优尚

YOUSHANG SEMICONDUCTOR

# 设计研发新型功率器件

## 各类小信号开关

## 中低压及高压大电流等场效应管

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## Description

This bipolar junction transistor (BJT) has been designed to meet the stringent requirements of automotive applications.

## Features

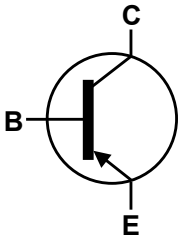
- $BV_{CEO}$ > -500V
- $I_C$ = -150mA high Continuous Collector Current
- $I_{CM}$ Up to -500mA Peak Pulse Current
- Excellent $h_{FE}$ Characteristics up to $I_C$ = -100mA

## Mechanical Data

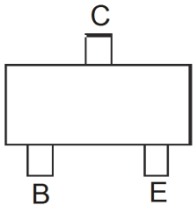
- Case: SOT23
- Case Material: Molded Plastic, “Green” Molding Compound UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 (e3)
- Weight 0.008 grams (Approximate)

SOT23

Top View




Device Symbol




Top View
Pin-Out

## Absolute Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | -500 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | -500 | V |
| Emitter-Base Voltage | $V_{EBO}$ | -7 | V |
| Continuous Collector Current | $I_C$ | -150 | mA |
| Peak Pulse Current | $I_{CM}$ | -500 | mA |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

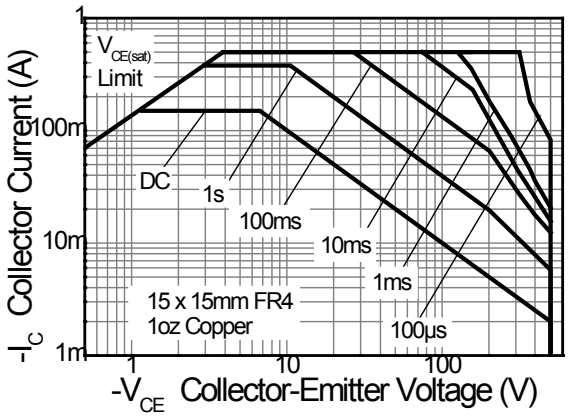
| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation | (Note 5) | $P_D$ | 500 | mW |
| Thermal Resistance, Junction to Ambient | (Note 5) | $R_{\theta JA}$ | 250 | °C/W |
| Thermal Resistance, Junction to Lead | (Note 6) | $R_{\theta JL}$ | 194 | °C/W |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## ESD Ratings (Note 7)

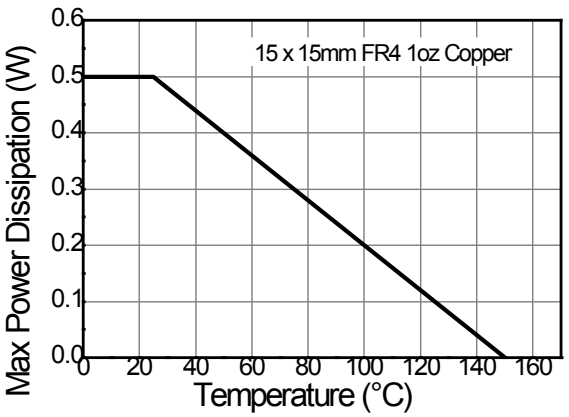
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|---|---|---|---|---|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4000 | V | 3A |
| Electrostatic Discharge - Machine Model | ESD MM | 400 | V | C |

Notes:
5. For a device mounted with the collector lead on 15mm × 15mm 1oz copper that is on a single-sided FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
6. Thermal resistance from junction to solder-point (at the end of the collector lead).
7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

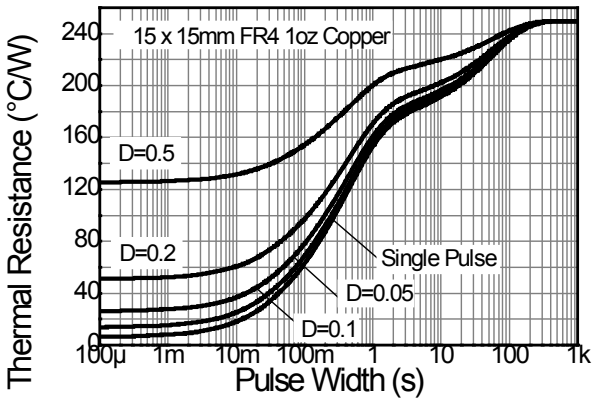
## Thermal Characteristics and Derating Information



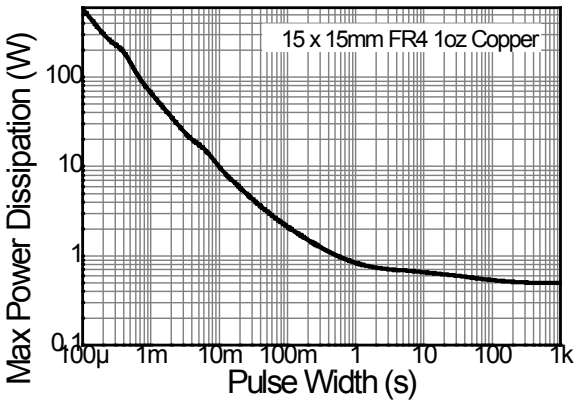

**Safe Operating Area**




**Derating Curve**




**Transient Thermal Impedance**



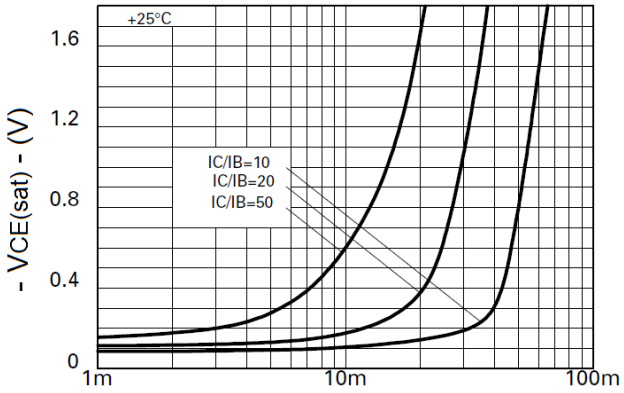

**Pulse Power Dissipation**

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | -500 | — | — | V | $I_C$ = -100μA |
| Collector-Emitter Breakdown Voltage (Note 8) | $BV_{CEO}$ | -500 | — | — | V | $I_C$ = -1mA |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | -7 | — | — | V | $I_E$ = -100μA |
| Collector Cutoff Current | $I_{CBO}$ | — | — | -100 | nA | $V_{CB}$ = -500V |
| Emitter Cutoff Current | $I_{EBO}$ | — | — | -100 | nA | $V_{EB}$ = -5V |
| Static Forward Current Transfer Ratio (Note 8) | $h_{FE}$ | 100<br>80<br>— | —<br>—<br>15 | 300<br>300<br>— | — | $I_C$ = -1mA, $V_{CE}$ = -10V<br>$I_C$ = -50mA, $V_{CE}$ = -10V<br>$I_C$ = -100mA, $V_{CE}$ = -10V |
| Collector-Emitter Saturation Voltage (Note 8) | $V_{CE(sat)}$ | — | — | -200<br>-500 | mV | $I_C$ = - 20mA, $I_B$ = -2mA<br>$I_C$ = - 50mA, $I_B$ = -10mA |
| Base-Emitter Saturation Voltage (Note 8) | $V_{BE(sat)}$ | — | — | -0.9 | V | $I_C$ = -50mA, $I_B$ = -10mA |
| Base-Emitter Turn-On Voltage (Note 8) | $V_{BE(on)}$ | — | — | -0.9 | V | $I_C$ = -50mA, $V_{CE}$ = -10V |
| Output Capacitance | $C_{obo}$ | — | — | 8 | pF | $V_{CB}$ = -20V, f = 1MHz |
| Transition Frequency | $f_T$ | 60 | — | — | MHz | $V_{CE}$ = -20V, $I_C$ = -10mA, f = 50MHz |
| Turn-On Time | $t_{on}$ | — | 110 | — | ns | $V_{CE}$ = -100V, $I_C$ = -50mA, $I_{B1}$ = -5mA, $I_{B2}$ = 10mA |
| Turn-Off Time | $t_{off}$ | — | 1.5 | — | μs | |

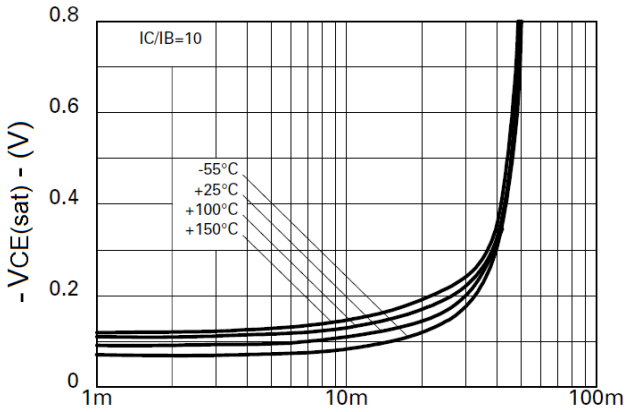
Note: 8. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%

## Typical Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)



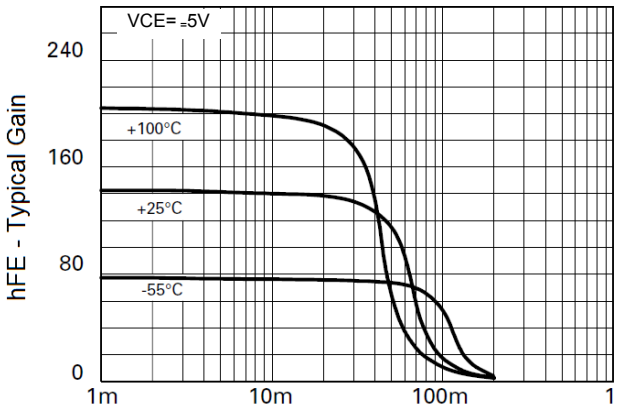

-$I_C$ Collector Current (A)

**$V_{CE(sat)}$ v $I_C$**



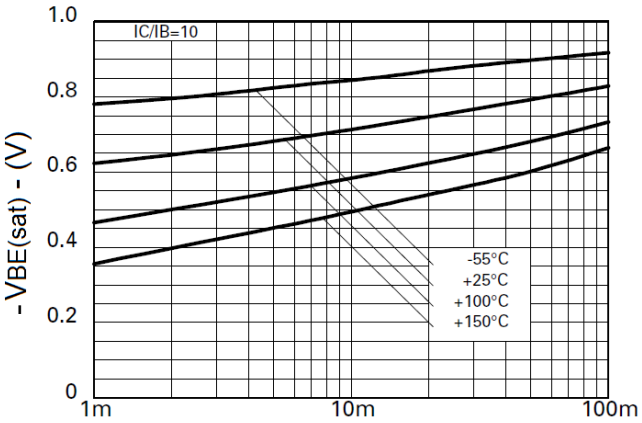

-$I_C$ Collector Current (A)

**$V_{CE(sat)}$ v $I_C$**



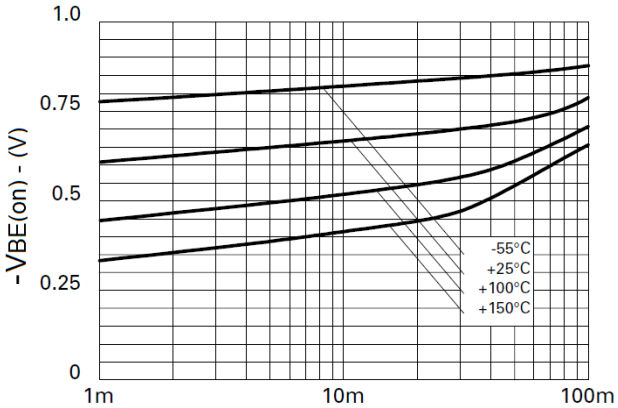

-$I_C$ Collector Current (A)

**hFE v $I_C$**




-$I_C$ Collector Current (A)

**$V_{BE(sat)}$ v $I_C$**

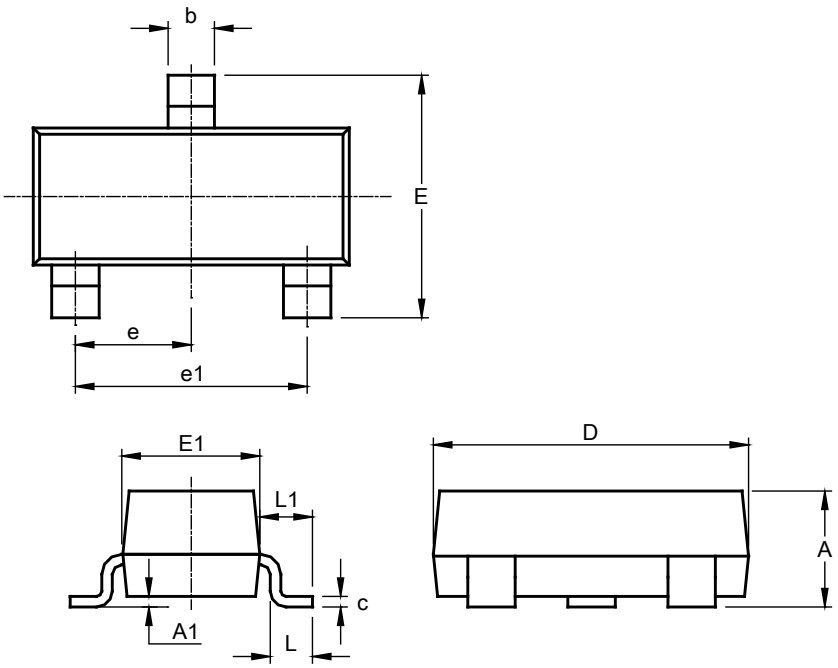



-$I_C$ Collector Current (A)

**$V_{BE(on)}$ v $I_C$**

## Package Outline Dimensions

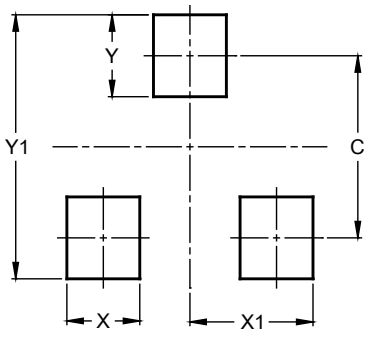
**SOT23 Type DN**




| SOT23 Type DN | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.89 | 1.12 | 1.00 |
| **A1** | 0.01 | 0.10 | 0.05 |
| **b** | 0.30 | 0.51 | 0.45 |
| **c** | 0.08 | 0.20 | 0.10 |
| **D** | 2.80 | 3.04 | 3.00 |
| **E** | 2.10 | 2.64 | 2.42 |
| **E1** | 1.20 | 1.40 | 1.37 |
| **e** | 0.95 REF | | |
| **e1** | 1.90 REF | | |
| **L** | 0.25 | 0.60 | 0.30 |
| **L1** | 0.45 | 0.62 | 0.54 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

**SOT23 Type DN**




| Dimensions | Value (in mm) |
|---|---|
| **C** | 2.0 |
| **X** | 0.8 |
| **X1** | 1.35 |
| **Y** | 0.9 |
| **Y1** | 2.9 |

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device Terminals and PCB tracking.