



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



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## Description

This bipolar junction transistor (BJT) is designed to meet the stringent requirement of Automotive Applications.

## Features

- $BV_{CEO} > -40V$
- $I_c = -2A$  High Continuous Collector Current
- $I_{CM} = -3A$  Peak Pulse Current
- Low Saturation Voltage -225mV Max @  $I_c = -1A$
- $R_{CE(sat)} = 90m\Omega$  at 0.5A for a Low Equivalent On-Resistance
- 730mW Power Dissipation

## Mechanical Data

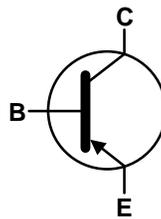
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish—Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 
- Weight 0.008 grams (Approximate)

## Application

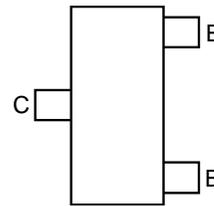
- Gate Driving MOSFETs and IGBTs
- Load Switch
- DC-DC Converters
- Battery Charging



Top View



Device Symbol



Top View  
Pin-Out

### Absolute Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CB0</sub>	-40	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-40	V
Emitter-Base Voltage	V <sub>EB0</sub>	-5	V
Peak Pulse Collector Current	I <sub>CM</sub>	-3	A
Continuous Collector Current	I <sub>C</sub>	-2	A
Base Current	I <sub>B</sub>	-300	mA

### Thermal Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

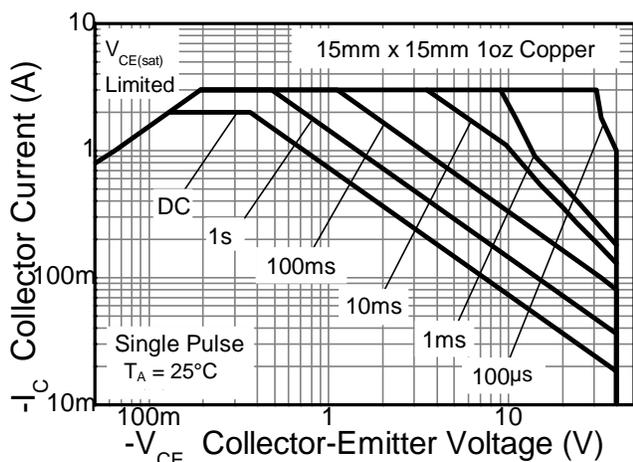
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P <sub>D</sub>	730	mW
Power Dissipation (Note 6)	P <sub>D</sub>	600	mW
Thermal Resistance, Junction to Ambient Air (Note 5)	R <sub>θJA</sub>	171	°C/W
Thermal Resistance, Junction to Ambient Air (Note 6)	R <sub>θJA</sub>	209	°C/W
Thermal Resistance, Junction to Lead (Note 7)	R <sub>θJL</sub>	75	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

### ESD Ratings (Note 8)

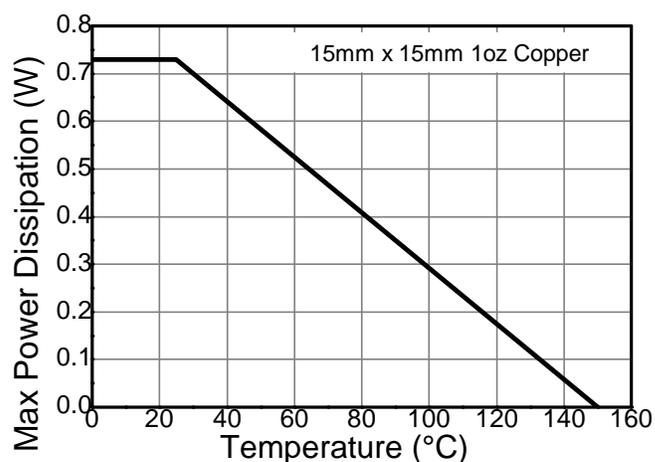
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge—Human Body Model	ESD HBM	4000	V	3A
Electrostatic Discharge—Machine Model	ESD MM	400	V	C

- Notes:
5. For a device mounted with the collector lead on 15mm x 15mm 1oz copper that is on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  6. Same as Note 7, except the device is mounted on minimum recommended pad layout.
  7. Thermal resistance from junction to solder-point (at the end of the collector lead).
  8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

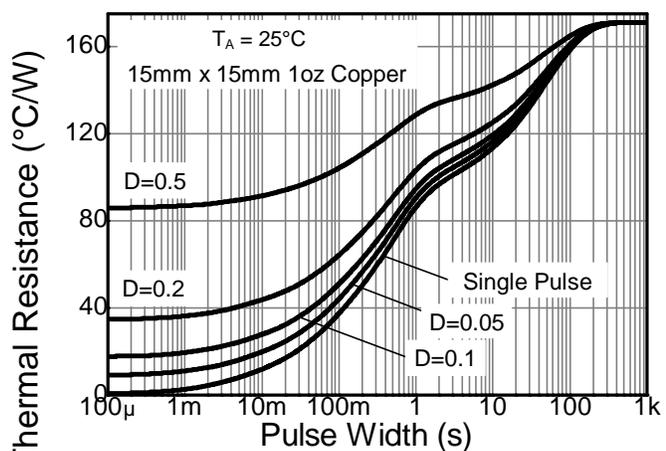
### Thermal Characteristics and Derating Information



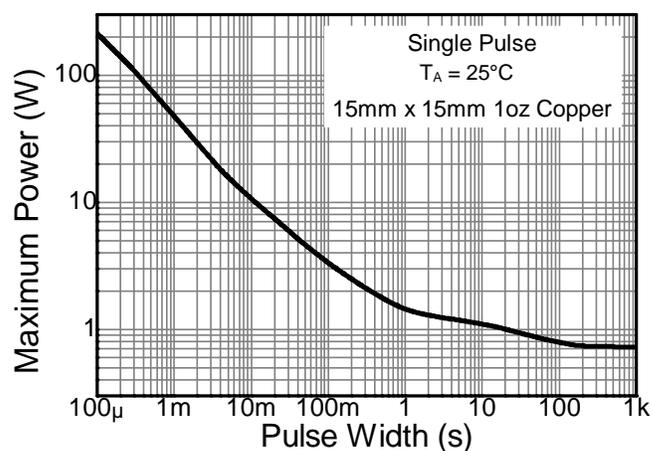
**Safe Operating Area**



**Derating Curve**



**Transient Thermal Impedance**



**Pulse Power Dissipation**

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Conditions
<b>OFF CHARACTERISTICS</b>						
Collector-Base Breakdown Voltage	$BV_{CBO}$	-40	—	—	V	$I_C = -100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 9)	$BV_{CEO}$	-40	—	—	V	$I_C = -10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	-5	—	—	V	$I_E = -100\mu\text{A}$
Collector-Base Cutoff Current	$I_{CBO}$	—	—	-100	nA	$V_{CB} = -30\text{V}, I_E = 0$
		—	—	-50	$\mu\text{A}$	$V_{CB} = -30\text{V}, I_E = 0, T_A = +150^\circ\text{C}$
Emitter-Base Cutoff Current	$I_{EBO}$	—	—	-100	nA	$V_{EB} = -4\text{V}, I_C = 0$
<b>ON CHARACTERISTICS (Note 9)</b>						
DC Current Gain	$h_{FE}$	300	—	—	—	$V_{CE} = -2\text{V}, I_C = -0.1\text{A}$
		260	—	—		$V_{CE} = -2\text{V}, I_C = -0.5\text{A}$
		210	—	—		$V_{CE} = -2\text{V}, I_C = -1\text{A}$
		100	—	—		$V_{CE} = -2\text{V}, I_C = -2\text{A}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	—	-100	mV	$I_C = -100\text{mA}, I_B = -1\text{mA}$
		—	-45	-110		$I_C = -500\text{mA}, I_B = -50\text{mA}$
		—	—	-225		$I_C = -750\text{mA}, I_B = -15\text{mA}$
		—	—	-225		$I_C = -1\text{A}, I_B = -50\text{mA}$
		—	—	-350		$I_C = -2\text{A}, I_B = -200\text{mA}$
Equivalent On-Resistance	$R_{CE(sat)}$	—	90	220	m $\Omega$	$I_C = -500\text{mA}, I_B = -50\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	—	—	-1.1	V	$I_C = -2\text{A}, I_B = -200\text{mA}$
Base-Emitter Turn-on Voltage	$V_{BE(on)}$	—	—	-0.75	V	$V_{CE} = -2\text{V}, I_C = -100\text{mA}$
<b>SMALL SIGNAL CHARACTERISTICS</b>						
Transition Frequency	$f_T$	100	—	—	MHz	$V_{CE} = -10\text{V}, I_C = -100\text{mA}, f = 100\text{MHz}$
Output Capacitance	$C_{obo}$	—	—	28	pF	$V_{CB} = -10\text{V}, f = 1\text{MHz}$

 Note: 9. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

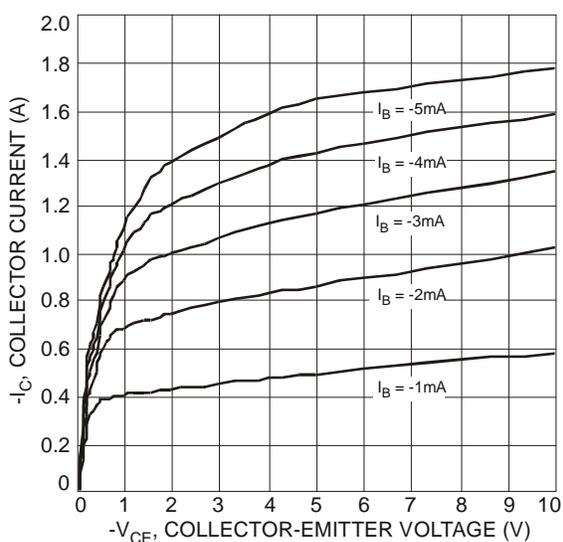
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)


Figure 1 Typical Collector Current vs. Collector-Emitter Voltage

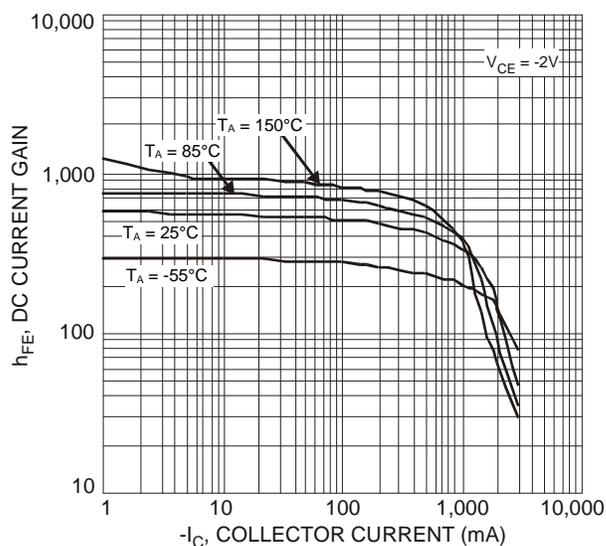


Figure 2 Typical DC Current Gain vs. Collector Current

**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.) (continued)

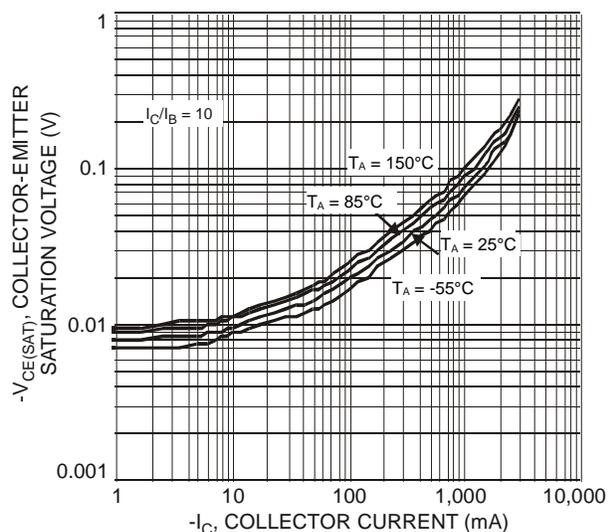


Figure 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current

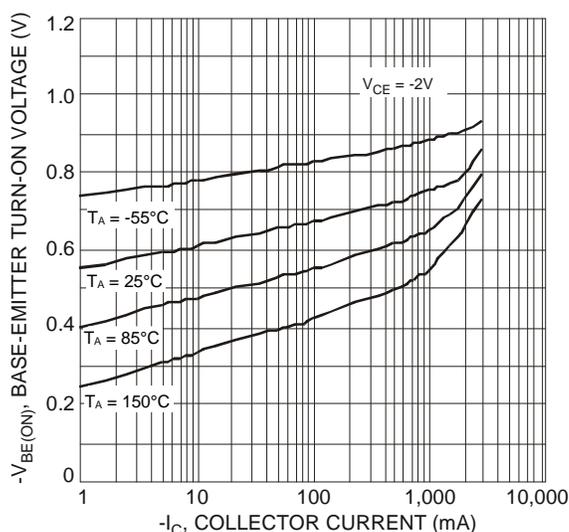


Figure 4 Typical Base-Emitter Turn-On Voltage vs. Collector Current

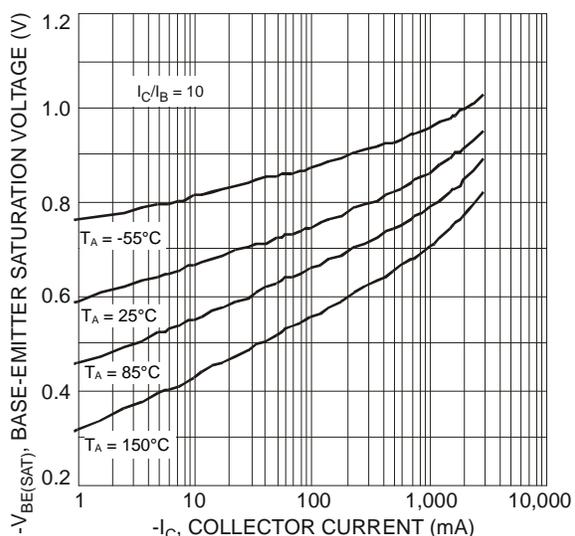


Figure 5 Typical Base-Emitter Saturation Voltage vs. Collector Current

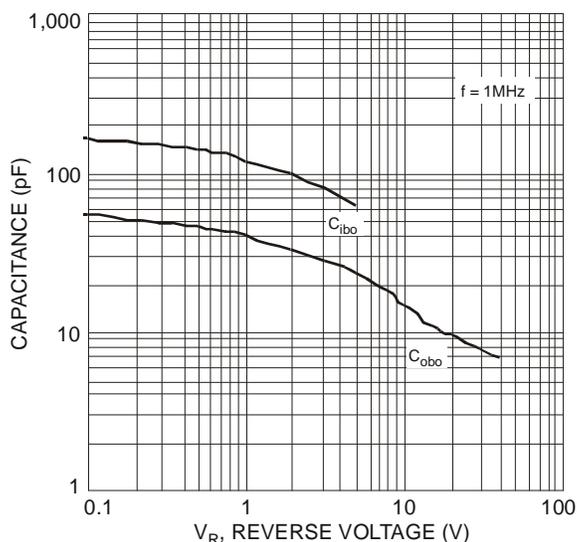


Figure 6 Typical Capacitance Characteristics

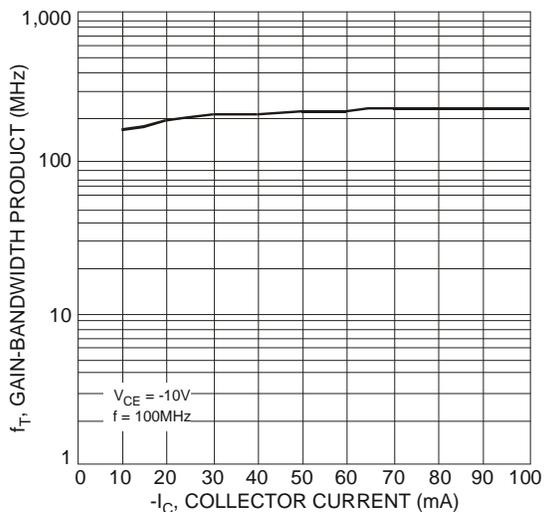
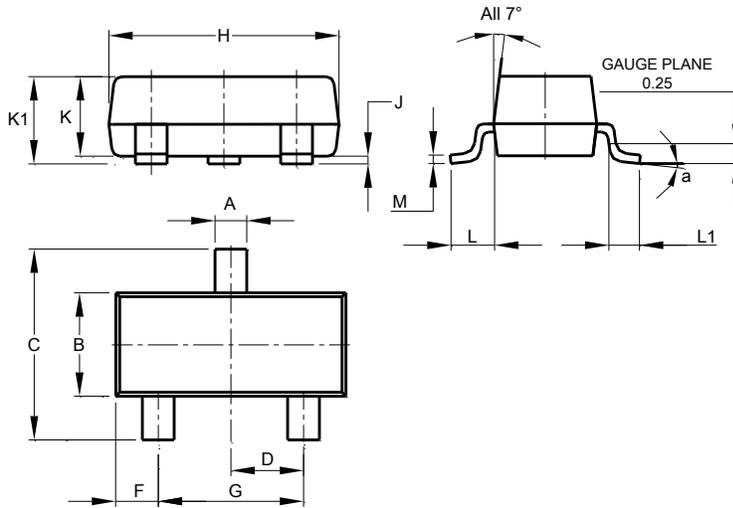


Figure 7 Typical Gain-Bandwidth Product vs. Collector Current

## Package Outline Dimensions

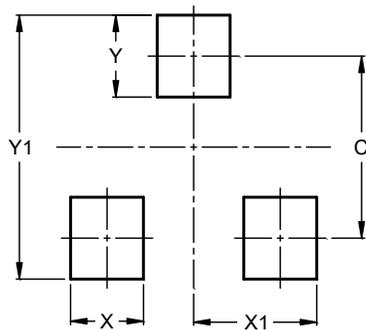
SOT23



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