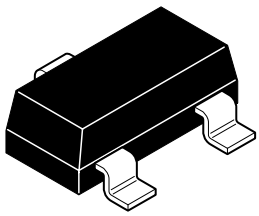
# ZXTN25020CFH
# 20V, SOT23, NPN medium power transistor

## Summary



**$BV_{CEX}$ > 70V**

**$BV_{CEO}$ > 20V**

**$BV_{ECO}$ > 5V**

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

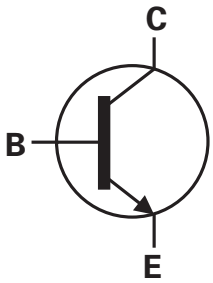
**$V_{CE(sat)}$ < 45 mV @ 1A**

**$R_{CE(sat)}$ = 28 mΩ**

**$P_D$ = 1.25W**

**Complementary part number ZXTP25020CFH**

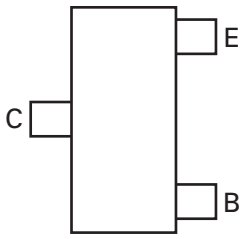
## Description




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
- High gain
- Low saturation voltage
- 70V forward blocking voltage
- 5V reverse blocking voltage




Pinout - top view

## Applications

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

## Ordering information

| Device | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---|---|---|---|
| ZXTN25020CFHTA | 7 | 8 | 3,000 |

## Device marking

1B3

## Absolute maximum ratings

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Collector-base voltage | $V_{CBO}$ | 70 | V |
| Collector-emitter voltage (forward blocking) | $V_{CEX}$ | 70 | V |
| Collector-emitter voltage | $V_{CEO}$ | 20 | V |
| Emitter-collector voltage (reverse blocking) | $V_{ECO}$ | 5 | V |
| Emitter-base voltage | $V_{EBO}$ | 7 | V |
| Continuous collector current[c] | $I_C$ | 4.5 | A |
| Base current | $I_B$ | 1 | A |
| Peak pulse current | $I_{CM}$ | 10 | A |
| Power dissipation at $T_{amb}$ =25°C[a] | $P_D$ | 0.73 | W |
| Linear derating factor | | 5.84 | mW/°C |
| Power dissipation at $T_{amb}$ =25°C[b] | $P_D$ | 1.05 | W |
| Linear derating factor | | 8.4 | mW/°C |
| Power dissipation at $T_{amb}$ =25°C[c] | $P_D$ | 1.25 | W |
| Linear derating factor | | 9.6 | mW/°C |
| Power dissipation at $T_{amb}$ =25°C[d] | $P_D$ | 1.81 | W |
| Linear derating factor | | 14.5 | mW/°C |
| Operating and storage temperature range | $T_j$, $T_{stg}$ | - 55 to 150 | °C |

## Thermal resistance

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Junction to ambient[a] | $R_{\Theta JA}$ | 171 | °C/W |
| Junction to ambient[b] | $R_{\Theta JA}$ | 119 | °C/W |
| Junction to ambient[c] | $R_{\Theta JA}$ | 100 | °C/W |
| Junction to ambient[d] | $R_{\Theta JA}$ | 69 | °C/W |

**NOTES:**

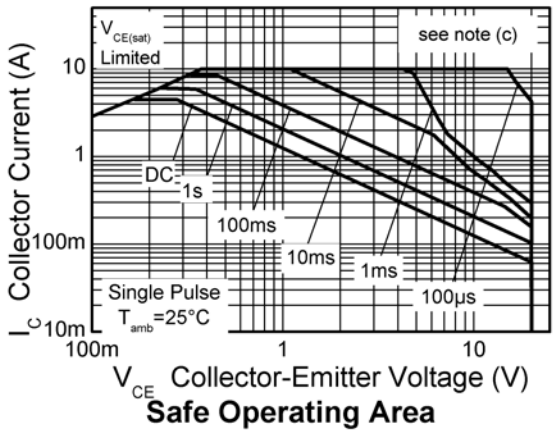
(a) For a device surface mounted on 15mm x 15mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.

(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.

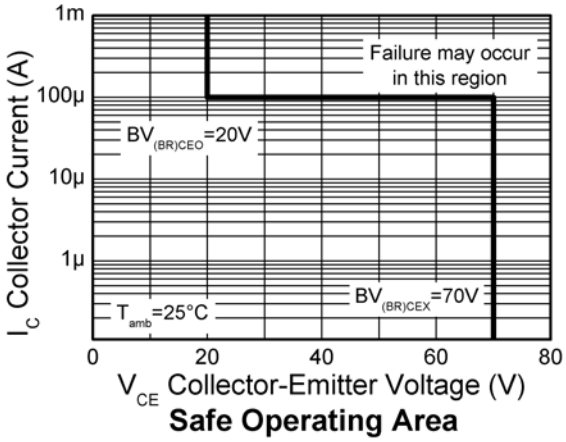
(c) Mounted on 50mm x 50mm x 1.6mm FR4 PCB with a high coverage of single sided 2 oz copper in still air conditions.

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

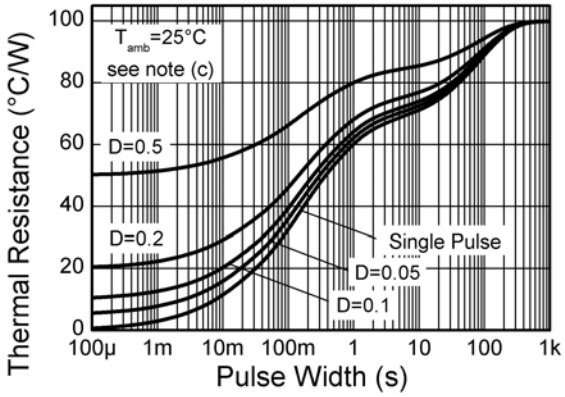
## Characteristics



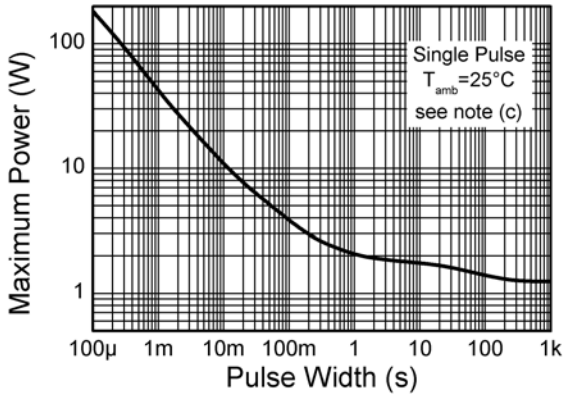

**Safe Operating Area**



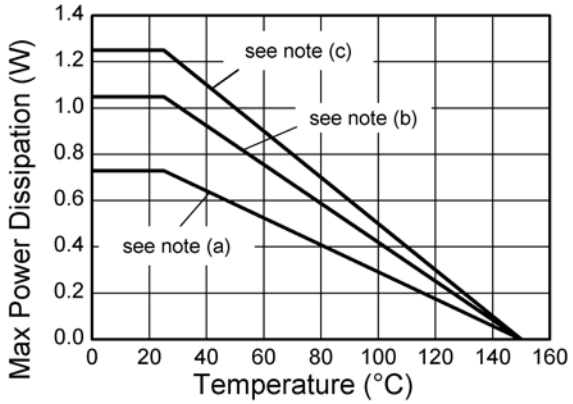

**Safe Operating Area**




**Transient Thermal Impedance**




**Pulse Power Dissipation**



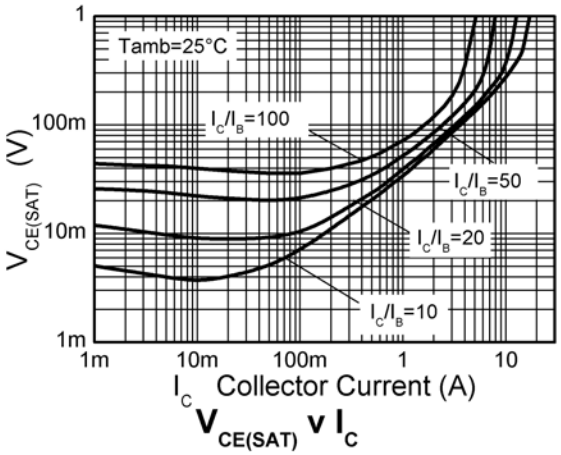

**Derating Curve**

## Electrical characteristics (at $T_{amb}$ = 25°C unless otherwise stated)

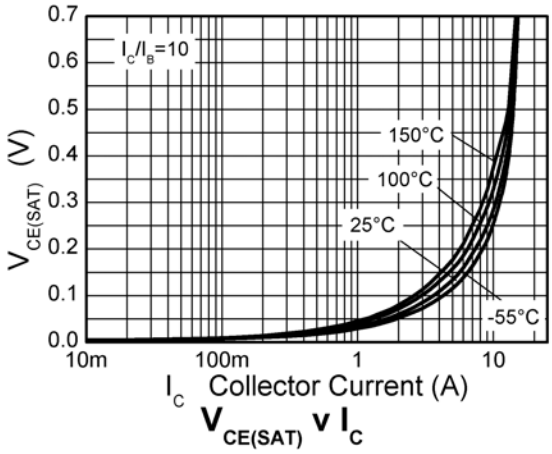
| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Collector-base breakdown voltage | $BV_{CBO}$ | 70 | 100 | | V | $I_C$ = 100μA |
| Collector-emitter breakdown voltage (forward blocking) | $BV_{CEX}$ | 70 | 100 | | | $I_C$ = 100μA, $R_{BE} \leq 1k\Omega$ or -1V < $V_{BE}$ < 0.25V |
| Collector-emitter breakdown voltage (base open) | $BV_{CEO}$ | 20 | 35 | | V | $I_C$ = 10mA (*) |
| Emitter-base breakdown voltage | $BV_{EBO}$ | 7 | 8.3 | | V | $I_E$ = 100μA |
| Emitter-collector breakdown voltage (reverse blocking) | $BV_{ECX}$ | 6 | 8.0 | | V | $I_E$ = 100μA, $R_{BC} \leq 1k\Omega$ or 0.25V > $V_{BC}$ > -0.25V |
| Emitter-collector breakdown voltage (base open) | $BV_{ECO}$ | 5 | 6.6 | | V | $I_E$ = 100μA, |
| Collector-base cut-off current | $I_{CBO}$ | | <1 | 50<br>20 | nA<br>μA | $V_{CB}$ = 56V<br>$V_{CB}$ = 56V, $T_{amb}$= 100°C |
| Collector-emitter cut-off current | $I_{CEX}$ | | - | 100 | nA | $V_{CE}$ = 56V; $R_{BE} \leq 1k\Omega$ or -1V < $V_{BE}$ < 0.25V |
| Emitter-base cut-off current | $I_{EBO}$ | | <1 | 50 | nA | $V_{EB}$ = 5.6V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | | 35<br>53<br>85<br>175<br>125 | 45<br>65<br>100<br>220<br>140 | mV<br>mV<br>mV<br>mV<br>mV | $I_C$ = 1A, $I_B$ = 100mA(*)<br>$I_C$ = 1A, $I_B$ = 20mA(*)<br>$I_C$ = 2A, $I_B$ = 40mA(*)<br>$I_C$ = 4.5A, $I_B$ = 90mA(*)<br>$I_C$ = 4.5A, $I_B$ = 450mA(*) |
| Base-emitter saturation voltage | $V_{BE(sat)}$ | | 905 | 1000 | mV | $I_C$ = 4.5A, $I_B$ = 90mA(*) |
| Base-emitter turn-on voltage | $V_{BE(on)}$ | | 815 | 900 | mV | $I_C$ = 4.5A, $V_{CE}$ = 2V(*) |
| Static forward current transfer ratio | $h_{FE}$ | 200<br>180<br>90<br>25 | 350<br>320<br>145<br>40 | 500 | | $I_C$ = 10mA, $V_{CE}$ = 2V(*)<br>$I_C$ = 1A, $V_{CE}$ = 2V(*)<br>$I_C$ = 4.5A, $V_{CE}$ = 2V(*)<br>$I_C$ = 10A, $V_{CE}$ = 2V(*) |
| Transition frequency | $f_T$ | | 185 | | MHz | $I_C$ = 50mA, $V_{CE}$ = 10V f = 100MHz |
| Output capacitance | $C_{OBO}$ | | 16.8 | 25 | pF | $V_{CB}$ = 10V, f = 1MHz(*) |
| Delay time | $t_d$ | | 70.5 | | ns | $V_{CC}$ = 10V. $I_C$ = 1A, $I_{B1}$ = $I_{B2}$= 10mA. |
| Rise time | $t_r$ | | 88 | | ns | |
| Storage time | $t_s$ | | 266 | | ns | |
| Fall time | $t_f$ | | 65 | | ns | |

**NOTES:**
(*) Measured under pulsed conditions. Pulse width ≤300μs; duty cycle ≤2%.

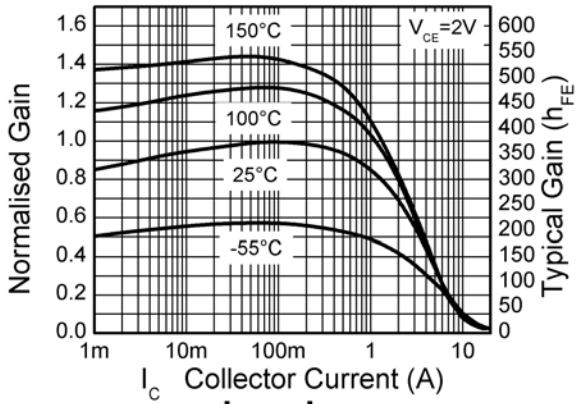
## Typical characteristics



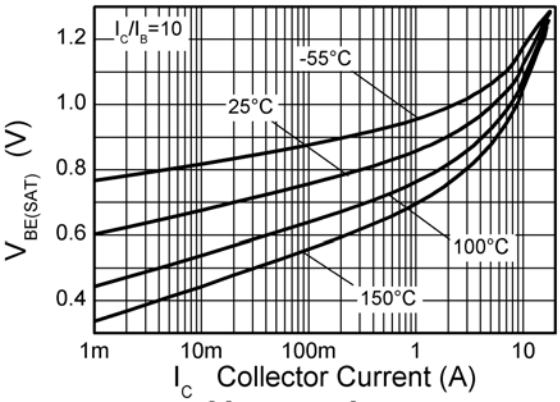

**$V_{CE(SAT)}$ v $I_C$**



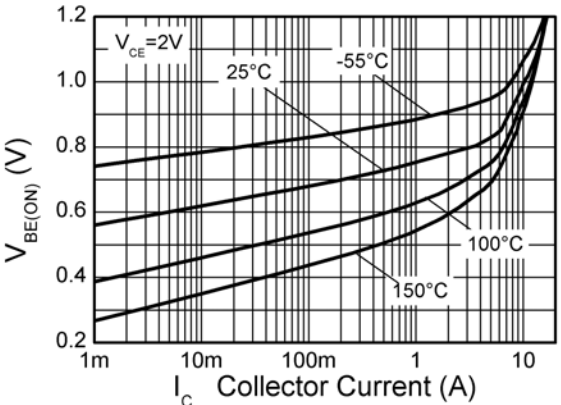

**$V_{CE(SAT)}$ v $I_C$**




**$h_{FE}$ v $I_C$**

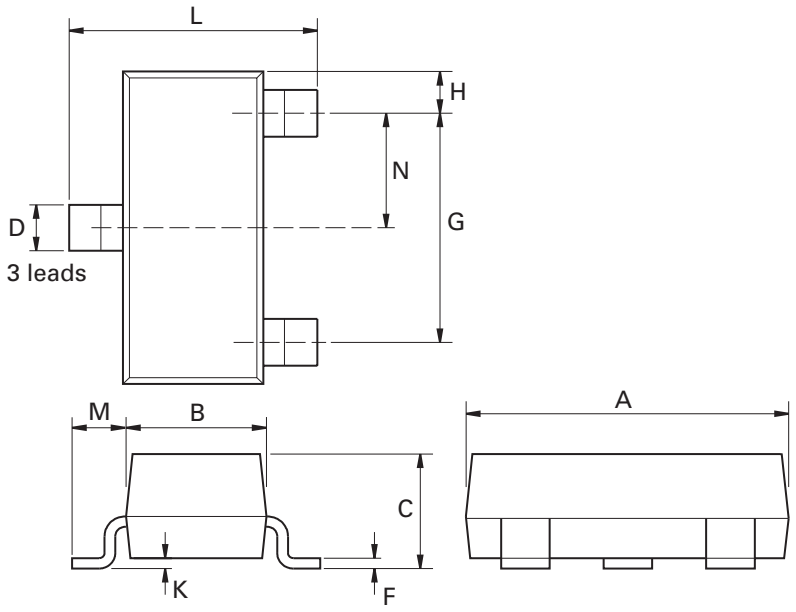



**$V_{BE(SAT)}$ v $I_C$**




**$V_{BE(ON)}$ v $I_C$**

## Package outline - SOT23




| Dim. | Millimeters | | Inches | | Dim. | Millimeters | | Inches | |
|---|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Max. | Max. |
| A | 2.67 | 3.05 | 0.105 | 0.120 | H | 0.33 | 0.51 | 0.013 | 0.020 |
| B | 1.20 | 1.40 | 0.047 | 0.055 | K | 0.01 | 0.10 | 0.0004 | 0.004 |
| C | - | 1.10 | - | 0.043 | L | 2.10 | 2.50 | 0.083 | 0.0985 |
| D | 0.37 | 0.53 | 0.015 | 0.021 | M | 0.45 | 0.64 | 0.018 | 0.025 |
| F | 0.085 | 0.15 | 0.0034 | 0.0059 | N | 0.95 NOM | | 0.0375 NOM | |
| G | 1.90 NOM | | 0.075 NOM | | - | - | - | - | - |

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


**Europe**
Zetex GmbH
Streitfeldstraße 19
D-81673 München
Germany

Telefon: (49) 89 45 49 49 0
Fax: (49) 89 45 49 49 49
europe.sales@zetex.com

**Americas**
Zetex Inc
700 Veterans Memorial Highway
Hauppauge, NY 11788
USA

Telephone: (1) 631 360 2222
Fax: (1) 631 360 8222
usa.sales@zetex.com

**Asia Pacific**
Zetex (Asia Ltd)
3701-04 Metroplaza Tower 1
Hing Fong Road, Kwai Fong
Hong Kong

Telephone: (852) 26100 611
Fax: (852) 24250 494
asia.sales@zetex.com

**Corporate Headquarters**
Zetex Semiconductors plc
Zetex Technology Park, Chadderton
Oldham, OL9 9LL
United Kingdom

Telephone: (44) 161 622 4444
Fax: (44) 161 622 4446
hq@zetex.com

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