



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

- $BV_{CEO} > 12V$
- $BV_{ECO} > 3V$
- $I_C = 4.5A$  Continuous Collector Current
- Low Saturation Voltage  $V_{CE(sat)} < 70mV @ 1A$
- $R_{CE(sat)} = 43m\Omega$
- 1.5W Power Dissipation
- Complementary PNP Type: NK-ZXTP07012EFF

## Mechanical Data

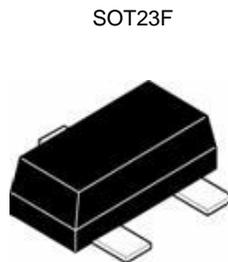
- Case: SOT23F
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208③
- Weight: 0.012 grams (Approximate)

## Description

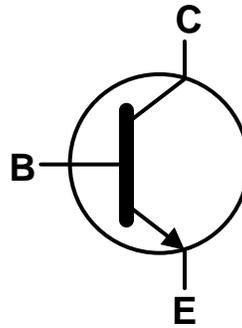
This low voltage NPN transistor has been designed for applications requiring high gain and very low saturation voltage. The SOT23F package is pin compatible with the industry standard SOT23 footprint but offers lower profile and higher dissipation for applications where power density is of utmost importance.

## Applications

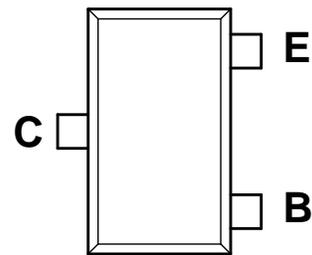
- LED Driver
- Boost Converters
- Logic Interface
- Motor Drive



Top View



Device Symbol



Top View  
Pin Configuration

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	20	V
Collector-Emitter Voltage	V <sub>CEO</sub>	12	V
Emitter-Collector Voltage (Reverse Blocking)	V <sub>ECO</sub>	3	V
Emitter-Base Voltage	V <sub>EBO</sub>	7	V
Continuous Collector Current	I <sub>C</sub>	4.5	A
Peak Pulse Current	I <sub>CM</sub>	10	A
Base Current	I <sub>B</sub>	1	A

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

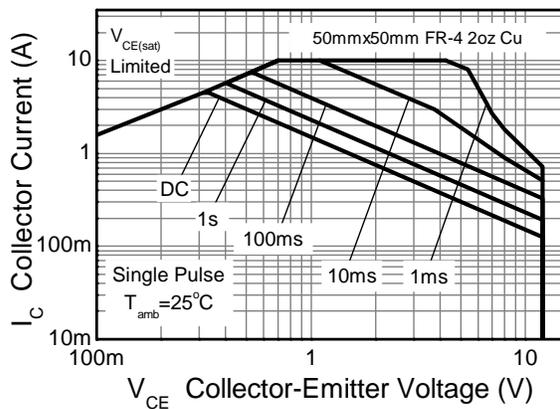
Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor	P <sub>D</sub>	0.84	W mW/°C
		6.72	
		1.34	
		10.72	
		1.50	
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	12.0	°C/W
		2.0	
		16.0	
		149	
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	93	°C/W
		83	
		60	
Thermal Resistance, Junction to Lead	R <sub>θJL</sub>	43.77	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

### ESD Ratings (Note 10)

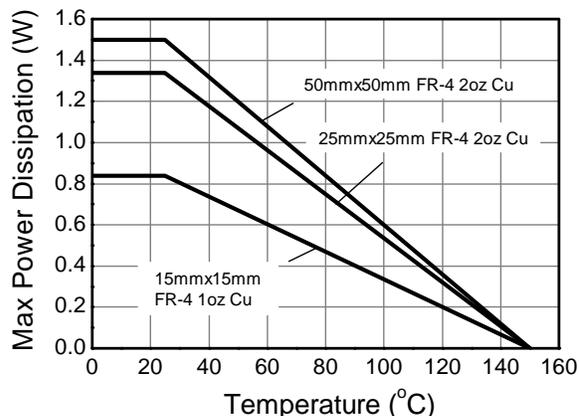
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
5. For a device mounted with the exposed collector pad on 15mm x 15mm 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. 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 50mm x 50mm 2oz copper.
  8. Same as Note 7, whilst measured at t < 5 seconds.
  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.

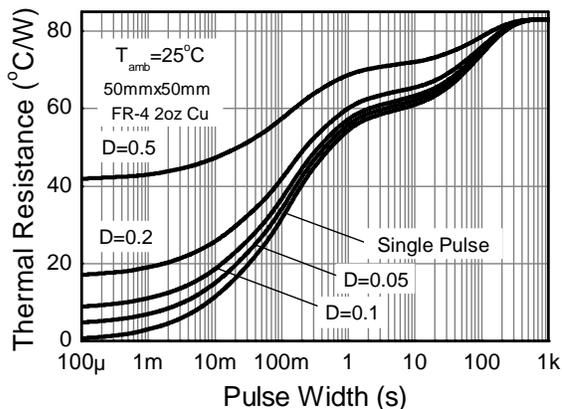
**Thermal Characteristics and Derating Information**



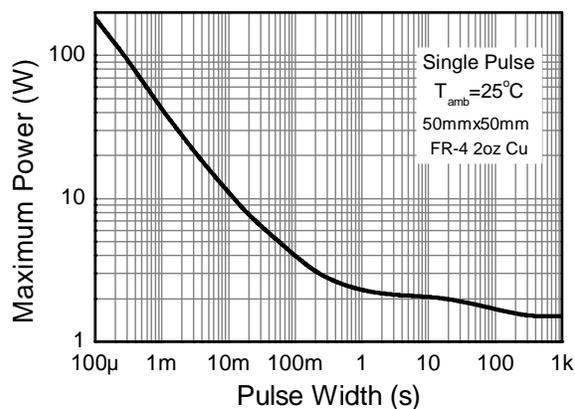
**Safe Operating Area**



**Derating Curve**



**Transient Thermal Impedance**



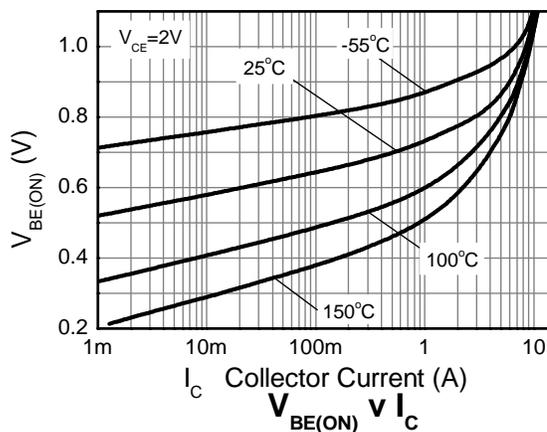
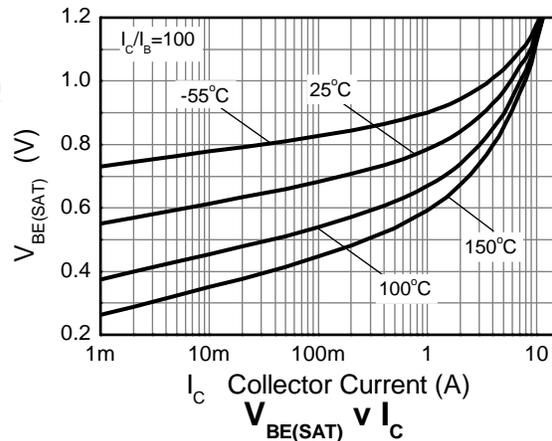
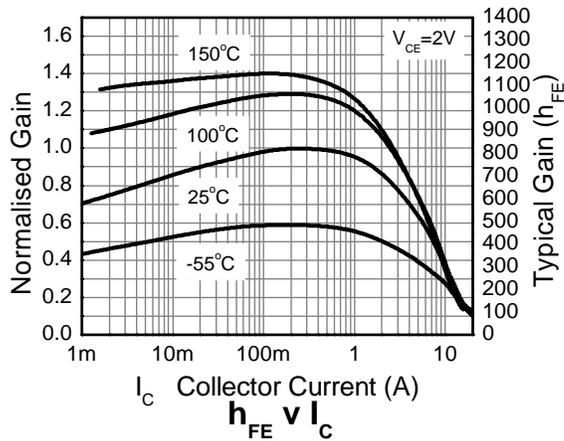
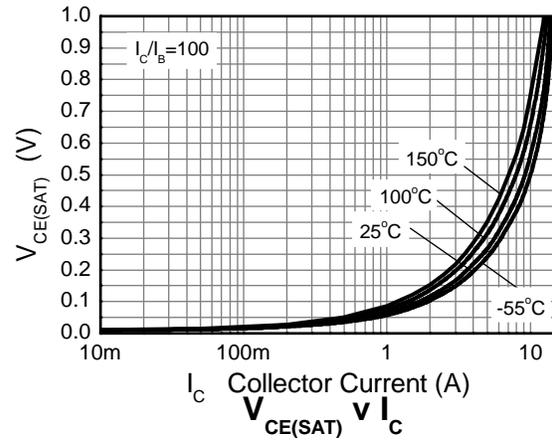
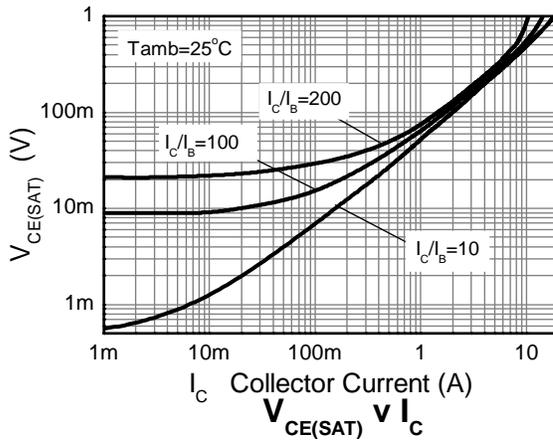
**Pulse Power Dissipation**

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

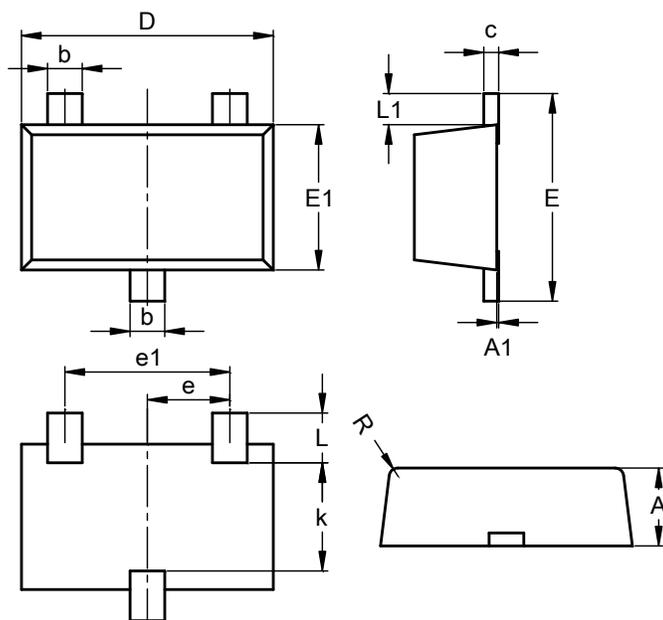
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	20	40	—	V	I <sub>C</sub> = 100μA
Collector-Emitter Breakdown Voltage (Base Open) (Note 11)	BV <sub>CEO</sub>	12	17	—	V	I <sub>C</sub> = 10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	7	8.3	—	V	I <sub>E</sub> = 100μA
Emitter-Collector Breakdown Voltage (Reverse Blocking)	BV <sub>ECX</sub>	6	8.2	—	V	I <sub>E</sub> = 100μA; R <sub>BC</sub> < 1kΩ or 0.25V < V <sub>BC</sub> < -0.25V
Emitter-Collector Breakdown Voltage (Base Open)	BV <sub>ECO</sub>	3	5.3	—	V	I <sub>E</sub> = 100μA
Collector-Base Cut-Off Current	I <sub>CBO</sub>	—	<1	50	nA μA	V <sub>CB</sub> = 16V V <sub>CB</sub> = 16V, T <sub>A</sub> = +100°C
Emitter-Base Cut-Off Current	I <sub>EBO</sub>	—	<1	50	nA	V <sub>EB</sub> = 5.6V
<b>ON CHARACTERISTICS (Note 11)</b>						
Static Forward Current Transfer Ratio	h <sub>FE</sub>	500 400 330 140	800 650 530 230	1500 — — —	—	I <sub>C</sub> = 100mA, V <sub>CE</sub> = 2V I <sub>C</sub> = 2A, V <sub>CE</sub> = 2V I <sub>C</sub> = 4.5A, V <sub>CE</sub> = 2V I <sub>C</sub> = 10A, V <sub>CE</sub> = 2V
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub>	—	25 60 50 105 215	40 85 70 150 320	mV	I <sub>C</sub> = 0.1A, I <sub>B</sub> = 0.5mA I <sub>C</sub> = 1A, I <sub>B</sub> = 10mA I <sub>C</sub> = 1A, I <sub>B</sub> = 100mA I <sub>C</sub> = 2A, I <sub>B</sub> = 20mA I <sub>C</sub> = 4.5A, I <sub>B</sub> = 45mA
Base-Emitter Saturation Voltage	V <sub>BE(sat)</sub>	—	945	1050	mV	I <sub>C</sub> = 4.5A, I <sub>B</sub> = 45mA
Base-Emitter On Voltage	V <sub>BE(on)</sub>	—	850	950	mV	I <sub>C</sub> = 4.5A, V <sub>CE</sub> = 2V
<b>SMALL SIGNAL CHARACTERISTICS</b>						
Transition Frequency	f <sub>T</sub>	150	220	—	MHz	I <sub>C</sub> = 50mA, V <sub>CE</sub> = 5V, f = 50MHz
Input Capacitance	C <sub>ibo</sub>	—	229	—	pF	V <sub>EB</sub> = 0.5V, f = 1MHz
Output Capacitance	C <sub>obo</sub>	—	40	50	pF	V <sub>CB</sub> = 10V, f = 1MHz
Delay Time	t <sub>d</sub>	—	26.8	—	ns	V <sub>CC</sub> = 10V, I <sub>C</sub> = 500mA, I <sub>B1</sub> = -I <sub>B2</sub> = 50mA
Rise Time	t <sub>r</sub>	—	14.2	—	ns	
Storage Time	t <sub>s</sub>	—	250	—	ns	
Fall Time	t <sub>f</sub>	—	67.7	—	ns	

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

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

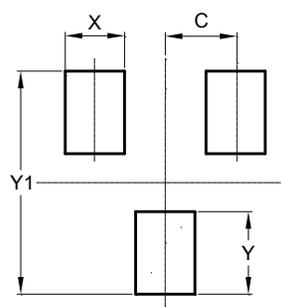


## Package Outline Dimensions

**SOT23F**


SOT23F			
Dim	Min	Max	Typ
A	0.80	1.00	0.90
A1	0.00	0.10	0.01
b	0.35	0.50	0.44
c	0.10	0.20	0.16
D	2.80	3.00	2.90
e	0.95 REF		
e1	1.90 REF		
E	2.30	2.50	2.40
E1	1.50	1.70	1.65
k	1.20	-	-
L	0.30	0.65	0.50
L1	0.30	0.50	0.40
R	0.05	0.15	-
All Dimensions in mm			

## Suggested Pad Layout

**SOT23F**


Dimensions	Value (in mm)
C	0.95
X	0.80
Y	1.110
Y1	3.000