

Features

- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching
- Complementary NPN Type: MMBT2222AQ
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **The MMBT2907AQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.**

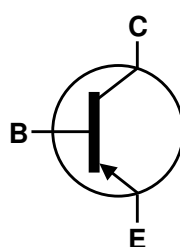
<https://www.diodes.com/quality/product-definitions/>

Mechanical Data

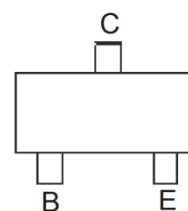
- Package: SOT23
- Package Material: Molded Plastic, "Green" Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208
- Weight: 0.008 grams (Approximate)



Top View



Device Symbol



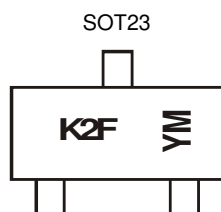
Top View
Pin-Out

Ordering Information (Note 4)

| Product | Status | Compliance | Marking | Reel Size (inches) | Tape Width (mm) | Quantity Per Reel |
|----------------|--------|------------|---------|--------------------|-----------------|-------------------|
| MMBT2907AQ-7-F | Active | Automotive | K2F | 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



K2F = Product Type Marking Code
 YM = Date Code Marking
 Y or \bar{Y} = Year (ex: I = 2021)
 M or \bar{M} = Month (ex: 9 = September)

Date Code Key

| Year | 2013 | | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|-------|------|-------|------|------|------|------|------|------|------|------|------|------|
| Code | A | | I | J | K | L | M | N | O | P | R | S |
| 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} | -60 | V |
| Collector-Emitter Voltage | V_{CEO} | -60 | V |
| Emitter-Base Voltage | V_{EBO} | -6.0 | V |
| Collector Current | I_C | -600 | mA |
| Peak Collector Current | I_{CM} | -800 | mA |
| Peak Base Current | I_{BM} | -200 | mA |

Thermal Characteristics

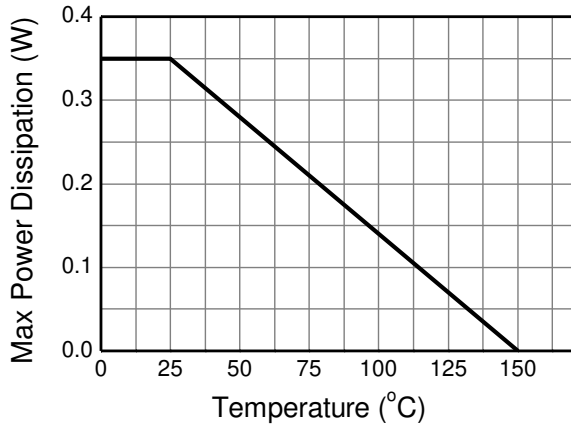
| Characteristic | Symbol | Value | Unit |
|---|-----------------|-------------|--------------------|
| Collector Power Dissipation | P_D | 310 | mW |
| | | 350 | |
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 403 | $^\circ\text{C/W}$ |
| | | 357 | |
| Thermal Resistance, Junction to Leads | $R_{\theta JL}$ | 350 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 120 | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |

ESD Ratings (Note 8)

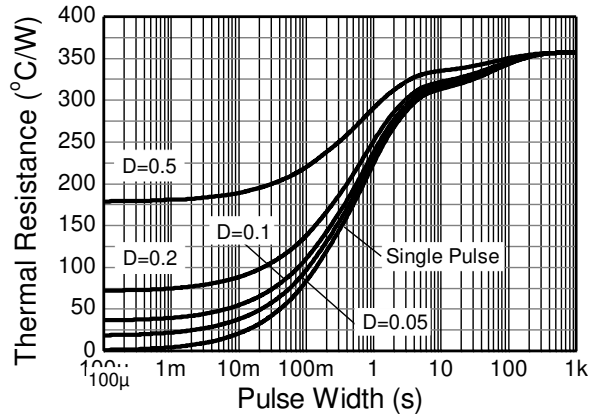
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge - Machine Model | ESD MM | 400 | V | C |

- Notes:
5. For a device mounted on minimum recommended pad layout 1oz copper that is on a single-sided FR-4 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.

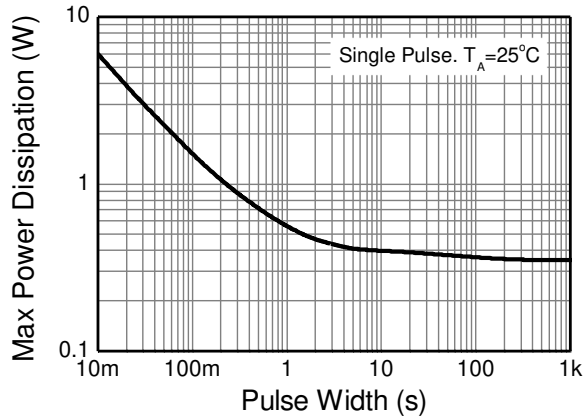
Thermal Characteristics and Derating Information



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 |
|--|----------------------|------|--------------|---------------|--|
| OFF CHARACTERISTICS | | | | | |
| Collector-Base Breakdown Voltage | BV_{CBO} | -60 | — | V | $I_C = -100\mu\text{A}$, $I_E = 0$ |
| Collector-Emitter Breakdown Voltage (Note 9) | BV_{CEO} | -60 | — | V | $I_C = -10\text{mA}$, $I_B = 0$ |
| Emitter-Base Breakdown Voltage | BV_{EBO} | -6.0 | — | V | $I_E = -100\mu\text{A}$, $I_C = 0$ |
| Collector Cut-Off Current | I_{CBO} | — | -10 | nA | $V_{CB} = -50\text{V}$, $I_E = 0$ |
| | | | -10 | μA | $V_{CB} = -50\text{V}$, $I_E = 0$, $T_A = +125^\circ\text{C}$ |
| Collector Cut-Off Current | I_{CEX} | — | -50 | nA | $V_{CE} = -30\text{V}$, $V_{EB(\text{off})} = -0.5\text{V}$ |
| Base Cut-Off Current | I_{BL} | — | -50 | nA | $V_{CE} = -30\text{V}$, $V_{EB(\text{off})} = -0.5\text{V}$ |
| Emitter Cut-Off Current | I_{EBO} | — | -50 | nA | $V_{EB} = -6.0\text{V}$ |
| ON CHARACTERISTICS (Note 9) | | | | | |
| DC Current Gain | h_{FE} | 75 | — | — | $I_C = -100\mu\text{A}$, $V_{CE} = -10\text{V}$ |
| | | 100 | — | | $I_C = -1.0\text{mA}$, $V_{CE} = -10\text{V}$ |
| | | 100 | — | | $I_C = -10\text{mA}$, $V_{CE} = -10\text{V}$ |
| | | 100 | 300 | | $I_C = -150\text{mA}$, $V_{CE} = -10\text{V}$ |
| | | 50 | — | | $I_C = -500\text{mA}$, $V_{CE} = -10\text{V}$ |
| Collector-Emitter Saturation Voltage | $V_{CE(\text{sat})}$ | — | -0.4 -1.6 | 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 | $V_{BE(\text{sat})}$ | — | -1.3 -2.6 | 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} | — | 8.0 | pF | $V_{CB} = -10\text{V}$, $f = 1.0\text{MHz}$, $I_E = 0$ |
| Input Capacitance | C_{ibo} | — | 30 | pF | $V_{EB} = -2.0\text{V}$, $f = 1.0\text{MHz}$, $I_C = 0$ |
| Current Gain-Bandwidth Product | f_T | 200 | — | MHz | $V_{CE} = -20\text{V}$, $I_C = -50\text{mA}$, $f = 100\text{MHz}$ |
| SWITCHING CHARACTERISTICS | | | | | |
| Turn-On Time | t_{on} | — | 45 | ns | $V_{CC} = -30\text{V}$, $I_C = -150\text{mA}$, $I_{B1} = -15\text{mA}$ |
| Delay Time | t_d | — | 10 | ns | |
| Rise Time | t_r | — | 40 | ns | |
| Turn-Off Time | t_{off} | — | 100 | ns | $V_{CC} = -6.0\text{V}$, $I_C = -150\text{mA}$, $I_{B1} = -I_{B2} = -15\text{mA}$ |
| Storage Time | t_s | — | 80 | ns | |
| Fall Time | t_f | — | 30 | ns | |

Note: 9. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.

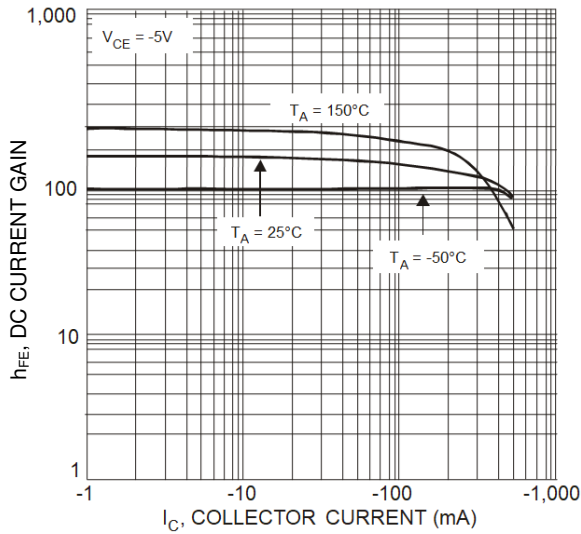


Fig. 1 Typical DC Current Gain vs. Collector Current

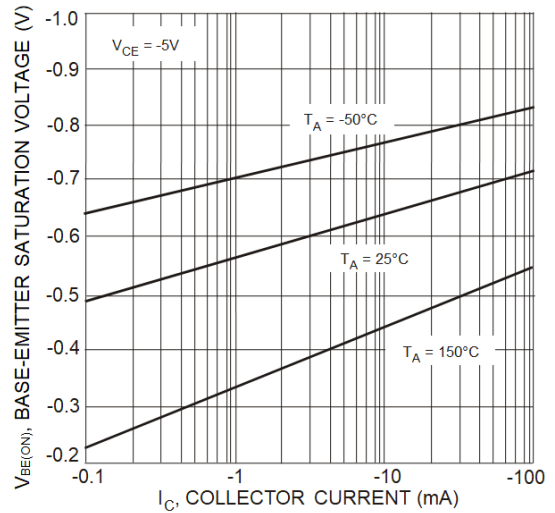


Fig. 2 Typical Base-Emitter Saturation Voltage vs. Collector Current

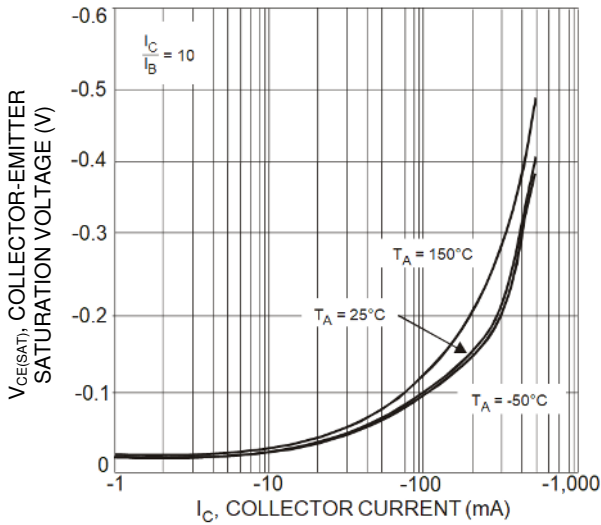


Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current

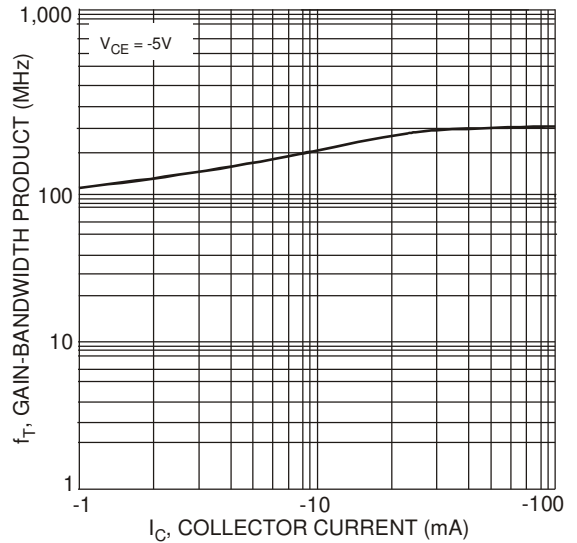


Fig. 4 Typical Gain-Bandwidth Product vs. Collector Current

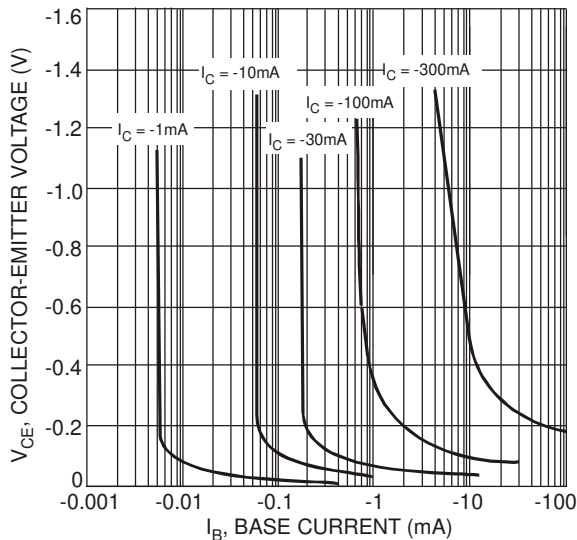


Fig. 5 Typical Collector Saturation Region

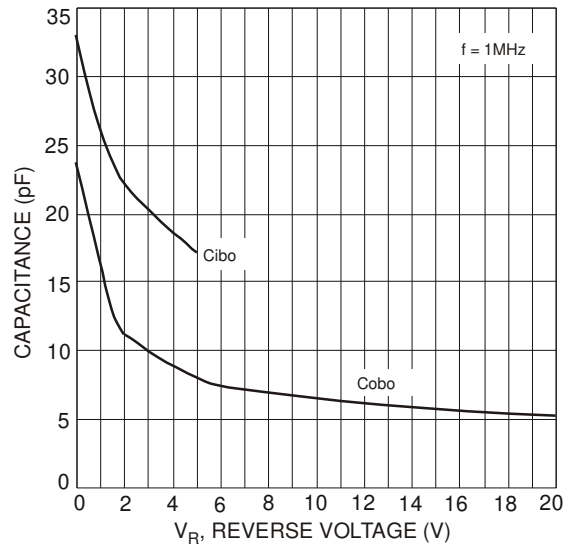
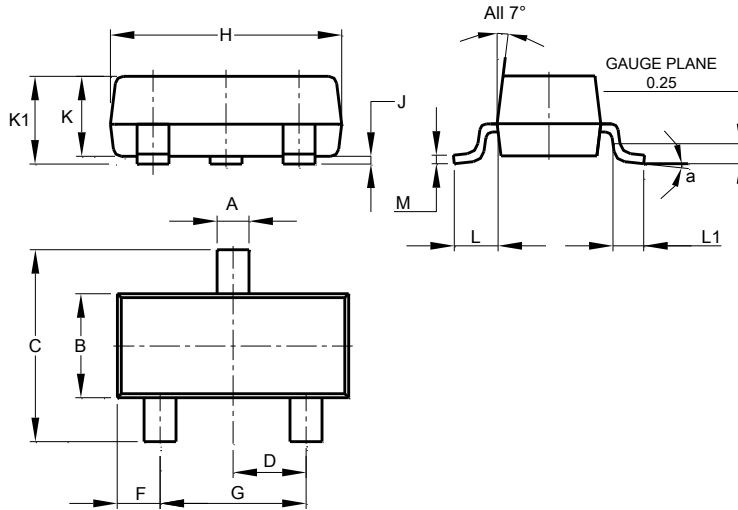


Fig. 6 Typical Capacitance Characteristics

Package Outline Dimensions

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

SOT23

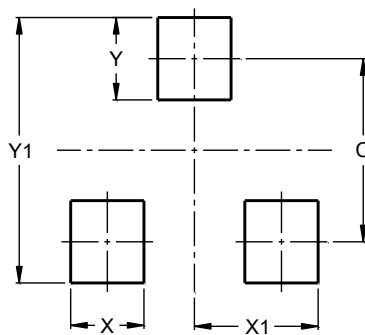


| SOT23 | | | |
|----------------------|-------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.37 | 0.51 | 0.40 |
| B | 1.20 | 1.40 | 1.30 |
| C | 2.30 | 2.50 | 2.40 |
| D | 0.89 | 1.03 | 0.915 |
| F | 0.45 | 0.60 | 0.535 |
| G | 1.78 | 2.05 | 1.83 |
| H | 2.80 | 3.00 | 2.90 |
| J | 0.013 | 0.10 | 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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