

# ZXTN25012EFH

## 12V, SOT23, NPN medium power transistor

### Summary

$BV_{CEO} > 12V$

$BV_{ECX} > 6V$

$h_{FE} > 500$

$I_{C(cont)} = 6A$

$V_{CE(sat)} < 32mV @ 1A$

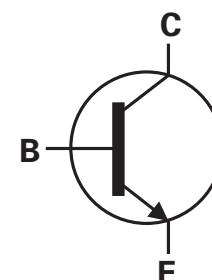
$R_{CE(sat)} = 23m\Omega$

$P_D = 1.25W$



### Description

Advanced process capability and package design have been used to maximize the power handling and performance of this small outline transistor. The compact size and ratings of this device make it ideally suited to applications where space is at a premium.

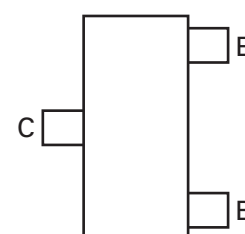


### Features

- High power dissipation SOT23 package
- High peak current
- Very high gain
- Low saturation voltage
- 6V reverse blocking voltage

### Applications

- MOSFET gate drivers
- Power switches
- Motor control
- DC fans
- DC-DC converters



Pinout - top view

### Ordering information

Device	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTN25012EFHTA	7	8	3,000

### Device marking

1C3

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## Absolute maximum 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	A
Base current	$I_B$	1	A
Peak pulse current	$I_{CM}$	15	A
Power dissipation at $T_{amb} = 25^{\circ}C^{(a)}$ Linear derating factor	$P_D$	0.73 5.84	W mW/ $^{\circ}C$
Power dissipation at $T_{amb} = 25^{\circ}C^{(b)}$ Linear derating factor	$P_D$	1.05 8.4	W mW/ $^{\circ}C$
Power dissipation at $T_{amb} = 25^{\circ}C^{(c)}$ Linear derating factor	$P_D$	1.25 9.6	W mW/ $^{\circ}C$
Power dissipation at $T_{amb} = 25^{\circ}C^{(d)}$ Linear derating factor	$P_D$	1.81 14.5	W mW/ $^{\circ}C$
Operating and storage temperature range	$T_j, T_{stg}$	- 55 to 150	$^{\circ}C$

## Thermal resistance

Parameter	Symbol	Limit	Unit
Junction to ambient <sup>(a)</sup>	$R_{\theta JA}$	171	$^{\circ}C/W$
Junction to ambient <sup>(b)</sup>	$R_{\theta JA}$	119	$^{\circ}C/W$
Junction to ambient <sup>(c)</sup>	$R_{\theta JA}$	100	$^{\circ}C/W$
Junction to ambient <sup>(d)</sup>	$R_{\theta JA}$	69	$^{\circ}C/W$

### NOTES:

(a) For a device surface mounted on 15mm x 15mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.

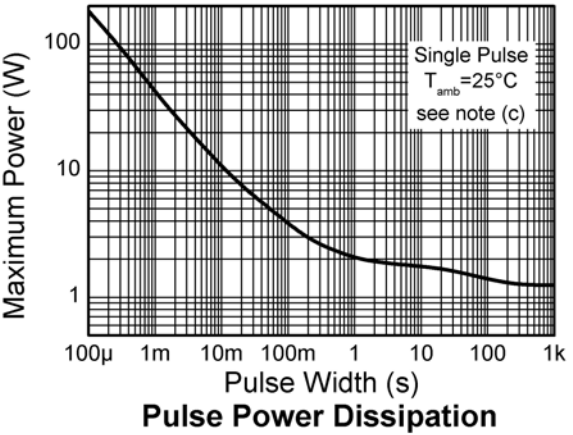
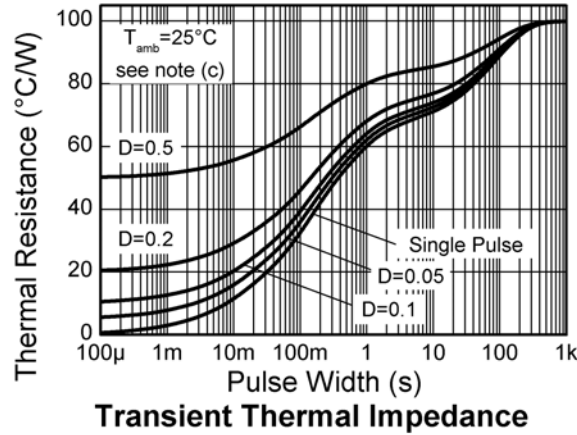
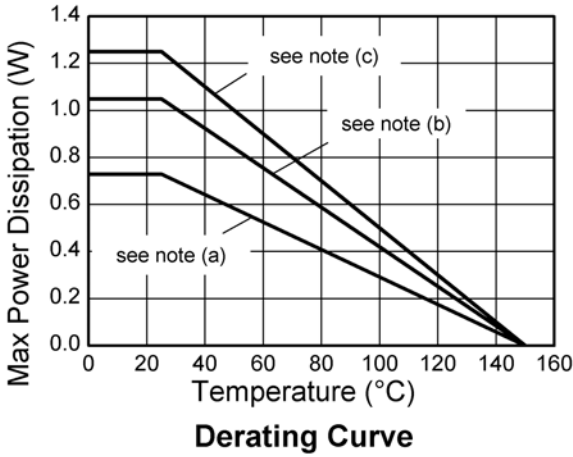
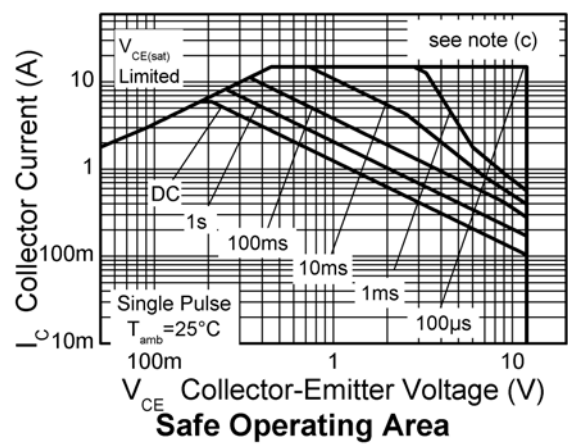
(b) Mounted on 25mm x 25mm x 1.6mm FR4 PCB with a high coverage of single sided 2 oz copper in still air conditions.

(c) Mounted on 50mm x 50mm x 1.6mm FR4 PCB with a high coverage of single sided 2 oz copper in still air conditions.

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

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## Characteristics



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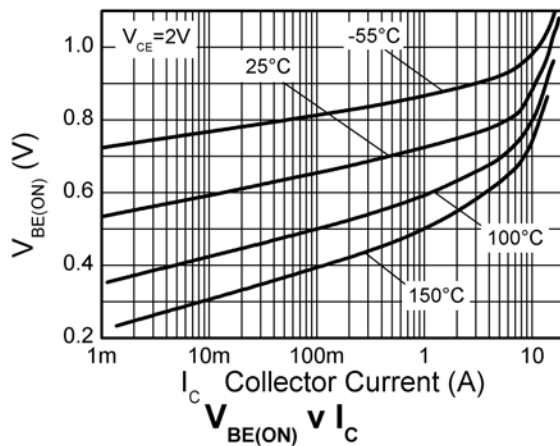
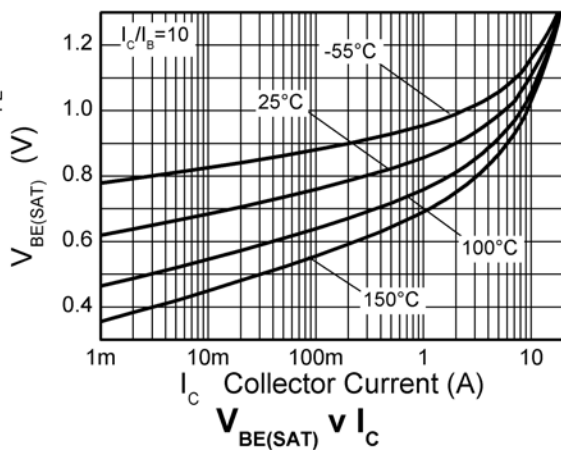
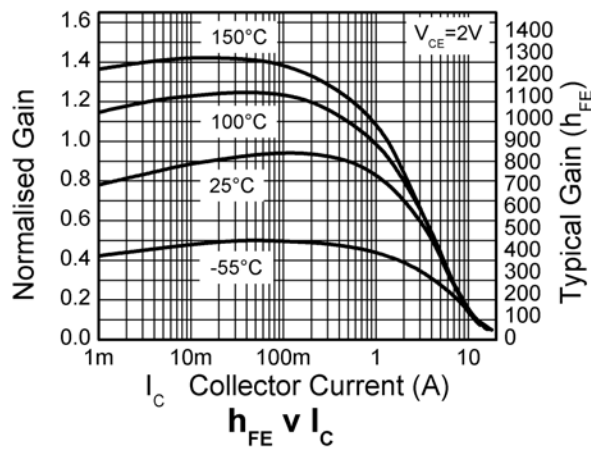
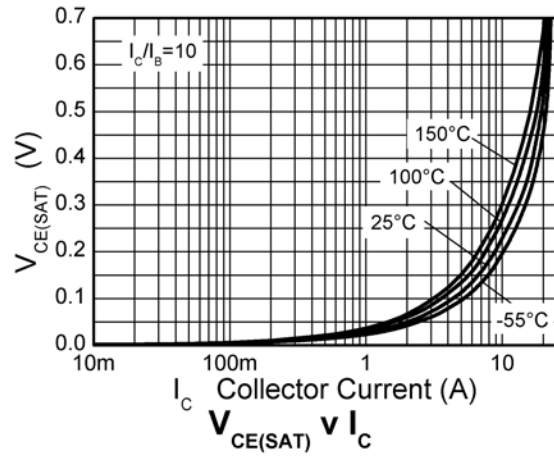
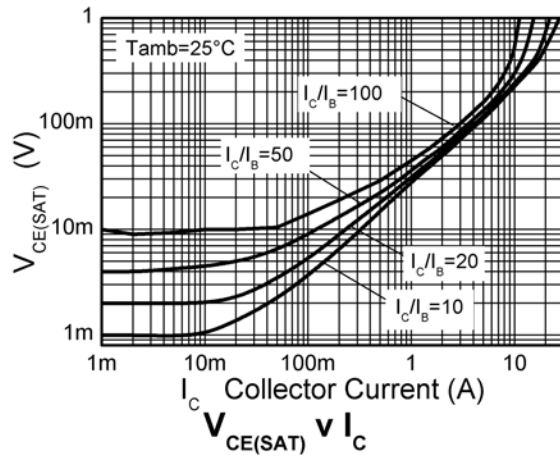
## Electrical characteristics (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

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 (base open)	$BV_{CEO}$	12	17		V	$I_C = 10\text{mA}^{(*)}$
Emitter-base breakdown voltage	$BV_{EBO}$	7	8.3		V	$I_E = 100\mu\text{A}$
Emitter-collector breakdown voltage (reverse blocking)	$BV_{ECX}$	6	8.0		V	$I_E = 100\mu\text{A}$ , $R_{BC} < 1\text{k}\Omega$ or $0.25\text{V} > V_{BC} > -0.25\text{V}$
Emitter-collector breakdown voltage (base open)	$BV_{ECO}$	4.5	5.5		V	$I_E = 100\mu\text{A}$ ,
Collector-base cut-off current	$I_{CBO}$		<1	50 0.5	nA $\mu\text{A}$	$V_{CB} = 20\text{V}$ $V_{CB} = 20\text{V}$ , $T_{amb} = 100^{\circ}\text{C}$
Emitter-base cut-off current	$I_{EBO}$		<1	50	nA	$V_{EB} = 5.6\text{V}$
Collector-emitter saturation voltage	$V_{CE(sat)}$		28	32	mV	$I_C = 1\text{A}$ , $I_B = 100\text{mA}^{(*)}$
			45	55	mV	$I_C = 1\text{A}$ , $I_B = 10\text{mA}^{(*)}$
			60	75	mV	$I_C = 2\text{A}$ , $I_B = 40\text{mA}^{(*)}$
			160	190	mV	$I_C = 6\text{A}$ , $I_B = 120\text{mA}^{(*)}$
Base-emitter saturation voltage	$V_{BE(sat)}$		920	1000	mV	$I_C = 6\text{A}$ , $I_B = 120\text{mA}^{(*)}$
Base-emitter turn-on voltage	$V_{BE(on)}$		800	900	mV	$I_C = 6\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$
Static forward current transfer ratio	$h_{FE}$	500	800	1500		$I_C = 10\text{mA}$ , $V_{CE} = 2\text{V}^{(*)}$
		500	750			$I_C = 1\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$
		300	460			$I_C = 4\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$
		40	55			$I_C = 15\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$
Transition frequency	$f_T$		260		MHz	$I_C = 50\text{mA}$ , $V_{CE} = 10\text{V}$ $f = 100\text{MHz}$
Output capacitance	$C_{OBO}$		25.6	35	pF	$V_{CB} = 10\text{V}$ , $f = 1\text{MHz}^{(*)}$
Delay time	$t_d$		70.9		ns	$V_{CC} = 10\text{V}$ . $I_C = 1\text{A}$ , $I_{B1} = I_{B2} = 10\text{mA}$ .
Rise time	$t_r$		69.8		ns	
Storage time	$t_s$		233		ns	
Fall time	$t_f$		71.6		ns	

### NOTES:

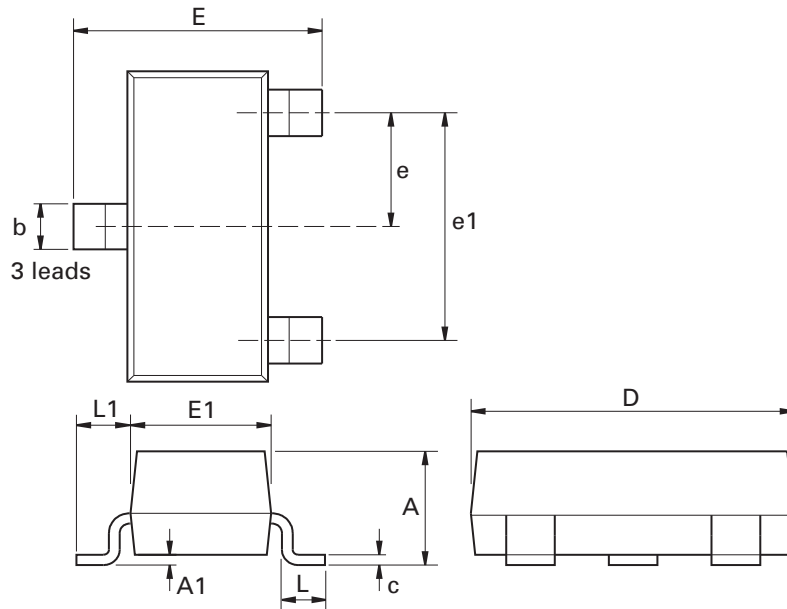
(\*) Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

## Typical characteristics



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## Package outline - SOT23



Dim.	Millimeters		Inches		Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	-	1.12	-	0.044	e1	1.90 NOM		0.075 NOM	
A1	0.01	0.10	0.0004	0.004	E	2.10	2.64	0.083	0.104
b	0.30	0.50	0.012	0.020	E1	1.20	1.40	0.047	0.055
c	0.085	0.20	0.003	0.008	L	0.25	0.60	0.0098	0.0236
D	2.80	3.04	0.110	0.120	L1	0.45	0.62	0.018	0.024
e	0.95 NOM		0.037 NOM		-	-	-	-	-

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

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