

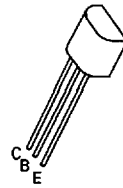
# NPN SILICON PLANAR MEDIUM POWER DARLINGTON TRANSISTORS

ISSUE 1 – MARCH 94

## ZTX604 ZTX605

### FEATURES

- \* 120 Volt  $V_{CEO}$
- \* 1 Amp continuous current
- \* Gain of 2K at  $I_C=1$  Amp
- \*  $P_{tot}=1$  Watt



E-Line  
TO92 Compatible

### ABSOLUTE MAXIMUM RATINGS.

| PARAMETER                                                                | SYMBOL         | ZTX604      | ZTX605 | UNIT                 |
|--------------------------------------------------------------------------|----------------|-------------|--------|----------------------|
| Collector-Base Voltage                                                   | $V_{CBO}$      | 120         | 140    | V                    |
| Collector-Emitter Voltage                                                | $V_{CEO}$      | 100         | 120    | V                    |
| Emitter-Base Voltage                                                     | $V_{EBO}$      | 10          |        | V                    |
| Peak Pulse Current                                                       | $I_{CM}$       | 4           |        | A                    |
| Continuous Collector Current                                             | $I_C$          | 1           |        | 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).

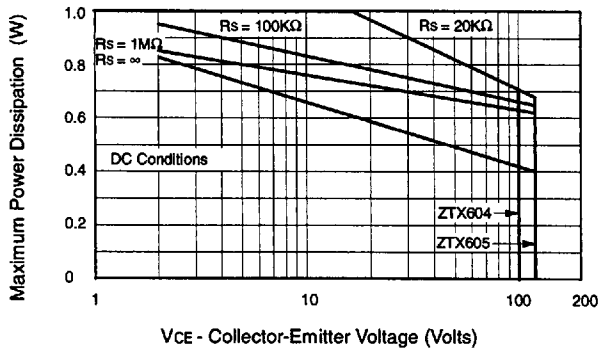
| PARAMETER                            | SYMBOL        | ZTX604 |            | ZTX605 |            | UNIT                                     | CONDITIONS.                                                                                                  |
|--------------------------------------|---------------|--------|------------|--------|------------|------------------------------------------|--------------------------------------------------------------------------------------------------------------|
|                                      |               | MIN.   | MAX.       | MIN.   | MAX.       |                                          |                                                                                                              |
| Collector-Base Breakdown Voltage     | $V_{(BR)CBO}$ | 120    |            | 140    |            | V                                        | $I_C=100\mu A$                                                                                               |
| Collector-Emitter Breakdown Voltage  | $V_{(BR)CEO}$ | 100    |            | 120    |            | V                                        | $I_C=10mA^*$                                                                                                 |
| Emitter-Base Breakdown Voltage       | $V_{(BR)EBO}$ | 10     |            | 10     |            | V                                        | $I_E=100\mu A$                                                                                               |
| Collector Cut-Off Current            | $I_{CBO}$     |        | 0.01<br>10 |        | 0.01<br>10 | $\mu A$<br>$\mu A$<br>$\mu A$<br>$\mu A$ | $V_{CB}=100V$<br>$V_{CB}=120V$<br>$V_{CB}=100V, T_{amb}=100^{\circ}C$<br>$V_{CB}=120V, T_{amb}=100^{\circ}C$ |
| Emitter Cut-Off Current              | $I_{EBO}$     |        | 0.1        |        | 0.1        | $\mu A$                                  | $V_{EB}=8V$                                                                                                  |
| Collector-Emitter Cut-Off Current    | $I_{CES}$     |        | 10         |        | 10         | $\mu A$                                  | $V_{CES}=100V$<br>$V_{CES}=120V$                                                                             |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ |        | 1.0<br>1.5 |        | 1.0<br>1.5 | V<br>V                                   | $I_C=250mA, I_B=0.25mA^*$<br>$I_C=1A, I_B=1mA^*$                                                             |
| Base-Emitter Saturation Voltage      | $V_{BE(sat)}$ |        | 1.8        |        | 1.8        | V                                        | $I_C=1A, I_B=1mA^*$                                                                                          |
| Base-Emitter Turn-On Voltage         | $V_{BE(on)}$  |        | 1.7        |        | 1.7        | V                                        | $I_C=1A, V_{CE}=5V^*$                                                                                        |

# ZTX604 ZTX605

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

| PARAMETER                             | SYMBOL    | ZTX604                 |      | ZTX605                 |      | UNIT          | CONDITIONS.                                                                                                                                                             |
|---------------------------------------|-----------|------------------------|------|------------------------|------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       |           | MIN.                   | MAX. | MIN.                   | MAX. |               |                                                                                                                                                                         |
| Static Forward Current Transfer Ratio | $h_{FE}$  | 2K<br>5K<br>2K<br>0.5K | 100K | 2K<br>5K<br>2K<br>0.5K | 100K |               | $I_C=50\text{mA}$ , $V_{CE}=5\text{V}$<br>$I_C=500\text{mA}$ , $V_{CE}=5\text{V}^*$<br>$I_C=1\text{A}$ , $V_{CE}=5\text{V}^*$<br>$I_C=2\text{A}$ , $V_{CE}=5\text{V}^*$ |
| Transition Frequency                  | $f_T$     | 150                    |      | 150                    |      | MHz           | $I_C=100\text{mA}$ , $V_{CE}=10\text{V}$<br>$f=20\text{MHz}$                                                                                                            |
| Input Capacitance                     | $C_{ibo}$ | 90 Typical             |      |                        |      | pF            | $V_{EB}=500\text{mV}$ , $f=1\text{MHz}$                                                                                                                                 |
| Output Capacitance                    | $C_{obo}$ | 15 Typical             |      |                        |      | pF            | $V_{CB}=10\text{V}$ , $f=1\text{MHz}$                                                                                                                                   |
| Switching Times                       | $t_{on}$  | 0.5 Typical            |      |                        |      | $\mu\text{s}$ | $I_C=500\text{mA}$ , $V_{CE}=10\text{V}$<br>$I_{B1}=I_{B2}=0.5\text{mA}$                                                                                                |
|                                       | $t_{off}$ | 1.6 Typical            |      |                        |      | $\mu\text{s}$ |                                                                                                                                                                         |

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



**Voltage Derating Graph**

The maximum permissible operational temperature can be obtained from this graph using the following equation

$$T_{amb(max)} = \frac{\text{Power(max)} - \text{Power(act)}}{0.0057} + 25^{\circ}\text{C}$$

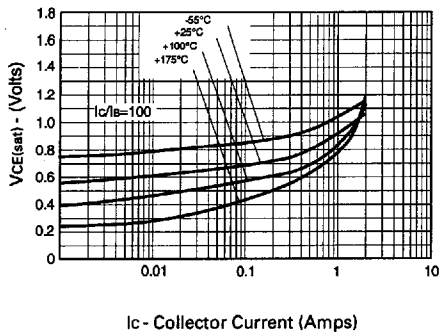
$T_{amb(max)}$  = Maximum operating ambient temperature

Power(max) = Maximum power dissipation figure, obtained from the above graph for a given  $V_{CE}$  and source resistance ( $R_S$ )

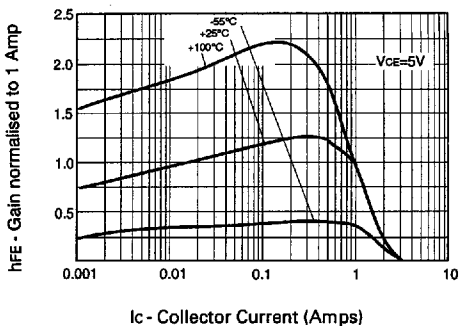
Power(actual) = Actual power dissipation in users circuit

# ZTX604 ZTX605

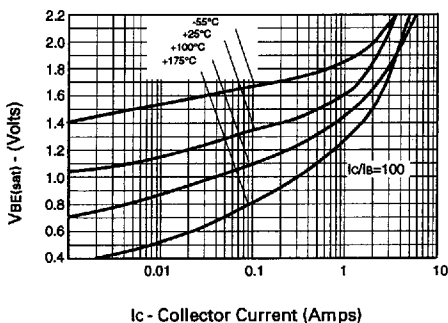
## TYPICAL CHARACTERISTICS



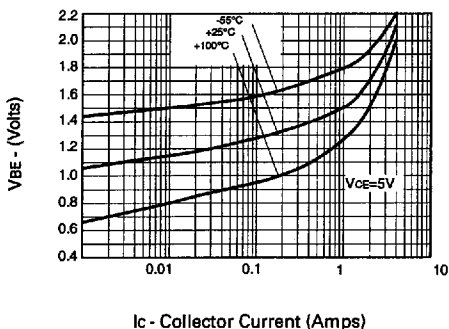
**$V_{CE(sat)}$  v  $I_C$**



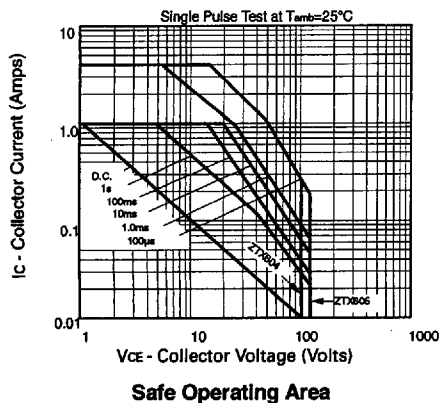
**$hFE$  v  $I_C$**



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

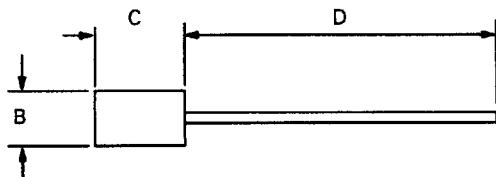


**$V_{BE(on)}$  v  $I_C$**

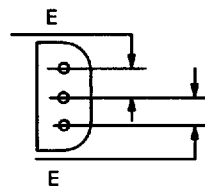
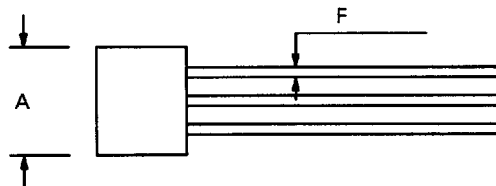


# E-Line Package Dimensions

## 3 Pin Device



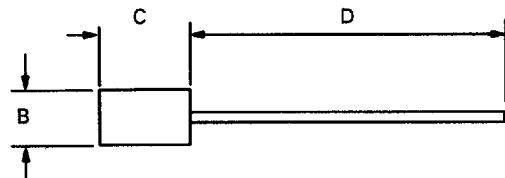
| DIM | Millimeters |       | Inches   |        |
|-----|-------------|-------|----------|--------|
|     | Min         | Max   | Min      | Max    |
| A   | 4.37        | 4.77  | 0.172    | 0.188  |
| B   | 2.16        | 2.41  | 0.085    | 0.095  |
| C   | 3.61        | 4.01  | 0.142    | 0.158  |
| D   | 13.00       | 13.97 | 0.512    | 0.550  |
| E   | NOM 1.27    |       | NOM 0.05 |        |
| F   | 0.37        | 0.495 | 0.016    | 0.0195 |



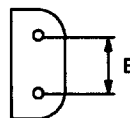
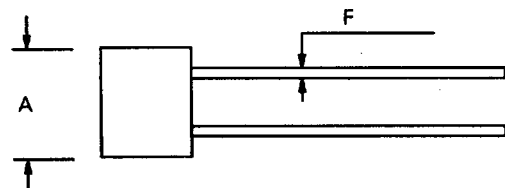
Leads to pass through a hole 0.7mm dia.

Various lead forms are offered, details of which are available on request.

## 2 Pin Device

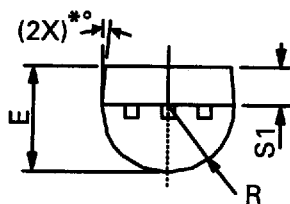
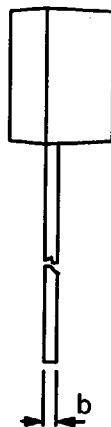
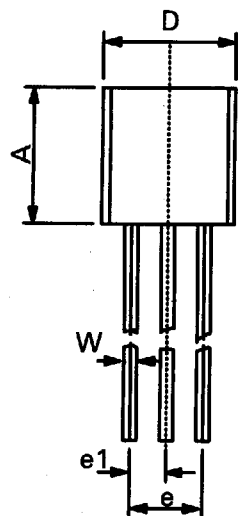


| DIM | Millimeters |       | Inches   |        |
|-----|-------------|-------|----------|--------|
|     | Min         | Max   | Min      | Max    |
| A   | 4.37        | 4.77  | 0.172    | 0.188  |
| B   | 2.16        | 2.41  | 0.085    | 0.095  |
| C   | 3.61        | 4.01  | 0.142    | 0.158  |
| D   | 13.00       | 13.97 | 0.512    | 0.550  |
| E   | NOM 2.54    |       | NOM 0.10 |        |
| F   | 0.37        | 0.495 | 0.016    | 0.0195 |



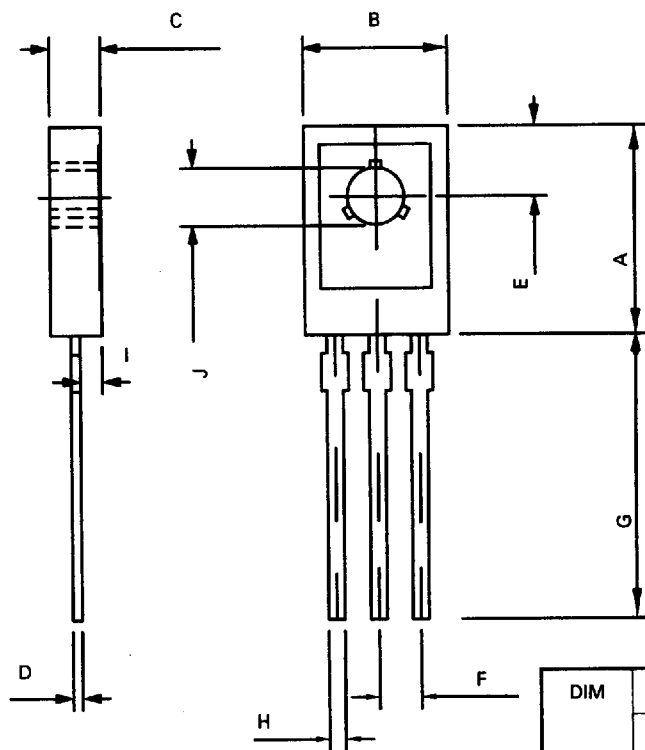
Leads to pass through a hole 0.7mm dia.

# T092 Package Dimensions



| DIM | Millimeters |       | Inches |       |
|-----|-------------|-------|--------|-------|
|     | Min         | Max   | Min    | Max   |
| A   | 4.32        | 4.95  | 0.170  | 0.195 |
| b   | 0.36        | 0.51  | 0.014  | 0.020 |
| E   | 3.30        | 3.94  | 0.130  | 0.155 |
| e   | 2.41        | 2.67  | 0.095  | 0.105 |
| e1  | 1.14        | 1.40  | 0.045  | 0.055 |
| L   | 12.70       | 15.49 | 0.500  | 0.610 |
| R   | 2.16        | 2.41  | 0.085  | 0.095 |
| S1  | 1.14        | 1.52  | 0.045  | 0.060 |
| W   | 0.41        | 0.56  | 0.016  | 0.022 |
| D   | 4.45        | 4.95  | 0.175  | 0.195 |
| *°  | 4°          | 6°    | 4°     | 6°    |

# **TO126 Package Dimensions**



| DIM | Millimeters  |      |
|-----|--------------|------|
|     | Min          | Max  |
| A   |              | 11.1 |
| B   |              | 7.80 |
| C   |              | 2.80 |
| D   | 0.50 typical |      |
| E   | 3.75 typical |      |
| F   | 2.29 typical |      |
| G   | 15.3         |      |
| H   |              | 0.88 |
| I   | 1.2 typical  |      |
| J   | 3.00         | 3.20 |