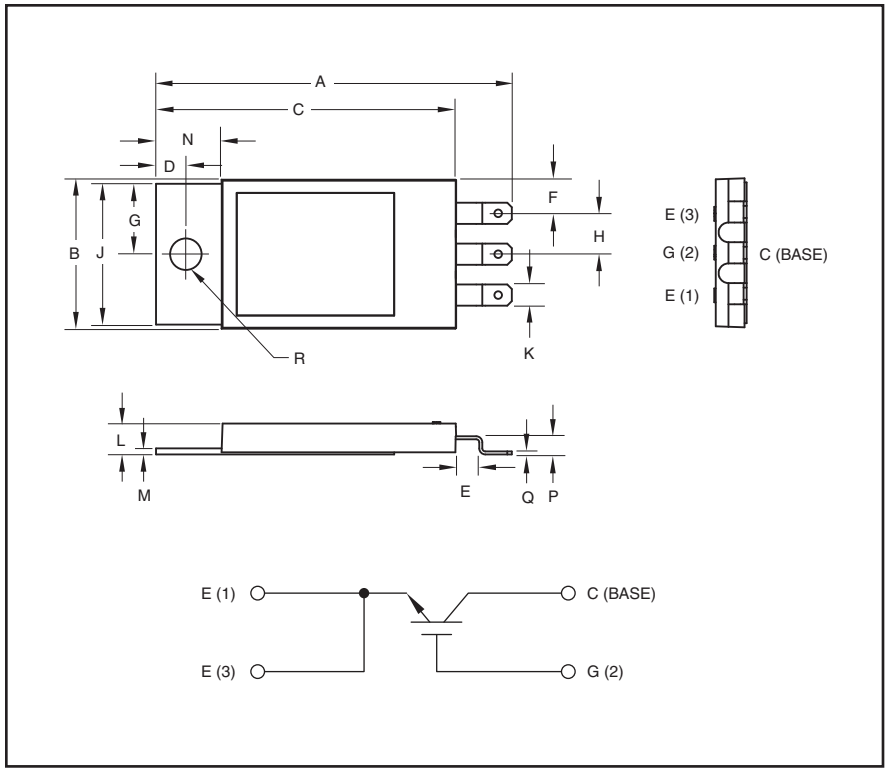
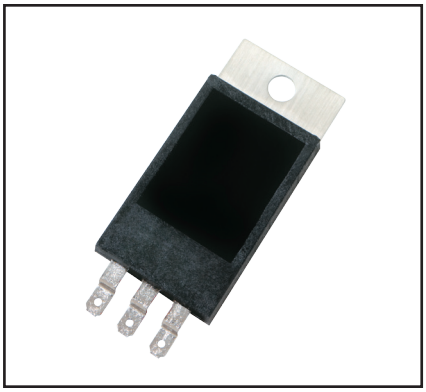
*Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272*
*www.pwrx.com*

# HV Single Discrete IGBT
## 60 Amperes/4500 Volts



**Description:**
Powerex Single Non-isolated Discrete is designed specially for customer high voltage switching and pulse power applications.

**Features:**
- ☐ Low Drive Requirement
- ☐ Low $V_{CE(sat)}$
- ☐ Non-Isolated Molybdenum Mounting Plate
- ☐ IGBT is designed to be used by being immersed in oil or conformal coated in assembly

**Outline Drawing and Circuit Diagram**

| Dimensions | Inches | Millimeters |
|---|---|---|
| A | 2.35 | 59.7 |
| B | 0.98 | 25.0 |
| C | 1.98 | 50.3 |
| D | 0.197 | 5.0 |
| E | 0.22 | 5.5 |
| F | 0.22 | 5.6 |
| G | 0.465 | 11.8 |
| H | 0.27 | 6.9 |

| Dimensions | Inches | Millimeters |
|---|---|---|
| J | 0.93 | 23.6 |
| K | 0.14 | 3.6 |
| L | 0.20 | 5.2 |
| M | 0.40 | 1.0 |
| N | 0.43 | 11.0 |
| P | 0.20 | 0.5 |
| Q | 0.12 | 3.0 |
| R | 0.208 Dia. | 5.3 Dia. |

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***QIS4506002***
***HV Single Discrete IGBT***
*60 Amperes/4500 Volts*

## Maximum Ratings, $T_j$ = 25 °C unless otherwise specified

| Ratings | Symbol | QIS4506002 | Units |
|---|---|---|---|
| Collector Emitter Voltage | $V_{CES}$ | 4500 | Volts |
| Gate Emitter Voltage | $V_{GES}$ | ±20 | Volts |
| Collector Current (DC, $T_C$ = 127°C) | $I_C$ | 60 | Amperes |
| Peak Collector Current (Pulsed) | $I_{CM}$ | 120* | Amperes |
| Junction Temperature | $T_j$ | -55 to 150 | °C |
| Storage Temperature | $T_{stg}$ | -55 to 125 | °C |
| Mounting Torque, M5 Mounting Screws | — | 30 | in-lb |
| Weight (Typical) | — | 20 | Grams |

## Static Electrical Characteristics, $T_j$ = 25 °C unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Collector Cutoff Current | $I_{CES}$ | $V_{CE} = V_{CES}$, $V_{GE}$ = 0V | — | — | 1.0 | mA |
| Gate Leakage Current | $I_{GES}$ | $V_{GE} = V_{GES}$, $V_{CE}$ = 0V | — | — | 0.5 | µA |
| Gate-Emitter Threshold Voltage | $V_{GE(th)}$ | $I_C$ = 7mA, $V_{CE}$ = 10V | 4.5 | 6.0 | 7.5 | Volts |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$ = 60A, $V_{GE}$ = 15V, $T_j$ = 25°C | — | 3.0 | 3.9** | Volts |
| | | $I_C$ = 60A, $V_{GE}$ = 15V, $T_j$ = 125°C | — | 3.6 | — | Volts |
| Total Gate Charge | $Q_G$ | $V_{CC}$ = 2250V, $I_C$ = 60A, $V_{GE}$ = 15V | — | 450 | — | nC |

## Dynamic Electrical Characteristics, $T_j$ = 25 °C unless otherwise specified

| Characteristics | | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Input Capacitance | | $C_{ies}$ | $V_{GE}$ = 0V, $V_{CE}$ = 10V | — | 9.0 | — | nF |
| Output Capacitance | | $C_{oes}$ | | — | 0.65 | — | nF |
| Reverse Transfer Capacitance | | $C_{res}$ | | — | 0.2 | — | nF |
| Resistive | Turn-on Delay Time | $t_{d(on)}$ | $V_{CC}$ = 2250V, | — | — | 2.4 | µs |
| Load | Rise Time | $t_r$ | $I_C$ = 60A, | — | — | 2.4 | µs |
| Switching | Turn-off Delay Time | $t_{d(off)}$ | $V_{GE1} = V_{GE2}$ = 15V, | — | — | 6.0 | µs |
| Times | Fall Time | $t_f$ | $R_G$ = 120Ω | — | — | 1.2 | µs |
| Turn-on Switching Energy | | $E_{on}$ | $T_j$ = 125°C, $I_C$ = 60A, $V_{CC}$ = 2250V, | — | 250 | — | mJ/P |
| Turn-off switching Energy | | $E_{off}$ | $V_{GE}$ = ±15V, $R_G$ = 120Ω, $L_S$ = 180nH | — | 170 | — | mJ/P |

## Thermal and Mechanical Characteristics, $T_j$ = 25 °C unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Thermal Resistance, Junction to Case | $R_{th(j-c)}$ | IGBT | — | 0.10 | 0.12 | °C/W |
| Thermal Resistance, Case to Sink | $R_{th(c-s)}$ | $\lambda_{grease}$ = 1W/mK | — | 0.10 | — | °C/W |
| Thermal Grease Applied | | | | | | |

* Pulse width and repetition rate should be such that device junction temperature ($T_j$) does not exceed device rating.
**Pulse width and repetition rate should be such that device junction temperature rise is negligible.

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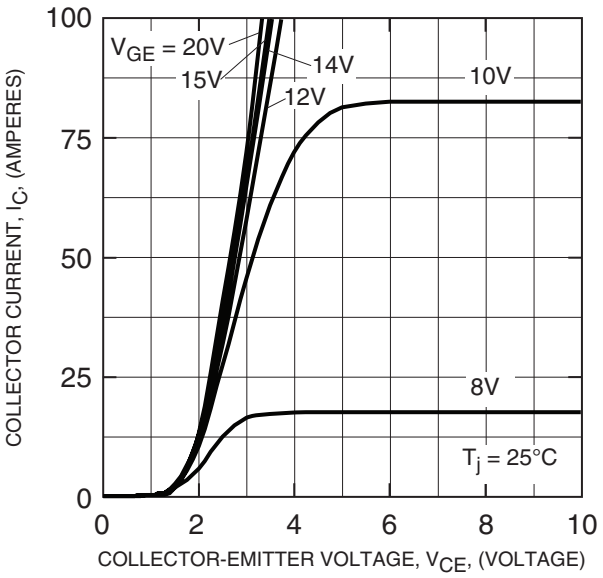
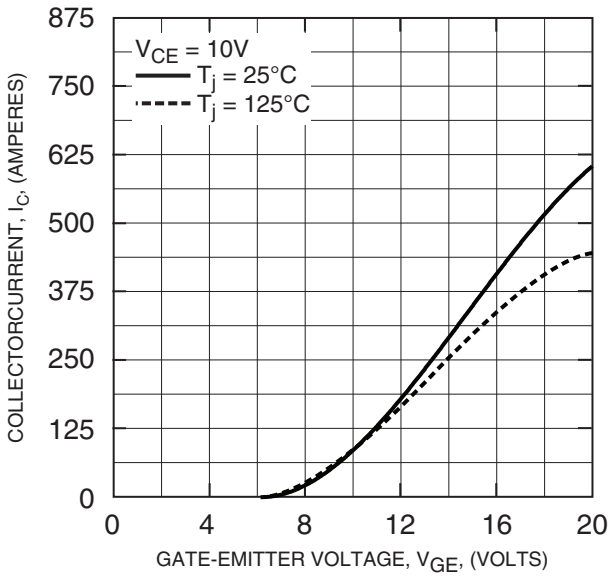
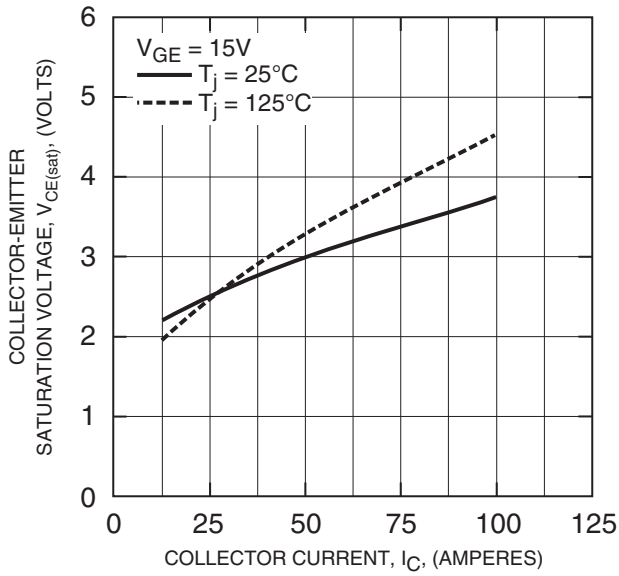
**OUTPUT CHARACTERISTICS (TYPICAL)**



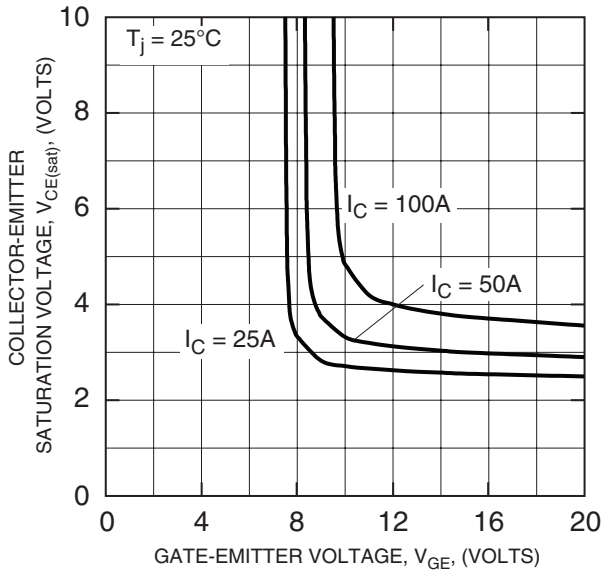

**TRANSFER CHARACTERISTICS (TYPICAL)**




**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**




**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



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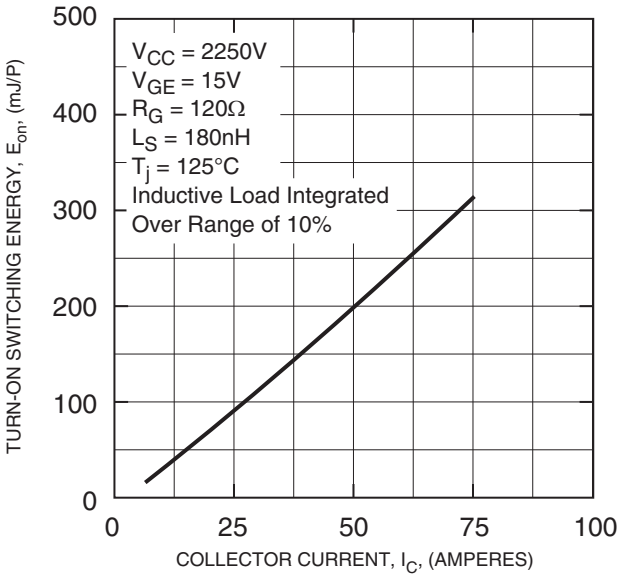
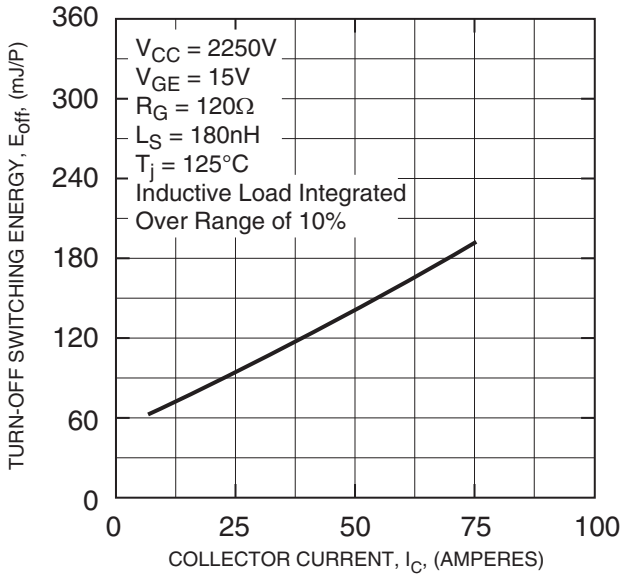
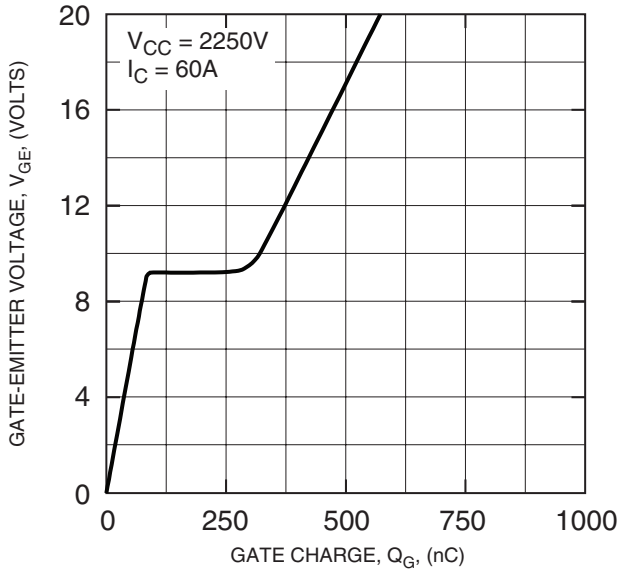
**TURN-ON SWITCHING ENERGY CHARACTERISTICS (TYPICAL)**



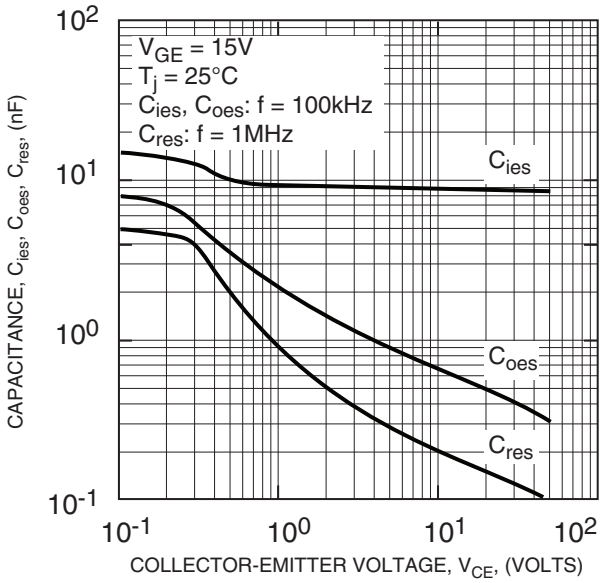

**TURN-OFF SWITCHING ENERGY CHARACTERISTICS (TYPICAL)**




**GATE CHARGE CHARACTERISTICS (TYPICAL)**




**CAPACITANCE CHARACTERISTICS (TYPICAL)**



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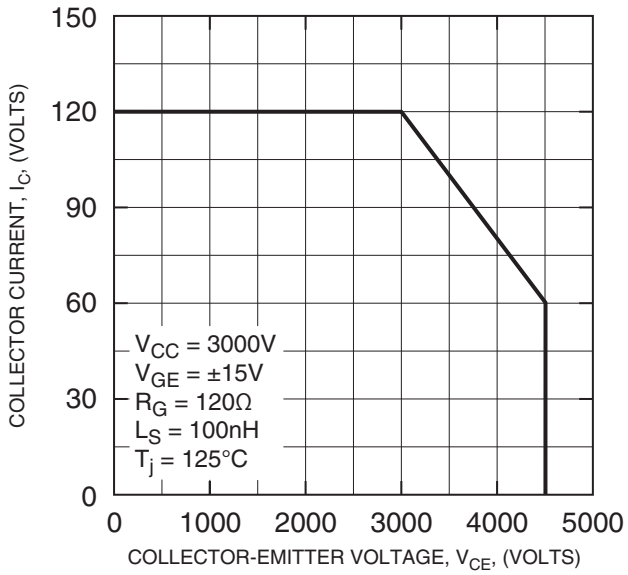
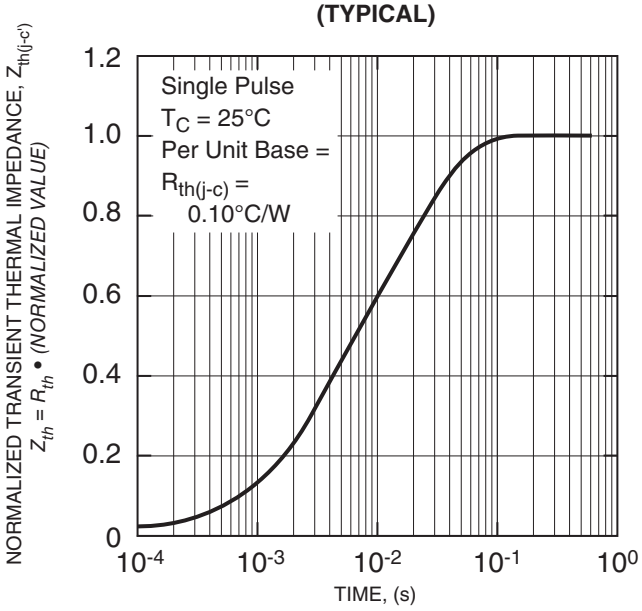
**REVERSE BIAS SAFE OPERATING AREA (RBSOA) (TYPICAL)**




**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (TYPICAL)**




$$Z_{th(j\text{-}c)}(t) = \sum_{i=1}^{n} R_i \left\{1 - \exp\left(\frac{-t}{\tau_i}\right)\right\}$$

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| $R_i$ (°C/W) | -6.55E-03 | 1.66E-02 | 6.24E-03 | 8.32E-02 |
| $\tau_i$ (sec) | 3.33E-04 | 7.57-E-04 | 2.34E-03 | 1.34E-02 |