

## ZXTEM322

### MPPS™ Miniature Package Power Solutions 80V NPN LOW SATURATION TRANSISTOR

#### SUMMARY

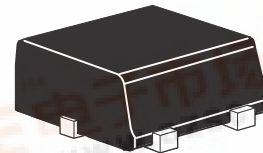
**NPN** —  $V_{CE0} = 80V$ ;  $R_{SAT} = 68m\Omega$ ;  $I_C = 3.5A$

#### DESCRIPTION

Packaged in the new innovative 2mm x 2mm MLP (Micro Leaded Package) outline, these new 4<sup>th</sup> generation low saturation dual PNP transistors offer extremely low on state losses making them ideal for use in DC-DC circuits and various driving and power management functions.

Additionally users gain several other **key benefits**:

**Performance capability equivalent to much larger packages**  
**Improved circuit efficiency & power levels**  
**PCB area and device placement savings**  
**Lower Package Height (0.9mm nom)**  
**Reduced component count**



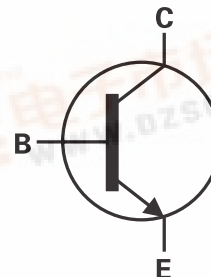
MLP322

#### FEATURES

- Low Equivalent On Resistance
- Extremely Low Saturation Voltage (**185mV max @1A**)
- $h_{FE}$  specified up to 5A
- $I_C = 3.5A$  Continuous Collector Current
- 2mm x 2mm MLP

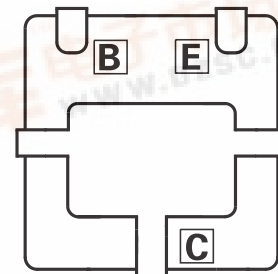
#### APPLICATIONS

- DC - DC Converters
- DC - DC Modules
- Power switches
- Motor control



#### ORDERING INFORMATION

| DEVICE     | REEL SIZE | TAPE WIDTH | QUANTITY PER REEL |
|------------|-----------|------------|-------------------|
| ZXTEM322TA | 7"        | 8mm        | 3000              |
| ZXTEM322TC | 13"       | 8mm        | 10000             |



Underside View

#### DEVICE MARKING

- SE

ISSUE 1 - JUNE 2003

# ZXTEM322

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                                                                              | SYMBOL        | LIMIT        | UNIT                        |
|----------------------------------------------------------------------------------------|---------------|--------------|-----------------------------|
| Collector-Base Voltage                                                                 | $V_{CBO}$     | 100          | V                           |
| Collector-Emitter Voltage                                                              | $V_{CEO}$     | 80           | V                           |
| Emitter-Base Voltage                                                                   | $V_{EBO}$     | 7.5          | V                           |
| Peak Pulse Current                                                                     | $I_{CM}$      | 5            | A                           |
| Continuous Collector Current <sup>(a)</sup>                                            | $I_C$         | 3.5          | A                           |
| Base Current                                                                           | $I_B$         | 1000         | mA                          |
| Power Dissipation at $T_A=25^{\circ}\text{C}$ <sup>(a)</sup><br>Linear Derating Factor | $P_D$         | 1.5<br>12    | W<br>mW/ $^{\circ}\text{C}$ |
| Power Dissipation at $T_A=25^{\circ}\text{C}$ <sup>(b)</sup><br>Linear Derating Factor | $P_D$         | 2.45<br>19.6 | W<br>mW/ $^{\circ}\text{C}$ |
| Power Dissipation at $T_A=25^{\circ}\text{C}$ <sup>(d)</sup><br>Linear Derating Factor | $P_D$         | 1<br>8       | W<br>mW/ $^{\circ}\text{C}$ |
| Power Dissipation at $T_A=25^{\circ}\text{C}$ <sup>(e)</sup><br>Linear Derating Factor | $P_D$         | 3<br>24      | W<br>mW/ $^{\circ}\text{C}$ |
| Operating & Storage Temperature Range                                                  | $T_j:T_{stg}$ | -55 to +150  | $^{\circ}\text{C}$          |
| Junction Temperature                                                                   | $T_j$         | 150          | $^{\circ}\text{C}$          |

## THERMAL RESISTANCE

| PARAMETER                          | SYMBOL          | VALUE | UNIT                 |
|------------------------------------|-----------------|-------|----------------------|
| Junction to Ambient <sup>(a)</sup> | $R_{\theta JA}$ | 83    | $^{\circ}\text{C/W}$ |
| Junction to Ambient <sup>(b)</sup> | $R_{\theta JA}$ | 51    | $^{\circ}\text{C/W}$ |
| Junction to Ambient <sup>(d)</sup> | $R_{\theta JA}$ | 125   | $^{\circ}\text{C/W}$ |
| Junction to Ambient <sup>(e)</sup> | $R_{\theta JA}$ | 42    | $^{\circ}\text{C/W}$ |

### NOTES

(a) For a single device surface mounted on 10 sq cm 1oz copper on FR4 PCB, in still air conditions **with all exposed pads attached**.

(b) For a single device surface mounted on 10 sq cm 1oz copper on FR4 PCB, in still air conditions measured at  $t \leq 5$  secs **with all exposed pads attached**.

(c) Repetitive rating - pulse width limited by max junction temperature. Refer to Transient Thermal Impedance graph.

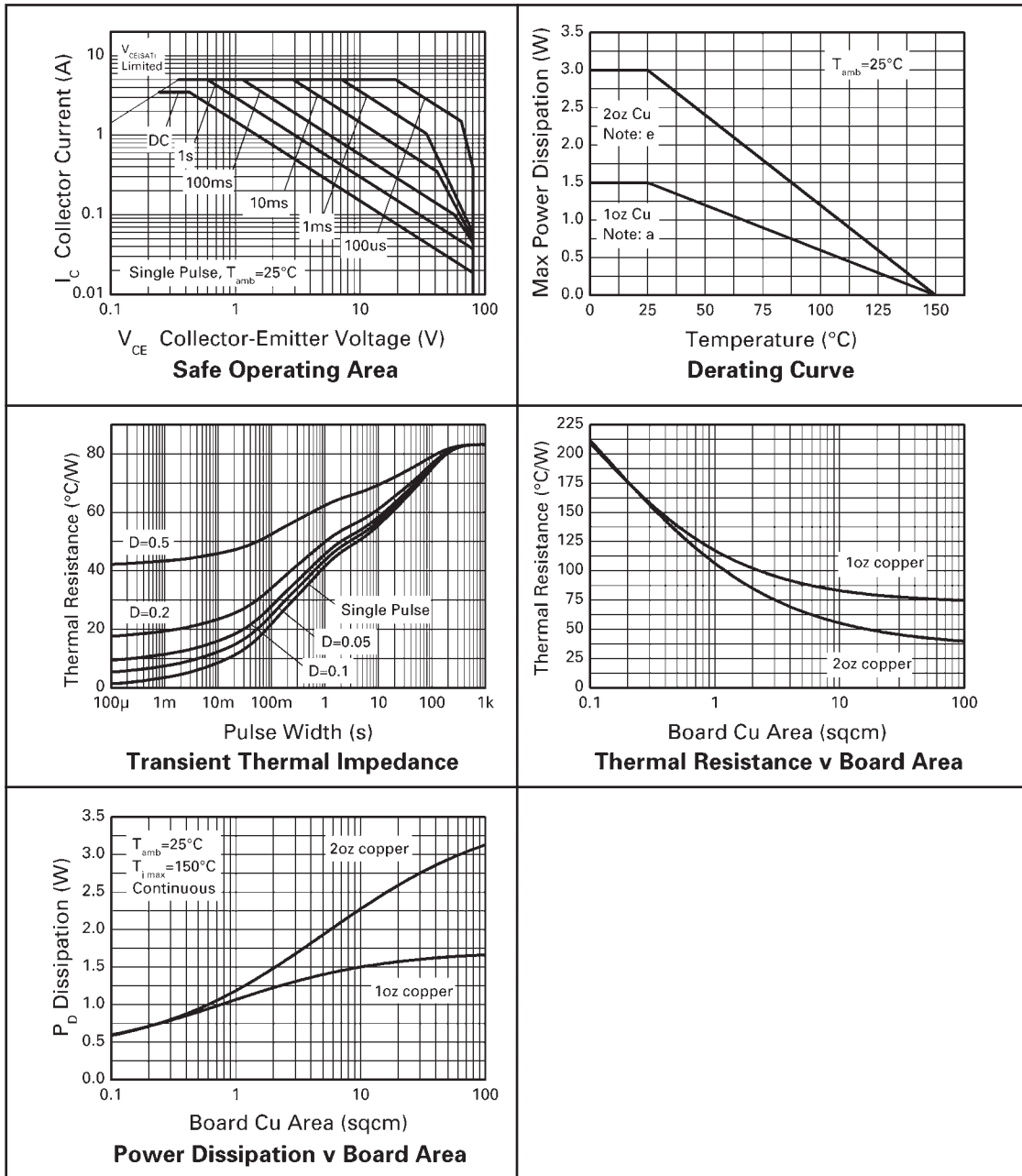
(d) For a single device surface mounted on 10 sq cm 1oz copper FR4 PCB, in still air conditions **with minimal lead connections only**.

(e) For a single device surface mounted on 65 sq cm 2oz copper FR4 PCB, in still air conditions **with all exposed pads attached**.

(f) The minimum copper dimensions required for mounting are no smaller than the exposed metal pads on the base of the device, as shown in the package dimensions data. The thermal resistance for a device mounted on 1.5mm thick FR4 board using minimum copper of 1oz weight and 1mm wide tracks is  $R_{th} = 300^{\circ}\text{C/W}$  giving a power rating of  $P_{tot} = 420\text{mW}$

# ZXTEM322

## TYPICAL CHARACTERISTICS



# ZXTEM322

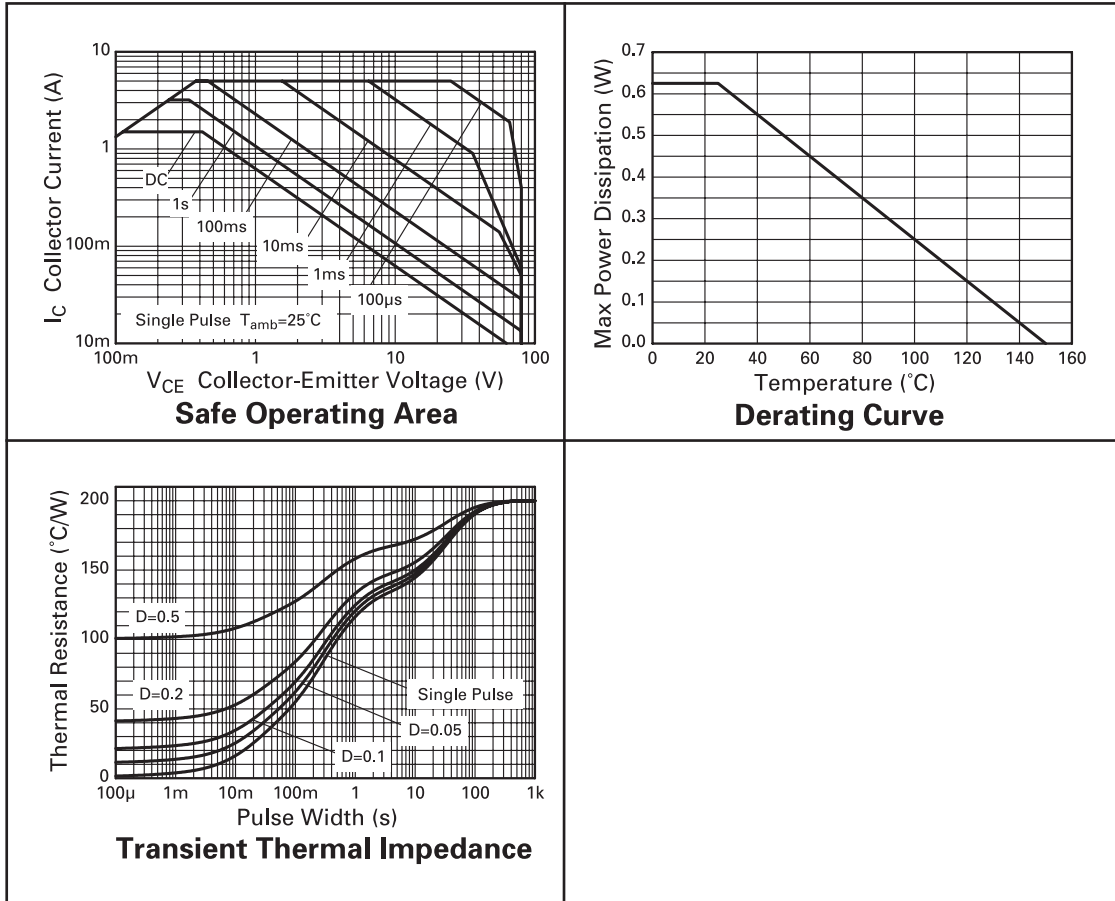
## ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^{\circ}\text{C}$ unless otherwise stated)

| PARAMETER                             | SYMBOL        | MIN.                          | TYP.                                | MAX.                          | UNIT | CONDITIONS                                                                                                                                                                                                                                    |
|---------------------------------------|---------------|-------------------------------|-------------------------------------|-------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Collector-Base Breakdown Voltage      | $V_{(BR)CBO}$ | 100                           | 180                                 |                               | V    | $I_C=100\mu\text{A}$                                                                                                                                                                                                                          |
| Collector-Emitter Breakdown Voltage   | $V_{(BR)CEO}$ | 80                            | 110                                 |                               | V    | $I_C=10\text{mA}^*$                                                                                                                                                                                                                           |
| Emitter-Base Breakdown Voltage        | $V_{(BR)EBO}$ | 7.5                           | 8.2                                 |                               | V    | $I_E=100\mu\text{A}$                                                                                                                                                                                                                          |
| Collector Cut-Off Current             | $I_{CBO}$     |                               |                                     | 25                            | nA   | $V_{CB}=80\text{V}$                                                                                                                                                                                                                           |
| Emitter Cut-Off Current               | $I_{EBO}$     |                               |                                     | 25                            | nA   | $V_{EB}=6\text{V}$                                                                                                                                                                                                                            |
| Collector Emitter Cut-Off Current     | $I_{CES}$     |                               |                                     | 25                            | nA   | $V_{CE}=65\text{V}$                                                                                                                                                                                                                           |
| Collector-Emitter Saturation Voltage  | $V_{CE(sat)}$ |                               | 15<br>45<br>145<br>160<br>240       | 20<br>60<br>185<br>200<br>325 | mV   | $I_C=0.1\text{A}, I_B=10\text{mA}^*$<br>$I_C=0.5\text{A}, I_B=50\text{mA}^*$<br>$I_C=1\text{A}, I_B=20\text{mA}^*$<br>$I_C=1.5\text{A}, I_B=50\text{mA}^*$<br>$I_C=3.5\text{A}, I_B=300\text{mA}^*$                                           |
| Base-Emitter Saturation Voltage       | $V_{BE(sat)}$ |                               | 1.09                                | 1.175                         | V    | $I_C=3.5\text{A}, I_B=300\text{mA}^*$                                                                                                                                                                                                         |
| Base-Emitter Turn-On Voltage          | $V_{BE(on)}$  |                               | 0.96                                | 1.05                          | V    | $I_C=3.5\text{A}, V_{CE}=2\text{V}^*$                                                                                                                                                                                                         |
| Static Forward Current Transfer Ratio | $h_{FE}$      | 200<br>300<br>110<br>60<br>20 | 450<br>450<br>170<br>90<br>30<br>10 | 900                           |      | $I_C=10\text{mA}, V_{CE}=2\text{V}^*$<br>$I_C=200\text{mA}, V_{CE}=2\text{V}^*$<br>$I_C=1\text{A}, V_{CE}=2\text{V}^*$<br>$I_C=1.5\text{A}, V_{CE}=2\text{V}^*$<br>$I_C=3\text{A}, V_{CE}=2\text{V}^*$<br>$I_C=5\text{A}, V_{CE}=2\text{V}^*$ |
| Transition Frequency                  | $f_T$         | 100                           | 160                                 |                               | MHz  | $I_C=50\text{mA}, V_{CE}=10\text{V}$<br>$f=100\text{MHz}$                                                                                                                                                                                     |
| Output Capacitance                    | $C_{obo}$     |                               | 11.5                                | 18                            | pF   | $V_{CB}=10\text{A}, f=1\text{MHz}$                                                                                                                                                                                                            |
| Turn-On Time                          | $t_{(on)}$    |                               | 86                                  |                               | ns   | $V_{CC}=10\text{V}, I_C=1\text{A}$                                                                                                                                                                                                            |
| Turn-Off Time                         | $t_{(off)}$   |                               | 1128                                |                               | ns   | $I_{B1}=I_{B2}=25\text{mA}$                                                                                                                                                                                                                   |

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

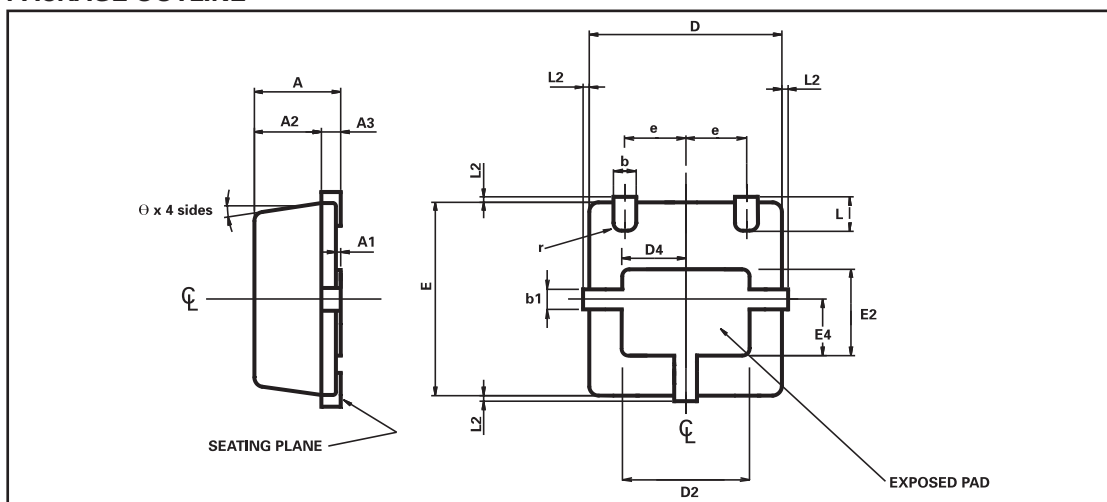
# ZXTEM322

## TYPICAL CHARACTERISTICS



# ZXTEM322

## PACKAGE OUTLINE



Controlling dimensions are in millimetres. Approximate conversions are given in inches

## PACKAGE DIMENSIONS

| DIM | Millimetres |      | Inches     |        | DIM | Millimetres |      | Inches     |        |
|-----|-------------|------|------------|--------|-----|-------------|------|------------|--------|
|     | Min         | Max  | Min        | Max    |     | Min         | Max  | Min        | Max    |
| A   | 0.80        | 1.00 | 0.0315     | 0.0393 | e   | 0.65 REF    |      | 0.0255 REF |        |
| A1  | 0.00        | 0.05 | 0.00       | 0.002  | E   | 2.00 BSC    |      | 0.0787 BSC |        |
| A2  | 0.65        | 0.75 | 0.0255     | 0.0295 | E2  | 0.79        | 0.99 | 0.031      | 0.039  |
| A3  | 0.15        | 0.25 | 0.0059     | 0.0098 | E4  | 0.48        | 0.68 | 0.0188     | 0.0267 |
| b   | 0.18        | 0.28 | 0.0070     | 0.0110 | L   | 0.20        | 0.45 | 0.0078     | 0.0177 |
| b1  | 0.17        | 0.30 | 0.0066     | 0.0118 | L2  | 0.125 MAX.  |      | 0.005 REF  |        |
| D   | 2.00 BSC    |      | 0.0787 BSC |        | r   | 0.075 BSC   |      | 0.0029 BSC |        |
| D2  | 1.22        | 1.42 | 0.0480     | 0.0559 | Θ   | 0°          | 12°  | 0°         | 12°    |
| D4  | 0.56        | 0.76 | 0.0220     | 0.0299 |     |             |      |            |        |

© Zetex plc 2003

| Europe                                                                                                                                                   | Americas                                                                                                                                                | Asia Pacific                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Zetex plc<br>Fields New Road<br>Chadderton<br>Oldham, OL9 8NP<br>United Kingdom<br>Telephone (44) 161 622 4444<br>Fax: (44) 161 622 4446<br>hq@zetex.com | Zetex Inc<br>700 Veterans Memorial Hwy<br>Hauppauge, NY 11788<br><br>USA<br>Telephone: (1) 631 360 2222<br>Fax: (1) 631 360 8222<br>usa.sales@zetex.com | Zetex (Asia) Ltd<br>3701-04 Metroplaza Tower 1<br>Hing Fong Road<br>Kwai Fong<br>Hong Kong<br>Telephone: (852) 26100 611<br>Fax: (852) 24250 494<br>asia.sales@zetex.com |

These offices are supported by agents and distributors in major countries world-wide.

This publication is issued to provide outline information only which (unless agreed by the Company in writing) may not be used, applied or reproduced for any purpose or form part of any order or contract or be regarded as a representation relating to the products or services concerned. The Company reserves the right to alter without notice the specification, design, price or conditions of supply of any product or service.

For the latest product information, log on to [www.zetex.com](http://www.zetex.com)