



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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## Features

- $BV_{CEO} > 10V$
- $I_C = 5A$  High Continuous Collector Current
- $I_{CM} = 20A$  Peak Pulse Current
- Low Saturation Voltage  $V_{CE(sat)} < 45mV @ 500mA$
- $R_{SAT} = 44m\Omega @ 5A$  for a Low Equivalent On-Resistance
- $h_{FE}$  Specified up to 20A for a High Gain Hold-Up

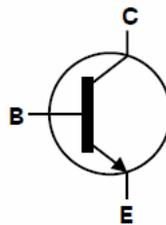
## Mechanical Data

- Package: SOT223
- Package 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 
- Weight: 0.112 grams (Approximate)

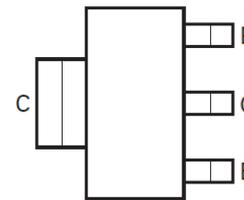
SOT223



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>	35	V
Collector-Emitter Voltage	V <sub>CEO</sub>	10	V
Emitter-Base Voltage	V <sub>EBO</sub>	7	V
Continuous Collector Current	I <sub>C</sub>	5	A
Peak Pulse Current	I <sub>CM</sub>	20	A
Base Current	I <sub>B</sub>	500	mA

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

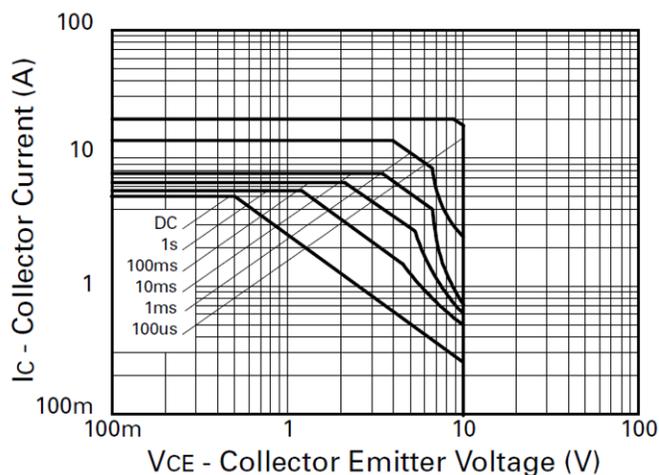
Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	(Note 5)	3
		(Note 6)	2
		(Note 7)	1.6
		(Note 8)	1.2
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	(Note 5)	41.7
		(Note 6)	62.5
		(Note 7)	78.1
		(Note 8)	104
Thermal Resistance Junction to Lead	R <sub>θJL</sub>	10.9	
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

### ESD Ratings (Note 10)

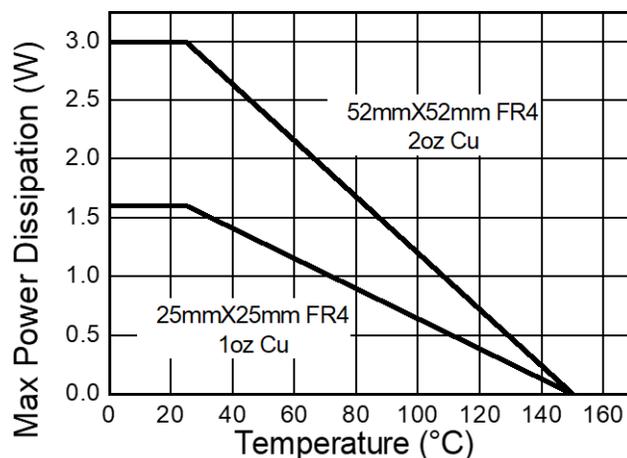
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
5. For a device mounted with the collector lead on 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 a steady-state.
  6. Same as note (5), except the device is mounted on 25mm x 25mm 2oz copper.
  7. Same as note (5), except the device is mounted on 25mm x 25mm 1oz copper.
  8. Same as note (5), except the device is mounted on minimum recommended pad layout.
  9. Thermal resistance from junction to solder-point (at the end of the collector lead).
  10. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

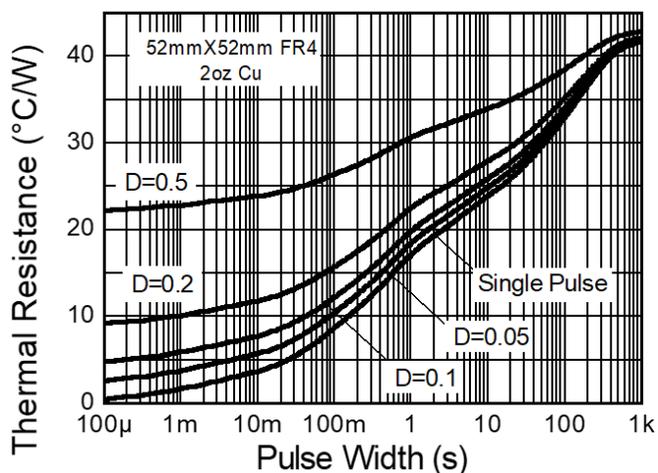
**Thermal Characteristics and Derating Information**



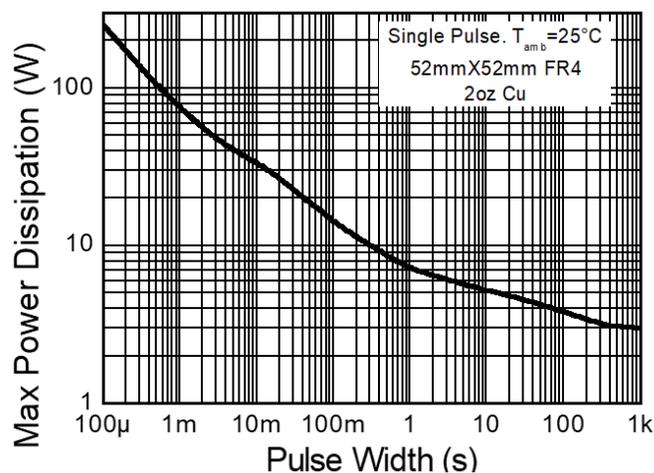
**Fig.1 Safe Operating Area**



**Fig.2 Derating Curve**



**Fig.3 Transient Thermal Impedance**



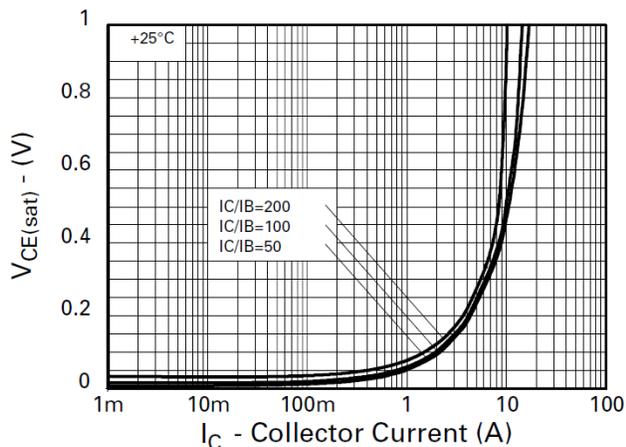
**Fig.4 Pulse Power Dissipation**

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

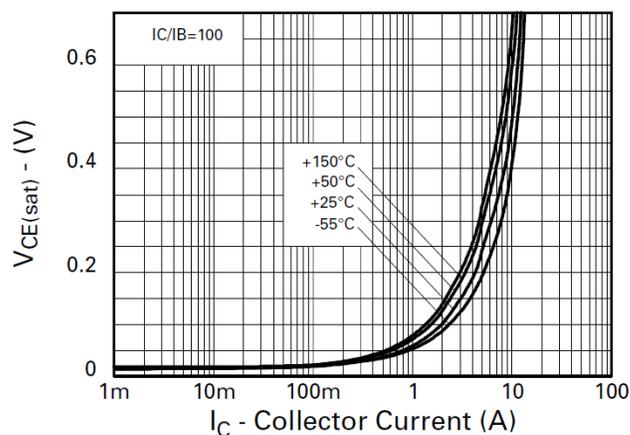
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	35	65	—	V	I <sub>C</sub> = 100μA
Collector-Emitter Breakdown Voltage	BV <sub>CES</sub>	35	55	—	V	I <sub>C</sub> = 100μA
Collector-Emitter Breakdown Voltage	BV <sub>CEV</sub>	35	60	—	V	I <sub>C</sub> = 100μA, V <sub>EB</sub> = 1V
Collector-Emitter Breakdown Voltage (Note 11)	BV <sub>CEO</sub>	10	16	—	V	I <sub>C</sub> = 10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	7	8.7	—	V	I <sub>E</sub> = 100μA
Collector Cut-Off Current	I <sub>CBO</sub>	—	0.3	10	nA	V <sub>CB</sub> = 20V
Collector Cut-Off Current	I <sub>CES</sub>	—	0.3	10	nA	V <sub>CB</sub> = 20V
Emitter Cut-Off Current	I <sub>EBO</sub>	—	0.3	10	nA	V <sub>EB</sub> = 4V
Collector-Emitter Saturation Voltage (Note 11)	V <sub>CE(sat)</sub>	—	25	40	mV	I <sub>C</sub> = 500mA, I <sub>B</sub> = 10mA
		—	50	70		I <sub>C</sub> = 1A, I <sub>B</sub> = 10mA
		—	140	200		I <sub>C</sub> = 3A, I <sub>B</sub> = 15mA
		—	220	350		I <sub>C</sub> = 5A, I <sub>B</sub> = 25mA
Base-Emitter Saturation Voltage (Note 11)	V <sub>BE(sat)</sub>	—	925	1000	mV	I <sub>C</sub> = 5A, I <sub>B</sub> = 25mA
Base-Emitter Turn-On Voltage (Note 11)	V <sub>BE(on)</sub>	—	890	975	mV	I <sub>C</sub> = 5A, V <sub>CE</sub> = 2V
DC Current Gain (Note 11)	h <sub>FE</sub>	280	430	1200	—	I <sub>C</sub> = 10mA, V <sub>CE</sub> = 2V
		290	440			I <sub>C</sub> = 0.5A, V <sub>CE</sub> = 2V
		300	450			I <sub>C</sub> = 1A, V <sub>CE</sub> = 2V
		200	330			I <sub>C</sub> = 5A, V <sub>CE</sub> = 2V
		60	110			I <sub>C</sub> = 20A, V <sub>CE</sub> = 2V
Output Capacitance	C <sub>obo</sub>	—	85	110	pF	V <sub>CB</sub> = 10V, f = 1MHz
Current Gain-Bandwidth Product	f <sub>T</sub>	—	150	—	MHz	V <sub>CE</sub> = 10V, I <sub>C</sub> = 50mA, f = 50MHz
Switching Times	t <sub>on</sub>	—	130	—	ns	I <sub>C</sub> = 4A, V <sub>CC</sub> = 10V, I <sub>B1</sub> = -I <sub>B2</sub> = 40mA
	t <sub>off</sub>	—	230	—		

Note: 11. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2.

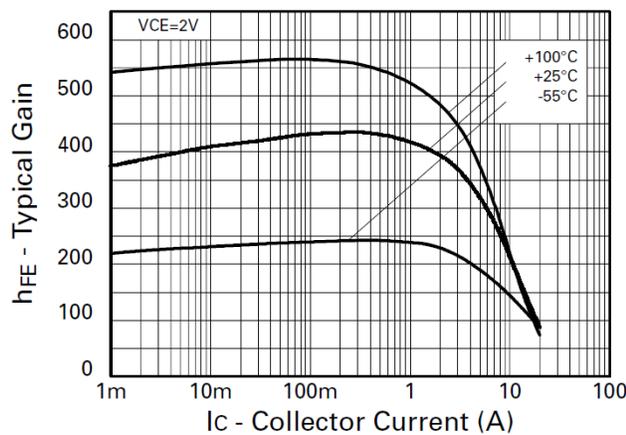
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



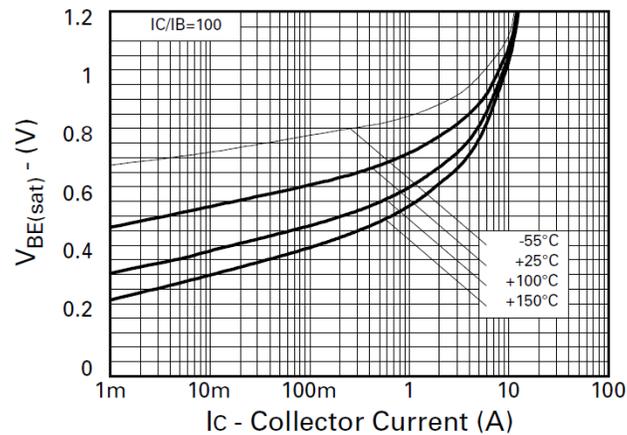
**Fig.5  $V_{CE(sat)} \ v \ I_C$**



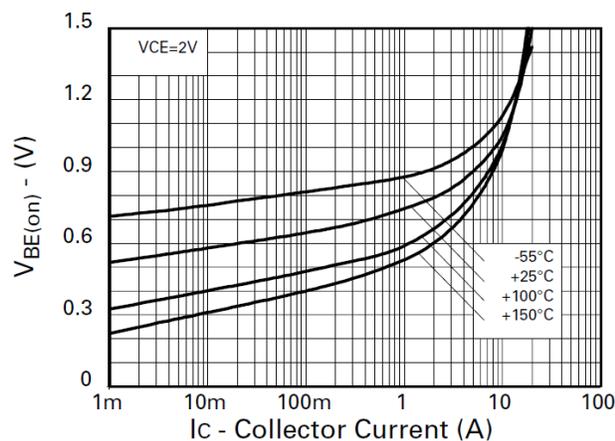
**Fig.6  $V_{CE(sat)} \ v \ I_C$**



**Fig.7  $h_{FE} \ v \ I_C$**



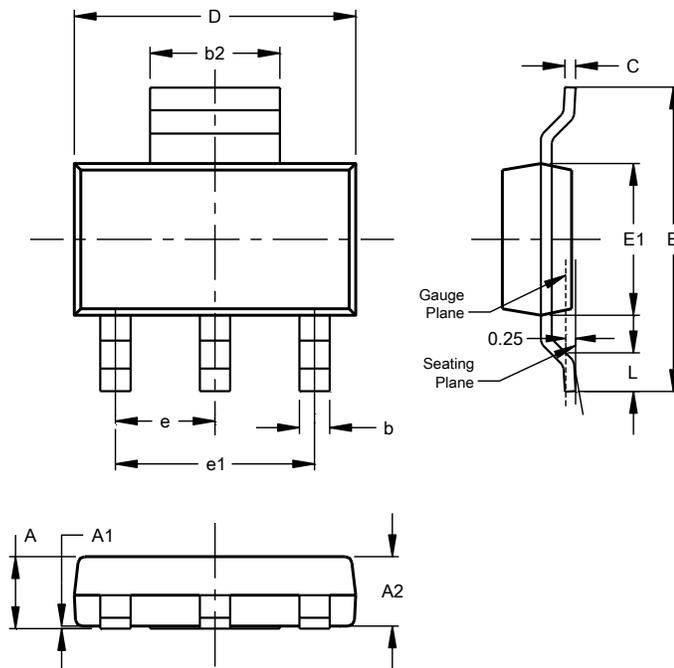
**Fig.8  $V_{BE(sat)} \ v \ I_C$**



**Fig.9  $V_{BE(on)} \ v \ I_C$**

### Package Outline Dimensions

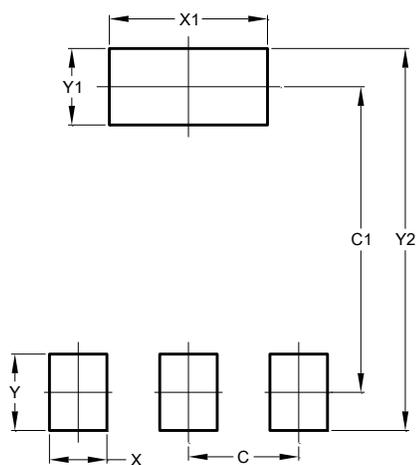
SOT223 (Type DN)



SOT223 (Type DN)			
Dim	Min	Max	Typ
A	--	1.70	--
A1	0.01	0.15	--
A2	1.50	1.68	1.60
b	0.60	0.80	0.70
b2	2.90	3.10	--
c	0.20	0.32	--
D	6.30	6.70	--
E	6.70	7.30	--
E1	3.30	3.70	--
e	--	--	2.30
e1	--	--	4.60
L	0.85	--	--
All Dimensions in mm			

### Suggested Pad Layout

SOT223 (Type DN)



Dimensions	Value (in mm)
C	2.30
C1	6.40
X	1.20
X1	3.30
Y	1.60
Y1	1.60
Y2	8.00