



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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## Description

This Bipolar Junction Transistor (BJT) is designed to meet the stringent requirements of automotive applications.

## Features

- $BV_{CE0} > 40V$
- $I_C = 1A$  high Continuous Current
- Low saturation voltage  $V_{CE(sat)} < 500mV @ 1A$
- Complementary PNP type: NK-FCX591AQ

## Mechanical Data

- Package: SOT89
- 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 ③
- Weight: 0.05 grams (Approximate)

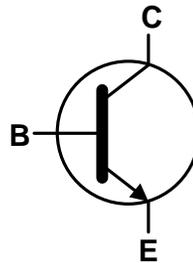
## Applications

- Power MOSFET gate driving
- Low loss power switching

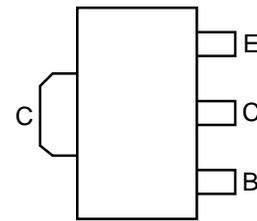
SOT89



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>	40	V
Collector-Emitter Voltage	V <sub>CEO</sub>	40	V
Emitter-Base Voltage	V <sub>EBO</sub>	7	V
Continuous Collector Current	I <sub>C</sub>	1	A
Peak Pulse Current	I <sub>CM</sub>	2	A

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

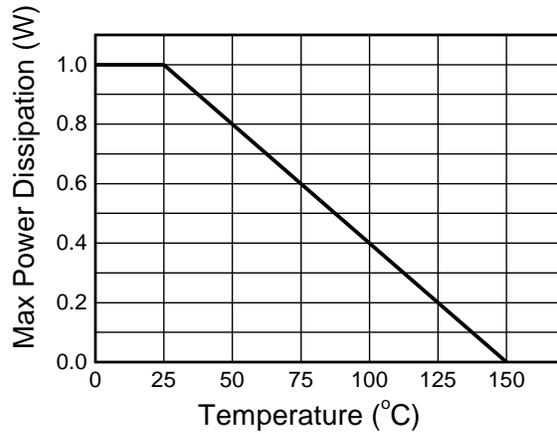
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	P <sub>D</sub>	1	W
Thermal Resistance, Junction to Ambient Air (Note 5)	R <sub>θJA</sub>	125	°C/W
Thermal Resistance, Junction to Leads (Note 6)	R <sub>θJL</sub>	10.01	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-65 to +150	°C

**ESD Ratings** (Note 7)

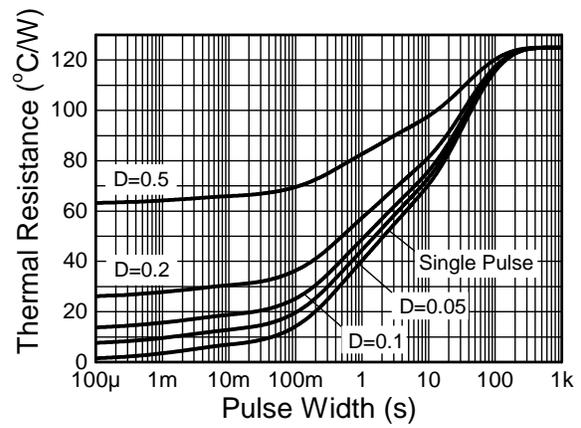
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

- Notes:
5. For a device surface mounted on 15mm x 15mm FR4 PCB with high coverage of single sided 1 oz copper, in still air conditions; device measured when operating in steady state condition.
  6. Thermal resistance from junction to solder-point (on the exposed collector pad).
  7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

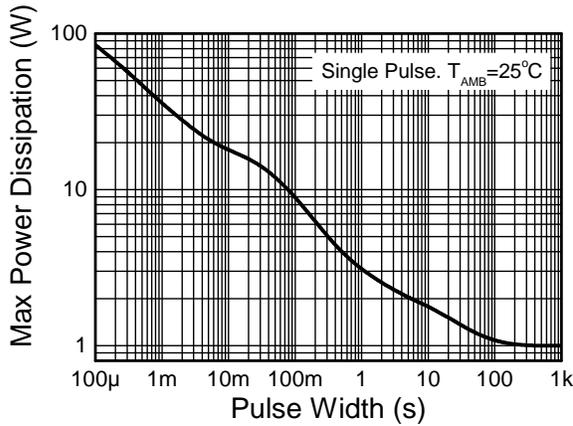
## Thermal Characteristics and Derating Information



**Fig. 1 Derating Curve**



**Fig. 2 Transient Thermal Impedance**



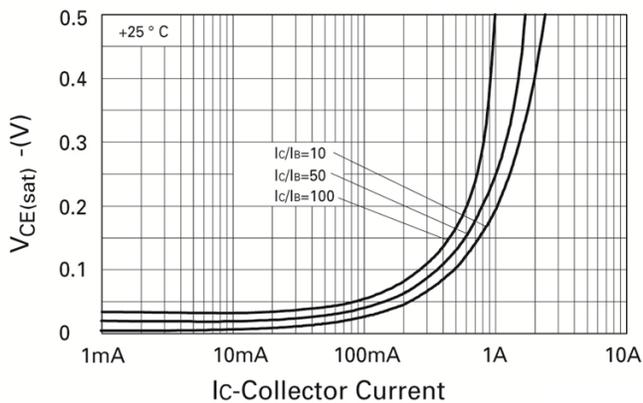
**Fig. 3 Pulse Power Dissipation**

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

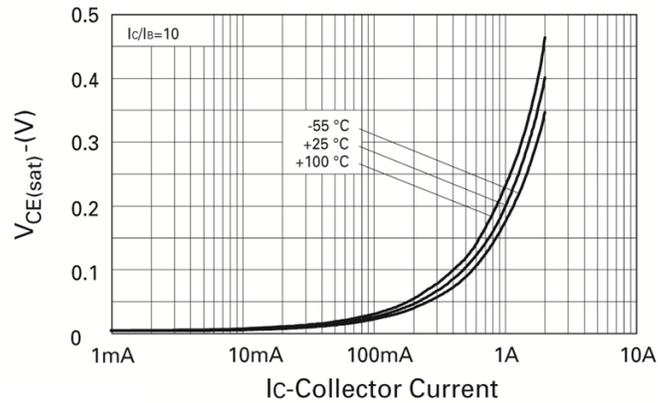
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CB0</sub>	40	-	-	V	I <sub>C</sub> = 100μA
Collector-Emitter Breakdown Voltage (Note 8)	BV <sub>CEO</sub>	40	-	-	V	I <sub>C</sub> = 10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	7	-	-	V	I <sub>E</sub> = 100μA
Collector Cutoff Current	I <sub>CB0</sub>	-	-	100	nA	V <sub>CB</sub> = 30V
Emitter Cutoff Current	I <sub>EBO</sub>	-	-	100	nA	V <sub>EB</sub> = 4V
Emitter Cutoff Current	I <sub>CES</sub>	-	-	100	nA	V <sub>CE</sub> = 30V
DC current transfer Static ratio (Note 8)	h <sub>FE</sub>	300	-	-	-	I <sub>C</sub> = 1mA, V <sub>CE</sub> = 5V
		300	-	900		I <sub>C</sub> = 500mA, V <sub>CE</sub> = 5V
		200	-	-		I <sub>C</sub> = 1A, V <sub>CE</sub> = 5V
		35	-	-		I <sub>C</sub> = 2A, V <sub>CE</sub> = 5V
Collector-Emitter Saturation Voltage (Note 8)	V <sub>CE(sat)</sub>	-	-	0.3 0.5	V	I <sub>C</sub> = 500mA, I <sub>B</sub> = 50mA I <sub>C</sub> = 1A, I <sub>B</sub> = 100mA
Base-Emitter Saturation Voltage (Note 8)	V <sub>BE(sat)</sub>	-	-	1.1	V	I <sub>C</sub> = 1A, I <sub>B</sub> = 100mA
Base-Emitter Turn-on Voltage (Note 8)	V <sub>BE(on)</sub>	-	-	1.0	V	I <sub>C</sub> = 1A, V <sub>CE</sub> = 5V
Transitional Frequency	f <sub>T</sub>	150	-	-	MHz	I <sub>C</sub> = 50mA, V <sub>CE</sub> = 10V f = 100MHz
Output capacitance	C <sub>obo</sub>	-	-	10	pF	V <sub>CB</sub> = 10V, f = 1MHz,

Note: 8. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

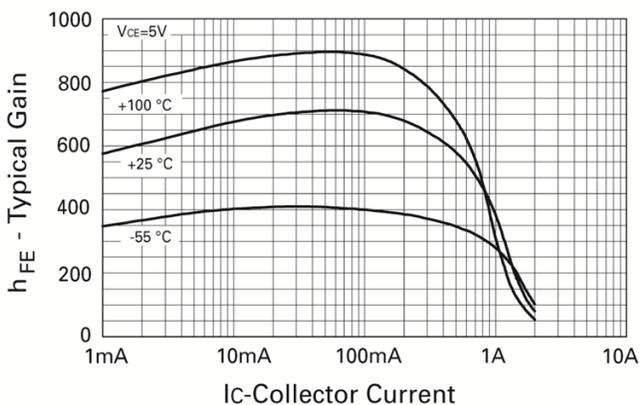
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



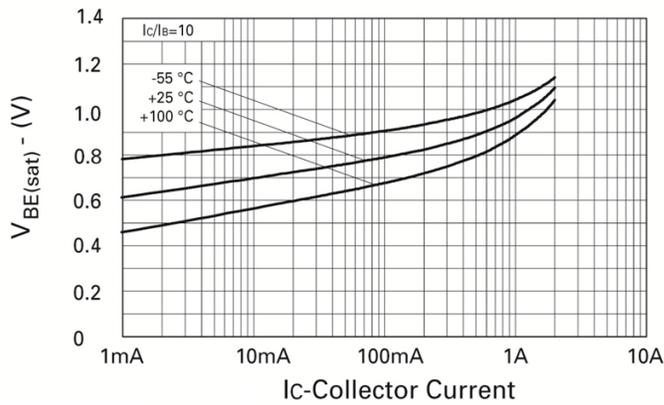
**Fig. 4  $V_{CE(sat)}$  v  $I_C$**



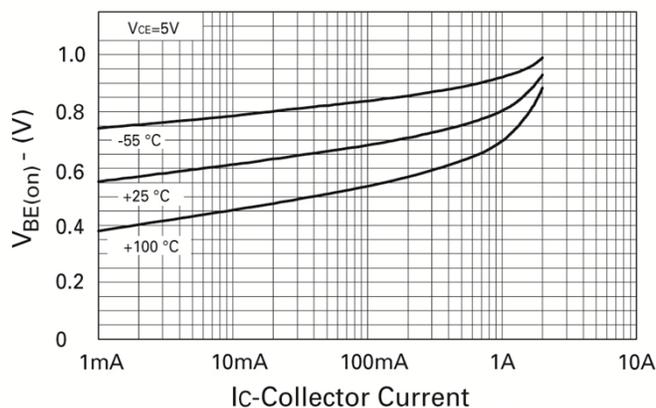
**Fig. 5  $V_{CE(sat)}$  v  $I_C$**



**Fig. 6  $h_{FE}$  v  $I_C$**



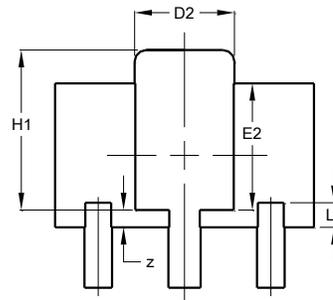
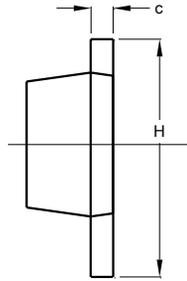
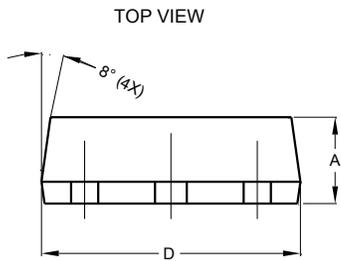
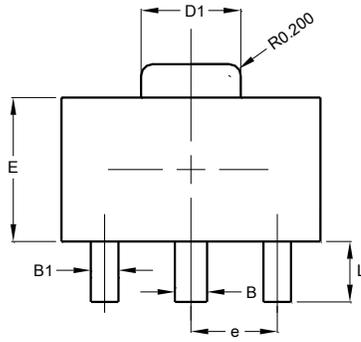
**Fig. 7  $V_{BE(sat)}$  v  $I_C$**



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

## Package Outline Dimensions

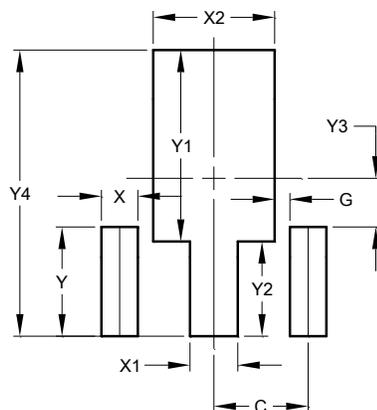
SOT89



SOT89			
Dim	Min	Max	Typ
A	1.40	1.60	1.50
B	0.50	0.62	0.56
B1	0.42	0.54	0.48
c	0.35	0.43	0.38
D	4.40	4.60	4.50
D1	1.62	1.83	1.733
D2	1.61	1.81	1.71
E	2.40	2.60	2.50
E2	2.05	2.35	2.20
e	-	-	1.50
H	3.95	4.25	4.10
H1	2.63	2.93	2.78
L	0.90	1.20	1.05
L1	0.327	0.527	0.427
z	0.20	0.40	0.30
All Dimensions in mm			

## Suggested Pad Layout

SOT89



Dimensions	Value (in mm)
C	1.500
G	0.244
X	0.580
X1	0.760
X2	1.933
Y	1.730
Y1	3.030
Y2	1.500
Y3	0.770
Y4	4.530