

# ZXTN07012EFF

## 12V, SOT23F, NPN high gain power transistor

### Summary

$BV_{CEO} > 12V$

$BV_{ECO} > 3V$

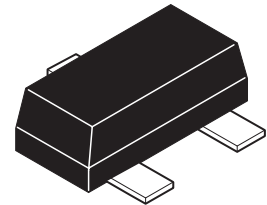
$I_{C(cont)} = 4.5A$

$V_{CE(sat)} < 70mV @ 1A$

$R_{CE(sat)} = 43m\Omega$

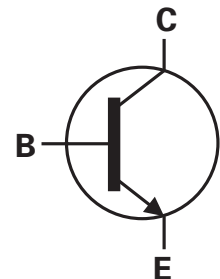
$P_D = 1.5W$

Complementary part number ZXTP07012EFF



### Description

This low voltage NPN transistor has been designed for applications requiring high gain and very low saturation voltage. The SOT23F package is pin compatible with the industry standard SOT23 footprint but offers lower profile and higher dissipation for applications where power density is of utmost importance.

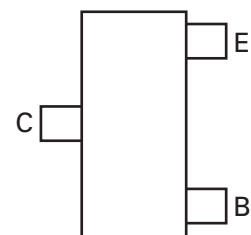


### Features

- Low profile SOT23F package
- Low saturation voltage
- High gain
- High power dissipation

### Applications

- LED driver
- Boost converter
- Logic interface
- Motor drive



Pinout - top view

### Ordering information

Device	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTN07012EFFTA	7	8	3000

### Device marking

1D3

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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)	$V_{ECO}$	3	V
Emitter-base voltage	$V_{EBO}$	7	V
Continuous collector current <sup>(c)</sup>	$I_C$	4.5	A
Base current	$I_B$	1	A
Peak pulse current	$I_{CM}$	10	A
Power dissipation at $T_{amb} = 25^\circ\text{C}^{(a)}$		0.84	W
Linear derating factor	$P_D$	6.72	mW/°C
Power dissipation at $T_{amb} = 25^\circ\text{C}^{(b)}$		1.34	W
Linear derating factor	$P_D$	10.72	mW/°C
Power dissipation at $T_{amb} = 25^\circ\text{C}^{(c)}$		1.50	W
Linear derating factor	$P_D$	12.0	mW/°C
Power dissipation at $T_{amb} = 25^\circ\text{C}^{(d)}$		2.0	W
Linear derating factor	$P_D$	16.0	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>	$R_{\theta JA}$	149	°C/W
Junction to ambient <sup>(b)</sup>	$R_{\theta JA}$	93	°C/W
Junction to ambient <sup>(c)</sup>	$R_{\theta JA}$	83	°C/W
Junction to ambient <sup>(d)</sup>	$R_{\theta JA}$	60	°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.

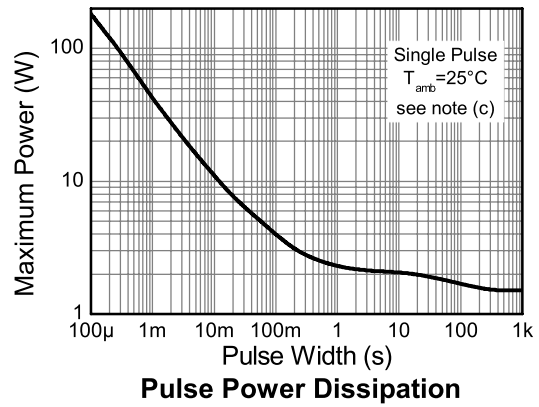
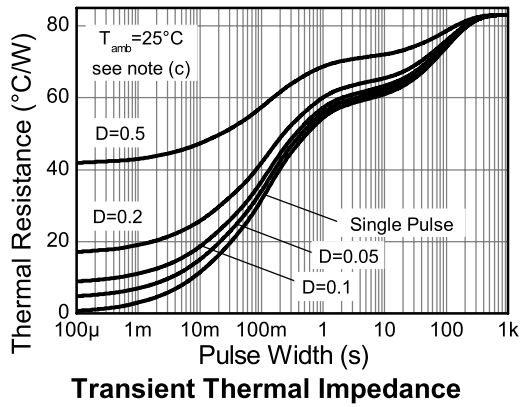
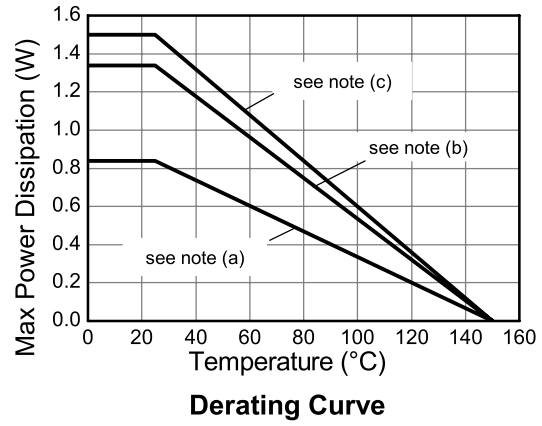
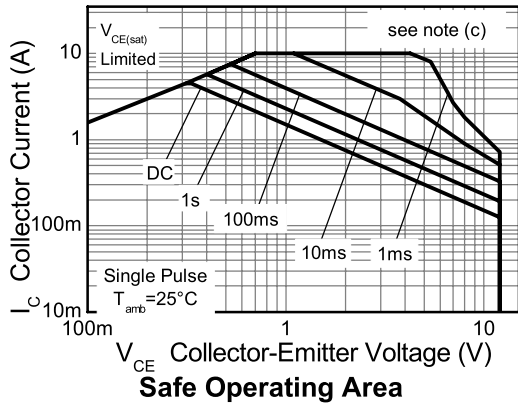
(b) Mounted on 25mm x 25mm x 1.6mm FR4 PCB with a high coverage of single sided 2 oz copper in still air conditions.

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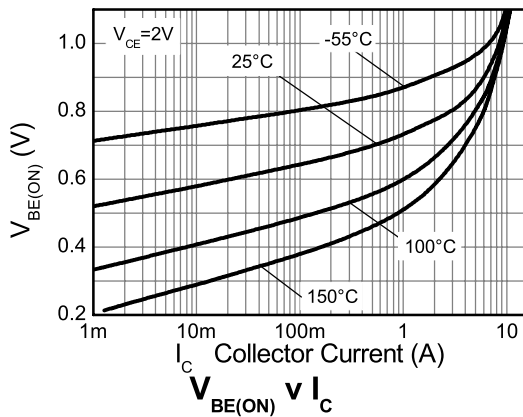
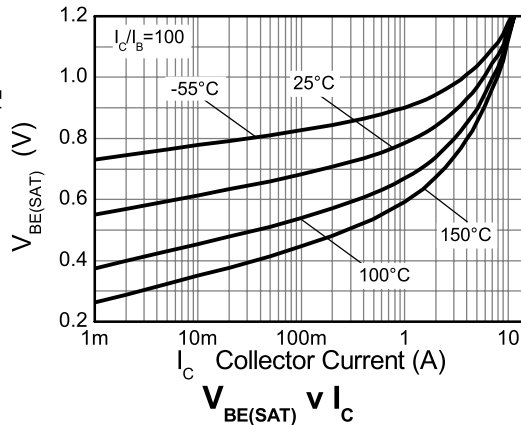
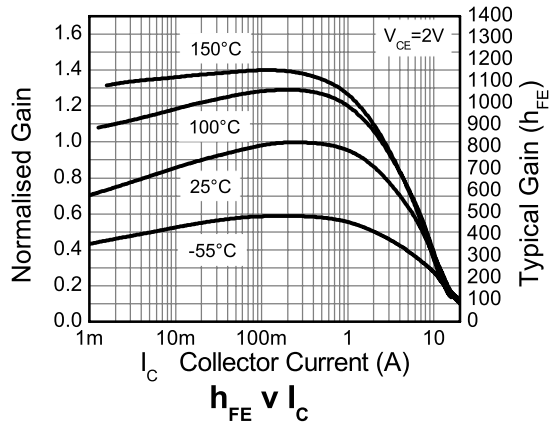
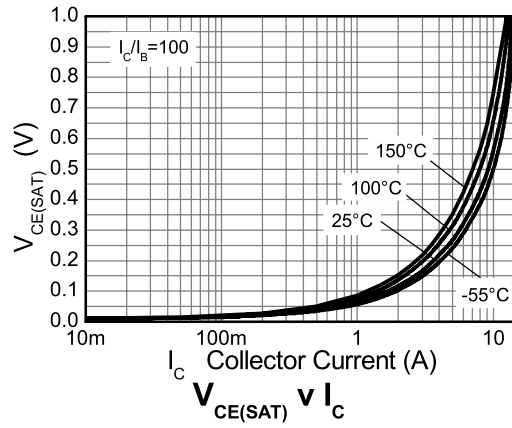
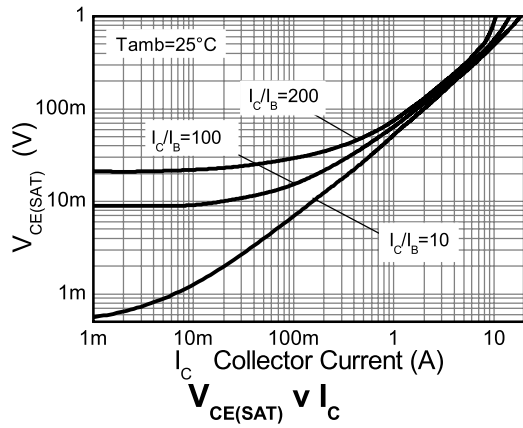
## Electrical characteristics (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

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	8.2		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)	$BV_{ECO}$	3.0	5.3		V	$I_E = 100\mu\text{A}$ ,
Collector-base cut-off current	$I_{CBO}$		<1	50 20	nA $\mu\text{A}$	$V_{CB} = 16\text{V}$ $V_{CB} = 16\text{V}$ , $T_{amb} = 100^{\circ}\text{C}$
Emitter-base cut-off current	$I_{EBO}$		<1	50	nA	$V_{EB} = 5.6\text{V}$
Collector-emitter saturation voltage	$V_{CE(sat)}$		25 60 50 105 215	40 85 70 150 320	mV mV mV mV mV	$I_C = 100\text{mA}$ , $I_B = 0.5\text{mA}^{(*)}$ $I_C = 1\text{A}$ , $I_B = 10\text{mA}^{(*)}$ $I_C = 1\text{A}$ , $I_B = 100\text{mA}^{(*)}$ $I_C = 2\text{A}$ , $I_B = 20\text{mA}^{(*)}$ $I_C = 4.5\text{A}$ , $I_B = 45\text{mA}^{(*)}$
Base-emitter saturation voltage	$V_{BE(sat)}$		945	1050	mV	$I_C = 4.5\text{A}$ , $I_B = 45\text{mA}^{(*)}$
Base-emitter turn-on voltage	$V_{BE(on)}$		850	950	mV	$I_C = 4.5\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$
Static forward current transfer ratio	$h_{FE}$	500 400 330 140	800 650 530 230	1500		$I_C = 0.1\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$ $I_C = 2\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$ $I_C = 4.5\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$ $I_C = 10\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$
Transition frequency	$f_T$	150	220		MHz	$I_C = 50\text{mA}$ , $V_{CE} = 5\text{V}$ $f = 50\text{MHz}$
Input capacitance	$C_{ibo}$		229		pF	$V_{EB} = 0.5\text{V}$ , $f = 1\text{MHz}^{(*)}$
Output capacitance	$C_{Obo}$		40	50	pF	$V_{CB} = 10\text{V}$ , $f = 1\text{MHz}^{(*)}$
Delay time	$t_d$		26.8		ns	$V_{CC} = 10\text{V}$ .
Rise time	$t_r$		14.2		ns	$I_C = 500\text{mA}$ ,
Storage time	$t_s$		250		ns	$I_{B1} = I_{B2} = 50\text{mA}$ .
Fall time	$t_f$		67.7		ns	

### NOTES:

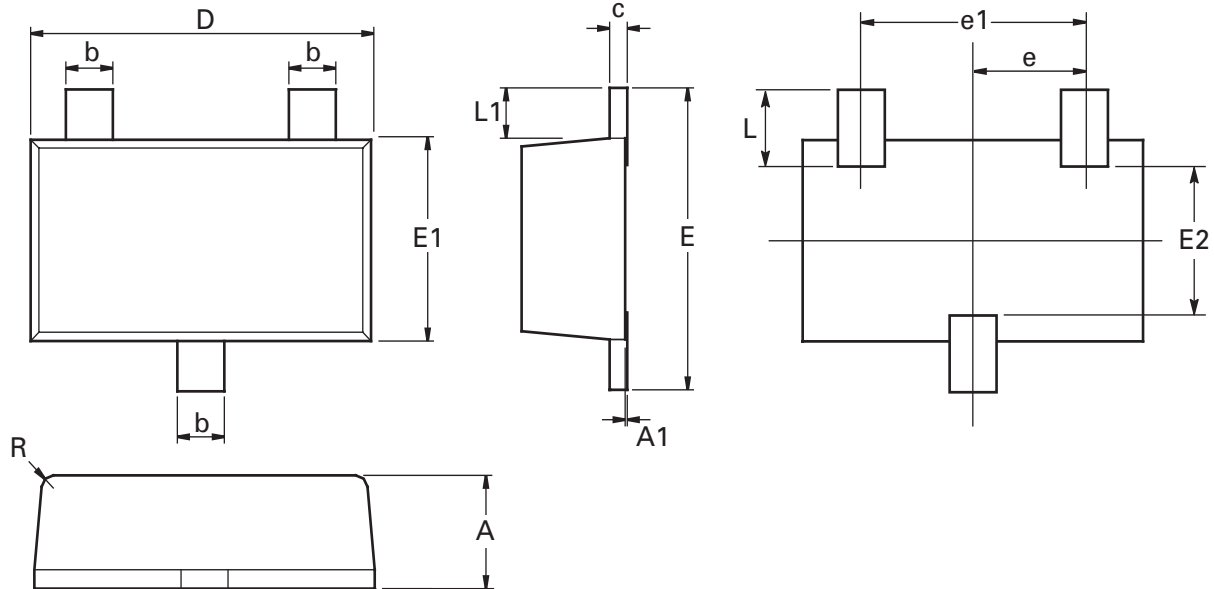
(\*) Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

## Typical characteristics



# ZXTN07012EFF

## Package outline - SOT23F



Dim.	Millimeters		Inches		Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Max.	Max.
A	0.80	1.00	0.0315	0.0394	E	2.30	2.50	0.0906	0.0984
A1	0.00	0.10	0.00	0.0043	E1	1.50	1.70	0.0590	0.0669
b	0.35	0.45	0.0153	0.0161	E2	1.10	1.26	0.0433	0.0496
c	0.10	0.20	0.0043	0.0079	L	0.48	0.68	0.0189	0.0268
D	2.80	3.00	0.1102	0.1181	L1	0.30	0.50	0.0153	0.0161
e	0.95 ref		0.0374 ref		R	0.05	0.15	0.0019	0.0059
e1	1.80	2.00	0.0709	0.0787	O	0°	12°	0°	12°

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

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