



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

- $BV_{CEO} > 60V$
- $I_C = 7A$  Continuous Collector Current
- $I_{CM} = 20A$  Peak Pulse Current
- Low Saturation Voltage  $V_{CE(sat)} < 50mV$  max @ 1A
- $R_{SAT} = 30m\Omega$  @ 6.5A for Low Equivalent On-Resistance
- $h_{FE}$  Specified up to 20A for High Gain Hold-Up

## Mechanical Data

- Case: SOT223
- 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: 0.112 grams (Approximate)

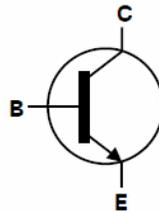
## Applications

- DC-DC Converters
- MOSFET Gate Drivers
- Charging Circuits
- Power Switches
- Motor Control

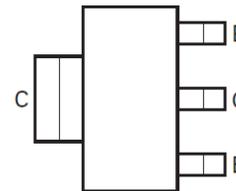
SOT223



Top View



Device Schematic



Pin-Out Top View

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	60	V
Collector-Emitter Voltage	V <sub>CEO</sub>	25	V
Emitter-Base Voltage	V <sub>EBO</sub>	7	V
Continuous Collector Current	I <sub>C</sub>	7	A
Peak Pulse Current	I <sub>CM</sub>	20	A

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

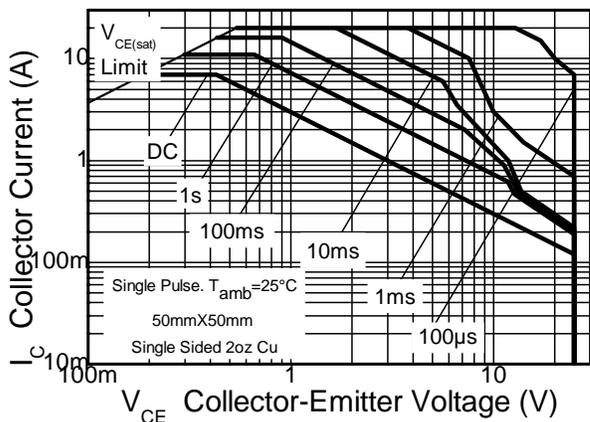
Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor	P <sub>D</sub>	3.0	W
		24	
		1.6	
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	12.8	°C/W
		42	
		78	
Thermal Resistance, Junction to Lead	R <sub>θJL</sub>	8.8	
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**ESD Ratings** (Note 8)

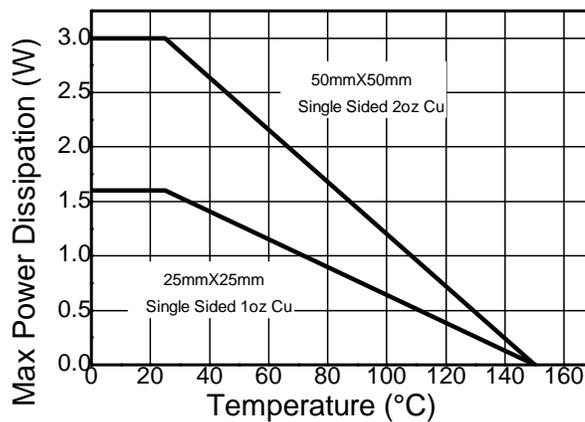
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	8,000	V	3B
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
5. For a device mounted with the collector lead on 52mm x 52mm 2oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady-state.
  6. Same as Note 5, except the device is mounted on 25mm x 25mm 1oz copper.
  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.

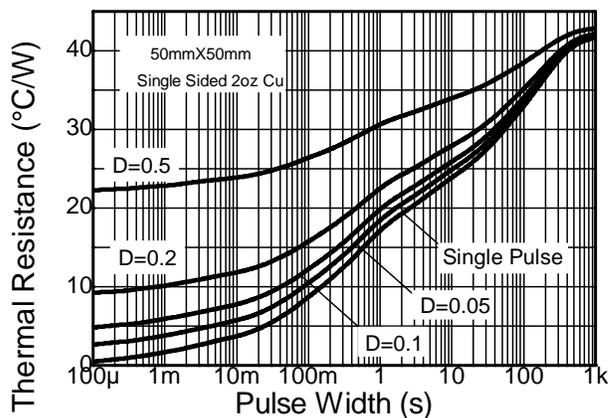
### Thermal Characteristics and Derating Information



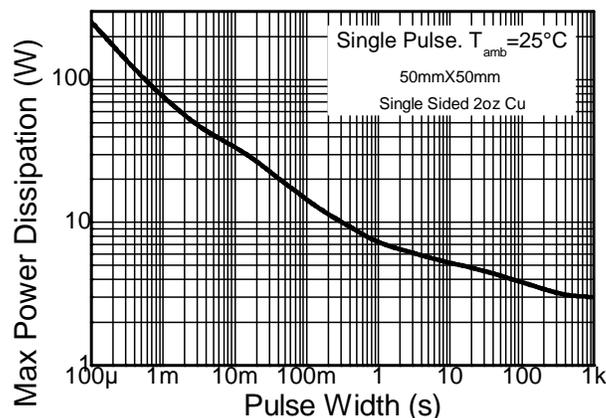
**Safe Operating Area**



**Derating Curve**



**Transient Thermal Impedance**



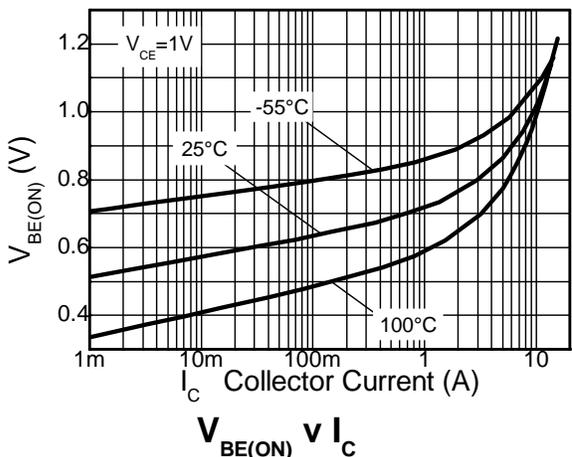
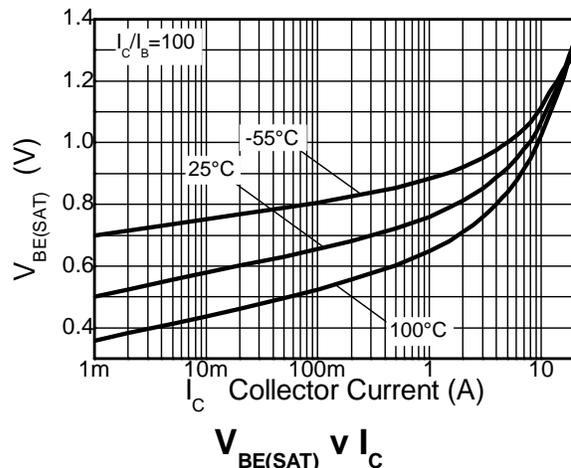
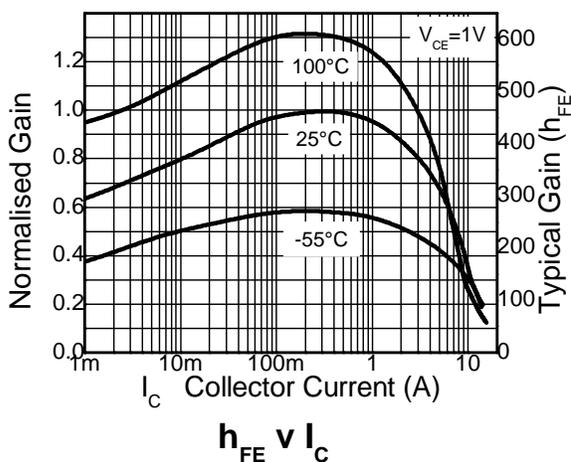
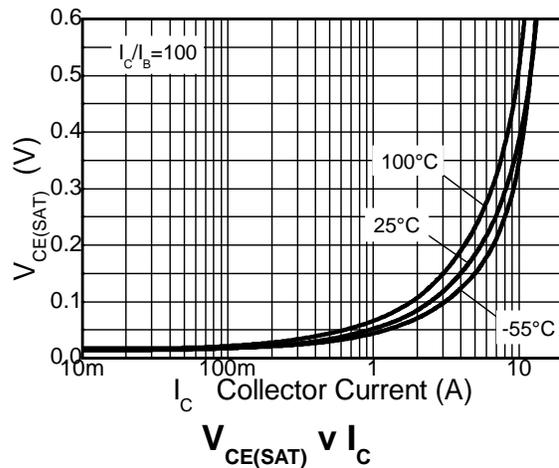
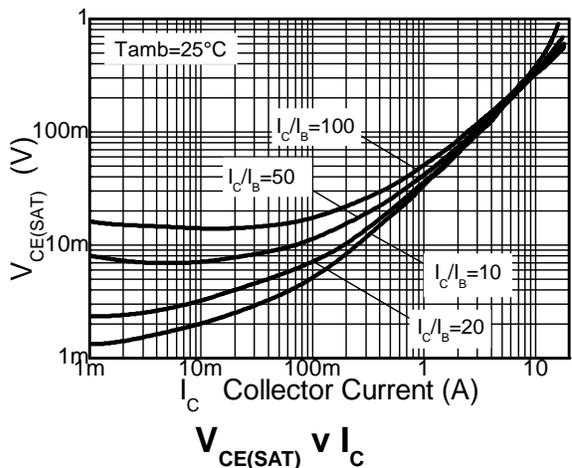
**Pulse Power Dissipation**

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

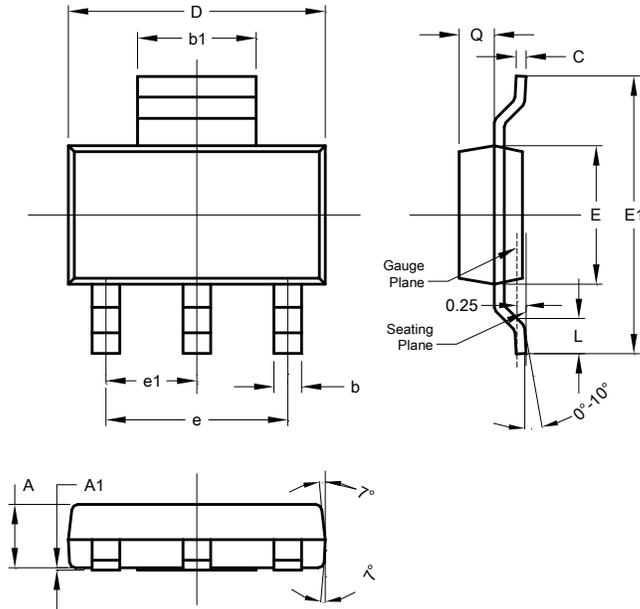
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	60	120	—	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage	$BV_{CER}$	60	120	—	V	$I_C = 1\mu\text{A}$ , $R_B \leq 1\text{k}\Omega$
Collector-Emitter Breakdown Voltage (Note 9)	$BV_{CEO}$	25	35	—	V	$I_C = 10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	7.0	8.1	—	V	$I_E = 100\mu\text{A}$
Collector Cut-Off Current	$I_{CBO}$	—	< 1	50	nA	$V_{CB} = 50\text{V}$
		—	—	0.5	$\mu\text{A}$	$V_{CB} = 50\text{V}$ , $T_A = +100^\circ\text{C}$
Collector Cut-Off Current	$I_{CER}$ $R \leq 1\text{k}\Omega$	—	< 1	100	nA	$V_{CB} = 50\text{V}$
		—	—	0.5	$\mu\text{A}$	$V_{CB} = 50\text{V}$ , $T_A = +100^\circ\text{C}$
Emitter Cut-Off Current	$I_{EBO}$	—	< 1	10	nA	$V_{EB} = 6\text{V}$
Collector-Emitter Saturation Voltage (Note 9)	$V_{CE(sat)}$	—	28 35 55 115 195	40 50 75 140 230	mV	$I_C = 500\text{mA}$ , $I_B = 10\text{mA}$ $I_C = 1\text{A}$ , $I_B = 100\text{mA}$ $I_C = 1\text{A}$ , $I_B = 10\text{mA}$ $I_C = 2\text{A}$ , $I_B = 10\text{mA}$ $I_C = 6.5\text{A}$ , $I_B = 150\text{mA}$
Base-Emitter Saturation Voltage (Note 9)	$V_{BE(sat)}$	—	980	1080	mV	$I_C = 6.5\text{A}$ , $I_B = 150\text{mA}$
Base-Emitter Turn-On Voltage (Note 9)	$V_{BE(on)}$	—	890	980	mV	$I_C = 6.5\text{A}$ , $V_{CE} = 1\text{V}$
DC Current Gain (Note 9)	$h_{FE}$	300 300 200 40	400 450 275 55	—	—	$I_C = 10\text{mA}$ , $V_{CE} = 1\text{V}$ $I_C = 1\text{A}$ , $V_{CE} = 1\text{V}$ $I_C = 7\text{A}$ , $V_{CE} = 1\text{V}$ $I_C = 20\text{A}$ , $V_{CE} = 1\text{V}$
Transition Frequency	$f_T$	—	150	—	MHz	$V_{CE} = 10\text{V}$ , $I_C = 100\text{mA}$ , $f = 50\text{MHz}$
Output Capacitance (Note 9)	$C_{obo}$	—	48	—	pF	$V_{CB} = 10\text{V}$ , $f = 1\text{MHz}$
Switching Times	$t_{ON}$	—	33	—	ns	$V_{CC} = 10\text{V}$ , $I_C = 1\text{A}$ , $I_{B1} = -I_{B2} = 100\text{mA}$
	$t_{OFF}$	—	464	—		

 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.)

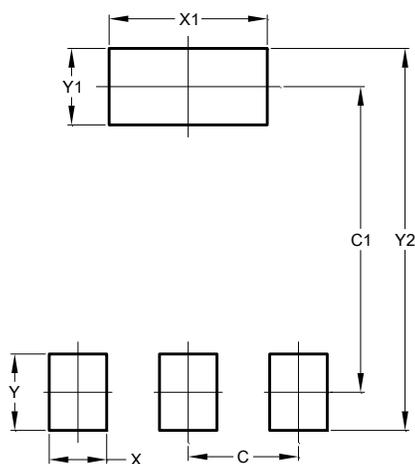


### Package Outline Dimensions



SOT223			
Dim	Min	Max	Typ
A	1.55	1.65	1.60
A1	0.010	0.15	0.05
b	0.60	0.80	0.70
b1	2.90	3.10	3.00
C	0.20	0.30	0.25
D	6.45	6.55	6.50
E	3.45	3.55	3.50
E1	6.90	7.10	7.00
e	-	-	4.60
e1	-	-	2.30
L	0.85	1.05	0.95
Q	0.84	0.94	0.89
<b>All Dimensions in mm</b>			

### Suggested Pad Layout



Dimensions	Value (in mm)
C	2.30
C1	6.40
X	1.20
X1	3.30
Y	1.60
Y1	1.60
C2	8.00