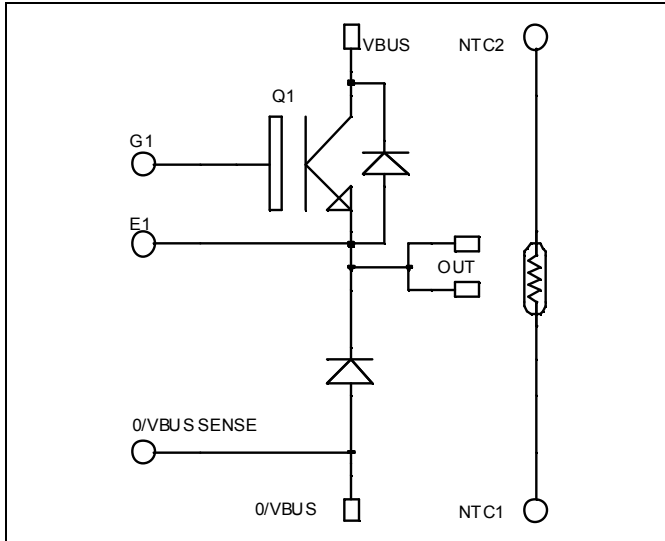


## Buck chopper NPT IGBT Power Module

$V_{CES} = 600V$   
 $I_C = 90A @ T_c = 80^\circ C$

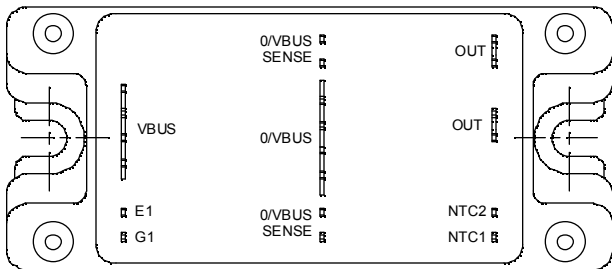


### Application

- AC and DC motor control
- Switched Mode Power Supplies

### Features

- Non Punch Through (NPT) Fast IGBT®
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 100 kHz
  - Soft recovery parallel diodes
  - Low diode VF
  - Low leakage current
  - Avalanche energy rated
  - RBSOA and SCSOA rated
- Kelvin emitter for easy drive
- Very low stray inductance
  - Symmetrical design
  - Lead frames for power connections
- Internal thermistor for temperature monitoring
- High level of integration



### Benefits

- Outstanding performance at high frequency operation
- Stable temperature behavior
- Very rugged
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Easy paralleling due to positive TC of VCEsat
- Low profile
- RoHS compliant

### Absolute maximum ratings

| Symbol    | Parameter                             | Max ratings         | Unit        |
|-----------|---------------------------------------|---------------------|-------------|
| $V_{CES}$ | Collector - Emitter Breakdown Voltage | 600                 | V           |
| $I_C$     | Continuous Collector Current          | $T_c = 25^\circ C$  | 110         |
|           |                                       | $T_c = 80^\circ C$  | 90          |
| $I_{CM}$  | Pulsed Collector Current              | $T_c = 25^\circ C$  | 315         |
| $V_{GE}$  | Gate - Emitter Voltage                | $\pm 20$            | V           |
| $P_D$     | Maximum Power Dissipation             | $T_c = 25^\circ C$  | 416         |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 150^\circ C$ | 200A @ 600V |

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on [www.microsemi.com](http://www.microsemi.com)

All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified

**Electrical Characteristics**

| Symbol        | Characteristic                       | Test Conditions                                | Min | Typ        | Max        | Unit          |
|---------------|--------------------------------------|--|-----|------------|------------|---------------|
| $I_{CES}$     | Zero Gate Voltage Collector Current  | $V_{GE} = 0\text{V}$<br>$V_{CE} = 600\text{V}$ |     |            | 250<br>500 | $\mu\text{A}$ |
| $V_{CE(sat)}$ | Collector Emitter saturation Voltage | $V_{GE} = 15\text{V}$<br>$I_C = 90\text{A}$    |     | 2.0<br>2.2 | 2.5        | V             |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 1\text{mA}$            | 3   |            | 5          | V             |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$      |     |            | $\pm 150$  | nA            |

**Dynamic Characteristics**

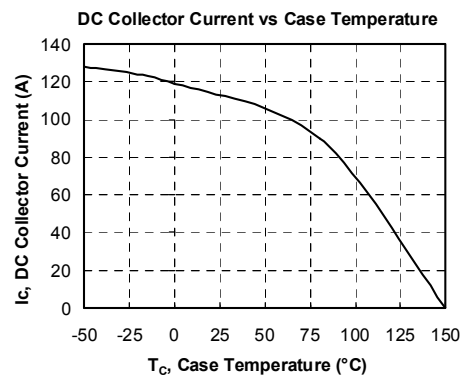
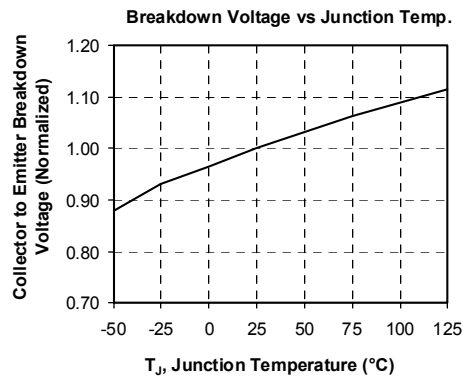
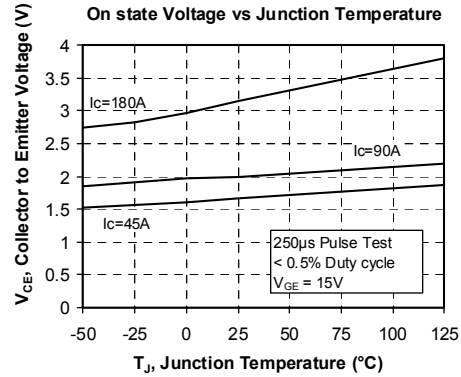
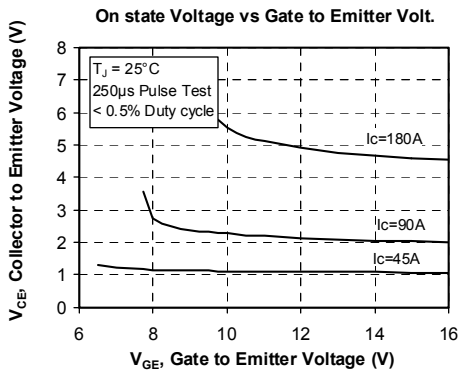
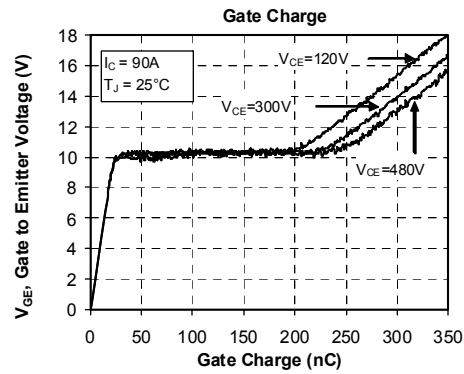
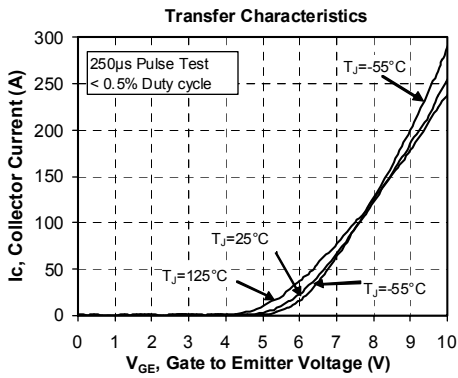
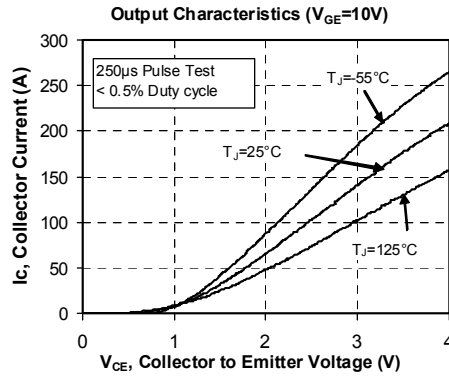
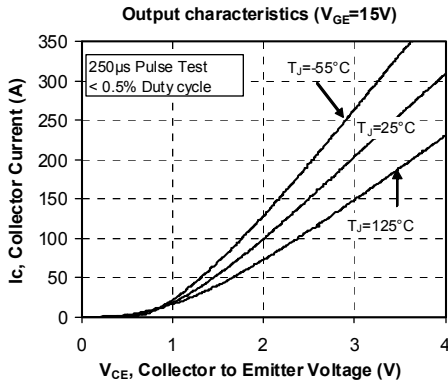
| Symbol       | Characteristic               | Test Conditions                                  | Min | Typ  | Max | Unit |
|--------------|------------------------------|--|-----|------|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0\text{V}$                             |     | 4300 |     | pF   |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25\text{V}$                            |     | 470  |     |      |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$                                |     | 400  |     |      |
| $Q_g$        | Total gate Charge            | $V_{GE} = 15\text{V}$                            |     | 330  |     | nC   |
| $Q_{ge}$     | Gate – Emitter Charge        | $V_{Bus} = 300\text{V}$                          |     | 290  |     |      |
| $Q_{gc}$     | Gate – Collector Charge      | $I_C = 90\text{A}$                               |     | 200  |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )       |     | 26   |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = 15\text{V}$                            |     | 25   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $V_{Bus} = 400\text{V}$                          |     | 150  |     |      |
| $T_f$        | Fall Time                    | $I_C = 90\text{A}$<br>$R_G = 5\ \Omega$          |     | 30   |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $125^\circ\text{C}$ )      |     | 26   |     | ns   |
| $T_r$        | Rise Time                    | $V_{GE} = 15\text{V}$                            |     | 25   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          | $V_{Bus} = 400\text{V}$                          |     | 170  |     |      |
| $T_f$        | Fall Time                    | $I_C = 90\text{A}$<br>$R_G = 5\ \Omega$          |     | 40   |     |      |
| $E_{on}$     | Turn-on Switching Energy     | $V_{GE} = 15\text{V}$<br>$V_{Bus} = 400\text{V}$ |     | 4.3  |     | mJ   |
| $E_{off}$    | Turn-off Switching Energy    | $I_C = 90\text{A}$<br>$R_G = 5\ \Omega$          |     | 3.5  |     |      |

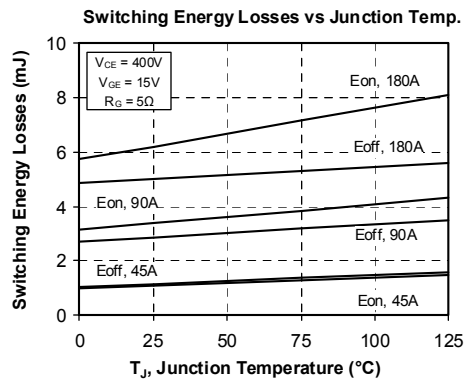
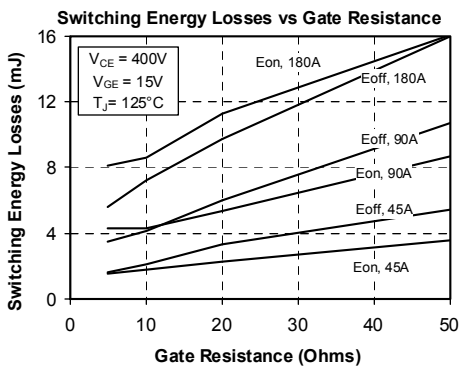
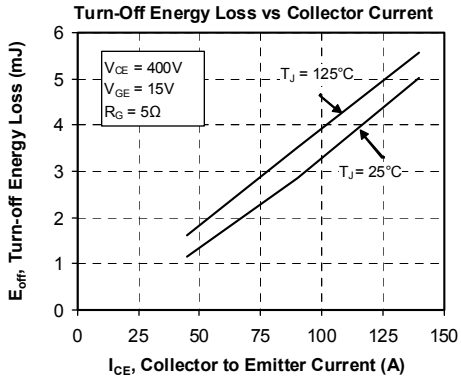
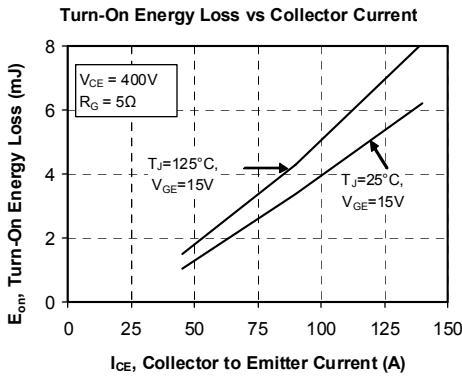
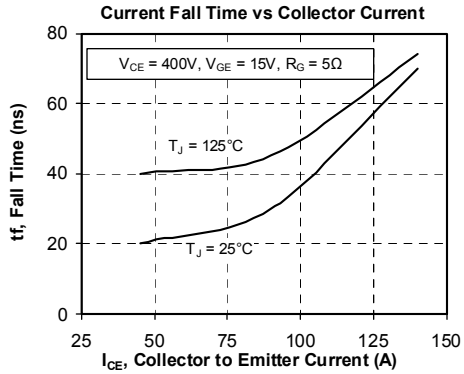
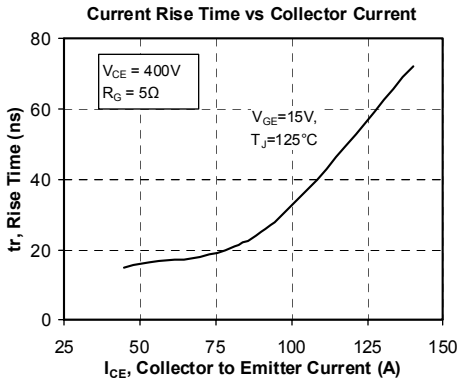
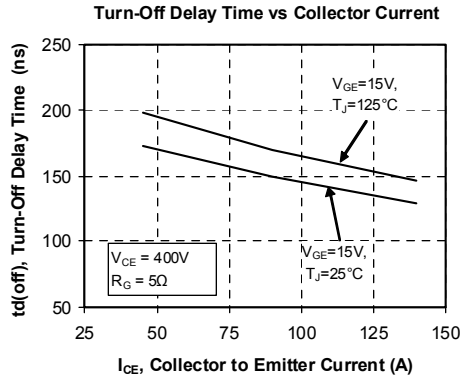
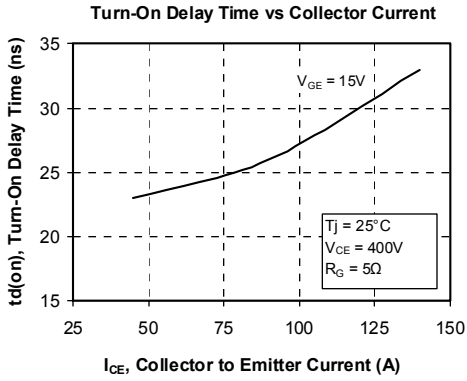
**Chopper diode ratings and characteristics**

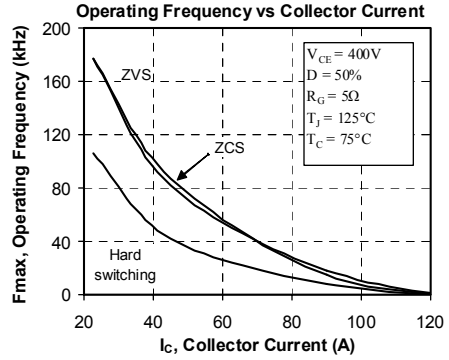
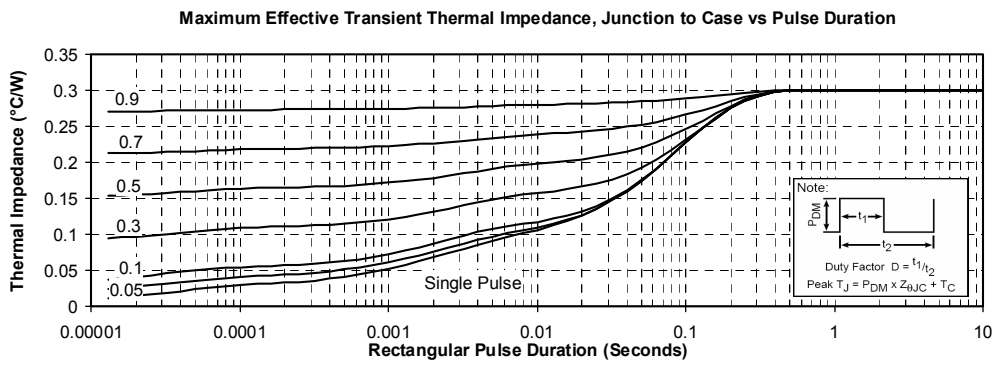
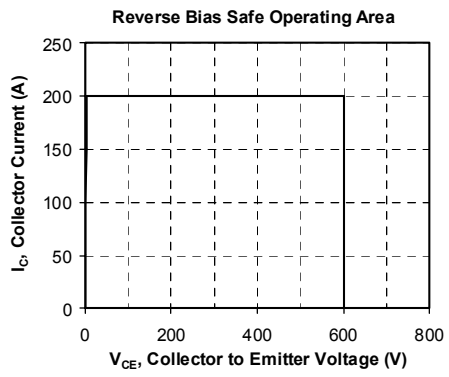
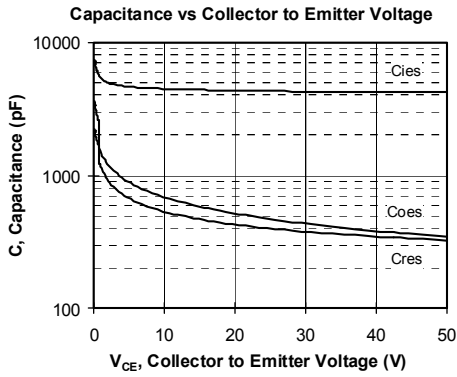
| Symbol    | Characteristic                          | Test Conditions                                  | Min | Typ  | Max        | Unit          |
|-----------|---|--|-----|------|------------|---------------|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage |  | 600 |      |            | V             |
| $I_{RM}$  | Maximum Reverse Leakage Current         | $V_R = 600\text{V}$                              |     |      | 250<br>500 | $\mu\text{A}$ |
| $I_F$     | DC Forward Current                      |  |     | 100  |            | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 100\text{A}$                              |     | 1.6  | 1.8        | V             |
|           |   | $I_F = 200\text{A}$                              |     | 1.9  |            |               |
|           |   | $I_F = 100\text{A}$<br>$T_j = 125^\circ\text{C}$ |     | 1.4  |            |               |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 100\text{A}$<br>$V_R = 400\text{V}$       |     | 180  |            | ns            |
|           |   | $T_j = 25^\circ\text{C}$                         |     | 220  |            |               |
| $Q_{rr}$  | Reverse Recovery Charge                 | $di/dt = 200\text{A}/\mu\text{s}$                |     | 390  |            | nC            |
|           |   | $T_j = 125^\circ\text{C}$                        |     | 1450 |            |               |



## Typical Performance Curve







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