



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) has been designed to meet the stringent requirements of automotive applications.

## Features

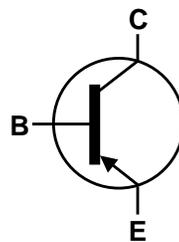
- Epitaxial Planar Die Construction
- Complementary NPN Type - NK-MMBT5551Q
- Ideal for Low Power Amplification and Switching

## Mechanical Data

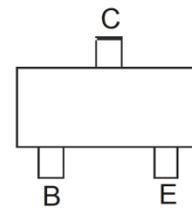
- Package: SOT23
- Package Material: Molded Plastic, "Green" Molding Compound  
UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per  
MIL-STD-202, Method 208 
- Weight: 0.008 grams (Approximate)



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>	-160	V
Collector-Emitter Voltage	V <sub>CEO</sub>	-150	V
Emitter-Base Voltage	V <sub>EBO</sub>	-5	V
Collector Current	I <sub>C</sub>	-600	mA

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

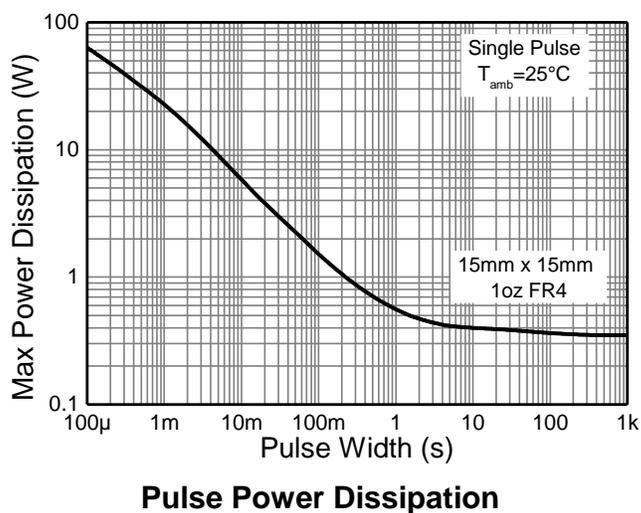
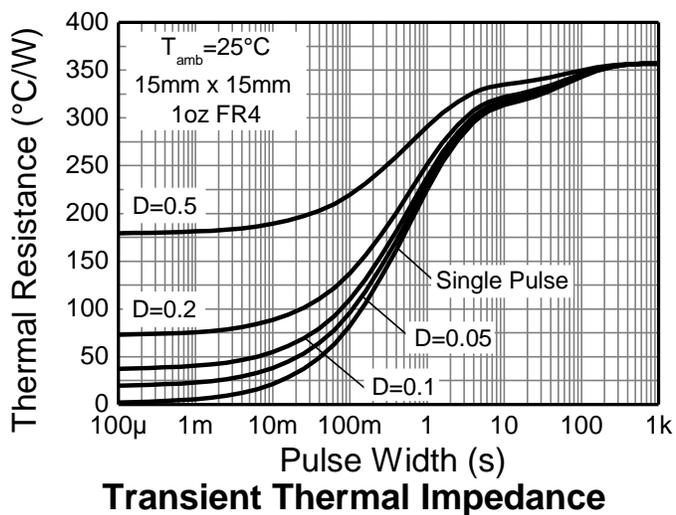
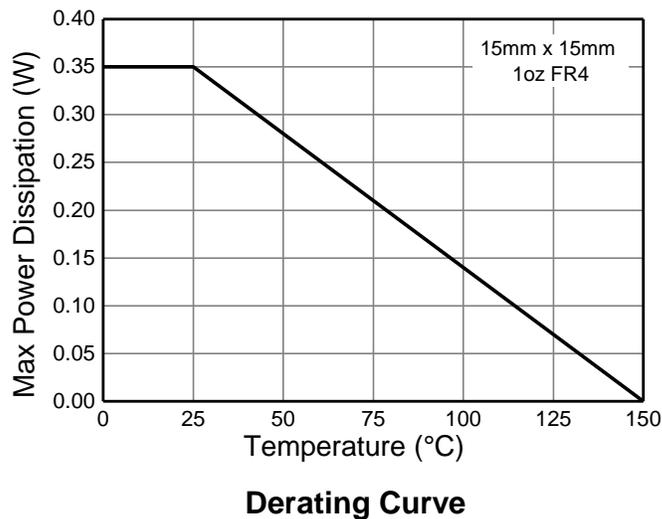
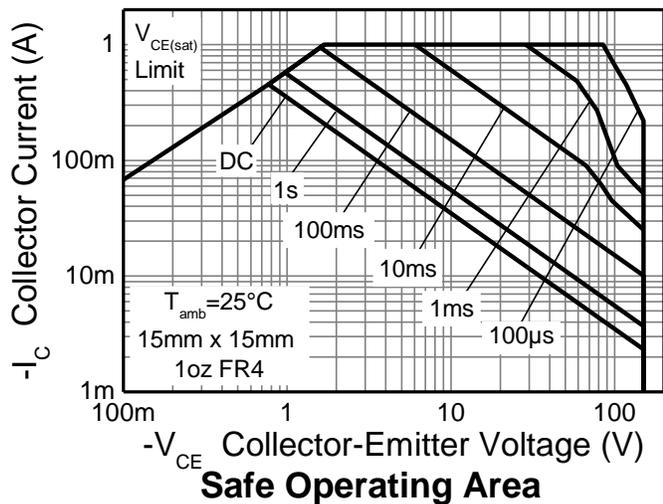
Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	(Note 5) 310	mW
		(Note 6) 350	
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	(Note 5) 403	°C/W
		(Note 6) 357	
Thermal Resistance, Junction to Leads	R <sub>θJL</sub>	350	°C/W
Operating and Storage Temperature Range	T <sub>J</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	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 FR4 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**



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

Characteristic	Symbol	Min	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b> (Note 9)					
Collector-Base Breakdown Voltage	BV <sub>CB0</sub>	-160	—	V	I <sub>C</sub> = -100μA, I <sub>E</sub> = 0
Collector-Emitter Breakdown Voltage	BV <sub>CEO</sub>	-150	—	V	I <sub>C</sub> = -1mA, I <sub>B</sub> = 0
Emitter-Base Breakdown Voltage	BV <sub>EB0</sub>	-5	—	V	I <sub>E</sub> = -100μA, I <sub>C</sub> = 0
Collector Cutoff Current	I <sub>CB0</sub>	—	-50 -50	nA μA	V <sub>CB</sub> = -120V, I <sub>E</sub> = 0 V <sub>CB</sub> = -120V, I <sub>E</sub> = 0, T <sub>A</sub> = +100°C
Emitter Cutoff Current	I <sub>EBO</sub>	—	-50	nA	V <sub>EB</sub> = -4V, I <sub>C</sub> = 0
<b>ON CHARACTERISTICS</b> (Note 9)					
DC Current Gain	h <sub>FE</sub>	50 60 50	— 240 —	—	I <sub>C</sub> = -1mA, V <sub>CE</sub> = -5V I <sub>C</sub> = -10mA, V <sub>CE</sub> = -5V I <sub>C</sub> = -50mA, V <sub>CE</sub> = -5V
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	—	-0.2 -0.5	V	I <sub>C</sub> = -10mA, I <sub>B</sub> = -1mA I <sub>C</sub> = -50mA, I <sub>B</sub> = -5mA
Base-Emitter Saturation Voltage	V <sub>BE(sat)</sub>	—	-1	V	I <sub>C</sub> = -10mA, I <sub>B</sub> = -1mA I <sub>C</sub> = -50mA, I <sub>B</sub> = -5mA
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Output Capacitance	C <sub>obo</sub>	—	6	pF	V <sub>CB</sub> = -10V, f = 1MHz, I <sub>E</sub> = 0
Small Signal Current Gain	h <sub>fe</sub>	40	260	—	V <sub>CE</sub> = -10V, I <sub>C</sub> = -1mA, f = 1kHz
Current Gain-Bandwidth Product	f <sub>T</sub>	100	300	MHz	V <sub>CE</sub> = -10V, I <sub>C</sub> = -10mA, f = 100MHz
Noise Figure	NF	—	8.0	dB	V <sub>CE</sub> = -5V, I <sub>C</sub> = -200μA, R <sub>S</sub> = 10Ω, f = 1kHz

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

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

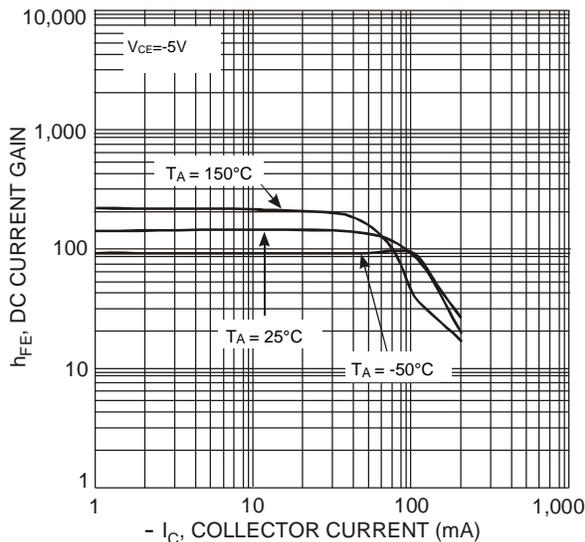


Fig. 2 Typical DC Current Gain vs. Collector Current

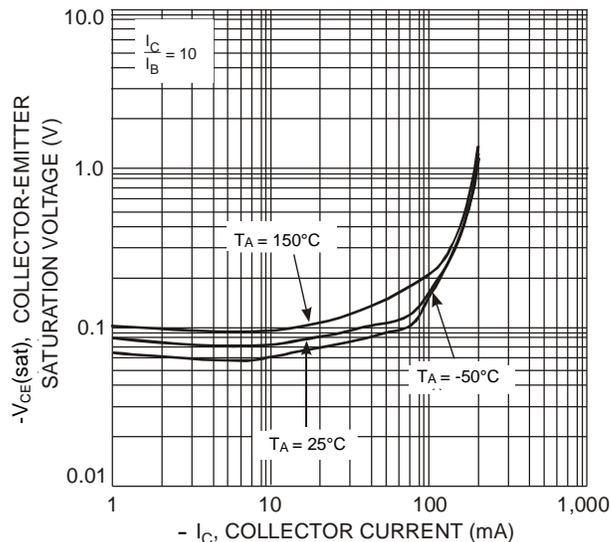


Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current

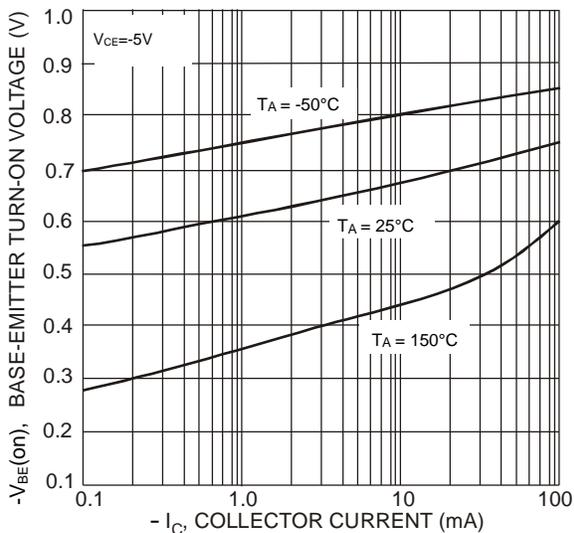


Fig. 4 Typical Base-Emitter Turn-On Voltage vs. Collector Current

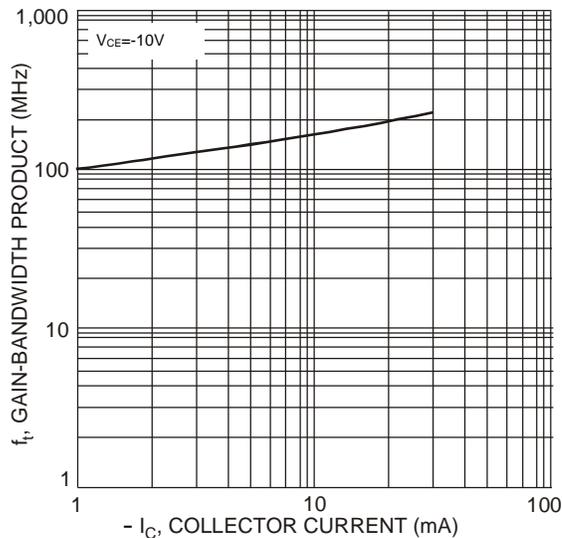
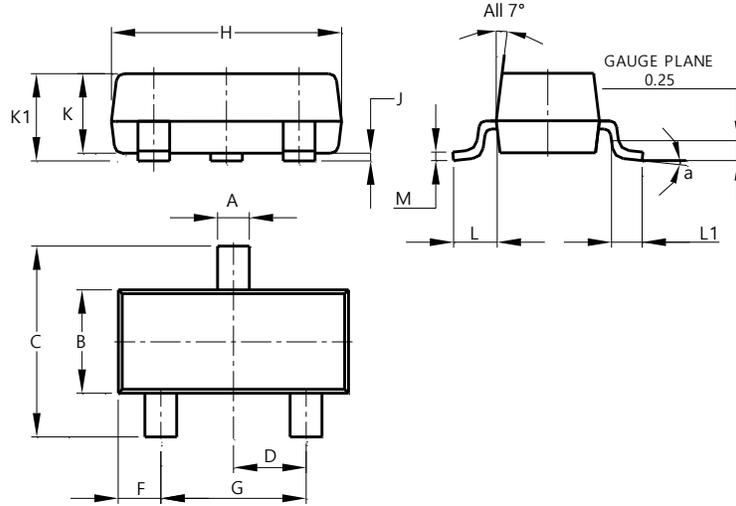


Fig. 5 Typical Gain-Bandwidth Product vs. Collector Current

## Package Outline Dimensions

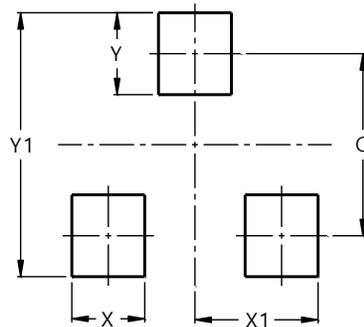
SOT23



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

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.