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

0755-83047638
ysbdt@szyoushang.cn
www.szyoushang.cn

企业微信二维码

企业QQ二维码

## Description

This Bipolar Junction Transistor (BJT) is designed to meet the stringent requirement of Automotive Applications.

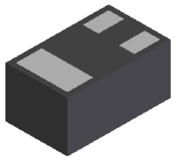
## Features

- $BV_{CEO}$ > -15V
- $I_C$ = -500mA High Collector Current
- $I_{CM}$ = -1A Peak Pulse Current
- $P_D$ = 1000mW Power Dissipation
- Low Collector-Emitter Saturation Voltage, $V_{CE(SAT)}$
- 0.60mm$^2$ Package Footprint, 13 Times Smaller than SOT23
- 0.5mm Height Package Minimizing Off-Board Profile
- Complementary NPN Type NK-DSS2515M

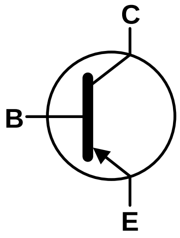
## Mechanical Data

- Case: X1-DFN1006-3
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — NiPdAu. Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.0009 grams (Approximate)

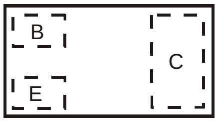
X1-DFN1006-3



Bottom View



Device Symbol



Top View
Device Schematic

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

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | -15 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | -15 | V |
| Emitter-Base Voltage | $V_{EBO}$ | -6 | V |
| Collector Current - Continuous | $I_C$ | -500 | mA |
| Peak Pulse Collector Current | $I_{CM}$ | -1 | A |
| Peak Base Current | $I_{BM}$ | -100 | mA |

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

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation | (Note 6) | $P_D$ | 400 | mW |
| | (Note 7) | | 1000 | |
| Thermal Resistance, Junction to Ambient | (Note 6) | $R_{\theta JA}$ | 310 | °C/W |
| | (Note 7) | | 120 | |
| Thermal Resistance, Junction to Lead | (Note 8) | $R_{\theta JL}$ | 120 | °C/W |
| Operating and Storage and Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## ESD Ratings (Note 9)

| Characteristic | Symbol | Value | Unit | JEDEC Class |
|---|---|---|---|---|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge - Machine Model | ESD MM | 200 | V | B |

Notes:
6. For the device mounted on minimum recommended pad layout 1oz copper that is on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in steady state condition. The entire exposed collector pad is attached to the heatsink.
7. Same as Note 6, except the exposed collector pad is mounted on 25mm x 25mm 2oz copper.
8. Thermal resistance from junction to solder-point (on the exposed collector pad).
9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

## Thermal Characteristics

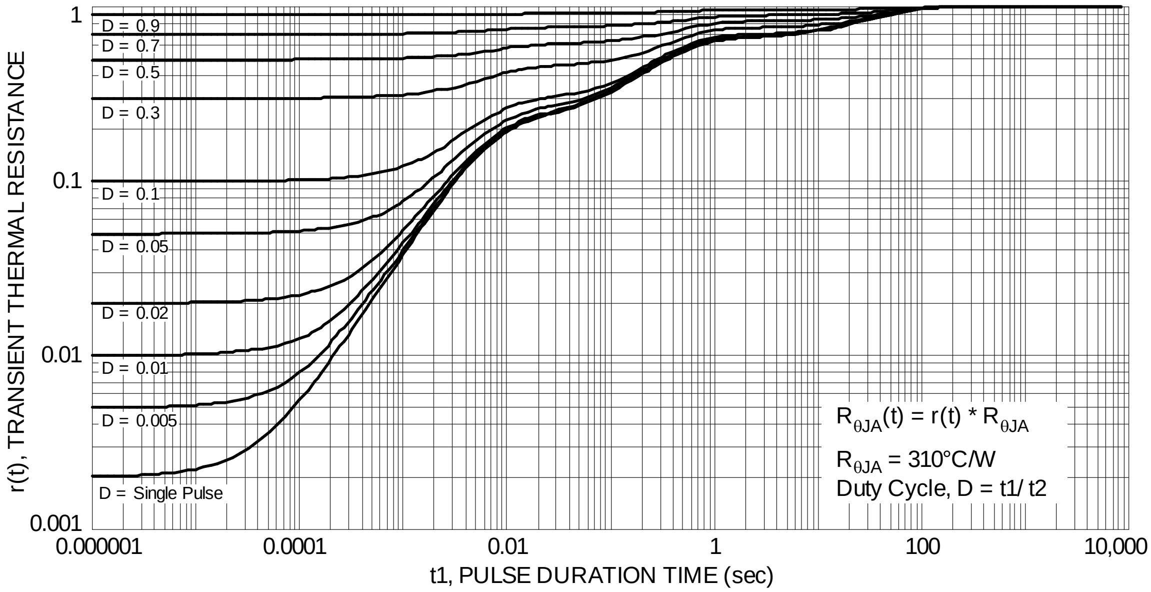


Fig. 1 Transient Thermal Resistance

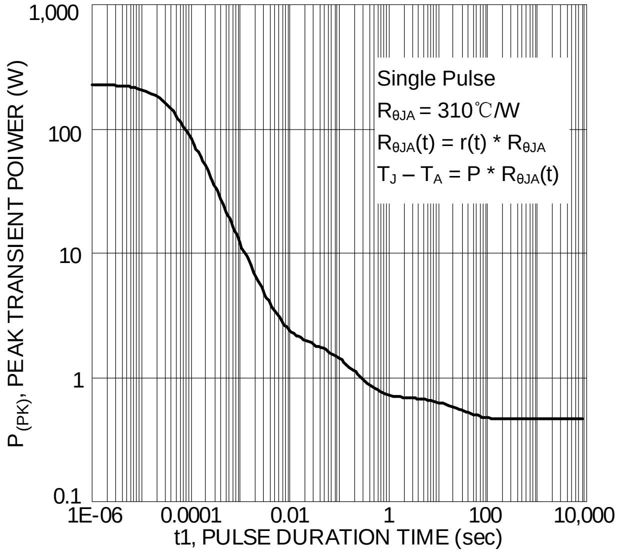


Fig. 2 Single Pulse Maximum Power Dissipation

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

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | -15 | — | — | V | $I_C$ = -100µA, $I_E$ = 0 |
| Collector-Emitter Breakdown Voltage (Note 10) | $BV_{CEO}$ | -15 | — | — | V | $I_C$ = -10mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | -6 | — | — | V | $I_E$ = -100µA, $I_C$ = 0 |
| Collector Cutoff Current | $I_{CBO}$ | — | — | -100 | nA | $V_{CB}$ = -15V, $I_E$ = 0 |
| | | | | -50 | µA | $V_{CB}$ = -15V, $I_E$ = 0, $T_A$ = +150°C |
| Emitter Cutoff Current | $I_{EBO}$ | — | — | -100 | nA | $V_{EB}$ = -5V, $I_C$ = 0 |
| **ON CHARACTERISTICS (Note 10)** | | | | | | |
| DC Current Gain | $h_{FE}$ | 200 | — | — | — | $V_{CE}$ = -2V, $I_C$ = -10mA |
| | | 150 | — | — | | $V_{CE}$ = -2V, $I_C$ = -100mA |
| | | 90 | — | — | | $V_{CE}$ = -2V, $I_C$ = -500mA |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | — | — | -25 | mV | $I_C$ = -10mA, $I_B$ = -0.5mA |
| | | — | — | -150 | | $I_C$ = -200mA, $I_B$ = -10mA |
| | | — | — | -250 | | $I_C$ = -500mA, $I_B$ = -50mA |
| Collector-Emitter Saturation Resistance | $R_{CE(SAT)}$ | — | — | 500 | mΩ | $I_C$ = -500mA, $I_B$ = -50mA |
| Base-Emitter Saturation Voltage | $V_{BE(SAT)}$ | — | — | -1.1 | V | $I_C$ = -500mA, $I_B$ = -50mA |
| Base-Emitter Turn On Voltage | $V_{BE(ON)}$ | — | — | -0.9 | V | $V_{CE}$ = -2V, $I_C$ = -100mA |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | |
| Output Capacitance | $C_{obo}$ | — | — | 10 | pF | $V_{CB}$ = -10V, f = 1.0MHz |
| Current Gain-Bandwidth Product | $f_T$ | 100 | 340 | — | MHz | $V_{CE}$ = -5V, $I_C$ = -100mA, f = 100MHz |

Note: 10. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.

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

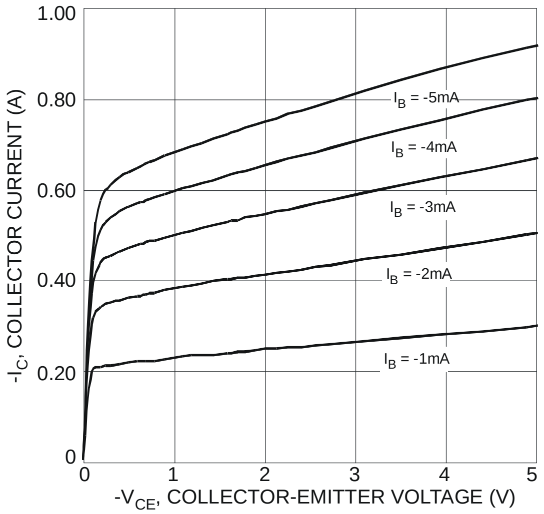


Fig.3 Typical Collector Current vs. Collector-Emitter Voltage

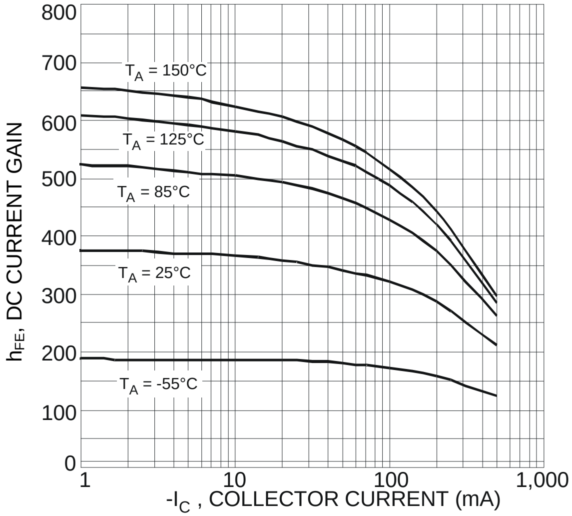


Fig. 4 Typical DC Current Gain vs. Collector Current

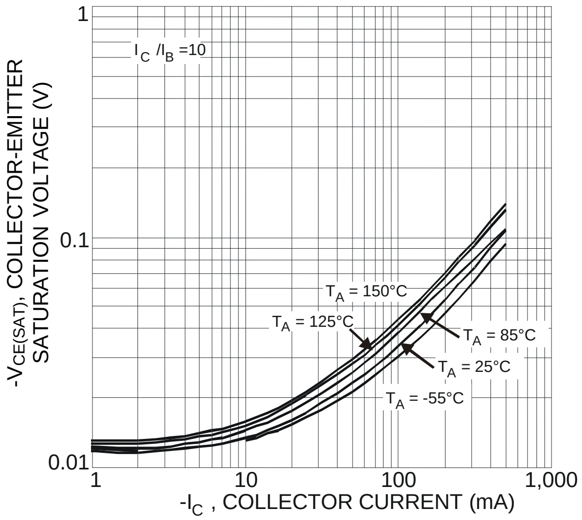


Fig. 5 Typical Collector-Emitter Saturation Voltage vs. Collector Current

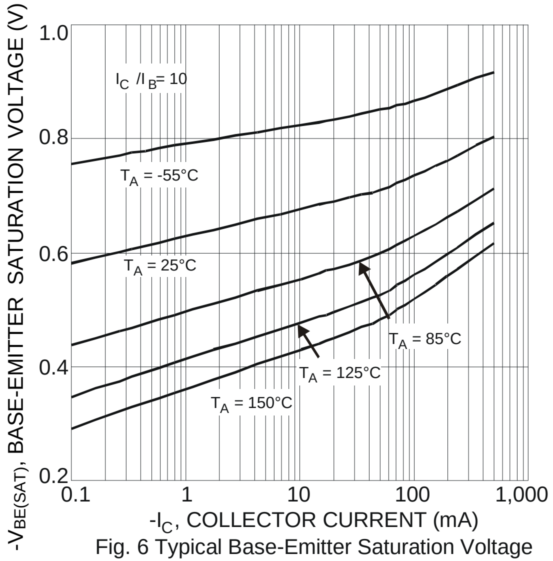


Fig. 6 Typical Base-Emitter Saturation Voltage vs. Collector Current

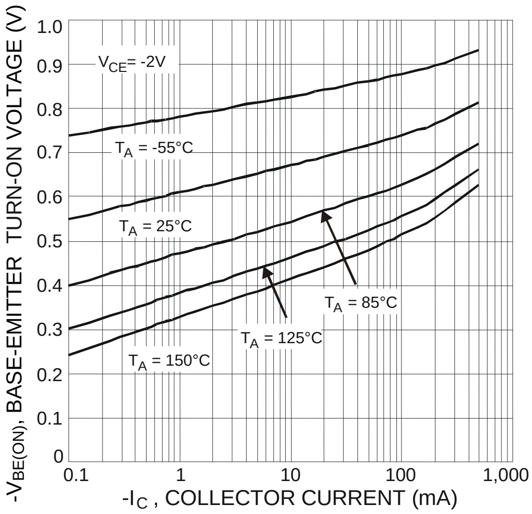


Fig. 7 Typical Base-Emitter Turn-On Voltage vs. Collector Current

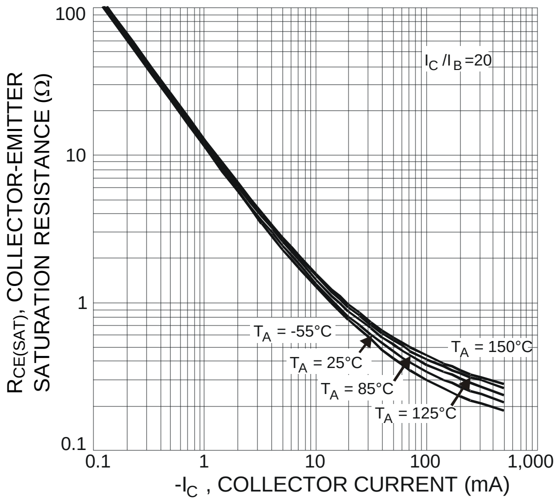
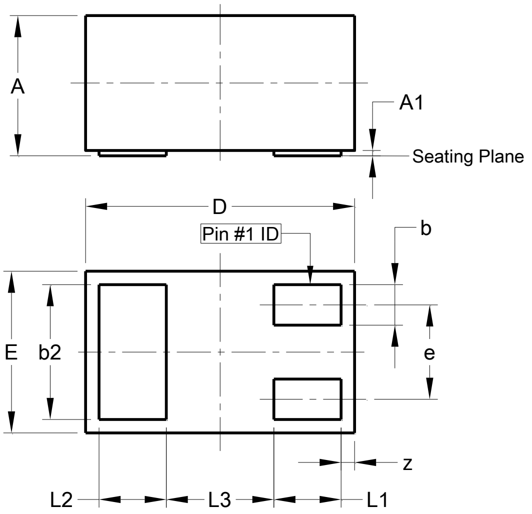


Fig. 8 Typical Collector-Emitter Saturation Resistance vs. Collector Current

## Package Outline Dimensions

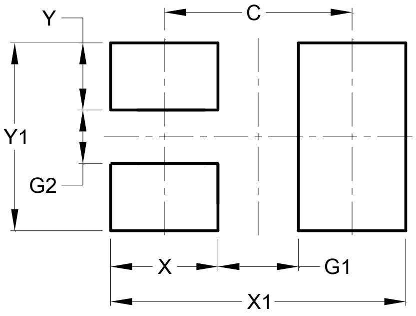
**X1-DFN1006-3**



| X1-DFN1006-3 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.47 | 0.53 | 0.50 |
| **A1** | 0.00 | 0.05 | 0.03 |
| **b** | 0.10 | 0.20 | 0.15 |
| **b2** | 0.45 | 0.55 | 0.50 |
| **D** | 0.95 | 1.075 | 1.00 |
| **E** | 0.55 | 0.675 | 0.60 |
| **e** | — | — | 0.35 |
| **L1** | 0.20 | 0.30 | 0.25 |
| **L2** | 0.20 | 0.30 | 0.25 |
| **L3** | — | — | 0.40 |
| **z** | 0.02 | 0.08 | 0.05 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

**X1-DFN1006-3**



| Dimensions | Value (in mm) |
|---|---|
| **C** | 0.70 |
| **G1** | 0.30 |
| **G2** | 0.20 |
| **X** | 0.40 |
| **X1** | 1.10 |
| **Y** | 0.25 |
| **Y1** | 0.70 |