

Features

- Epitaxial Planar Die Construction
- Complementary NPN Type Available (MMBT4401)
- Ideal for Medium Power Amplification and Switching
- **Lead Free, RoHS Compliant (Note 1)**
- **Halogen and Antimony Free "Green" Device (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

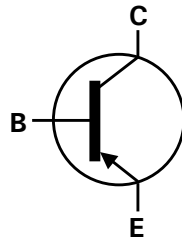
Mechanical Data

- Case: SOT23
- UL Flammability Rating 94V-0
- Case material: molded Plastic "Green" Compound
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Matte Tin Finish
- Weight: 0.008 grams (Approximate)

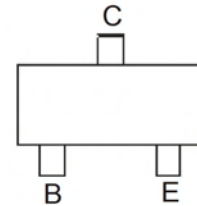
SOT23



Top View



Device Symbol



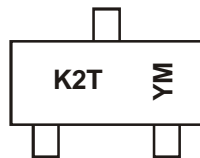
Top View
Pin-Out

Ordering Information (Note 3)

| Product | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|--------------|---------|--------------------|-----------------|-------------------|
| MMBT4403-7-F | K2T | 7 | 8 | 3,000 |

- Notes:
1. No purposefully added lead.
 2. Diodes Inc.'s "Green" Policy can be found on our website at <http://www.diodes.com>
 3. For more packaging details, go to our website at <http://www.diodes.com>.

Marking Information



K2T = Product Type Marking Code
 YM = Date Code Marking
 Y = Year (ex: Y = 2011)
 M = Month (ex: 9 = September)

Date Code Key

| Year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|------|------|------|------|------|------|------|------|------|
| Code | X | Y | Z | A | B | C | D | E |

| 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 |

Maximum Ratings @ $T_A = 25^\circ\text{C}$ unless otherwise specified

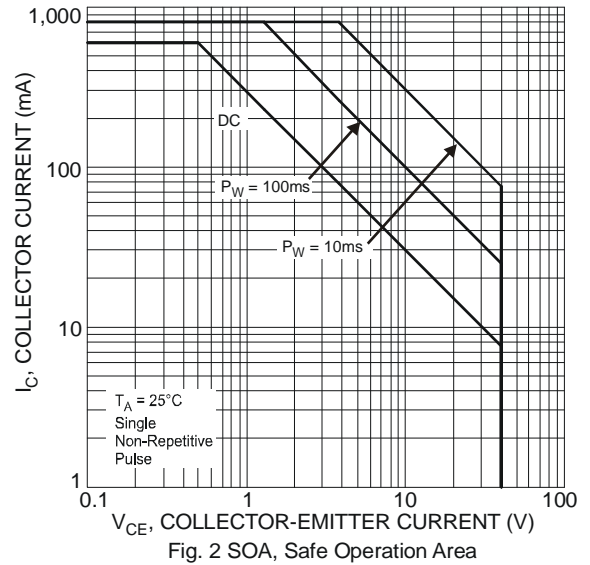
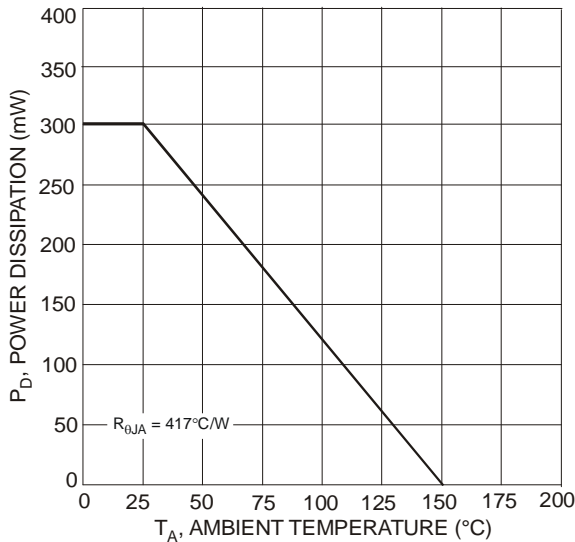
| Characteristic | Symbol | Value | Unit |
|---|-----------|-------|------|
| Collector-Base Voltage | V_{CB0} | -40 | V |
| Collector-Emitter Voltage | V_{CEO} | -40 | V |
| Emitter-Base Voltage | V_{EBO} | -5.0 | V |
| Collector Current - Continuous (Note 4) | I_C | -600 | mA |

Thermal Characteristics @ $T_A = 25^\circ\text{C}$ unless otherwise specified

| Characteristic | Symbol | Value | Unit |
|--|-----------------|-------------|---------------------------|
| Power Dissipation (Note 4) | P_D | 300 | mW |
| Thermal Resistance, Junction to Ambient (Note 4) | $R_{\theta JA}$ | 417 | $^\circ\text{C}/\text{W}$ |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

Notes: 4. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch

Typical Thermal Characteristics



Electrical Characteristics @ $T_A = 25^\circ\text{C}$ unless otherwise specified

| Characteristic | Symbol | Min | Max | Unit | Test Condition | |
|--------------------------------------|---------------|------------|----------------|------------------|--|--|
| OFF CHARACTERISTICS (Note 5) | | | | | | |
| Collector-Base Breakdown Voltage | $V_{(BR)CBO}$ | -40 | — | V | $I_C = -100\mu\text{A}, I_E = 0$ | |
| Collector-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | -40 | — | V | $I_C = -1.0\text{mA}, I_B = 0$ | |
| Emitter-Base Breakdown Voltage | $V_{(BR)EBO}$ | -5.0 | — | V | $I_E = -100\mu\text{A}, I_C = 0$ | |
| Collector Cutoff Current | I_{CEX} | — | -100 | nA | $V_{CE} = -35\text{V}, V_{EB(OFF)} = -0.4\text{V}$ | |
| Base Cutoff Current | I_{BL} | — | -100 | nA | $V_{CE} = -35\text{V}, V_{EB(OFF)} = -0.4\text{V}$ | |
| ON CHARACTERISTICS (Note 5) | | | | | | |
| DC Current Gain | h_{FE} | 30 | — | — | $I_C = -100\mu\text{A}, V_{CE} = -1.0\text{V}$ | |
| | | 60 | — | | | $I_C = -1.0\text{mA}, V_{CE} = -1.0\text{V}$ |
| | | 100 | — | | | $I_C = -10\text{mA}, V_{CE} = -1.0\text{V}$ |
| | | 100 | 300 | | | $I_C = -150\text{mA}, V_{CE} = -2.0\text{V}$ |
| | | 20 | — | | | $I_C = -500\text{mA}, V_{CE} = -2.0\text{V}$ |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | — | -0.40 -0.75 | V | $I_C = -150\text{mA}, I_B = -15\text{mA}$ $I_C = -500\text{mA}, I_B = -50\text{mA}$ | |
| Base-Emitter Saturation Voltage | $V_{BE(SAT)}$ | -0.75 — | -0.95 -1.30 | V | $I_C = -150\text{mA}, I_B = -15\text{mA}$ $I_C = -500\text{mA}, I_B = -50\text{mA}$ | |
| SMALL SIGNAL CHARACTERISTICS | | | | | | |
| Output Capacitance | C_{obo} | — | 8.5 | pF | $V_{CB} = -10\text{V}, f = 1.0\text{MHz}, I_E = 0$ | |
| Input Capacitance | C_{ibo} | — | 30 | pF | $V_{EB} = -0.5\text{V}, f = 1.0\text{MHz}, I_C = 0$ | |
| Input Impedance | h_{ie} | 1.5 | 15 | $k\Omega$ | $V_{CE} = -10\text{V}, I_C = -1.0\text{mA}, f = 1.0\text{kHz}$ | |
| Voltage Feedback Ratio | h_{re} | 0.1 | 8.0 | $\times 10^{-4}$ | | |
| Small Signal Current Gain | h_{fe} | 60 | 500 | — | | |
| Output Admittance | h_{oe} | 1.0 | 100 | μS | | |
| Current Gain-Bandwidth Product | f_T | 200 | — | MHz | $V_{CE} = -10\text{V}, I_C = -20\text{mA}, f = 100\text{MHz}$ | |
| SWITCHING CHARACTERISTICS | | | | | | |
| Delay Time | t_d | — | 15 | ns | $V_{CC} = -30\text{V}, I_C = -150\text{mA}, V_{BE(off)} = -2.0\text{V}, I_{B1} = -15\text{mA}$ | |
| Rise Time | t_r | — | 20 | ns | | |
| Storage Time | t_s | — | 225 | ns | $V_{CC} = -30\text{V}, I_C = -150\text{mA}, I_{B1} = I_{B2} = -15\text{mA}$ | |
| Fall Time | t_f | — | 30 | ns | | |

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

Typical Electrical Characteristics

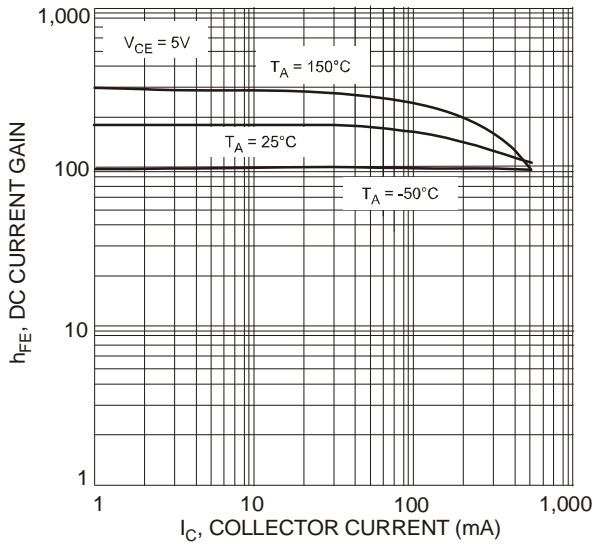


Fig. 3 Typical DC Current Gain vs. Collector Current

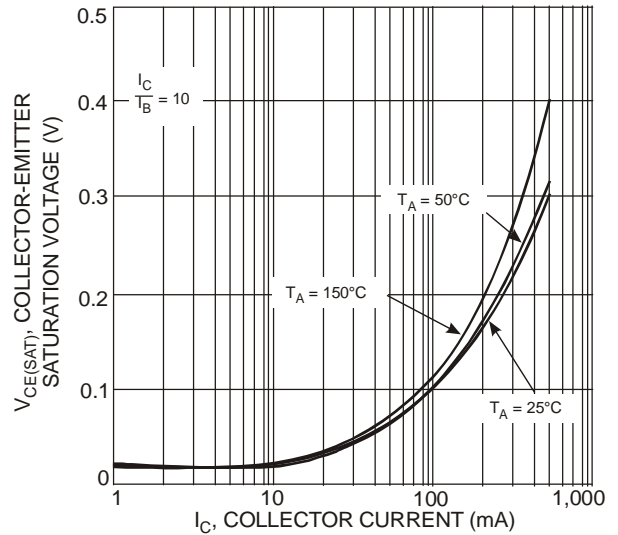


Fig. 4 Typical Collector-Emitter Saturation Voltage vs. Collector Current

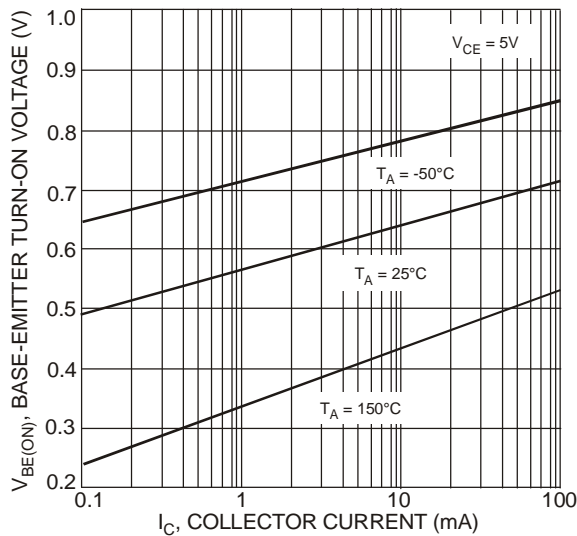


Fig. 5 Typical Base-Emitter Turn-On Voltage vs. Collector Current

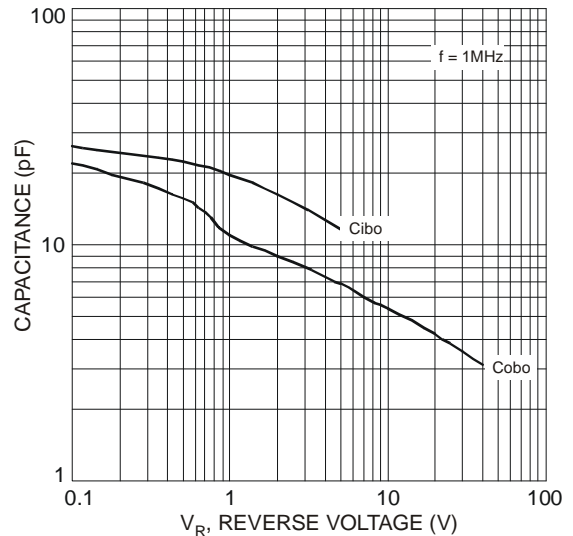


Fig. 6 Typical Capacitance Characteristics

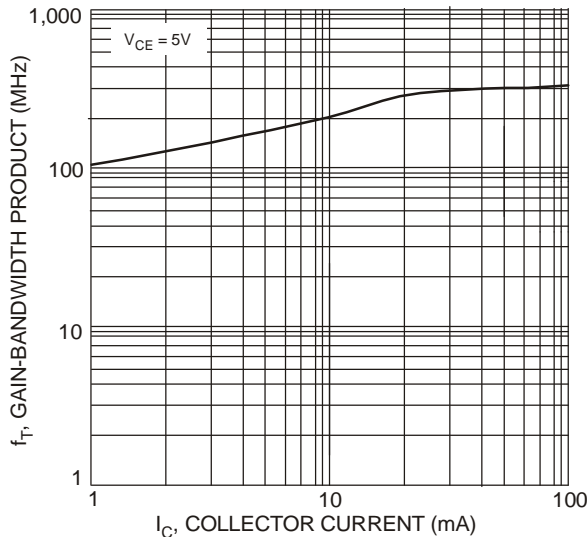


Fig. 7 Typical Gain-Bandwidth Product vs. Collector Current

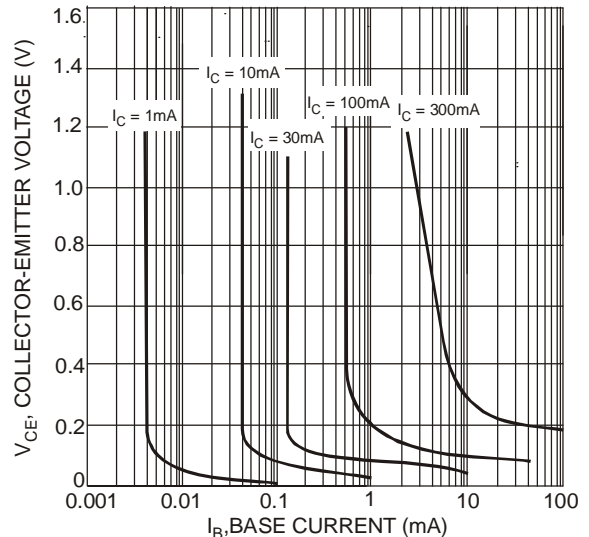
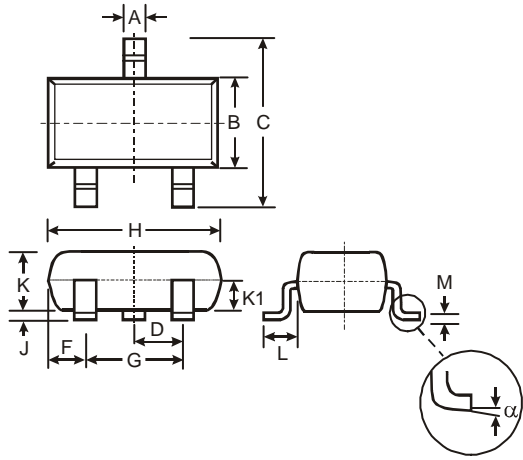


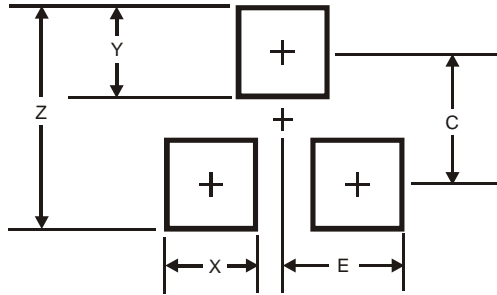
Fig. 8 Typical Collector Saturation Region

Package Outline Dimensions



| SOT23 | | | |
|----------------------|-------|------|-------|
| Dim | Min | Max | Typ |
| A | 0.37 | 0.51 | 0.40 |
| B | 1.20 | 1.40 | 1.30 |
| C | 2.30 | 2.50 | 2.40 |
| D | 0.89 | 1.03 | 0.915 |
| F | 0.45 | 0.60 | 0.535 |
| G | 1.78 | 2.05 | 1.83 |
| H | 2.80 | 3.00 | 2.90 |
| J | 0.013 | 0.10 | 0.05 |
| K | 0.903 | 1.10 | 1.00 |
| K1 | - | - | 0.400 |
| L | 0.45 | 0.61 | 0.55 |
| M | 0.085 | 0.18 | 0.11 |
| α | 0° | 8° | - |
| All Dimensions in mm | | | |

Suggested Pad Layout



| Dimensions | Value (in mm) |
|------------|---------------|
| Z | 2.9 |
| X | 0.8 |
| Y | 0.9 |
| C | 2.0 |
| E | 1.35 |

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