

# ZXTN25020DFH

## 20V SOT23 NPN medium power transistor

### Summary

$BV_{CEX} > 100V$ ;  $BV_{(BR)CEO} > 20V$

$BV_{ECO} > 5V$ ;

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

$R_{CE(sat)} = 28\ m\Omega$  typical

$V_{CE(sat)} < 43\ mV$  @ 1A;

$P_D = 1.25W$

Complementary part number ZXTP25020DFH

### 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

- Higher power dissipation SOT23 package
- High peak current
- Low saturation voltage
- 100V forward blocking voltage
- 5V reverse blocking voltage

### Applications

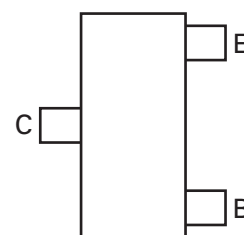
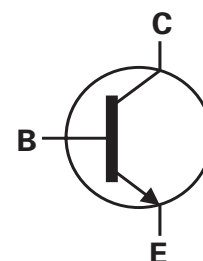
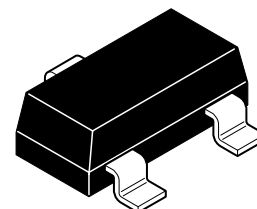
- DC - DC converters
- MOSFET and IGBT gate driving
- LED driver
- Motor drive
- Relay, lamp and solenoid drive

### Ordering information

| Device         | Reel size (inches) | Tape width | Quantity per reel |
|----------------|--------------------|------------|-------------------|
| ZXTN25020DFHTA | 7                  | 8mm        | 3000              |

### Device marking

016



Pinout - top view

# ZXTN25020DFH

## Absolute maximum ratings

| Parameter                                                    | Symbol         | Limit       | Unit  |
|--------------------------------------------------------------|----------------|-------------|-------|
| Collector-base voltage                                       | $V_{CBO}$      | 100         | V     |
| Collector-emitter voltage (forward blocking)                 | $V_{CEX}$      | 100         | 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 <sup>(c)</sup>                  | $I_C$          | 4.5         | A     |
| Base current                                                 | $I_B$          | 1           | A     |
| Peak pulse current                                           | $I_{CM}$       | 15          | A     |
| Power dissipation at $T_A = 25^\circ\text{C}$ <sup>(a)</sup> | $P_D$          | 0.73        | W     |
| Linear derating factor                                       |                | 5.84        | mW/°C |
| Power dissipation at $T_A = 25^\circ\text{C}$ <sup>(b)</sup> | $P_D$          | 1.05        | W     |
| Linear derating factor                                       |                | 8.4         | mW/°C |
| Power dissipation at $T_A = 25^\circ\text{C}$ <sup>(c)</sup> | $P_D$          | 1.25        | W     |
| Linear derating factor                                       |                | 9.6         | mW/°C |
| Power dissipation at $T_A = 25^\circ\text{C}$ <sup>(d)</sup> | $P_D$          | 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 <sup>(a)</sup> | $R_{\theta JA}$ | 171   | °C/W |
| Junction to ambient <sup>(b)</sup> | $R_{\theta JA}$ | 119   | °C/W |
| Junction to ambient <sup>(c)</sup> | $R_{\theta JA}$ | 100   | °C/W |
| Junction to ambient <sup>(d)</sup> | $R_{\theta JA}$ | 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.

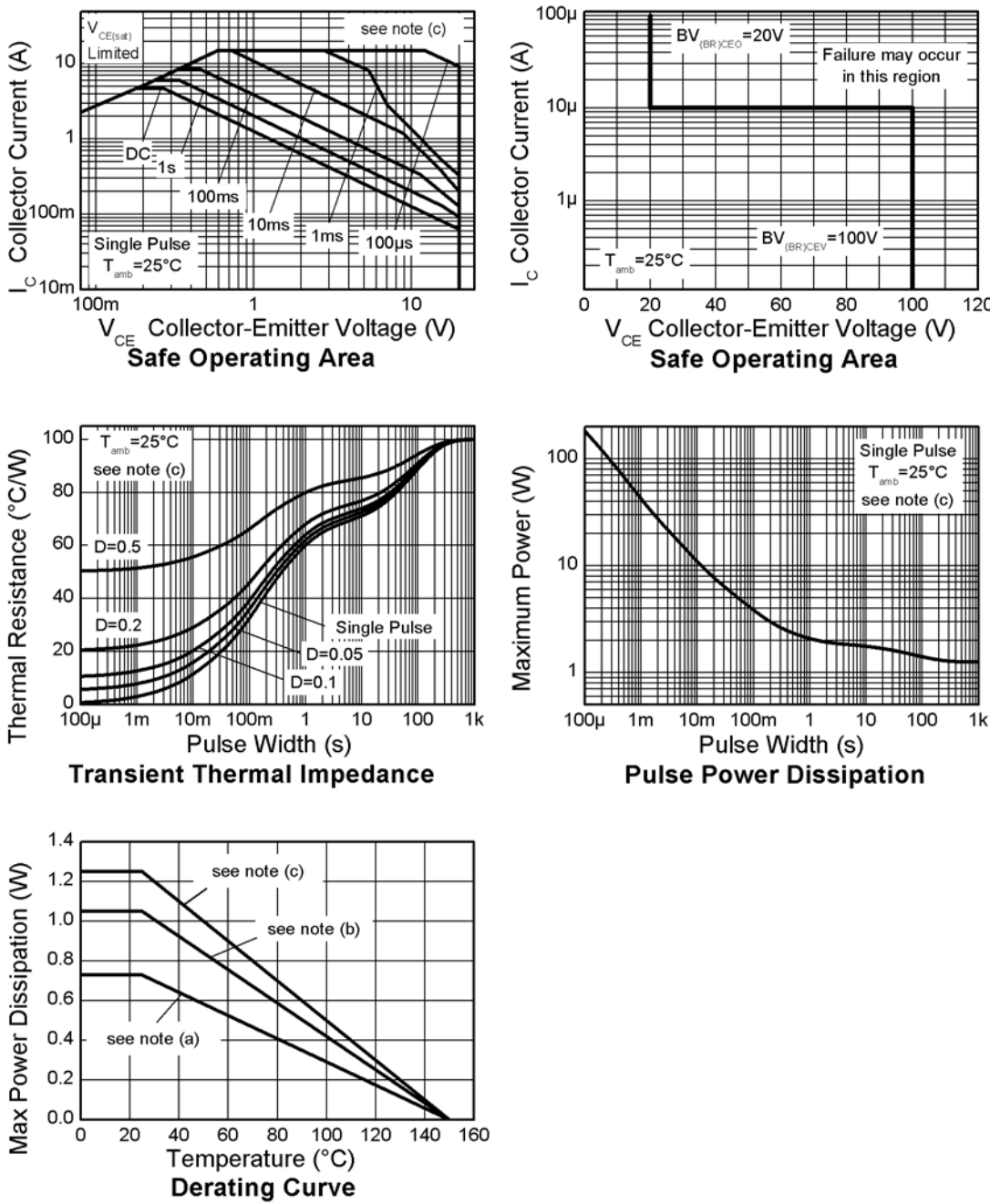
(b) Mounted on 25mm x 25mm x 1.6mm FR4 PCB with a high coverage of single sided 2 oz copper in still air conditions.

(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  $t < 5\text{secs}$ .

# ZXTN25020DFH

## Characteristics



# ZXTN25020DFH

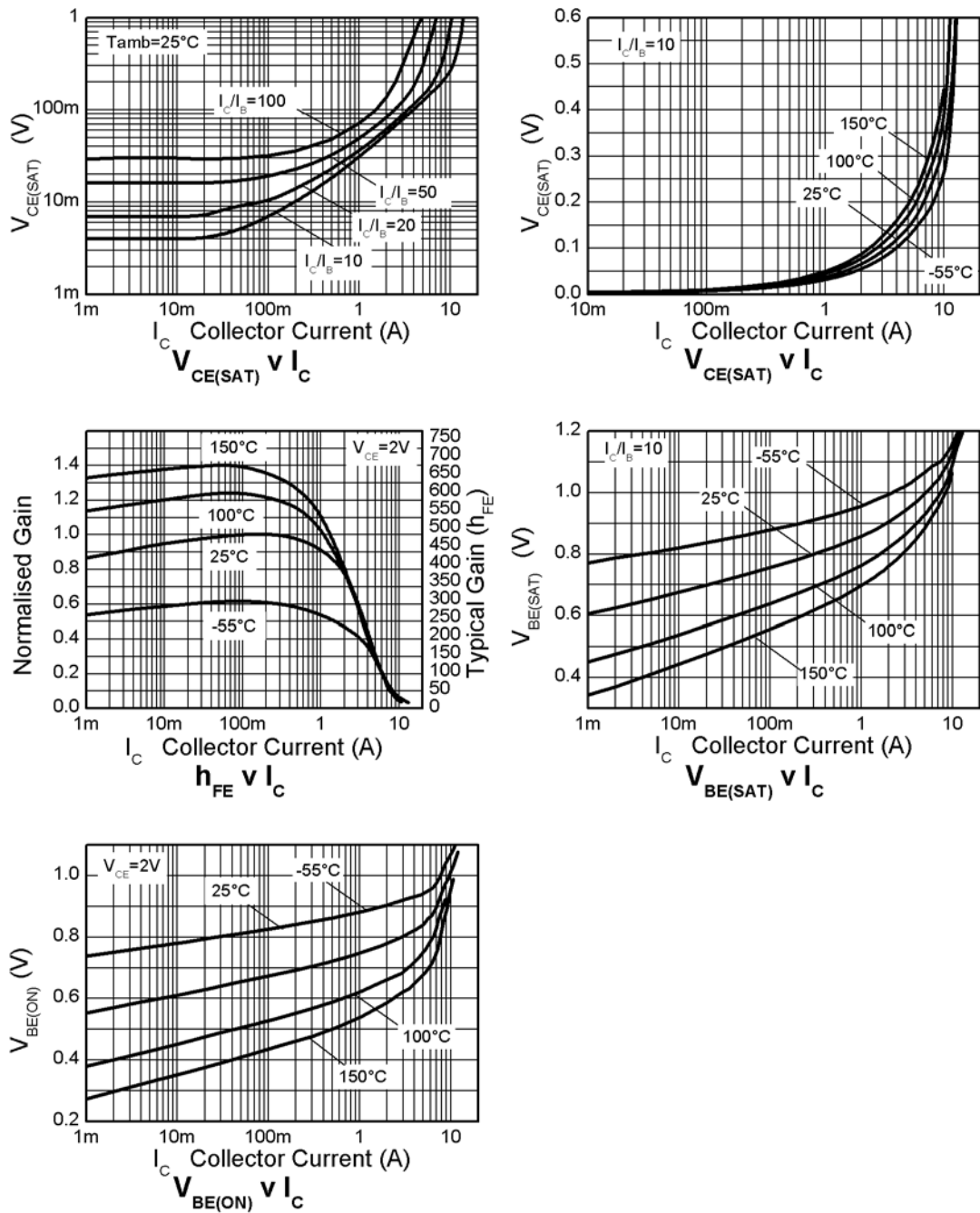
## Electrical characteristics (at $T_{AMB} = 25^{\circ}\text{C}$ unless otherwise stated)

| Parameter                                              | Symbol        | Min. | Typ. | Max.     | Unit                | Conditions                                                                                        |
|--------------------------------------------------------|---------------|------|------|----------|---------------------|---------------------------------------------------------------------------------------------------|
| Collector emitter breakdown voltage (base open)        | $BV_{CEO}$    | 20   | 35   |          | V                   | $I_C = 10\text{mA}^{(*)}$                                                                         |
| Emitter-collector breakdown voltage (reverse blocking) | $BV_{ECX}$    | 6    | 8    |          | 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)        | $BV_{ECO}$    | 5    | 6    |          | V                   | $I_E = 100\text{mA}$ ,                                                                            |
| Emitter base breakdown voltage                         | $BV_{EBO}$    | 7    | 8.3  |          | V                   | $I_E = 100\text{mA}$                                                                              |
| Collector cut-off current                              | $I_{CBO}$     |      | <1   | 50<br>20 | nA<br>$\mu\text{A}$ | $V_{CB} = 100\text{V}$<br>$V_{CB} = 100\text{V}$ , $T_{AMB} = 100^{\circ}\text{C}$                |
| Collector emitter cut-off current                      | $I_{CEX}$     |      | -    | 100      | nA                  | $V_{CE} = 100\text{V}$ ; $R_{BE} \leq 1\text{k}\Omega$ or $-1\text{V} < V_{BE} < 0.25\text{V}$    |
| Emitter cut-off current                                | $I_{EBO}$     |      | <1   | 50       | nA                  | $V_{EB} = 5.6\text{V}$                                                                            |
| Collector emitter saturation voltage                   | $V_{CE(sat)}$ |      | 35   | 43       | mV                  | $I_C = 1\text{A}$ , $I_B = 100\text{mA}^{(*)}$                                                    |
|                                                        |               |      | 55   | 70       | mV                  | $I_C = 1\text{A}$ , $I_B = 20\text{mA}^{(*)}$                                                     |
|                                                        |               |      | 90   | 110      | mV                  | $I_C = 2\text{A}$ , $I_B = 40\text{mA}^{(*)}$                                                     |
|                                                        |               |      | 125  | 170      | mV                  | $I_C = 2\text{A}$ , $I_B = 20\text{mA}^{(*)}$                                                     |
|                                                        |               |      | 125  | 150      | mV                  | $I_C = 4.5\text{A}$ , $I_B = 450\text{mA}^{(*)}$                                                  |
|                                                        |               |      | 205  | 265      | mV                  | $I_C = 4.5\text{A}$ , $I_B = 90\text{mA}^{(*)}$                                                   |
| Base emitter saturation voltage                        | $V_{BE(sat)}$ |      | 900  | 1000     | mV                  | $I_C = 4.5\text{A}$ , $I_B = 90\text{mA}^{(*)}$                                                   |
| Base emitter turn-on voltage                           | $V_{BE(on)}$  |      | 820  | 900      | mV                  | $I_C = 4.5\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$                                                  |
| Static forward current transfer ratio                  | $h_{FE}$      | 300  | 450  | 900      |                     | $I_C = 10\text{mA}$ , $V_{CE} = 2\text{V}^{(*)}$                                                  |
|                                                        |               | 250  | 380  |          |                     | $I_C = 2\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$                                                    |
|                                                        |               | 120  | 170  |          |                     | $I_C = 4.5\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$                                                  |
|                                                        |               |      | 15   |          |                     | $I_C = 15\text{A}$ , $V_{CE} = 2\text{V}^{(*)}$                                                   |
| Transition frequency                                   | $f_T$         |      | 215  |          | MHz                 | $I_C = 50\text{mA}$ , $V_{CE} = 10\text{V}$<br>$f = 100\text{MHz}$                                |
| Output capacitance                                     | $C_{OBO}$     |      | 16.5 | 25       | pF                  | $V_{CB} = 10\text{V}$ , $f = 1\text{MHz}^{(*)}$                                                   |
| Delay time                                             | $t_{(d)}$     |      | 68   |          | ns                  | $V_{CC} = 10\text{V}$ . $I_C = 1\text{A}$ ,<br>$I_{B1} = I_{B2} = 10\text{mA}$ .                  |
| Rise time                                              | $t_{(r)}$     |      | 72   |          | ns                  |                                                                                                   |
| Storage time                                           | $t_{(s)}$     |      | 361  |          | ns                  |                                                                                                   |
| Fall time                                              | $t_{(f)}$     |      | 64   |          | ns                  |                                                                                                   |

### NOTES:

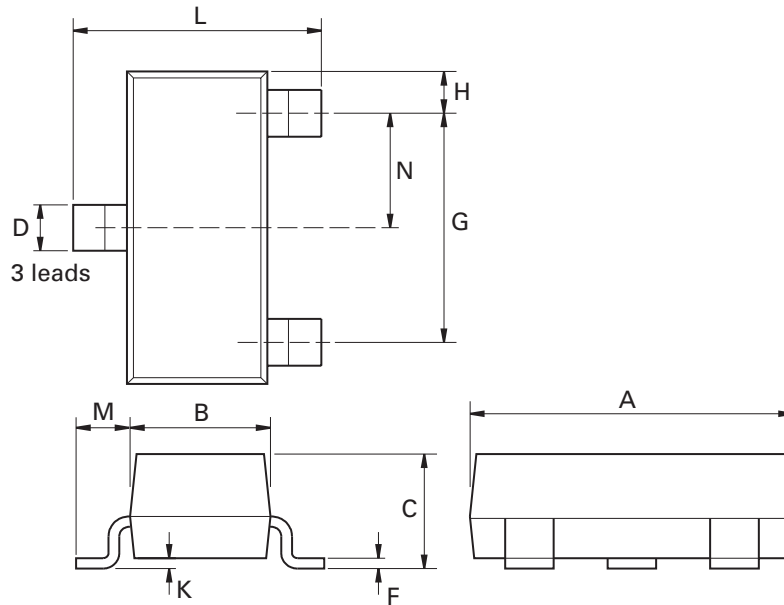
(\*) Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

Characteristics



# ZXTN25020DFH

## 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

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