

# ZXTN19020DFF

## 20V, SOT23F, NPN high gain power transistor

### Summary

$BV_{CEX} > 70V$

$BV_{CEO} > 20V$

$BV_{ECO} > 4.5V$

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

$V_{CE(sat)} = < 30mV @ 1A$

$R_{CE(sat)} = 18m\Omega$

$P_D = 1.5W$

Complementary part number ZXTP19020DFF

### Description

Advanced process capability has been used to maximize the performance of this transistor. The SOT23F package is compatible with the industry standard SOT23 footprint but offers lower profile and higher dissipation for applications where power density is of utmost importance.

### Features

- Very low saturation voltage
- High gain
- High forward blocking voltage
- Low profile high dissipation package

### Applications

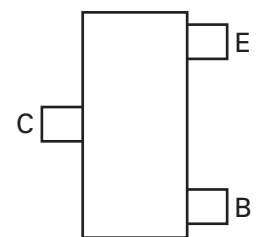
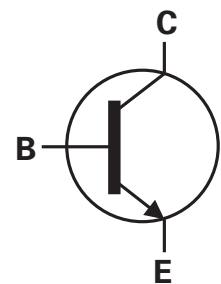
- MOSFET and IGBT gate driving
- LED driving
- Strobe flash
- Motor drive
- Micro buffers

### Ordering information

| Device         | Reel size (inches) | Tape width (mm) | Quantity per reel |
|----------------|--------------------|-----------------|-------------------|
| ZXTN19020DFFTA | 7                  | 8               | 3000              |

### Device marking

1E3



Pinout - top view

# ZXTN19020DFF

## 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 (base open)                   | $V_{CEO}$      | 20          | V     |
| Emitter-collector voltage (reverse blocking)            | $V_{ECO}$      | 4.5         | 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                                      | $I_{CM}$       | 20          | A     |
| Power dissipation at $T_{amb} = 25^\circ\text{C}^{(a)}$ | $P_D$          | 0.84        | W     |
| Linear derating factor                                  |                | 6.72        | mW/°C |
| Power dissipation at $T_{amb} = 25^\circ\text{C}^{(b)}$ | $P_D$          | 1.34        | W     |
| Linear derating factor                                  |                | 10.72       | mW/°C |
| Power dissipation at $T_{amb} = 25^\circ\text{C}^{(c)}$ | $P_D$          | 1.5         | W     |
| Linear derating factor                                  |                | 12.0        | mW/°C |
| Power dissipation at $T_{amb} = 25^\circ\text{C}^{(d)}$ | $P_D$          | 2.0         | W     |
| Linear derating factor                                  |                | 16.0        | mW/°C |
| Operating and storage temperature range                 | $T_j, T_{stg}$ | - 55 to 150 | °C    |

## Thermal resistance

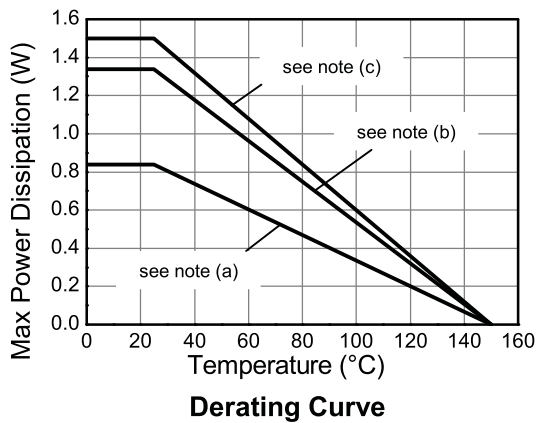
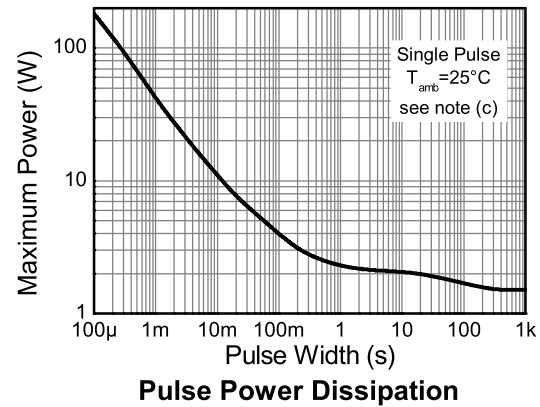
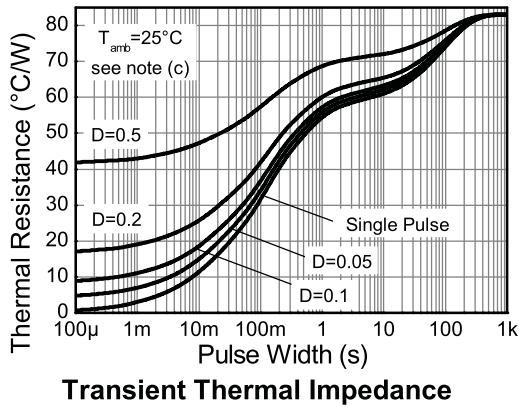
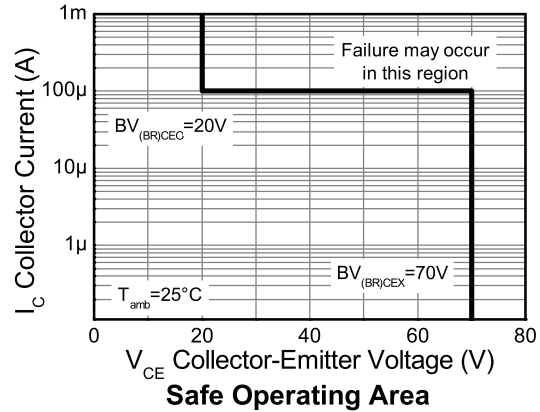
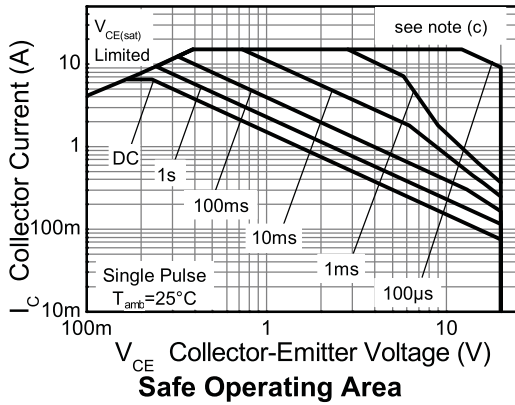
| Parameter                          | Symbol          | Value | Unit |
|------------------------------------|-----------------|-------|------|
| Junction to ambient <sup>(a)</sup> | $R_{\theta JA}$ | 149.3 | °C/W |
| Junction to ambient <sup>(b)</sup> | $R_{\theta JA}$ | 93.4  | °C/W |
| Junction to ambient <sup>(c)</sup> | $R_{\theta JA}$ | 83.3  | °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.

# ZXTN19020DFF

## Characteristics



# ZXTN19020DFF

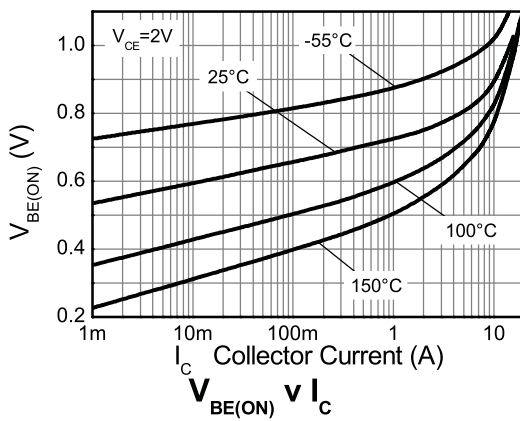
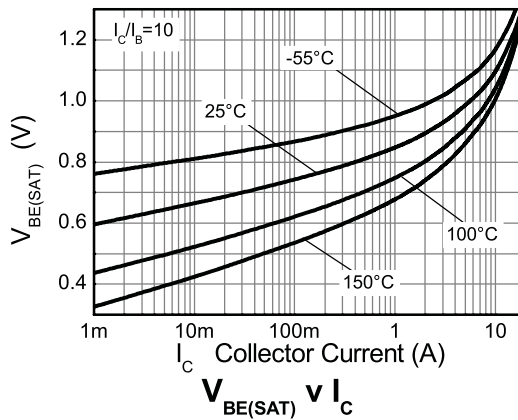
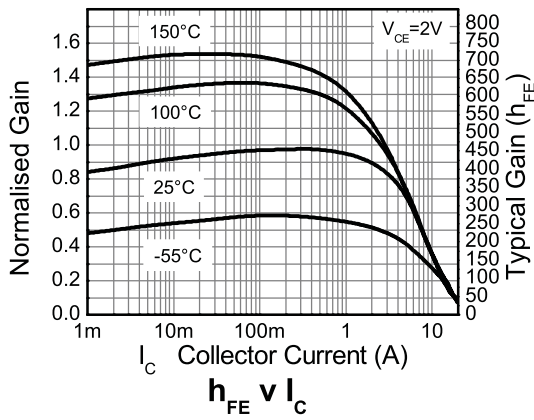
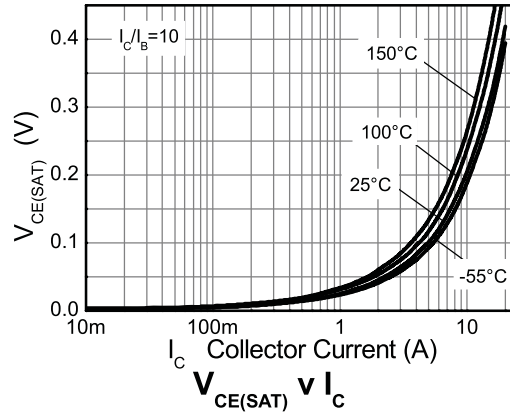
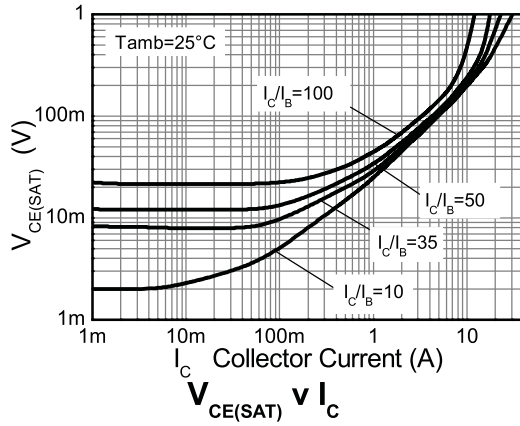
## Electrical characteristics (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

| Parameter  | Symbol        | Min.                    | Typ.                        | Max.                        | Unit                       | Conditions  |
|--|---------------|-------------------------|-----------------------------|-----------------------------|----------------------------|---|
| Collector-base breakdown voltage                       | $BV_{CBO}$    | 70                      | 100                         |                             | V                          | $I_C = 100\mu\text{A}$  |
| Collector-emitter breakdown voltage (forward blocking) | $BV_{CEX}$    | 70                      | 100                         |                             | V                          | $I_C = 100\mu\text{A}$ , $R_{BE} \leq 1\text{k}\Omega$ or $-1\text{V} < V_{BE} < 0.25\text{V}$  |
| Collector-emitter breakdown voltage (base open)        | $BV_{CEO}$    | 20                      | 30                          |                             | V                          | $I_C = 10\text{mA}^{(*)}$   |
| Emitter-base breakdown voltage                         | $BV_{EBO}$    | 7                       | 8.4                         |                             | V                          | $I_E = 100\mu\text{A}$  |
| Emitter-collector breakdown voltage (reverse blocking) | $BV_{ECX}$    | 6                       | 8.4                         |                             | V                          | $I_E = 100\mu\text{A}$ , $R_{BC} \leq 1\text{k}\Omega$ or $0.25\text{V} > V_{BC} > -0.25\text{V}$   |
| Emitter-collector breakdown voltage (base open)        | $BV_{ECO}$    | 4.5                     | 5.7                         |                             | V                          | $I_E = 100\mu\text{A}$ ,  |
| Collector-base cut-off current                         | $I_{CBO}$     |                         | <1                          | 50<br>20                    | nA<br>$\mu\text{A}$        | $V_{CB} = 56\text{V}$<br>$V_{CB} = 56\text{V}$ , $T_{amb} = 100^{\circ}\text{C}$  |
| Collector-emitter cut-off current                      | $I_{CEX}$     |                         | -                           | 100                         | nA                         | $V_{CE} = 56\text{V}$ , $R_{BE} \leq 1\text{k}\Omega$ or $-1\text{V} < V_{BE} < 0.25\text{V}$   |
| Emitter-base cut-off current                           | $I_{EBO}$     |                         | <1                          | 50                          | nA                         | $V_{EB} = 5.6\text{V}$  |
| Collector-emitter saturation voltage                   | $V_{CE(sat)}$ |                         | 25<br>45<br>70<br>55<br>140 | 30<br>65<br>95<br>75<br>190 | mV<br>mV<br>mV<br>mV<br>mV | $I_C = 1\text{A}$ , $I_B = 100\text{mA}^{(*)}$<br>$I_C = 1\text{A}$ , $I_B = 10\text{mA}^{(*)}$<br>$I_C = 2\text{A}$ , $I_B = 20\text{mA}^{(*)}$<br>$I_C = 2\text{A}$ , $I_B = 40\text{mA}^{(*)}$<br>$I_C = 6.5\text{A}$ , $I_B = 180\text{mA}^{(*)}$ |
| Base-emitter saturation voltage                        | $V_{BE(sat)}$ |                         | 940                         | 1050                        | mV                         | $I_C = 6.5\text{A}$ , $I_B = 180\text{mA}^{(*)}$  |
| Base-emitter turn-on voltage                           | $V_{BE(on)}$  |                         | 830                         | 950                         | mV                         | $I_C = 6.5\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$  |
| Static forward current transfer ratio                  | $h_{FE}$      | 300<br>260<br>160<br>50 | 450<br>420<br>270<br>80     | 900                         |                            | $I_C = 0.1\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$<br>$I_C = 2\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$<br>$I_C = 6.5\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$<br>$I_C = 15\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$   |
| Transition frequency                                   | $f_T$         |                         | 160                         |                             | MHz                        | $I_C = 50\text{mA}$ , $V_{CE} = 10\text{V}$<br>$f = 50\text{MHz}$   |
| Input capacitance                                      | $C_{ibo}$     |                         | 297                         |                             | pF                         | $V_{EB} = 0.5\text{V}$ , $f = 1\text{MHz}^{(*)}$  |
| Output capacitance                                     | $C_{obo}$     |                         | 32.6                        | 40                          | pF                         | $V_{CB} = 10\text{V}$ , $f = 1\text{MHz}^{(*)}$   |
| Delay time   | $t_d$         |                         | 129                         |                             | ns                         | $V_{CC} = 10\text{V}$ .   |
| Rise time  | $t_r$         |                         | 96                          |                             | ns                         | $I_C = 1\text{A}$ ,   |
| Storage time   | $t_s$         |                         | 398                         |                             | ns                         | $I_{B1} = -I_{B2} = 10\text{mA}$ .  |
| Fall time  | $t_f$         |                         | 90                          |                             | ns                         |   |

### NOTES:

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

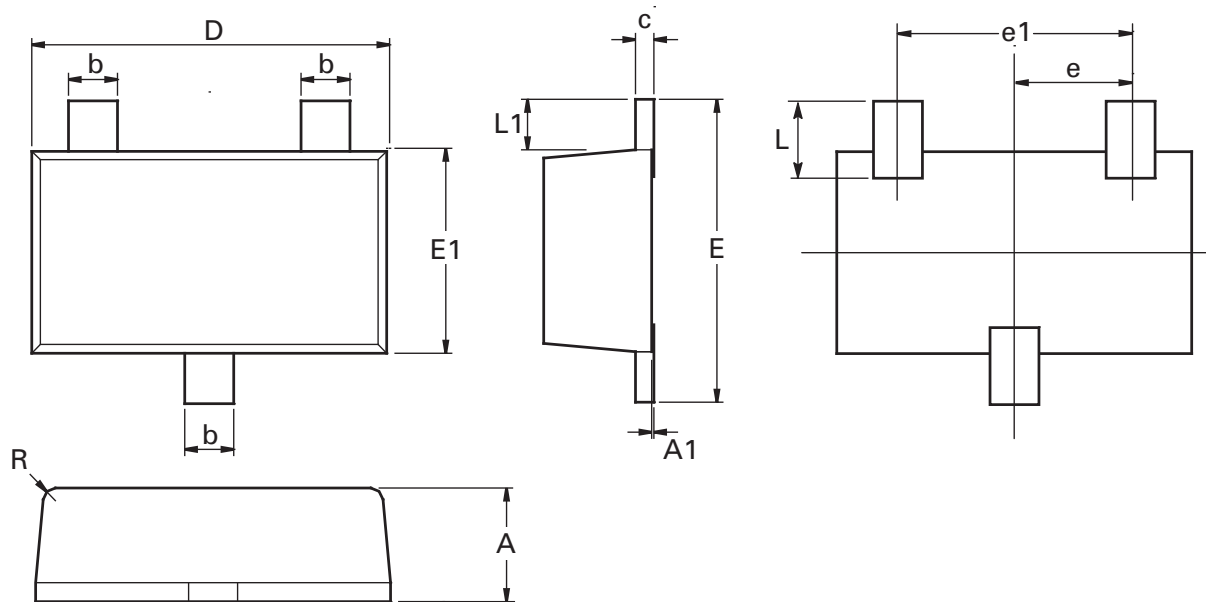
## Typical characteristics



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# ZXTN19020DFF

## 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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| "Active"                          | Product status recommended for new designs                                     |
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