

## Features

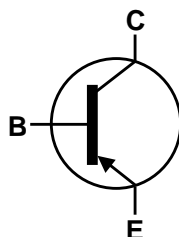
- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching
- Complementary NPN Type: MMBT2222A
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
-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

## Mechanical Data

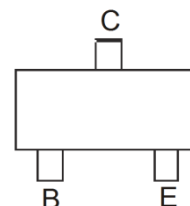
- Case: SOT23
- Case Material: Molded Plastic, "Green" Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208
- Weight: 0.008 grams (Approximate)



Top View



Device Symbol

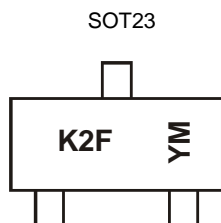

 Top View  
Pin-Out

## 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](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](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



K2F = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: D = 2016)  
 M or  $\bar{M}$  = 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<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic            | Symbol           | Value | Unit |
|---------------------------|------------------|-------|------|
| Collector-Base Voltage    | V <sub>CB0</sub> | -60   | V    |
| Collector-Emitter Voltage | V <sub>CEO</sub> | -60   | V    |
| Emitter-Base Voltage      | V <sub>EBO</sub> | -6.0  | V    |
| Collector Current         | I <sub>C</sub>   | -600  | mA   |
| Peak Collector Current    | I <sub>CM</sub>  | -800  | mA   |
| Peak Base Current         | I <sub>BM</sub>  | -200  | mA   |

**Thermal Characteristics**

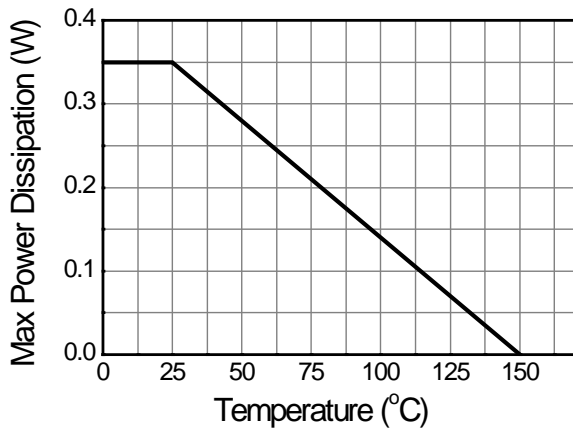
| Characteristic                          | Symbol                            | Value           | Unit |
|---|-----------------------------------|-----------------|------|
| Collector Power Dissipation             | P <sub>D</sub>                    | (Note 6)<br>310 | mW   |
|   |                                   | (Note 7)<br>350 |      |
| Thermal Resistance, Junction to Ambient | R <sub>θJA</sub>                  | (Note 6)<br>403 | °C/W |
|   |                                   | (Note 7)<br>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)

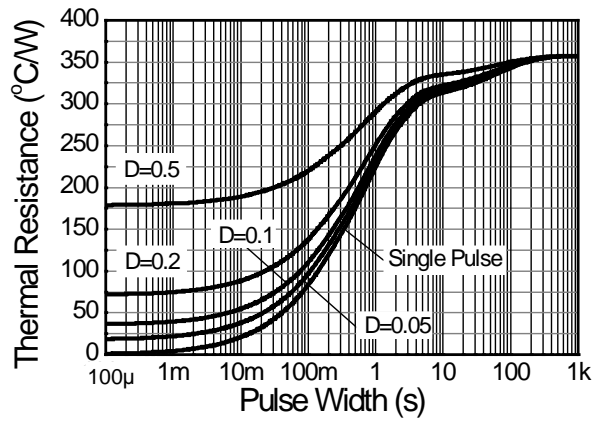
| Characteristic                             | Symbol  | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge - Machine Model    | ESD MM  | 400   | V    | C           |

- 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.

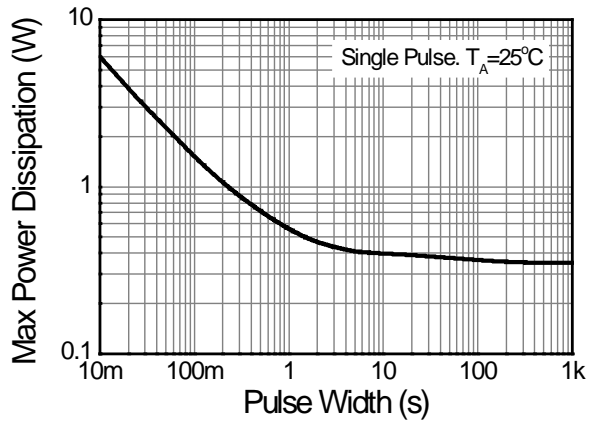
**Thermal Characteristics and Derating Information**



**Derating Curve**



**Transient Thermal Impedance**



**Pulse Power Dissipation**

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

| Characteristic                                | Symbol               | Min                           | Max                     | Unit     | Test Condition   |
|---|----------------------|-------------------------------|-------------------------|----------|--|
| <b>OFF CHARACTERISTICS</b>                    |                      |                               |                         |          |  |
| Collector-Base Breakdown Voltage              | BV <sub>CBO</sub>    | -60                           | —                       | V        | I <sub>C</sub> = -100μA, I <sub>E</sub> = 0  |
| Collector-Emitter Breakdown Voltage (Note 10) | BV <sub>CEO</sub>    | -60                           | —                       | V        | I <sub>C</sub> = -10mA, I <sub>B</sub> = 0   |
| Emitter-Base Breakdown Voltage                | BV <sub>EBO</sub>    | -6.0                          | —                       | V        | I <sub>E</sub> = -100μA, I <sub>C</sub> = 0  |
| Collector Cut-Off Current                     | I <sub>CBO</sub>     | —                             | -10                     | nA<br>μA | V <sub>CB</sub> = -50V, I <sub>E</sub> = 0<br>V <sub>CB</sub> = -50V, I <sub>E</sub> = 0, T <sub>A</sub> = +125°C  |
| Collector Cut-Off Current                     | I <sub>CEX</sub>     | —                             | -50                     | nA       | V <sub>CE</sub> = -30V, V <sub>EB(OFF)</sub> = -0.5V   |
| Base Cut-Off Current                          | I <sub>BL</sub>      | —                             | -50                     | nA       | V <sub>CE</sub> = -30V, V <sub>EB(OFF)</sub> = -0.5V   |
| Emitter Cut-Off Current                       | I <sub>EBO</sub>     | —                             | -50                     | nA       | V <sub>EB</sub> = -6.0V  |
| <b>ON CHARACTERISTICS (Note 10)</b>           |                      |                               |                         |          |  |
| DC Current Gain                               | h <sub>FE</sub>      | 75<br>100<br>100<br>100<br>50 | —<br>—<br>—<br>300<br>— | —        | I <sub>C</sub> = -100μA, V <sub>CE</sub> = -10V<br>I <sub>C</sub> = -1.0mA, V <sub>CE</sub> = -10V<br>I <sub>C</sub> = -10mA, V <sub>CE</sub> = -10V<br>I <sub>C</sub> = -150mA, V <sub>CE</sub> = -10V<br>I <sub>C</sub> = -500mA, V <sub>CE</sub> = -10V |
| Collector-Emitter Saturation Voltage          | V <sub>CE(SAT)</sub> | —                             | -0.4<br>-1.6            | V        | I <sub>C</sub> = -150mA, I <sub>B</sub> = -15mA<br>I <sub>C</sub> = -500mA, I <sub>B</sub> = -50mA   |
| Base-Emitter Saturation Voltage               | V <sub>BE(SAT)</sub> | —                             | -1.3<br>-2.6            | V        | I <sub>C</sub> = -150mA, I <sub>B</sub> = -15mA<br>I <sub>C</sub> = -500mA, I <sub>B</sub> = -50mA   |
| <b>SMALL SIGNAL CHARACTERISTICS</b>           |                      |                               |                         |          |  |
| Output Capacitance                            | C <sub>obo</sub>     | —                             | 8.0                     | pF       | V <sub>CB</sub> = -10V, f = 1.0MHz, I <sub>E</sub> = 0   |
| Input Capacitance                             | C <sub>ibo</sub>     | —                             | 30                      | pF       | V <sub>EB</sub> = -2.0V, f = 1.0MHz, I <sub>C</sub> = 0  |
| Current Gain-Bandwidth Product                | f <sub>T</sub>       | 200                           | —                       | MHz      | V <sub>CE</sub> = -20V, I <sub>C</sub> = -50mA,<br>f = 100MHz  |
| <b>SWITCHING CHARACTERISTICS</b>              |                      |                               |                         |          |  |
| Turn-On Time                                  | t <sub>ON</sub>      | —                             | 45                      | ns       | V <sub>CC</sub> = -30V, I <sub>C</sub> = -150mA,<br>I <sub>B1</sub> = -15mA  |
| Delay Time                                    | t <sub>D</sub>       | —                             | 10                      | ns       |  |
| Rise Time                                     | t <sub>R</sub>       | —                             | 40                      | ns       |  |
| Turn-Off Time                                 | t <sub>OFF</sub>     | —                             | 100                     | ns       | V <sub>CC</sub> = -6.0V, I <sub>C</sub> = -150mA,<br>I <sub>B1</sub> = I <sub>B2</sub> = -15mA   |
| Storage Time                                  | t <sub>S</sub>       | —                             | 80                      | ns       |  |
| Fall Time                                     | t <sub>F</sub>       | —                             | 30                      | ns       |  |

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

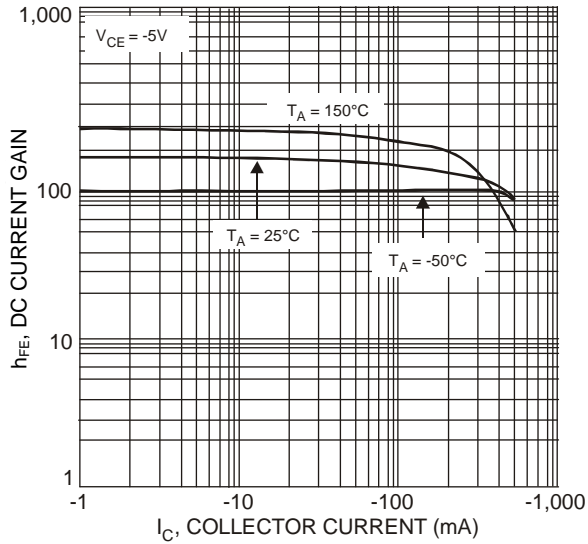


Fig. 1 Typical DC Current Gain vs. Collector Current

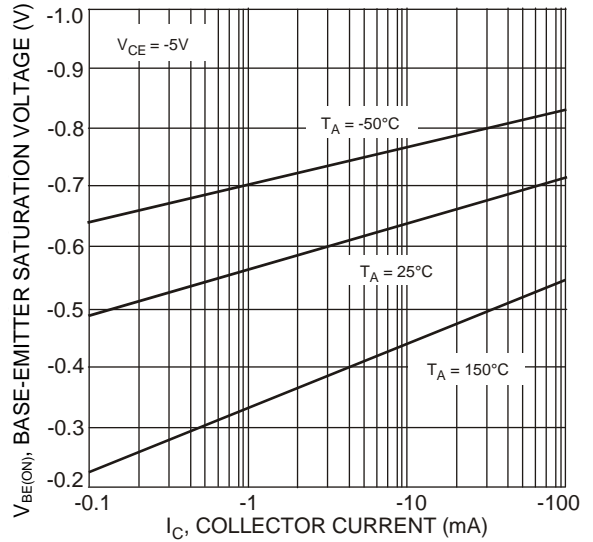


Fig. 2 Typical Base-Emitter Saturation Voltage vs. Collector Current

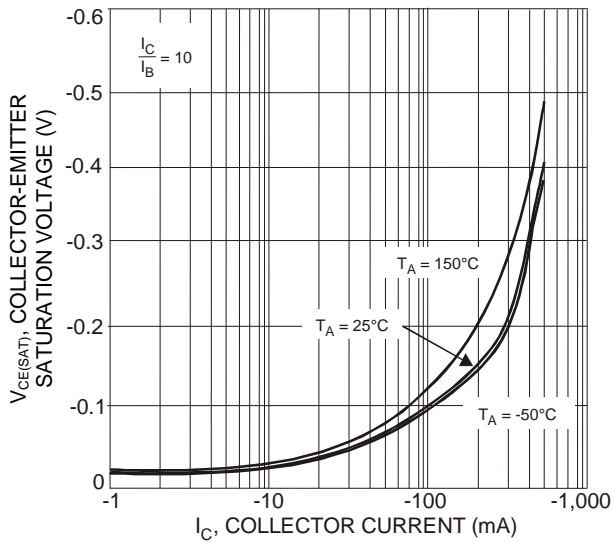


Fig. 3 Typical Collector-Emitter Saturation Voltage vs. Collector Current

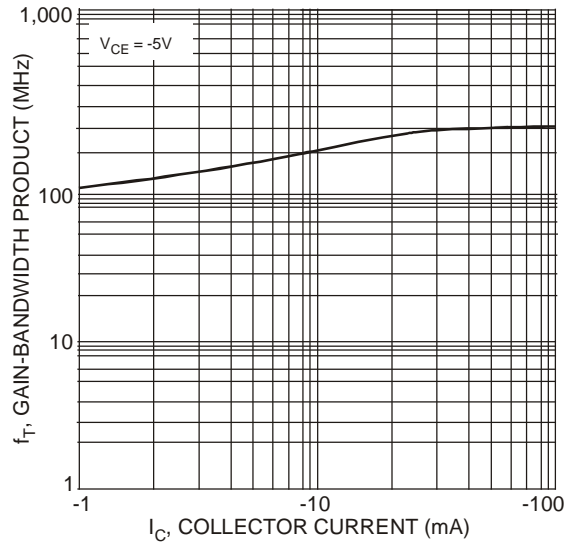


Fig. 4 Typical Gain-Bandwidth Product vs. Collector Current

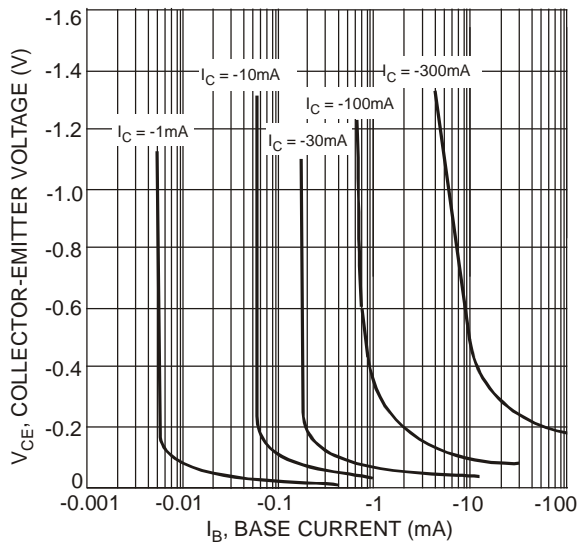


Fig. 5 Typical Collector Saturation Region

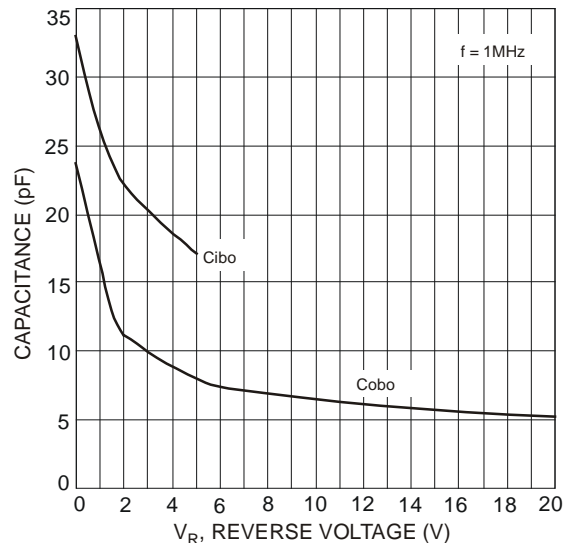
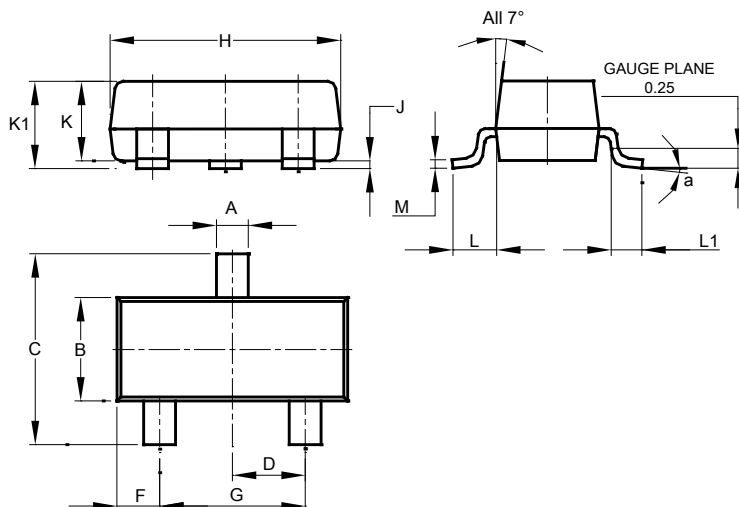


Fig. 6 Typical Capacitance Characteristics

## Package Outline Dimensions

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

### SOT23

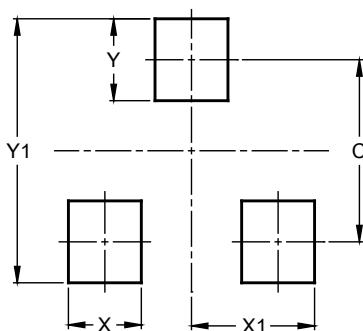


| SOT23                |       |       |       |
|----------------------|-------|-------|-------|
| Dim                  | Min   | Max   | Typ   |
| A                    | 0.37  | 0.51  | 0.40  |
| B                    | 1.20  | 1.40  | 1.30  |
| C                    | 2.30  | 2.50  | 2.40  |
| D                    | 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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