

Molding Type Module IGBT, Chopper in 1 Package, 1200 V and 50 A


INT-A-PAK
FEATURES

- High short circuit capability, self limiting to $6 \times I_C$
- 10 μ s short circuit capability
- Low inductance case
- Fast and soft reverse recovery antiparallel FWD
- Isolated copper baseplate using DCB (Direct Copper Bonding) technology
- $V_{CE(on)}$ with positive temperature coefficient
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
COMPLIANT

| PRODUCT SUMMARY | |
|--|-------------------------|
| V_{CES} | 1200 V |
| I_C at $T_C = 80^\circ\text{C}$ | 50 A |
| $V_{CE(on)}$ (typical) at $I_C = 50\text{ A}, 25^\circ\text{C}$ | 1.7 V |
| Speed | 8 kHz to 30 kHz |
| Package | INT-A-PAK |
| Circuit | Chopper low side switch |

TYPICAL APPLICATIONS

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

DESCRIPTION

Vishay's IGBT power module provides ultralow conduction loss as well as short circuit ruggedness. It is designed for applications such as general 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 | I_C | $T_C = 25^\circ\text{C}$ | 100 | A |
| | | $T_C = 80^\circ\text{C}$ | 50 | |
| Pulsed collector current | $I_{CM}^{(1)}$ | $t_p = 1\text{ ms}$ | 100 | |
| Diode continuous forward current | I_F | | 50 | |
| Diode maximum forward current | I_{FM} | | 100 | |
| Maximum power dissipation | P_D | $T_J = 150^\circ\text{C}$ | 446 | |
| Short circuit withstand time | t_{SC} | $T_J = 125^\circ\text{C}$ | 10 | μ s |
| I^2t -value, diode | I^2t | $V_R = 0\text{ V}, t = 10\text{ ms}, T_J = 125^\circ\text{C}$ | 420 | 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

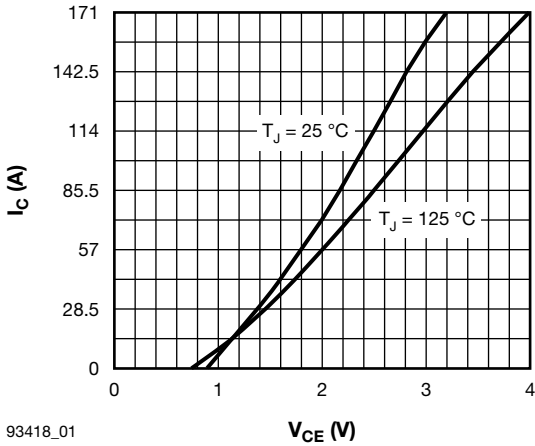
| IGBT ELECTRICAL SPECIFICATIONS ($T_C = 25^\circ\text{C}$ unless otherwise noted) | | | | | | |
|---|---------------|--|------|------|------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Collector to emitter breakdown voltage | $V_{(BR)CES}$ | $T_J = 25^\circ\text{C}$ | 1200 | - | - | V |
| Collector to emitter saturation voltage | $V_{CE(on)}$ | $V_{GE} = 15\text{ V}, I_C = 50\text{ A}, T_J = 25^\circ\text{C}$ | - | 1.70 | - | |
| | | $V_{GE} = 15\text{ V}, I_C = 50\text{ A}, T_J = 125^\circ\text{C}$ | - | 1.95 | - | |
| Gate to emitter threshold voltage | $V_{GE(th)}$ | $V_{CE} = V_{GE}, I_C = 2\text{ mA}, T_J = 25^\circ\text{C}$ | 5.0 | 6.2 | 7.0 | |
| Zero gate voltage collector current | I_{CES} | $V_{CE} = V_{CES}, V_{GE} = 0\text{ V}, T_J = 25^\circ\text{C}$ | - | - | 1.0 | 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 | $t_{d(on)}$ | $V_{CC} = 600\text{ V}, I_C = 50\text{ A}, R_g = 18\ \Omega,$ $V_{GE} = \pm 15\text{ V}, T_J = 25\text{ }^\circ\text{C}$ | - | 220 | - | 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} | | $V_{CC} = 600\text{ V}, I_C = 50\text{ A}, R_g = 18\ \Omega,$ $V_{GE} = \pm 15\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | - | 2.1 | - | mJ |
| Turn-off switching loss | E_{off} | | | - | 2.6 | - | |
| Turn-on delay time | $t_{d(on)}$ | - | | 270 | - | ns | |
| Rise time | t_r | - | | 60 | - | | |
| Turn-off delay time | $t_{d(off)}$ | - | | 500 | - | | |
| Fall time | t_f | - | | 65 | - | | |
| Turn-on switching loss | E_{on} | $V_{GE} = 0\text{ V}, V_{CE} = 25\text{ V}, f = 1.0\text{ MHz}$ | - | 4.1 | - | mJ | |
| Turn-off switching loss | E_{off} | | - | 4.7 | - | | |
| Input capacitance | C_{ies} | | $V_{GE} = 0\text{ V}, V_{CE} = 25\text{ V}, f = 1.0\text{ MHz}$ | - | 4.29 | - | nF |
| Output capacitance | C_{oes} | | | - | 0.30 | - | |
| Reverse transfer capacitance | C_{res} | | | - | 0.20 | - | |
| SC data | I_{SC} | | $t_{sc} \leq 10\ \mu\text{s}, V_{GE} = 15\text{ V}, T_J = 125\text{ }^\circ\text{C},$ $V_{CC} = 900\text{ V}, V_{CEM} \leq 1200\text{ V}$ | - | 270 | - | A |
| Internal gate resistance | R_{gint} | | - | 10 | - | Ω | |
| Stray inductance | L_{CE} | | - | - | 30 | nH | |
| Module lead resistance, terminal to chip | $R_{CC'+EE'}$ | $T_C = 25\text{ }^\circ\text{C}$ | - | 0.75 | - | m Ω | |

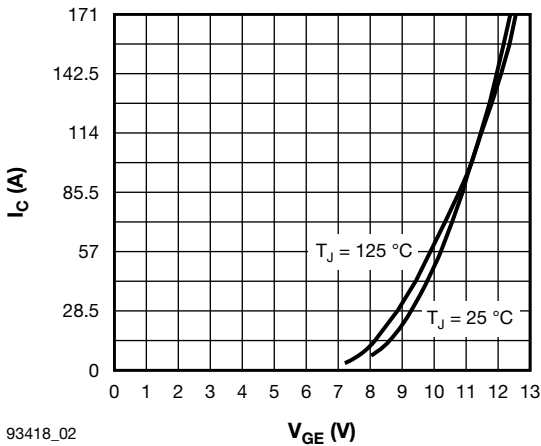
| DIODE ELECTRICAL SPECIFICATIONS ($T_C = 25\text{ }^\circ\text{C}$ unless otherwise noted) | | | | | | | |
|--|-----------|--|-----------------------------------|------|------|-------|----|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS | |
| Diode forward voltage | V_F | $I_F = 50\text{ A}$ | $T_J = 25\text{ }^\circ\text{C}$ | - | 2.15 | - | V |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 2.35 | - | |
| Diode reverse recovery time | t_{rr} | $I_F = 50\text{ A}, V_R = 600\text{ V},$ $dI/dt = -2100\text{ A}/\mu\text{s},$ $V_{GE} = -15\text{ V}$ | $T_J = 25\text{ }^\circ\text{C}$ | - | 90 | - | ns |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 130 | - | |
| Diode peak reverse recovery current | I_{RM} | | $T_J = 25\text{ }^\circ\text{C}$ | - | 52 | - | A |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 60 | - | |
| Diode reverse recovery energy | E_{rec} | | $T_J = 25\text{ }^\circ\text{C}$ | - | 1.9 | - | mJ |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 4.0 | - | |

| THERMAL AND MECHANICAL SPECIFICATIONS | | | | | | |
|---------------------------------------|------------|---------------------------|------------|------|------|------------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Operating junction temperature range | T_J | | -40 | - | 150 | $^\circ\text{C}$ |
| Storage temperature range | T_{Stg} | | -40 | - | 125 | |
| Junction to case per 1/2 module | R_{thJC} | | - | - | 0.28 | K/W |
| | | | - | - | 0.65 | |
| 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 | | | 150 | | | g |



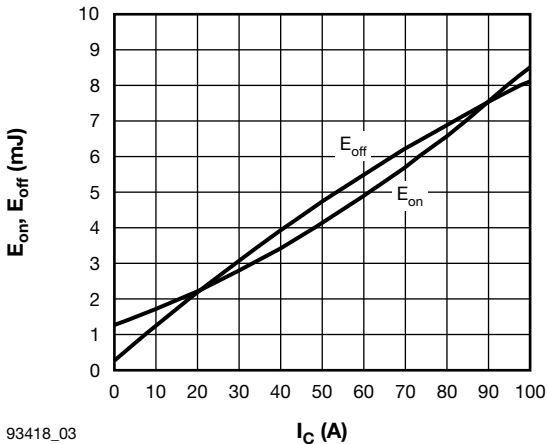
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Fig. 1 - Typical Output Characteristics
 $V_{GE} = 15\text{ V}$



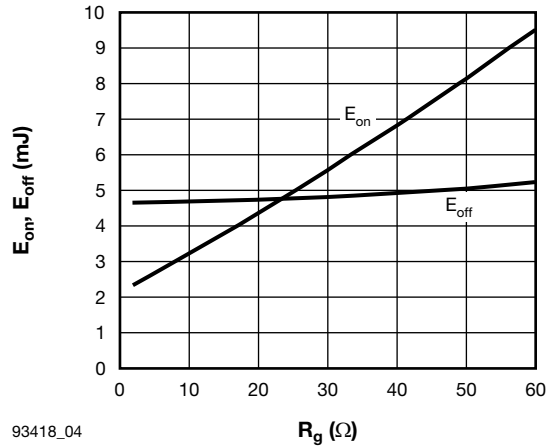
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Fig. 2 - Typical Transfer Characteristics
 $V_{CE} = 20\text{ V}$



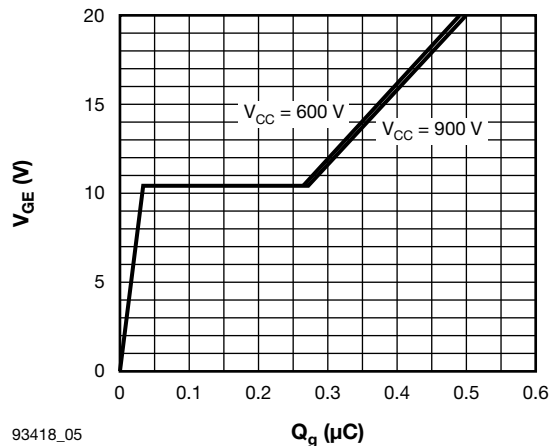
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Fig. 3 - Switching Loss vs. Collector Current
 $T_J = 125\text{ }^\circ\text{C}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_g = 18\text{ }\Omega$



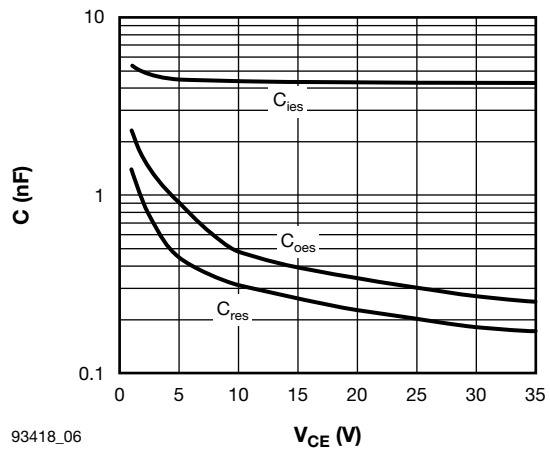
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Fig. 4 - Switching Loss vs. Gate Resistance
 $T_J = 125\text{ }^\circ\text{C}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $I_C = 50\text{ A}$



93418_05

Fig. 5 - Gate Charge Characteristics
 $I_C = 50\text{ A}$, $T_J = 25\text{ }^\circ\text{C}$



93418_06

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

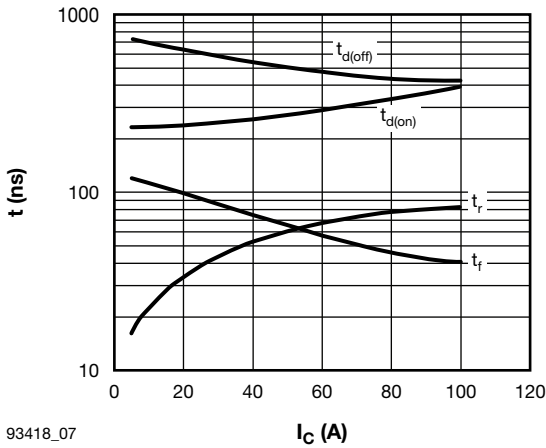


Fig. 7 - Typical Switching Time vs. I_C
 $T_J = 125^\circ\text{C}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_g = 18\ \Omega$

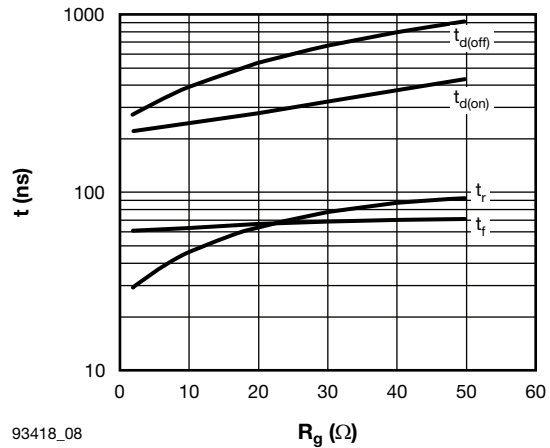


Fig. 8 - Typical Switching Time vs. Gate Resistance
 $T_J = 125^\circ\text{C}$, $V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $I_C = 50\text{ A}$

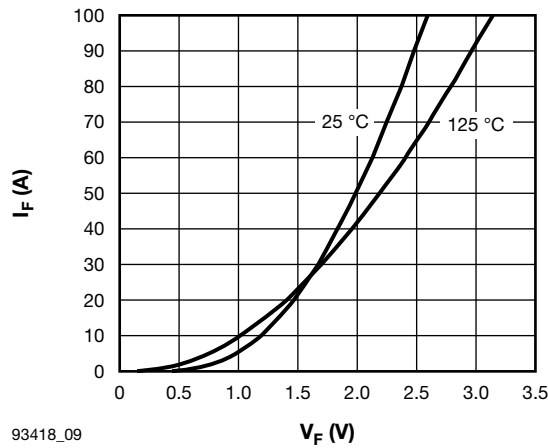


Fig. 9 - Typical Forward Characteristics (Diode)

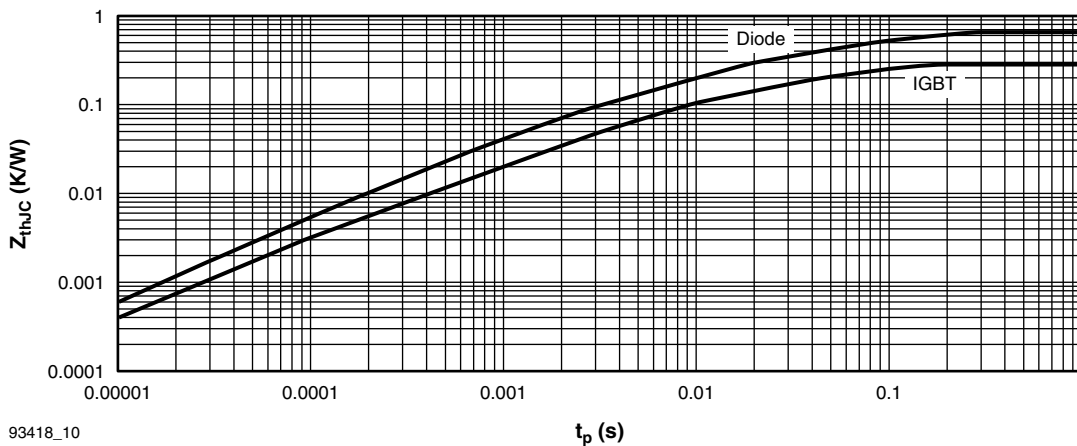
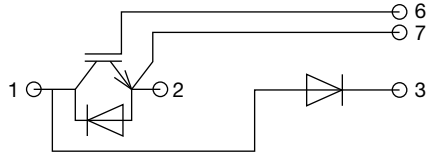


Fig. 10 - Transient Thermal Impedance



CIRCUIT CONFIGURATION

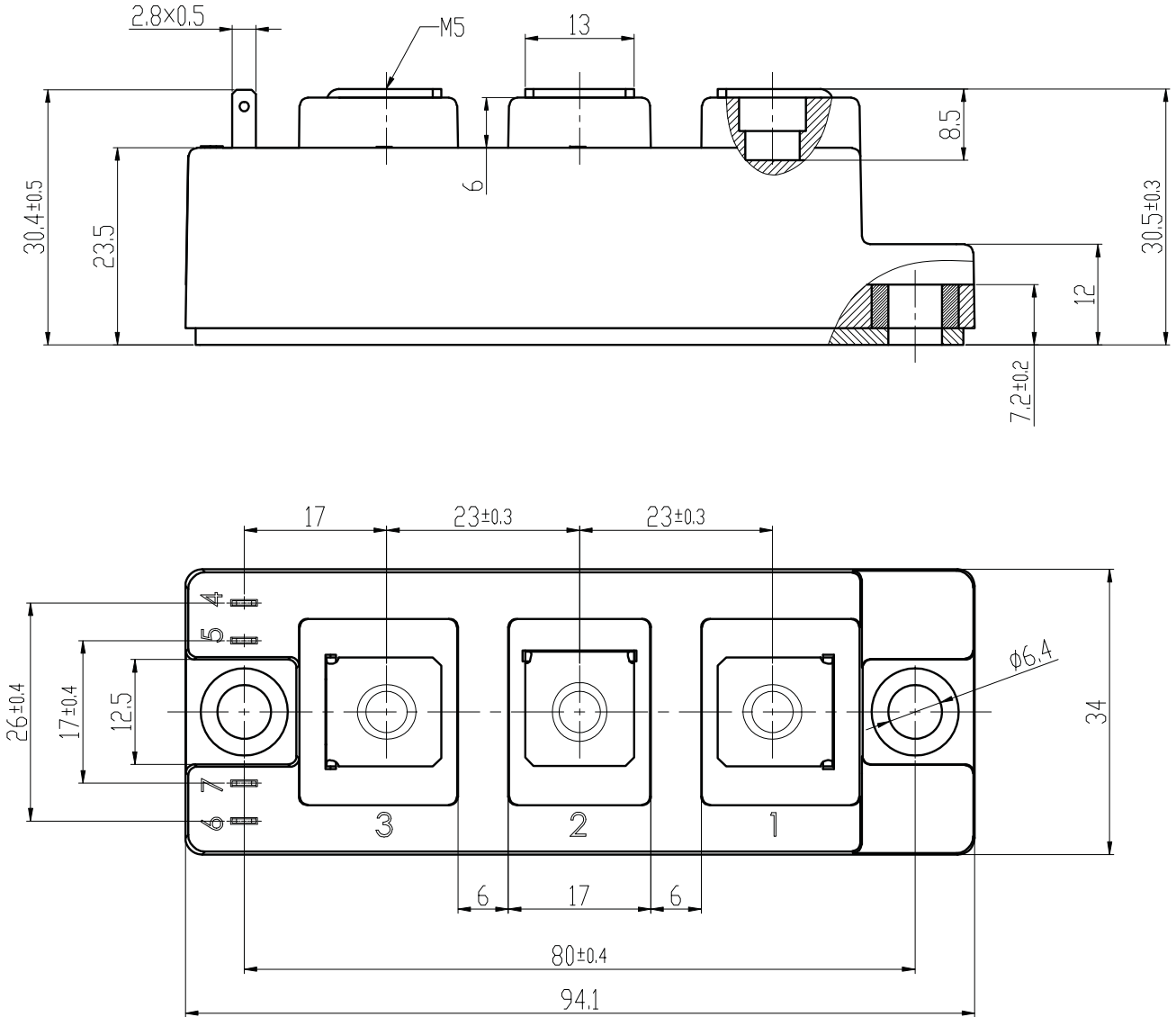


| LINKS TO RELATED DOCUMENTS | |
|----------------------------|--|
| Dimensions | www.vishay.com/doc?95524 |



INT-A-PAK

DIMENSIONS in millimeters (inches)





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