



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

- $BV_{CEO} > 40V$
- $I_C = 600mA$  Collector Current
- Epitaxial Planar Die Construction
- Ultra-Small Surface Mount Package
- Complementary PNP Type: NK-MMBT2907AT

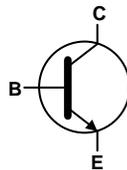
## Mechanical Data

- Case: SOT523
- 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 <sup>(E3)</sup>
- Weight: 0.002 grams (Approximate)

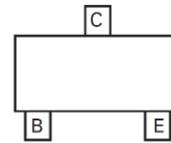
SOT523



Top View



Device Schematic



Package Pin Out Configuration

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	60	V
Collector-Emitter Voltage	$V_{CEO}$	40	V
Emitter-Base Voltage	$V_{EBO}$	6	V
Collector Current	$I_C$	600	mA

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

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	$P_D$	150	mW
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	833	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

**ESD Ratings** (Note 6)

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 with the collector lead 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 a steady-state.  
 6. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

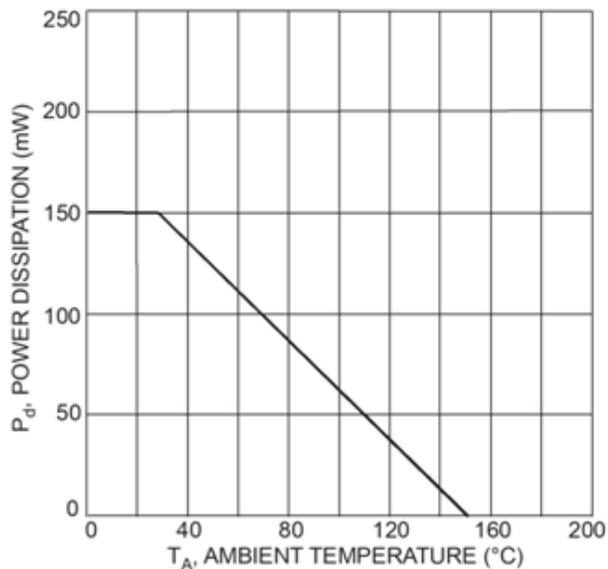
**Thermal Characteristics and Derating Information**


Fig. 1 Power Derating Curve

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

Characteristic	Symbol	Min	Max	Unit	Test Condition	
<b>OFF CHARACTERISTICS (Note 7)</b>						
Collector-Base Breakdown Voltage	$BV_{CBO}$	60	—	V	$I_C = 100\mu\text{A}$ , $I_E = 0$	
Collector-Emitter Breakdown Voltage	$BV_{CEO}$	40	—	V	$I_C = 1\text{mA}$ , $I_B = 0$	
Emitter-Base Breakdown Voltage	$BV_{EBO}$	6	—	V	$I_E = 100\mu\text{A}$ , $I_C = 0$	
Collector Cutoff Current	$I_{CEX}$	—	100	nA	$V_{CE} = 35\text{V}$ , $V_{EB(OFF)} = 0.4\text{V}$	
Base Cutoff Current	$I_{BL}$	—	100	nA	$V_{CE} = 35\text{V}$ , $V_{EB(OFF)} = 0.4\text{V}$	
<b>ON CHARACTERISTICS (Note 7)</b>						
DC Current Gain	$h_{FE}$	20	—	—	$I_C = 100\mu\text{A}$ , $V_{CE} = 1\text{V}$	
		40	—			$I_C = 1.0\text{mA}$ , $V_{CE} = 1\text{V}$
		80	—			$I_C = 10\text{mA}$ , $V_{CE} = 1\text{V}$
		100	300			$I_C = 150\text{mA}$ , $V_{CE} = 1\text{V}$
		40	—			$I_C = 500\text{mA}$ , $V_{CE} = 2\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	0.4 0.75	V	$I_C = 150\text{mA}$ , $I_B = 15\text{mA}$ $I_C = 500\text{mA}$ , $I_B = 50\text{mA}$	
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	0.75 —	0.95 1.2	V	$I_C = 150\text{mA}$ , $I_B = 15\text{mA}$ $I_C = 500\text{mA}$ , $I_B = 50\text{mA}$	
<b>SMALL SIGNAL CHARACTERISTICS</b>						
Output Capacitance	$C_{obo}$	—	6.5	pF	$V_{CB} = 5\text{V}$ , $f = 1.0\text{MHz}$ , $I_E = 0$	
Input Capacitance	$C_{ibo}$	—	30	pF	$V_{EB} = 0.5\text{V}$ , $f = 1.0\text{MHz}$ , $I_C = 0$	
Input Impedance	$h_{ie}$	1	15	k $\Omega$	$V_{CE} = 10\text{V}$ , $I_C = 1\text{mA}$ , $f = 1\text{MHz}$	
Voltage Feedback Ratio	$h_{re}$	0.1	8.0	$\times 10^{-4}$		
Small Signal Current Gain	$h_{fe}$	75	375	—		
Output Admittance	$h_{oe}$	1	30	$\mu\text{S}$		
Current Gain-Bandwidth Product	$f_T$	250	—	MHz	$V_{CE} = 20\text{V}$ , $I_C = 20\text{mA}$ , $f = 100\text{MHz}$	
<b>SWITCHING CHARACTERISTICS</b>						
Delay Time	$t_D$	—	15	ns	$V_{CC} = 30\text{V}$ , $I_C = 150\text{mA}$ , $V_{BE(OFF)} = 2\text{V}$ , $I_{B1} = 15\text{mA}$	
Rise Time	$t_R$	—	20	ns		
Storage Time	$t_S$	—	225	ns	$V_{CC} = 30\text{V}$ , $I_C = 150\text{mA}$ $I_{B1} = -I_{B2} = 15\text{mA}$	
Fall Time	$t_F$	—	30	ns		

 Notes: 7. 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.)

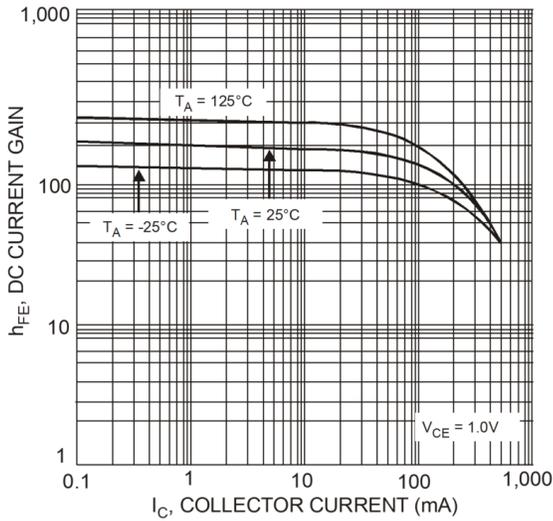


Fig. 2 Typical DC Current Gain vs. Collector Current

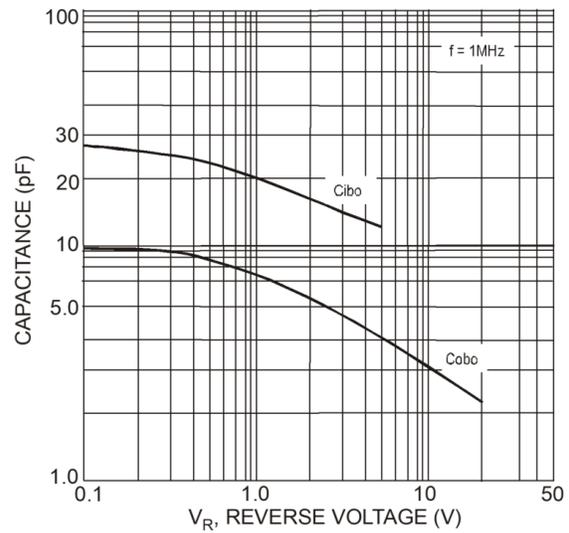


Fig. 3 Typical Capacitance

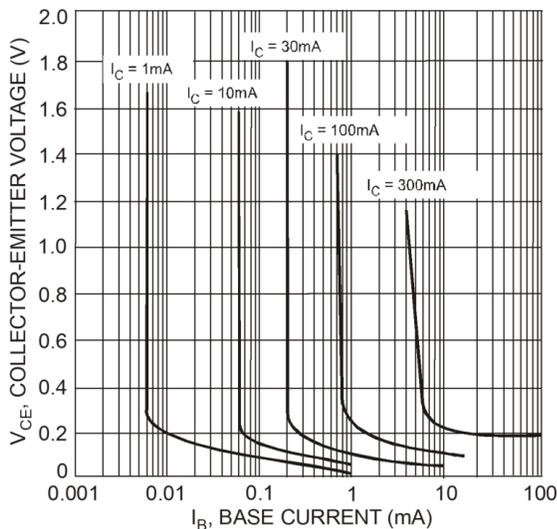


Fig. 4 Typical Collector Saturation Region

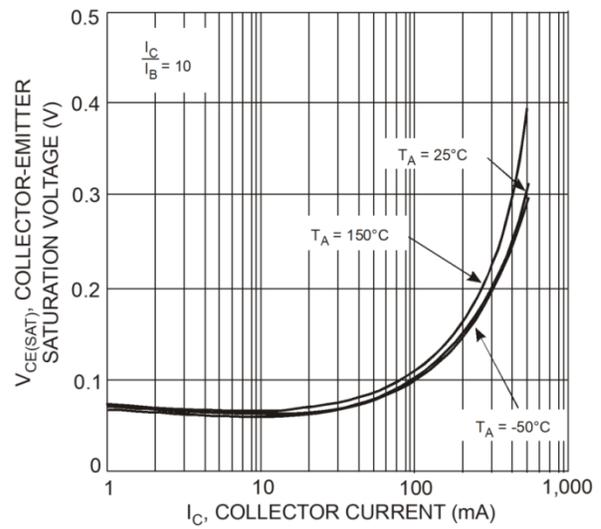


Fig. 5 Typical Collector Emitter Saturation Voltage vs. Collector Current

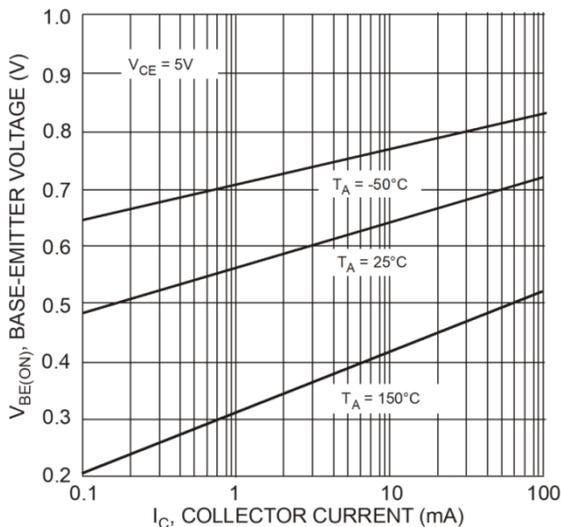


Fig. 6 Typical Base-Emitter Voltage vs. Collector Current

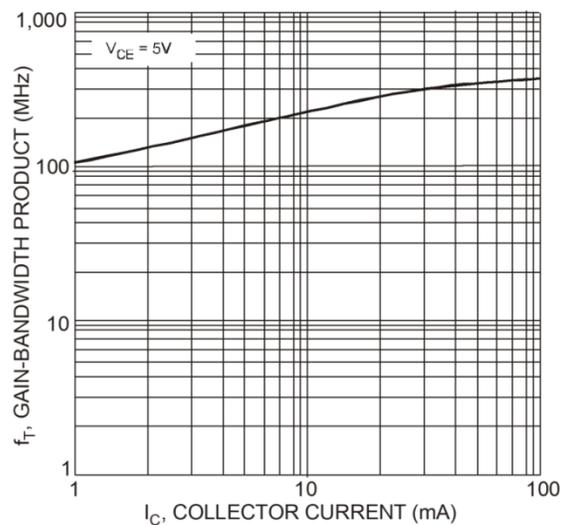
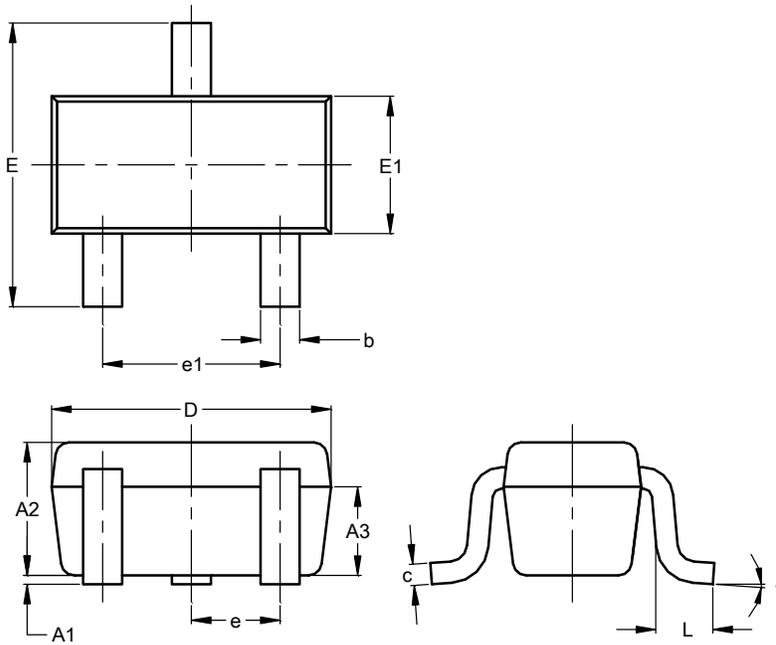


Fig. 7 Typical Gain-Bandwidth Product vs. Collector Current

Package Outline Dimensions

SOT523

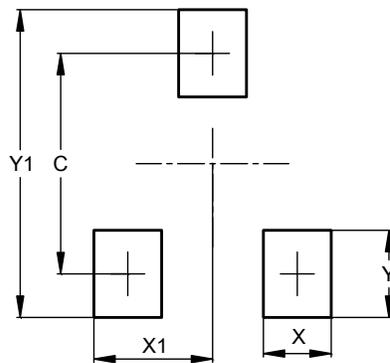


SOT523			
Dim	Min	Max	Typ
A1	0.00	0.10	0.05
A2	0.60	0.80	0.75
A3	0.45	0.65	0.50
b	0.15	0.30	0.22
c	0.10	0.20	0.12
D	1.50	1.70	1.60
E	1.45	1.75	1.60
E1	0.75	0.85	0.80
e	0.50 BSC		
e1	0.90	1.10	1.00
L	0.20	0.40	0.33
a	0°	--	8°

All Dimensions in mm

Suggested Pad Layout

SOT523



Dimensions	Value (in mm)
C	1.29
X	0.40
X1	0.70
Y	0.51
Y1	1.80