



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

- $BV_{CEO} > 40V$
- $I_C = 200mA$  Collector Current
- Epitaxial Planar Die Construction
- Ultra-Small Surface Mount Package
- Complementary PNP Type: NK-MMBT3906T

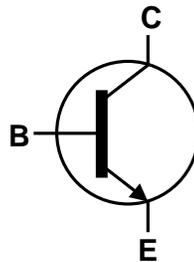
## Mechanical Data

- Case: SOT523
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads Solderable per MIL-STD-202, Method 208 (G3)
- Weight: 0.002 grams (Approximate)

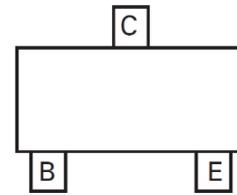
SOT523



Top View



Device Symbol



Pin-Out Top View

**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	$I_C$	200	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	$^\circ\text{C}/\text{W}$
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 FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  6. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

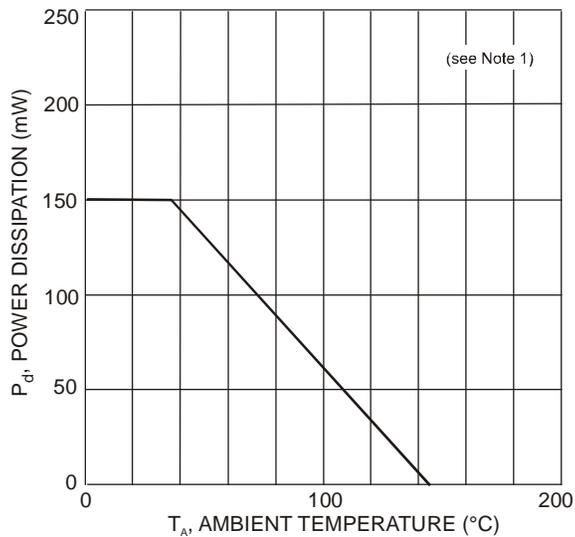
**Thermal Characteristics and Derating Information**


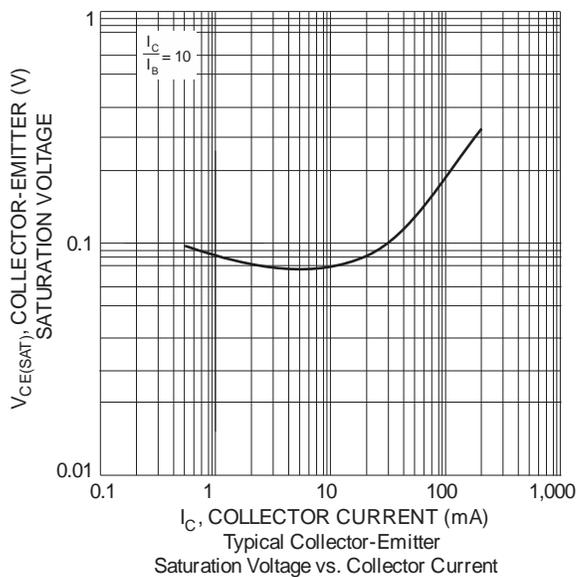
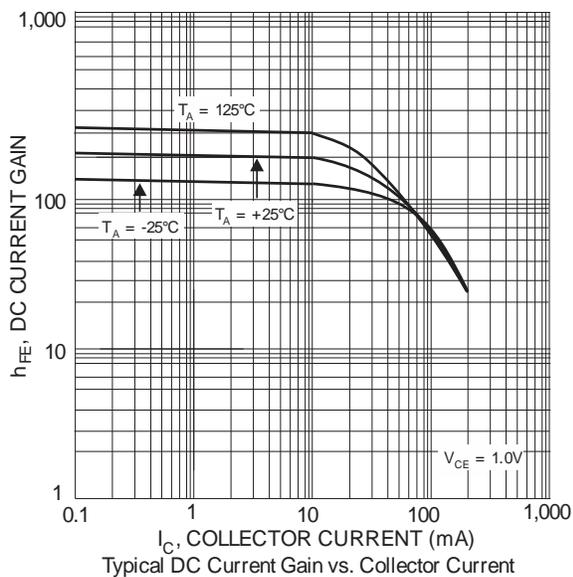
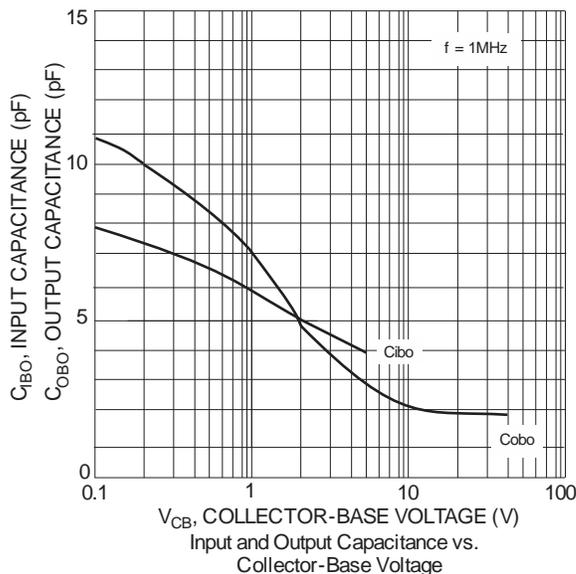
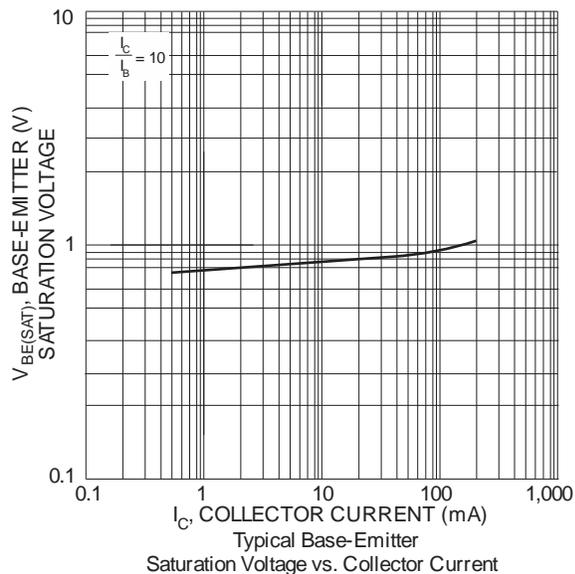
Fig. 1, Power Derating Curve

**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	$I_C = 10\mu\text{A}, I_E = 0$	
Collector-Emitter Breakdown Voltage	$BV_{CEO}$	40	—	V	$I_C = 1\text{mA}, I_B = 0$	
Emitter-Base Breakdown Voltage	$BV_{EBO}$	6	—	V	$I_E = 10\mu\text{A}, I_C = 0$	
Collector Cutoff Current	$I_{CEX}$	—	50	nA	$V_{CE} = 30\text{V}, V_{EB(OFF)} = 3\text{V}$	
Base Cutoff Current	$I_{BL}$	—	50	nA	$V_{CE} = 30\text{V}, V_{EB(OFF)} = 3\text{V}$	
<b>ON CHARACTERISTICS (Note 7)</b>						
DC Current Gain	$h_{FE}$	40	—	—	$I_C = 100\mu\text{A}, V_{CE} = 1\text{V}$	
		70	—			$I_C = 1\text{mA}, V_{CE} = 1\text{V}$
		100	300			$I_C = 10\text{mA}, V_{CE} = 1\text{V}$
		60	—			$I_C = 50\text{mA}, V_{CE} = 1\text{V}$
		30	—			$I_C = 100\text{mA}, V_{CE} = 1\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(SAT)}$	—	0.20 0.30	V	$I_C = 10\text{mA}, I_B = 1\text{mA}$ $I_C = 50\text{mA}, I_B = 5\text{mA}$	
Base-Emitter Saturation Voltage	$V_{BE(SAT)}$	0.65 —	0.85 0.95	V	$I_C = 10\text{mA}, I_B = 1\text{mA}$ $I_C = 50\text{mA}, I_B = 5\text{mA}$	
<b>SMALL SIGNAL CHARACTERISTICS</b>						
Output Capacitance	$C_{OBO}$	—	4	pF	$V_{CB} = 5\text{V}, f = 1.0\text{MHz}, I_E = 0$	
Input Capacitance	$C_{IBO}$	—	8	pF	$V_{EB} = 0.5\text{V}, f = 1.0\text{MHz}, I_C = 0$	
Input Impedance	$h_{iE}$	1	10	k $\Omega$	$V_{CE} = 10\text{V}, I_C = 1\text{mA},$ $f = 1.0\text{MHz}$	
Voltage Feedback Ratio	$h_{RE}$	0.5	8.0	$\times 10^{-4}$		
Small Signal Current Gain	$h_{FE}$	100	400	—		
Output Admittance	$h_{OE}$	1	40	$\mu\text{S}$		
Current Gain-Bandwidth Product	$f_T$	300	—	MHz	$V_{CE} = 20\text{V}, I_C = 10\text{mA},$ $f = 100\text{MHz}$	
Noise Figure	NF	—	5	dB	$V_{CC} = 5\text{V}, I_C = 100\mu\text{A},$ $R_S = 1\text{k}\Omega, f = 1\text{MHz}$	
<b>SWITCHING CHARACTERISTICS</b>						
Delay Time	$t_D$	—	35	ns	$V_{CC} = 3\text{V}, I_C = 10\text{mA},$ $V_{BE(OFF)} = -0.5\text{V}, I_{B1} = 1\text{mA}$	
Rise Time	$t_R$	—	35	ns		
Storage Time	$t_S$	—	200	ns	$V_{CC} = 3.0\text{V}, I_C = 10\text{mA}$ $I_{B1} = -I_{B2} = 1.0\text{mA}$	
Fall Time	$t_F$	—	50	ns		

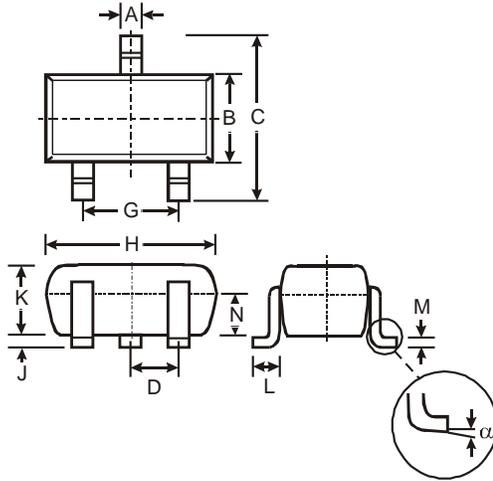
 Note: 7. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

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



## Package Outline Dimensions

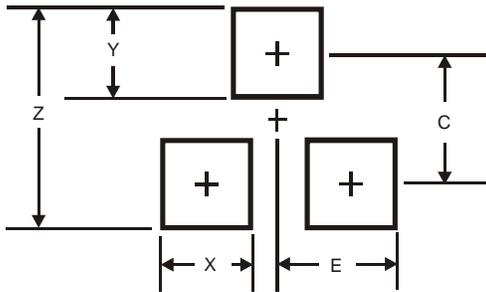
SOT523



SOT523			
Dim	Min	Max	Typ
A	0.15	0.30	0.22
B	0.75	0.85	0.80
C	1.45	1.75	1.60
D	—	—	0.50
G	0.90	1.10	1.00
H	1.50	1.70	1.60
J	0.00	0.10	0.05
K	0.60	0.80	0.75
L	0.10	0.30	0.22
M	0.10	0.20	0.12
N	0.45	0.65	0.50
$\alpha$	0°	8°	—
All Dimensions in mm			

## Suggested Pad Layout

SOT523



Dimensions	Value (in mm)
Z	1.8
X	0.4
Y	0.51
C	1.3
E	0.7