## ZXTN08400BFF

## 400V，SOT23F，NPN medium power high voltage transistor

## Summary

$\mathrm{BV}_{\text {CEX }}>450 \mathrm{~V}$
$\mathrm{BV}_{\text {CEO }}>400 \mathrm{~V}$
$B V_{\text {ECO }}>6 V$
$\mathrm{I}_{\mathrm{C} \text {（cont）}}=0.5 \mathrm{~A}$

$\mathrm{V}_{\text {CE（sat）}}<175 \mathrm{mV}$＠ 500 mA
$\mathrm{P}_{\mathrm{D}}=1.5 \mathrm{~W}$

## Complementary part number ZXTP08400BFF

## Description

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

## Features


－High voltage
－Low saturation voltage
－Low profile small outline package

## Applications

－Modems
－Telecoms line switching


Pinout－top view

## Ordering information

| Device | Reel size <br> （inches） | Tape width <br> $(\mathbf{m m})$ | Quantity <br> per reel |
| :--- | :---: | :---: | :---: |
| ZXTN08400BFFTA | 7 | 8 | 3000 |

## Device marking

## ZXTN08400BFF

## Absolute maximum ratings

| Parameter | Symbol | Limit | Unit |
| :--- | :---: | :---: | :---: |
| Collector-base voltage | $\mathrm{V}_{\mathrm{CBO}}$ | 450 | V |
| Collector-emitter voltage (forward blocking) | $\mathrm{V}_{\mathrm{CEX}}$ | 450 | V |
| Collector-emitter voltage | $\mathrm{V}_{\mathrm{CEO}}$ | 400 | V |
| Emitter-collector voltage (reverse blocking) | $\mathrm{V}_{\mathrm{ECO}}$ | 6 | V |
| Emitter-base voltage | $\mathrm{V}_{\mathrm{EBO}}$ | 7 | V |
| Continuous collector current ${ }^{(\mathrm{c})}$ | $\mathrm{I}_{\mathrm{C}}$ | 0.5 | A |
| Peak pulse current | $\mathrm{I}_{\mathrm{CM}}$ | 1 | A |
| Base current | $\mathrm{I}_{\mathrm{B}}$ | 0.2 | A |
| Power dissipation at $\mathrm{T}_{\mathrm{amb}}=25^{\circ} \mathrm{C}^{\text {(a) }}$ | $\mathrm{P}_{\mathrm{D}}$ | 0.84 | W |
| Linear derating factor |  | 6.72 | $\mathrm{~mW} /{ }^{\circ} \mathrm{C}$ |
| Power dissipation at $\mathrm{T}_{\mathrm{amb}}=25^{\circ} \mathrm{C}^{(\mathrm{b})}$ | $\mathrm{P}_{\mathrm{D}}$ | 1.34 | W |
| Linear derating factor |  | 10.72 | $\mathrm{~mW} /{ }^{\circ} \mathrm{C}$ |
| Power dissipation at $\mathrm{T}_{\mathrm{amb}}=25^{\circ} \mathrm{C}^{(\mathrm{c})}$ | $\mathrm{P}_{\mathrm{D}}$ | 1.5 | W |
| Linear derating factor |  | 12.0 | $\mathrm{~mW} /{ }^{\circ} \mathrm{C}$ |
| Power dissipation at $\mathrm{T}_{\mathrm{amb}}=25^{\circ} \mathrm{C}$ (d) | $\mathrm{P}_{\mathrm{D}}$ | 2.0 | W |
| Linear derating factor |  | 16.0 | $\mathrm{~mW} /{ }^{\circ} \mathrm{C}$ |
| Operating and storage temperature range | $\mathrm{T}_{\mathrm{j}}, \mathrm{T}_{\text {stg }}$ | -55 to 150 | ${ }^{\circ} \mathrm{C}$ |

Thermal resistance

| Parameter | Symbol | Limit | Unit |
| :--- | :---: | :---: | :---: |
| Junction to ambient ${ }^{(\mathrm{a})}$ | $\mathrm{R}_{\Theta J A}$ | 149 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |
| Junction to ambient $^{(\mathrm{b})}$ | $\mathrm{R}_{\text {ӨJA }}$ | 93 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |
| Junction to ambient $^{(\mathrm{c})}$ | $\mathrm{R}_{\text {ӨJA }}$ | 83 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |
| Junction to ambient ${ }^{(\mathrm{d})}$ | $\mathrm{R}_{\Theta J A}$ | 60 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |

## NOTES:

(a) For a device surface mounted on $15 \mathrm{~mm} \times 15 \mathrm{~mm} \times 1.6 \mathrm{~mm}$ FR4 PCB with high coverage of single sided 1 oz copper, in still air conditions.
(b) Mounted on $25 \mathrm{~mm} \times 25 \mathrm{~mm} \times 1.6 \mathrm{~mm}$ FR4 PCB with a high coverage of single sided 2 oz copper in still air conditions.
(c) Mounted on $50 \mathrm{~mm} \times 50 \mathrm{~mm} \times 1.6 \mathrm{~mm}$ FR4 PCB with a high coverage of single sided 2 oz copper in still air conditions.
(d) As (c) above measured at $\mathrm{t}<5 \mathrm{secs}$.

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## Typical characteristics




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## Electrical characteristics (at $\mathbf{T}_{\mathrm{amb}}=\mathbf{2 5}{ }^{\circ} \mathrm{C}$ unless otherwise stated)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Collector-base breakdown voltage | $\mathrm{BV}_{\text {CBO }}$ | 450 | 550 |  | V | $\mathrm{I}_{\mathrm{C}}=100 \mu \mathrm{~A}$ |
| Collector-emitter breakdown voltage (forward blocking) | $\mathrm{BV}_{\text {CEX }}$ | 450 | 550 |  | V | $\begin{aligned} & \mathrm{I}_{\mathrm{C}}=100 \mu \mathrm{~A}, \mathrm{R}_{\mathrm{BE}}<1 \mathrm{k} \Omega \text { or } \\ & -1 \mathrm{~V}<\mathrm{V}_{\mathrm{BE}}<0.25 \mathrm{~V} \end{aligned}$ |
| Collector-emitter breakdown voltage (base open) | $\mathrm{BV}_{\text {CEO }}$ | 400 | 500 |  | V | $\mathrm{I}_{\mathrm{C}}=10 \mathrm{~mA}{ }^{(*)}$ |
| Emitter-collector breakdown voltage (reverse blocking) | $\mathrm{BV}_{\mathrm{ECX}}$ | 6 | 8.0 |  | V | $\begin{aligned} & \mathrm{I}_{\mathrm{E}}=100 \mu \mathrm{~A}, \mathrm{R}_{\mathrm{BC}}<1 \mathrm{k} \Omega \text { or } \\ & 0.25 \mathrm{~V}>\mathrm{V}_{\mathrm{BC}}>-0.25 \mathrm{~V} \end{aligned}$ |
| Emitter-collector breakdown voltage (base open) | $\mathrm{BV}_{\mathrm{ECO}}$ | 6 | 8.5 |  | V | $\mathrm{I}_{\mathrm{E}}=100 \mu \mathrm{~A}$, |
| Emitter-base breakdown voltage | $B V_{\text {EBO }}$ | 7 | 8.1 |  | V | $\mathrm{I}_{\mathrm{E}}=100 \mu \mathrm{~A}$ |
| Collector-base cut-off current | $\mathrm{I}_{\text {CBO }}$ |  | <1 | $\begin{aligned} & 50 \\ & 20 \end{aligned}$ | $\mathrm{nA}$ $\mu \mathrm{A}$ | $\begin{aligned} & \mathrm{V}_{\mathrm{CB}}=360 \mathrm{~V} \\ & \mathrm{~V}_{\mathrm{CB}}=360 \mathrm{~V}, \mathrm{~T}_{\mathrm{amb}}=100^{\circ} \mathrm{C} \end{aligned}$ |
| Collector-emitter cut-off current | $\mathrm{I}_{\text {CEX }}$ |  | <1 | 100 | nA | $\begin{aligned} & \mathrm{V}_{\mathrm{CE}}=360 \mathrm{~V}, \mathrm{R}_{\mathrm{BE}}<1 \mathrm{k} \Omega \text { or } \\ & -1 \mathrm{~V}<\mathrm{V}_{\mathrm{BE}}<0.25 \mathrm{~V} \end{aligned}$ |
| Emitter-base cut-off current | $\mathrm{I}_{\text {Ebo }}$ |  | <1 | 50 | nA | $\mathrm{V}_{\mathrm{EB}}=5.6 \mathrm{~V}$ |
| Collector-emitter saturation voltage | $\mathrm{V}_{\text {CE(sat) }}$ |  | $\begin{gathered} \hline 70 \\ 50 \\ 120 \\ 125 \end{gathered}$ | $\begin{gathered} \hline 85 \\ 70 \\ 170 \\ 175 \end{gathered}$ | $\begin{aligned} & \mathrm{mV} \\ & \mathrm{mV} \\ & \mathrm{mV} \\ & \mathrm{mV} \end{aligned}$ | $\begin{aligned} & \mathrm{I}_{\mathrm{C}}=20 \mathrm{~mA}, \mathrm{I}_{\mathrm{B}}=1 \mathrm{~mA}^{(*)} \\ & \mathrm{I}_{\mathrm{C}}=50 \mathrm{~mA}, \mathrm{I}_{\mathrm{B}}=5 \mathrm{~mA}^{(*)} \\ & \mathrm{I}_{\mathrm{C}}=300 \mathrm{~mA}, \mathrm{I}_{\mathrm{B}}=30 \mathrm{~mA}^{(*)} \\ & \mathrm{I}_{\mathrm{C}}=500 \mathrm{~mA}, \mathrm{I}_{\mathrm{B}}=100 \mathrm{~mA}^{(*)} \end{aligned}$ |
| Base-emitter saturation voltage | $\mathrm{V}_{\mathrm{BE} \text { (sat) }}$ |  | 865 | 950 | mV | $\mathrm{I}_{C}=500 \mathrm{~mA}, \mathrm{I}_{\mathrm{B}}=100 \mathrm{~mA}^{(*)}$ |
| Base-emitter turn-on voltage | $\mathrm{V}_{\text {BE(on) }}$ |  | 800 | 900 | mV | $\left.\mathrm{I}_{\mathrm{C}}=500 \mathrm{~mA}, \mathrm{~V}_{C E}=10 \mathrm{~V}^{*}\right)$ |
| Static forward current transfer ratio | $\mathrm{h}_{\text {FE }}$ | $\begin{gathered} 90 \\ 100 \\ 10 \end{gathered}$ | $\begin{gathered} 165 \\ 180 \\ 20 \end{gathered}$ | 300 |  | $\begin{aligned} & \mathrm{I}_{\mathrm{C}}=1 \mathrm{~mA}, \mathrm{~V}_{\mathrm{CE}}=5 \mathrm{~V}^{(*)} \\ & \mathrm{I}_{\mathrm{C}}=50 \mathrm{~mA}, \mathrm{~V}_{\mathrm{CE}}=5 \mathrm{~V}^{(*)} \\ & \mathrm{I}_{\mathrm{C}}=500 \mathrm{~mA}, \mathrm{~V}_{\mathrm{CE}}=10 \mathrm{~V}^{*}{ }^{*} \end{aligned}$ |
| Transition frequency | $\mathrm{f}_{\mathrm{T}}$ |  | 40 |  | MHz | $\begin{aligned} & \mathrm{I}_{\mathrm{C}}=10 \mathrm{~mA}, \mathrm{~V}_{\mathrm{CE}}=20 \mathrm{~V} \\ & \mathrm{f}=20 \mathrm{MHz} \end{aligned}$ |
| Output capacitance | $\mathrm{C}_{\text {OBO }}$ |  | 8 | 10 | pF | $\mathrm{V}_{\mathrm{CB}}=20 \mathrm{~V}, \mathrm{f}=1 \mathrm{MHz}^{\left({ }^{*}\right)}$ |
| Delay time | $\mathrm{t}_{\mathrm{d}}$ |  | 100 |  | ns | $\mathrm{V}_{C C}=100 \mathrm{~V}$. |
| Rise time | $\mathrm{t}_{\mathrm{r}}$ |  | 52 |  | ns | $\mathrm{I}_{\mathrm{C}}=100 \mathrm{~mA},$ |
| Storage time | $\mathrm{t}_{\mathrm{s}}$ |  | 3122 |  | ns |  |
| Fall time | $\mathrm{t}_{\mathrm{f}}$ |  | 240 |  | ns |  |

## NOTES:

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

## ZXTN08400BFF

## Typical characteristics



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## 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 | 0 | $0^{\circ}$ | $12^{\circ}$ | $0^{\circ}$ | $12^{\circ}$ |

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

| Europe | Americas | Asia Pacific | Corporate Headquarters |
| :--- | :--- | :--- | :--- |
| Zetex GmbH | Zetex Inc | Zetex (Asia Ltd) | Zetex Semiconductors plc |
| Kustermann-park | 700 Veterans Memorial Highway | 3701-04 Metroplaza Tower 1 | Zetex Technology Park, Chadderton |
| Balanstraße 59 | Haupauge, NY 11788 | Hing Fong Road, Kwai Fong | Oldham, OL9 9LL |
| D-81541 München | USA | Hong Kong | United Kingdom |
| Germany |  |  |  |
| Telefon: (49) 89 45 49 49 0 | Telephone: (1) 631 360 2222 | Telephone: (852) 26100611 | Telephone: (44) 161622 4444 |
| Fax: (49) 89 45 49 49 49 <br> europe.sales@zetex.com | Fax: (1) 631 360 8222 <br> usa.sales@zetex.com | Fax: (852) 24250 494 <br> asia.sales@zetex.com | Fax: (44) 161622 4446 |
| hq@zetex.com |  |  |  |

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