## Features

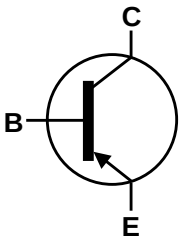
- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching
- Complementary NPN Type: MMBT2222A
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

## Mechanical Data

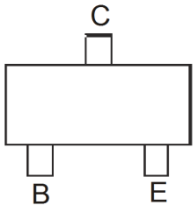
- Case: SOT23
- Case Material: Molded Plastic, "Green" Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 e3
- Weight: 0.008 grams (Approximate)

SOT23

Top View




Device Symbol




Top View
Pin-Out

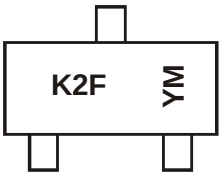
## Ordering Information (Notes 4 & 5)

| Product | Status | Compliance | Marking | Reel Size (inches) | Tape Width (mm) | Quantity Per Reel |
|---|---|---|---|---|---|---|
| MMBT2907A-7-F | Active | AEC-Q101 | K2F | 7 | 8 | 3,000 |
| MMBT2907A-13-F | Active | AEC-Q101 | K2F | 13 | 8 | 10,000 |
| 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) compliant.
2. See http://www.diodes.com/quality/lead_free.html 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 http://www.diodes.com/product_compliance_definitions.html.
5. For packaging details, go to our website at http://www.diodes.com/products/packages.html.

## Marking Information

SOT23




K2F = Product Type Marking Code
YM = Date Code Marking
Y or $\overline{Y}$ = Year (ex: D = 2016)
M or $\overline{M}$ = Month (ex: 9 = September)

Date Code Key

| Year | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|
| Code | A | B | C | D | E | F | G | H |

| 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 | 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

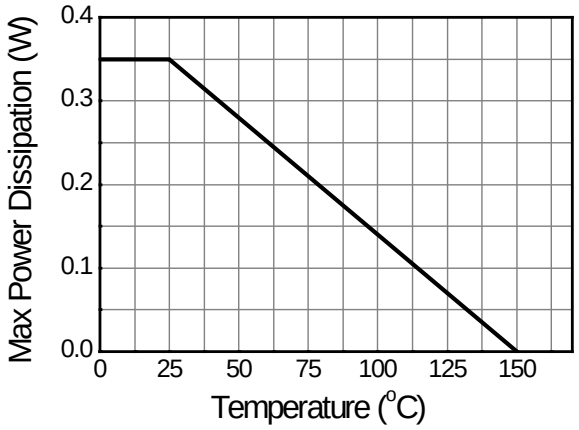
| Characteristic | | Symbol | Value | Unit |
|---|---|---|---|---|
| Collector Power Dissipation | (Note 6) | $P_D$ | 310 | mW |
| | (Note 7) | | 350 | |
| Thermal Resistance, Junction to Ambient | (Note 6) | $R_{\theta JA}$ | 403 | °C/W |
| | (Note 7) | | 357 | |
| Thermal Resistance, Junction to Leads | (Note 8) | $R_{\theta JL}$ | 350 | °C/W |
| Operating and Storage Temperature Range | | $T_J$,$T_{STG}$ | -55 to +150 | °C |

## ESD Ratings (Note 9)

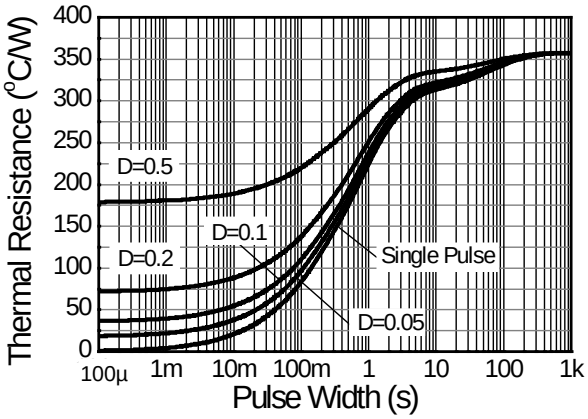
| Characteristic | Symbol | Value | Unit | JEDEC Class |
|---|---|---|---|---|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V | 3A |
| Electrostatic Discharge - Machine Model | ESD MM | 400 | V | C |

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.

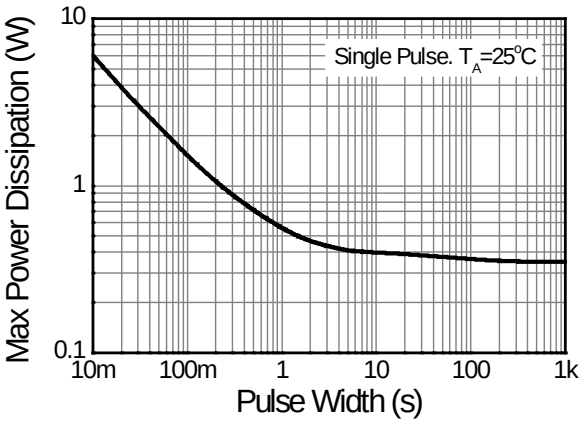
## Thermal Characteristics and Derating Information




**Derating Curve**




**Transient Thermal Impedance**




**Pulse Power Dissipation**

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

| Characteristic | Symbol | Min | Max | Unit | Test Condition |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector-Base Breakdown Voltage | $BV_{CBO}$ | -60 | — | V | $I_C$ = -100µA, $I_E$ = 0 |
| Collector-Emitter Breakdown Voltage (Note 10) | $BV_{CEO}$ | -60 | — | V | $I_C$ = -10mA, $I_B$ = 0 |
| Emitter-Base Breakdown Voltage | $BV_{EBO}$ | -6.0 | — | V | $I_E$ = -100µA, $I_C$ = 0 |
| Collector Cut-Off Current | $I_{CBO}$ | — | -10 | nA<br>µA | $V_{CB}$ = -50V, $I_E$ = 0<br>$V_{CB}$ = -50V, $I_E$ = 0, $T_A$ = +125°C |
| Collector Cut-Off Current | $I_{CEX}$ | — | -50 | nA | $V_{CE}$ = -30V, $V_{EB(OFF)}$ = -0.5V |
| Base Cut-Off Current | $I_{BL}$ | — | -50 | nA | $V_{CE}$ = -30V, $V_{EB(OFF)}$ = -0.5V |
| Emitter Cut-Off Current | $I_{EBO}$ | — | -50 | nA | $V_{EB}$ = -6.0V |
| **ON CHARACTERISTICS (Note 10)** | | | | | |
| DC Current Gain | $h_{FE}$ | 75<br>100<br>100<br>100<br>50 | —<br>—<br>—<br>300<br>— | — | $I_C$ = -100µA, $V_{CE}$ = -10V<br>$I_C$ = -1.0mA, $V_{CE}$ = -10V<br>$I_C$ = -10mA, $V_{CE}$ = -10V<br>$I_C$ = -150mA, $V_{CE}$ = -10V<br>$I_C$ = -500mA, $V_{CE}$ = -10V |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | — | -0.4<br>-1.6 | V | $I_C$ = -150mA, $I_B$ = -15mA<br>$I_C$ = -500mA, $I_B$ = -50mA |
| Base-Emitter Saturation Voltage | $V_{BE(SAT)}$ | — | -1.3<br>-2.6 | V | $I_C$ = -150mA, $I_B$ = -15mA<br>$I_C$ = -500mA, $I_B$ = -50mA |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | |
| Output Capacitance | $C_{obo}$ | — | 8.0 | pF | $V_{CB}$ = -10V, f = 1.0MHz, $I_E$ = 0 |
| Input Capacitance | $C_{ibo}$ | — | 30 | pF | $V_{EB}$ = -2.0V, f = 1.0MHz, $I_C$ = 0 |
| Current Gain-Bandwidth Product | $f_T$ | 200 | — | MHz | $V_{CE}$ = -20V, $I_C$ = -50mA, f = 100MHz |
| **SWITCHING CHARACTERISTICS** | | | | | |
| Turn-On Time | $t_{ON}$ | — | 45 | ns | $V_{CC}$ = -30V, $I_C$ = -150mA, $I_{B1}$ = -15mA |
| Delay Time | $t_D$ | — | 10 | ns | |
| Rise Time | $t_R$ | — | 40 | ns | |
| Turn-Off Time | $t_{OFF}$ | — | 100 | ns | $V_{CC}$ = -6.0V, $I_C$ = -150mA, $I_{B1}$ = $I_{B2}$ = -15mA |
| Storage Time | $t_S$ | — | 80 | ns | |
| Fall Time | $t_F$ | — | 30 | ns | |

Note: 10. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤ 2%.

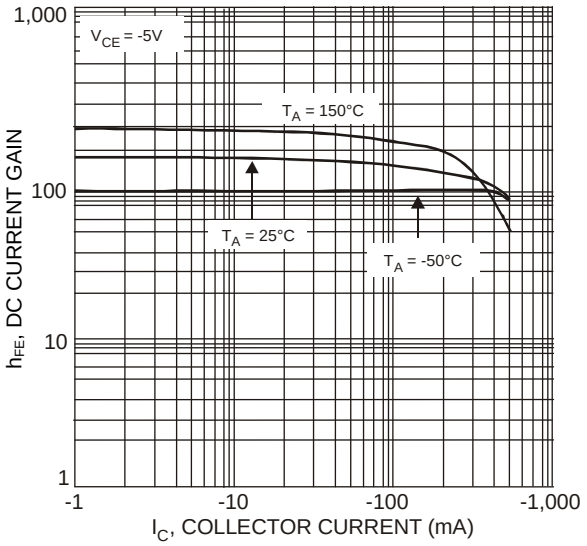



Fig. 1 Typical DC Current Gain vs. Collector Current

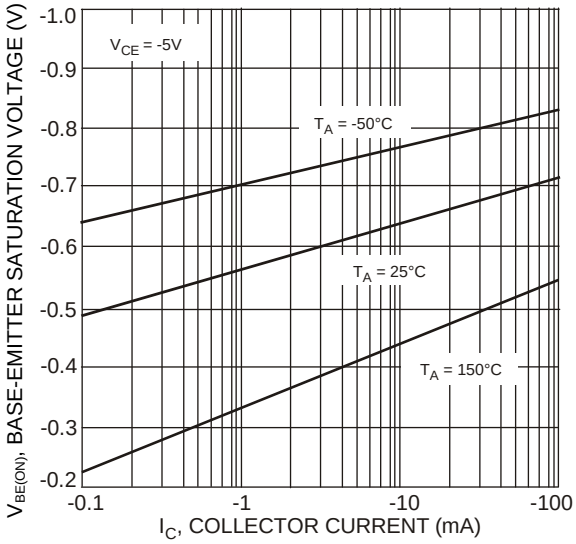



Fig. 2 Typical Base-Emitter Saturation Voltage vs. Collector Current

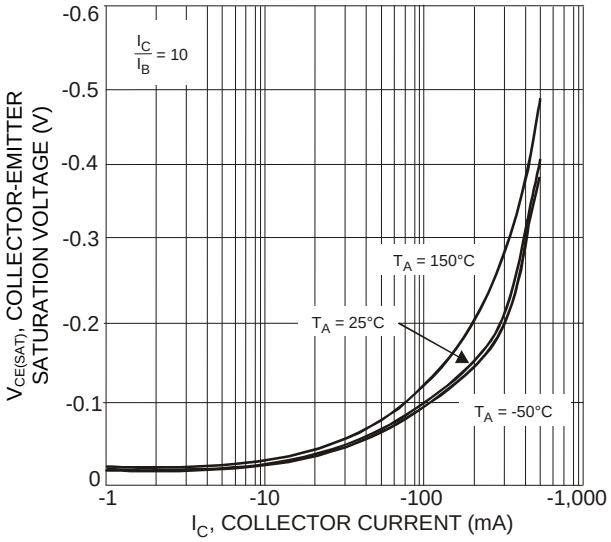



Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current

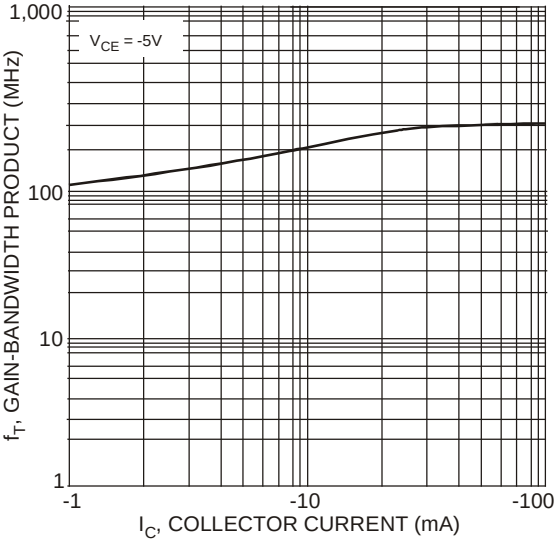



Fig. 4 Typical Gain-Bandwidth Product vs. Collector Current

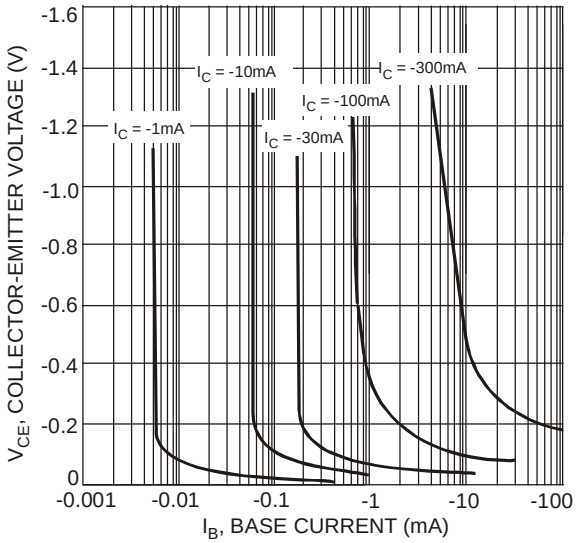



Fig. 5 Typical Collector Saturation Region

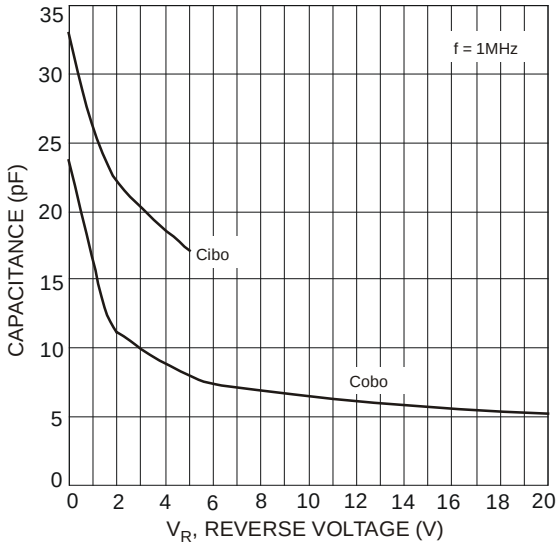
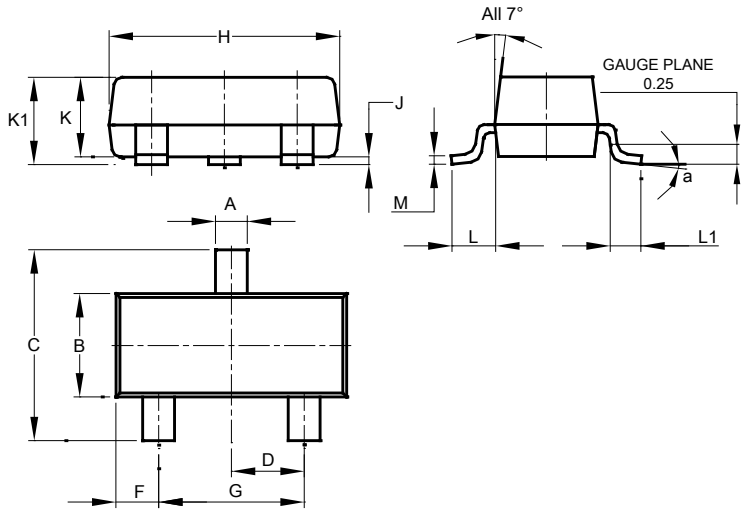



Fig. 6 Typical Capacitance Characteristics

## Package Outline Dimensions

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

**SOT23**

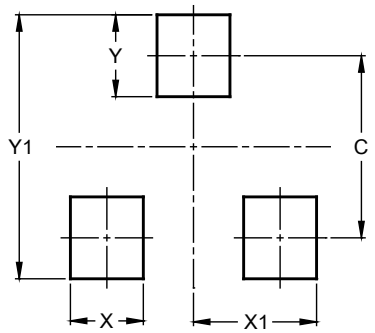



| SOT23 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.37 | 0.51 | 0.40 |
| **B** | 1.20 | 1.40 | 1.30 |
| **C** | 2.30 | 2.50 | 2.40 |
| **D** | 0.89 | 1.03 | 0.915 |
| **F** | 0.45 | 0.60 | 0.535 |
| **G** | 1.78 | 2.05 | 1.83 |
| **H** | 2.80 | 3.00 | 2.90 |
| **J**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