

# ZXTN2020F

## 100V, SOT23, NPN medium power transistor

### Summary

$V_{(BR)CEV} > 160V$ ,  $V_{(BR)CEO} > 100V$

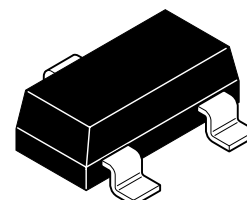
$I_{C(cont)} = 4A$

$R_{CE(sat)} = 30m\Omega$  typical

$V_{CE(sat)} < 50mV$  @ 1A

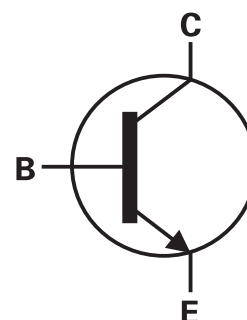
$P_D = 1.2W$

Complementary part number: ZXTP2029F



### 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.

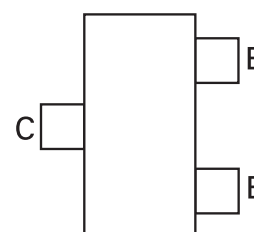


### Features

- Higher power dissipation SOT23 package
- High peak current
- Low saturation voltage
- 160V forward blocking voltage

### Applications

- MOSFET and IGBT gate driving
- Motor drive
- Relay, lamp and solenoid drive



Pinout - top view

### Ordering information

| Device      | Reel size (inches) | Tape width (mm) | Quantity per reel |
|-------------|--------------------|-----------------|-------------------|
| ZXTN2020FTA | 7                  | 8               | 3,000             |

### Device marking

853

**Absolute maximum ratings**

| Parameter                                   | Symbol         | Limit       | Unit            |
|---------------------------------------------|----------------|-------------|-----------------|
| Collector-base voltage                      | $V_{CBO}$      | 160         | V               |
| Collector-emitter voltage                   | $V_{(BR)CEV}$  | 160         | V               |
| Collector-emitter voltage                   | $V_{CEO}$      | 100         | V               |
| Emitter-base voltage                        | $V_{EBO}$      | 7           | V               |
| Peak pulse current                          | $I_{CM}$       | 12          | A               |
| Continuous collector current <sup>(a)</sup> | $I_C$          | 4           | A               |
| Base current                                | $I_B$          | 1           | A               |
| Power dissipation @ $T_A=25^{\circ}C^{(a)}$ | $P_D$          | 1.0         | W               |
| Linear derating factor                      |                | 8           | mW/ $^{\circ}C$ |
| Power dissipation @ $T_A=25^{\circ}C^{(b)}$ | $P_D$          | 1.2         | W               |
| Linear derating factor                      |                | 9.6         | mW/ $^{\circ}C$ |
| Power dissipation @ $T_A=25^{\circ}C^{(c)}$ | $P_D$          | 1.56        | W               |
| Linear derating factor                      |                | 12.5        | mW/ $^{\circ}C$ |
| Operating and storage temperature           | $T_j; T_{stg}$ | -55 to +150 | $^{\circ}C$     |

**Thermal resistance**

| Parameter                          | Symbol         | Value | Unit          |
|------------------------------------|----------------|-------|---------------|
| Junction to ambient <sup>(a)</sup> | $R\theta_{JA}$ | 125   | $^{\circ}C/W$ |
| Junction to ambient <sup>(b)</sup> | $R\theta_{JA}$ | 104   | $^{\circ}C/W$ |
| Junction to ambient <sup>(c)</sup> | $R\theta_{JA}$ | 80    | $^{\circ}C/W$ |

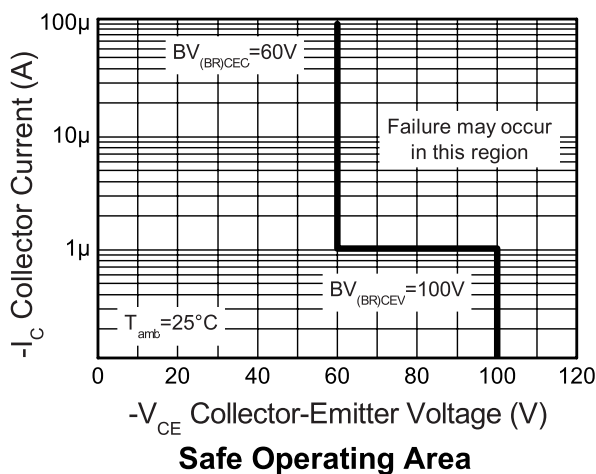
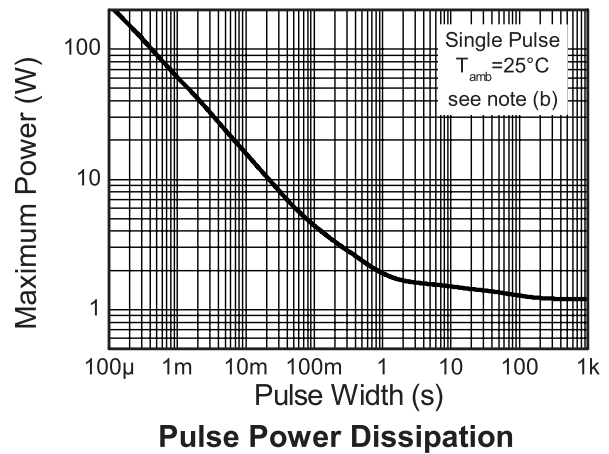
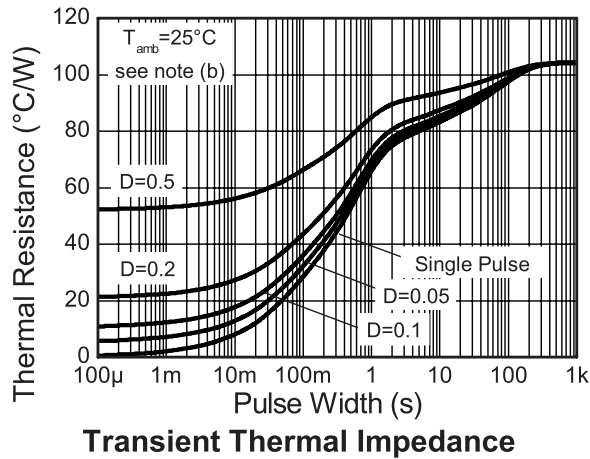
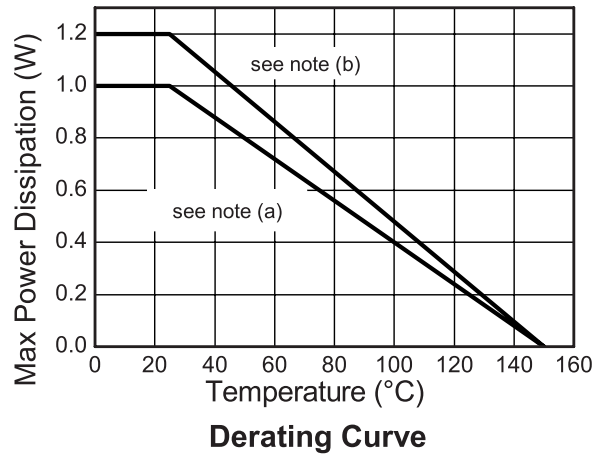
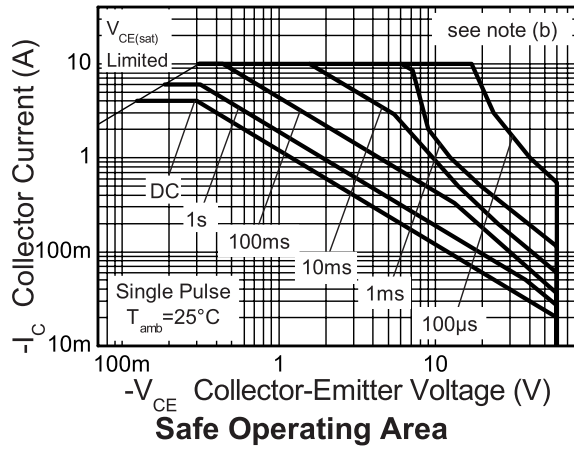
**NOTES:**

(a) Mounted on 18mm x 18mm x 1.6mm FR4 PCB with a very high coverage of 2 oz weight copper in still air conditions.

(b) Mounted on 30mm x 30mm x 1.6mm FR4 PCB with a very high coverage of 2 oz weight copper in still air conditions.

(c) as (b) above measured at  $t < 5$ secs.

## Characteristics



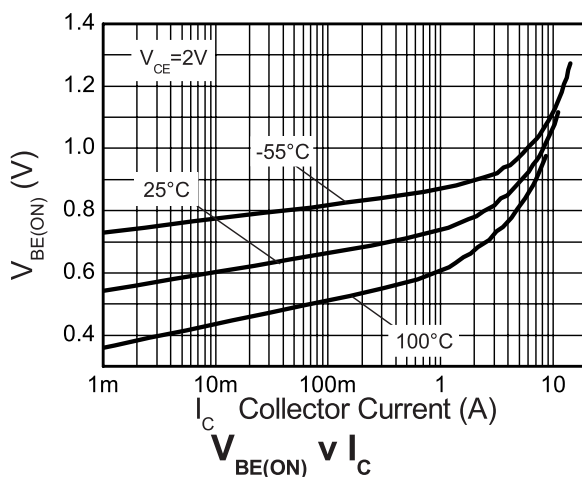
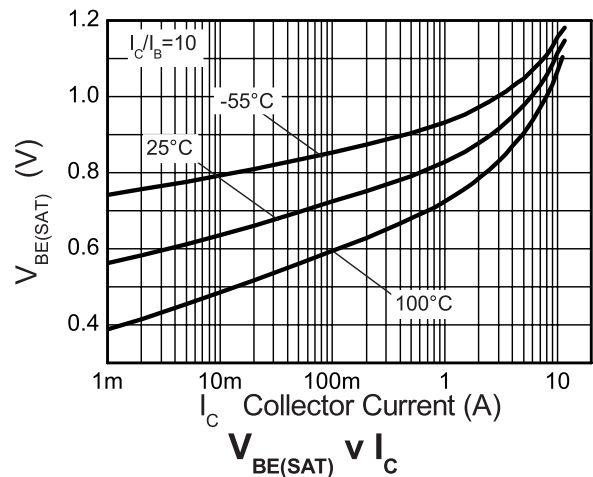
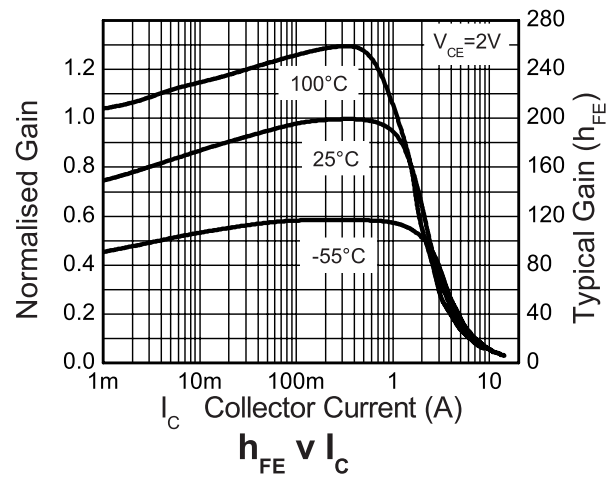
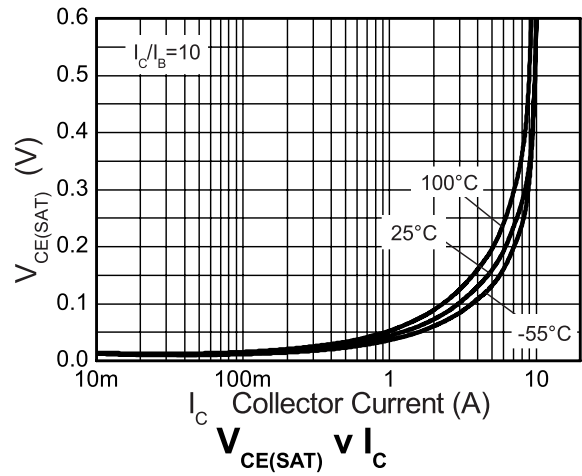
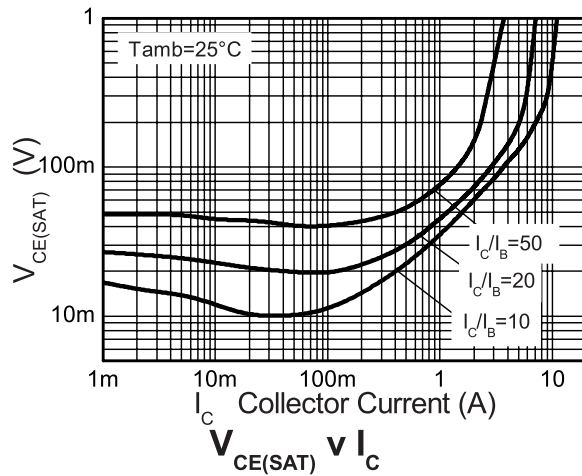
## Electrical characteristics (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

| Parameter                             | Symbol        | Min.             | Typ.                   | Max.                   | Unit                 | Conditions                                                                                                                                                                                                                  |
|---------------------------------------|---------------|------------------|------------------------|------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Collector-base breakdown voltage      | $V_{(BR)CBO}$ | 160              | 200                    |                        | V                    | $I_C=100\mu\text{A}$                                                                                                                                                                                                        |
| Collector-emitter breakdown voltage   | $V_{(BR)CEV}$ | 160              | 200                    |                        | V                    | $I_C=1\mu\text{A}$ , $-1\text{V} < V_{BE} < +0.3\text{V}$                                                                                                                                                                   |
| Collector-emitter breakdown voltage   | $V_{(BR)CEO}$ | 100              | 115                    |                        | V                    | $I_C=10\text{mA}$ <sup>(a)</sup>                                                                                                                                                                                            |
| Emitter-base breakdown voltage        | $V_{(BR)EBO}$ | 7                | 8                      |                        | V                    | $I_E=100\mu\text{A}$                                                                                                                                                                                                        |
| Collector-emitter cut-off current     | $I_{CEV}$     |                  | <1                     | 20                     | nA                   | $V_{CES}=128\text{V}$ ,<br>$V_{BE} = -1\text{V}$                                                                                                                                                                            |
| Collector-base cut-off current        | $I_{CBO}$     |                  | <1                     | 20                     | nA                   | $V_{CB}=128\text{V}$                                                                                                                                                                                                        |
| Emitter-base cut-off current          | $I_{EBO}$     |                  | <1                     | 10                     | nA                   | $V_{EB}=6\text{V}$                                                                                                                                                                                                          |
| Static forward current transfer ratio | $H_{FE}$      | 100<br>100<br>35 | 220<br>200<br>60<br>13 | 300                    |                      | $I_C=10\text{mA}$ , $V_{CE}=2\text{V}$ <sup>(a)</sup><br>$I_C=1\text{A}$ , $V_{CE}=2\text{V}$ <sup>(a)</sup><br>$I_C=4\text{A}$ , $V_{CE}=2\text{V}$ <sup>(a)</sup><br>$I_C=10\text{A}$ , $V_{CE}=2\text{V}$ <sup>(a)</sup> |
| Collector-emitter saturation voltage  | $V_{CE(sat)}$ |                  | 20<br>40<br>85<br>120  | 30<br>50<br>105<br>150 | mV<br>mV<br>mV<br>mV | $I_C=0.1\text{A}$ , $I_B=5\text{mA}$ <sup>(a)</sup><br>$I_C=1\text{A}$ , $I_B=100\text{mA}$ <sup>(a)</sup><br>$I_C=2\text{A}$ , $I_B=100\text{mA}$ <sup>(a)</sup><br>$I_C=4\text{A}$ , $I_B=400\text{mA}$ <sup>(a)</sup>    |
| Base-emitter saturation voltage       | $V_{BE(sat)}$ |                  | 0.94                   | 1.05                   | V                    | $I_C=4\text{A}$ , $I_B=400\text{mA}$ <sup>(a)</sup>                                                                                                                                                                         |
| Base-emitter turn-on voltage          | $V_{BE(on)}$  |                  | 0.84                   | 0.94                   | V                    | $I_C=4\text{A}$ , $V_{CE}=2\text{V}$ <sup>(a)</sup>                                                                                                                                                                         |
| Transition frequency                  | $f_T$         |                  | 130                    |                        | MHz                  | $I_C=100\text{mA}$ , $V_{CE}=10\text{V}$ ,<br>$f=50\text{MHz}$                                                                                                                                                              |
| Output capacitance                    | $C_{obo}$     |                  | 22                     |                        | pF                   | $V_{CB}=10\text{V}$ , $f=1\text{MHz}$                                                                                                                                                                                       |
| Turn-on time                          | $t_{(on)}$    |                  | 37                     |                        | ns                   | $V_{CC}=10\text{V}$ , $I_C=1\text{A}$ ,                                                                                                                                                                                     |
| Turn-off time                         | $t_{(off)}$   |                  | 910                    |                        | ns                   | $I_{B1}=I_{B2}=100\text{mA}$                                                                                                                                                                                                |

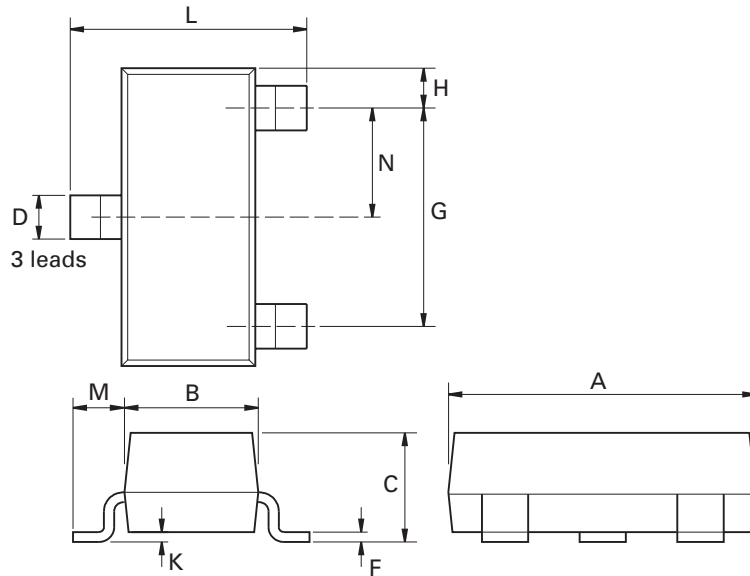
### NOTES:

(a) Measured under pulsed conditions. Pulse width=300 $\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

## Typical characteristics



## Packaging details - 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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