

## Description

This bipolar junction transistor (BJT) is designed to meet the stringent requirements of automotive applications.

## Features

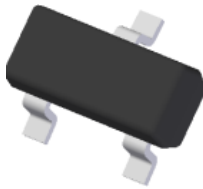
- $BV_{CEO} > 160V$
- Ideal for Low Power Amplification and Switching
- Complementary PNP Type Available (MMBT5401)
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen- and Antimony-Free. "Green" Device (Note 3)**
- **The MMBT5551Q is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF16949 certified facilities.**

<https://www.diodes.com/quality/product-definitions/>

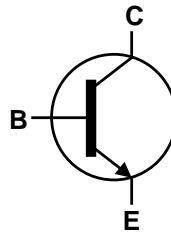
## Mechanical Data

- Case: SOT23
- 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 <sup>(e3)</sup>
- Weight: 0.008 grams (Approximate)

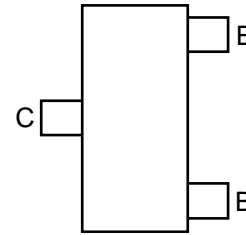
SOT23



Top View



Device Symbol



Top View  
Pin-Out

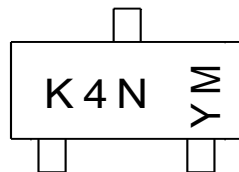
## Ordering Information (Note 4)

| Part Number | Marking | Reel size (inches) | Tape width (mm) | Quantity per reel |
|-------------|---------|--------------------|-----------------|-------------------|
| MMBT5551Q-7 | K4N     | 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. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information

SOT23



K4N = Product Type Marking Code  
YM = Date Code Marking  
Y = Year (ex: H = 2020)  
M = Month (ex: 9 = September)

### Date Code Key

| Year  | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |     |     |
|-------|------|------|------|------|------|------|------|------|------|------|-----|-----|
| Code  | H    | I    | J    | K    | L    | M    | N    | O    | P    | R    |     |     |
| 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** (@  $T_A = +25^\circ\text{C}$  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    |
| Continuous Collector Current (Note 5) | $I_C$     | 600   | mA   |

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

| Characteristic                                   | Symbol          | Value       | Unit               |
|--|-----------------|-------------|--------------------|
| Power Dissipation (Note 5)                       | $P_D$           | 300         | mW                 |
| Thermal Resistance, Junction to Ambient (Note 5) | $R_{\theta JA}$ | 417         | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range          | $T_J, T_{STG}$  | -55 to +150 | $^\circ\text{C}$   |

**ESD Ratings** (Note 6)

| 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:
- For a device mounted on minimum recommended pad layout 1oz copper that is on a single-sided FR4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  - Refer to JEDEC specification JESD22-A114 and JESD22-A115.

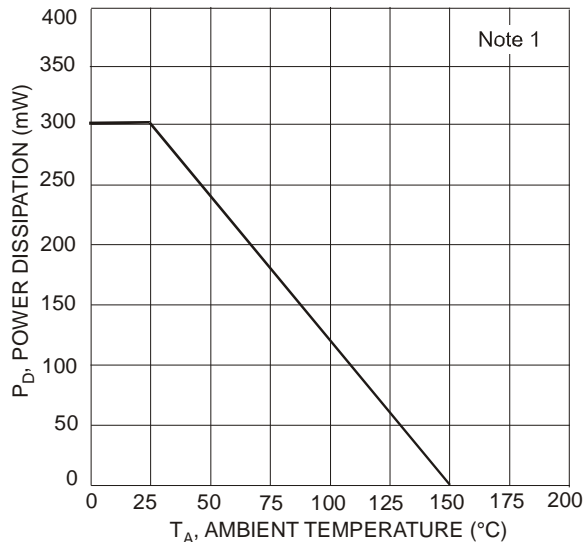


Fig. 1 Power Dissipation vs. Ambient Temperature

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

| Characteristic                       | Symbol        | Min            | Max           | Unit                | Test Condition   |
|--------------------------------------|---------------|----------------|---------------|---------------------|--|
| <b>OFF CHARACTERISTICS (Note 7)</b>  |               |                |               |                     |  |
| Collector-Base Breakdown Voltage     | $BV_{CBO}$    | 180            | —             | V                   | $I_C = 100\mu\text{A}, I_E = 0$  |
| Collector-Emitter Breakdown Voltage  | $BV_{CEO}$    | 160            | —             | V                   | $I_C = 1.0\text{mA}, I_B = 0$  |
| Emitter-Base Breakdown Voltage       | $BV_{EBO}$    | 6.0            | —             | V                   | $I_E = 10\mu\text{A}, I_C = 0$   |
| Collector Cutoff Current             | $I_{CBO}$     | —              | 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                  | $V_{EB} = 4.0\text{V}, I_C = 0$  |
| <b>ON CHARACTERISTICS (Note 7)</b>   |               |                |               |                     |  |
| DC Current Gain                      | $h_{FE}$      | 80<br>80<br>30 | —<br>250<br>— | —                   | $I_C = 1.0\text{mA}, V_{CE} = 5.0\text{V}$<br>$I_C = 10\text{mA}, V_{CE} = 5.0\text{V}$<br>$I_C = 50\text{mA}, V_{CE} = 5.0\text{V}$ |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | —              | 0.15<br>0.20  | V                   | $I_C = 10\text{mA}, I_B = 1.0\text{mA}$<br>$I_C = 50\text{mA}, I_B = 5.0\text{mA}$   |
| Base-Emitter Saturation Voltage      | $V_{BE(sat)}$ | —              | 1.0           | V                   | $I_C = 10\text{mA}, I_B = 1.0\text{mA}$<br>$I_C = 50\text{mA}, I_B = 5.0\text{mA}$   |
| <b>SMALL SIGNAL CHARACTERISTICS</b>  |               |                |               |                     |  |
| Output Capacitance                   | $C_{obo}$     | —              | 6.0           | pF                  | $V_{CB} = 10\text{V}, f = 1.0\text{MHz}, I_E = 0$  |
| Small Signal Current Gain            | $h_{fe}$      | 50             | 250           | —                   | $V_{CE} = 10\text{V}, I_C = 1.0\text{mA}, f = 1.0\text{kHz}$   |
| 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                  | $V_{CE} = 5.0\text{V}, I_C = 200\mu\text{A}, R_S = 1.0\text{k}\Omega, f = 1.0\text{kHz}$   |

Notes: 7. 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.)

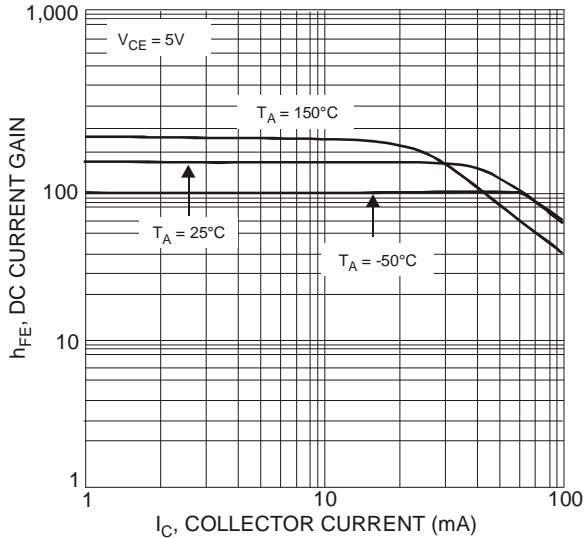


Fig. 2 Typical DC Current Gain vs. Collector Current

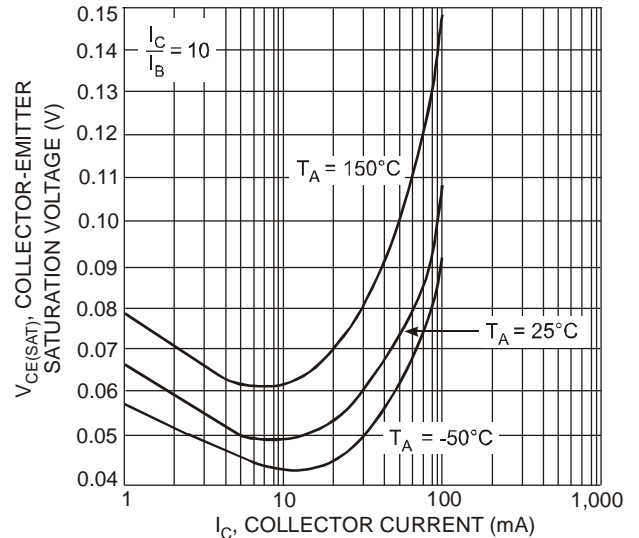


Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current

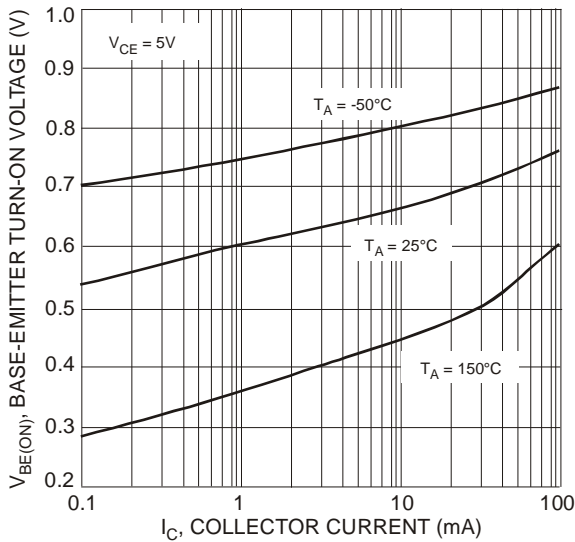


Fig. 4 Typical Base-Emitter Turn-On Voltage vs. Collector Current

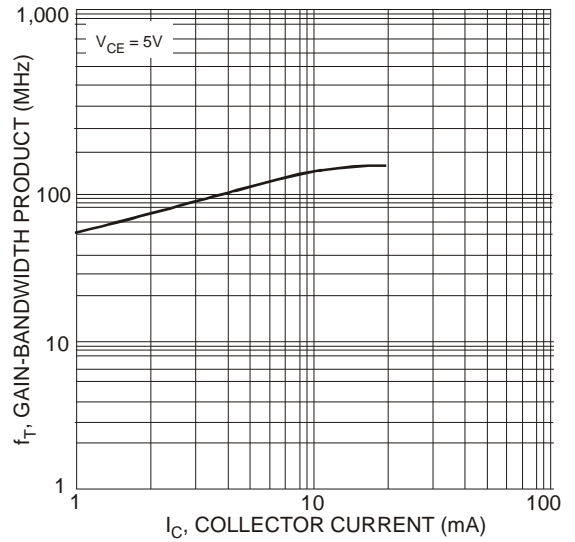
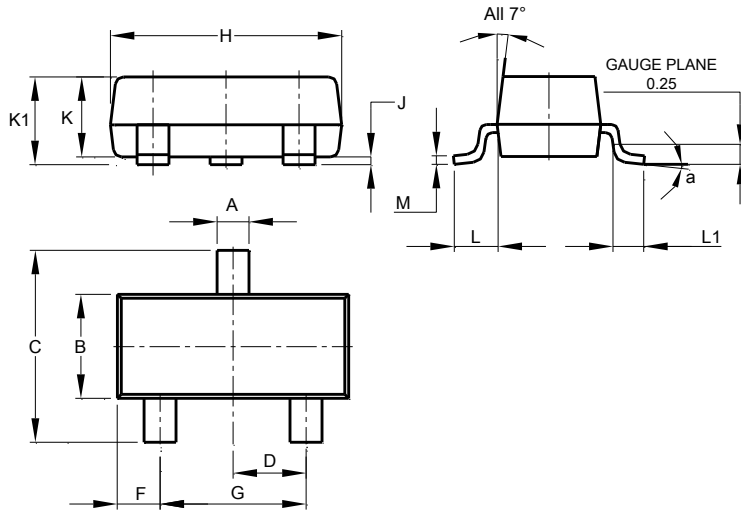


Fig. 5 Typical Gain-Bandwidth Product vs. Collector Current

**Package Outline Dimensions**

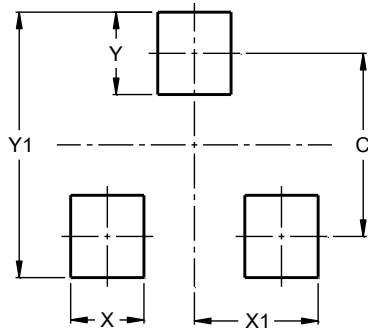
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



| 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.



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

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