

**60V NPN MEDIUM POWER LOW SATURATION TRANSISTOR IN SOT223**
**Features**

- $BV_{CEO} > 60V$
- $I_C = 6A$  High Continuous Collector Current
- $I_{CM} = 20A$  Peak Pulse Current
- Low Saturation Voltage  $V_{CE(sat)} < -60mV @ -1A$
- $R_{SAT} = 35m\Omega$  for a Low Equivalent On-Resistance
- $h_{FE}$  Specified up to 10A for a High Gain Hold-Up
- Complementary PNP Type: ZX5T951G
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**

**Mechanical Data**

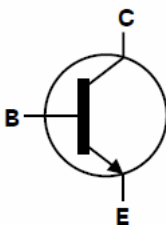
- Case: SOT223
- Case Material: Molded Plastic. "Green" Molding Compound; UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads; Solderable per MIL-STD-202, Method 208 @3
- Weight: 0.112 grams (Approximate)

**Applications**

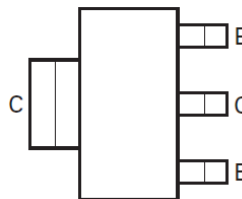
- Emergency Lighting Circuits
- MOSFET & IGBT Gate Drivers
- Solenoid, Relay and Actuator Drivers
- DC Modules
- Motor Control



Top View



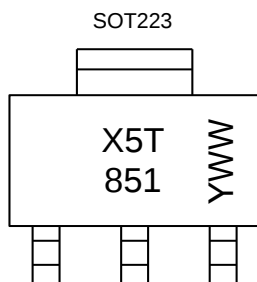
Device Symbol


 Top View  
 Pin-Out

**Ordering Information** (Note 4)

| Product    | Compliance | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|------------|------------|---------|--------------------|-----------------|-------------------|
| ZX5T851GTA | AEC-Q101   | X5T851  | 7                  | 12              | 1,000             |
| ZX5T851GTC | AEC-Q101   | X5T851  | 13                 | 12              | 4,000             |

- 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. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

**Marking Information**


X5T 851 = Product Type Marking Code  
 YWW = Date Code Marking  
 Y or  $\bar{Y}$  = Last Digit of Year (ex: 5= 2015)  
 WW or  $\bar{W}W$  = Week Code (01-53)

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

| Characteristic               | Symbol           | Value | Unit |
|------------------------------|------------------|-------|------|
| Collector-Base Voltage       | V <sub>CBO</sub> | 150   | V    |
| Collector-Emitter Voltage    | V <sub>CEO</sub> | 60    | V    |
| Emitter-Base Voltage         | V <sub>EBO</sub> | 7     | V    |
| Continuous Collector Current | I <sub>C</sub>   | 6     | A    |
| Peak Pulse Current           | I <sub>CM</sub>  | 20    | A    |

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

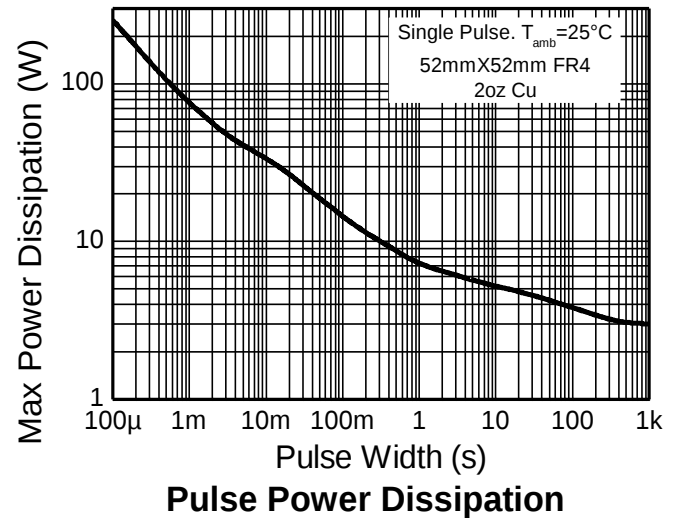
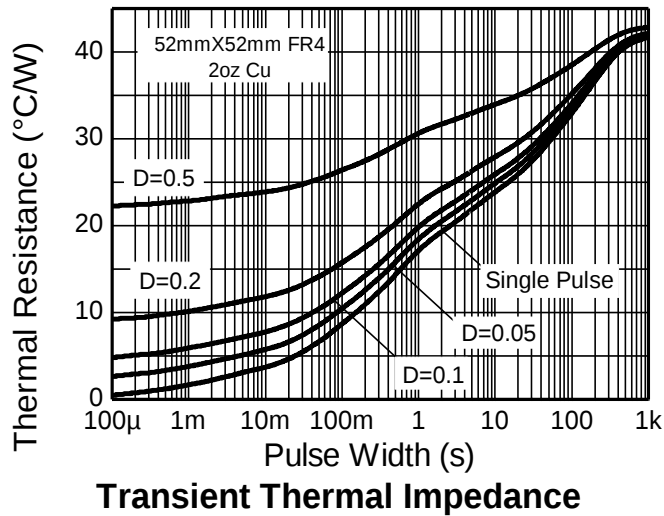
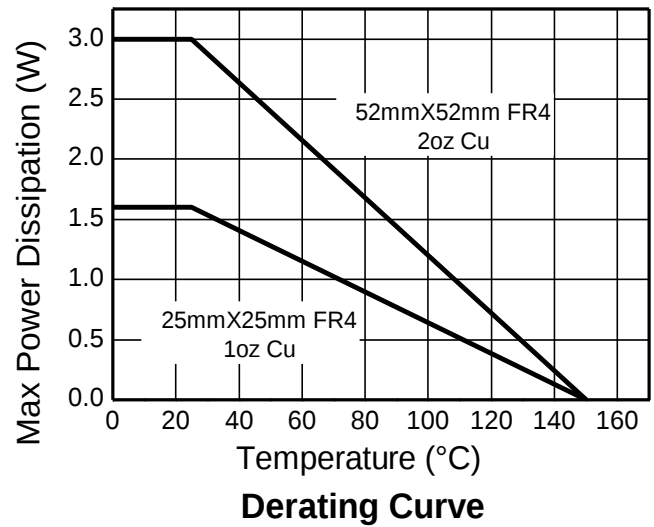
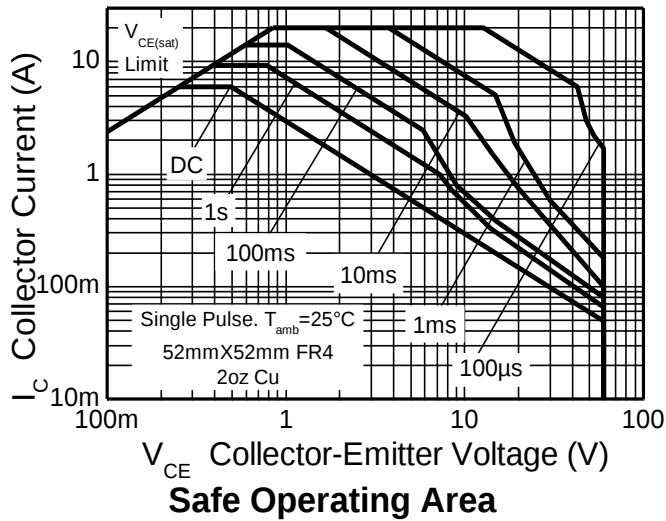
| Characteristic                          | Symbol                            | Value       | Unit |
|-----------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation                       | P <sub>D</sub>                    | 3.0         | W    |
|                                         |                                   | 2.0         |      |
|                                         |                                   | 1.6         |      |
|                                         |                                   | 1.2         |      |
| Thermal Resistance, Junction to Ambient | R <sub>θJA</sub>                  | 41.7        | °C/W |
|                                         |                                   | 62.5        |      |
|                                         |                                   | 78.1        |      |
|                                         |                                   | 104         |      |
| Thermal Resistance Junction to Lead     | R <sub>θJL</sub>                  | 10.5        |      |
| Operating and Storage Temperature Range | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

**ESD Ratings** (Note 8)

| 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:
- For a device mounted with the collector lead 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.
  - Same as Note 5, except the device is mounted on 25mm x 25mm 2oz copper.
  - Same as Note 5, except the device is mounted on 25mm x 25mm 1oz copper.
  - Same as Note 5, except the device is mounted on minimum recommended pad layout.
  - Thermal resistance from junction to solder-point (at the end of the collector lead).
  - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

## Thermal Characteristics and Derating Information

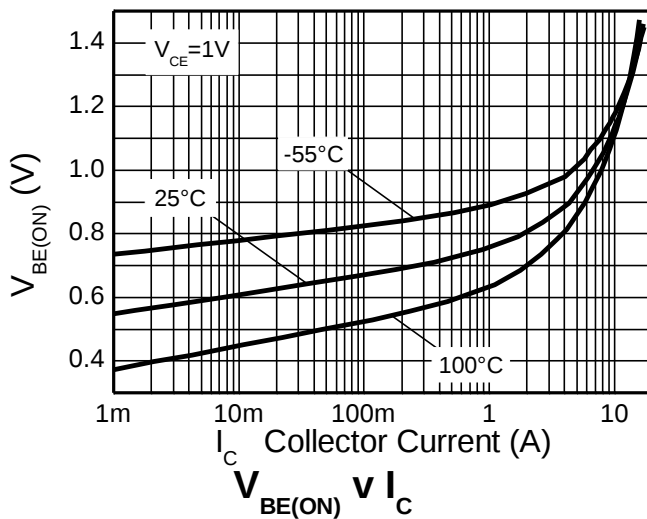
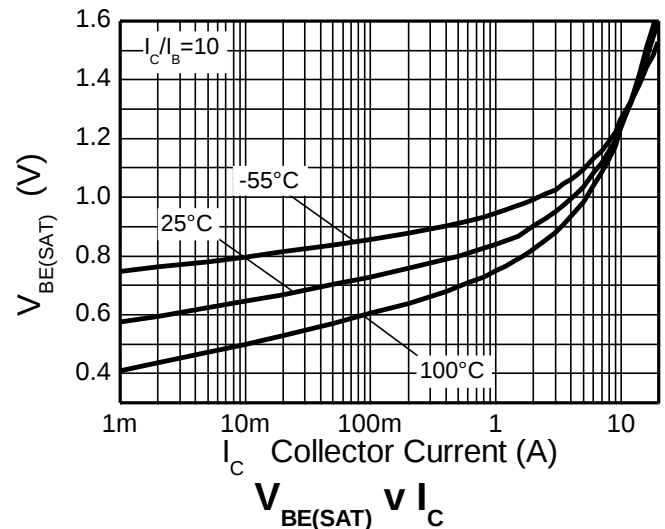
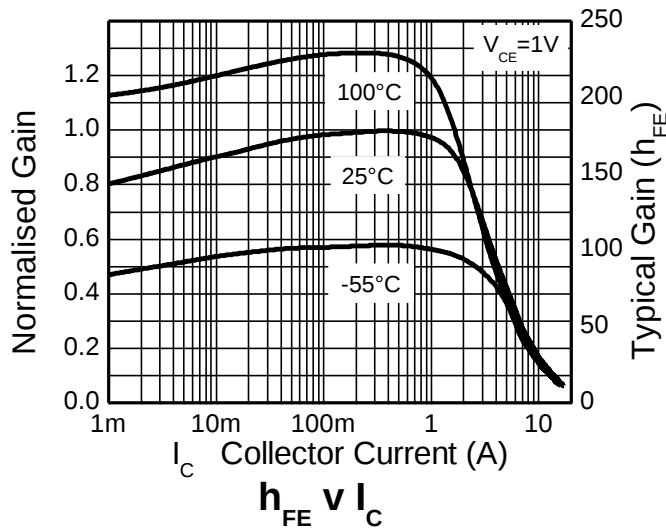
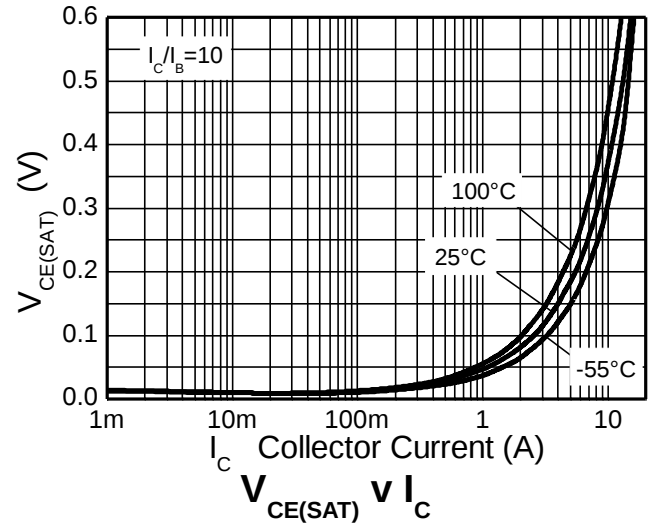
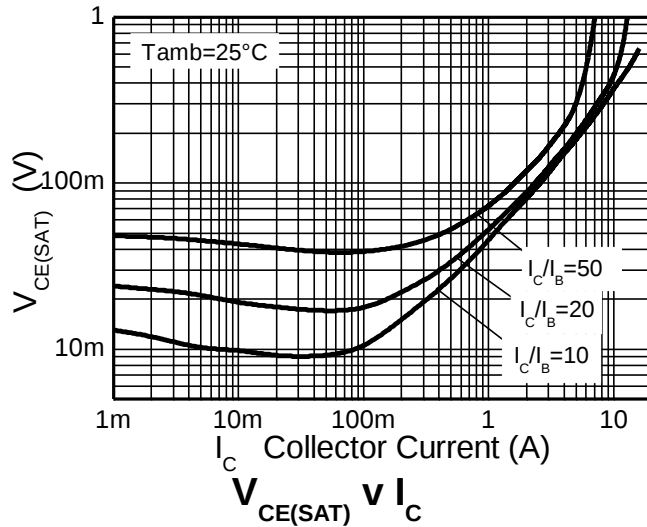


**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                 | Symbol               | Min | Typ  | Max  | Unit | Test Condition                                                                            |
|------------------------------------------------|----------------------|-----|------|------|------|-------------------------------------------------------------------------------------------|
| Collector-Base Breakdown Voltage               | BV <sub>CBO</sub>    | 150 | 190  | –    | V    | I <sub>C</sub> = 100μA                                                                    |
| Collector-Emitter Breakdown Voltage            | BV <sub>CER</sub>    | 150 | 190  | –    | V    | I <sub>C</sub> = -1μA, R <sub>B</sub> ≤ 1kΩ                                               |
| Collector-Emitter Breakdown Voltage (Note 11)  | BV <sub>CEO</sub>    | 60  | 80   | –    | V    | I <sub>C</sub> = 10mA                                                                     |
| Emitter-Base Breakdown Voltage                 | BV <sub>EBO</sub>    | 7   | 8.1  | –    | V    | I <sub>E</sub> = 100μA                                                                    |
| Collector Cut-Off Current                      | I <sub>CBO</sub>     | –   | <1   | 20   | nA   | V <sub>CB</sub> = 120V                                                                    |
|                                                |                      | –   | –    | 0.5  | μA   | V <sub>CB</sub> = 120V, T <sub>A</sub> = +100°C                                           |
| Collector Cut-Off Current                      | I <sub>CER</sub>     | –   | <1   | 20   | nA   | V <sub>CB</sub> = 120V                                                                    |
|                                                | R <sub>B</sub> ≤ 1kΩ | –   | –    | 0.5  | μA   | V <sub>CB</sub> = 120V, T <sub>A</sub> = +100°C                                           |
| Emitter Cut-Off Current                        | I <sub>EBO</sub>     | –   | <1   | 10   | nA   | V <sub>EB</sub> = 6V                                                                      |
| Collector-Emitter Saturation Voltage (Note 11) | V <sub>CE(sat)</sub> | –   | 20   | 30   | mV   | I <sub>C</sub> = 100mA, I <sub>B</sub> = 5mA                                              |
|                                                |                      | –   | 45   | 60   |      | I <sub>C</sub> = 1A, I <sub>B</sub> = 100mA                                               |
|                                                |                      | –   | 50   | 70   |      | I <sub>C</sub> = 1A, I <sub>B</sub> = 50mA                                                |
|                                                |                      | –   | 100  | 135  |      | I <sub>C</sub> = 2A, I <sub>B</sub> = 50mA                                                |
|                                                |                      | –   | 210  | 260  |      | I <sub>C</sub> = 6A, I <sub>B</sub> = 300mA                                               |
| Base-Emitter Saturation Voltage (Note 11)      | V <sub>BE(sat)</sub> | –   | 1000 | 1100 | mV   | I <sub>C</sub> = 6A, I <sub>B</sub> = 300mA                                               |
| Base-Emitter Turn-On Voltage (Note 11)         | V <sub>BE(on)</sub>  | –   | 940  | 1050 | mV   | I <sub>C</sub> = 6A, V <sub>CE</sub> = 1V                                                 |
| DC Current Gain (Note 11)                      | h <sub>FE</sub>      | 100 | 200  | –    | –    | I <sub>C</sub> = 10mA, V <sub>CE</sub> = 1V                                               |
|                                                |                      | 100 | 200  | 300  |      | I <sub>C</sub> = 2A, V <sub>CE</sub> = 1V                                                 |
|                                                |                      | 55  | 105  | –    |      | I <sub>C</sub> = 5A, V <sub>CE</sub> = 1V                                                 |
|                                                |                      | 20  | 40   | –    |      | I <sub>C</sub> = 10A, V <sub>CE</sub> = 1V                                                |
| Output Capacitance                             | C <sub>obo</sub>     | –   | 31   | –    | pF   | V <sub>CB</sub> = 10V, f = 1MHz                                                           |
| Current Gain-Bandwidth Product                 | f <sub>T</sub>       | –   | 130  | –    | MHz  | V <sub>CE</sub> = 5V, I <sub>C</sub> = 100mA,<br>f = 100MHz                               |
| Switching Times                                | t <sub>on</sub>      | –   | 42   | –    | ns   | I <sub>C</sub> = 1A, V <sub>CC</sub> = 10V,<br>I <sub>B1</sub> = -I <sub>B2</sub> = 100mA |
|                                                | t <sub>off</sub>     | –   | 760  | –    |      |                                                                                           |

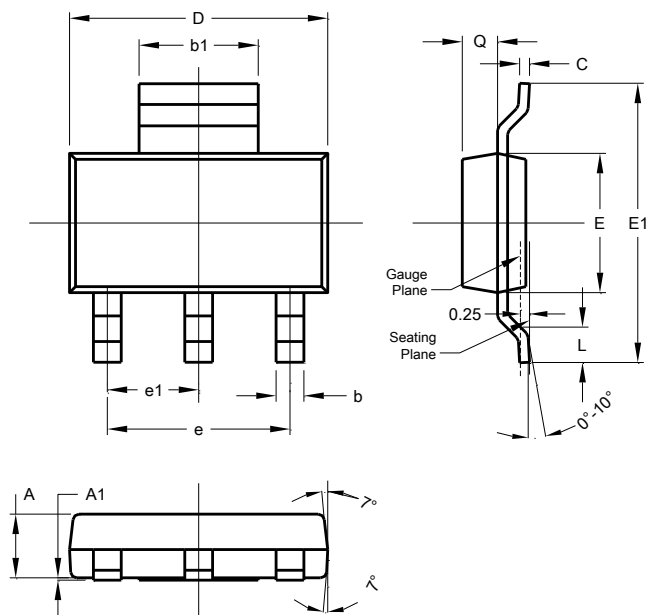
Note: 11. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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



## Package Outline Dimensions

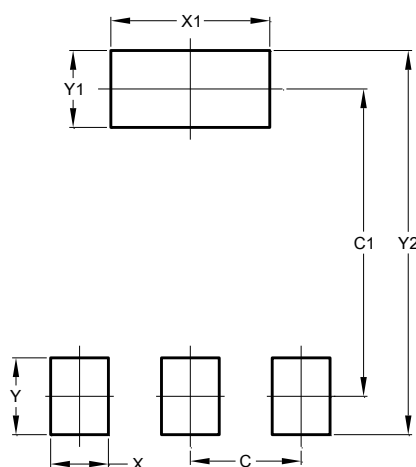
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



| SOT223               |       |      |      |
|----------------------|-------|------|------|
| Dim                  | Min   | Max  | Typ  |
| A                    | 1.55  | 1.65 | 1.60 |
| A1                   | 0.010 | 0.15 | 0.05 |
| b                    | 0.60  | 0.80 | 0.70 |
| b1                   | 2.90  | 3.10 | 3.00 |
| C                    | 0.20  | 0.30 | 0.25 |
| D                    | 6.45  | 6.55 | 6.50 |
| E                    | 3.45  | 3.55 | 3.50 |
| E1                   | 6.90  | 7.10 | 7.00 |
| e                    | -     | -    | 4.60 |
| e1                   | -     | -    | 2.30 |
| L                    | 0.85  | 1.05 | 0.95 |
| Q                    | 0.84  | 0.94 | 0.89 |
| 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) |
|------------|---------------|
| C          | 2.30          |
| C1         | 6.40          |
| X          | 1.20          |
| X1         | 3.30          |
| Y          | 1.60          |
| Y1         | 1.60          |
| Y2         | 8.00          |

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