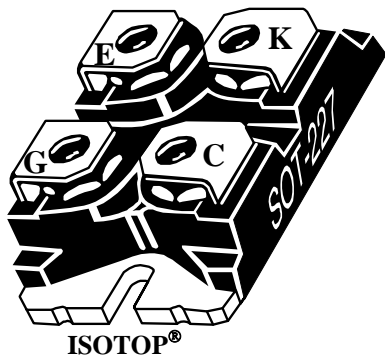
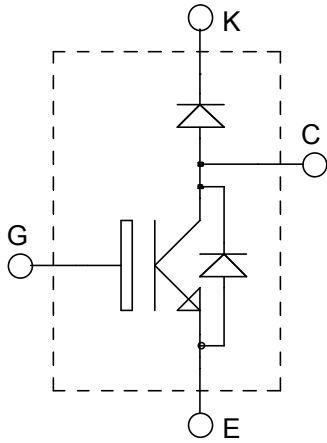


**ISOTOP<sup>®</sup> Boost chopper  
NPT IGBT  
SiC chopper diode**

**$V_{CES} = 1200V$   
 $I_C = 15A @ T_c = 90^{\circ}C$**



### Application

- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction
- Brake switch

### Features

- **Non Punch Through (NPT) Fast IGBT**
  - Low voltage drop
  - Low tail current
  - Switching frequency up to 50 kHz
  - Low leakage current
  - RBSOA and SCSOA rated
- **Chopper SiC Schottky Diode**
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF
- ISOTOP<sup>®</sup> Package (SOT-227)
- Very low stray inductance
- 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  $T_C$  of  $V_{CESat}$
- RoHS Compliant

### Absolute maximum ratings

| Symbol    | Parameter                             |                      | Max ratings | Unit |
|-----------|---------------------------------------|----------------------|-------------|------|
| $V_{CES}$ | Collector - Emitter Breakdown Voltage |                      | 1200        | V    |
| $I_C$     | Continuous Collector Current          | $T_C = 25^{\circ}C$  | 30          | A    |
|           |                                       | $T_C = 90^{\circ}C$  | 15          |      |
| $I_{CM}$  | Pulsed Collector Current              | $T_C = 25^{\circ}C$  | 60          |      |
| $V_{GE}$  | Gate - Emitter Voltage                |                      | $\pm 20$    | V    |
| $P_D$     | Maximum Power Dissipation             | $T_C = 25^{\circ}C$  | 156         | W    |
| RBSOA     | Reverse Bias Safe Operating Area      | $T_j = 125^{\circ}C$ | 30A@1150V   |      |

**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>$V_{CE} = 1200\text{V}$ | $T_j = 25^\circ\text{C}$  |     |     | 250  | $\mu\text{A}$ |
|               |                                      |   | $T_j = 125^\circ\text{C}$ |     |     | 500  |               |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $V_{GE} = 15\text{V}$<br>$I_C = 15\text{A}$     | $T_j = 25^\circ\text{C}$  | 2.5 | 3.2 | 3.7  | V             |
|               |                                      |   | $T_j = 125^\circ\text{C}$ |     | 4.0 |      |               |
| $V_{GE(th)}$  | Gate Threshold Voltage               | $V_{GE} = V_{CE}, I_C = 1\text{mA}$             | 4                         |     | 6   | V    |               |
| $I_{GES}$     | Gate – Emitter Leakage Current       | $V_{GE} = 20\text{V}, V_{CE} = 0\text{V}$       |                           |     | 400 | nA   |               |

**Dynamic Characteristics**

| Symbol       | Characteristic               | Test Conditions   | Min                       | Typ  | Max | Unit |
|--------------|------------------------------|---|---------------------------|------|-----|------|
| $C_{ies}$    | Input Capacitance            | $V_{GE} = 0\text{V}$<br>$V_{CE} = 25\text{V}$<br>$f = 1\text{MHz}$  |                           | 1000 |     | pF   |
| $C_{oes}$    | Output Capacitance           |   |                           | 150  |     |      |
| $C_{res}$    | Reverse Transfer Capacitance |   |                           | 70   |     |      |
| $Q_g$        | Total gate Charge            | $V_{GE} = 15\text{V}$<br>$V_{Bus} = 600\text{V}$<br>$I_C = 15\text{A}$  |                           | 99   |     | nC   |
| $Q_{ge}$     | Gate – Emitter Charge        |   |                           | 10   |     |      |
| $Q_{gc}$     | Gate – Collector Charge      |   |                           | 70   |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $25^\circ\text{C}$ )<br>$V_{GE} = 15\text{V}$<br>$V_{Bus} = 600\text{V}$<br>$I_C = 15\text{A}$<br>$R_G = 33\Omega$  |                           | 60   |     | ns   |
| $T_r$        | Rise Time                    |   |                           | 50   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |   |                           | 315  |     |      |
| $T_f$        | Fall Time                    |   |                           | 30   |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | Inductive Switching ( $125^\circ\text{C}$ )<br>$V_{GE} = 15\text{V}$<br>$V_{Bus} = 600\text{V}$<br>$I_C = 15\text{A}$<br>$R_G = 33\Omega$ |                           | 60   |     | ns   |
| $T_r$        | Rise Time                    |   |                           | 50   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |   |                           | 356  |     |      |
| $T_f$        | Fall Time                    |   |                           | 40   |     |      |
| $E_{on}$     | Turn-on Switching Energy     | $V_{GE} = 15\text{V}$<br>$V_{Bus} = 600\text{V}$<br>$I_C = 15\text{A}$<br>$R_G = 33\Omega$  | $T_j = 125^\circ\text{C}$ |      | 1.2 | mJ   |
| $E_{off}$    | Turn-off Switching Energy    |   |                           |      | 1   |      |
| $I_{sc}$     | Short Circuit data           | $V_{GE} \leq 15\text{V}; V_{Bus} = 900\text{V}$<br>$t_p \leq 10\mu\text{s}; T_j = 125^\circ\text{C}$                                      |                           | 90   |     | A    |

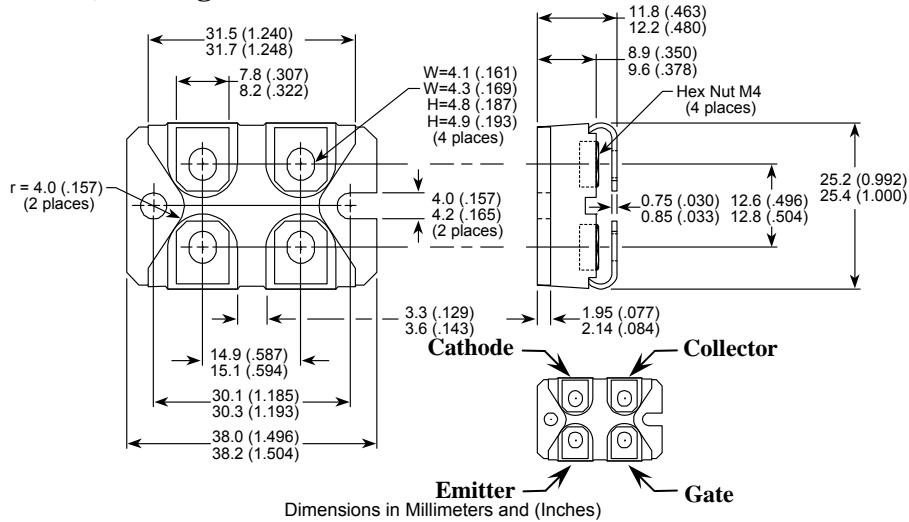
**Chopper SiC diode ratings and characteristics**

| Symbol    | Characteristic                          | Test Conditions  | Min                       | Typ | Max | Unit |               |
|-----------|---|--|---------------------------|-----|-----|------|---------------|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage |  | 1200                      |     |     | V    |               |
| $I_{RM}$  | Maximum Reverse Leakage Current         | $V_R = 1200\text{V}$   | $T_j = 25^\circ\text{C}$  |     | 32  | 200  | $\mu\text{A}$ |
|           |   |  | $T_j = 175^\circ\text{C}$ |     | 56  | 1000 |               |
| $I_F$     | DC Forward Current                      | $T_c = 125^\circ\text{C}$  |                           | 10  |     | A    |               |
| $V_F$     | Diode Forward Voltage                   | $I_F = 10\text{A}$   | $T_j = 25^\circ\text{C}$  |     | 1.6 | 1.8  | V             |
|           |   |  | $T_j = 175^\circ\text{C}$ |     | 2.3 | 3    |               |
| $Q_C$     | Total Capacitive Charge                 | $I_F = 10\text{A}, V_R = 600\text{V}$<br>$di/dt = 500\text{A}/\mu\text{s}$ |                           | 40  |     | nC   |               |
| C         | Total Capacitance                       | $f = 1\text{MHz}, V_R = 200\text{V}$                                       |                           | 96  |     | pF   |               |
|           |   | $f = 1\text{MHz}, V_R = 400\text{V}$                                       |                           | 69  |     |      |               |

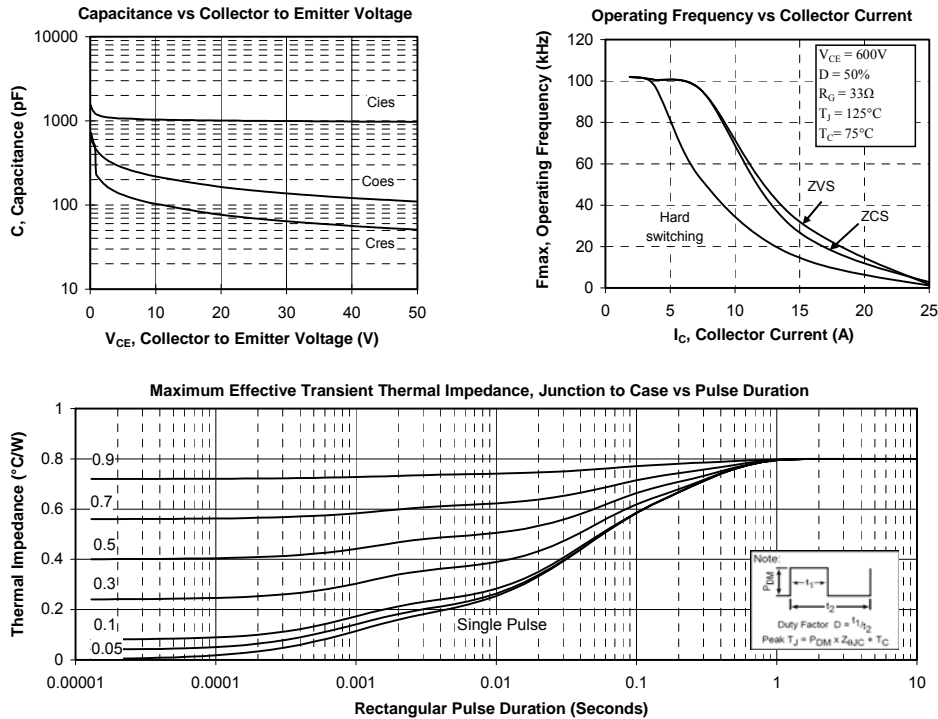
## Thermal and package characteristics

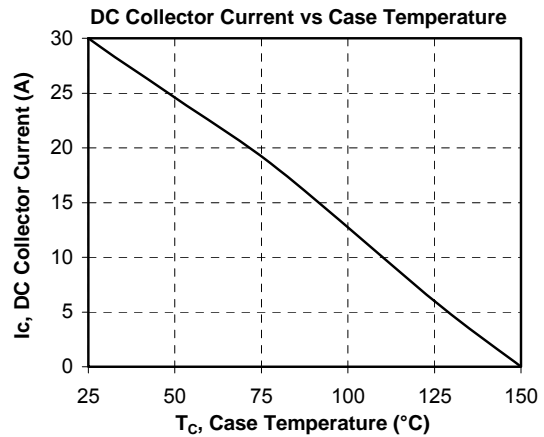
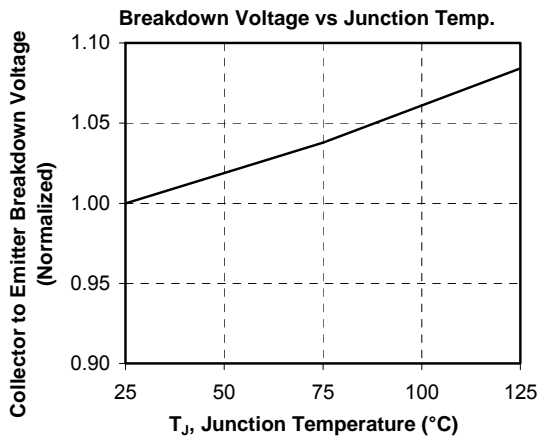
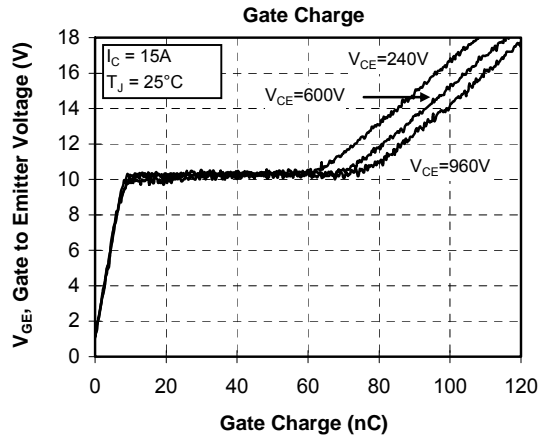
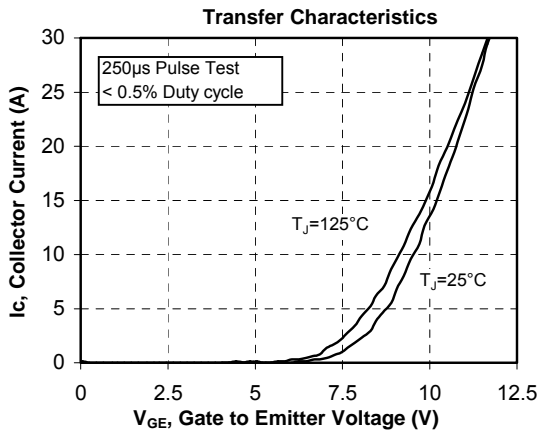
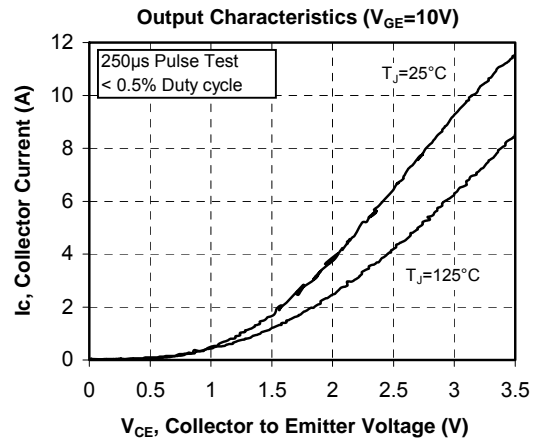
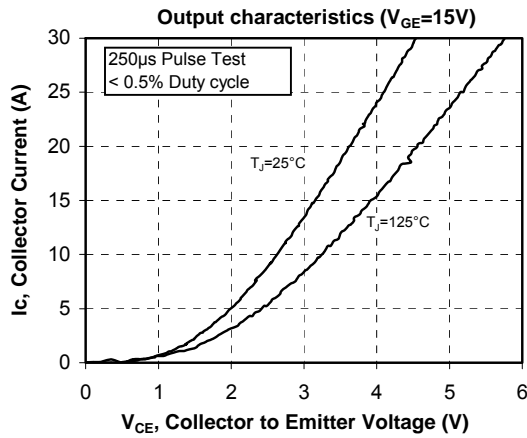
| Symbol         | Characteristic   | Min               | Typ  | Max  | Unit |
|----------------|--|-------------------|------|------|------|
| $R_{thJC}$     | Junction to Case Thermal Resistance  | IGBT              |      | 0.8  | °C/W |
|                |  | SiC chopper Diode |      | 1.65 |      |
| $R_{thJA}$     | Junction to Ambient (IGBT & Diode)   |                   |      | 20   |      |
| $V_{ISOL}$     | RMS Isolation Voltage, any terminal to case t=1 min, I isol<1mA, 50/60Hz     | 2500              |      |      | V    |
| $T_J, T_{STG}$ | Storage Temperature Range  | -55               |      | 150  | °C   |
| $T_L$          | Max Lead Temp for Soldering:0.063" from case for 10 sec                      |                   |      | 300  |      |
| Torque         | Mounting torque (Mounting = 8-32 or 4mm Machine and terminals = 4mm Machine) |                   |      | 1.5  | N.m  |
| Wt             | Package Weight   |                   | 29.2 |      | g    |

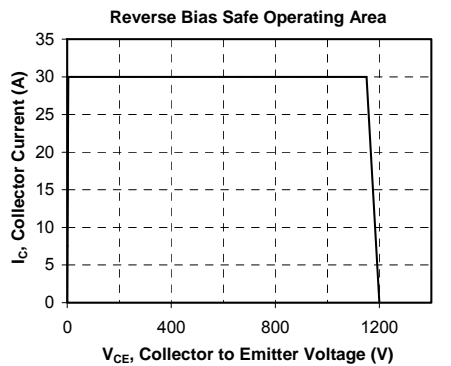
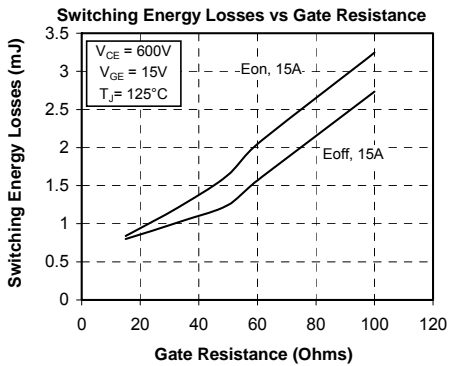
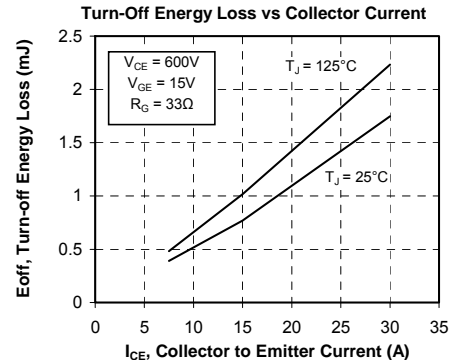
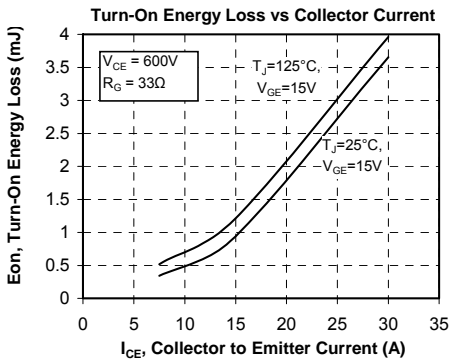
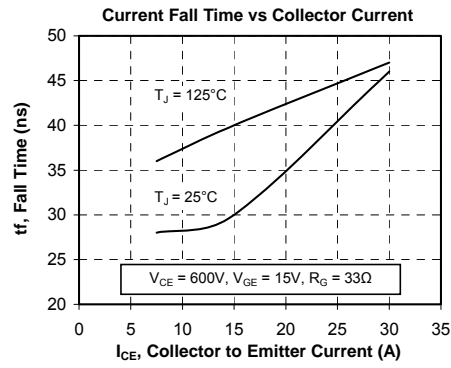
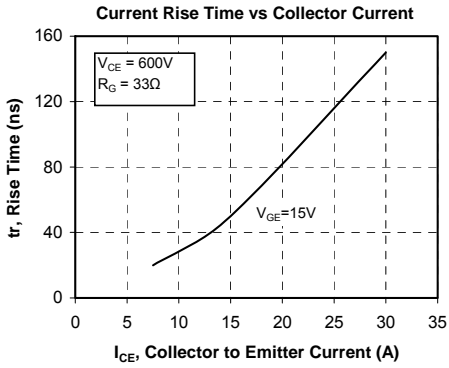
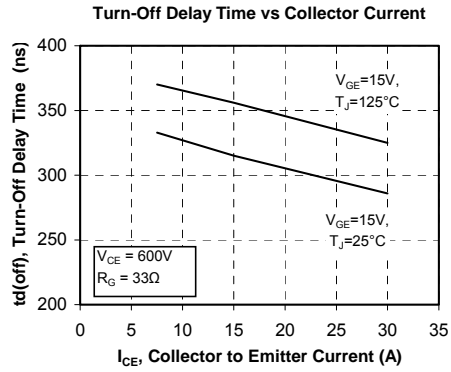
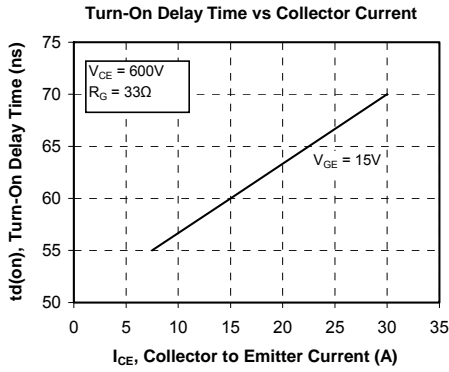
## SOT-227 (ISOTOP<sup>®</sup>) Package Outline



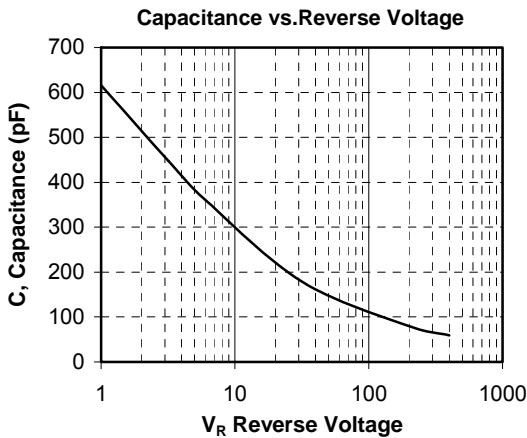
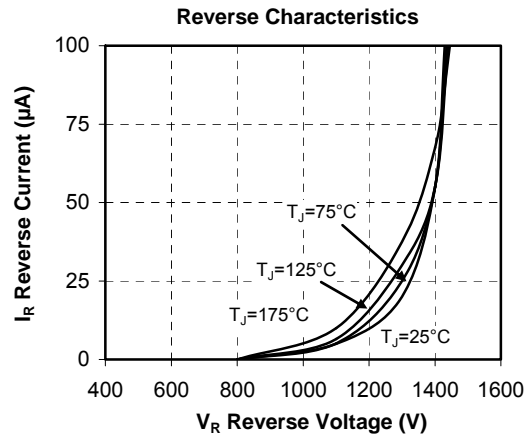
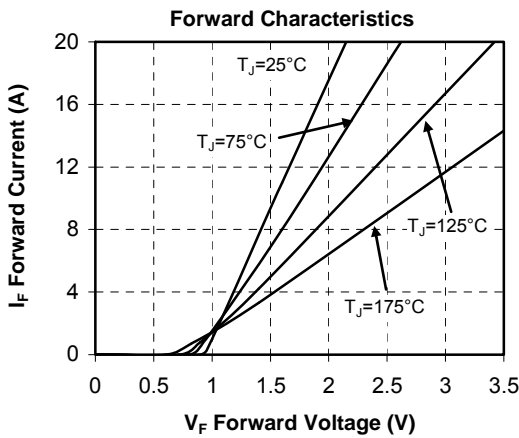
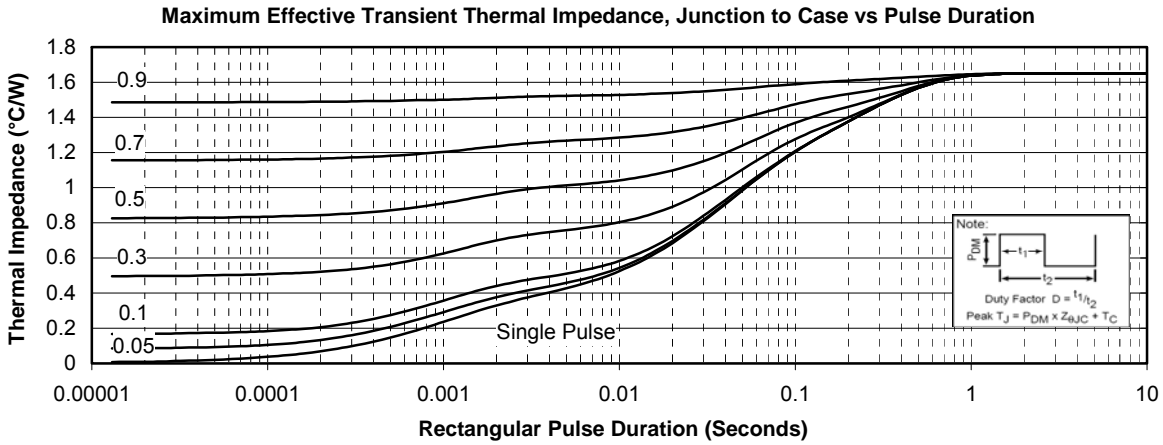
## Typical IGBT Performance Curve







## Typical SiC chopper diode Performance Curve



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Microsemi's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 6,939,743 7,352,045 5,283,201 5,801,417 5,648,283 7,196,634 6,664,594 7,157,886 6,939,743 7,342,262 and foreign patents. U.S and Foreign patents pending. All Rights Reserved.