



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

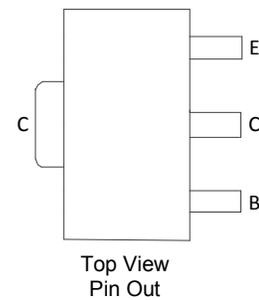
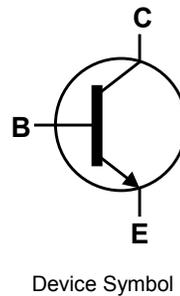
- $BV_{CEO} > 12V$
- Low Saturation Voltage  $V_{CE(sat)} < 38mV @ 1A$
- $I_C = 6.5A$  High Continuous Current
- $P_D = 2.4W$  Power Dissipation
- $R_{sat} = 25m\Omega$  for a Low Equivalent On-Resistance
- Complementary part number: NK-ZXTP25012EZ

## 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 
- Weight: 0.05 grams (Approximate)

## Application

- LED driving
- Motor driving
- Boost converters
- Royer converters
- Camera strobe
- MOSFET gate drivers



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

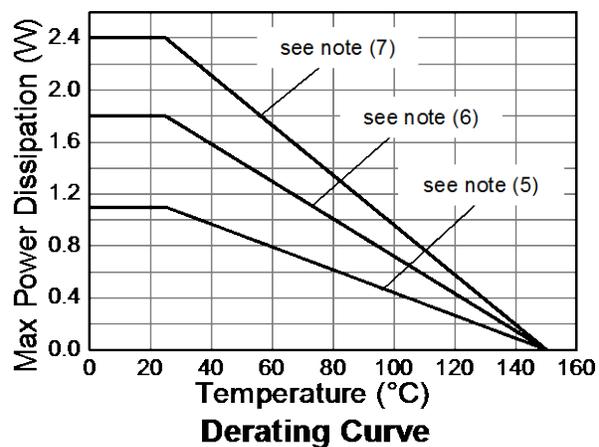
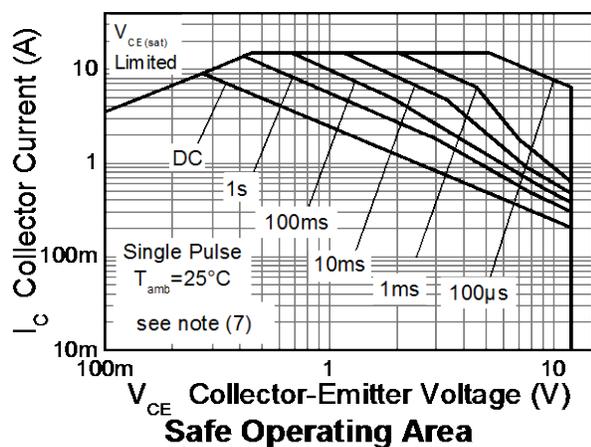
Characteristic	Symbol	Value	Unit
Collector-Base Voltage	$V_{CBO}$	20	V
Collector-Emitter Voltage	$V_{CEO}$	12	V
Emitter-Collector Voltage (reverse blocking)	$V_{ECX}$	6	V
Emitter-Base Voltage	$V_{EBO}$	7	V
Continuous Collector Current	$I_C$	6.5	A
Peak Pulse Collector Current (single pulse)	$I_{CM}$	15	A
Base Current	$I_B$	1	A

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

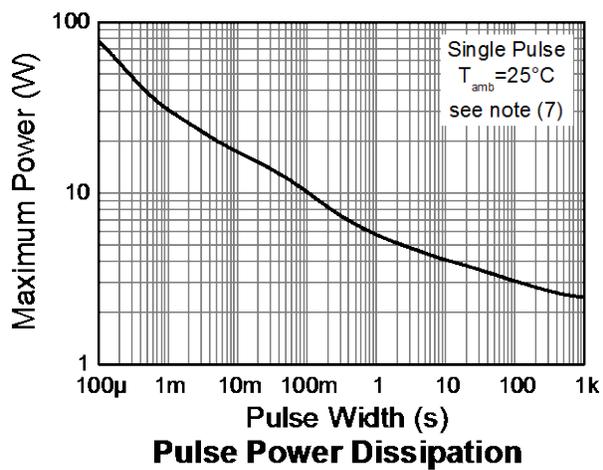
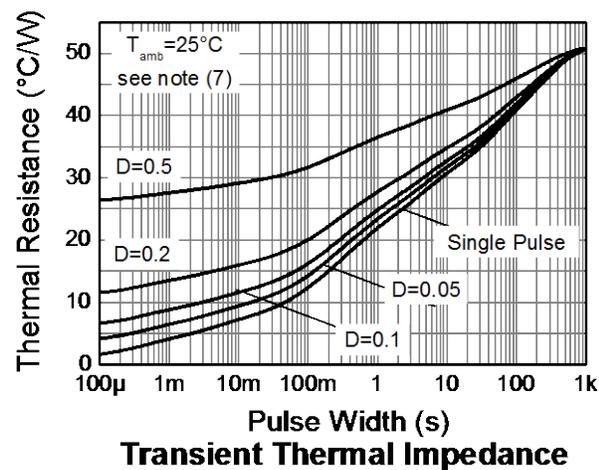
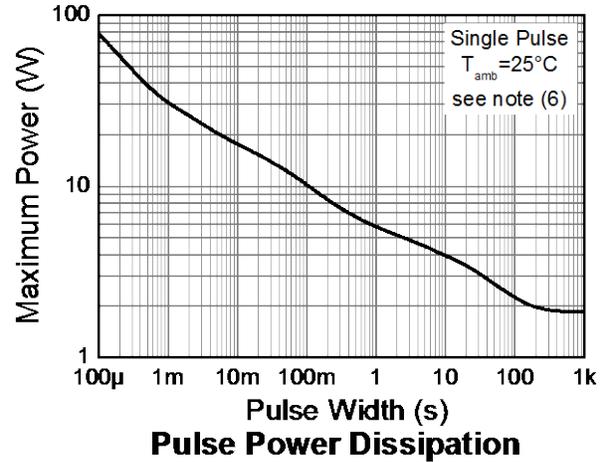
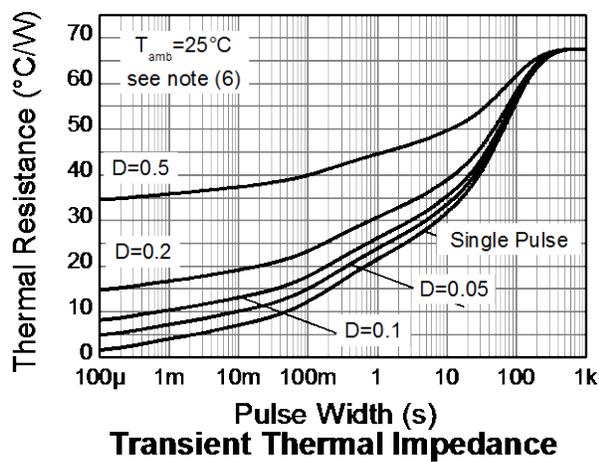
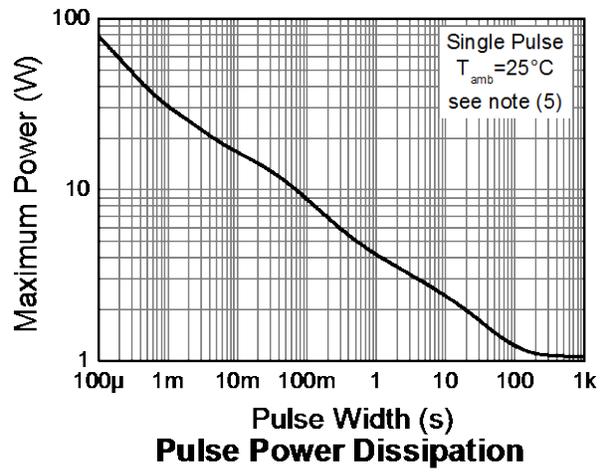
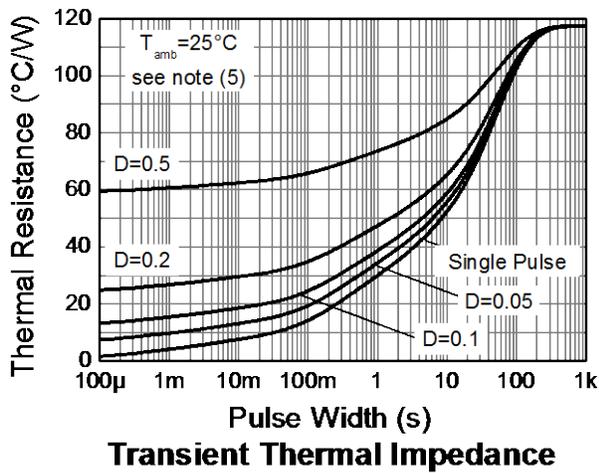
Characteristic	Symbol	Value	Unit
Power Dissipation (Note 5) Linear Derating Factor	$P_D$	1.1 8.8	W mW/ $^\circ\text{C}$
Power Dissipation (Note 6) Linear Derating Factor	$P_D$	1.8 14.4	W mW/ $^\circ\text{C}$
Power Dissipation (Note 7) Linear Derating Factor	$P_D$	2.4 19.2	W mW/ $^\circ\text{C}$
Power Dissipation (Note 8) Linear Derating Factor	$P_D$	4.46 35.7	W mW/ $^\circ\text{C}$
Power Dissipation (Note 9) Linear Derating Factor	$P_D$	19.2 153	W 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



**Thermal Characteristics and Derating Information (cont.)**

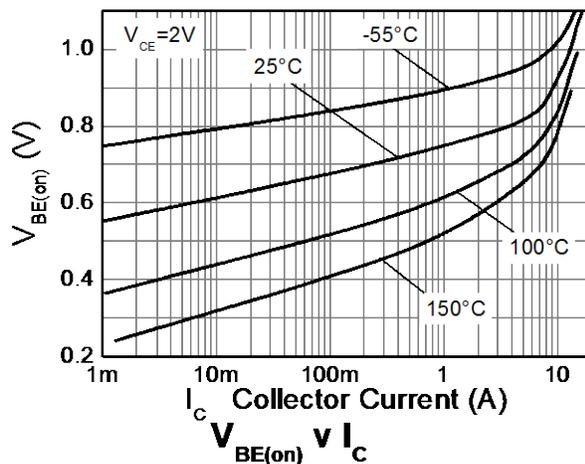
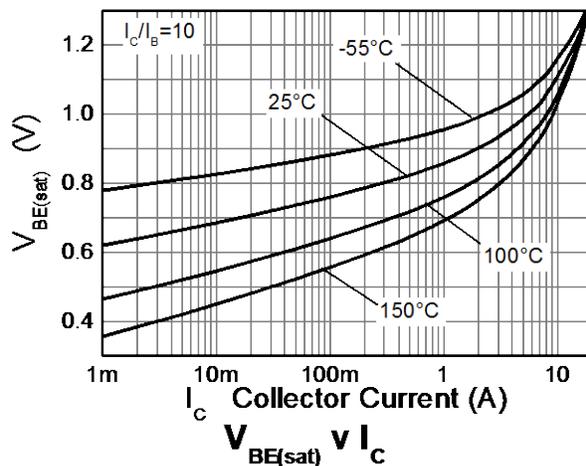
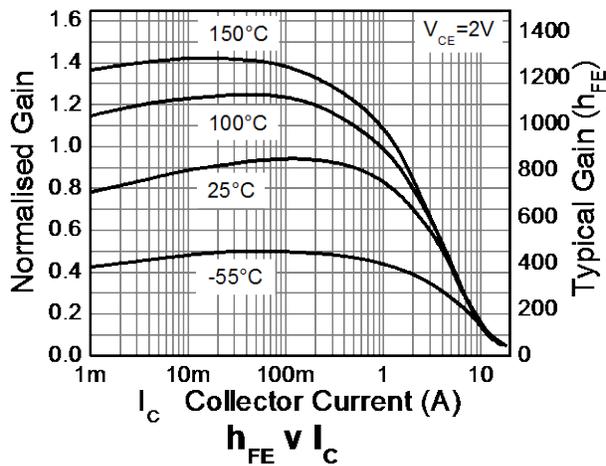
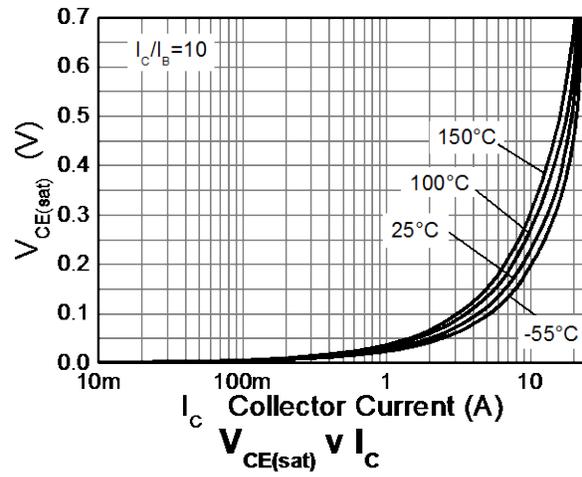
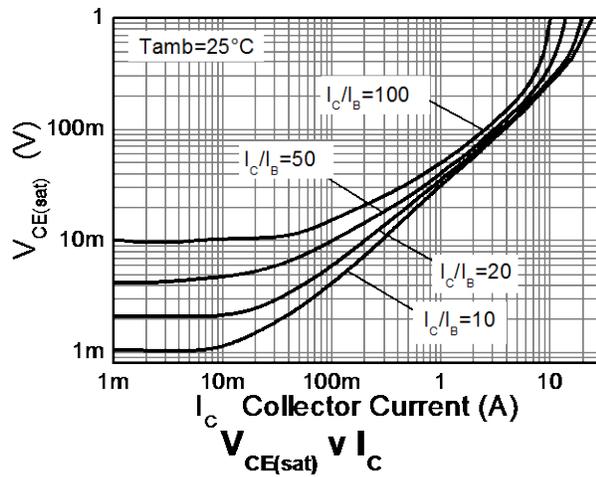


**Electrical Characteristics** (@  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	20	40	—	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 10)	$BV_{CEO}$	12	17	—	V	$I_C = 10\text{mA}$
Emitter-Collector breakdown voltage (reverse blocking)	$BV_{ECX}$	6	8	—	V	$I_E = 100\text{mA}$ , $R_{BC} < 1\text{k}\Omega$ or $0.25\text{V} > V_{BC} > -0.25\text{V}$
Emitter-Collector breakdown voltage (reverse blocking)	$BV_{ECO}$	4.5	5.5	—	V	$I_E = 100\mu\text{A}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	7	8.3	—	V	$I_E = 100\mu\text{A}$
Collector-Base Cutoff Current	$I_{CBO}$	—	1	50	nA $\mu\text{A}$	$V_{CB} = 20\text{V}$ $V_{CB} = 20\text{V}$ , $T_A = +100^\circ\text{C}$
Collector-Emitter Cutoff Current	$I_{CEX}$	—	—	100	nA	$V_{CE} = 20\text{V}$ , $R_{BE} < 1\text{k}\Omega$ or $-1\text{V} < V_{BE} < 0.25\text{V}$
Emitter Cutoff Current	$I_{EBO}$	—	1	50	nA	$V_{EB} = 5.6\text{V}$
Collector-Emitter Saturation Voltage (Note 10)	$V_{CE(sat)}$	—	31 50 70 90 200	38 60 85 130 270	mV	$I_C = 1\text{A}$ , $I_B = 100\text{mA}$ $I_C = 1\text{A}$ , $I_B = 10\text{mA}$ $I_C = 2\text{A}$ , $I_B = 40\text{mA}$ $I_C = 2\text{A}$ , $I_B = 20\text{mA}$ $I_C = 6.5\text{A}$ , $I_B = 130\text{mA}$
Base-Emitter Saturation Voltage (Note 10)	$V_{BE(sat)}$	—	950	1050	mV	$I_C = 6.5\text{A}$ , $I_B = 130\text{mA}$
Base-Emitter Turn-On Voltage (Note 10)	$V_{BE(on)}$	—	840	950	mV	$I_C = 6.5\text{A}$ , $V_{CE} = 2\text{V}$
DC Current Gain (Note 10)	$h_{FE}$	500 500 185 30	800 750 250 50	1500 — — —	—	$I_C = 10\text{mA}$ , $V_{CE} = 2\text{V}$ $I_C = 1\text{A}$ , $V_{CE} = 2\text{V}$ $I_C = 6.5\text{A}$ , $V_{CE} = 2\text{V}$ $I_C = 15\text{A}$ , $V_{CE} = 2\text{V}$
Transitional frequency	$f_T$	—	260	—	MHz	$I_C = 50\text{mA}$ , $V_{CE} = 10\text{V}$ , $f = 100\text{MHz}$
Input Capacitance	$C_{ibo}$	—	137	250	pF	$V_{EB} = 0.5\text{V}$ , $f = 1\text{MHz}$
Output Capacitance	$C_{obo}$	—	25	35	pF	$V_{CB} = 10\text{V}$ , $f = 1\text{MHz}$
Delay time	$t_d$	—	71	—	ns	$V_{CC} = 10\text{V}$ , $I_C = 1\text{A}$ , $I_{B1} = -I_{B2} = 10\text{mA}$
Rise time	$t_r$	—	70	—	ns	
Storage time	$t_s$	—	233	—	ns	
Fall time	$t_f$	—	72	—	ns	

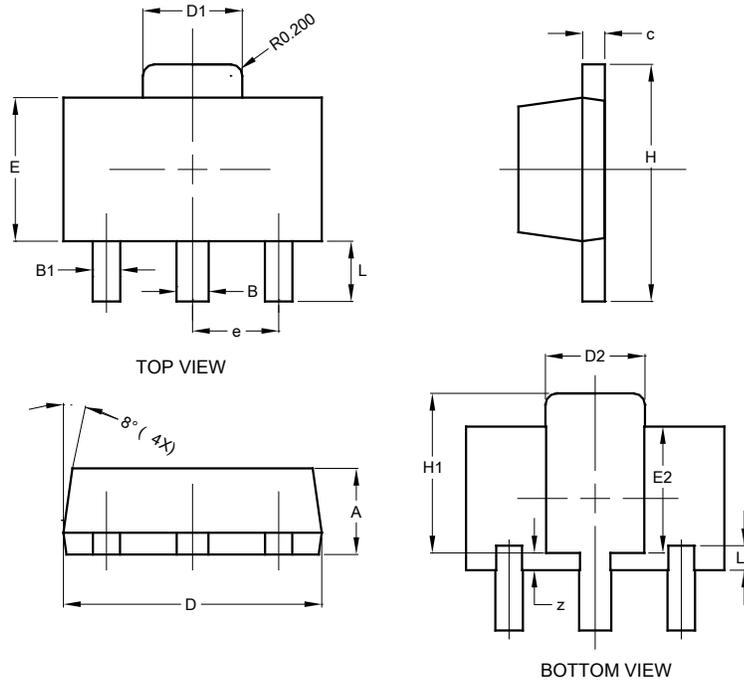
 Note: 10. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

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



### Package Outline Dimensions

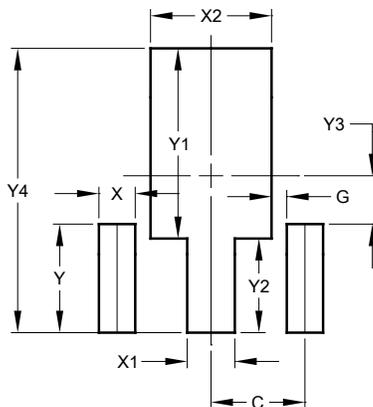
SOT89



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