

# ZXTN25012EZ

## 12V NPN high gain transistor in SOT89

### Summary

$BV_{CEO} > 12V$

$BV_{ECX} > 6V$

$h_{FE} > 500$

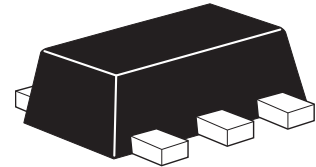
$I_{C(cont)} = 6.5A$

$V_{CE(sat)} < 38mV @ 1A$

$R_{CE(sat)} = 25m\Omega$

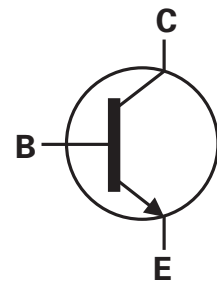
$P_D = 2.4W$

Complementary part number ZXTN25012EZ



### Description

Packaged in the SOT89 outline this new ultra high gain, low saturation 12V NPN transistor offers extremely low on state losses making it ideal for use in DC-DC circuits and various driving and power management functions

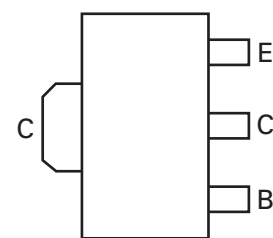


### Features

- 6.5A continuous current
- Up to 15A peak current
- Very low saturation voltages
- 6V reverse blocking voltage

### Applications

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



Pinout - top view

### Ordering information

Device	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTN25012EZTA	7	12	1000

### Device marking

1K7

# ZXTN25012EZ

## Absolute maximum and thermal ratings

Parameter	Symbol	Limit	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 <sup>(c)</sup>	$I_C$	6.5	A
Base current	$I_B$	1	A
Peak pulse current	$I_{CM}$	15	A
Power dissipation at $T_A = 25^\circ\text{C}^{(a)}$	$P_D$	1.1	W
Linear derating factor		8.8	mW/°C
Power dissipation at $T_A = 25^\circ\text{C}^{(b)}$	$P_D$	1.8	W
Linear derating factor		14.4	mW/°C
Power dissipation at $T_A = 25^\circ\text{C}^{(c)}$	$P_D$	2.4	W
Linear derating factor		19.2	mW/°C
Power dissipation at $T_A = 25^\circ\text{C}^{(d)}$	$P_D$	4.46	W
Linear derating factor		35.7	mW/°C
Power dissipation at $T_C = 25^\circ\text{C}^{(e)}$	$P_D$	19.2	W
Linear derating factor		153	mW/°C
Operating and storage temperature range	$T_j, T_{stg}$	-55 to +150	°C

## Thermal resistance

Parameter	Symbol	Limit	Unit
Junction to ambient <sup>(a)</sup>	$R_{\theta JA}$	117	°C/W
Junction to ambient <sup>(b)</sup>	$R_{\theta JA}$	68	°C/W
Junction to ambient <sup>(c)</sup>	$R_{\theta JA}$	51	°C/W
Junction to ambient <sup>(d)</sup>	$R_{\theta JA}$	28	°C/W
Junction to case <sup>(e)</sup>	$R_{\theta JC}$	7.95	°C/W

### NOTES:

(a) 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.

(b) Mounted on 25mm x 25mm x 0.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.

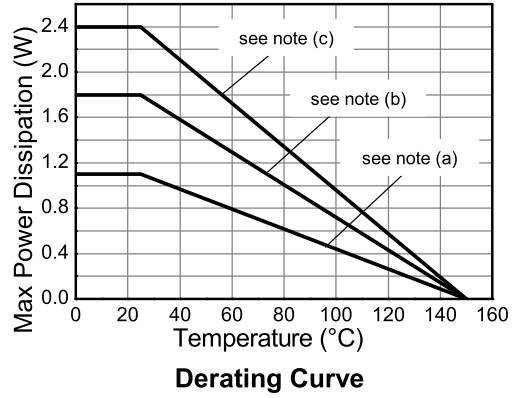
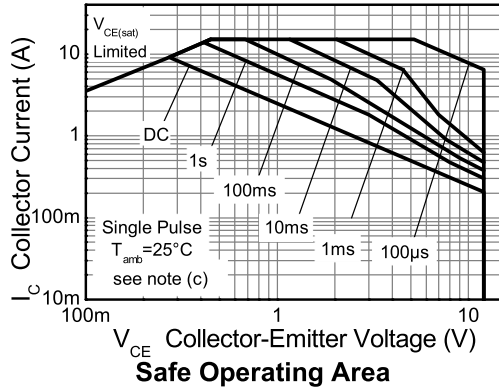
(c) Mounted on 50mm x 50mm x 0.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions.

(d) As (c) above measured at  $t < 5$  seconds.

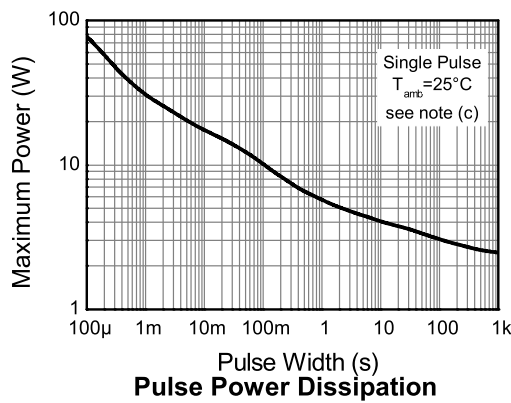
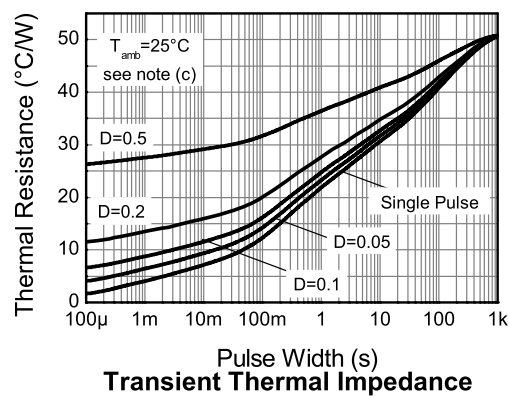
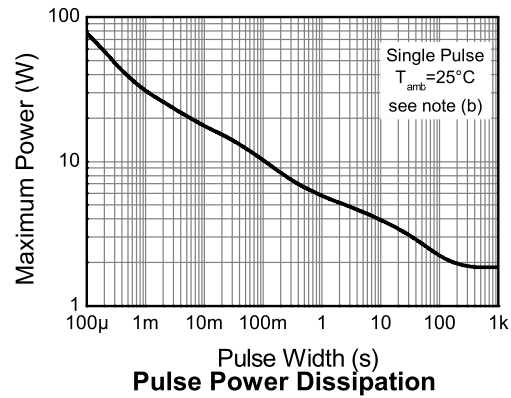
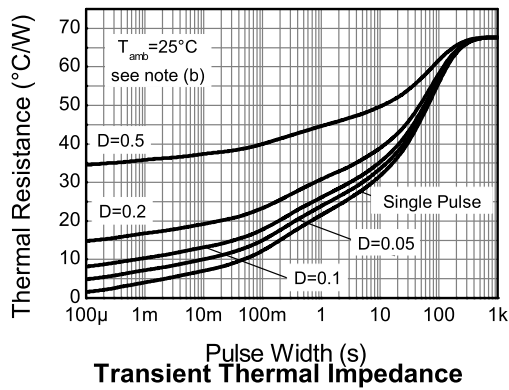
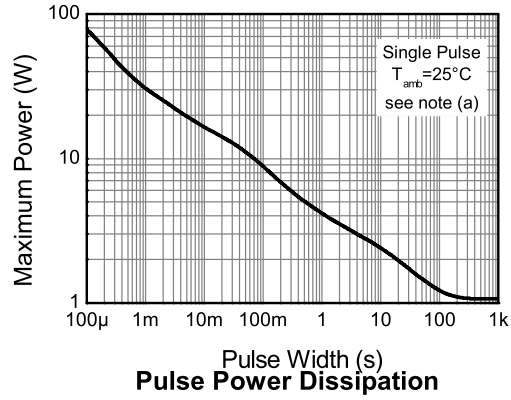
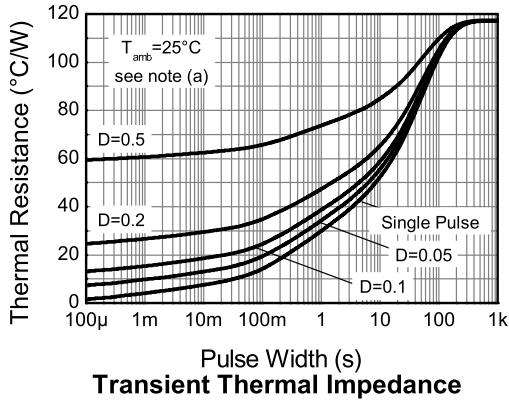
(e) Junction to case (collector tab). Typical

# ZXTN25012EZ

## Thermal characteristics



## Thermal characteristics



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## Electrical characteristics (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

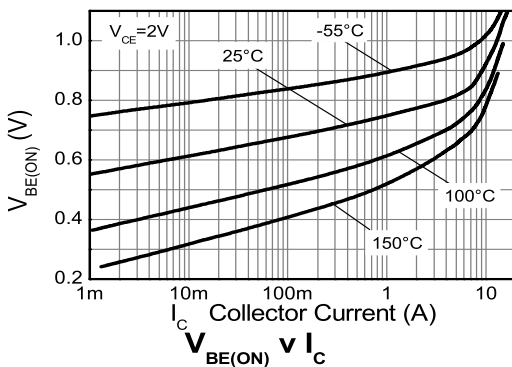
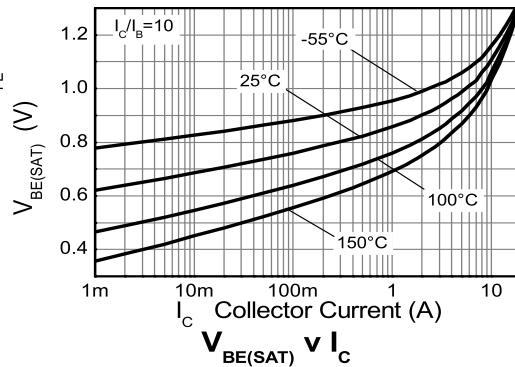
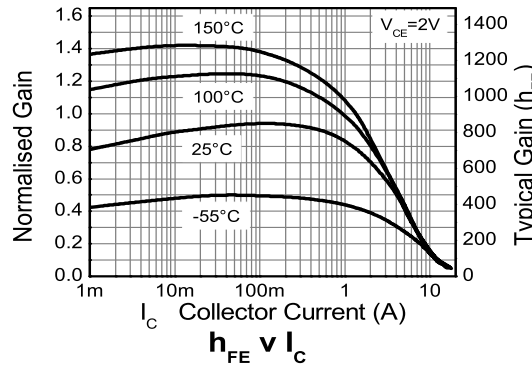
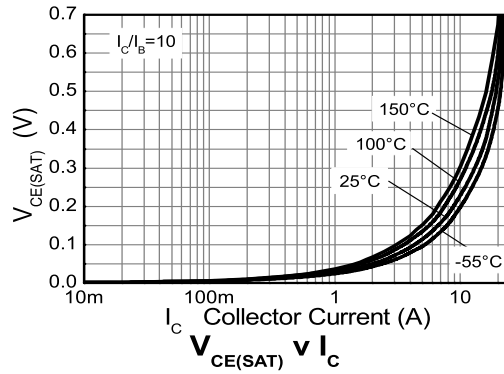
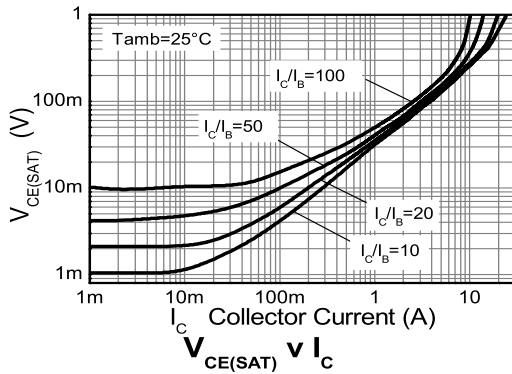
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-Base breakdown voltage	$BV_{CBO}$	20	40		V	$I_C = 100\mu\text{A}$
Collector-Emitter breakdown voltage	$BV_{CEO}$	12	17		V	$I_C = 10\text{mA}^{(*)}$
Emitter-Collector breakdown voltage (reverse blocking)	$BV_{ECX}$	6	8		V	$I_E = 100\text{mA}$ , $R_{BC} < 1\text{k}\Omega$ 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 cut-off current	$I_{CBO}$		<1	50 0.5	nA $\mu\text{A}$	$V_{CB} = 20\text{V}$ $V_{CB} = 20\text{V}$ , $T_{amb} = 100^{\circ}\text{C}$
Collector-Emitter cut-off 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 cut-off current	$I_{EBO}$		<1	50	nA	$V_{EB} = 5.6\text{V}$
Collector-Emitter saturation voltage	$V_{CE(sat)}$		31 50 70 90 200	38 60 85 130 270	mV mV mV mV 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	$V_{BE(sat)}$		950	1050	mV	$I_C = 6.5\text{A}$ , $I_B = 130\text{mA}^{(*)}$
Base-Emitter turn-on voltage	$V_{BE(on)}$		840	950	mV	$I_C = 6.5\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$
Static forward current transfer ratio	$h_{FE}$	500 500 185 30	800 750 250 50	1500		$I_C = 10\text{mA}$ , $V_{CE} = 2\text{V}^{(*)}$ $I_C = 1\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$ $I_C = 6.5\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$ $I_C = 15\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$
Transition 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	$I_C = 1\text{A}$ , $V_{CC} = 10\text{V}$ , $I_{B1} = -I_{B2} = 10\text{mA}$
Rise time	$t_r$		70		ns	
Storage time	$t_s$		233		ns	
Fall time	$t_f$		72		ns	

### NOTES:

(\*) Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

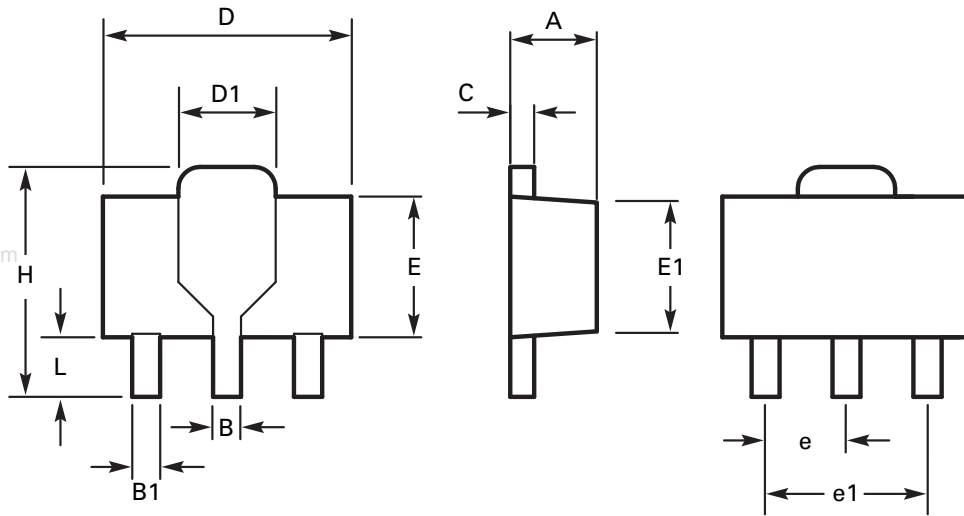
# ZXTN25012EZ

## Typical characteristics



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## Package outline - SOT89



DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	1.40	1.60	0.550	0.630	E	2.29	2.60	0.090	0.102
B	0.44	0.56	0.017	0.022	E1	2.13	2.29	0.084	0.090
B1	0.36	0.48	0.014	0.019	e	1.50 BSC		0.059 BSC	
C	0.35	0.44	0.014	0.017	e1	3.00 BSC		0.118 BSC	
D	4.40	4.60	0.173	0.181	H	3.94	4.25	0.155	0.167
D1	1.52	1.83	0.064	0.072	L	0.89	1.20	0.035	0.047

**Note:** Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

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