# Molding Type Module IGBT, 2 in 1 Package, 1200 V, 50 A

INT-A-PAK

## FEATURES

- Low $V_{CE(on)}$ trench IGBT technology
- Low switching losses
- 10 μs short circuit capability
- $V_{CE(on)}$ 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
- 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 °C | 50 A |
| $V_{CE(on)}$ (typical) at $I_C$ = 50 A, 25 °C | 1.65 V |
| Speed | 8 kHz to 30 kHz |
| Package | INT-A-PAK |
| Circuit | Half bridge |

## 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 °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 | 100 | A |
| | | $T_C$ = 80 °C | 50 | |
| Pulsed collector current | $I_{CM}$ (1) | $t_p$ = 1 ms | 100 | |
| Diode continuous forward current | $I_F$ | | 50 | |
| Diode maximum forward current | $I_{FM}$ (1) | | 100 | |
| Maximum power dissipation | $P_D$ | $T_J$ = 175 °C | 405 | W |
| RMS isolation voltage | $V_{ISOL}$ | f = 50 Hz, t = 1 min | 2500 | V |

**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, $I_C$ = 50 A, $T_J$ = 25 °C | - | 1.90 | 2.35 | |
| | | $V_{GE}$ = 15 V, $I_C$ = 50 A, $T_J$ = 175 °C | - | 2.50 | - | |
| Gate to emitter threshold voltage | $V_{GE(th)}$ | $V_{CE}$ = $V_{GE}$, $I_C$ = 1.4 mA, $T_J$ = 25 °C | 5.0 | 5.5 | 7.5 | |
| Collector cut-off current | $I_{CES}$ | $V_{CE}$ = $V_{CES}$, $V_{GE}$ = 0 V, $T_J$ = 25 °C | - | - | 5.0 | 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, $I_C$ = 50 A, $R_g$ = 15 Ω, $V_{GE}$ = ± 15 V, $T_J$ = 25 °C | - | 148 | - | ns |
| Rise time | $t_r$ | | - | 84 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 245 | - | |
| Fall time | $t_f$ | | - | 251 | - | |
| Turn-on switching loss | $E_{on}$ | | - | 5.51 | - | mJ |
| Turn-off switching loss | $E_{off}$ | | - | 2.70 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{CC}$ = 600 V, $I_C$ = 50 A, $R_g$ = 15 Ω, $V_{GE}$ = ± 15 V, $T_J$ = 125 °C | - | 263 | - | ns |
| Rise time | $t_r$ | | - | 81 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 256 | - | |
| Fall time | $t_f$ | | - | 292 | - | |
| Turn-on switching loss | $E_{on}$ | | - | 6.63 | - | mJ |
| Turn-off switching loss | $E_{off}$ | | - | 3.25 | - | |
| Input capacitance | $C_{ies}$ | $V_{GE}$ = 0 V, $V_{CE}$ = 30 V, f = 1.0 MHz | - | 6.24 | - | nF |
| Output capacitance | $C_{oes}$ | | - | 0.23 | - | |
| Reverse transfer capacitance | $C_{res}$ | | - | 0.15 | - | |
| SC data | $I_{SC}$ | $t_p$ ≤ 10 μs, $V_{GE}$ = 15 V, $T_J$ = 125 °C, $V_{CC}$ = 600 V, $V_{CEM}$ ≤ 1200 V | - | 450 | - | A |
| Stray inductance | $L_{CE}$ | | - | - | 30 | nH |
| Module lead resistance, terminal to chip | $R_{CC'+EE'}$ | | - | 0.75 | - | mΩ |

| DIODE ELECTRICAL SPECIFICATIONS ($T_C$ = 25 °C unless otherwise noted) | | | | | | | |
|---|---|---|---|---|---|---|---|
| PARAMETER | SYMBOL | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNITS |
| Forward voltage | $V_F$ | $I_F$ = 50 A | $T_J$ = 25 °C | - | 1.85 | 2.25 | V |
| | | | $T_J$ = 125 °C | - | 1.95 | - | |
| Reverse recovery charge | $Q_{rr}$ | $I_F$ = 50 A, $V_R$ = 600 V, $dI_F/dt$ = -654 A/μs $V_{GE}$ = -15 V | $T_J$ = 25 °C | - | 3.1 | - | μC |
| | | | $T_J$ = 125 °C | - | 6.1 | - | |
| Peak reverse recovery current | $I_{rr}$ | | $T_J$ = 25 °C | - | 24 | - | A |
| | | | $T_J$ = 125 °C | - | 31 | - | |
| Reverse recovery energy | $E_{rec}$ | | $T_J$ = 25 °C | - | 0.98 | - | mJ |
| | | | $T_J$ = 125 °C | - | 2.06 | - | |

| THERMAL AND MECHANICAL SPECIFICATIONS | | | | | | | |
|---|---|---|---|---|---|---|---|
| PARAMETER | | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNITS |
| Operating junction temperature | | $T_J$ | | - | - | 175 | °C |
| Storage temperature range | | $T_{Stg}$ | | -40 | - | 125 | °C |
| Junction to case | IGBT | $R_{thJC}$ | | - | - | 0.37 | K/W |
| | Diode | | | - | - | 0.49 | |
| 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 |

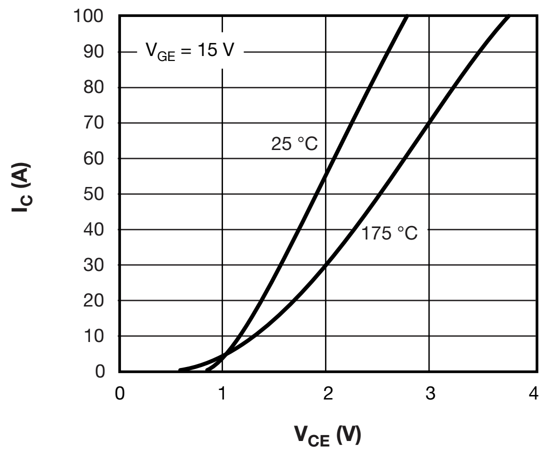



Fig. 1 - IGBT Typical Output Characteristics

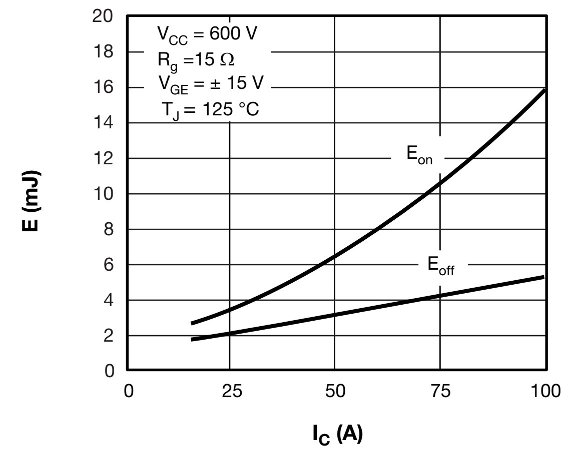



Fig. 3 - IGBT Switching Loss vs. $I_C$

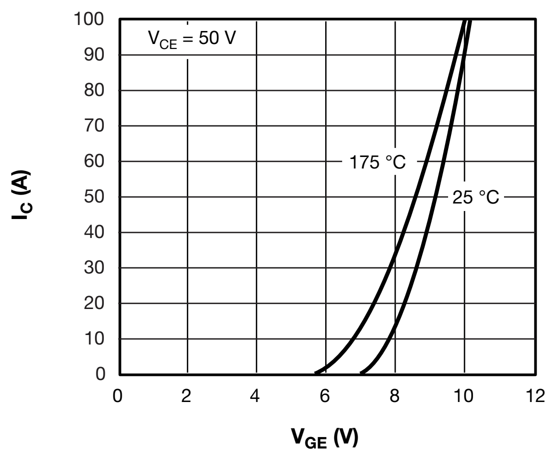



Fig. 2 - IGBT Transfer Characteristics

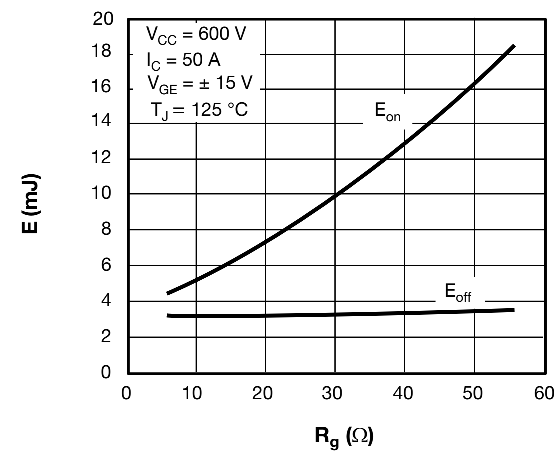



Fig. 4 - IGBT Switching Loss vs. $R_G$

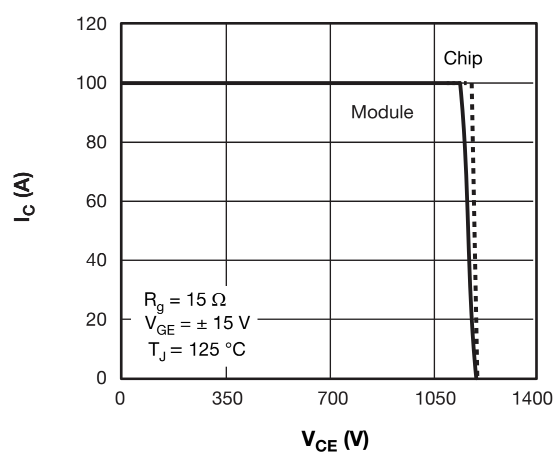



Fig. 5 - RBSOA

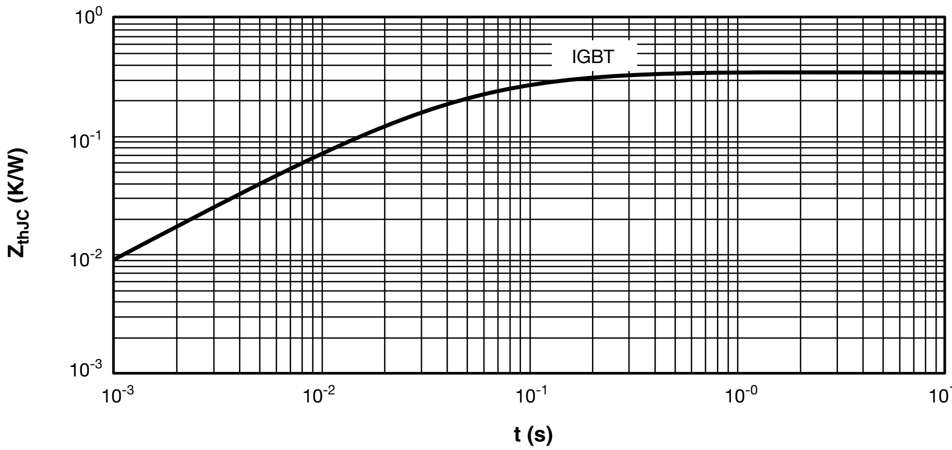



Fig. 6 - IGBT Transient Thermal Impedance

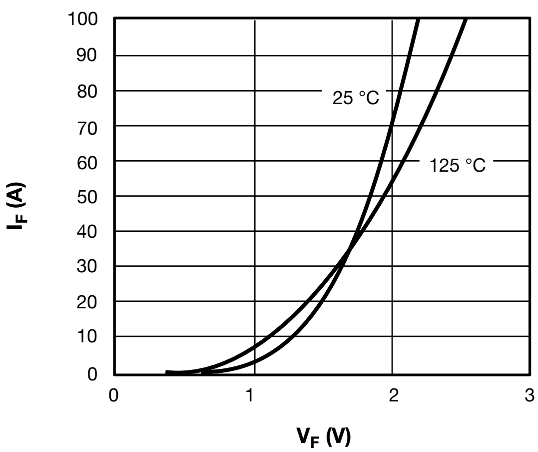



Fig. 7 - Diode Forward Characteristics

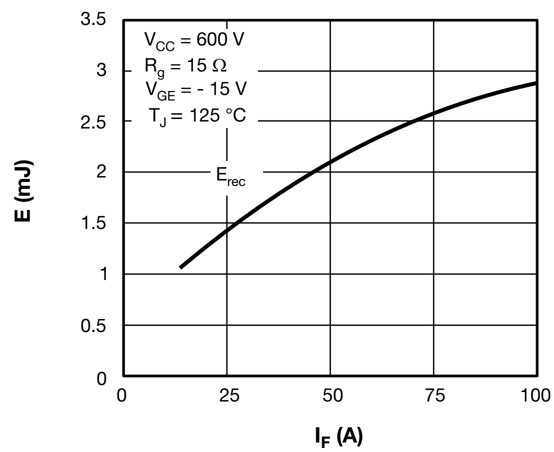



Fig. 8 - Diode Switching Loss vs. $I_F$

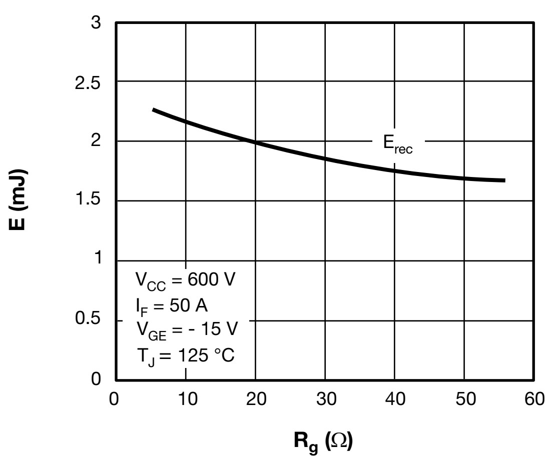



Fig. 9 - Diode Switching Loss vs. $R_G$

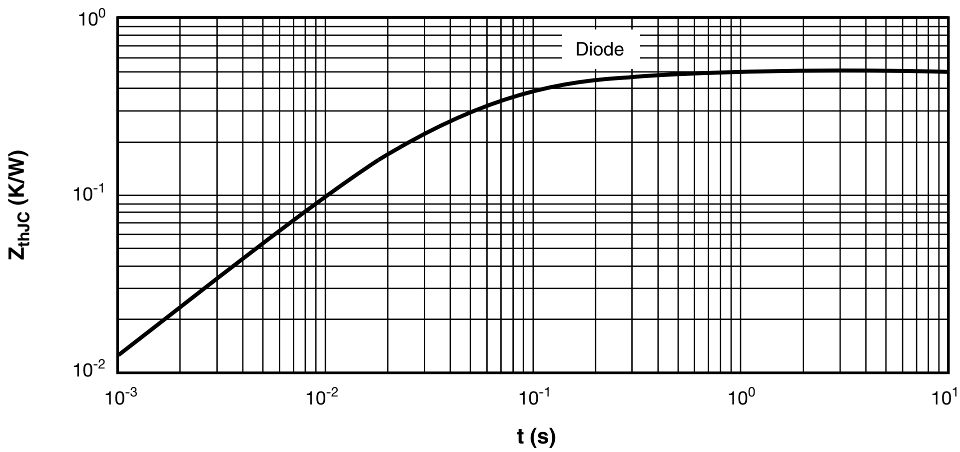
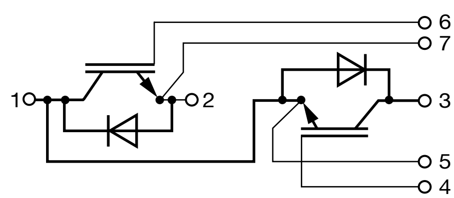



Fig. 10 - Diode Transient Thermal Impedance

## CIRCUIT CONFIGURATION




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

# Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.