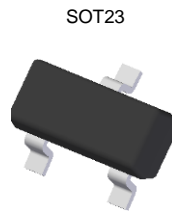


## Features

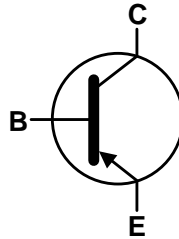
- Epitaxial Planar Die Construction
- Complementary NPN Type - MMBT5551
- Ideal for Low Power Amplification and Switching
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

## Mechanical Data

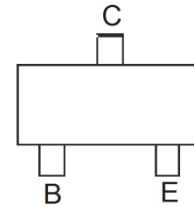
- Case: SOT23
- Case Material: Molded Plastic, "Green" Molding Compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208③
- Weight: 0.008 grams (Approximate)



Top View



Device Symbol



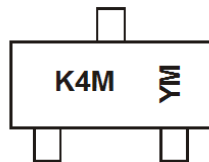
Top View  
Pin-Out

## Ordering Information (Notes 4 & 5)

| Part Number   | Compliance | Marking | Reel Size (inches) | Tape Width (mm) | Quantity Per Reel |
|---------------|------------|---------|--------------------|-----------------|-------------------|
| MMBT5401-7-F  | AEC-Q101   | K4M     | 7                  | 8               | 3,000             |
| MMBT5401-13-F | AEC-Q101   | K4M     | 13                 | 8               | 10,000            |
| MMBT5401Q-7-F | Automotive | K4M     | 7                  | 8               | 3,000             |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to <https://www.diodes.com/quality/>.
  5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



K4M = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: F = 2018)  
 M = Month (ex: 3 = March)

### Date Code Key

| Year | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|------|------|------|------|------|------|------|------|------|------|------|
| Code | E    | F    | G    | H    | I    | J    | K    | L    | M    | N    |

| 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   |

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

| Characteristic            | Symbol           | Value | Unit |
|---------------------------|------------------|-------|------|
| Collector-Base Voltage    | V <sub>CBO</sub> | -160  | V    |
| Collector-Emitter Voltage | V <sub>CEO</sub> | -150  | V    |
| Emitter-Base Voltage      | V <sub>EBO</sub> | -5    | V    |
| Collector Current         | I <sub>C</sub>   | -600  | mA   |

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

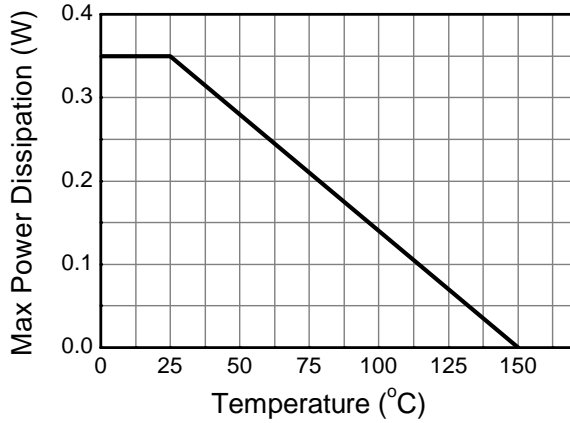
| Characteristic                          | Symbol                            | Value       | Unit |
|---|-----------------------------------|-------------|------|
| Power Dissipation                       | P <sub>D</sub>                    | (Note 6)    | 310  |
|   |                                   | (Note 7)    | 350  |
| Thermal Resistance, Junction to Ambient | R <sub>θJA</sub>                  | (Note 6)    | 403  |
|   |                                   | (Note 7)    | 357  |
| Thermal Resistance, Junction to Leads   | R <sub>θJL</sub>                  | 350         | °C/W |
| Operating and Storage Temperature Range | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

### ESD Ratings (Note 9)

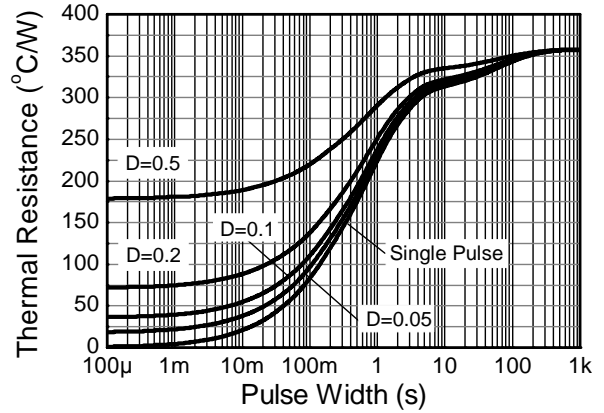
| Characteristic                             | Symbol  | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge - Machine Model    | ESD MM  | 400   | V    | C           |

- Notes:
6. For a device mounted on minimum recommended pad layout 1oz copper that is on a single-sided FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  7. Same as note (6), except the device is mounted on 15 mm x 15mm 1oz copper.
  8. Thermal resistance from junction to solder-point (at the end of the leads).
  9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

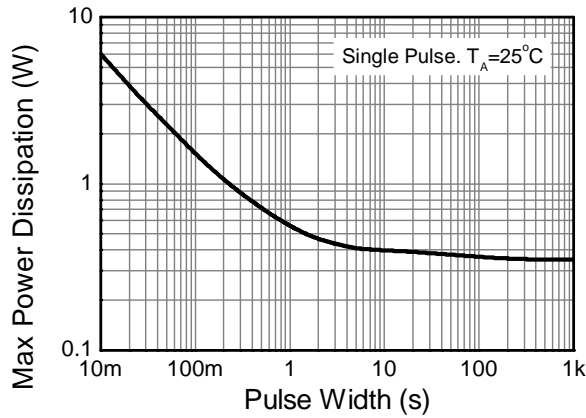
**Thermal Characteristics and Derating Information**



**Derating Curve**



**Transient Thermal Impedance**



**Pulse Power Dissipation**

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

| Characteristic                       | Symbol        | Min            | Max           | Unit                | Test Condition   |
|--------------------------------------|---------------|----------------|---------------|---------------------|--|
| <b>OFF CHARACTERISTICS (Note 10)</b> |               |                |               |                     |  |
| Collector-Base Breakdown Voltage     | $BV_{CBO}$    | -160           | —             | V                   | $I_C = -100\mu\text{A}, I_E = 0$   |
| Collector-Emitter Breakdown Voltage  | $BV_{CEO}$    | -150           | —             | V                   | $I_C = -1\text{mA}, I_B = 0$   |
| Emitter-Base Breakdown Voltage       | $BV_{EBO}$    | -5             | —             | V                   | $I_E = -100\mu\text{A}, I_C = 0$   |
| Collector Cutoff Current             | $I_{CBO}$     | —              | -50<br>-50    | nA<br>$\mu\text{A}$ | $V_{CB} = -120\text{V}, I_E = 0$<br>$V_{CB} = -120\text{V}, I_E = 0, T_A = +100^\circ\text{C}$                                     |
| Emitter Cutoff Current               | $I_{EBO}$     | —              | -50           | nA                  | $V_{EB} = -4\text{V}, I_C = 0$   |
| <b>ON CHARACTERISTICS (Note 10)</b>  |               |                |               |                     |  |
| DC Current Gain                      | $h_{FE}$      | 50<br>60<br>50 | —<br>240<br>— | —                   | $I_C = -1\text{mA}, V_{CE} = -5\text{V}$<br>$I_C = -10\text{mA}, V_{CE} = -5\text{V}$<br>$I_C = -50\text{mA}, V_{CE} = -5\text{V}$ |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | —              | -0.2<br>-0.5  | V                   | $I_C = -10\text{mA}, I_B = -1\text{mA}$<br>$I_C = -50\text{mA}, I_B = -5\text{mA}$   |
| Base-Emitter Saturation Voltage      | $V_{BE(SAT)}$ | —              | -1            | V                   | $I_C = -10\text{mA}, I_B = -1\text{mA}$<br>$I_C = -50\text{mA}, I_B = -5\text{mA}$   |
| <b>SMALL SIGNAL CHARACTERISTICS</b>  |               |                |               |                     |  |
| Output Capacitance                   | $C_{obo}$     | —              | 6             | pF                  | $V_{CB} = -10\text{V}, f = 1\text{MHz}, I_E = 0$   |
| Small Signal Current Gain            | $h_{fe}$      | 40             | 260           | —                   | $V_{CE} = -10\text{V}, I_C = -1\text{mA}, f = 1\text{kHz}$   |
| Current Gain-Bandwidth Product       | $f_T$         | 100            | 300           | MHz                 | $V_{CE} = -10\text{V}, I_C = -10\text{mA}, f = 100\text{MHz}$  |
| Noise Figure                         | NF            | —              | 8.0           | dB                  | $V_{CE} = -5\text{V}, I_C = -200\mu\text{A}, R_S = 10\Omega, f = 1\text{kHz}$  |

Notes: 10. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

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

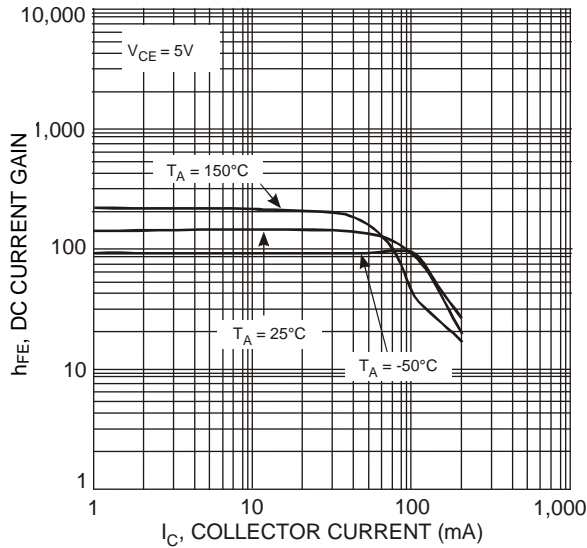


Fig. 1 Typical DC Current Gain vs. Collector Current

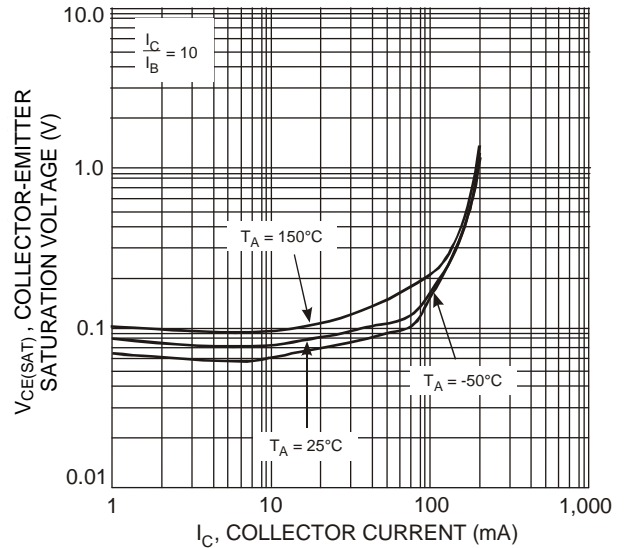


Fig. 2 Typical Collector-Emitter Saturation Voltage vs. Collector Current

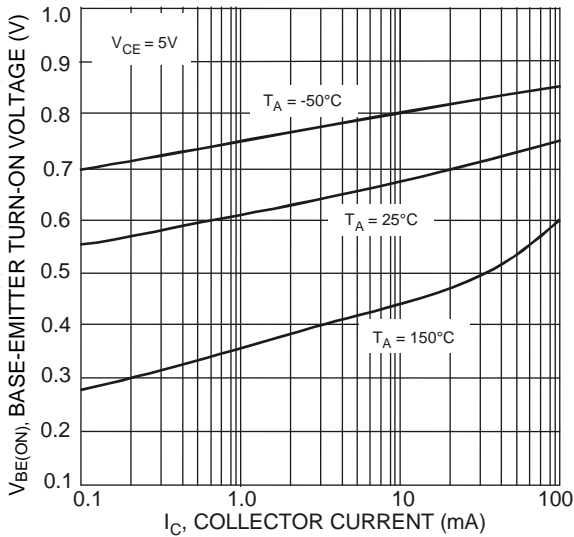


Fig. 3 Typical Base-Emitter Turn-On Voltage vs. Collector Current

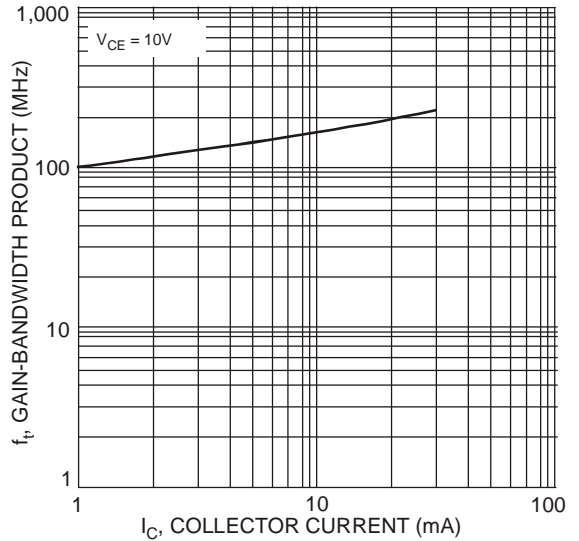
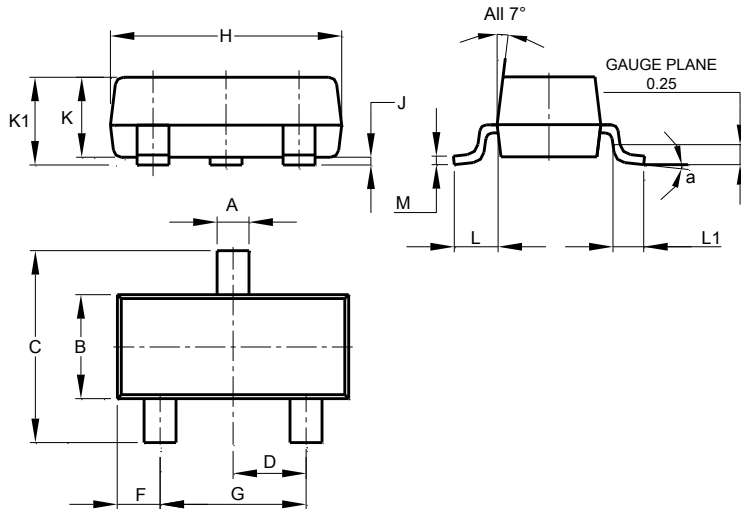


Fig. 4 Typical Gain-Bandwidth Product vs. Collector Current

**Package Outline Dimensions**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT23**

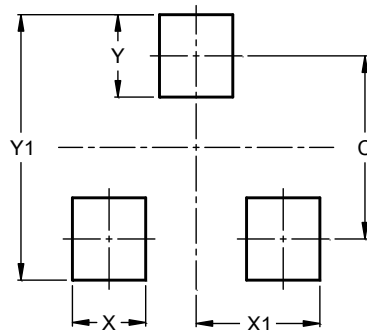


| SOT23                |       |       |       |
|----------------------|-------|-------|-------|
| Dim                  | Min   | Max   | Typ   |
| A                    | 0.37  | 0.51  | 0.40  |
| B                    | 1.20  | 1.40  | 1.30  |
| C                    | 2.30  | 2.50  | 2.40  |
| D                    | 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                    | 0.890 | 1.00  | 0.975 |
| K1                   | 0.903 | 1.10  | 1.025 |
| L                    | 0.45  | 0.61  | 0.55  |
| L1                   | 0.25  | 0.55  | 0.40  |
| M                    | 0.085 | 0.150 | 0.110 |
| a                    | 0°    | 8°    | --    |
| All Dimensions in mm |       |       |       |

**Suggested Pad Layout**

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

**SOT23**



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 2.0           |
| X          | 0.8           |
| X1         | 1.35          |
| Y          | 0.9           |
| Y1         | 2.9           |

Note: For high voltage applications, the appropriate industry sector guidelines should be considered with regards to creepage and clearance distances between device terminals and PCB tracking.

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