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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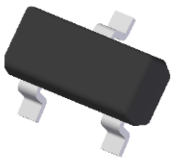
## Features

- Epitaxial Planar Die Construction
- Complementary NPN Type - NK-MMBT5551
- Ideal for Low Power Amplification and Switching

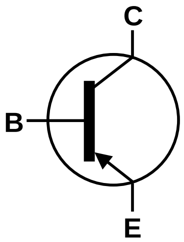
## Mechanical Data

- Package: SOT23
- Package 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)

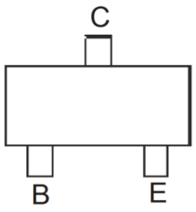
SOT23



Top View



Device Symbol



Top View
Pinout

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

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | -160 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | -150 | V |
| Emitter-Base Voltage | $V_{EBO}$ | -5 | V |
| Collector Current | $I_C$ | -600 | mA |

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

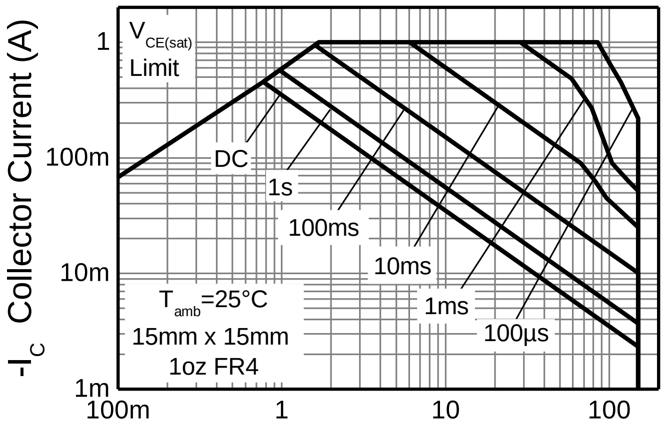
| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation | (Note 5) | $P_D$ | 310 | mW |
| | (Note 6) | | 350 | |
| Thermal Resistance, Junction to Ambient | (Note 5) | $R_{\theta JA}$ | 403 | °C/W |
| | (Note 6) | | 357 | |
| Thermal Resistance, Junction to Leads | (Note 7) | $R_{\theta JL}$ | 350 | °C/W |
| Operating and Storage Temperature Range | | $T_J, T_{STG}$ | -55 to +150 | °C |

## ESD Ratings (Note 8)

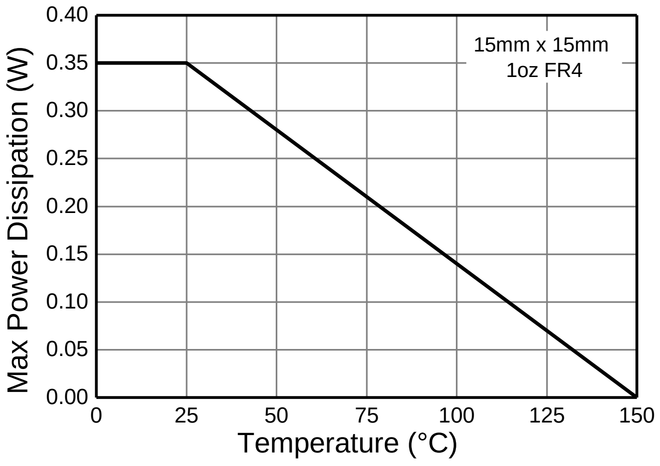
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|---|---|---|---|---|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge - Machine Model | ESD MM | 400 | V | C |

Notes:
5. For a device mounted on minimum recommended pad layout 1oz copper that is on a single-sided FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state.
6. Same as note (5), except the device is mounted on 15mm x 15mm 1oz copper.
7. Thermal resistance from junction to solder-point (at the end of the leads).
8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

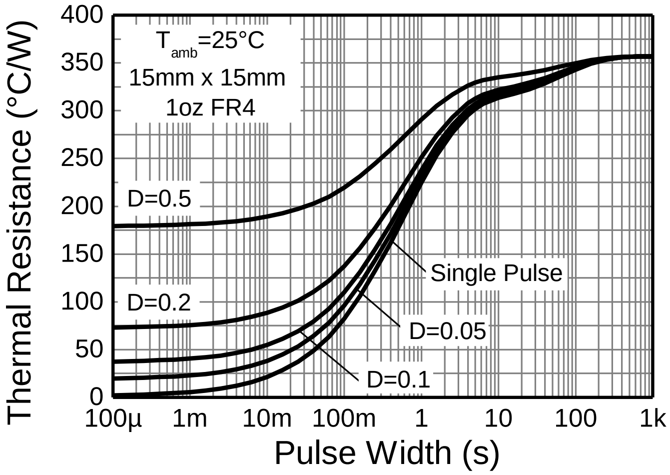
## Thermal Characteristics and Derating Information



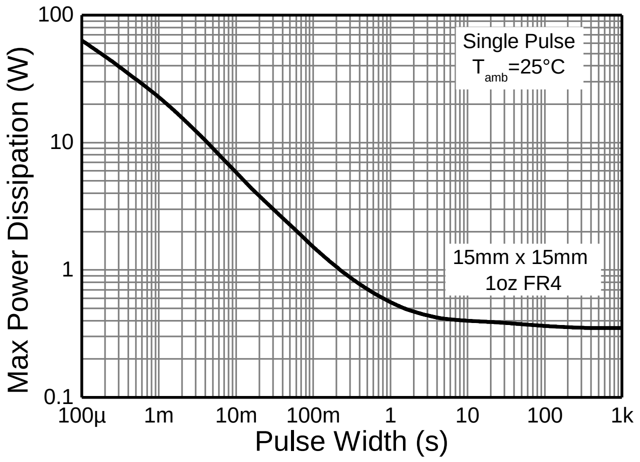
**Safe Operating Area**



**Derating Curve**



**Transient Thermal Impedance**



**Pulse Power Dissipation**

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

| Characteristic | Symbol | Min | Max | Unit | Test Condition |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 9)** | | | | | |
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | -160 | — | V | $I_C$ = -100μA, $I_E$ = 0 |
| Collector-Emitter Breakdown Voltage | $BV_{CEO}$ | -150 | — | V | $I_C$ = -1mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | -5 | — | V | $I_E$ = -100μA, $I_C$ = 0 |
| Collector Cutoff Current | $I_{CBO}$ | — | -50<br>-50 | nA<br>μA | $V_{CB}$ = -120V, $I_E$ = 0<br>$V_{CB}$ = -120V, $I_E$ = 0, $T_A$ = +100°C |
| Emitter Cutoff Current | $I_{EBO}$ | — | -50 | nA | $V_{EB}$ = -4V, $I_C$ = 0 |
| **ON CHARACTERISTICS (Note 9)** | | | | | |
| DC Current Gain | $h_{FE}$ | 50<br>60<br>50 | —<br>240<br>— | — | $I_C$ = -1mA, $V_{CE}$ = -5V<br>$I_C$ = -10mA, $V_{CE}$ = -5V<br>$I_C$ = -50mA, $V_{CE}$ = -5V |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | — | -0.2<br>-0.5 | V | $I_C$ = -10mA, $I_B$ = -1mA<br>$I_C$ = -50mA, $I_B$ = -5mA |
| Base-Emitter Saturation Voltage | $V_{BE(sat)}$ | — | -1 | V | $I_C$ = -10mA, $I_B$ = -1mA<br>$I_C$ = -50mA, $I_B$ = -5mA |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | |
| Output Capacitance | $C_{obo}$ | — | 6 | pF | $V_{CB}$ = -10V, f = 1MHz, $I_E$ = 0 |
| Small Signal Current Gain | $h_{fe}$ | 40 | 260 | — | $V_{CE}$ = -10V, $I_C$ = -1mA, f = 1kHz |
| Current Gain-Bandwidth Product | $f_T$ | 100 | 300 | MHz | $V_{CE}$ = -10V, $I_C$ = -10mA, f = 100MHz |
| Noise Figure | NF | — | 8.0 | dB | $V_{CE}$ = -5V, $I_C$ = -200μA, $R_S$ = 10Ω, f = 1kHz |

Note: 9. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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

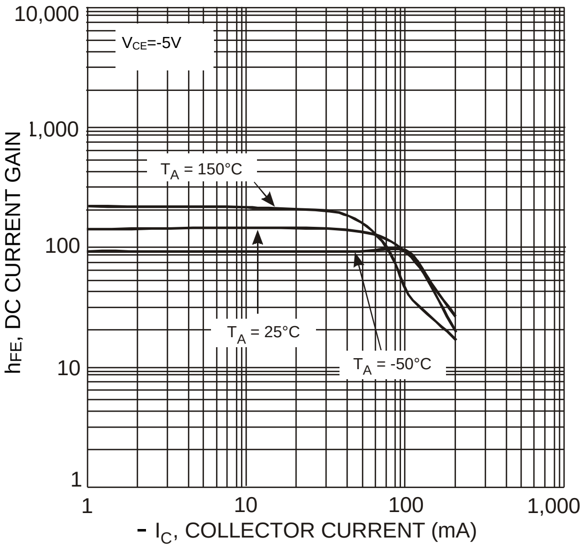


Fig. 1 Typical DC Current Gain vs. Collector Current

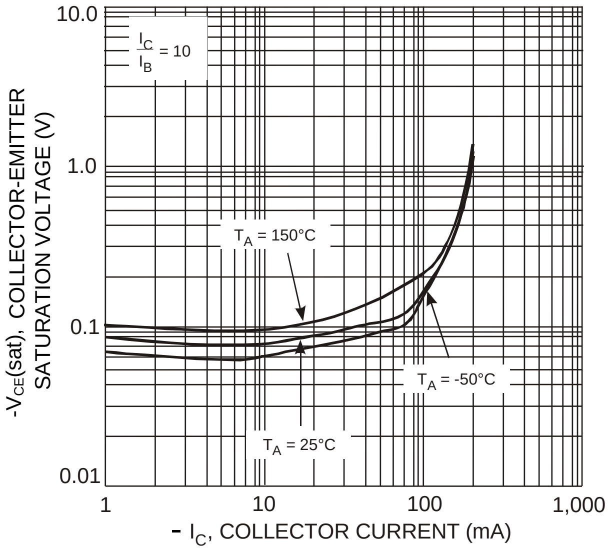


Fig. 2 Typical Collector-Emitter Saturation Voltage vs. Collector Current

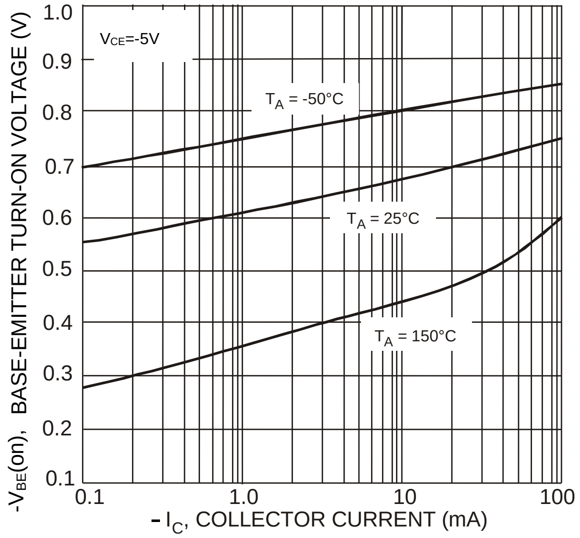


Fig. 3 Typical Base-Emitter Turn-On Voltage vs. Collector Current

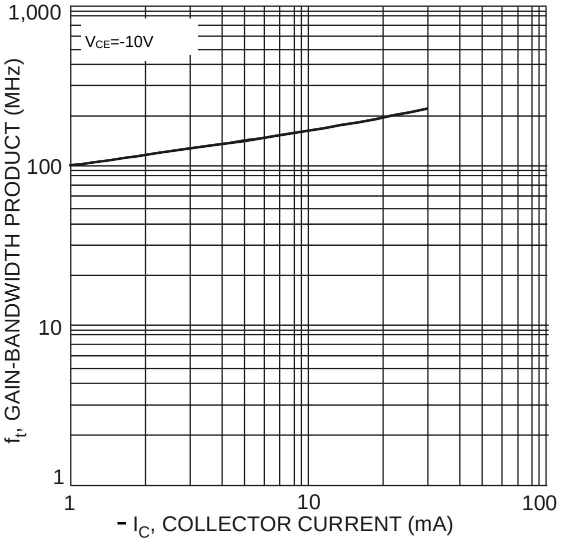


Fig.4 Typical Gain-Bandwidth Product vs. Collector Current

## Package Outline Dimensions

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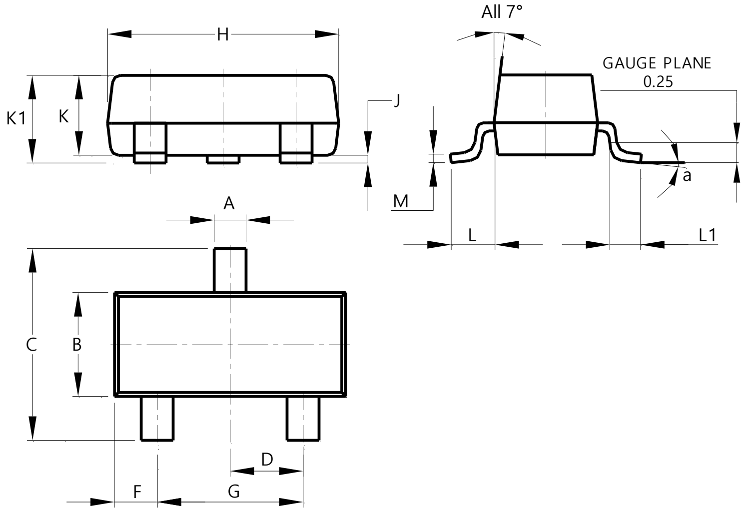
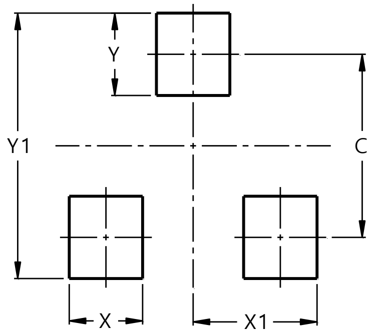
**SOT23**



| SOT23 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.37 | 0.51 | 0.40 |
| **B** | 1.20 | 1.40 | 1.30 |
| **C** | 2.30 | 2.50 | 2.40 |
| **D** | 0.89 | 1.03 | 0.915 |
| **F** | 0.45 | 0.60 | 0.535 |
| **G** | 1.78 | 2.05 | 1.83 |
| **H** | 2.80 | 3.00 | 2.90 |
| **J** | 0.013 | 0.10 | 0.05 |
| **K** | 0.890 | 1.00 | 0.975 |
| **K1** | 0.903 | 1.10 | 1.025 |
| **L** | 0.45 | 0.61 | 0.55 |
| **L1** | 0.25 | 0.55 | 0.40 |
| **M** | 0.085 | 0.150 | 0.110 |
| **a** | 0° | 8° | -- |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

**SOT23**



| 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.