

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

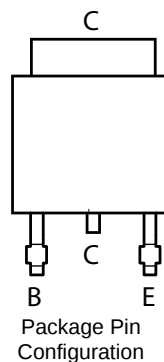
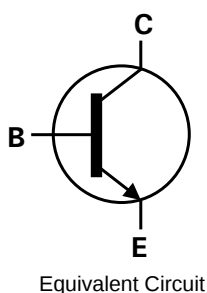
- $BV_{CEO} > 45V$
- $I_C = 3A$  high Continuous Collector Current
- $I_{CM} = 6A$  Peak Pulse Current
- High gain device  $>400 @1A$
- $R_{CE(sat)} = 77m\Omega$  for low equivalent On-Resistance
- $h_{FE}$  specified up to 6A for a high gain hold up
- **Totally Lead-Free & Fully RoHS Compliant (Notes 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)

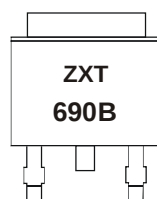
**Applications**

- DC – DC converters
- Power Switches
- IGBT & MOSFET gate drivers
- Motor Control
- Automotive Circuits
- Siren drivers


**Ordering Information** (Notes 4 & 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. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See <http://www.diodes.com> 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.
  5. For packaging details, go to our website at <http://www.diodes.com>

**Marking Information**


ZXT690B = Product Type Marking Code

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

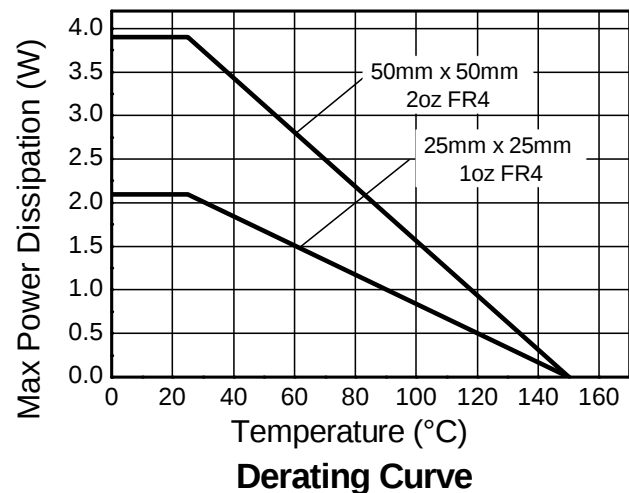
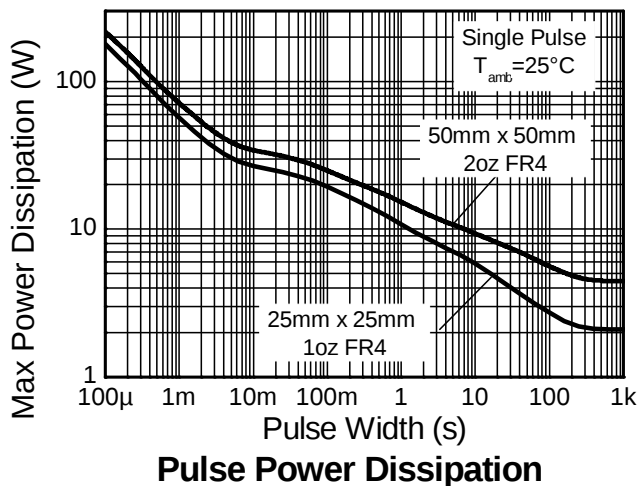
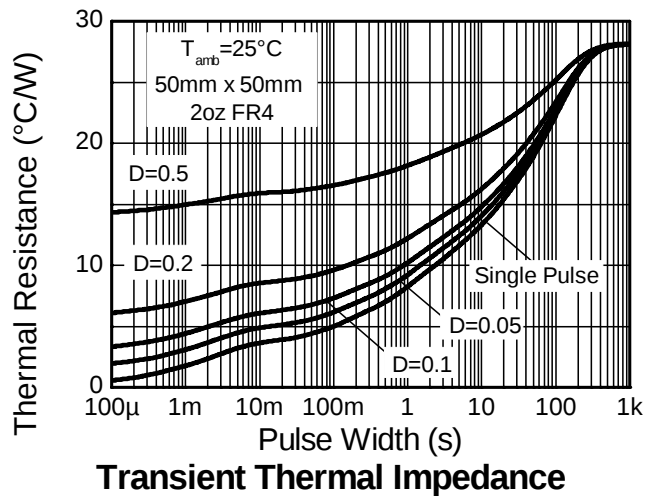
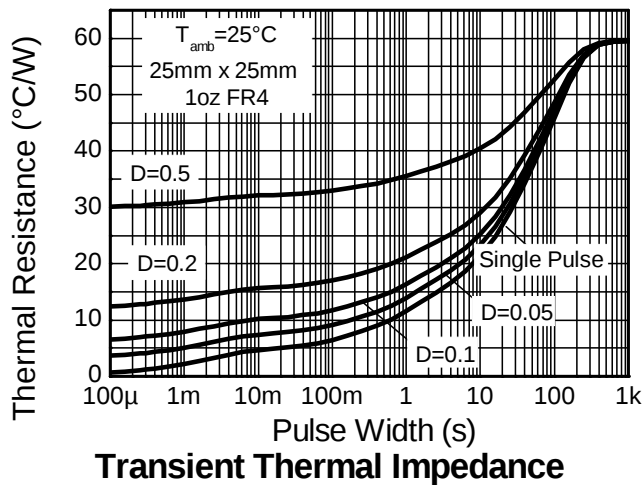
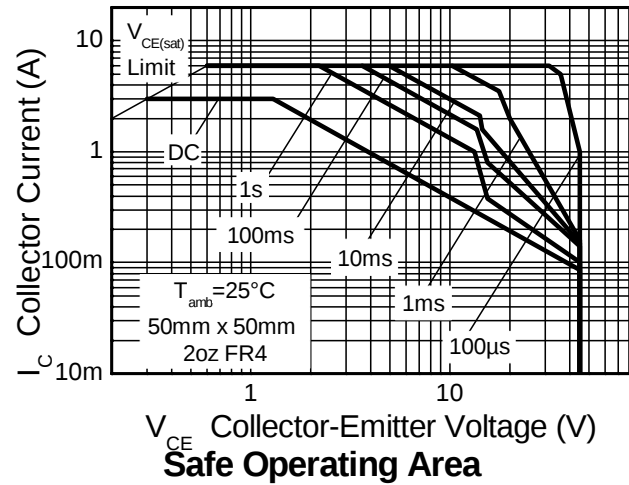
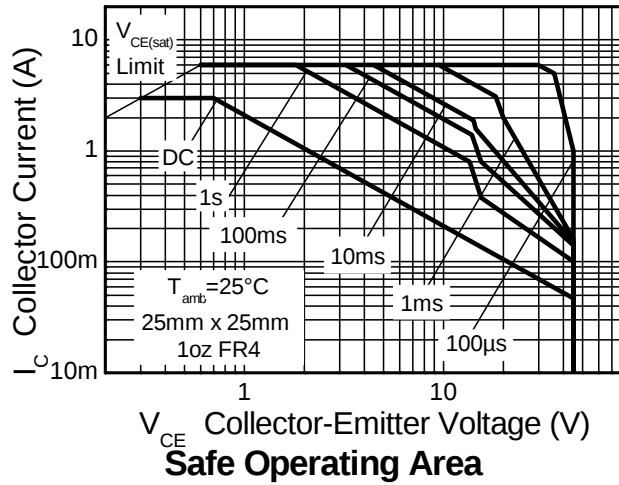
| Characteristic               | Symbol            | Value | Unit |
|------------------------------|-------------------|-------|------|
| Collector-Base Voltage       | BV <sub>CBO</sub> | 60    | V    |
| Collector-Emitter Voltage    | BV <sub>CEO</sub> | 45    | V    |
| Emitter-Base Voltage         | 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>                    | 2.1         | W    |
|                                             |                                   | 3.4         |      |
|                                             |                                   | 3.9         |      |
| Thermal Resistance, Junction to Ambient Air | R <sub>θJA</sub>                  | 59          | °C/W |
|                                             |                                   | 36          |      |
|                                             |                                   | 32          |      |
| Thermal Resistance, Junction to Leads       | R <sub>θJL</sub>                  | 2.97        | °C/W |
| Operating and Storage Temperature Range     | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

- Notes:
6. For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
  7. Same as note (6), except the device is surface mounted on 25mm x 25mm with 2oz copper.
  8. Same as note (6), except the device is surface mounted on 50mm x 50mm with 2oz copper.
  9. Thermal resistance from junction to solder-point (at the end of the collector lead).

## Thermal Characteristics and Derating Information

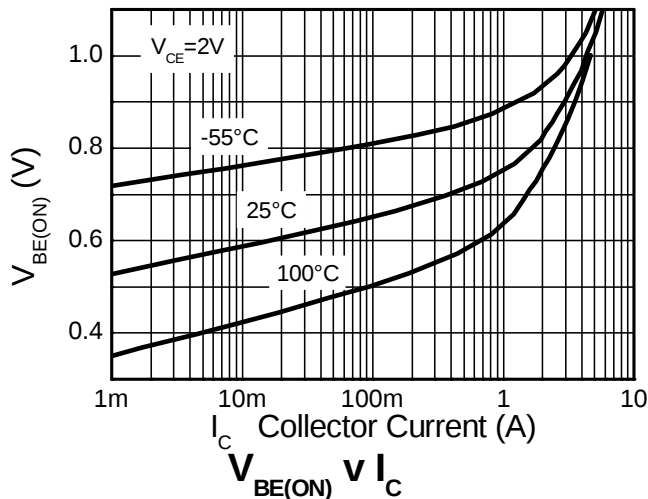
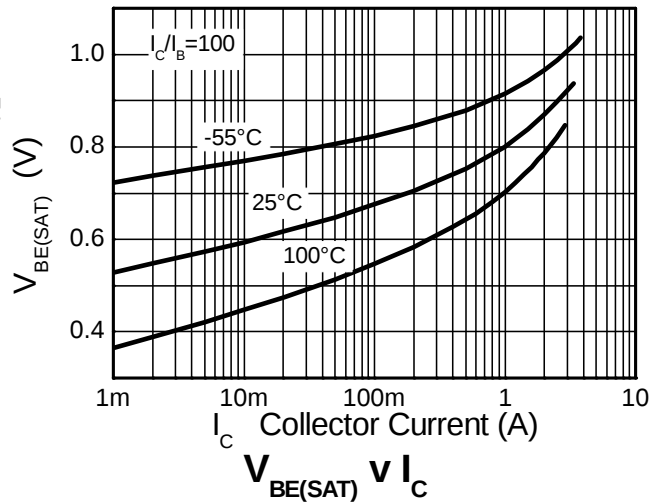
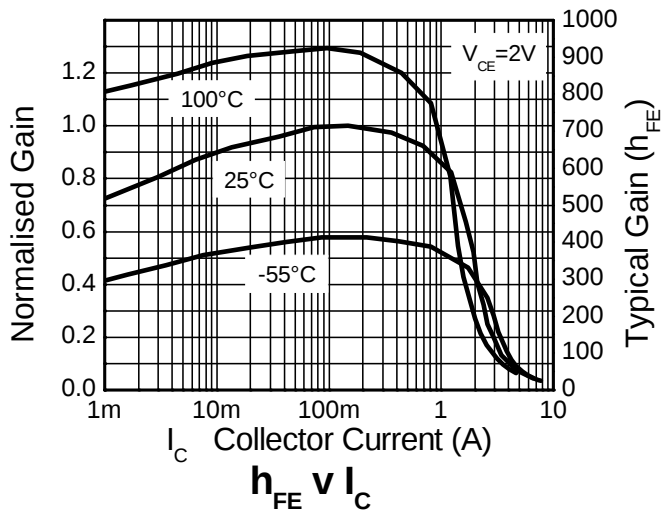
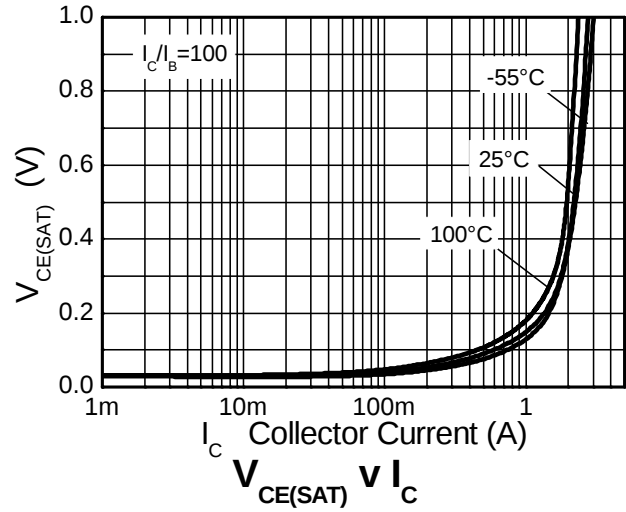
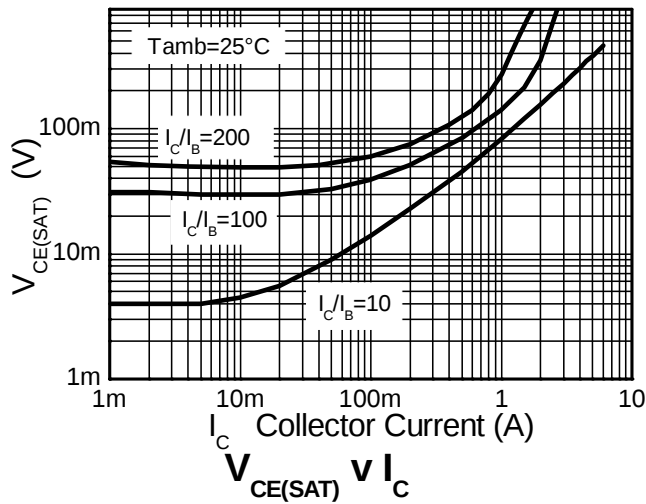


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                | Symbol               | Min | Typ  | Max | Unit | Test Condition                                         |
|-----------------------------------------------|----------------------|-----|------|-----|------|--------------------------------------------------------|
| Collector-Base Breakdown Voltage              | BV <sub>CBO</sub>    | 60  | 145  | —   | V    | I <sub>C</sub> = 100μA                                 |
| Collector-Emitter Breakdown Voltage (Note 9)  | BV <sub>CEO</sub>    | 45  | 65   | —   | V    | I <sub>C</sub> = 10mA                                  |
| Emitter-Base Breakdown Voltage                | BV <sub>EBO</sub>    | 7   | 8.2  | —   | V    | I <sub>E</sub> = 100μA                                 |
| Collector Cutoff Current                      | I <sub>CBO</sub>     | —   | <1   | 20  | nA   | V <sub>CB</sub> = 35V                                  |
| Collector Cutoff Current                      | I <sub>CES</sub>     | —   | <1   | 20  | nA   | V <sub>CB</sub> = 35V                                  |
| Emitter Cutoff Current                        | I <sub>EBO</sub>     | —   | <1   | 20  | nA   | V <sub>EB</sub> = 5.6V                                 |
| Collector-Emitter Saturation Voltage (Note 9) | V <sub>CE(sat)</sub> | —   | 50   | 85  | mV   | I <sub>C</sub> = 0.1A, I <sub>B</sub> = 0.5mA          |
|                                               |                      |     | 240  | 360 |      | I <sub>C</sub> = 1A, I <sub>B</sub> = 5mA              |
|                                               |                      |     | 210  | 320 |      | I <sub>C</sub> = 2A, I <sub>B</sub> = 40mA             |
|                                               |                      |     | 230  | 350 |      | I <sub>C</sub> = 3A, I <sub>B</sub> = 150mA            |
| Base-Emitter Saturation Voltage (Note 9)      | V <sub>BE(sat)</sub> | —   | 1.0  | 1.2 | mV   | I <sub>C</sub> = 3A, I <sub>B</sub> = 150mA            |
| Base-Emitter Turn-On Voltage (Note 9)         | V <sub>BE(on)</sub>  | —   | 0.9  | 1.1 | mV   | I <sub>C</sub> = 3A, V <sub>CE</sub> = 2V              |
| DC Current Gain (Note 9)                      | h <sub>FE</sub>      | 500 | 700  | —   | —    | I <sub>C</sub> = 100mA, V <sub>CE</sub> = 2V           |
|                                               |                      | 400 | 600  |     |      | I <sub>C</sub> = 1A, V <sub>CE</sub> = 2V              |
|                                               |                      | 150 | 350  |     |      | I <sub>C</sub> = 2A, V <sub>CE</sub> = 2V              |
|                                               |                      | 60  | 120  |     |      | I <sub>C</sub> = 3A, V <sub>CE</sub> = 2V              |
| Current Gain-Bandwidth Product                | f <sub>T</sub>       | 150 | —    | —   | MHz  | I <sub>C</sub> = 50mA, V <sub>CE</sub> = 5V, f = 50MHz |
| Output Capacitance (Note 9)                   | C <sub>obo</sub>     | —   | 16   | —   | pF   | V <sub>CB</sub> = 10V, f = 1MHz                        |
| Turn-On Time                                  | t <sub>on</sub>      | —   | 33   | —   | ns   | I <sub>C</sub> = 500mA, V <sub>CC</sub> = 10V,         |
| Turn-Off Time                                 | t <sub>off</sub>     | —   | 1300 | —   | ns   | I <sub>B1</sub> = -I <sub>B2</sub> = 50mA              |

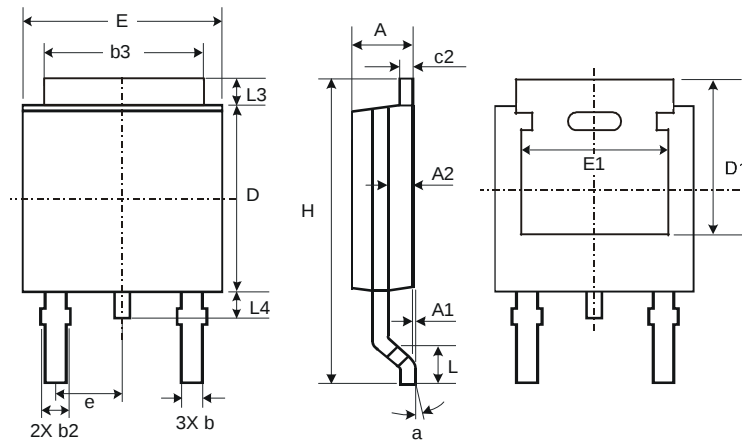
Notes: 9. Measured under pulsed conditions. Pulse width ≤ 300μs; duty cycle ≤ 2%.

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



## Package Outline Dimensions

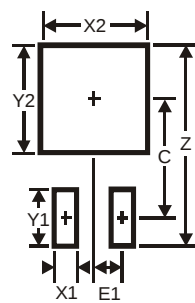
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| 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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