# 17.5V NPN MEDIUM POWER HIGH GAIN TRANSISTOR IN SOT223

## Features

- $BV_{CEO}$ > 17.5V
- $BV_{CES}$ > 50V
- $I_C$ = 5A High Continuous Collector Current
- $I_{CM}$ = 20A Peak Pulse Current
- Low Saturation Voltage $V_{CE(sat)}$ <45mV @ 500mA
- $R_{SAT}$ = 50mΩ @ 5A for a Low Equivalent On-Resistance
- $h_{FE}$ Specified up to 20A 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**

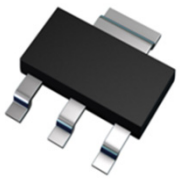
## Mechanical Data

- 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 e3
- Weight: 0.112 grams (approximate)

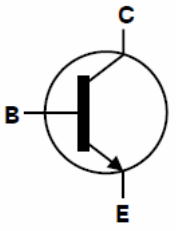
## Applications

- Solenoid, Relay and Actuator Drivers
- DC Modules
- Motor Control

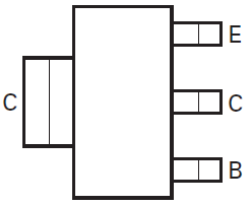
SOT223



Top View




Device Symbol



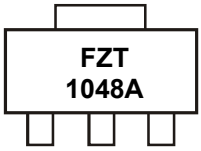

Top View
Pin-Out

## Ordering Information (Note 4)

| Product | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|---|---|---|---|---|
| FZT1048ATA | FZT1048A | 7 | 12 | 1,000 |

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 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




FZT1048A = Product Type Marking Code

## Absolute Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 50 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 17.5 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 7 | V |
| Continuous Collector Current | $I_C$ | 5 | A |
| Peak Pulse Current | $I_{CM}$ | 20 | A |
| Base Current | $I_B$ | 500 | mA |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

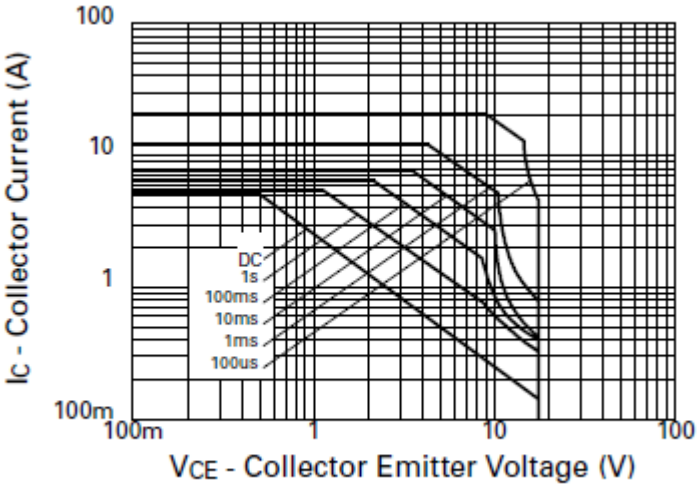
| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation | (Note 5) | $P_D$ | 3.0 | W |
| | (Note 6) | | 2.0 | |
| | (Note 7) | | 1.6 | |
| | (Note 8) | | 1.2 | |
| Thermal Resistance, Junction to Ambient | (Note 5) | $R_{\theta JA}$ | 41.7 | °C/W |
| | (Note 6) | | 62.5 | |
| | (Note 7) | | 78.1 | |
| | (Note 8) | | 104 | |
| Thermal Resistance Junction to Lead | (Note 9) | $R_{\theta JL}$ | 10.9 | |
| Operating and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## ESD Ratings (Note 10)

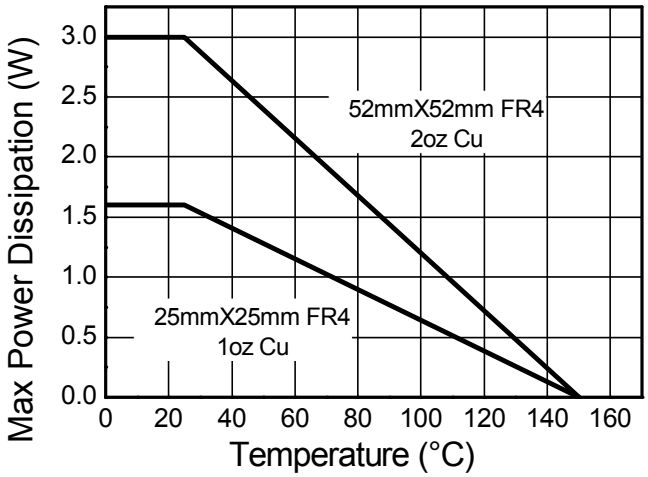
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|---|---|---|---|---|
| Electrostatic Discharge - Human Body Model | ESD HBM | 8,000 | V | 3B |
| Electrostatic Discharge - Machine Model | ESD MM | 400 | V | C |

Notes:
5. For a device mounted with the collector lead on 52mm x 52mm 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.
6. Same as note (5), except the device is mounted on 25mm x 25mm 2oz copper.
7. Same as note (5), except the device is mounted on 25mm x 25mm 1oz copper.
8. Same as note (5), except the device is mounted on minimum recommended pad layout.
9. Thermal resistance from junction to solder-point (at the end of the collector lead).
10. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

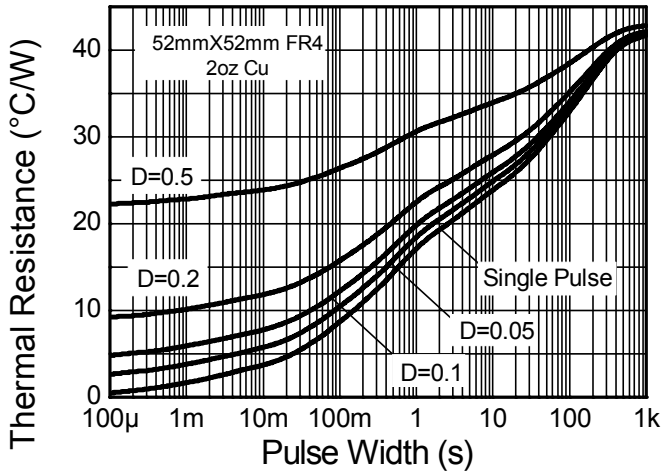
## Thermal Characteristics and Derating Information



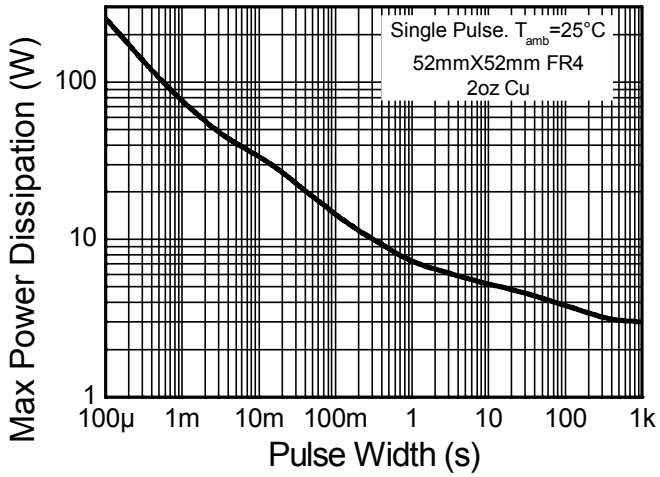

**Safe Operating Area**




**Derating Curve**




**Transient Thermal Impedance**



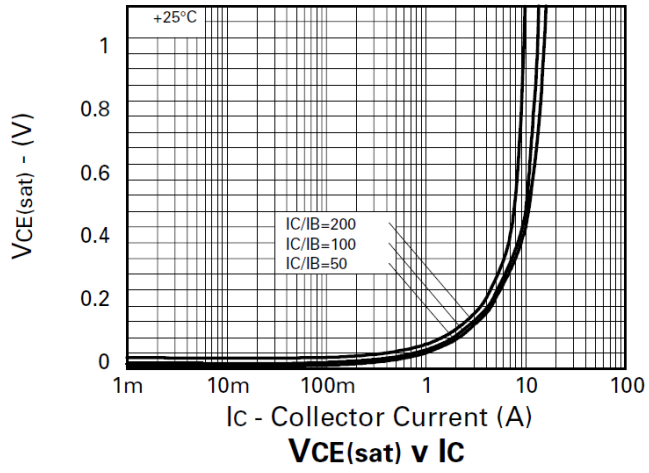

**Pulse Power Dissipation**

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

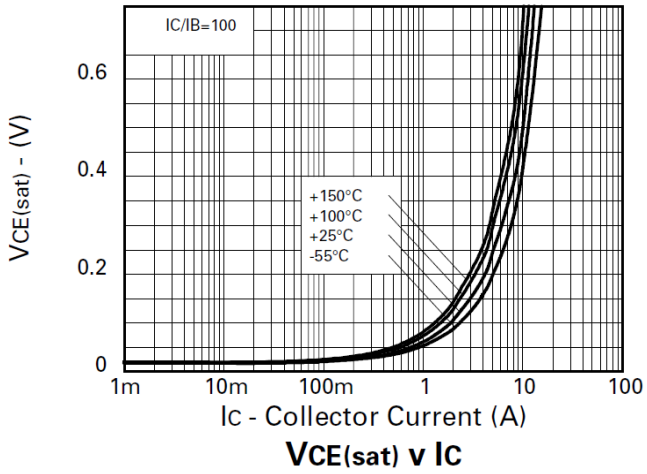
| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | 50 | 85 | — | V | $I_C$ = 100µA |
| Collector-Emitter Breakdown Voltage | $BV_{CES}$ | 50 | 85 | — | V | $I_C$ = 100µA |
| Collector-Emitter Breakdown Voltage | $BV_{CEV}$ | 50 | 85 | — | V | $I_C$ = 100µA, $V_{EB}$ = 1V |
| Collector-Emitter Breakdown Voltage (Note 11) | $BV_{CEO}$ | 17.5 | 24 | — | V | $I_C$ = 10mA |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | 7 | 8.7 | — | V | $I_E$ = 100µA |
| Collector Cut-off Current | $I_{CBO}$ | — | 0.3 | 10 | nA | $V_{CB}$ = 35V |
| Collector Cut-off Current | $I_{CES}$ | — | 0.3 | 10 | nA | $V_{CB}$ = 35V |
| Emitter Cut-off Current | $I_{EBO}$ | — | 0.3 | 10 | nA | $V_{EB}$ = 4V |
| Collector-Emitter Saturation Voltage (Note 11) | $V_{CE(sat)}$ | — | 27 | 45 | mV | $I_C$ = 500mA, $I_B$ = 10mA |
| | | — | 55 | 75 | | $I_C$ = 1A, $I_B$ = 10mA |
| | | — | 155 | 210 | | $I_C$ = 3A, $I_B$ = 15mA |
| | | — | 250 | 350 | | $I_C$ = 5A, $I_B$ = 25mA |
| Base-Emitter Saturation Voltage (Note 11) | $V_{BE(sat)}$ | — | 920 | 1000 | mV | $I_C$ = 5A, $I_B$ = 25mA |
| Base-Emitter Turn-On Voltage (Note 11) | $V_{BE(on)}$ | — | 880 | 970 | mV | $I_C$ = 5A, $V_{CE}$ = 2V |
| DC Current Gain (Note 11) | $h_{FE}$ | 290 | 440 | 1200 | — | $I_C$ = 10mA, $V_{CE}$ = 2V |
| | | 300 | 450 | 1200 | | $I_C$ = 1A, $V_{CE}$ = 2V |
| | | 180 | 300 | — | | $I_C$ = 5A, $V_{CE}$ = 2V |
| | | 50 | 90 | — | | $I_C$ = 20A, $V_{CE}$ = 2V |
| Output Capacitance | $C_{obo}$ | — | 60 | 80 | pF | $V_{CB}$ = 10V, f = 1MHz |
| Current Gain-Bandwidth Product | $f_T$ | — | 150 | — | MHz | $V_{CE}$ = 10V, $I_C$ = 50mA, f = 50MHz |
| Switching Times | $t_{on}$ | — | 120 | — | ns | $I_C$ = 4A, $V_{CC}$ = 10V, $I_{B1}$ = -$I_{B2}$ = 40mA |
| | $t_{off}$ | — | 310 | — | | |

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

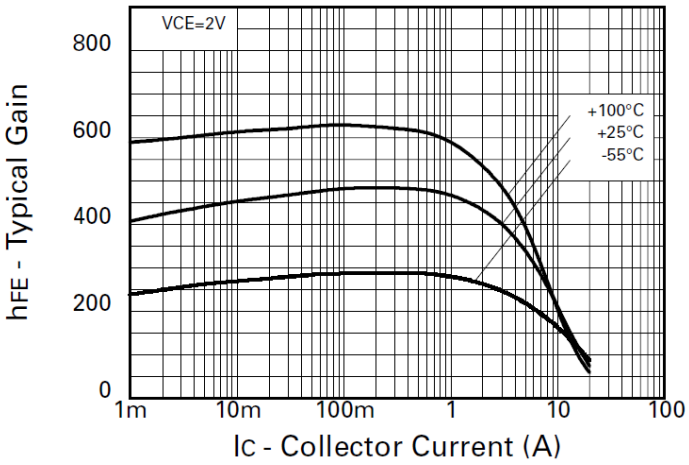
## Typical Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)



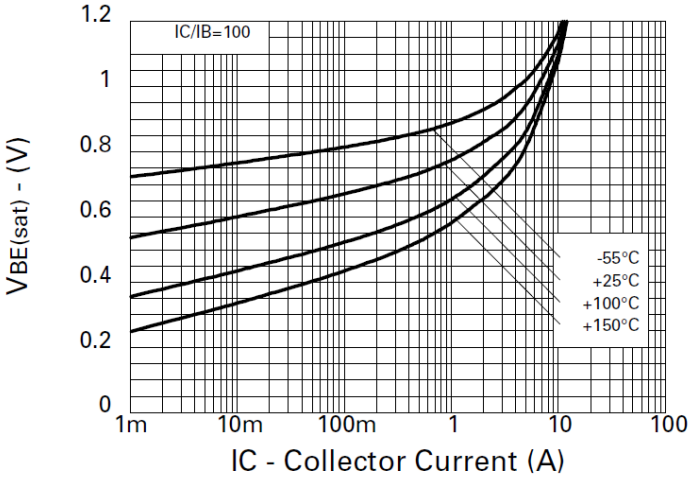

**VCE(sat) v IC**



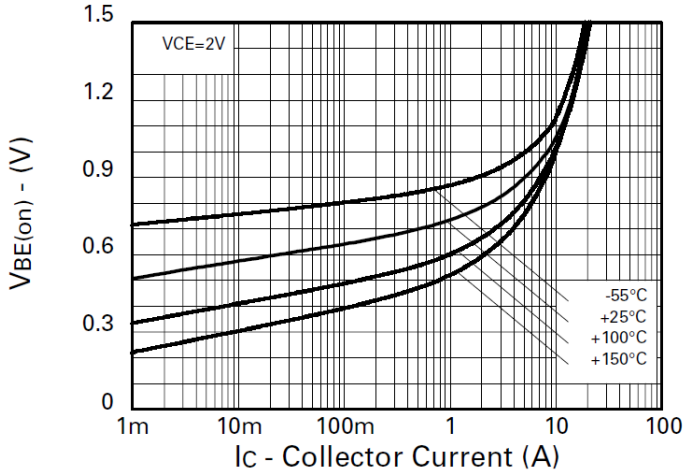

**VCE(sat) v IC**




**hFE v IC**



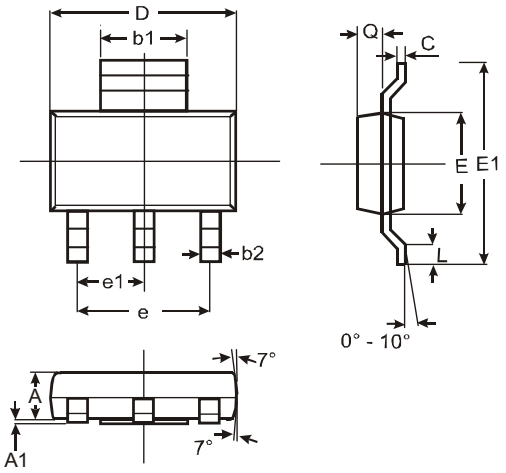

**VBE(sat) v IC**




**VBE(on) v IC**

## Package Outline Dimensions

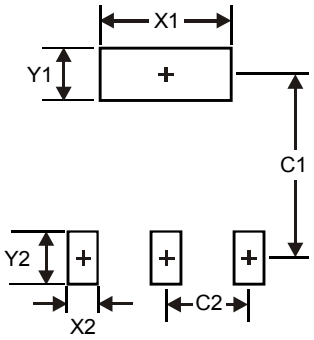
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.




| SOT223 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 1.55 | 1.65 | 1.60 |
| **A1** | 0.010 | 0.15 | 0.05 |
| **b1** | 2.90 | 3.10 | 3.00 |
| **b2** | 0.60 | 0.80 | 0.70 |
| **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) |
|---|---|
| **X1** | 3.3 |
| **X2** | 1.2 |
| **Y1** | 1.6 |
| **Y2** | 1.6 |
| **C1** | 6.4 |
| **C2** | 2.3 |

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