



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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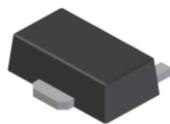
## Features

- $BV_{CE0} > -40V$
- $I_C = -4A$  Continuous Collector Current
- Ultra-Low Collector-Emitter Saturation Voltage
- Ideally Suited for Automated Assembly Processes
- Ideal for Medium Power Switching or Amplification Applications

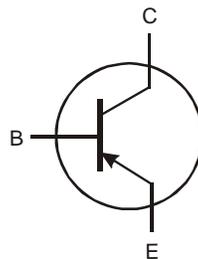
## Mechanical Data

- Package: SOT89
- Package 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 208 
- Weight: 0.055 grams (Approximate)

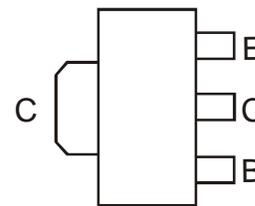
SOT89



Top View



Device Schematic



Pin-Out Top

### Absolute Maximum Ratings @ $T_A = 25^\circ\text{C}$ unless otherwise specified

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	-40	V
Collector-Emitter Voltage	$V_{CEO}$	-40	V
Emitter-Base Voltage	$V_{EBO}$	-6	V
Peak Pulse Collector Current	$I_{CM}$	-10	A
Repetitive Peak Pulse Collector Current (Note 5)	$I_{CRP}$	-5	A
Continuous Collector Current	$I_C$	-4	A
Peak Pulse Base Current	$I_{BM}$	-2	A
Continuous Base Current	$I_B$	-1	A

### Thermal Characteristics

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 6) @ $T_A = 25^\circ\text{C}$	$P_D$	0.9	W
Thermal Resistance, Junction to Ambient Air (Note 6) @ $T_A = 25^\circ\text{C}$	$R_{\theta JA}$	139	$^\circ\text{C/W}$
Power Dissipation (Note 7) @ $T_A = 25^\circ\text{C}$	$P_D$	2	W
Thermal Resistance, Junction to Ambient Air (Note 7) @ $T_A = 25^\circ\text{C}$	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$
Thermal Resistance, Junction to Case (Note 6) @ $T_A = 25^\circ\text{C}$	$R_{\theta JC}$	17	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$

- Notes:
5. Pulse width  $\leq 10\text{ms}$ ; Duty cycle  $\leq 0.2$
  6. For a device mounted on FR-4 PCB with minimum recommended pad layout.
  7. For a device mounted on FR-4 PCB with  $1\text{inch}^2$  copper pad layout.

### Thermal Characteristics and Derating Information

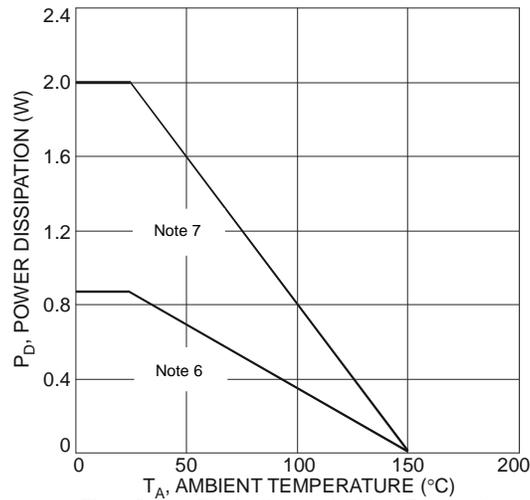


Fig. 1 Power Dissipation vs. Ambient Temperature

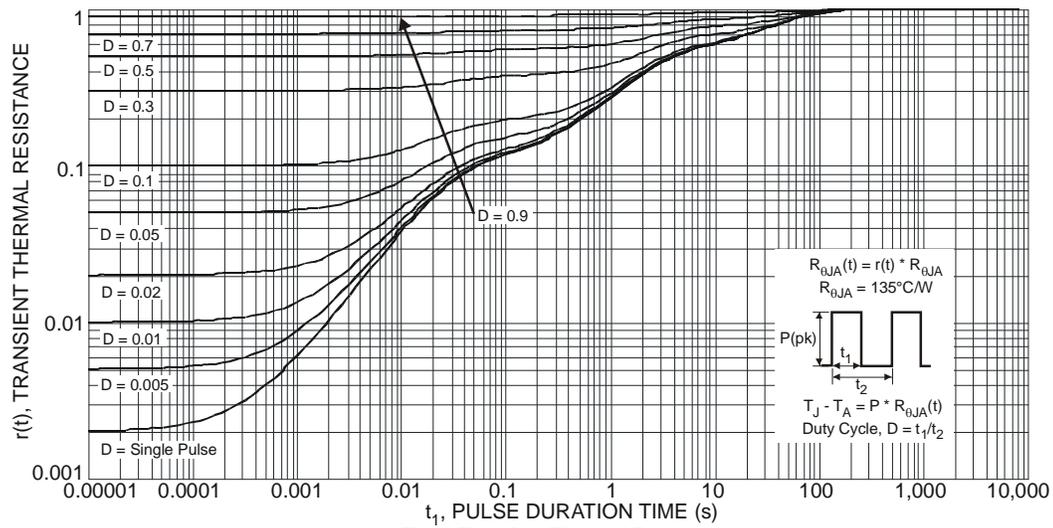


Fig. 2 Transient Thermal Response

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Conditions
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>	-6	—	—	V	I <sub>E</sub> = -100μA
Collector-Base Cutoff Current	I <sub>CB0</sub>	—	—	-100	nA	V <sub>CB</sub> = -30V, I <sub>E</sub> = 0
		—	—	-50	μA	V <sub>CB</sub> = -30V, I <sub>E</sub> = 0, T <sub>A</sub> = 150°C
Emitter-Base Cutoff Current	I <sub>EBO</sub>	—	—	-100	nA	V <sub>EB</sub> = -5V, I <sub>C</sub> = 0
DC Current Gain (Note 8)	h <sub>FE</sub>	250	—	—	—	V <sub>CE</sub> = -2V, I <sub>C</sub> = -0.5A
		200	350	—		V <sub>CE</sub> = -2V, I <sub>C</sub> = -1A
		150	—	—		V <sub>CE</sub> = -2V, I <sub>C</sub> = -2A
		50	—	—		V <sub>CE</sub> = -2V, I <sub>C</sub> = -5A
Collector-Emitter Saturation Voltage (Note 8)	V <sub>CE(sat)</sub>	—	—	-120	mV	I <sub>C</sub> = -0.5A, I <sub>B</sub> = -5mA
		—	—	-170		I <sub>C</sub> = -1A, I <sub>B</sub> = -10mA
		—	-70	-160		I <sub>C</sub> = -2A, I <sub>B</sub> = -200mA
		—	-165	-340		I <sub>C</sub> = -4A, I <sub>B</sub> = -200mA
		—	-150	-375		I <sub>C</sub> = -5A, I <sub>B</sub> = -500mA
Equivalent On-Resistance	R <sub>CE(sat)</sub>	—	-30	-75	mΩ	I <sub>C</sub> = -5A, I <sub>B</sub> = -500mA
Base-Emitter Saturation Voltage	V <sub>BE(sat)</sub>	—	—	-1.1	V	I <sub>C</sub> = -4A, I <sub>B</sub> = -200mA
		—	—	-1.2		I <sub>C</sub> = -5A, I <sub>B</sub> = -500mA
Base-Emitter Turn-on Voltage	V <sub>BE(on)</sub>	—	—	-1.0	V	V <sub>CE</sub> = -2V, I <sub>C</sub> = -2A
Transition Frequency	f <sub>T</sub>	60	—	—	MHz	V <sub>CE</sub> = -10V, I <sub>C</sub> = -0.1A, f = 100MHz
Collector Capacitance	C <sub>C</sub>	—	—	105	pF	V <sub>CB</sub> = -10V, I <sub>E</sub> = 0A, f = 1MHz
Turn-On Time	t <sub>on</sub>	—	63	—	ns	V <sub>CC</sub> = -10V, I <sub>C</sub> = -2A, I <sub>B1</sub> = -I <sub>B2</sub> = -200mA
Delay Time	t <sub>d</sub>	—	15	—	ns	
Rise Time	t <sub>r</sub>	—	48	—	ns	
Turn-Off Time	t <sub>off</sub>	—	280	—	ns	
Storage Time	t <sub>s</sub>	—	232	—	ns	
Fall Time	t <sub>f</sub>	—	48	—	ns	

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

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

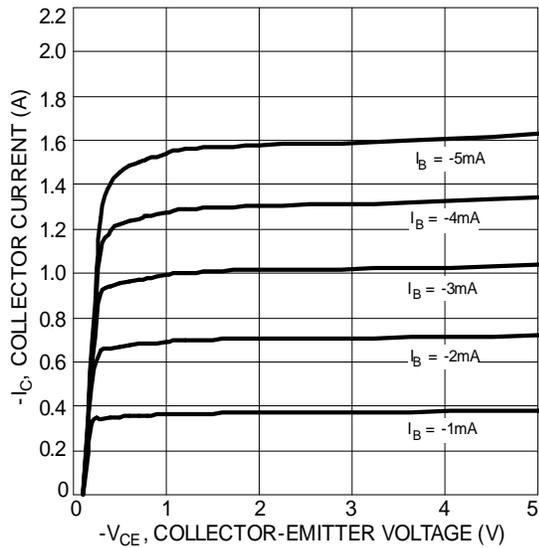


Fig. 3 Typical Collector Current vs. Collector-Emitter Voltage

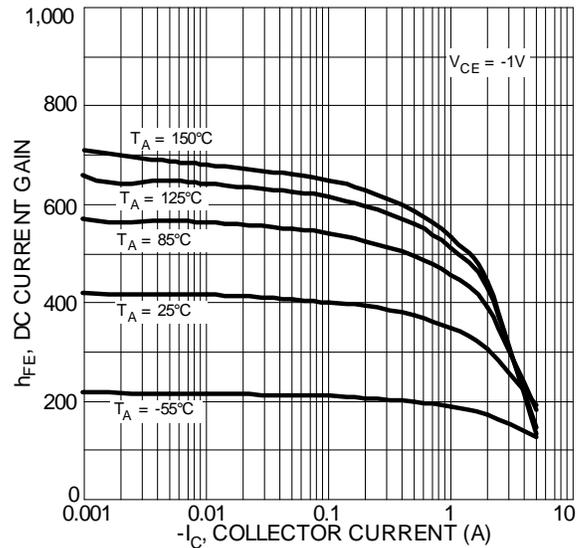


Fig. 4 Typical DC Current Gain vs. Collector Current

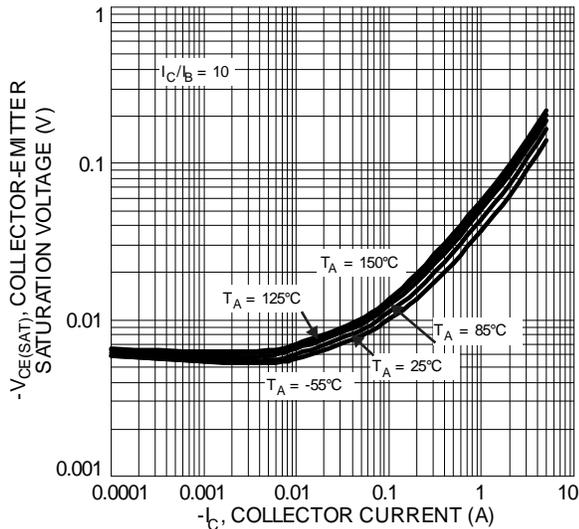


Fig. 5 Typical Collector-Emitter Saturation Voltage vs. Collector Current

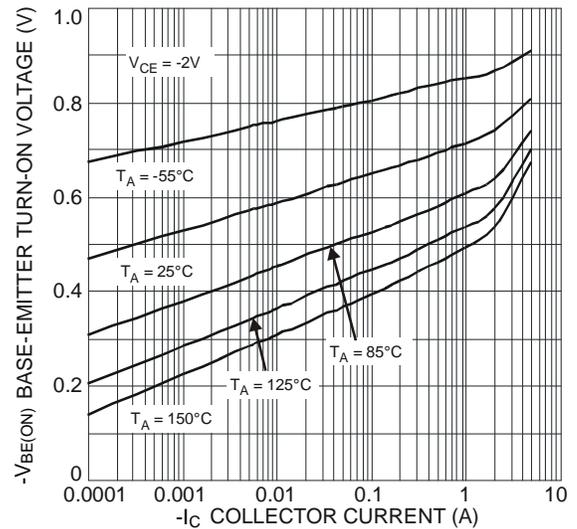


Fig. 6 Typical Base-Emitter Turn-On Voltage vs. Collector Current

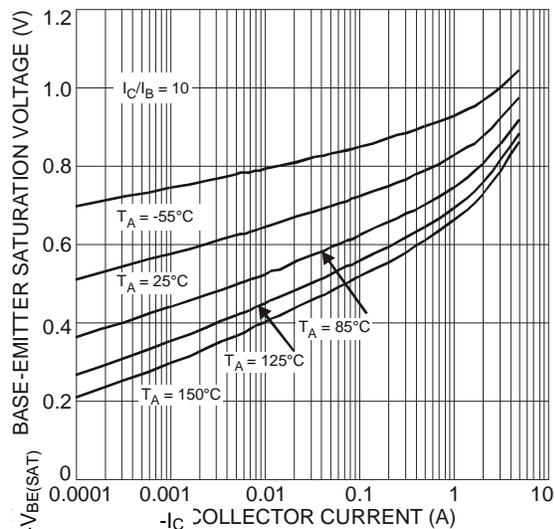


Fig. 7 Typical Base-Emitter Saturation Voltage vs. Collector Current

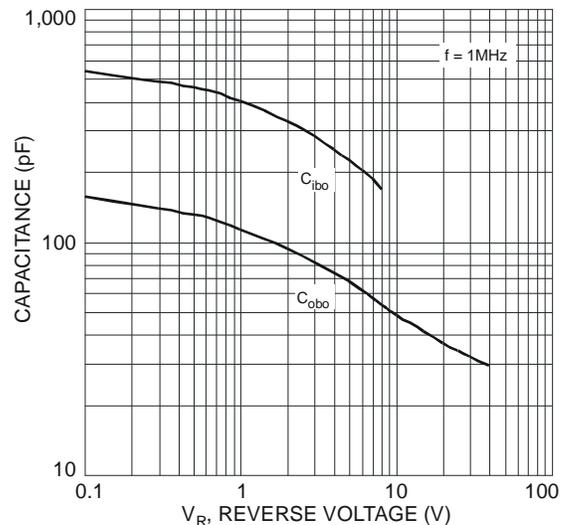
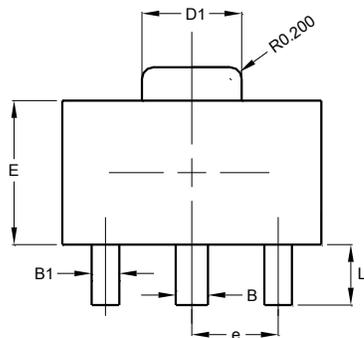


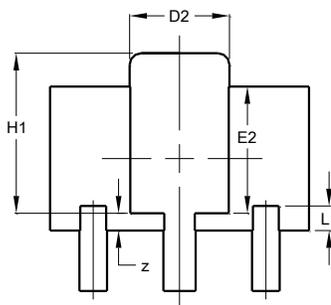
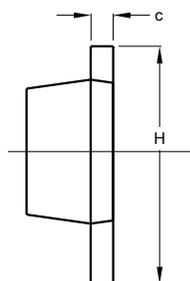
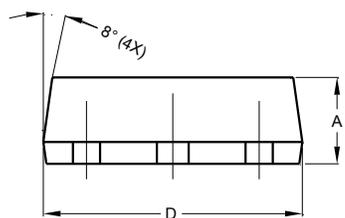
Fig. 8 Typical Capacitance Characteristics

### Package Outline Dimensions

SOT89



TOP VIEW

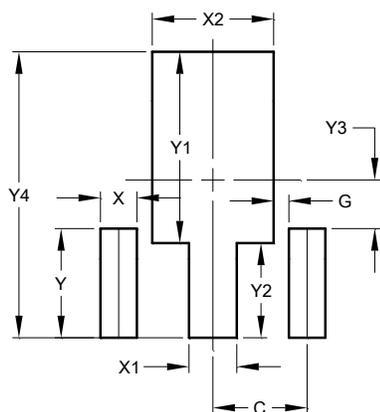


BOTTOM VIEW

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