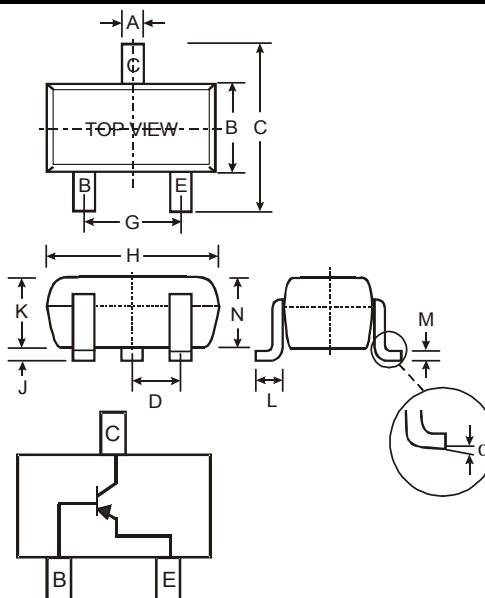


## Features

- Epitaxial Planar Die Construction
- Complementary NPN Type Available (MMBT4401T)
- Ultra-Small Surface Mount Package
- **Lead Free/RoHS Compliant (Note 2)**
- **"Green" Device (Note 3 and 4)**

## Mechanical Data

- Case: SOT-523
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminals: Solderable per MIL-STD-202, Method 208
- Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe).
- Terminal Connections: See Diagram
- Marking Information: 2T, See Page 4
- Ordering & Date Code Information: See Page 4
- Weight: 0.002 grams (approximate)



| SOT-523              |      |      |      |
|----------------------|------|------|------|
| Dim                  | Min  | Max  | Typ  |
| A                    | 0.15 | 0.30 | 0.22 |
| B                    | 0.75 | 0.85 | 0.80 |
| C                    | 1.45 | 1.75 | 1.60 |
| D                    | —    | —    | 0.50 |
| G                    | 0.90 | 1.10 | 1.00 |
| H                    | 1.50 | 1.70 | 1.60 |
| J                    | 0.00 | 0.10 | 0.05 |
| K                    | 0.60 | 0.80 | 0.75 |
| L                    | 0.10 | 0.30 | 0.22 |
| M                    | 0.10 | 0.20 | 0.12 |
| N                    | 0.45 | 0.65 | 0.50 |
| $\alpha$             | 0°   | 8°   | —    |
| All Dimensions in mm |      |      |      |

## Maximum Ratings @T<sub>A</sub> = 25°C unless otherwise specified

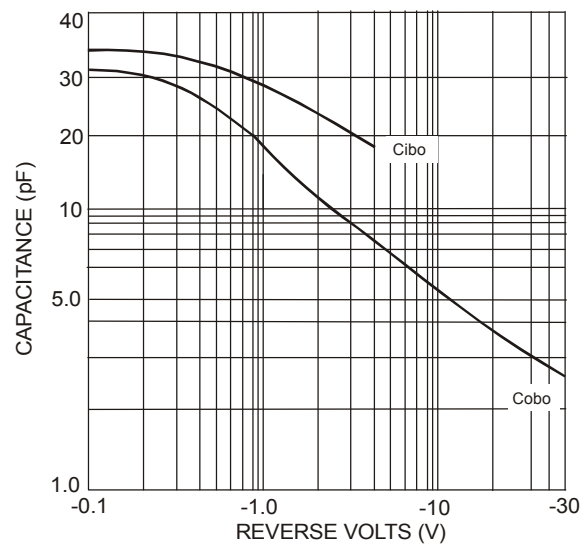
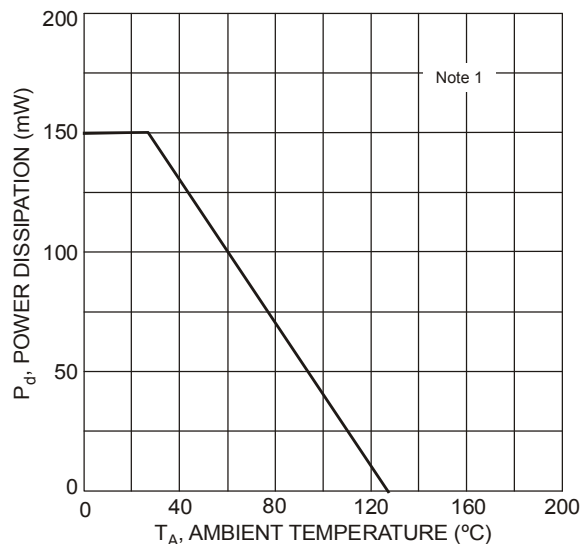
| Characteristic                                   | Symbol                            | Value       | Unit |
|--------------------------------------------------|-----------------------------------|-------------|------|
| Collector-Base Voltage                           | V <sub>CBO</sub>                  | -40         | V    |
| Collector-Emitter Voltage                        | V <sub>CEO</sub>                  | -40         | V    |
| Emitter-Base Voltage                             | V <sub>EBO</sub>                  | -5.0        | V    |
| Collector Current – Continuous (Note 1)          | I <sub>C</sub>                    | -600        | mA   |
| Power Dissipation (Note 1)                       | P <sub>d</sub>                    | 150         | mW   |
| Thermal Resistance, Junction to Ambient (Note 1) | R <sub>θJA</sub>                  | 833         | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

- Notes:
1. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.
  2. No purposefully added lead
  3. Diodes Inc.'s "Green" policy can be found on our website at [http://www.diodes.com/products/lead\\_free/index.php](http://www.diodes.com/products/lead_free/index.php).
  4. Product manufactured with Date Code UO (week 40, 2007) and newer are built with Green Molding Compound. Product manufactured prior to Date Code UO are built with Non-Green Molding Compound and may contain Halogens or Sb2O3 Fire Retardants.

## Electrical Characteristics @T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic                       | Symbol               | Min                          | Max                     | Unit               | Test Condition                                                                                                                                                                                                                                                  |
|--------------------------------------|----------------------|------------------------------|-------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS (Note 5)</b>  |                      |                              |                         |                    |                                                                                                                                                                                                                                                                 |
| Collector-Base Breakdown Voltage     | V <sub>(BR)CBO</sub> | -40                          | —                       | V                  | I <sub>C</sub> = -100μA, I <sub>E</sub> = 0                                                                                                                                                                                                                     |
| Collector-Emitter Breakdown Voltage  | V <sub>(BR)CEO</sub> | -40                          | —                       | V                  | I <sub>C</sub> = -1.0mA, I <sub>B</sub> = 0                                                                                                                                                                                                                     |
| Emitter-Base Breakdown Voltage       | V <sub>(BR)EBO</sub> | -5.0                         | —                       | V                  | I <sub>E</sub> = -100μA, I <sub>C</sub> = 0                                                                                                                                                                                                                     |
| Collector Cutoff Current             | I <sub>CEX</sub>     | —                            | -100                    | nA                 | V <sub>CE</sub> = -35V, V <sub>EB(OFF)</sub> = -0.4V                                                                                                                                                                                                            |
| Base Cutoff Current                  | I <sub>BL</sub>      | —                            | -100                    | nA                 | V <sub>CE</sub> = -35V, V <sub>EB(OFF)</sub> = -0.4V                                                                                                                                                                                                            |
| <b>ON CHARACTERISTICS (Note 5)</b>   |                      |                              |                         |                    |                                                                                                                                                                                                                                                                 |
| DC Current Gain                      | h <sub>FE</sub>      | 30<br>60<br>100<br>100<br>20 | —<br>—<br>—<br>300<br>— | —                  | I <sub>C</sub> = -100μA, V <sub>CE</sub> = -1.0V<br>I <sub>C</sub> = -1.0mA, V <sub>CE</sub> = -1.0V<br>I <sub>C</sub> = -10mA, V <sub>CE</sub> = -1.0V<br>I <sub>C</sub> = -150mA, V <sub>CE</sub> = -2.0V<br>I <sub>C</sub> = -500mA, V <sub>CE</sub> = -2.0V |
| Collector-Emitter Saturation Voltage | V <sub>CE(SAT)</sub> | —                            | -0.40<br>-0.75          | V                  | I <sub>C</sub> = -150mA, I <sub>B</sub> = -15mA<br>I <sub>C</sub> = -500mA, I <sub>B</sub> = -50mA                                                                                                                                                              |
| Base-Emitter Saturation Voltage      | V <sub>BE(SAT)</sub> | -0.75<br>—                   | -0.95<br>-1.30          | V                  | I <sub>C</sub> = -150mA, I <sub>B</sub> = -15mA<br>I <sub>C</sub> = -500mA, I <sub>B</sub> = -50mA                                                                                                                                                              |
| <b>SMALL SIGNAL CHARACTERISTICS</b>  |                      |                              |                         |                    |                                                                                                                                                                                                                                                                 |
| Output Capacitance                   | C <sub>cb</sub>      | —                            | 8.5                     | pF                 | V <sub>CB</sub> = -10V, f = 1.0MHz, I <sub>E</sub> = 0                                                                                                                                                                                                          |
| Input Capacitance                    | C <sub>eb</sub>      | —                            | 30                      | pF                 | V <sub>EB</sub> = -0.5V, f = 1.0MHz, I <sub>C</sub> = 0                                                                                                                                                                                                         |
| Input Impedance                      | h <sub>ie</sub>      | 1.5                          | 15                      | kΩ                 | V <sub>CE</sub> = -10V, I <sub>C</sub> = -1.0mA,<br>f = 1.0kHz                                                                                                                                                                                                  |
| Voltage Feedback Ratio               | h <sub>re</sub>      | 0.1                          | 8.0                     | x 10 <sup>-4</sup> |                                                                                                                                                                                                                                                                 |
| Small Signal Current Gain            | h <sub>fe</sub>      | 60                           | 500                     | —                  |                                                                                                                                                                                                                                                                 |
| Output Admittance                    | h <sub>oe</sub>      | 1.0                          | 100                     | μS                 |                                                                                                                                                                                                                                                                 |
| Current Gain-Bandwidth Product       | f <sub>T</sub>       | 200                          | —                       | MHz                | V <sub>CE</sub> = -10V, I <sub>C</sub> = -20mA,<br>f = 100MHz                                                                                                                                                                                                   |
| <b>SWITCHING CHARACTERISTICS</b>     |                      |                              |                         |                    |                                                                                                                                                                                                                                                                 |
| Delay Time                           | t <sub>d</sub>       | —                            | 15                      | ns                 | V <sub>CC</sub> = -30V, I <sub>C</sub> = -150mA,                                                                                                                                                                                                                |
| Rise Time                            | t <sub>r</sub>       | —                            | 20                      | ns                 | V <sub>BE(off)</sub> = -2.0V, I <sub>B1</sub> = -15mA                                                                                                                                                                                                           |
| Storage Time                         | t <sub>s</sub>       | —                            | 225                     | ns                 | V <sub>CC</sub> = -30V, I <sub>C</sub> = -150mA,                                                                                                                                                                                                                |
| Fall Time                            | t <sub>f</sub>       | —                            | 30                      | ns                 | I <sub>B1</sub> = I <sub>B2</sub> = -15mA                                                                                                                                                                                                                       |

Notes: 5. Short duration pulse test used to minimize self-heating effect.



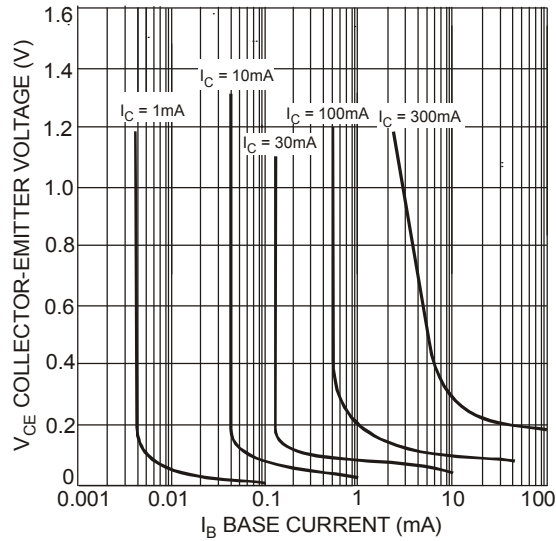


Fig. 3 Typical Collector Saturation Region

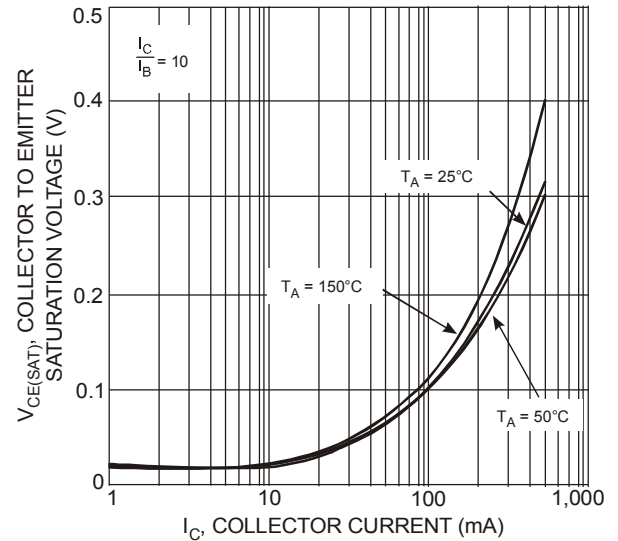


Fig. 4 Collector Emitter Saturation Voltage vs. Collector Current

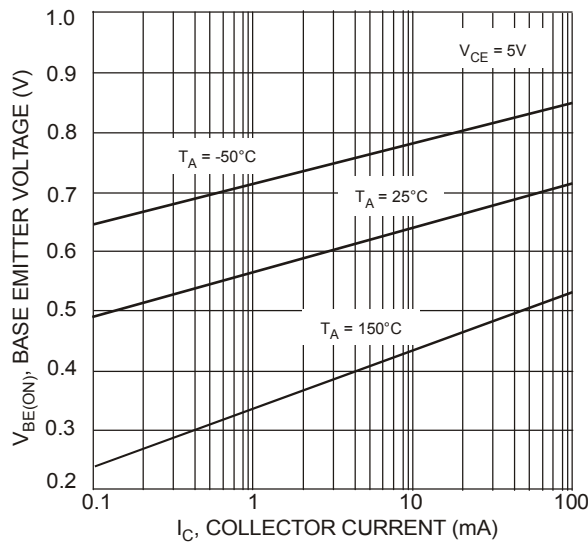


Fig. 5 Base-Emitter Voltage vs. Collector Current

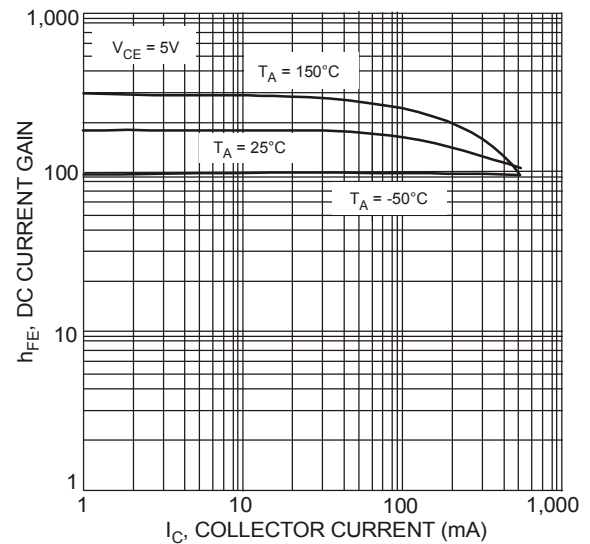


Fig. 6 DC Current Gain vs. Collector Current

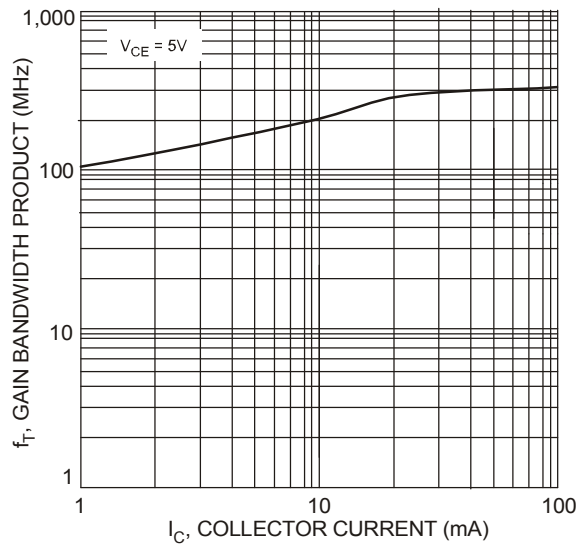


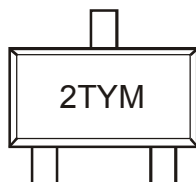
Fig. 7 Gain Bandwidth Product vs. Collector Current

## Ordering Information (Note 6)

| Device        | Packaging | Shipping         |
|---------------|-----------|------------------|
| MMBT4403T-7-F | SOT-523   | 3000/Tape & Reel |

Notes: 6. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

## Marking Information



2T = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: N = 2002)  
 M = Month (ex: 9 = September)

### Date Code Key

| Year | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|------|------|------|------|------|------|------|------|------|------|------|------|
| Code | N    | P    | R    | S    | T    | U    | V    | W    | X    | Y    | Z    |

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | O   | N   | D   |

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