# MMBTA05 / MMBTA06

## NPN MEDIUM POWER TRANSISTOR IN SOT23

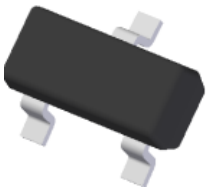
## Features

- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching
- Complementary PNP Type: MMBTA55 and MMBTA56
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The MMBTA05Q and MMBTA06Q are suitable for automotive applications requiring specific change control; these parts are AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**
  **https://www.diodes.com/quality/product-definitions/**

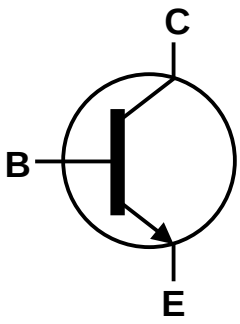
## Mechanical Data

- Package: SOT23
- Package 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 208 e3
- Weight: 0.008 grams (Approximate)

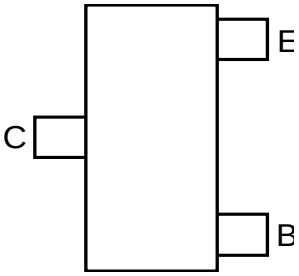
SOT23



Top View




Device Symbol



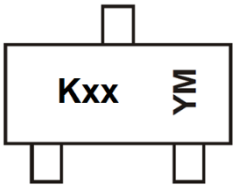

Top View
Pin Configuration

## Ordering Information (Note 4)

| Orderable Part Number | Marking | Reel size (inches) | Tape width (mm) | Packing | |
|---|---|---|---|---|---|
| | | | | Quantity | Carrier |
| MMBTA05-7-F | K1G / K1H | 7 | 8 | 3,000 | Reel |
| MMBTA05Q-13-F | K1G / K1H | 13 | 8 | 10,000 | Reel |
| MMBTA06-7-F | K1G | 7 | 8 | 3,000 | Reel |
| MMBTA06Q-7-F | K1G | 7 | 8 | 3,000 | Reel |

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




Kxx = Product Type Marking Code (See Ordering Information)
YM = Date Code Marking
Y or $\overline{Y}$ = Year (ex: K = 2023)
M or $\overline{M}$ = Month (ex: 9 = September)

Date Code Key

| Year | 2010 | … | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | X | … | K | L | M | N | P | R | S | T | U | V |

| 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°C, unless otherwise specified.)

| Characteristic | Symbol | MMBTA05 | MMBTA06 | Unit |
|---|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 60 | 80 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 60 | 80 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 4.0 | | V |
| Collector Current | $I_C$ | 500 | | mA |
| Peak Collector Current | $I_{CM}$ | 1 | | A |

## Thermal Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Power Dissipation | (Note 5) | $P_D$ | 310 | mW |
| | (Note 6) | | 350 | |
| Thermal Resistance, Junction to Ambient | (Note 5) | $R_{\theta JA}$ | 403 | °C/W |
| | (Note 6) | | 357 | |
| Thermal Resistance, Junction to Leads | (Note 7) | $R_{\theta JL}$ | 350 | °C/W |
| Operating and Storage Temperature Range | | $T_J$,$T_{STG}$ | -55 to +150 | °C |

## ESD Ratings (Note 8)

| 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:
5. 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.
6. Same as note (5), except the device is mounted on 15 mm x 15mm 1oz copper.
7. Thermal resistance from junction to solder-point (at the end of the leads).
8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

## Thermal Characteristics and Derating Information

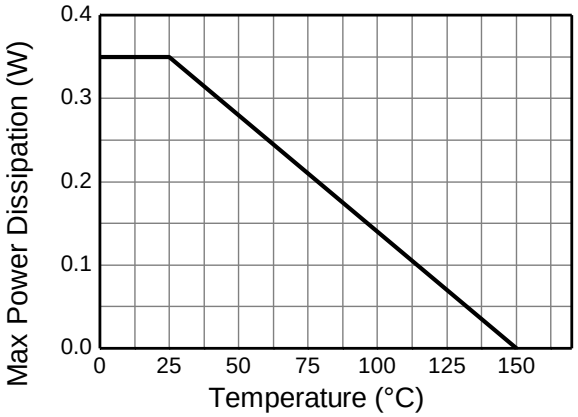



**Figure 1 Derating Curve**

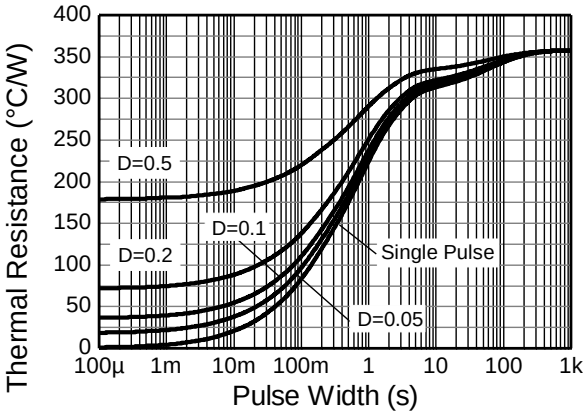



**Figure 2 Transient Thermal Impedance**

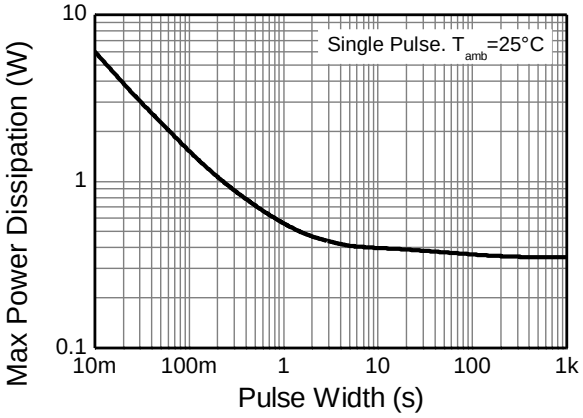



**Figure 3 Pulse Power Dissipation**

## Electrical Characteristics (@$T_A$ = +25°C, unless otherwise specified.)

| Characteristic | | Symbol | Min | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector-Base Breakdown Voltage | MMBTA05<br>MMBTA06 | $BV_{CBO}$ | 60<br>80 | — | V | $I_C$ = 100µA, $I_E$ = 0 |
| Collector-Emitter Breakdown Voltage (Note 9) | MMBTA05<br>MMBTA06 | $BV_{CEO}$ | 60<br>80 | — | V | $I_C$ = 10.0mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | | $BV_{EBO}$ | 4.0 | — | V | $I_E$ = 100 µA, $I_C$ = 0 |
| Collector Cutoff Current | MMBTA05<br>MMBTA06 | $I_{CBO}$ | — | 100 | nA | $V_{CB}$ = 60V, $I_E$ = 0<br>$V_{CB}$ = 80V, $I_E$ = 0 |
| Collector Cutoff Current | MMBTA05<br>MMBTA06 | $I_{CES}$ | — | 100 | nA | $V_{CE}$ = 60V, $I_{BO}$ = 0V<br>$V_{CE}$ = 80V, $I_{BO}$ = 0V |
| **ON CHARACTERISTICS** (Note 9) | | | | | | |
| DC Current Gain | | $h_{FE}$ | 100 | — | — | $I_C$ = 10mA, $V_{CE}$ = 1.0V<br>$I_C$ = 100mA, $V_{CE}$ = 1.0V |
| Collector-Emitter Saturation Voltage | | $V_{CE(sat)}$ | — | 0.25 | V | $I_C$ = 100mA, $I_B$ = 10mA |
| Base-Emitter Turn-On Voltage | | $V_{BE(on)}$ | — | 1.2 | V | $I_C$ = 100mA, $V_{CE}$ = 1.0V |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | |
| Current Gain-Bandwidth Product | | $f_T$ | 100 | — | MHz | $V_{CE}$ = 2.0V, $I_C$ = 10mA, f = 100MHz |

Note: 9. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.

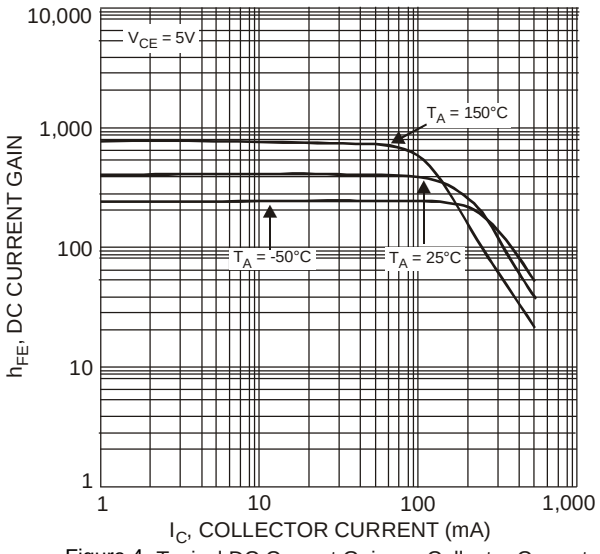



Figure 4 Typical DC Current Gain vs. Collector Current

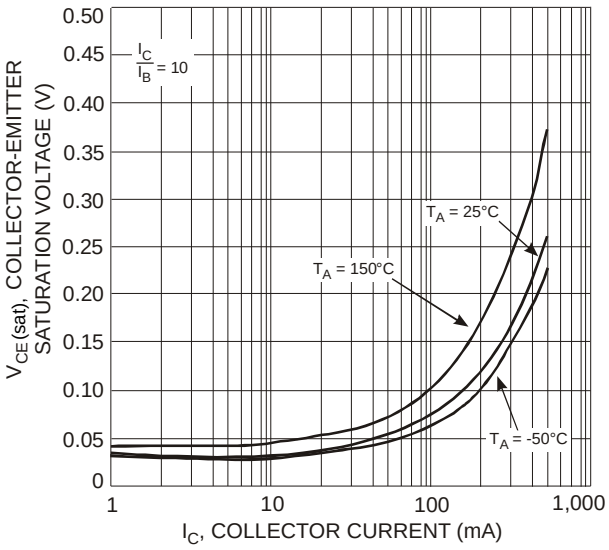



Figure 5 Collector-Emitter Saturation Voltage vs. Collector Current

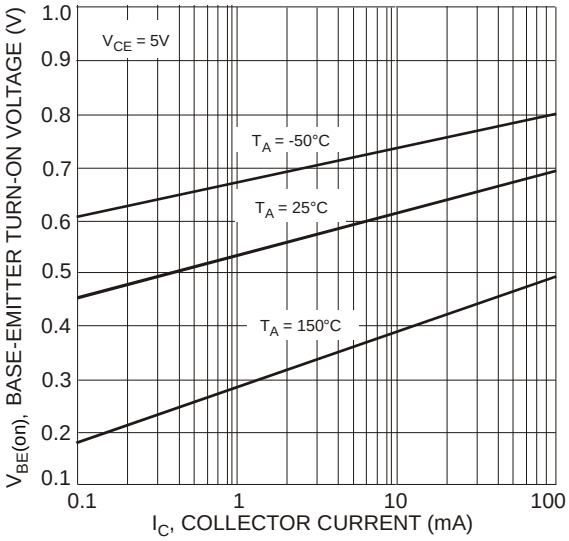



Figure 6 Typical Base-Emitter Turn-On Voltage vs. Collector Current

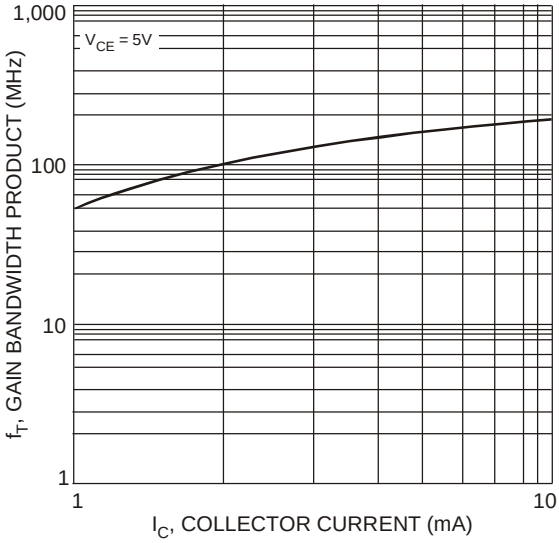



Figure 7 Typical Gain Bandwidth Product vs. Collector Current

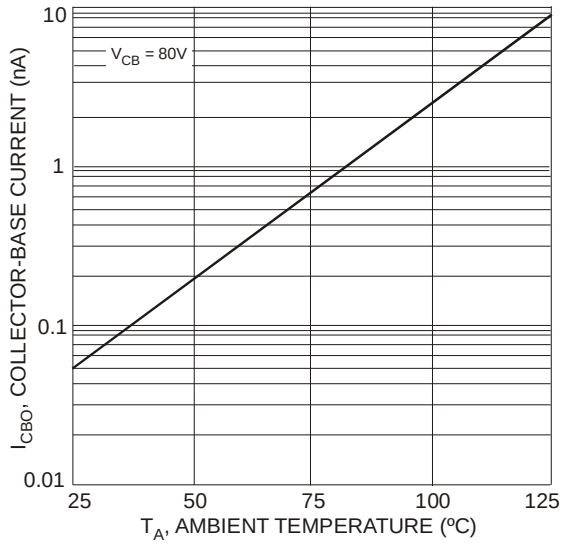



Figure 8 Typical Collector-Cutoff Current vs. Ambient Temperature

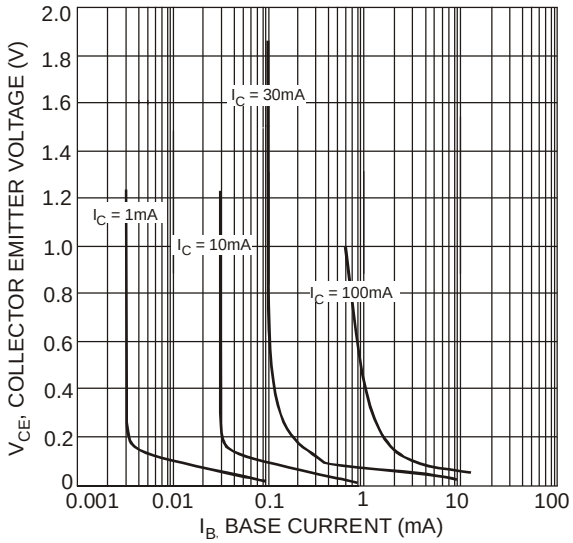
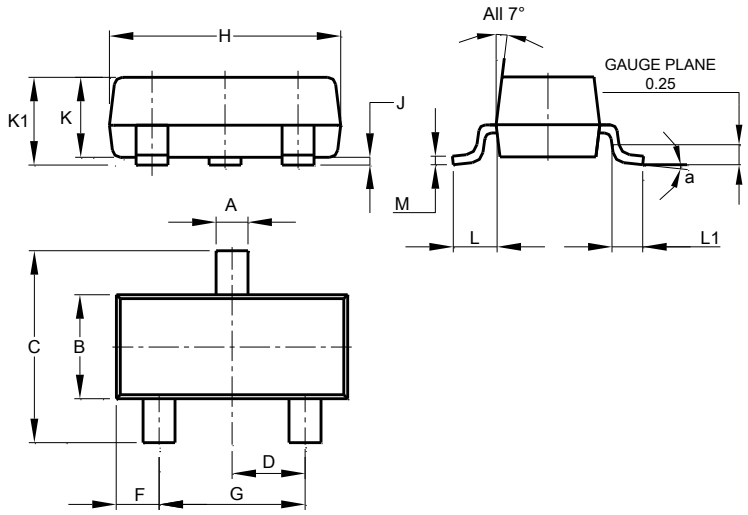



Figure 9 Typical Collector Saturation Region

## Package Outline Dimensions

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

**SOT23**

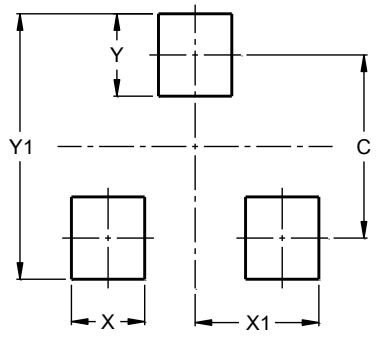



| SOT23 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.37 | 0.51 | 0.40 |
| **B** | 1.20 | 1.40 | 1.30 |
| **C** | 2.30 | 2.50 | 2.40 |
| **D** | 0.89 | 1.03 | 0.915 |
| **F** | 0.45 | 0.60 | 0.535 |
| **G** | 1.78 | 2.05 | 1.83 |
| **H** | 2.80 | 3.00 | 2.90 |
| **J** | 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 |

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