

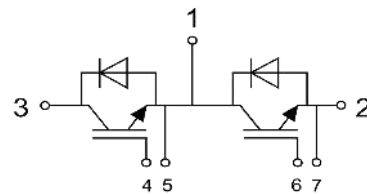
| |
|-------------------------------------|
| $V_{CES} = 1200V$ |
| $I_C = 50A$ at $T_C = 80^\circ C$ |
| $t_{SC} \geq 10\mu sec$ |
| $V_{CE(ON)} = 2.30V$ at $I_C = 50A$ |

**IGBT Half-Bridge
POWIR 34™ Package**



Applications:

- Industrial Motor Drive
- Uninterruptible Power Supply
- Welding and Cutting Machine
- Switched Mode Power Supply
- Induction Heating
- AC Inverter Drive



| Features | Benefits |
|--|---|
| Low $V_{CE(ON)}$ and Switching Losses | High Efficiency in a Wide Range of Applications |
| 100% RBSOA Tested | Rugged Transient Performance |
| 10μsec Short Circuit Safe Operating Area | |
| POWIR 34™ Package | Industry Standard |
| Lead Free | RoHS Compliant, Environmental Friendly |

| Base Part Number | Package Type | Standard Pack | Quantity | Orderable Part Number |
|------------------|------------------|---------------|----------|-----------------------|
| IRG5K50HF12A | POWIR 34™ | Box | 80 | IRG5K50HF12A |

Absolute Maximum Ratings of IGBT

| | | | |
|-----------|--|---------------------------------------|-------|
| V_{CES} | Collector to Emitter Voltage | 1200 | V |
| V_{GES} | Continuous Gate to Emitter Voltage | ±20 | V |
| I_C | Continuous Collector Current | $T_C = 80^\circ C$ | 50 A |
| | | $T_C = 25^\circ C$ | 100 A |
| I_{CM} | Pulse Collector Current | $T_J = 150^\circ C$ | 100 A |
| P_D | Maximum Power Dissipation (IGBT) | $T_C = 25^\circ C, T_J = 150^\circ C$ | 390 W |
| T_J | Maximum IGBT Junction Temperature | 150 | °C |
| T_{JOP} | Maximum Operating Junction Temperature Range | -40 to +150 | °C |
| T_{stg} | Storage Temperature | -40 to +125 | °C |

Electrical Characteristics of IGBT at $T_J = 25^\circ\text{C}$ (Unless Otherwise Specified)

| Parameter | | Min. | Typ. | Max. | Unit | Test Conditions | |
|---------------|---|------|------|------|------|---------------------------------|---------------------------|
| $V_{(BR)CES}$ | Collector to Emitter Breakdown Voltage | 1200 | | | V | $V_{GE} = 0V, I_C = 1mA$ | |
| $V_{GE(th)}$ | Gate Threshold Voltage | 4.5 | 5.3 | 6.0 | V | $I_C = 0.50mA, V_{CE} = V_{GE}$ | |
| $V_{CE(ON)}$ | Collector to Emitter Saturation Voltage | | 2.30 | 2.60 | V | $T_J = 25^\circ\text{C}$ | $I_C = 50A, V_{GE} = 15V$ |
| | | | 2.60 | | V | $T_J = 125^\circ\text{C}$ | |
| I_{CES} | Collector to Emitter Leakage Current | | | 1 | mA | $V_{GE} = 0V, V_{CE} = V_{CES}$ | |
| I_{GES} | Gate to Emitter Leakage Current | | | 400 | nA | $V_{GE} = \pm 20V, V_{CE} = 0$ | |

Switching Characteristics of IGBT

| Parameter | | Min. | Typ. | Max. | Unit | Test Conditions | |
|--------------|-----------------------------------|-----------|------|------|---------|---|---|
| $t_{d(on)}$ | Turn-on Delay Time | | 130 | | ns | $T_J = 25^\circ\text{C}$ | $V_{CC} = 600V, I_C = 50A, R_G = 15\Omega, V_{GE} = \pm 15V, \text{Inductive Load}$ |
| | | | 120 | | | $T_J = 125^\circ\text{C}$ | |
| t_r | Rise Time | | 80 | | ns | $T_J = 25^\circ\text{C}$ | |
| | | | 80 | | | $T_J = 125^\circ\text{C}$ | |
| $t_{d(off)}$ | Turn-off Delay Time | | 320 | | ns | $T_J = 25^\circ\text{C}$ | |
| | | | 355 | | | $T_J = 125^\circ\text{C}$ | |
| t_f | Fall Time | | 150 | | ns | $T_J = 25^\circ\text{C}$ | |
| | | | 200 | | | $T_J = 125^\circ\text{C}$ | |
| E_{on} | Turn-on Switching Loss | | 4.52 | | mJ | $T_J = 25^\circ\text{C}$ | |
| | | | 4.66 | | | $T_J = 125^\circ\text{C}$ | |
| E_{off} | Turn-off Switching Loss | | 2.54 | | mJ | $T_J = 25^\circ\text{C}$ | |
| | | | 3.53 | | | $T_J = 125^\circ\text{C}$ | |
| Q_g | Total Gate Charge | | 580 | | nC | $T_J = 25^\circ\text{C}$ | |
| C_{ies} | Input Capacitance | | 6.2 | | nF | $V_{CE} = 25V, V_{GE} = 0V, f = 1MHz, T_J = 25^\circ\text{C}$ | |
| C_{oes} | Output Capacitance | | 0.52 | | | | |
| C_{res} | Reverse Transfer Capacitance | | 0.21 | | | | |
| RBSOA | Reverse Bias Safe Operating Area | Trapezoid | | | | $I_C = 100A, V_{CC} = 960V, V_P = 1200V, R_G = 15\Omega, V_{GE} = +15V \text{ to } 0V, T_J = 150^\circ\text{C}$ | |
| SCSOA | Short Circuit Safe Operating Area | 10 | | | μs | $V_{CC} = 600V, V_{GE} = 15V, T_J = 150^\circ\text{C}$ | |

Absolute Maximum Ratings of Freewheeling Diode

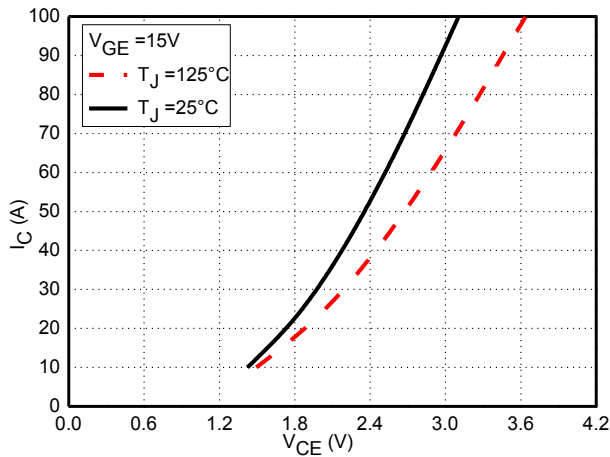
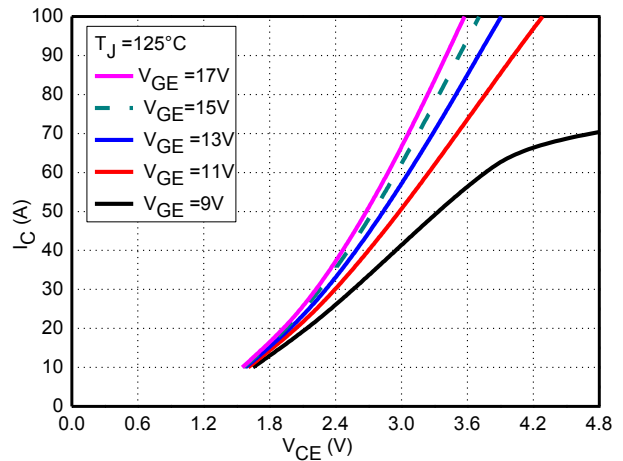
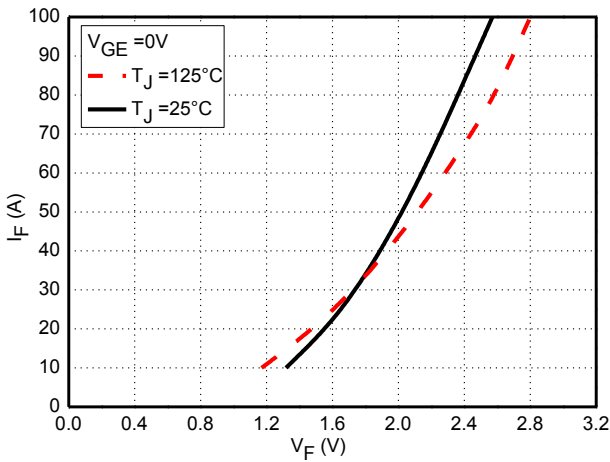
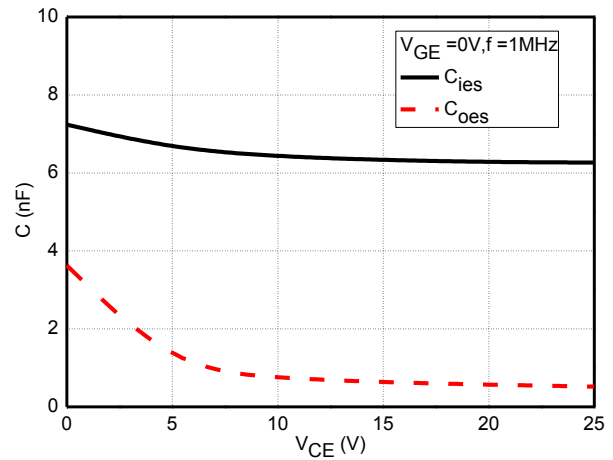
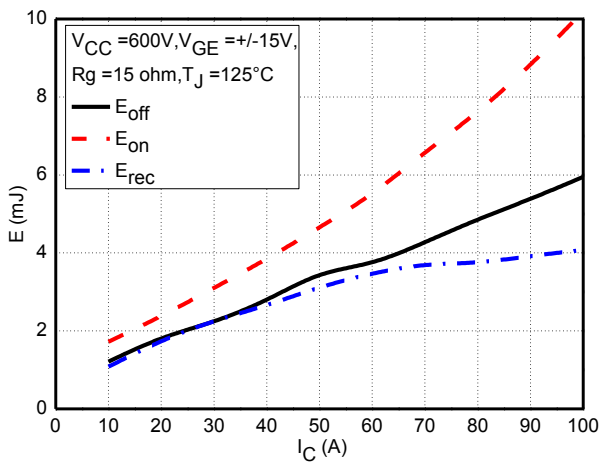
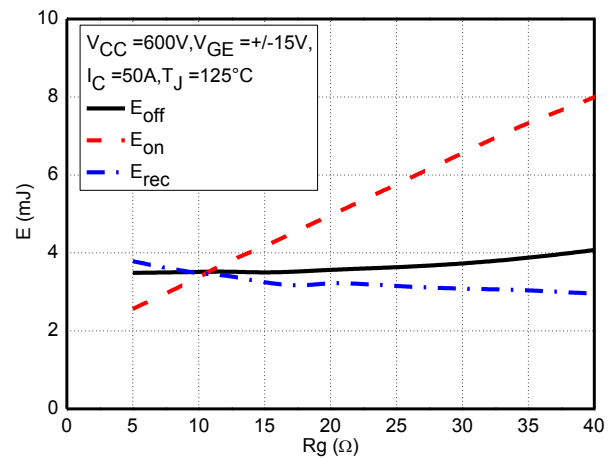
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|-----------|--|------|---|
| V_{RRM} | Repetitive Peak Reverse Voltage | 1200 | V |
| I_F | Diode Continuous Forward Current, $T_C = 25^\circ\text{C}$ | 100 | A |
| | Diode Continuous Forward Current, $T_C = 80^\circ\text{C}$ | 50 | |
| I_{FM} | Pulse Diode Current | 100 | A |

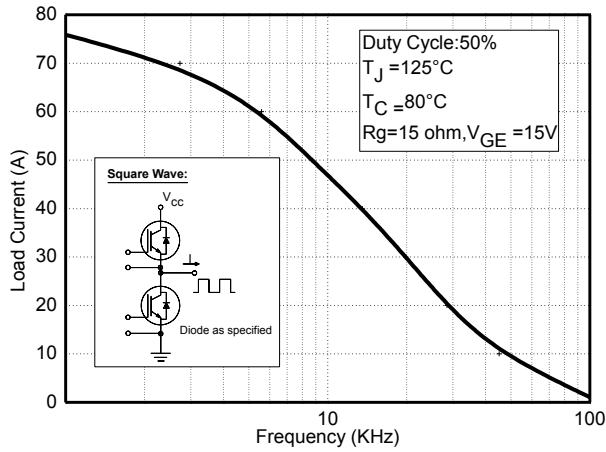
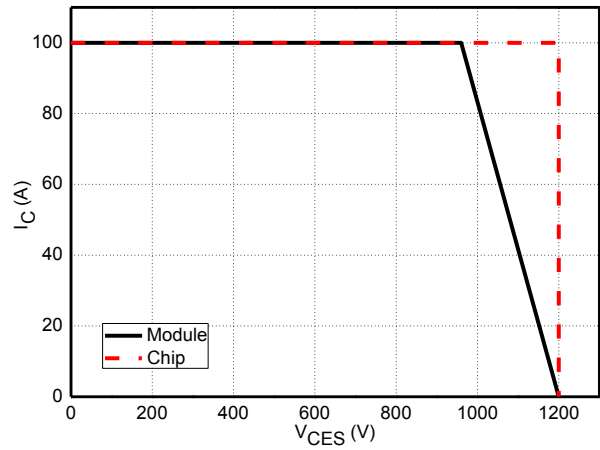
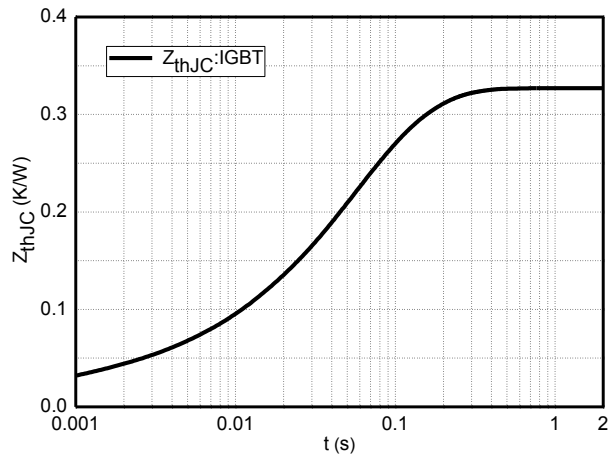
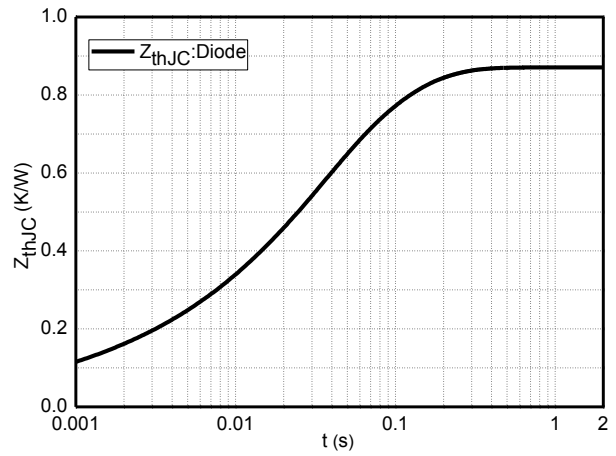
Electrical and Switching Characteristics of Freewheeling Diode

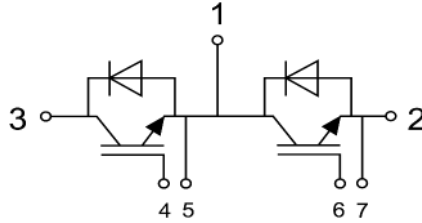
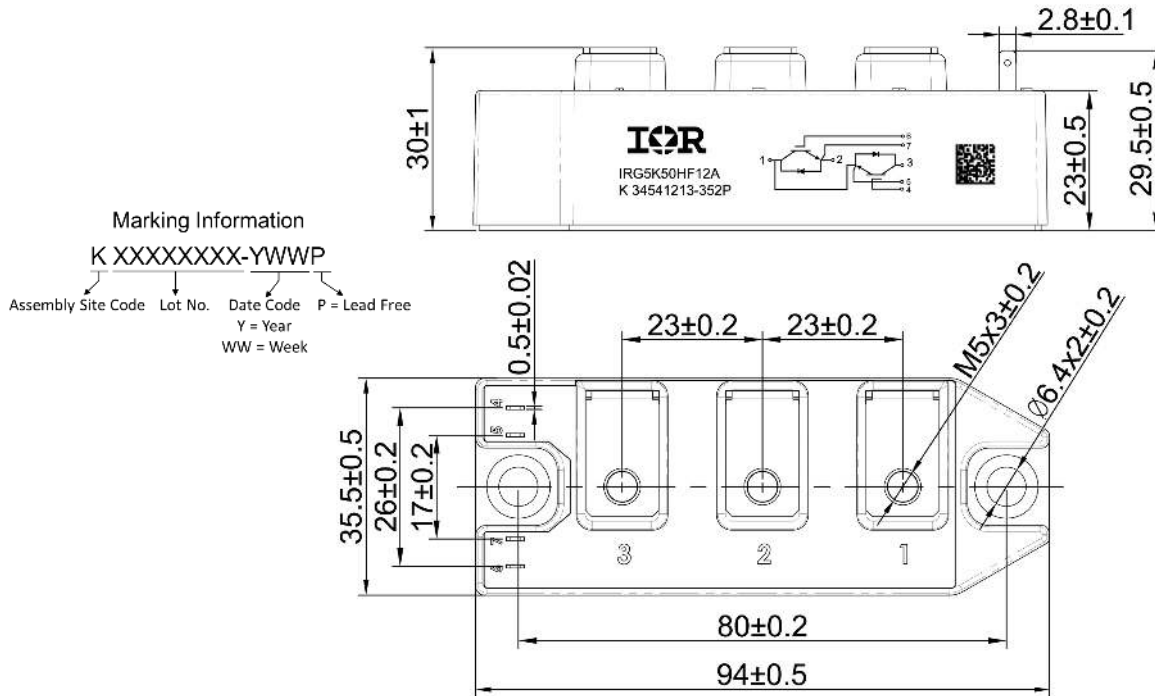
| Parameter | | Typ. | Max. | Unit | Test Conditions | |
|-----------|-------------------------------|------|------|---------------|---------------------------|---|
| V_F | Forward Voltage | 2.00 | 2.70 | V | $T_J = 25^\circ\text{C}$ | $I_F = 50\text{A}$, $V_{GE} = 0\text{V}$ |
| | | 2.20 | | | $T_J = 125^\circ\text{C}$ | |
| I_{rr} | Peak Reverse Recovery Current | 40 | | A | $T_J = 25^\circ\text{C}$ | $I_F = 50\text{A}$, $di/dt = 960\text{A}/\mu\text{s}$, $V_{rr} = 600\text{V}$, $V_{GE} = -15\text{V}$ |
| | | 50 | | | $T_J = 125^\circ\text{C}$ | |
| Q_{rr} | Reverse Recovery Charge | 3.6 | | μC | $T_J = 25^\circ\text{C}$ | |
| | | 6.5 | | | $T_J = 125^\circ\text{C}$ | |
| E_{rec} | Reverse Recovery Energy | 1.7 | | mJ | $T_J = 25^\circ\text{C}$ | |
| | | 3.1 | | | $T_J = 125^\circ\text{C}$ | |

Module Characteristics

| Parameter | | Min. | Typ. | Max. | Unit |
|-----------------|--|------|------|------|---------------------------|
| V_{iso} | Isolation Voltage (All Terminals Shorted), $f = 50\text{Hz}$, 1minute | | | 2500 | V |
| $R_{\theta JC}$ | Junction-to-Case (IGBT) | | 0.32 | | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Junction-to-Case (Diode) | | 0.87 | | $^\circ\text{C}/\text{W}$ |
| $R_{\theta CS}$ | Case-To-Sink (Conductive Grease Applied) | | 0.1 | | $^\circ\text{C}/\text{W}$ |
| M | Power Terminals Screw: M5 | 3.0 | | 5.0 | N·m |
| M | Mounting Screw: M6 | 4.0 | | 6.0 | N·m |
| G | Weight | | 165 | | g |


Fig.1 Typical IGBT Saturation Characteristics

Fig.2 Typical IGBT Output Characteristics

Fig.3 Typical Diode Forward Characteristics

Fig. 4 Typical Capacitance Characteristics

Fig.5 Typical Switching Loss vs. Collector Current

Fig.6 Typical Switching Loss vs. Gate Resistance


Fig.7 Typical Load Current vs. Frequency

Fig.8 Reverse Bias Safe Operation Area (RBSOA)

Fig.9 Typical Transient Thermal Impedance (IGBT)

Fig.10 Typical Transient Thermal Impedance (Diode)

Internal Circuit:

Package Outline (Unit: mm):

Qualification Information†

| | |
|----------------------------|----------------|
| Qualification Level | Industrial |
| Moisture Sensitivity Level | Not Applicable |
| RoHS Compliant | Yes |

† Qualification standards can be found at International Rectifier’s web site: <http://www.irf.com/product-info/reliability/>