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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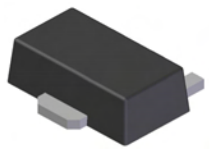
## Features

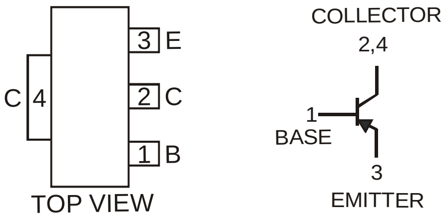
- Epitaxial Planar Die Construction
- Complementary NPN Type Available (NK-DXT3904)
- Ideally Suited for Automated Assembly Processes
- Ideal for Medium Power Switching or Amplification Applications



SOT89-3L

## Mechanical Data

- Case: SOT89-3L
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminals: Finish — Matte Tin annealed over Copper leadframe (Lead Free Plating). Solderable per MIL-STD-202, Method 208
- Marking & Type Code Information: See Page 4
- Ordering Information: See Page 4
- Weight: 0.072 grams (approximate)



Schematic and Pin Configuration

## Maximum Ratings @$T_A$ = 25°C unless otherwise specified

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | -40 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | -40 | V |
| Emitter-Base Voltage | $V_{EBO}$ | -5.0 | V |
| Collector Current – Continuous | $I_C$ | -200 | mA |

## Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation (Note 3) @ $T_A$ = 25°C | $P_D$ | 1 | W |
| Thermal Resistance, Junction to Ambient Air (Note 3) @ $T_A$ = 25°C | $R_{\theta JA}$ | 125 | °C/W |
| Operating and Storage Temperature Range | $T_j$, $T_{STG}$ | -55 to +150 | °C |

Notes: 1. No purposefully added lead.

## Electrical Characteristics @$T_A$ = 25°C unless otherwise specified

| Characteristic | Symbol | Min | Max | Unit | Test Condition |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 4)** | | | | | |
| Collector-Base Breakdown Voltage | $V_{(BR)CBO}$ | -40 | — | V | $I_C$ = -10μA, $I_E$ = 0 |
| Collector-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | -40 | — | V | $I_C$ = -1.0mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | $V_{(BR)EBO}$ | -5.0 | — | V | $I_E$ = -10μA, $I_C$ = 0 |
| Collector Cutoff Current | $I_{CEX}$ | — | -50 | nA | $V_{CE}$ = -30V, $V_{EB(OFF)}$ = -3.0V |
| | $I_{CBO}$ | — | -50 | nA | $V_{CB}$ = -30V, $I_E$ = 0 |
| Base Cutoff Current | $I_{BL}$ | — | -50 | nA | $V_{CE}$ = -30V, $V_{EB(OFF)}$ = -3.0V |
| **ON CHARACTERISTICS (Note 4)** | | | | | |
| DC Current Gain | $h_{FE}$ | 60 | — | — | $I_C$ = -100μA, $V_{CE}$ = -1.0V |
| | | 80 | — | | $I_C$ = -1.0mA, $V_{CE}$ = -1.0V |
| | | 100 | 300 | | $I_C$ = -10mA, $V_{CE}$ = -1.0V |
| | | 60 | — | | $I_C$ = -50mA, $V_{CE}$ = -1.0V |
| | | 30 | — | | $I_C$ = -100mA, $V_{CE}$ = -1.0V |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | — | -0.25 | V | $I_C$ = -10mA, $I_B$ = -1.0mA |
| | | | -0.40 | | $I_C$ = -50mA, $I_B$ = -5.0mA |
| Base-Emitter Saturation Voltage | $V_{BE(SAT)}$ | -0.65 | -0.85 | V | $I_C$ = -10mA, $I_B$ = -1.0mA |
| | | — | -0.95 | | $I_C$ = -50mA, $I_B$ = -5.0mA |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | |
| Output Capacitance | $C_{obo}$ | — | 4.5 | pF | $V_{CB}$ = -5.0V, f = 1.0MHz, $I_E$ = 0 |
| Input Capacitance | $C_{ibo}$ | — | 10 | pF | $V_{EB}$ = -0.5V, f = 1.0MHz, $I_C$ = 0 |
| Input Impedance | $h_{ie}$ | 2.0 | 12 | kΩ | $V_{CE}$ = -10V, $I_C$ = -1.0mA, f = 1.0kHz |
| Voltage Feedback Ratio | $h_{re}$ | 0.1 | 10 | x $10^{-4}$ | |
| Small Signal Current Gain | $h_{fe}$ | 100 | 400 | — | |
| Output Admittance | $h_{oe}$ | 3.0 | 60 | μS | |
| Current Gain-Bandwidth Product | $f_T$ | 250 | — | MHz | $V_{CE}$ = -20V, $I_C$ = -10mA, f = 100MHz |
| Noise Figure | NF | — | 4.0 | dB | $V_{CE}$ = -5.0V, $I_C$ = -100μA,<br>$R_S$ = 1.0kΩ, f = 1.0kHz |
| **SWITCHING CHARACTERISTICS** | | | | | |
| Delay Time | $t_d$ | — | 35 | ns | $V_{CC}$ = -3.0V, $I_C$ = -10mA,<br>$V_{BE(off)}$ = 0.5V, $I_{B1}$ = -1.0mA |
| Rise Time | $t_r$ | — | 35 | ns | |
| Storage Time | $t_s$ | — | 225 | ns | $V_{CC}$ = -3.0V, $I_C$ = -10mA,<br>$I_{B1}$ = $I_{B2}$ = -1.0mA |
| Fall Time | $t_f$ | — | 75 | ns | |

Notes: 4. Measured under pulsed condition. Pulse width = 300μs. Duty cycle ≤2%.

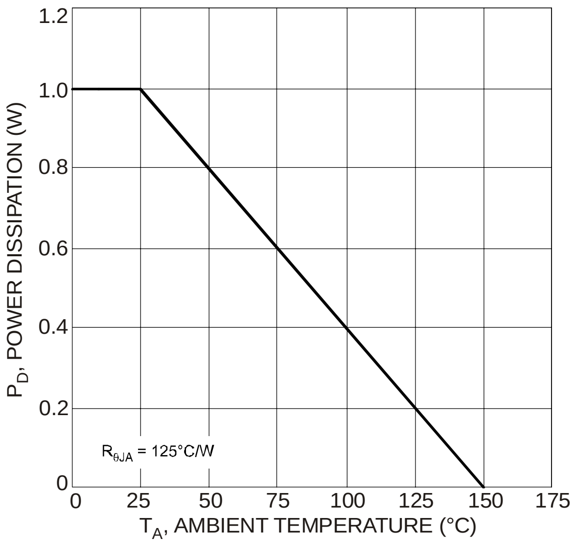


Fig. 1 Power Dissipation vs. Ambient Temperature (Note 3)

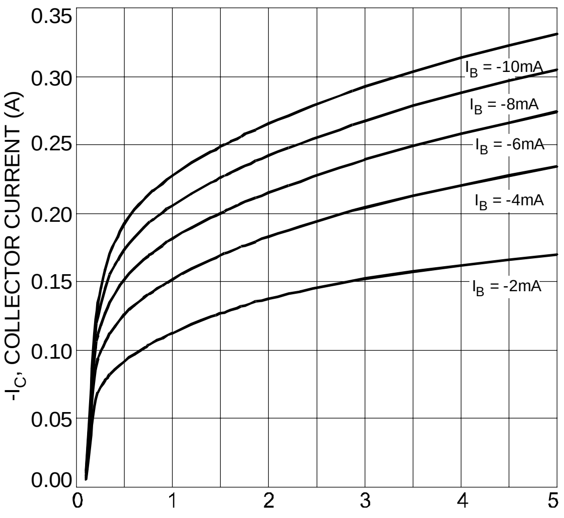


Fig. 2 Typical Collector Current vs.Collector-Emitter Voltage

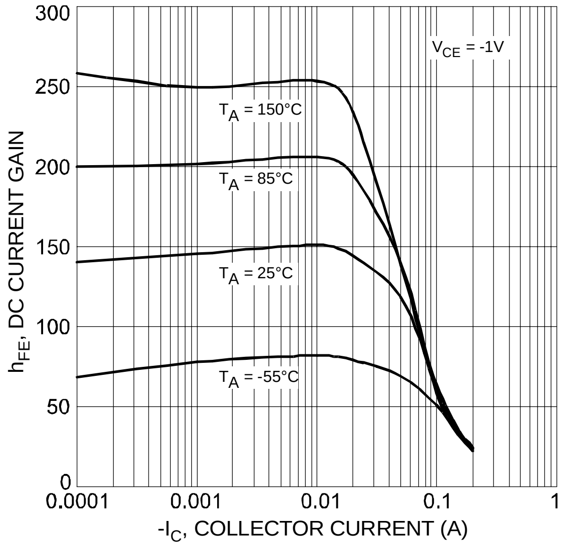


Fig. 3 Typical DC Current Gain vs. Collector Current

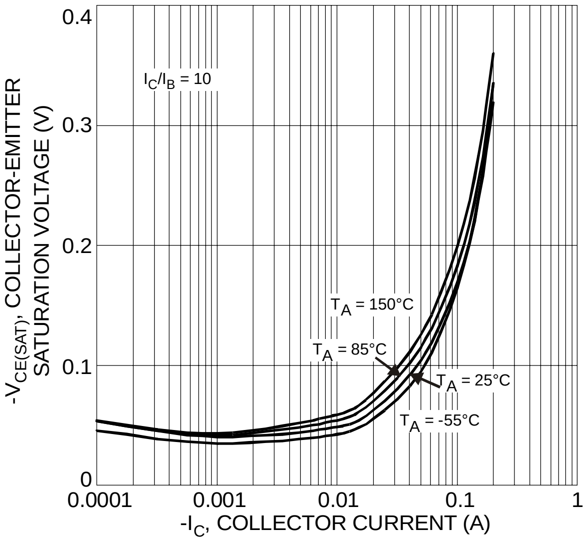


Fig. 4 Typical Collector-Emitter Saturation Voltage vs. Collector Current

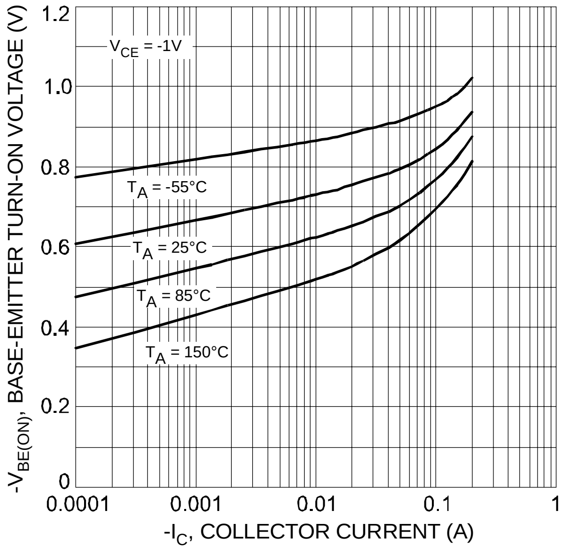


Fig. 5 Typical Base-Emitter Turn-On Voltage vs. Collector Current

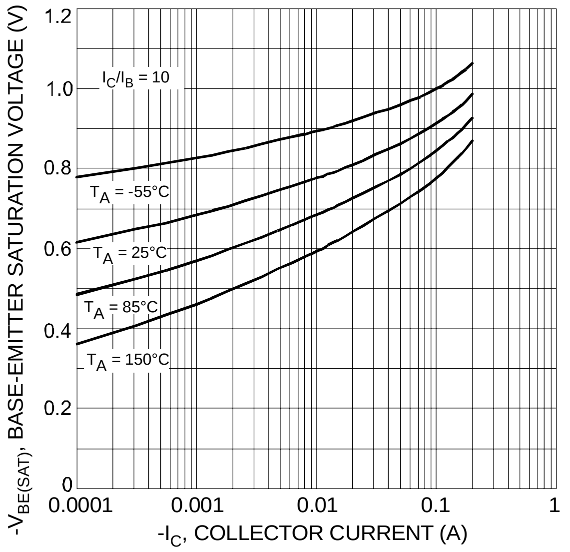


Fig. 6 Typical Base-Emitter Saturation Voltage vs. Collector Current

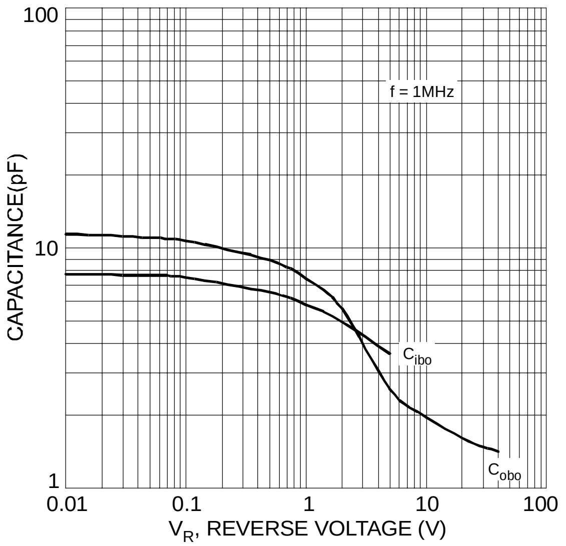


Fig. 7 Typical Capacitance Characteristics

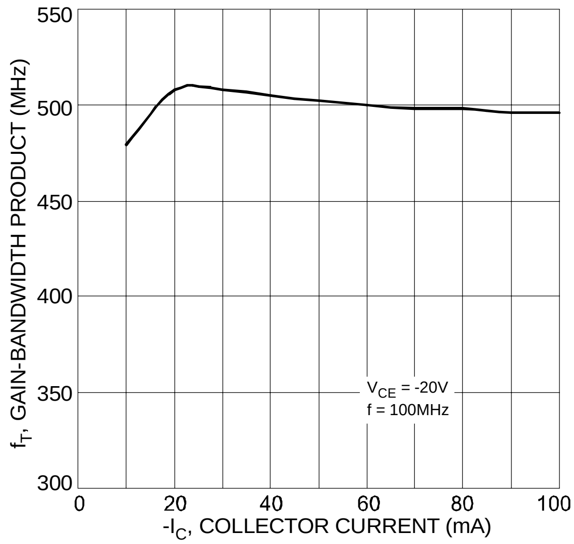
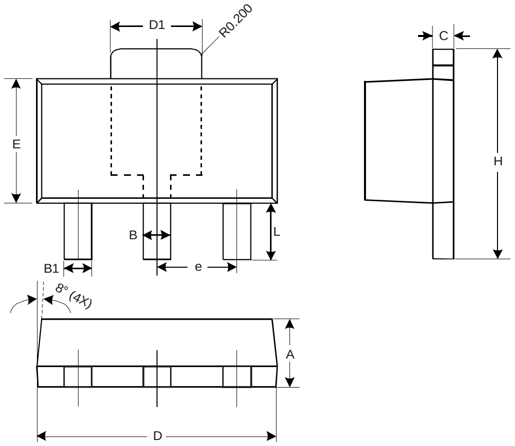


Fig. 8 Typical Gain-Bandwidth Product vs. Collector Current

## Package Outline Dimensions



| SOT89-3L | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 1.40 | 1.60 | 1.50 |
| **B** | 0.45 | 0.55 | 0.50 |
| **B1** | 0.37 | 0.47 | 0.42 |
| **C** | 0.35 | 0.43 | 0.38 |
| **D** | 4.40 | 4.60 | 4.50 |
| **D1** | 1.50 | 1.70 | 1.60 |
| **E** | 2.40 | 2.60 | 2.50 |
| **e** | — | — | 1.50 |
| **H** | 3.95 | 4.25 | 4.10 |
| **L** | 0.90 | 1.20 | 1.05 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout