

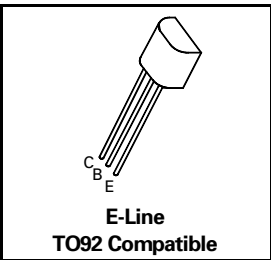
# NPN SILICON PLANAR MEDIUM POWER TRANSISTORS

**ZTX650**  
**ZTX651**

**ISSUE 2 – JULY 94**

**FEATURES**

- \* 60 Volt  $V_{CE0}$
- \* 2 Amp continuous current
- \* Low saturation voltage
- \*  $P_{tot}=1$  Watt



**ABSOLUTE MAXIMUM RATINGS.**

| PARAMETER  | SYMBOL         | ZTX650      | ZTX651 | UNIT                 |
|--|----------------|-------------|--------|----------------------|
| Collector-Base Voltage   | $V_{CBO}$      | 60          | 80     | V                    |
| Collector-Emitter Voltage  | $V_{CEO}$      | 45          | 60     | V                    |
| Emitter-Base Voltage   | $V_{EBO}$      | 5           |        | V                    |
| Peak Pulse Current   | $I_{CM}$       | 6           |        | A                    |
| Continuous Collector Current   | $I_C$          | 2           |        | A                    |
| Power Dissipation at $T_{amb}=25^{\circ}C$<br>derate above $25^{\circ}C$ | $P_{tot}$      | 1<br>5.7    |        | W<br>mW/ $^{\circ}C$ |
| Operating and Storage Temperature Range                                  | $T_j; T_{stg}$ | -55 to +200 |        | $^{\circ}C$          |

**ELECTRICAL CHARACTERISTICS (at  $T_{amb} = 25^{\circ}C$  unless otherwise stated).**

| PARAMETER                            | SYMBOL        | ZTX650 |              |            | ZTX651 |              |            | UNIT                                     | CONDITIONS.  |
|--------------------------------------|---------------|--------|--------------|------------|--------|--------------|------------|--|--|
|                                      |               | MIN.   | TYP.         | MAX.       | MIN.   | TYP.         | MAX.       |  |  |
| Collector-Base Breakdown Voltage     | $V_{(BR)CBO}$ | 60     |              |            | 80     |              |            | V  | $I_C=100\mu A$   |
| Collector-Emitter Breakdown Voltage  | $V_{(BR)CEO}$ | 45     |              |            | 60     |              |            | V  | $I_C=10mA^*$   |
| Emitter-Base Breakdown Voltage       | $V_{(BR)EBO}$ | 5      |              |            | 5      |              |            | V  | $I_E=100\mu A$   |
| Collector Cut-Off Current            | $I_{CBO}$     |        |              | 0.1<br>10  |        |              | 0.1<br>10  | $\mu A$<br>$\mu A$<br>$\mu A$<br>$\mu A$ | $V_{CB}=45V$<br>$V_{CB}=60V$<br>$V_{CB}=45V, T_{amb}=100^{\circ}C$<br>$V_{CB}=60V, T_{amb}=100^{\circ}C$ |
| Emitter Cut-Off Current              | $I_{EBO}$     |        |              | 0.1        |        |              | 0.1        | $\mu A$                                  | $V_{EB}=4V$  |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ |        | 0.12<br>0.23 | 0.3<br>0.5 |        | 0.12<br>0.23 | 0.3<br>0.5 | V<br>V                                   | $I_C=1A, I_B=100mA^*$<br>$I_C=2A, I_B=200mA^*$   |
| Base-Emitter Saturation Voltage      | $V_{BE(sat)}$ |        | 0.9          | 1.25       |        | 0.9          | 1.25       | V  | $I_C=1A, I_B=100mA^*$  |
| Base-Emitter Turn-On Voltage         | $V_{BE(on)}$  |        | 0.8          | 1          |        | 0.8          | 1          | V  | $I_C=1A, V_{CE}=2V^*$  |

# ZTX650 ZTX651

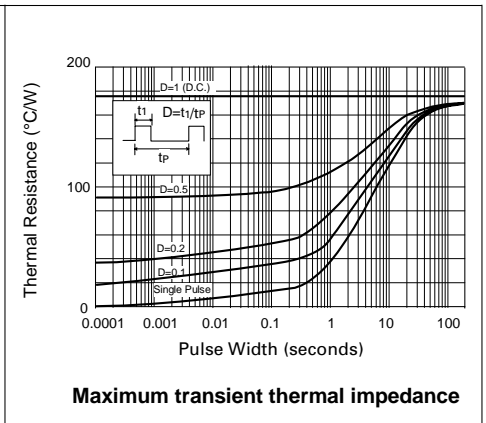
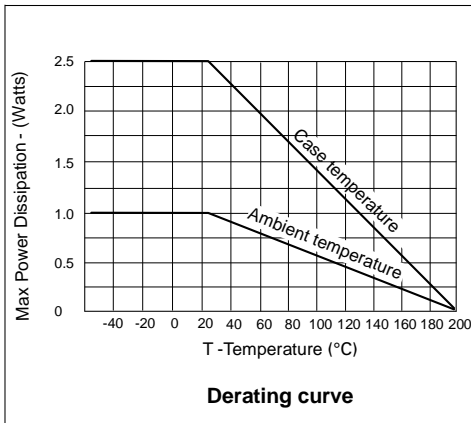
| PARAMETER            | SYMBOL    | ZTX650 |      |      | ZTX651 |      |      | UNIT | CONDITIONS.   |
|----------------------|-----------|--------|------|------|--------|------|------|------|---|
|                      |           | MIN.   | TYP. | MAX. | MIN.   | TYP. | MAX. |      |   |
| Transition Frequency | $f_T$     | 140    | 175  |      | 140    | 175  |      | MHz  | $I_C=100\text{mA}$ , $V_{CE}=5\text{V}$<br>$f=100\text{MHz}$            |
| Switching Times      | $t_{on}$  |        | 45   |      |        | 45   |      | ns   | $I_C=500\text{mA}$ , $V_{CC}=10\text{V}$<br>$I_{B1}=I_{B2}=50\text{mA}$ |
|                      | $t_{off}$ |        | 800  |      |        | 800  |      | ns   |   |
| Output Capacitance   | $C_{obo}$ |        |      | 30   |        |      | 30   | pF   | $V_{CB}=10\text{V}$ $f=1\text{MHz}$                                     |

\*Measured under pulsed conditions. Pulse width=300 $\mu$ s. Duty cycle  $\leq$  2%

## THERMAL CHARACTERISTICS

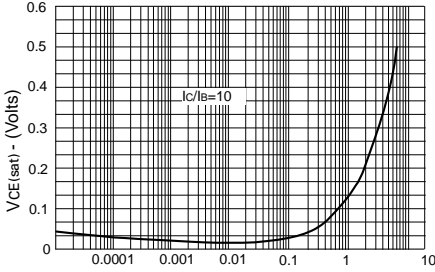
| PARAMETER  | SYMBOL           | MAX. | UNIT                 |
|--|------------------|------|----------------------|
| Thermal Resistance: Junction to Ambient <sub>1</sub> | $R_{th(j-amb)1}$ | 175  | $^{\circ}\text{C/W}$ |
| Junction to Ambient <sub>2</sub>                     | $R_{th(j-amb)2}$ | 116  | $^{\circ}\text{C/W}$ |
| Junction to Case                                     | $R_{th(j-case)}$ | 70   | $^{\circ}\text{C/W}$ |

† Device mounted on P.C.B. with copper equal to 1 sq. Inch minimum.



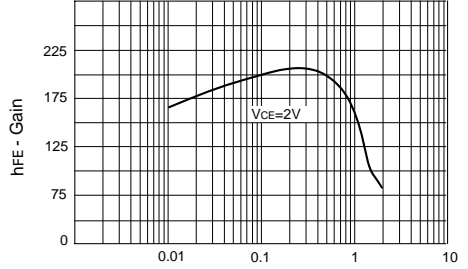
# ZTX650 ZTX651

## TYPICAL CHARACTERISTICS



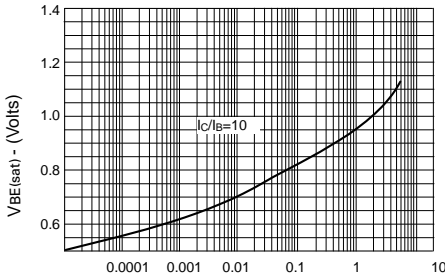
IC - Collector Current (Amps)

**VCE(sat) v IC**



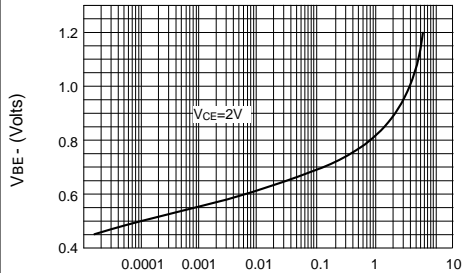
IC - Collector Current (Amps)

**hFE v IC**



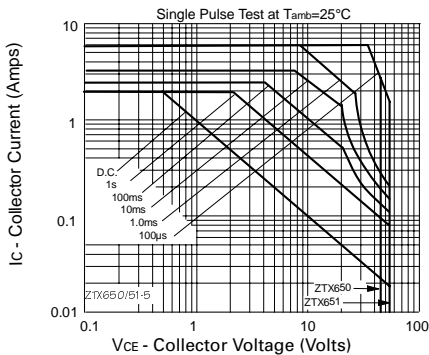
IC - Collector Current (Amps)

**VBE(sat) v IC**

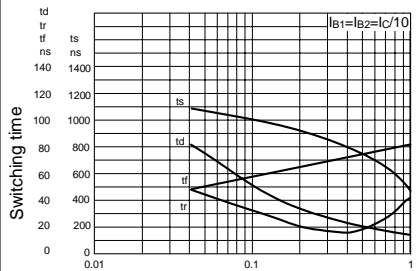


IC - Collector Current (Amps)

**VBE(on) v IC**



**Safe Operating Area**



IC - Collector Current (Amps)

**Switching Speeds**