

**45V NPN HIGH GAIN MEDIUM POWER TRANSISTOR**

**Features**

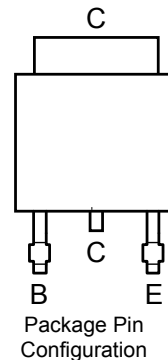
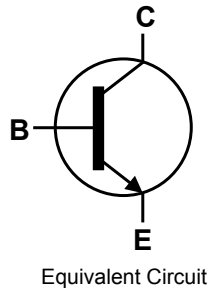
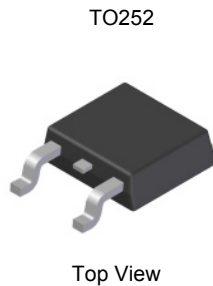
- $BV_{CEO} > 45V$
- $I_C = 3A$  high Continuous Collector Current
- $I_{CM} = 6A$  Peak Pulse Current
- High gain device  $>400 @1A$
- $R_{CE(sat)} = 77m\Omega$  for low equivalent On-Resistance
- $h_{FE}$  specified up to 6A for a high gain hold up
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP capable (Note 4)**

**Mechanical Data**

- Case: TO252 (DPAK)
- Case Material: Molded Plastic, "Green" Molding Compound.
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads; Solderable per MIL-STD-202, Method 208 (e3)
- Weight: 0.34 grams (approximate)

**Applications**

- DC - DC Converters
- Power Switches
- IGBT & MOSFET Gate Drivers
- Motor Control
- Automotive Circuits
- Siren Drivers

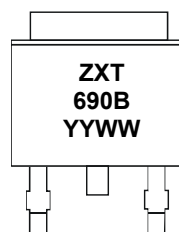


**Ordering Information** (Note 5)

| Product     | Compliance | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|-------------|------------|---------|--------------------|-----------------|-------------------|
| ZXT690BKTC  | AEC-Q101   | ZXT690B | 13                 | 16              | 2,500             |
| ZXT690BKQTC | Automotive | ZXT690B | 13                 | 16              | 2,500             |

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>

**Marking Information**



ZXT690B = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Last Digit of Year (ex: 13 = 2013)  
 WW = Week Code (01 – 53)

**Absolute Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic               | Symbol            | Value | Unit |
|------------------------------|-------------------|-------|------|
| Collector-Base Voltage       | BV <sub>CBO</sub> | 60    | V    |
| Collector-Emitter Voltage    | BV <sub>CEO</sub> | 45    | V    |
| Emitter-Base Voltage         | BV <sub>EBO</sub> | 7     | V    |
| Continuous Collector Current | I <sub>C</sub>    | 3     | A    |
| Peak Pulse Current           | I <sub>CM</sub>   | 6     | A    |
| Base Current                 | I <sub>B</sub>    | 0.5   | A    |

**Thermal Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

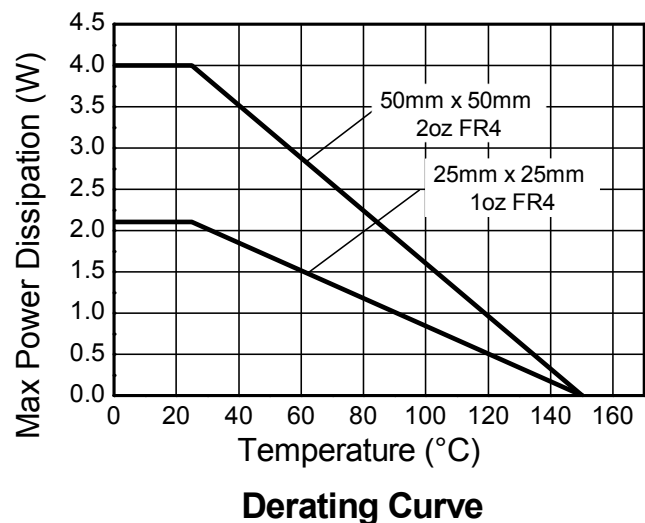
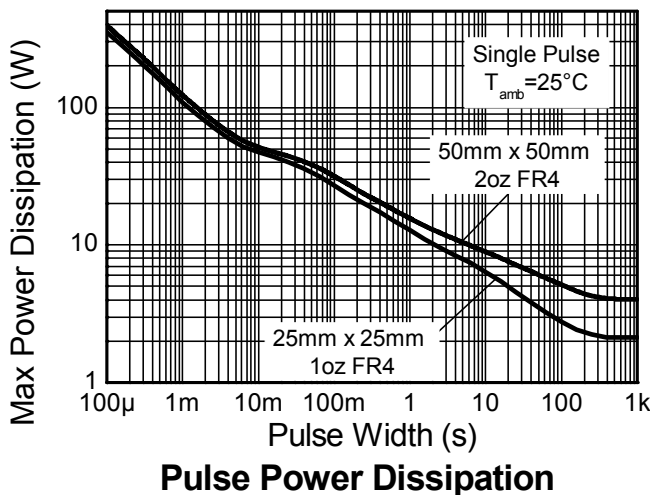
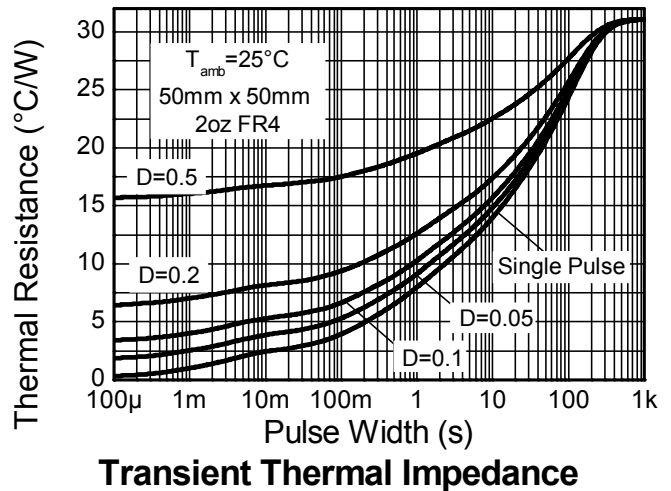
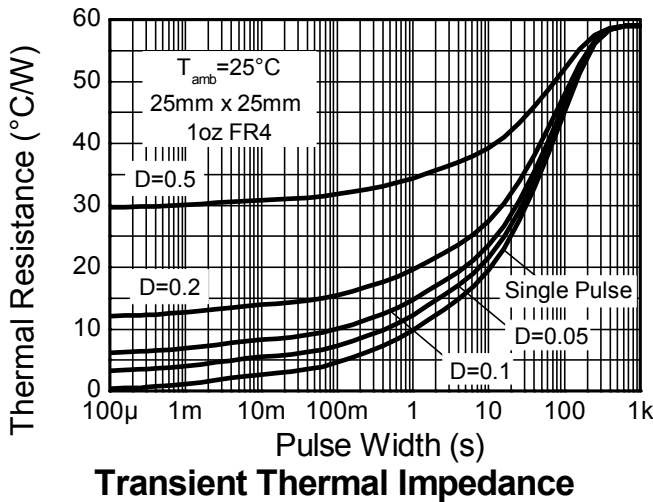
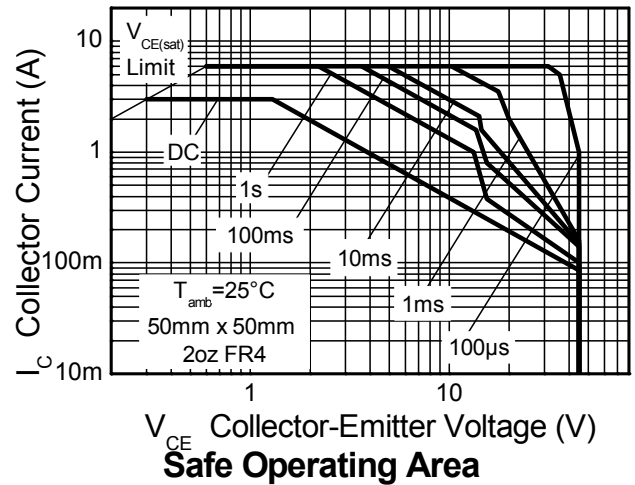
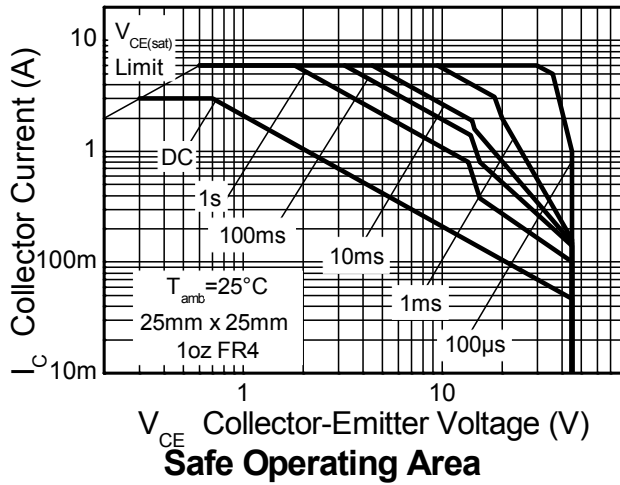
| Characteristic                              | Symbol                            | Value       | Unit |
|---|-----------------------------------|-------------|------|
| Power Dissipation                           | P <sub>D</sub>                    | (Note 6)    | 4.0  |
|   |                                   | (Note 7)    | 3.4  |
|   |                                   | (Note 8)    | 2.1  |
|   |                                   | (Note 9)    | 1.6  |
| Thermal Resistance, Junction to Ambient Air | R <sub>θJA</sub>                  | (Note 6)    | 32   |
|   |                                   | (Note 7)    | 36   |
|   |                                   | (Note 8)    | 59   |
|   |                                   | (Note 9)    | 80   |
| Thermal Resistance, Junction to Leads       | R <sub>θJL</sub>                  | 3           | °C/W |
| Thermal Resistance, Junction to Case        | R <sub>θJC</sub>                  | 14.6        |      |
| Operating and Storage Temperature Range     | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

**ESD Ratings** (Note 12)

| Characteristic                             | Symbol  | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge - Machine Model    | ESD MM  | 400   | V    | C           |

- Notes:
6. For a device mounted with the exposed collector pad on 50mm x 50mm 2oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  7. Same as note (6), except mounted on 25mm x 25mm 2oz copper.
  8. Same as note (6), except mounted on 25mm x 25mm 1oz copper.
  9. Same as note (6), except mounted on minimum recommended pad (MRP) layout.
  10. Thermal resistance from junction to solder-point (on the exposed collector pad).
  11. Thermal resistance from junction to the top of the case.
  12. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

**Thermal Characteristics and Derating Information**

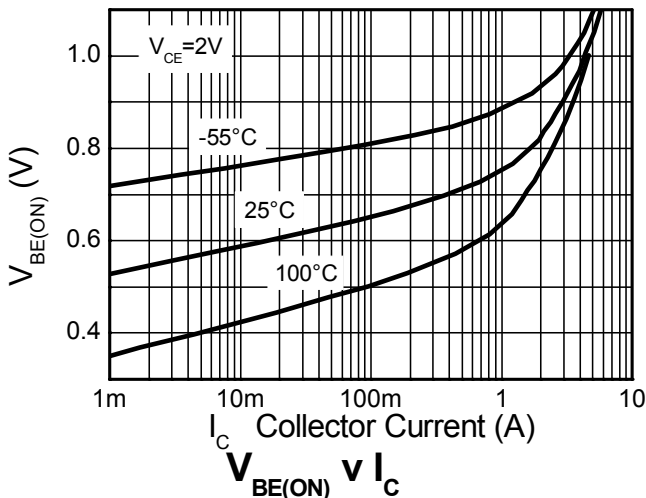
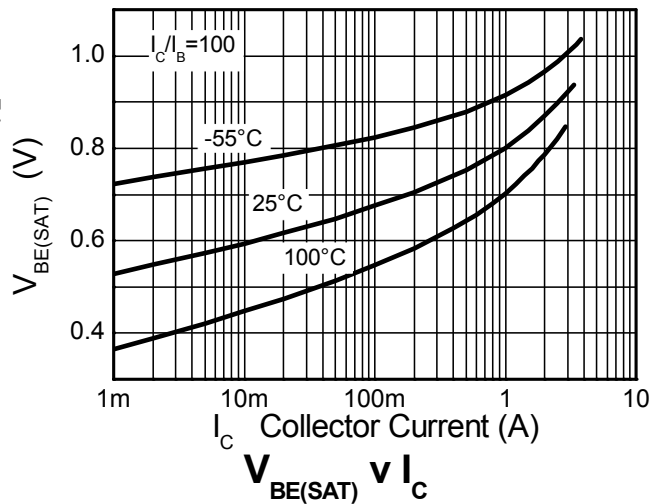
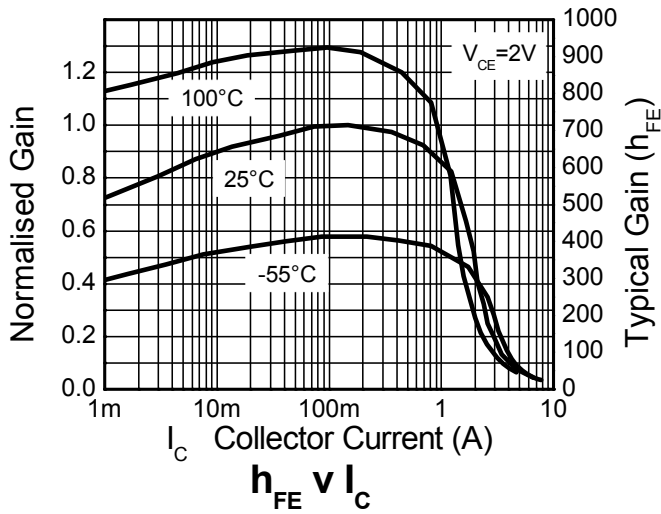
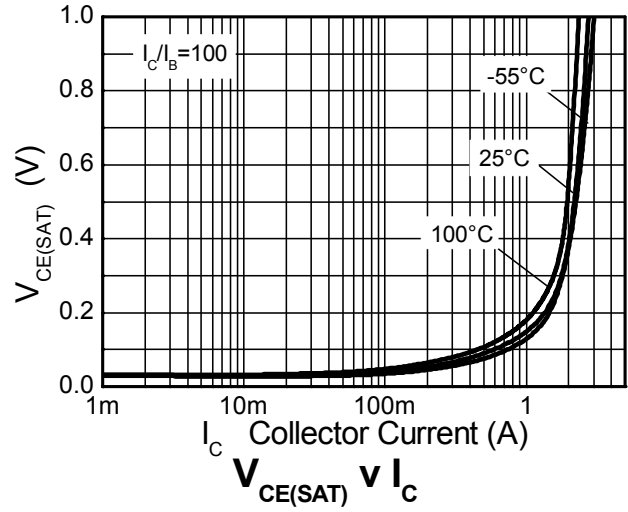
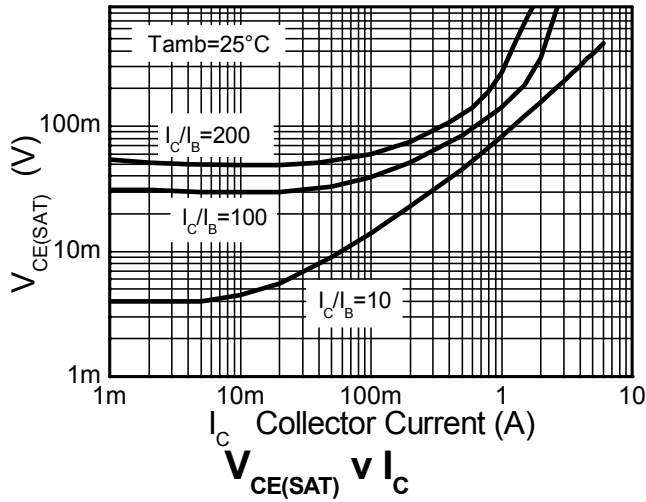


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                 | Symbol        | Min | Typ  | Max | Unit | Test Condition                       |                            |
|--|---------------|-----|------|-----|------|--------------------------------------|----------------------------|
| Collector-Base Breakdown Voltage               | $BV_{CBO}$    | 60  | 145  | —   | V    | $I_C = 100\mu A$                     |                            |
| Collector-Emitter Breakdown Voltage (Note 13)  | $BV_{CEO}$    | 45  | 65   | —   | V    | $I_C = 10mA$                         |                            |
| Emitter-Base Breakdown Voltage                 | $BV_{EBO}$    | 7   | 8.2  | —   | V    | $I_E = 100\mu A$                     |                            |
| Collector Cutoff Current                       | $I_{CBO}$     | —   | <1   | 20  | nA   | $V_{CB} = 35V$                       |                            |
| Collector Cutoff Current                       | $I_{CES}$     | —   | <1   | 20  | nA   | $V_{CB} = 35V$                       |                            |
| Emitter Cutoff Current                         | $I_{EBO}$     | —   | <1   | 20  | nA   | $V_{EB} = 5.6V$                      |                            |
| Collector-Emitter Saturation Voltage (Note 13) | $V_{CE(sat)}$ | —   | 50   | 85  | mV   | $I_C = 0.1A, I_B = 0.5mA$            |                            |
|  |               |     | 240  | 360 |      | $I_C = 1A, I_B = 5mA$                |                            |
|  |               |     | 210  | 320 |      | $I_C = 2A, I_B = 40mA$               |                            |
|  |               |     | 230  | 350 |      | $I_C = 3A, I_B = 150mA$              |                            |
| Base-Emitter Saturation Voltage (Note 13)      | $V_{BE(sat)}$ | —   | 1.0  | 1.2 | mV   | $I_C = 3A, I_B = 150mA$              |                            |
| Base-Emitter Turn-On Voltage (Note 13)         | $V_{BE(on)}$  | —   | 0.9  | 1.1 | mV   | $I_C = 3A, V_{CE} = 2V$              |                            |
| DC Current Gain (Note 13)                      | $h_{FE}$      | —   | 500  | 700 | —    | —                                    | $I_C = 100mA, V_{CE} = 2V$ |
|  |               |     | 400  | 600 |      |                                      | $I_C = 1A, V_{CE} = 2V$    |
|  |               |     | 150  | 350 |      |                                      | $I_C = 2A, V_{CE} = 2V$    |
|  |               |     | 60   | 120 |      |                                      | $I_C = 3A, V_{CE} = 2V$    |
| Current Gain-Bandwidth Product                 | $f_T$         | 150 | —    | —   | MHz  | $I_C = 50mA, V_{CE} = 5V, f = 50MHz$ |                            |
| Output Capacitance                             | $C_{obo}$     | —   | 16   | —   | pF   | $V_{CB} = 10V, f = 1MHz$             |                            |
| Turn-On Time                                   | $t_{on}$      | —   | 33   | —   | ns   | $I_C = 500mA, V_{CC} = 10V,$         |                            |
| Turn-Off Time                                  | $t_{off}$     | —   | 1300 | —   | ns   | $I_{B1} = -I_{B2} = 50mA$            |                            |

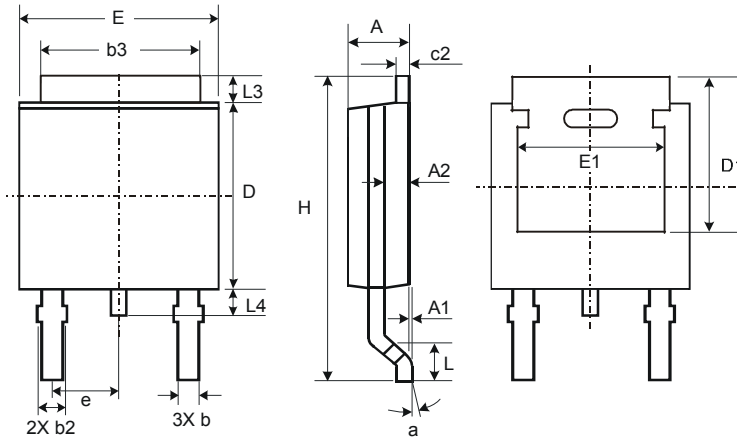
Note: 13. Measured under pulsed conditions. Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .

**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



## Package Outline Dimensions

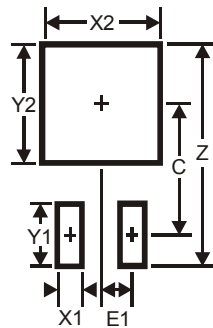
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| TO252                |      |       |       |
|----------------------|------|-------|-------|
| Dim                  | Min  | Max   | Typ   |
| A                    | 2.19 | 2.39  | 2.29  |
| A1                   | 0.00 | 0.13  | 0.08  |
| A2                   | 0.97 | 1.17  | 1.07  |
| b                    | 0.64 | 0.88  | 0.783 |
| b2                   | 0.76 | 1.14  | 0.95  |
| b3                   | 5.21 | 5.46  | 5.33  |
| c2                   | 0.45 | 0.58  | 0.531 |
| D                    | 6.00 | 6.20  | 6.10  |
| D1                   | 5.21 | –     | –     |
| e                    | –    | –     | 2.286 |
| E                    | 6.45 | 6.70  | 6.58  |
| E1                   | 4.32 | –     | –     |
| H                    | 9.40 | 10.41 | 9.91  |
| L                    | 1.40 | 1.78  | 1.59  |
| L3                   | 0.88 | 1.27  | 1.08  |
| L4                   | 0.64 | 1.02  | 0.83  |
| a                    | 0°   | 10°   | –     |
| All Dimensions in mm |      |       |       |

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| Z          | 11.6          |
| X1         | 1.5           |
| X2         | 7.0           |
| Y1         | 2.5           |
| Y2         | 7.0           |
| C          | 6.9           |
| E1         | 2.3           |

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