

Ultra Fast NPT - IGBT®

The Ultra Fast NPT - IGBT® is a new generation of high voltage power IGBTs. Using Non-Punch-Through Technology, the Ultra Fast NPT-IGBT® offers superior ruggedness and ultrafast switching speed.

Features

- Low Saturation Voltage
- Low Tail Current
- RoHS Compliant 
- Short Circuit Withstand Rated
- High Frequency Switching
- Ultra Low Leakage Current



Unless stated otherwise, Microsemi discrete IGBTs contain a single IGBT die. This device is recommended for applications such as induction heating (IH), motor control, general purpose inverters and uninterruptible power supplies (UPS).

MAXIMUM RATINGS

All Ratings: $T_C = 25^\circ\text{C}$ unless otherwise specified.

| Symbol | Parameter | Ratings | Unit |
|----------------|--|------------|------------------|
| V_{ces} | Collector Emitter Voltage | 1200 | V |
| V_{GE} | Gate-Emitter Voltage | ± 30 | |
| I_{C1} | Continuous Collector Current @ $T_C = 25^\circ\text{C}$ | 116 | A |
| I_{C2} | Continuous Collector Current @ $T_C = 70^\circ\text{C}$ | 85 | |
| I_{CM} | Pulsed Collector Current ^① | 240 | |
| SCWT | Short Circuit Withstand Time: $V_{CE} = 600V$, $V_{GE} = 15V$, $T_C = 125^\circ\text{C}$ | 10 | μs |
| P_D | Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | 543 | W |
| T_J, T_{STG} | Operating and Storage Junction Temperature Range | -55 to 150 | $^\circ\text{C}$ |
| T_L | Max. Lead Temp. for Soldering: 0.063" from Case for 10 Sec. | 300 | |

STATIC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Min | Typ | Max | Unit |
|---------------|---|------|-----|-----------|---------------|
| $V_{(BR)CES}$ | Collector-Emitter Breakdown Voltage ($V_{GE} = 0V$, $I_C = 1.0mA$) | 1200 | | | Volts |
| $V_{GE(TH)}$ | Gate Threshold Voltage ($V_{CE} = V_{GE}$, $I_C = 2.5mA$, $T_J = 25^\circ\text{C}$) | 3.5 | 5.0 | 6.5 | |
| $V_{CE(ON)}$ | Collector-Emitter On Voltage ($V_{GE} = 15V$, $I_C = 85A$, $T_J = 25^\circ\text{C}$) | | 2.5 | 3.2 | |
| | Collector-Emitter On Voltage ($V_{GE} = 15V$, $I_C = 85A$, $T_J = 125^\circ\text{C}$) | | 3.3 | | |
| | Collector-Emitter On Voltage ($V_{GE} = 15V$, $I_C = 170A$, $T_J = 25^\circ\text{C}$) | | 3.5 | | |
| I_{CES} | Collector Cut-off Current ($V_{CE} = 1200V$, $V_{GE} = 0V$, $T_J = 25^\circ\text{C}$) ^② | | 10 | 1000 | μA |
| | Collector Cut-off Current ($V_{CE} = 1200V$, $V_{GE} = 0V$, $T_J = 125^\circ\text{C}$) ^② | | 100 | | |
| I_{GES} | Gate-Emitter Leakage Current ($V_{GE} = \pm 20V$) | | | ± 250 | nA |



CAUTION: These Devices are Sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|-----------------|---------------------------------|---|-----|------|--------|---------|
| C_{ies} | Input Capacitance | Capacitance $V_{GE} = 0V, V_{CE} = 25V$ $f = 1MHz$ | | 8400 | | pF |
| C_{oes} | Output Capacitance | | | 725 | | |
| C_{res} | Reverse Transfer Capacitance | | | 190 | | |
| V_{GEP} | Gate to Emitter Plateau Voltage | Gate Charge $V_{GE} = 15V$ $V_{CE} = 600V$ $I_C = 85A$ | | 7.5 | | V |
| $Q_g^{(3)}$ | Total Gate Charge | | | 490 | 660 | nC |
| Q_{ge} | Gate-Emitter Charge | | | 60 | 85 | |
| Q_{gc} | Gate- Collector Charge | | | 230 | 320 | |
| $t_{d(on)}$ | Turn-On Delay Time | Inductive Switching (25°C) $V_{CC} = 600V$ $V_{GE} = 15V$ $I_C = 85A$ $R_G = 4.3 \Omega^{(4)}$ $T_J = +25^\circ C$ | | 43 | | ns |
| t_r | Current Rise Time | | | 70 | | |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 300 | | |
| t_f | Current Fall Time | | | 85 | | |
| $E_{on2}^{(5)}$ | Turn-On Switching Energy | Inductive Switching (125°C) $V_{CC} = 600V$ $V_{GE} = 15V$ $I_C = 85A$ $R_G = 4.3 \Omega^{(4)}$ $T_J = +125^\circ C$ | | 6000 | 9000 | μJ |
| $E_{off}^{(6)}$ | Turn-Off Switching Energy | | | 3800 | 5700 | |
| $t_{d(on)}$ | Turn-On Delay Time | | | 43 | | ns |
| t_r | Current Rise Time | | | 70 | | |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 350 | | |
| t_f | Current Fall Time | | | 95 | | |
| $E_{on2}^{(5)}$ | Turn-On Switching Energy | | | 7800 | 11,700 | μJ |
| $E_{off}^{(6)}$ | Turn-Off Switching Energy | | | 4900 | 7350 | |

THERMAL AND MECHANICAL CHARACTERISTICS

| Symbol | Characteristic / Test Conditions | Min | Typ | Max | Unit |
|-----------------|--|------|------|------|--------------|
| $R_{\theta JC}$ | Junction to Case | - | - | 0.23 | $^\circ C/W$ |
| W_T | Package Weight | - | 1.03 | - | oz |
| Torque | Terminals and Mounting Screws. | - | - | 10 | in·lbf |
| | | - | - | 1.1 | N·m |
| $V_{Isolation}$ | RMS Voltage (50-60Hz Sinusoidal Waveform from Terminals to Mounting Base for 1 Min.) | 2500 | - | - | Volts |

1 Repetitive Rating: Pulse width and case temperature limited by maximum junction temperature.

2 Pulse test: Pulse Width < 380 μs , duty cycle < 2%.

3 See Mil-Std-750 Method 3471.

4 R_G is external gate resistance, not including internal gate resistance or gate driver impedance. (MIC4452)

5 E_{on2} is the clamped inductive turn on energy that includes a commutating diode reverse recovery current in the IGBT turn on energy loss. A combi device is used for the clamping diode.

6 E_{off} is the clamped inductive turn-off energy measured in accordance with JEDEC standard JESD24-1.

Microsemi reserves the right to change, without notice, the specifications and information contained herein.

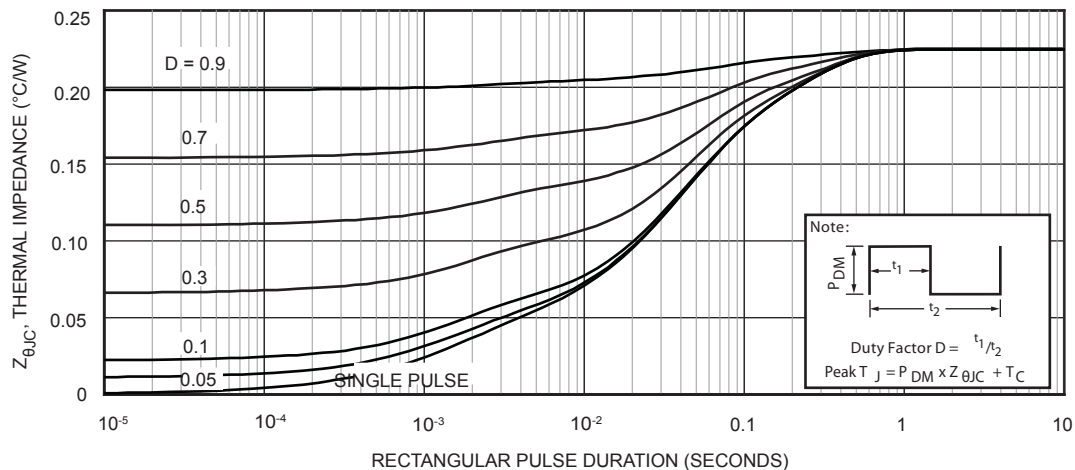


Figure 1, Maximum Effective Transient Thermal Impedance, Junction-To-Case vs Pulse Duration

TYPICAL PERFORMANCE CURVES

APT85GR120J

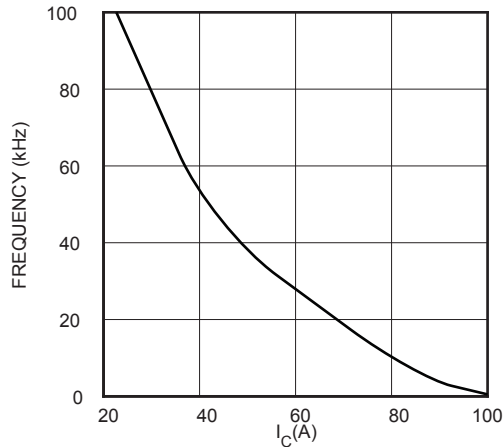


FIGURE 2, Max Frequency vs Current ($T_{case} = 75^{\circ}C$)

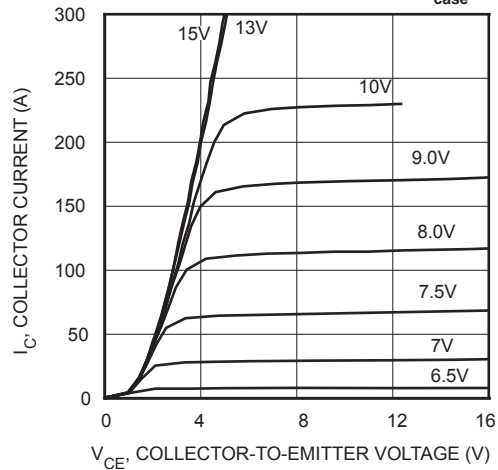


FIGURE 4, Output Characteristics ($T_J = 25^{\circ}C$)

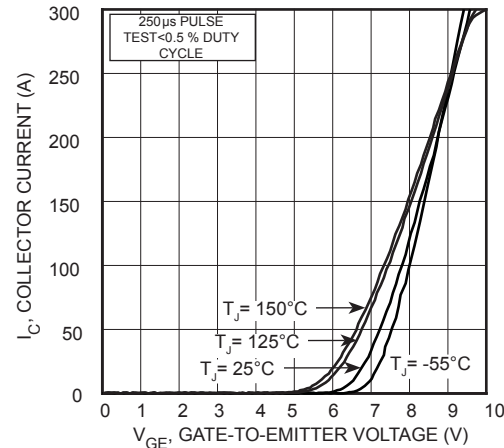


FIGURE 6, Transfer Characteristics

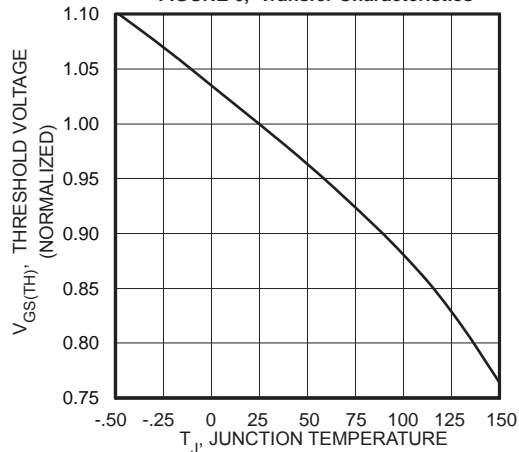


FIGURE 8, Threshold Voltage vs Junction Temperature

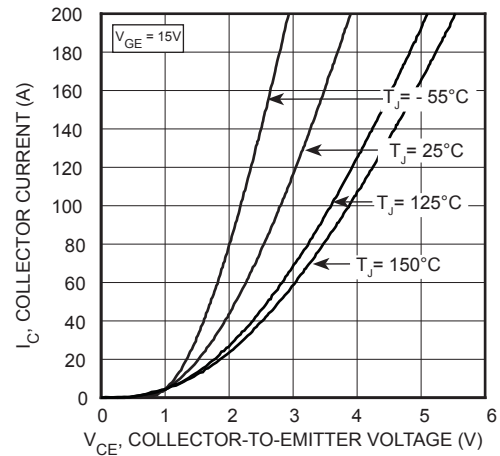


FIGURE 3, Saturation Voltage Characteristics ($T_J = 25^{\circ}C$)

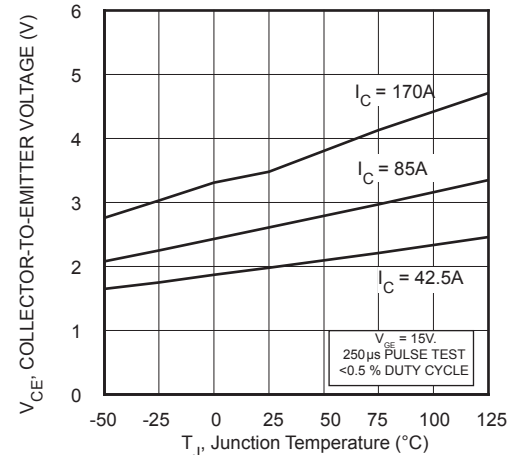


FIGURE 5, On State Voltage vs Junction Temperature

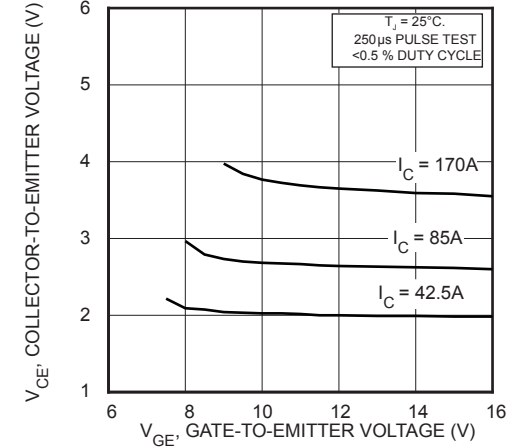


FIGURE 7, On State Voltage vs Gate-to-Emitter Voltage

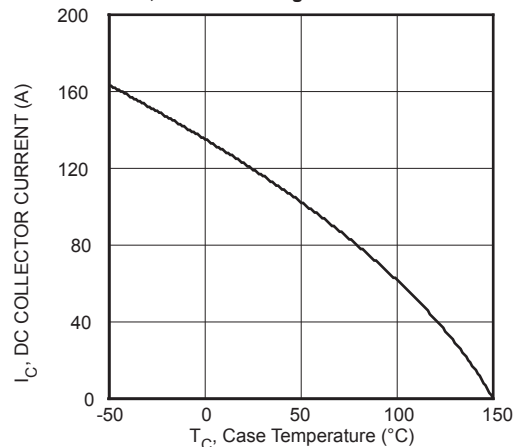


FIGURE 9, DC Collector Current vs Case Temperature

TYPICAL PERFORMANCE CURVES

APT85GR120J

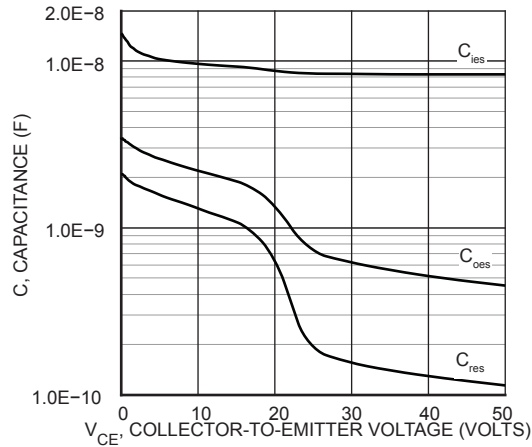


FIGURE 10, Capacitance vs Collector-To-Emitter Voltage

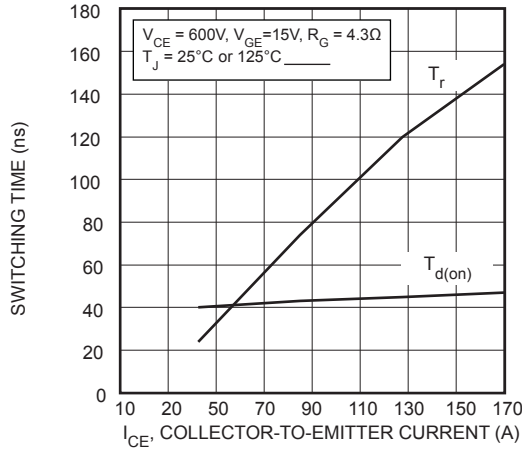


FIGURE 12, Turn-On Time vs Collector Current

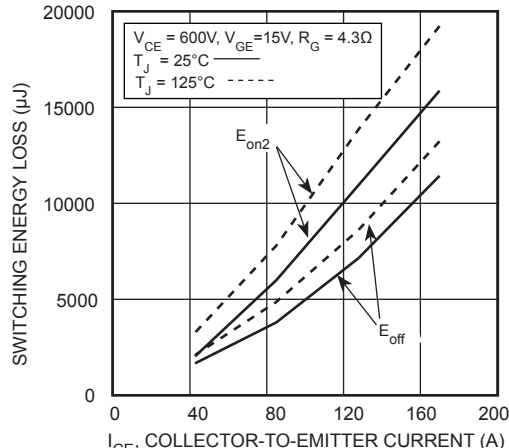


FIGURE 14, Energy Loss vs Collector Current

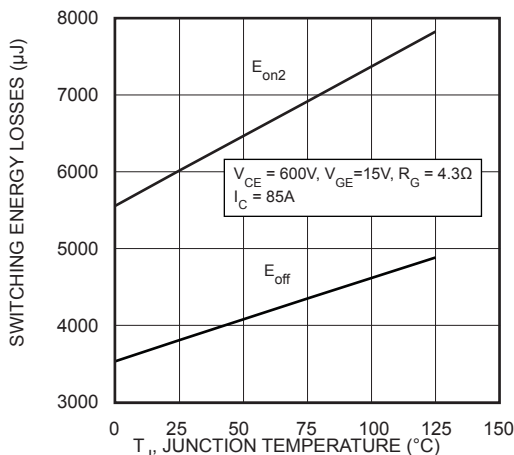


FIGURE 16, Switching Energy vs Junction Temperature

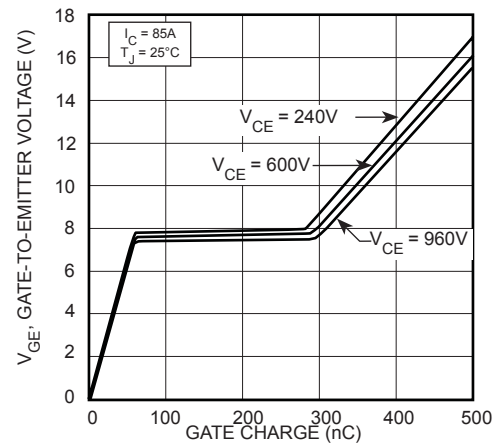


FIGURE 11, Gate charge

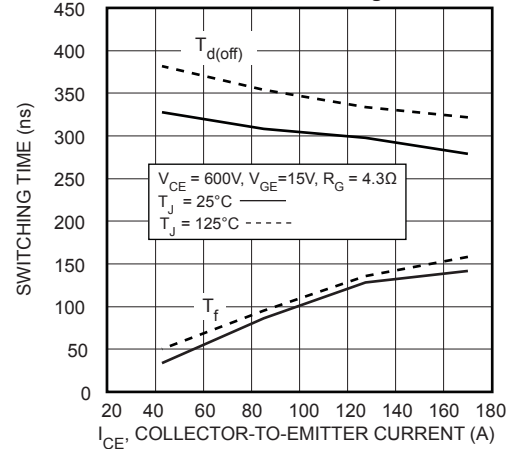


FIGURE 13, Turn-Off Time vs Collector Current

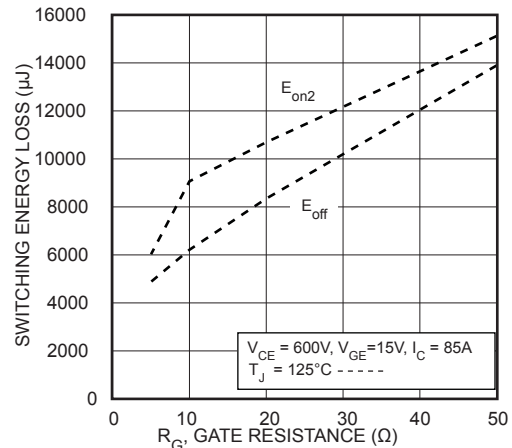


FIGURE 15, Energy Loss vs Gate Resistance

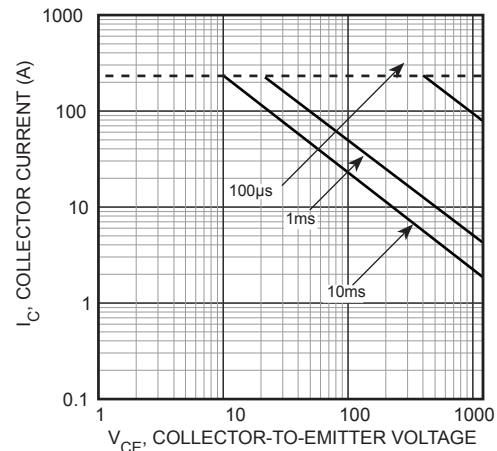
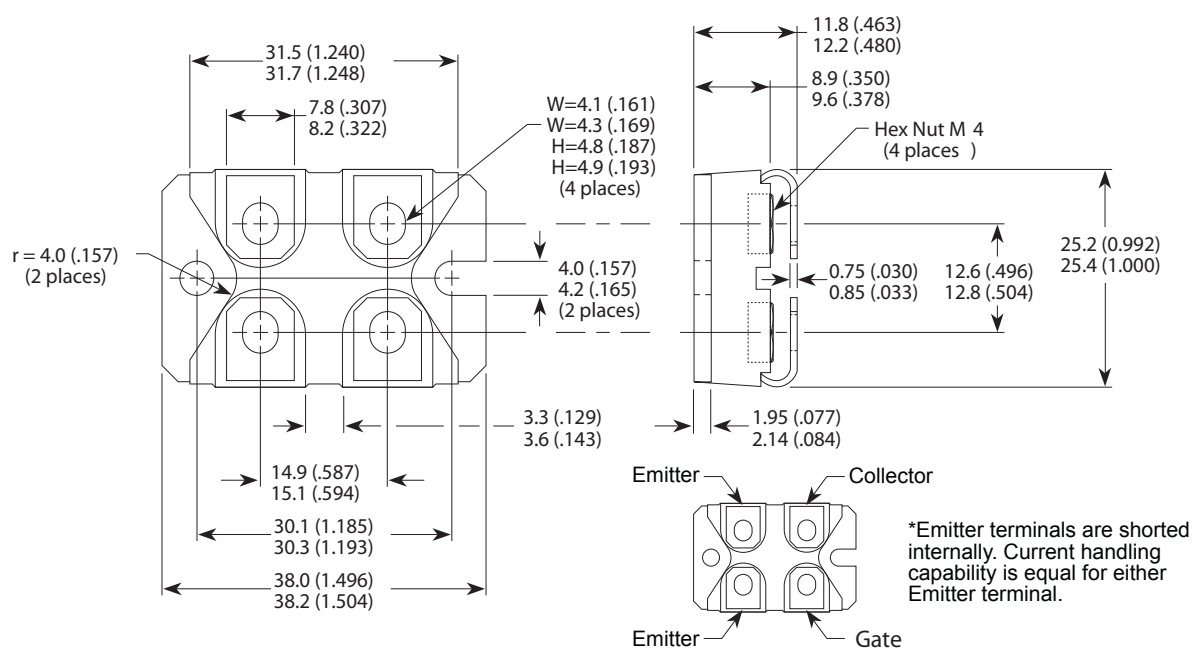


FIGURE 17, Minimum Switching Safe Operating Area

SOT-227 (ISOTOP®) Package Outline



Dimensions in Millimeters and (Inches)

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