**MMBT5551**

## NPN SMALL SIGNAL SURFACE MOUNT TRANSISTOR

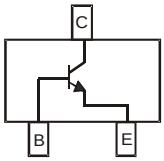
## Features

- Epitaxial Planar Die Construction
- Complementary PNP Type Available (MMBT5401)
- Ideal for Low Power Amplification and Switching
- **Lead, Halogen and Antimony Free, RoHS Compliant**
- **"Green" Device (Notes 2 and 3)**

## Mechanical Data

- Case: SOT-23
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020D
- Terminal Connections: See Diagram
- Terminals: Solderable per MIL-STD-202, Method 208
- Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe).
- Marking Information: See Page 3
- Ordering Information: See Page 3
- Weight: 0.008 grams (approximate)

Top View




Device Schematic

## Maximum Ratings @$T_A$ = 25°C unless otherwise specified

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 180 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 160 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 6.0 | V |
| Collector Current - Continuous (Note 1) | $I_C$ | 600 | mA |

## Thermal Characteristics

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation (Note 1) | $P_D$ | 300 | mW |
| Thermal Resistance, Junction to Ambient (Note 1) | $R_{\theta JA}$ | 417 | °C/W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -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. Halogen and Antimony Free.
3. Product manufactured with Data Code V9 (week 33, 2008) and newer are built with Green Molding Compound. Product manufactured prior to Date Code V9 are built with Non-Green Molding Compound and may contain Halogens or $Sb_2O_3$ Fire Retardants.

## Electrical Characteristics @$T_A$ = 25°C unless otherwise specified

| Characteristic | Symbol | Min | Max | Unit | Test Condition |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 4)** | | | | | |
| Collector-Base Breakdown Voltage | $V_{(BR)CBO}$ | 180 | — | V | $I_C$ = 100μA, $I_E$ = 0 |
| Collector-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | 160 | — | V | $I_C$ = 1.0mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | $V_{(BR)EBO}$ | 6.0 | — | V | $I_E$ = 10μA, $I_C$ = 0 |
| Collector Cutoff Current | $I_{CBO}$ | — | 50 | nA<br>μA | $V_{CB}$ = 120V, $I_E$ = 0<br>$V_{CB}$ = 120V, $I_E$ = 0, $T_A$ = 100°C |
| Emitter Cutoff Current | $I_{EBO}$ | — | 50 | nA | $V_{EB}$ = 4.0V, $I_C$ = 0 |
| **ON CHARACTERISTICS (Note 4)** | | | | | |
| DC Current Gain | $h_{FE}$ | 80<br>80<br>30 | —<br>250<br>— | — | $I_C$ = 1.0mA, $V_{CE}$ = 5.0V<br>$I_C$ = 10mA, $V_{CE}$ = 5.0V<br>$I_C$ = 50mA, $V_{CE}$ = 5.0V |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | — | 0.15<br>0.20 | V | $I_C$ = 10mA, $I_B$ = 1.0mA<br>$I_C$ = 50mA, $I_B$ = 5.0mA |
| Base-Emitter Saturation Voltage | $V_{BE(SAT)}$ | — | 1.0 | V | $I_C$ = 10mA, $I_B$ = 1.0mA<br>$I_C$ = 50mA, $I_B$ = 5.0mA |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | |
| Output Capacitance | $C_{obo}$ | — | 6.0 | pF | $V_{CB}$ = 10V, f = 1.0MHz, $I_E$ = 0 |
| Small Signal Current Gain | $h_{fe}$ | 50 | 250 | — | $V_{CE}$ = 10V, $I_C$ = 1.0mA, f = 1.0kHz |
| Current Gain-Bandwidth Product | $f_T$ | 100 | 300 | MHz | $V_{CE}$ = 10V, $I_C$ = 10mA, f = 100MHz |
| Noise Figure | nF | — | 8.0 | dB | $V_{CE}$ = 5.0V, $I_C$ = 200μA, $R_S$ = 1.0kΩ, f = 1.0kHz |

Notes: 4. Short duration pulse test used to minimize self-heating effect.

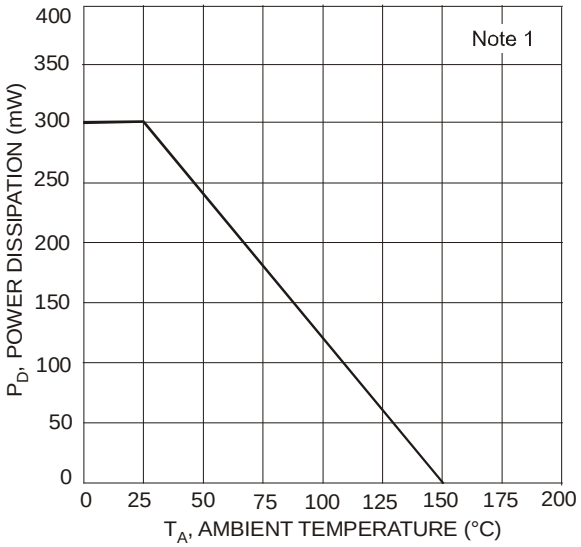



Fig. 1 Power Dissipation vs. Ambient Temperature

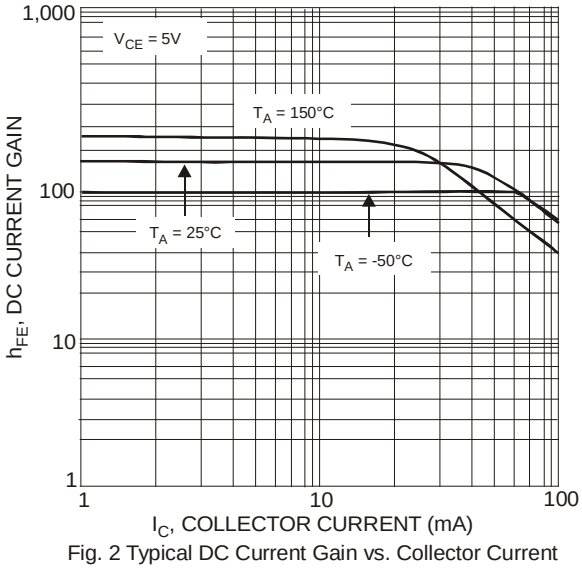



Fig. 2 Typical DC Current Gain vs. Collector Current

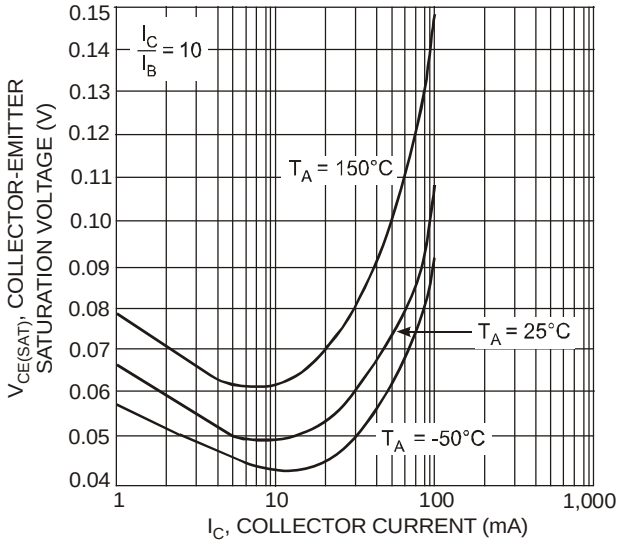



Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current

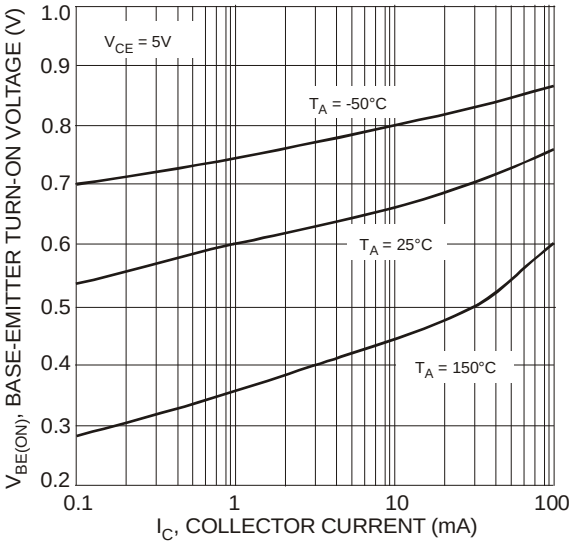



Fig. 4 Typical Base-Emitter Turn-On Voltage vs. Collector Current

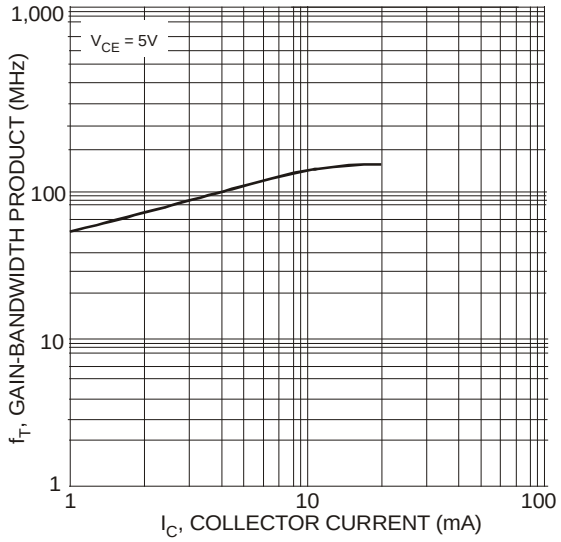


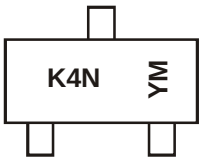

Fig. 5 Typical Gain-Bandwidth Product vs. Collector Current

## Ordering Information (Note 5)

| Part Number | Case | Packaging |
|---|---|---|
| MMBT5551-7-F | SOT-23 | 3000/Tape & Reel |

Notes: 5. For packaging details, go to our website at http://www.diodes.com/datasheets/ap02007.pdf.

## Marking Information



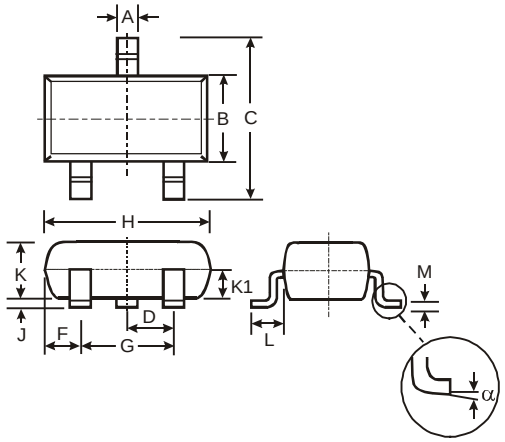

K4N = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: N = 2002)
M = Month (ex: 9 = September)

Date Code Key

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | J | K | L | M | N | P | R | S | T | U | V | W | X | Y | Z | A | B | C |

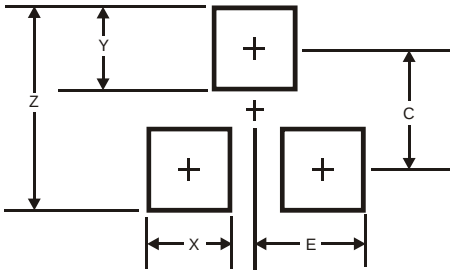
| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | O | N | D |

## Package Outline Dimensions




| SOT-23 | | | |
|---|---|---|---|
| **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 |