

# BUT11F/11AF

## High Voltage Power Switching Applications



TO-220F  
1.Base 2.Collector 3.Emitter

## NPN Silicon Transistor

### Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise noted

| Symbol    | Parameter  | Value      | Units            |
|-----------|--|------------|------------------|
| $V_{CBO}$ | Collector-Base Voltage<br>: BUT11F<br>: BUT11AF    | 850        | V                |
|           |  | 1000       | V                |
| $V_{CEO}$ | Collector-Emitter Voltage<br>: BUT11F<br>: BUT11AF | 400        | V                |
|           |  | 450        | V                |
| $V_{EBO}$ | Emitter-Base Voltage                               | 9          | V                |
| $I_C$     | Collector Current (DC)                             | 5          | A                |
| $I_{CP}$  | *Collector Current (Pulse)                         | 10         | A                |
| $I_B$     | Base Current (DC)                                  | 2          | A                |
| $I_{BP}$  | *Base Current (Pulse)                              | 4          | A                |
| $P_C$     | Collector Dissipation ( $T_C=25^\circ\text{C}$ )   | 40         | W                |
| $T_J$     | Junction Temperature                               | 150        | $^\circ\text{C}$ |
| $T_{STG}$ | Storage Temperature                                | - 65 ~ 150 | $^\circ\text{C}$ |

### Electrical Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

| Symbol         | Parameter   | Test Condition   | Min. | Typ. | Max. | Units         |
|----------------|---|--|------|------|------|---------------|
| $V_{CEO(sus)}$ | * Collector-Emitter Sustaining Voltage<br>: BUT11F<br>: BUT11AF | $I_C = 100\text{mA}, I_B = 0$  | 400  |      |      | V             |
|                |   |  | 450  |      |      | V             |
| $I_{CES}$      | Collector Cut-off Current<br>: BUT11F<br>: BUT11AF              | $V_{CE} = 850\text{V}, V_{BE} = 0$<br>$V_{CE} = 1000\text{V}, V_{BE} = 0$      |      |      | 1    | mA            |
|                |   |  |      |      | 1    | mA            |
| $I_{EBO}$      | Emitter Cut-off Current   | $V_{BE} = 9\text{V}, I_C = 0$  |      |      | 10   | mA            |
| $V_{CE(sat)}$  | Collector-Emitter Saturation Voltage<br>: BUT11F<br>: BUT11AF   | $I_C = 3\text{A}, I_B = 0.6\text{A}$<br>$I_C = 2.5\text{A}, I_B = 0.5\text{A}$ |      |      | 1.5  | V             |
|                |   |  |      |      | 1.5  | V             |
| $V_{BE(sat)}$  | Base-Emitter Saturation Voltage<br>: BUT11F<br>: BUT11AF        | $I_C = 3\text{A}, I_B = 0.6\text{A}$<br>$I_C = 2.5\text{A}, I_B = 0.5\text{A}$ |      |      | 1.3  | V             |
|                |   |  |      |      | 1.3  | V             |
| $t_{ON}$       | Turn On Time  | $V_{CC} = 250\text{V}, I_C = 2.5\text{A}$                                      |      |      | 1    | $\mu\text{s}$ |
| $t_{STG}$      | Storage Time  | $I_{B1} = -I_{B2} = 0.5\text{A}$<br>$R_L = 100\Omega$                          |      |      | 4    | $\mu\text{s}$ |
| $t_F$          | Fall Time   |  |      |      | 0.8  | $\mu\text{s}$ |

\* Pulsed: pulsed duration = 300 $\mu\text{s}$ , duty cycle = 1.5%

### Thermal Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

| Symbol          | Parameter                            | Typ | Max   | Units              |
|-----------------|--------------------------------------|-----|-------|--------------------|
| $R_{\theta jC}$ | Thermal Resistance, Junction to Case |     | 3.125 | $^\circ\text{C/W}$ |

# Typical Characteristics

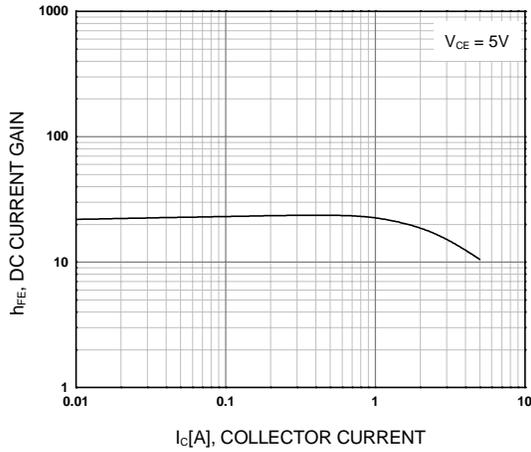


Figure 1. DC current Gain

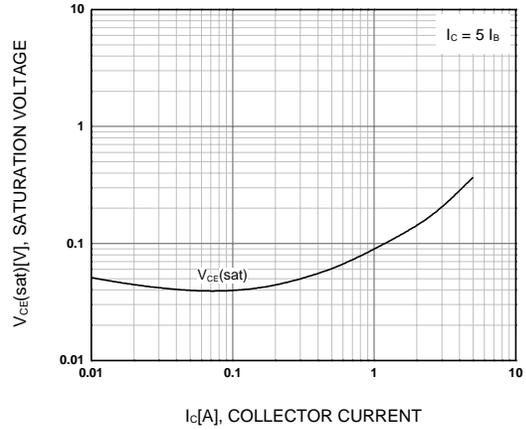


Figure 2. Collector-Emitter Saturation Voltage

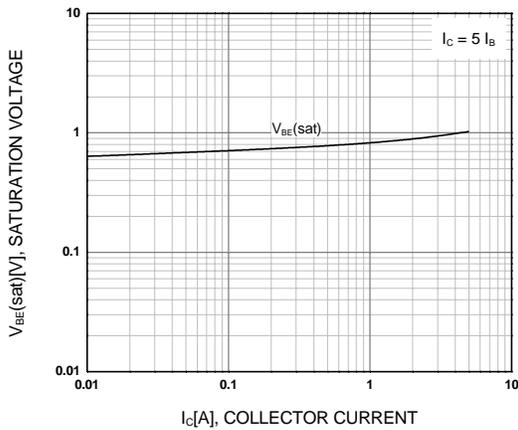


Figure 3. Base-Emitter Saturation Voltage

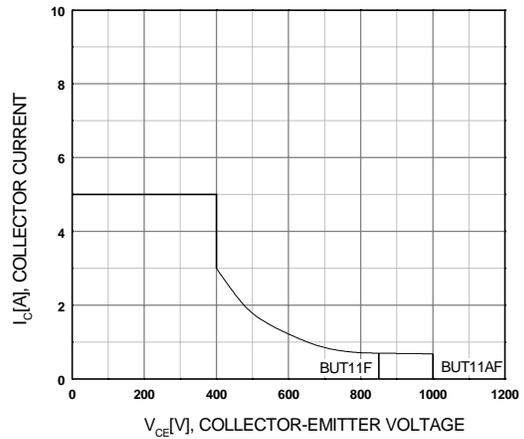


Figure 4. Reverse Biased Safe Operating Area

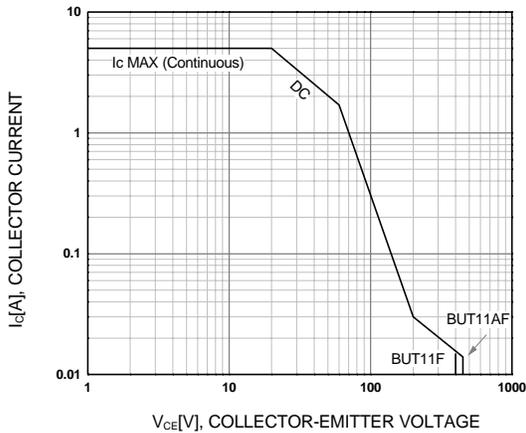


Figure 5. Safe Operating Area

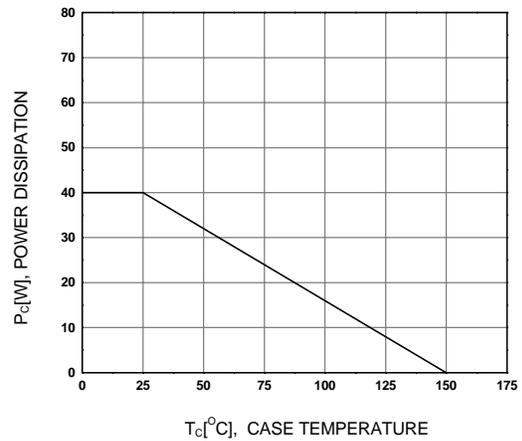
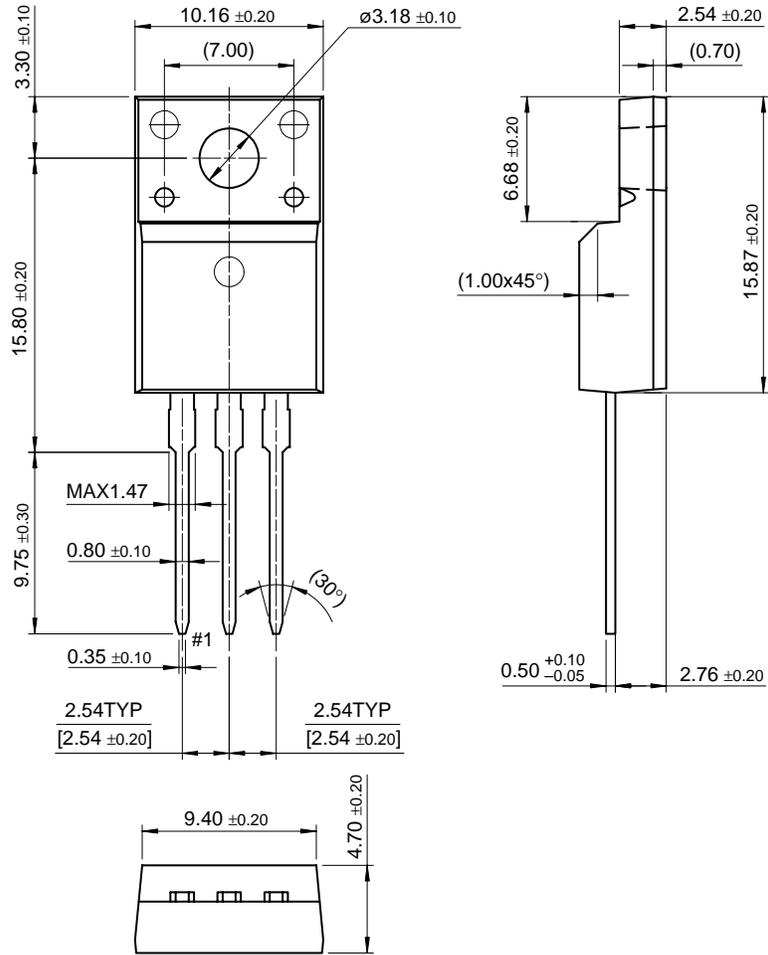


Figure 6. Power Derating

# Package Dimensions

BUT11F/11AF

## TO-220F



Dimensions in Millimeters

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| DenseTrench™         | GTO™                | PowerTrench®        | SuperSOT™-8     |
| DOMET™               | HiSeC™              | QFET™               | SyncFET™        |
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| EnSigna™             | MicroFET™           | Quiet Series™       | UHC™            |
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