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

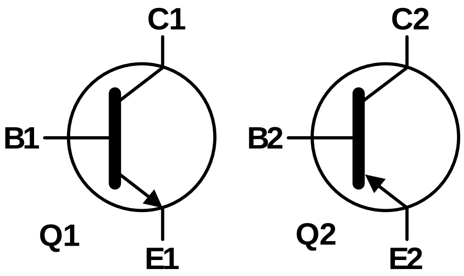
- Epitaxial Planar Die Construction
- Complementary Pair: 1 5551 Type NPN
  1 5401 Type PNP
- Ideal for Medium Power Amplification and Switching
- Ultra-Small Surface Mount Package

## Mechanical Data

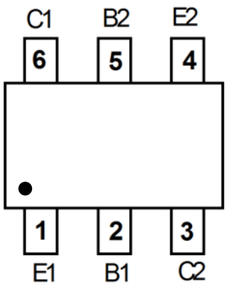
- Case: SOT363
- Case Material: Molded Plastic, “Green” Molding Compound, UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin Finish. Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.006 grams (Approximate)

SOT363

Top View



Device Symbol



Top View
Pin-Out

## Absolute Maximum Ratings – NPN 5551 Section (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 180 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 160 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 6 | V |
| Continuous Collector Current | $I_C$ | 200 | mA |

## Absolute Maximum Ratings – PNP 5401 Section (@$T_A$ = +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 | $V_{EBO}$ | -6 | V |
| Continuous Collector Current | $I_C$ | -200 | mA |

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

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation | (Note 5) | $P_D$ | 200 | mW |
| | (Notes 6 & 7) | | 320 | |
| Thermal Resistance, Junction to Ambient | (Note 5) | $R_{\theta JA}$ | 625 | °C/W |
| | (Notes 6 & 7) | | 390 | |
| Thermal Resistance, Junction to Case | (Note 8) | $R_{\theta JC}$ | 140 | |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

Notes:
5. For a device mounted on minimum recommended pad layout 1oz weight 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 25mm X 25mm 2oz copper.
7. Maximum combined dissipation.
8. Thermal resistance from junction to the top of package.

## Electrical Characteristics – NPN 5551 Section (@$T_A$ = +25°C, unless otherwise specified.)

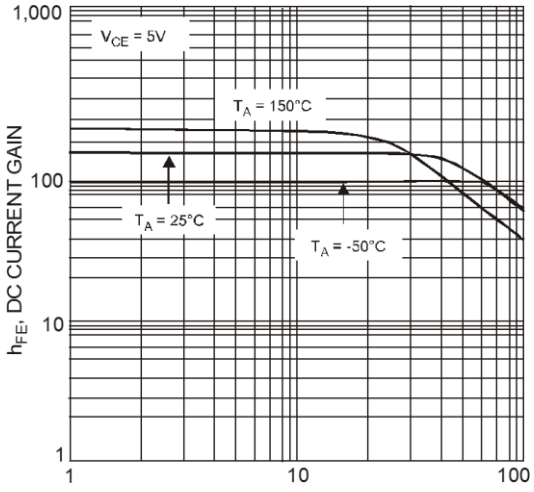
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | 180 | — | — | V | $I_C$ = 100µA, $I_E$ = 0 |
| Collector-Emitter Breakdown Voltage (Note 9) | $BV_{CEO}$ | 160 | — | — | V | $I_C$ = 1mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | 6 | — | — | V | $I_E$ = 10µA, $I_C$ = 0 |
| Collector-Base Cutoff Current | $I_{CBO}$ | — | — | 50 | nA | $V_{CB}$ = 120V, $I_E$ = 0 |
| | | — | — | 50 | µA | $V_{CB}$ = 120V, $I_E$ = 0, $T_A$ = +100°C |
| Base-Emitter Cutoff Current | $I_{EBO}$ | — | — | 50 | nA | $V_{EB}$ = 4V, $I_C$ = 0 |
| **ON CHARACTERISTICS (Note 9)** | | | | | | |
| DC Current Gain | $h_{FE}$ | 80 | — | — | — | $I_C$ = 1.0mA, $V_{CE}$ = 5.0V |
| | | 80 | | 250 | | $I_C$ = 10mA, $V_{CE}$ = 5.0V |
| | | 30 | | — | | $I_C$ = 50mA, $V_{CE}$ = 5.0V |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | — | — | 0.15 | V | $I_C$ = 10mA, $I_B$ = 1.0mA |
| | | | | 0.20 | | $I_C$ = 50mA, $I_B$ = 5.0mA |
| Base-Emitter Saturation Voltage | $V_{BE(SAT)}$ | — | — | 1.0 | V | $I_C$ = 10mA, $I_B$ = 1.0mA |
| | | | | | | $I_C$ = 50mA, $I_B$ = 5.0mA |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | |
| Output Capacitance | $C_{obo}$ | — | — | 6.0 | pF | $V_{CB}$ = 10V, f = 1.0MHz, $I_E$ = 0 |
| Small Signal Current Gain | $h_{fe}$ | 50 | — | 250 | — | $I_C$ = 1mA, $V_{CE}$ = 10V, f = 1.0MHz |
| Current Gain-Bandwidth Product | $f_T$ | 100 | — | 300 | MHz | $I_C$ = 10mA, $V_{CE}$ = 10V, f = 100MHz |
| Noise Figure | NF | — | — | 8.0 | dB | $V_{CE}$ = 5.0V, $I_C$ = 200µA,<br>$R_S$ = 1kΩ, f = 1.0kHz |

## Electrical Characteristics – PNP 5401 Section (@$T_A$ = +25°C, unless otherwise specified.)

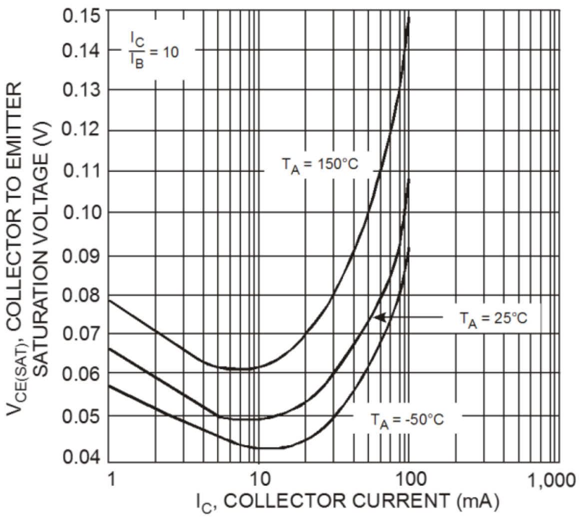
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | -160 | — | — | V | $I_C$ = -100µA, $I_E$ = 0 |
| Collector-Emitter Breakdown Voltage (Note 9) | $BV_{CEO}$ | -150 | — | — | V | $I_C$ = -1mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | -6 | — | — | V | $I_E$ = -10µA, $I_C$ = 0 |
| Collector-Base Cutoff Current | $I_{CBO}$ | — | — | -50 | nA | $V_{CB}$ = -120V, $I_E$ = 0 |
| | | — | — | -50 | µA | $V_{CB}$ = -120V, $I_E$ = 0, $T_A$ = +100°C |
| Base-Emitter Cutoff Current | $I_{EBO}$ | — | — | -50 | nA | $V_{EB}$ = -4V, $I_C$ = 0 |
| **ON CHARACTERISTICS (Note 9)** | | | | | | |
| DC Current Gain | $h_{FE}$ | 50 | — | — | — | $I_C$ = -1.0mA, $V_{CE}$ = -5.0V |
| | | 60 | | 240 | | $I_C$ = -10mA, $V_{CE}$ = -5.0V |
| | | 50 | | — | | $I_C$ = -50mA, $V_{CE}$ = -5.0V |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | — | — | -0.20 | V | $I_C$ = -10mA, $I_B$ = -1.0mA |
| | | | | -0.50 | | $I_C$ = -50mA, $I_B$ = -5.0mA |
| Base-Emitter Saturation Voltage | $V_{BE(SAT)}$ | — | — | -1.0 | V | $I_C$ = -10mA, $I_B$ = -1.0mA |
| | | | | | | $I_C$ = -50mA, $I_B$ = -5.0mA |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | |
| Output Capacitance | $C_{obo}$ | — | — | 6.0 | pF | $V_{CB}$ = -10V, f = 1.0MHz, $I_E$ = 0 |
| Small Signal Current Gain | $h_{fe}$ | 40 | — | 260 | — | $I_C$ = -1mA, $V_{CE}$ = -10V, f = 1.0MHz |
| Current Gain-Bandwidth Product | $f_T$ | 100 | — | 300 | MHz | $I_C$ = -10mA, $V_{CE}$ = -10V, f = 100MHz |
| Noise Figure | NF | — | — | 8.0 | dB | $V_{CE}$ = -5.0V, $I_C$ = -200µA,<br>$R_S$ = 1Ω, f = 1.0kHz |

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

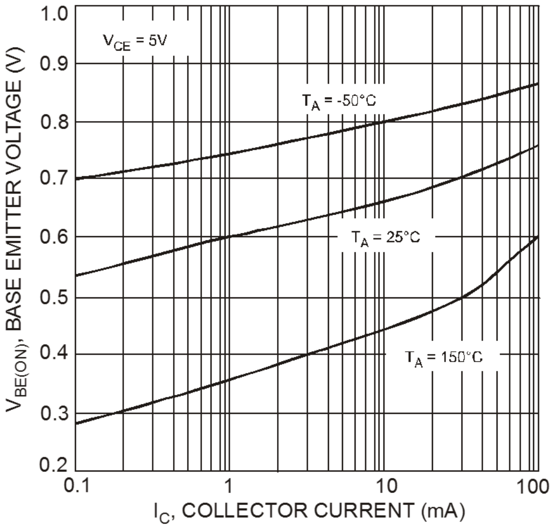
## Typical Electrical Characteristics – NPN 5551 Section (@$T_A$ = +25°C, unless otherwise specified.)



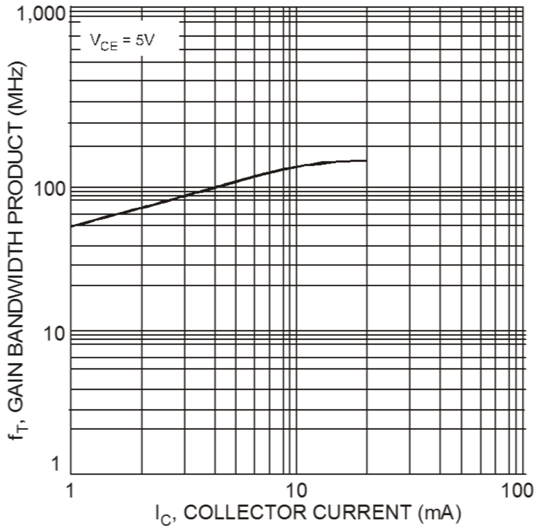
DC Current Gain vs. Collector Current



Collector Emitter Saturation Voltage vs. Collector Current

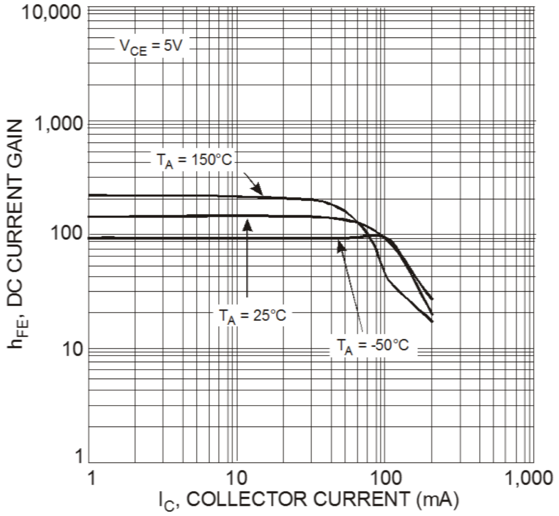


Base Emitter Voltage vs. Collector Current

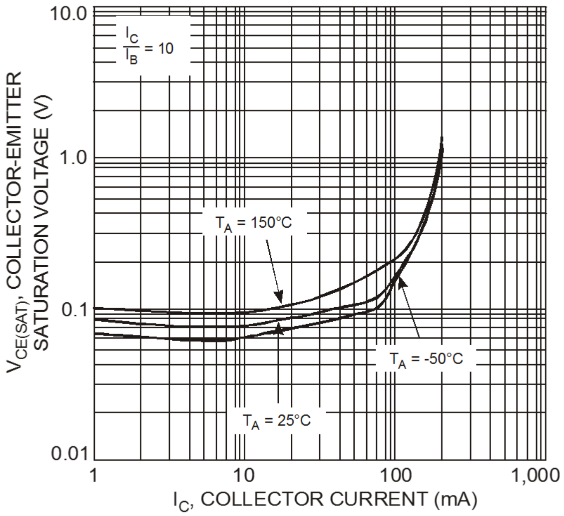


Gain Bandwidth Product vs. Collector Current

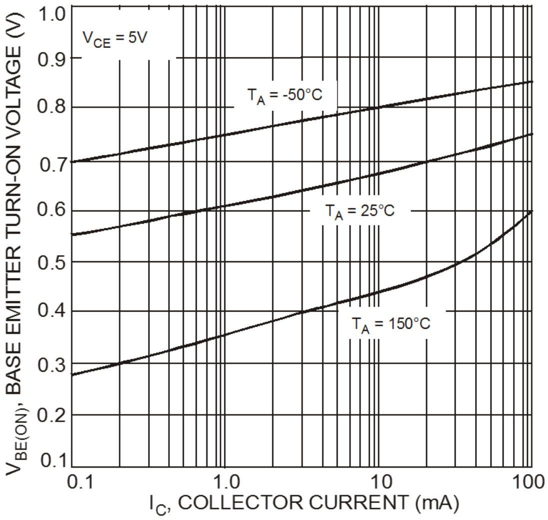
## Typical Electrical Characteristics – PNP 5401 Section (@$T_A$ = +25°C, unless otherwise specified.)



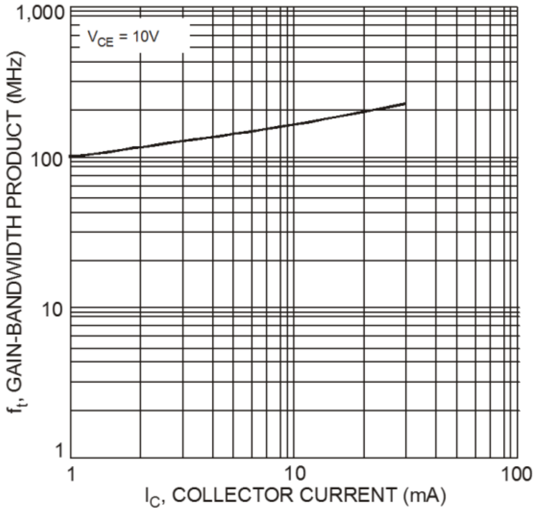
Typical DC Current Gain vs. Collector Current



Typical Collector-Emitter Saturation Voltage vs. Collector Current



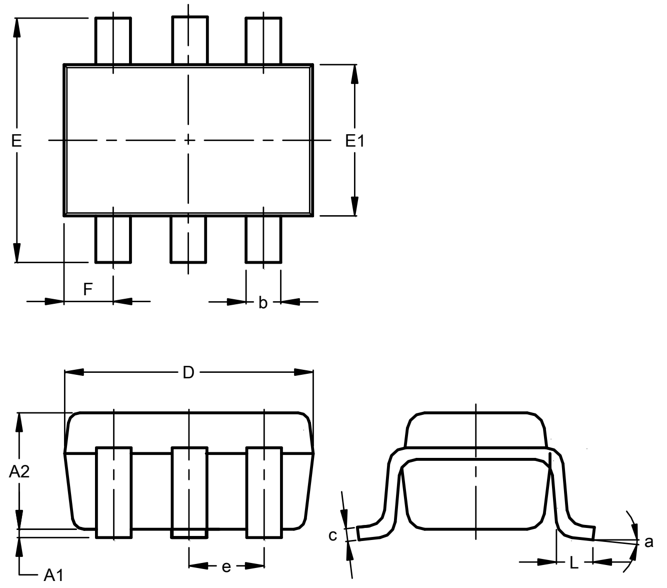
Typical Base-Emitter Turn-On Voltage vs. Collector Current



Typical Gain-Bandwidth Product vs Collector Current

## Package Outline Dimensions

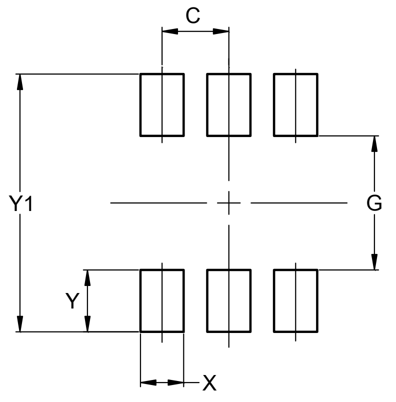
**SOT363**



| SOT363 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A1** | 0.00 | 0.10 | 0.05 |
| **A2** | 0.90 | 1.00 | 0.95 |
| **b** | 0.10 | 0.30 | 0.25 |
| **c** | 0.10 | 0.22 | 0.11 |
| **D** | 1.80 | 2.20 | 2.15 |
| **E** | 2.00 | 2.20 | 2.10 |
| **E1** | 1.15 | 1.35 | 1.30 |
| **e** | 0.650 BSC | | |
| **F** | 0.40 | 0.45 | 0.425 |
| **L** | 0.25 | 0.40 | 0.30 |
| **a** | 0° | 8° | -- |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

**SOT363**



| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.650 |
| **G** | 1.300 |
| **X** | 0.420 |
| **Y** | 0.600 |
| **Y1** | 2.500 |

**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.