



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

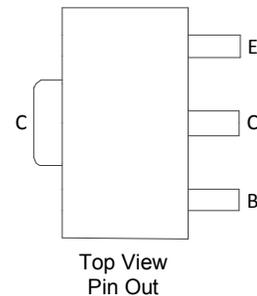
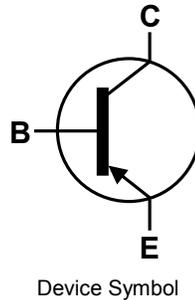
- $BV_{CEO} > -12V$
- $I_C = -4.5A$  High Continuous Current
- Low Saturation Voltage  $V_{CE(sat)} < -70mV @ -1A$
- $R_{sat} = 45m\Omega$  for a Low Equivalent On-Resistance
- $P_D = 2.4W$  Power Dissipation
- Complementary part number NK-ZXTN25012EZ

## Mechanical Data

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

## Application

- High side switch
- Battery charging
- Regulator circuits
- Buck converters
- MOSFET gate drivers



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

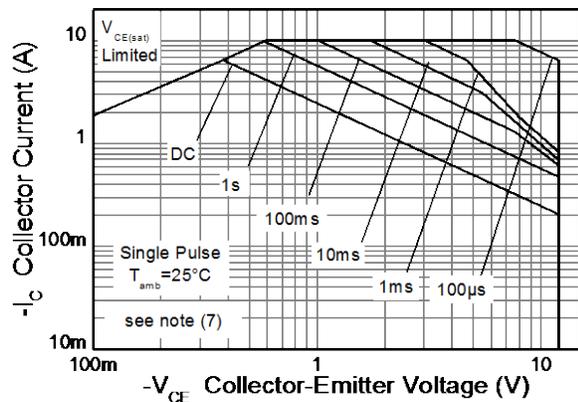
Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	-20	V
Collector-Emitter Voltage	$V_{CEO}$	-12	V
Emitter-Base Voltage	$V_{EBO}$	-7	V
Continuous Collector Current	$I_C$	-4.5	A
Peak Pulse Collector Current (Single Pulse)	$I_{CM}$	-10	A
Base Current	$I_B$	-1	A

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

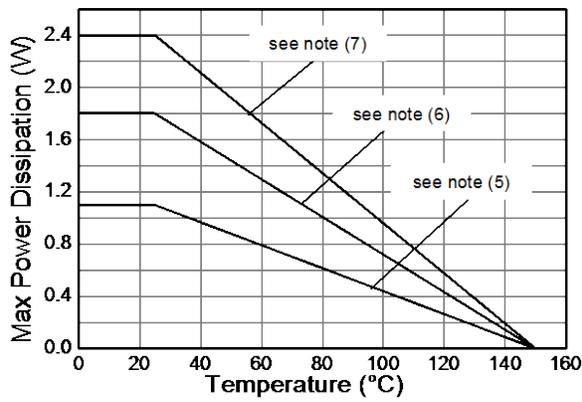
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5)	$P_D$	1.1	W
Linear Derating Factor		8.8	mW/ $^{\circ}\text{C}$
Power Dissipation (Note 6)	$P_D$	1.8	W
Linear Derating Factor		14.4	mW/ $^{\circ}\text{C}$
Power Dissipation (Note 7)	$P_D$	2.4	W
Linear Derating Factor		19.2	mW/ $^{\circ}\text{C}$
Power Dissipation (Note 8)	$P_D$	4.46	W
Linear Derating Factor		35.7	mW/ $^{\circ}\text{C}$
Power Dissipation (Note 9)	$P_D$	19.2	W
Linear Derating Factor		153	mW/ $^{\circ}\text{C}$
Thermal Resistance, Junction to Ambient (Note 5)	$R_{\theta JA}$	117	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to Ambient (Note 6)	$R_{\theta JA}$	68	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to Ambient (Note 7)	$R_{\theta JA}$	51	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to Ambient (Note 8)	$R_{\theta JA}$	28	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction to Case (Note 9)	$R_{\theta JC}$	7.95	$^{\circ}\text{C}/\text{W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^{\circ}\text{C}$

- Notes:
5. For a device surface mounted on 15mm x 15mm x 0.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; device measured when operating in steady state condition.
  6. Same as note (5), except the device is mounted on 25mm x 25mm x 0.6mm single sided 1oz weight copper.
  7. Same as note (5), except the device is mounted on 50mm x 50mm x 0.6mm single sided 1oz weight copper.
  8. Same as note (5), except the device is measured at  $t < 5$  seconds.
  9. Junction to case (collector tab). Typical.

### Thermal Characteristics and Derating Information

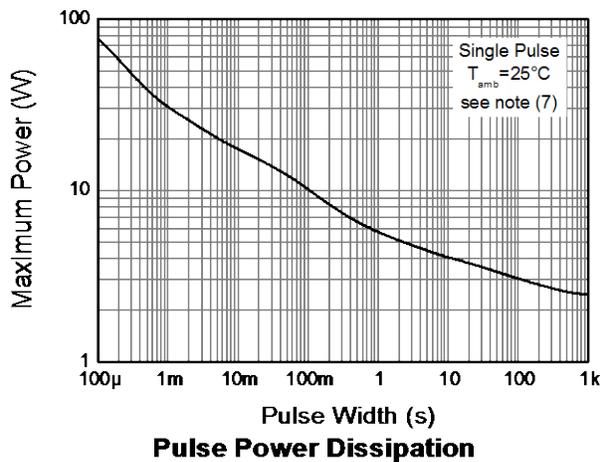
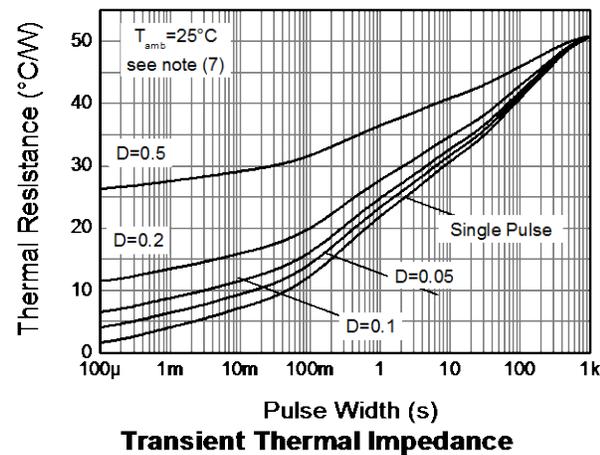
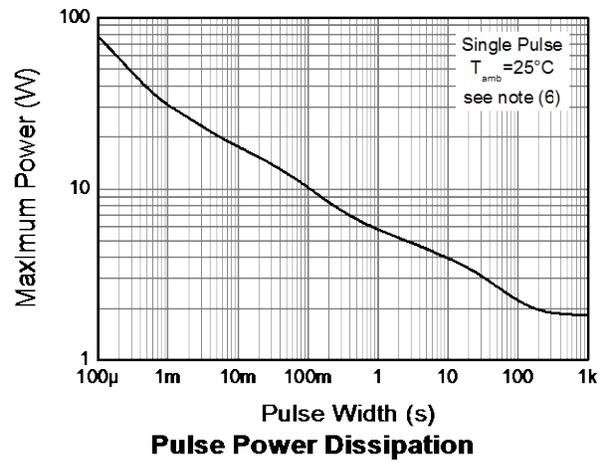
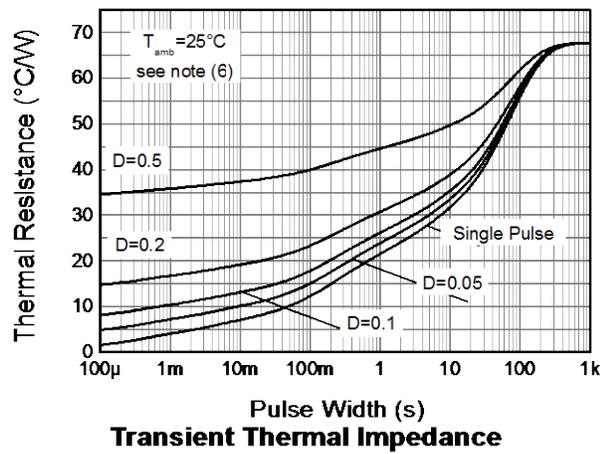
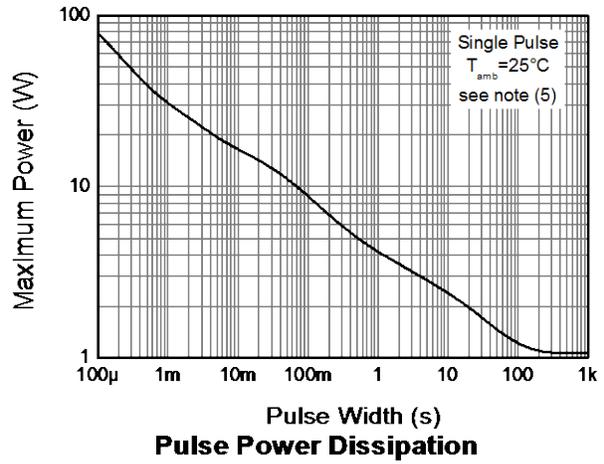
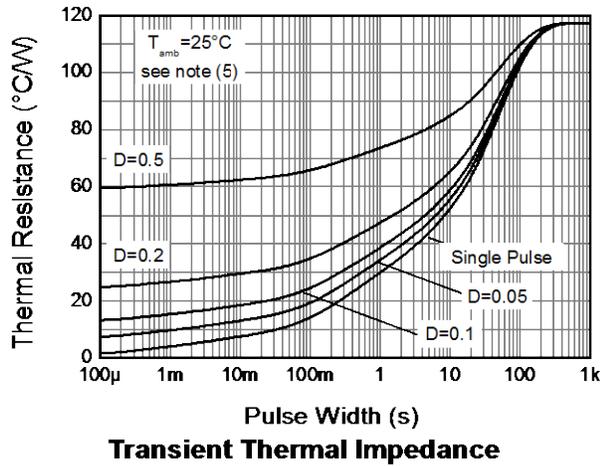


**Safe Operating Area**



**Derating Curve**

## Thermal Characteristics and Derating Information

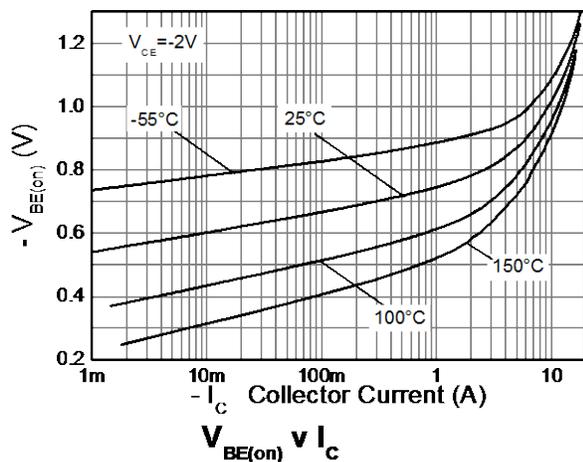
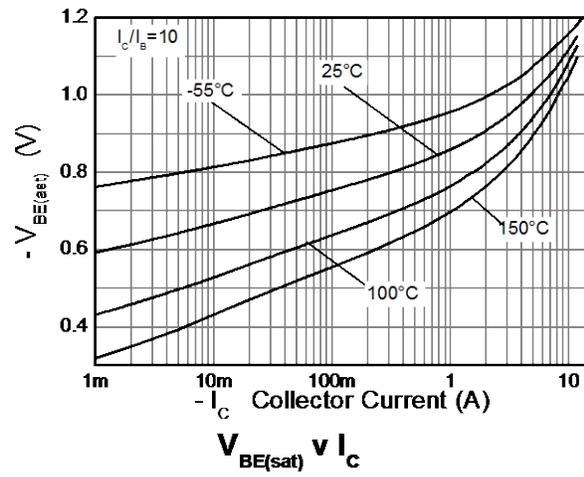
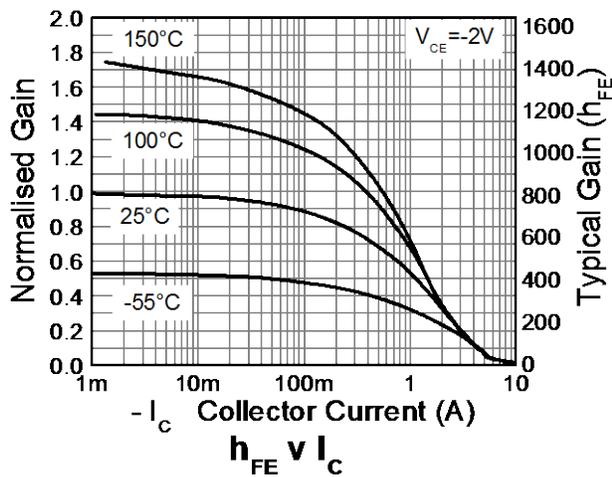
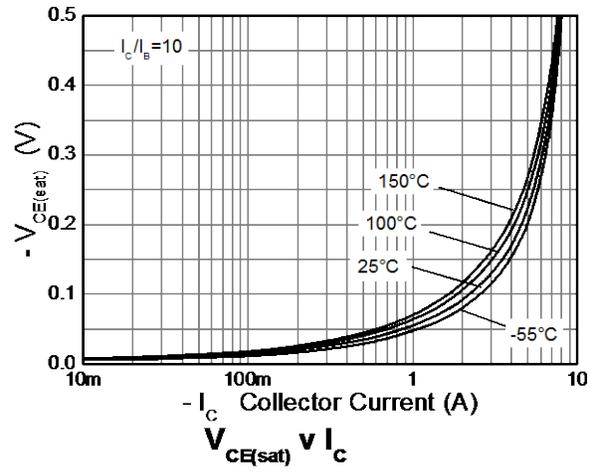
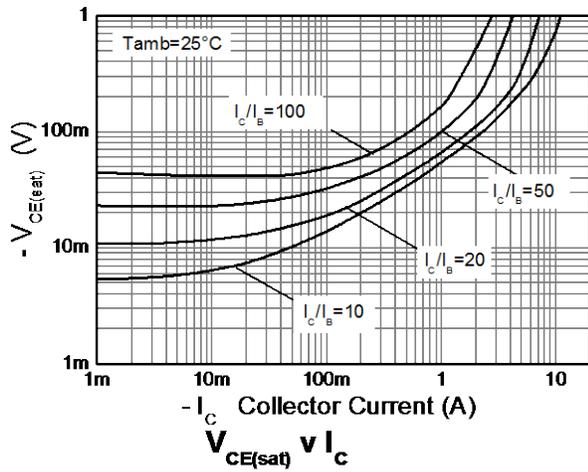


**Electrical Characteristics** (@  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	-12	-35	—	V	$I_C = -100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 10)	$BV_{CEO}$	-12	-25	—	V	$I_C = -10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	-7	-8.5	—	V	$I_E = -100\mu\text{A}$
Collector Cut-Off Current	$I_{CBO}$	—	-1	-50	nA $\mu\text{A}$	$V_{CB} = -12\text{V}$ $V_{CB} = -12\text{V}, T_A = +100^\circ\text{C}$
Emitter Cut-Off Current	$I_{EBO}$	—	-1	-50	nA	$V_{EB} = -5.6\text{V}$
Collector-Emitter Saturation Voltage (Note 10)	$V_{CE(sat)}$	—	-55 -155 -185 -200	-70 -265 -355 -285	mV	$I_C = -1\text{A}, I_B = -100\text{mA}$ $I_C = -1\text{A}, I_B = -10\text{mA}$ $I_C = -2\text{A}, I_B = -40\text{mA}$ $I_C = -5\text{A}, I_B = -450\text{mA}$
Base-Emitter Saturation Voltage (Note 10)	$V_{BE(sat)}$	—	-990	-1100	mV	$I_C = -4.5\text{A}, I_B = -450\text{mA}$
Base-Emitter Turn-On Voltage (Note 10)	$V_{BE(on)}$	—	-865	-975	mV	$I_C = -4.5\text{A}, V_{CE} = -2\text{V}$
Static forward current transfer ratio (Note 10)	$h_{FE}$	500 300 40 —	800 450 85 15	1500 — — —	—	$I_C = -10\text{mA}, V_{CE} = -2\text{V}$ $I_C = -1\text{A}, V_{CE} = -2\text{V}$ $I_C = -4.5\text{A}, V_{CE} = -2\text{V}$ $I_C = -10\text{A}, V_{CE} = -2\text{V}$
Transitional frequency	$f_T$	—	310	—	MHz	$I_C = -50\text{mA}, V_{CE} = -10\text{V}, f = 100\text{MHz}$
Input Capacitance	$C_{ibo}$	—	127	250	pF	$V_{EB} = -0.5\text{V}, f = 1\text{MHz}$
Output Capacitance	$C_{obo}$	—	16.9	30	pF	$V_{CB} = -10\text{V}, f = 1\text{MHz}$
Delay time	$t_d$	—	41	—	ns	$V_{CC} = -10\text{V}, I_C = -1\text{A}, I_{B1} = -I_{B2} = -10\text{mA}$
Rise time	$t_r$	—	62	—	ns	
Storage time	$t_s$	—	179	—	ns	
Fall time	$t_f$	—	65	—	ns	

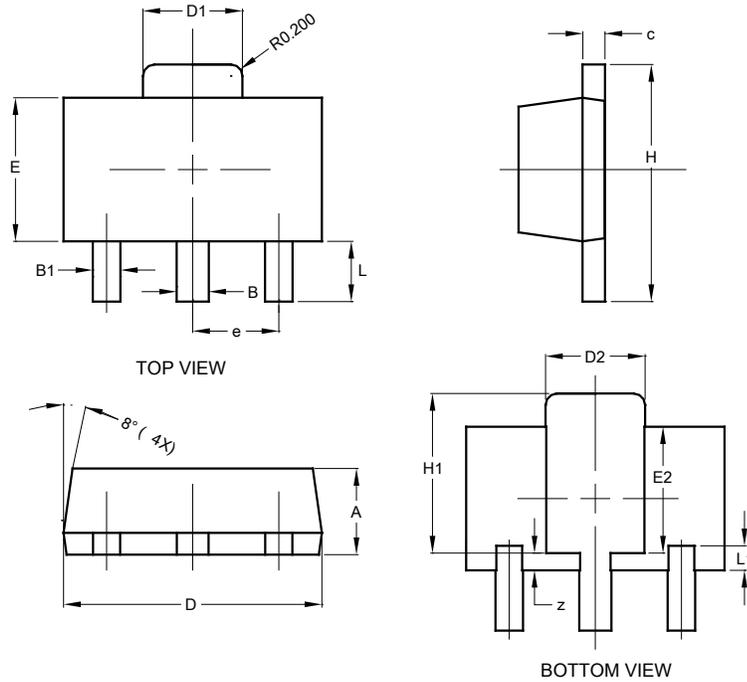
 Note: 10. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

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



### Package Outline Dimensions

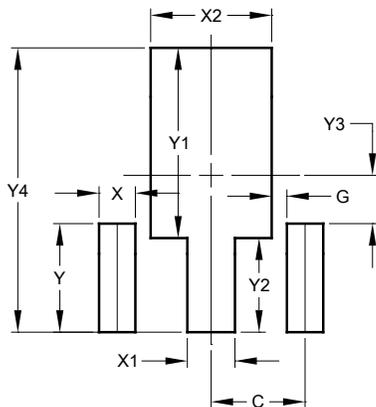
SOT89



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