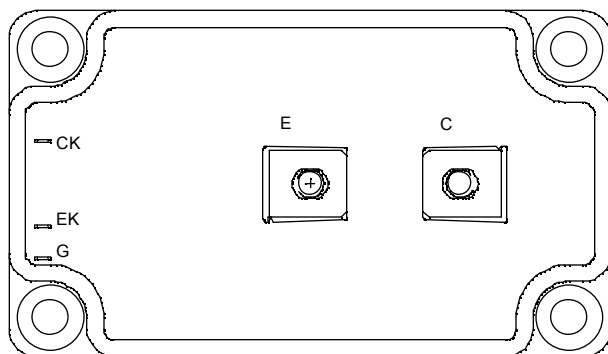
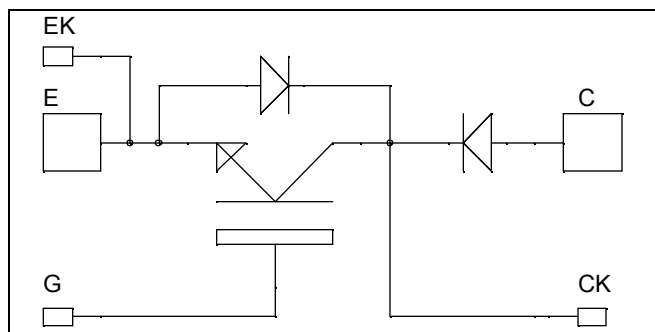


**Single Switch  
with Series diodes  
NPT IGBT Power Module**

$$V_{CES} = 1200V$$

$$I_C = 200A @ T_c = 80^{\circ}C$$



**Application**

- Zero Current Switching resonant mode

**Features**

- Non Punch Through (NPT) FAST IGBT
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 50 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
  - M5 power connectors
- 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
- Easy paralleling due to positive TC of VCEsat
- Low profile

**Absolute maximum ratings**

| Symbol    | Parameter                             |                      | Max ratings  | Unit |
|-----------|---------------------------------------|----------------------|--------------|------|
| $V_{CES}$ | Collector - Emitter Breakdown Voltage |                      | 1200         | V    |
| $I_C$     | Continuous Collector Current          | $T_c = 25^{\circ}C$  | 275          | A    |
|           |                                       | $T_c = 80^{\circ}C$  | 200          |      |
| $I_{CM}$  | Pulsed Collector Current              | $T_c = 25^{\circ}C$  | 600          |      |
| $V_{GE}$  | Gate - Emitter Voltage                |                      | $\pm 20$     | V    |
| $P_D$     | Maximum Power Dissipation             | $T_c = 25^{\circ}C$  | 1136         | W    |
| SSOA      | Switching Safe Operating Area         | $T_j = 150^{\circ}C$ | 600A @ 1200V |      |

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

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

### Electrical Characteristics

| Symbol       | Characteristic                        | Test Conditions                   | Min                       | Typ | Max       | Unit |
|--------------|---------------------------------------|-----------------------------------|---------------------------|-----|-----------|------|
| $BV_{CES}$   | Collector - Emitter Breakdown Voltage | $V_{GE} = 0V, I_C = 1.5mA$        | 1200                      |     |           | V    |
| $I_{CES}$    | Zero Gate Voltage Collector Current   | $V_{GE} = 0V$<br>$V_{CE} = 1200V$ | $T_j = 25^\circ\text{C}$  |     | 1.5       | mA   |
|              |                                       |                                   | $T_j = 125^\circ\text{C}$ | 7.0 |           |      |
| $V_{CE(on)}$ | Collector Emitter on Voltage          | $V_{GE} = 15V$<br>$I_C = 200A$    | $T_j = 25^\circ\text{C}$  | 3.2 | 3.7       | V    |
|              |                                       |                                   | $T_j = 125^\circ\text{C}$ | 4.0 |           |      |
| $V_{GE(th)}$ | Gate Threshold Voltage                | $V_{GE} = V_{CE}, I_C = 4mA$      | 4.5                       |     | 6.5       | V    |
| $I_{GES}$    | Gate - Emitter Leakage Current        | $V_{GE} = \pm 20V, V_{CE} = 0V$   |                           |     | $\pm 300$ | nA   |

### Dynamic Characteristics

| Symbol       | Characteristic               | Test Conditions                                                                                                        | Min | Typ  | Max | Unit |
|--------------|------------------------------|------------------------------------------------------------------------------------------------------------------------|-----|------|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0V$                                                                                                          |     | 13.8 |     | nF   |
| $C_{oes}$    | Output Capacitance           | $V_{CE} = 25V$                                                                                                         |     | 1.32 |     |      |
| $C_{res}$    | Reverse Transfer Capacitance | $f = 1MHz$                                                                                                             |     | 880  |     |      |
| $Q_g$        | Total gate Charge            | $V_{GS} = 15V$                                                                                                         |     | 1320 |     | nC   |
| $Q_{ge}$     | Gate - Emitter Charge        | $V_{Bus} = 600V$                                                                                                       |     | 140  |     |      |
| $Q_{gc}$     | Gate - Collector Charge      | $I_C = 200A$                                                                                                           |     | 800  |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $125^\circ\text{C}$ )<br>$V_{GE} = 15V$<br>$V_{Bus} = 600V$<br>$I_C = 200A$<br>$R_G = 1.2\Omega$ |     | 35   |     |      |
| $T_r$        | Rise Time                    |                                                                                                                        |     | 65   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                        |     | 320  |     |      |
| $T_f$        | Fall Time                    |                                                                                                                        |     | 30   |     |      |
| $E_{on}$     | Turn-on Switching Energy     |                                                                                                                        |     | 21.6 |     |      |
| $E_{off}$    | Turn-off Switching Energy    |                                                                                                                        |     | 9.2  |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           |                                                                                                                        |     | 35   |     | ns   |
| $T_r$        | Rise Time                    |                                                                                                                        |     | 65   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                        |     | 360  |     |      |
| $T_f$        | Fall Time                    |                                                                                                                        |     | 40   |     |      |
| $E_{on}$     | Turn-on Switching Energy     |                                                                                                                        |     | 27.9 |     | mJ   |
| $E_{off}$    | Turn-off Switching Energy    |                                                                                                                        |     | 12.2 |     |      |

### Series diode ratings and characteristics

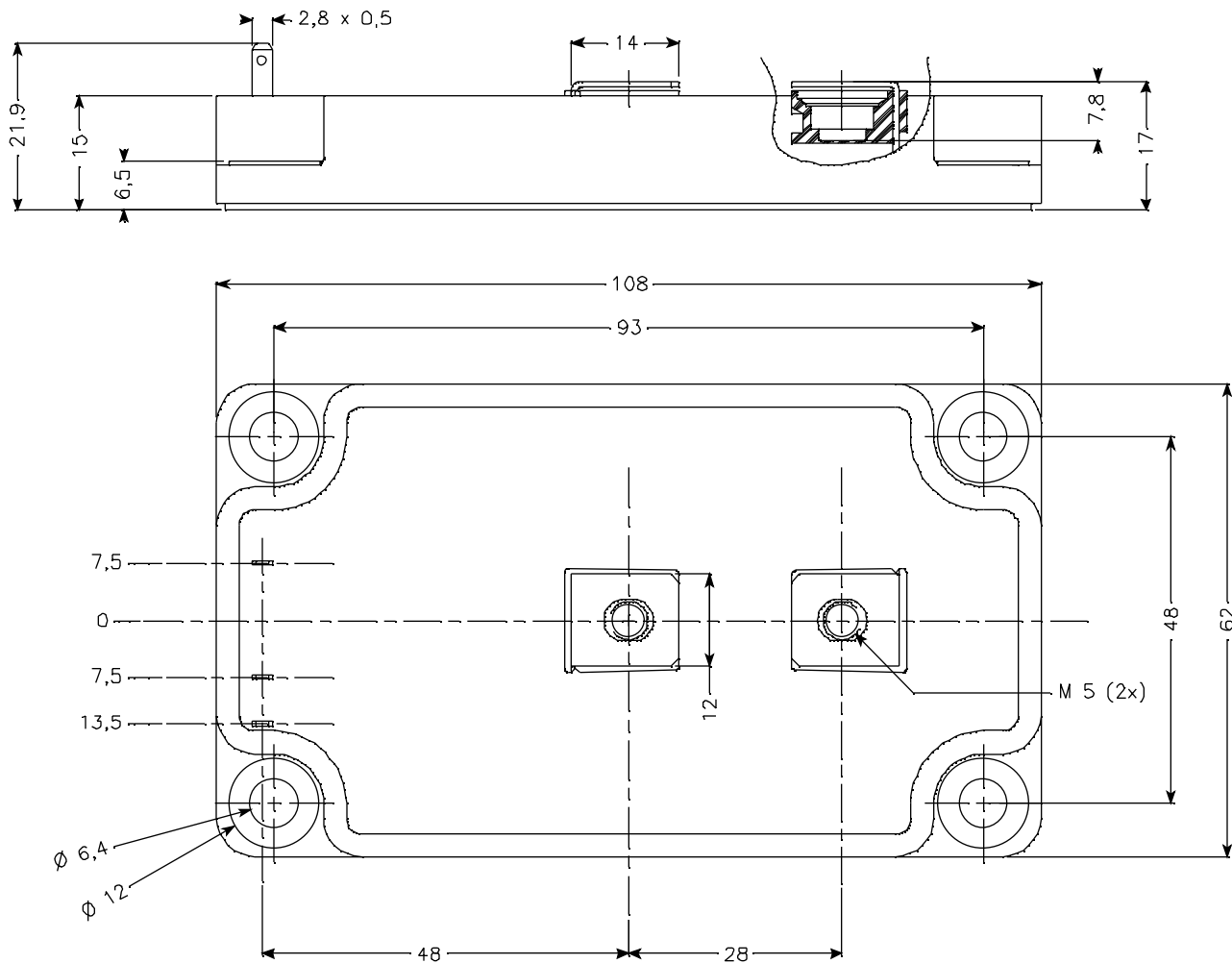
| Symbol      | Characteristic                     | Test Conditions                                      | Min                       | Typ | Max | Unit    |
|-------------|------------------------------------|------------------------------------------------------|---------------------------|-----|-----|---------|
| $V_{RRM}$   | Maximum Repetitive Reverse Voltage |                                                      | 1200                      |     |     |         |
| $I_{F(AV)}$ | Maximum Average Forward Current    | 50% duty cycle<br>$T_c = 70^\circ\text{C}$           |                           | 240 |     | A       |
| $V_F$       | Diode Forward Voltage              | $I_F = 240A$                                         |                           | 2   | 2.5 | V       |
|             |                                    | $I_F = 480A$                                         |                           | 2.3 |     |         |
|             |                                    | $I_F = 240A$<br>$T_j = 125^\circ\text{C}$            |                           | 1.8 |     |         |
| $t_{rr}$    | Reverse Recovery Time              | $I_F = 240A$<br>$V_R = 800V$<br>$di/dt = 800A/\mu s$ | $T_j = 25^\circ\text{C}$  | 400 |     | ns      |
|             |                                    |                                                      | $T_j = 125^\circ\text{C}$ | 470 |     |         |
| $Q_{rr}$    | Reverse Recovery Charge            | $I_F = 240A$<br>$V_R = 800V$<br>$di/dt = 800A/\mu s$ | $T_j = 25^\circ\text{C}$  | 4.8 |     | $\mu C$ |
|             |                                    |                                                      | $T_j = 125^\circ\text{C}$ | 16  |     |         |

**Thermal and package characteristics**

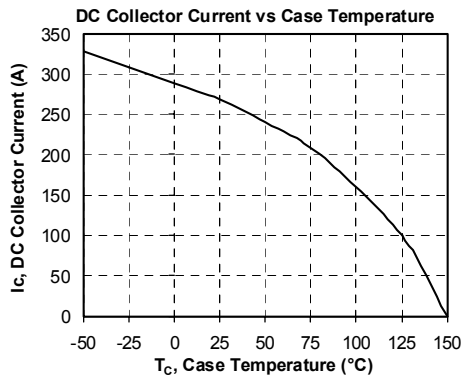
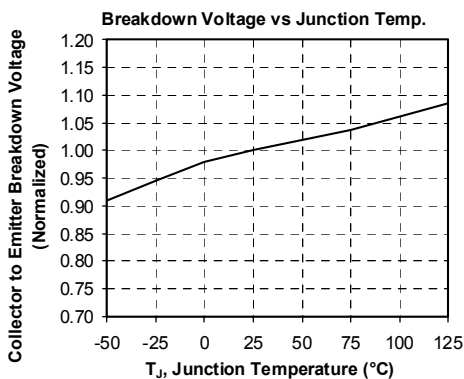
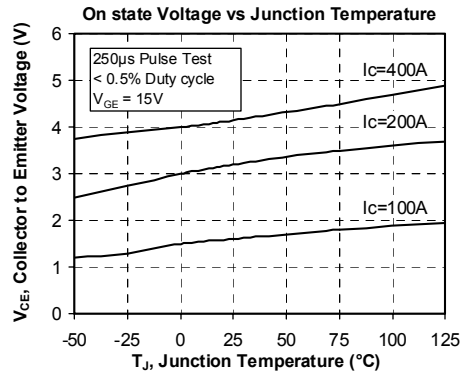
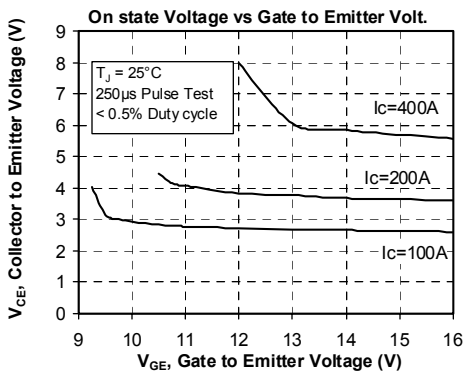
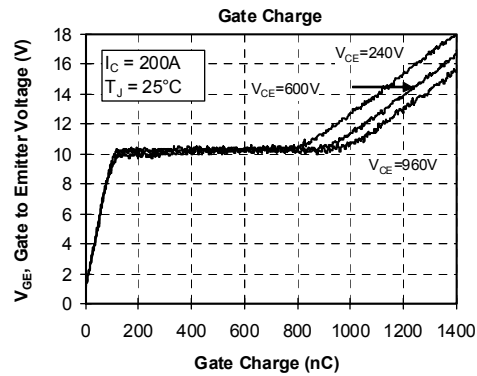
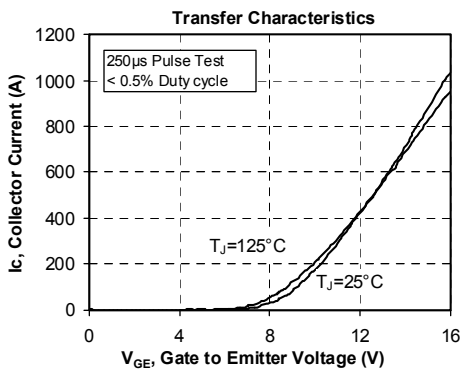
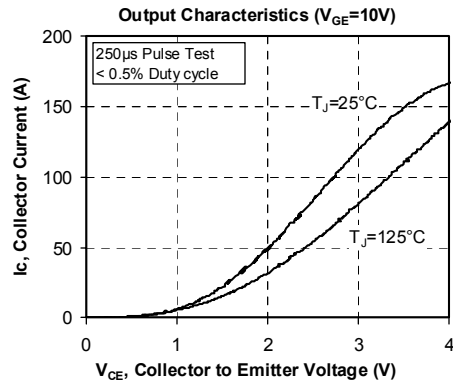
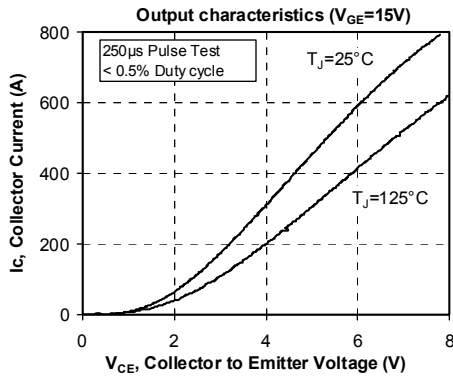
*Symbol Characteristic*

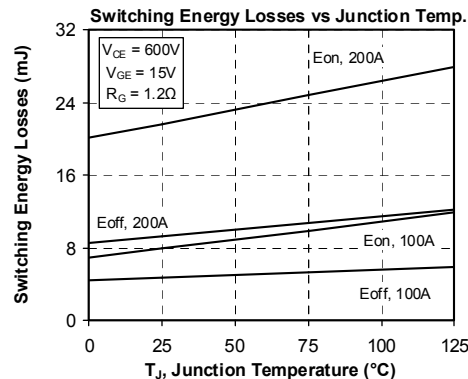
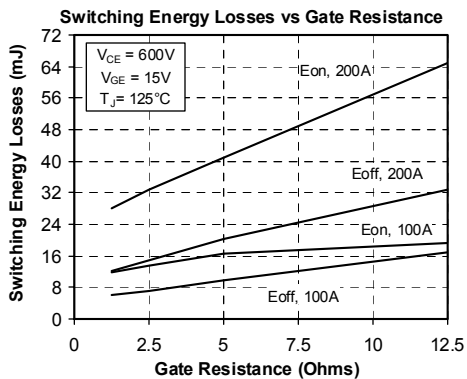
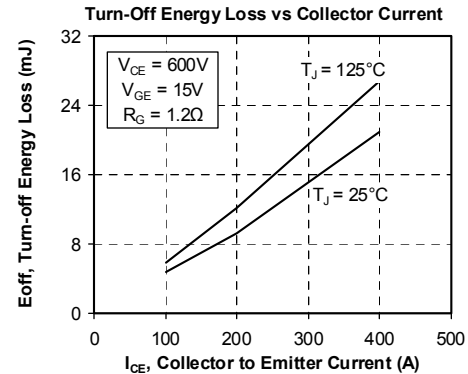
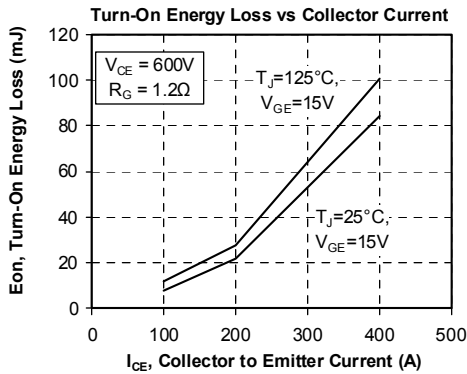
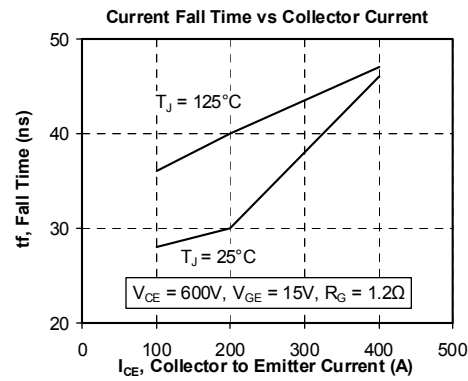
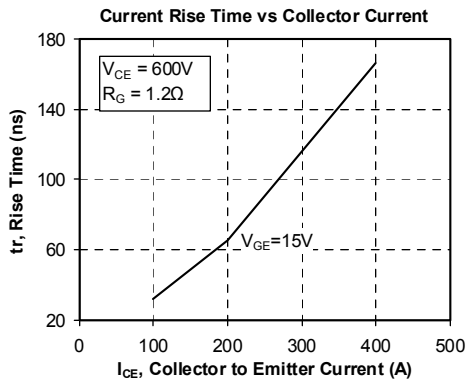
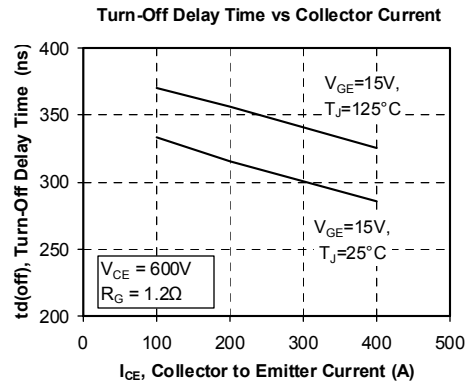
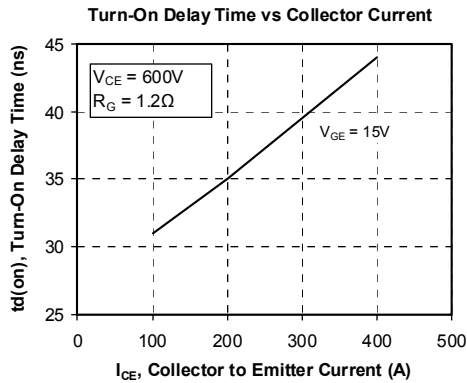
|            |                                                                                 |               | <i>Min</i> | <i>Typ</i> | <i>Max</i> | <i>Unit</i> |
|------------|---------------------------------------------------------------------------------|---------------|------------|------------|------------|-------------|
| $R_{thJC}$ | Junction to Case                                                                | IGBT          |            |            | 0.11       | °C/W        |
|            |                                                                                 | Diode         |            |            | 0.23       |             |
| $V_{ISOL}$ | RMS Isolation Voltage, any terminal to case $t=1$ min, $I_{isol}<1mA$ , 50/60Hz |               | 2500       |            |            | V           |
| $T_J$      | Operating junction temperature range                                            |               | -40        |            | 150        | °C          |
| $T_{STG}$  | Storage Temperature Range                                                       |               | -40        |            | 125        |             |
| $T_C$      | Operating Case Temperature                                                      |               | -40        |            | 100        |             |
| Torque     | Mounting torque                                                                 | To heatsink   | M6         | 3          | 5          | N.m         |
|            |                                                                                 | For terminals | M5         | 2          | 3.5        |             |
| Wt         | Package Weight                                                                  |               |            |            | 280        | g           |

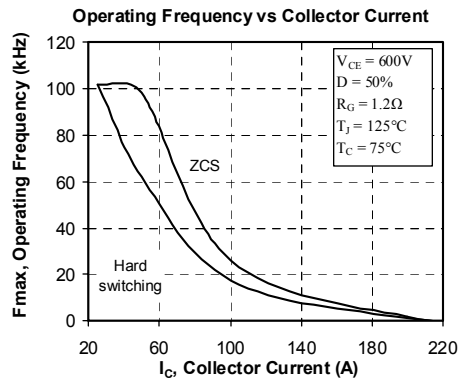
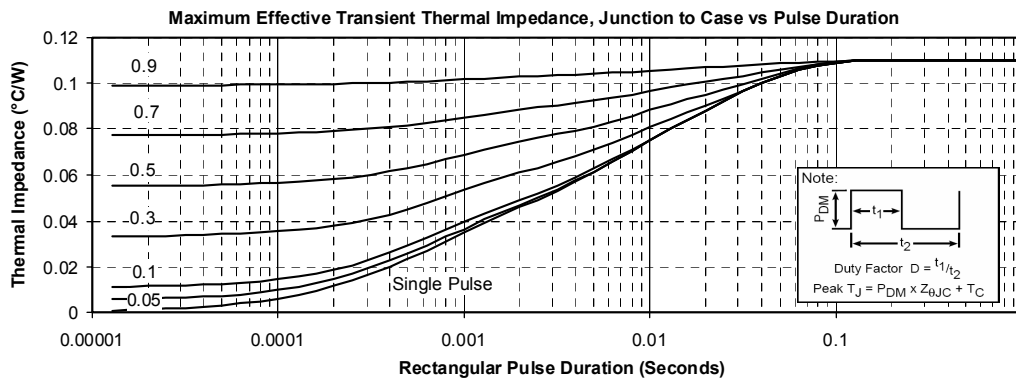
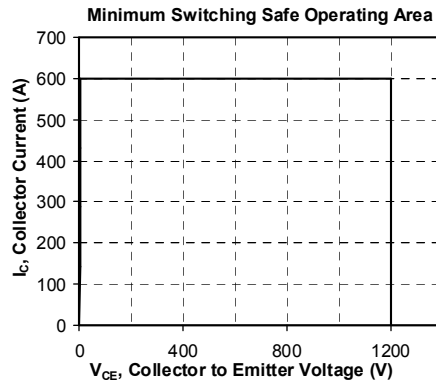
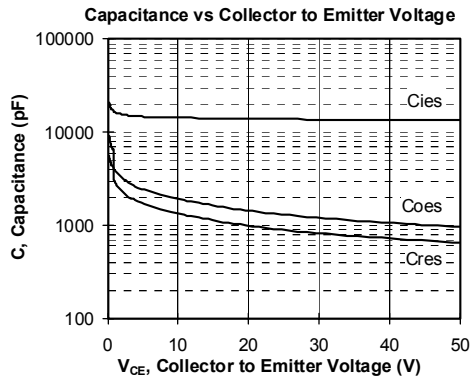
**Package outline**



**Typical Performance Curve**







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