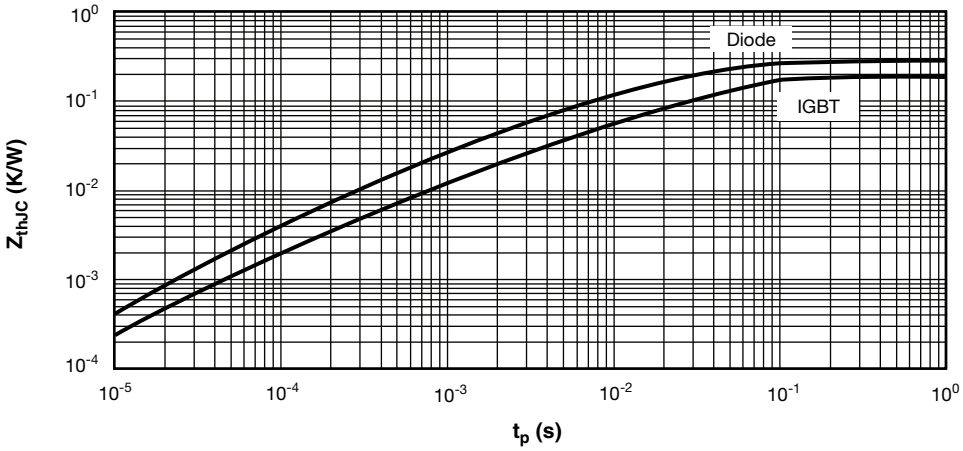
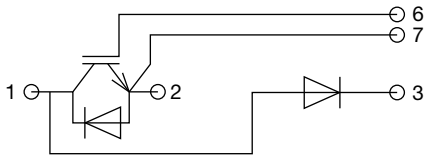



Fig. 10 - Transient Thermal Impedance

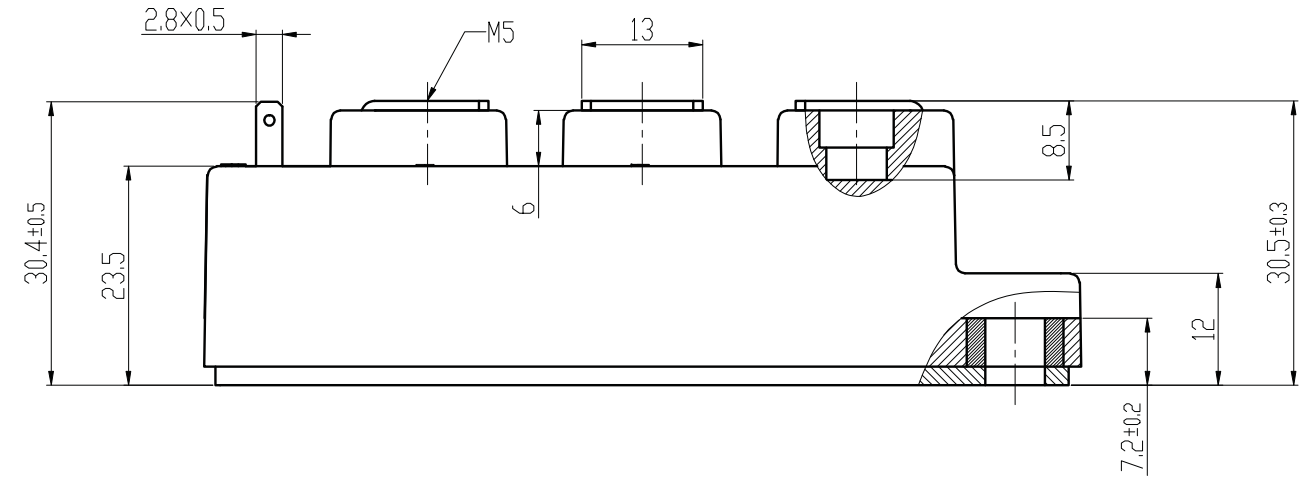
## CIRCUIT CONFIGURATION

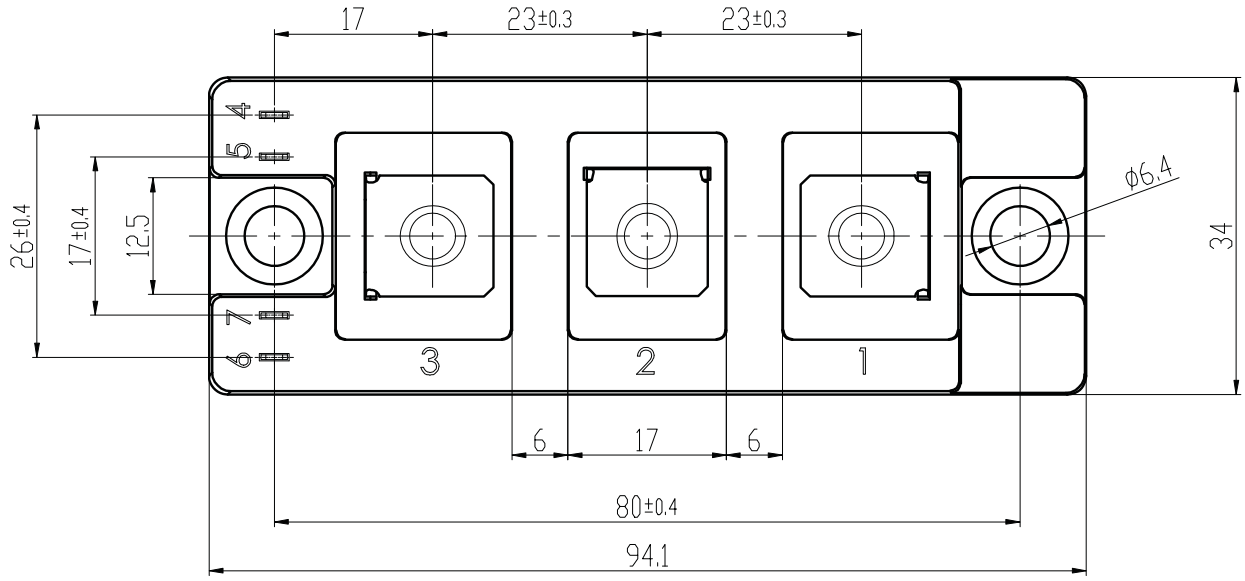



| LINKS TO RELATED DOCUMENTS | |
|---|---|
| Dimensions | www.vishay.com/doc?95524 |

# INT-A-PAK

**DIMENSIONS** in millimeters (inches)



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