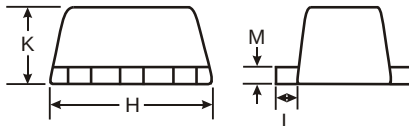
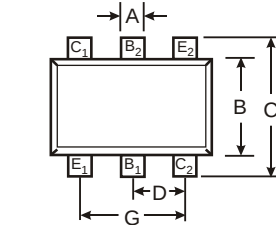


### Features

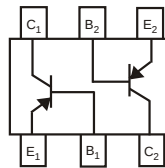
- Σ Epitaxial Planar Die Construction
- Σ Ideal for Low Power Amplification and Switching
- Σ Ultra-Small Surface Mount Package
- Σ **Lead Free By Design/RoHS Compliant (Note 1)**
- Σ **"Green" Device (Note 4)**

### Mechanical Data

- Σ Case: SOT-563
- Σ Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0
- Σ Moisture Sensitivity: Level 1 per J-STD-020C
- Σ Terminal Connections: See Diagram
- Σ Terminals: Finish - Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Σ Marking & Type Code Information: See Last Page
- Σ Ordering Information: See Last Page
- Σ Weight: 0.003 grams (approximate)



SEE NOTE 2



| SOT-563              |      |      |      |
|----------------------|------|------|------|
| Dim                  | Min  | Max  | Typ  |
| A                    | 0.15 | 0.30 | 0.25 |
| B                    | 1.10 | 1.25 | 1.20 |
| C                    | 1.55 | 1.70 | 1.60 |
| D                    | 0.50 |      |      |
| G                    | 0.90 | 1.10 | 1.00 |
| H                    | 1.50 | 1.70 | 1.60 |
| K                    | 0.56 | 0.60 | 0.60 |
| L                    | 0.10 | 0.30 | 0.20 |
| M                    | 0.10 | 0.18 | æ    |
| All Dimensions in mm |      |      |      |

### Maximum Ratings @ T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic                              | Symbol                            | Value       | Unit |
|---------------------------------------------|-----------------------------------|-------------|------|
| Collector-Base Voltage                      | V <sub>CBO</sub>                  | -40         | V    |
| Collector-Emitter Voltage                   | V <sub>CEO</sub>                  | -40         | V    |
| Emitter-Base Voltage                        | V <sub>EBO</sub>                  | -5.0        | V    |
| Collector Current - Continuous              | I <sub>C</sub>                    | -200        | mA   |
| Power Dissipation (Note 3)                  | P <sub>d</sub>                    | 150         | mW   |
| Thermal Resistance, Junction to Ambient     | R <sub>qJA</sub>                  | 833         | °C/W |
| Operating and Storage and Temperature Range | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

### Thermal Characteristics @ T<sub>A</sub> = 25°C unless otherwise specified

| Characteristic                          | Symbol           | Value | Unit |
|-----------------------------------------|------------------|-------|------|
| Power Dissipation (Note 3)              | P <sub>d</sub>   | 150   | mW   |
| Thermal Resistance, Junction to Ambient | R <sub>qJA</sub> | 833   | °C/W |

- Notes:
1. No purposefully added lead.
  2. Package is non-polarized. Parts may be on reel in orientation illustrated, 180° rotated, or mixed (both ways).
  3. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch; pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.
  4. Diodes Inc's "Green" policy can be found on our website at [http://www.diodes.com/products/lead\\_free/index.php](http://www.diodes.com/products/lead_free/index.php)

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

| Characteristic                       | Symbol        | Min                         | Max                                                 | Unit             | Test Condition                                                                                                                                                                                                                                              |
|--------------------------------------|---------------|-----------------------------|-----------------------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS (Note 5)</b>  |               |                             |                                                     |                  |                                                                                                                                                                                                                                                             |
| Collector-Base Breakdown Voltage     | $V_{(BR)CBO}$ | -40                         | $\infty$                                            | V                | $I_C = -10\text{mA}$ , $I_E = 0$                                                                                                                                                                                                                            |
| Collector-Emitter Breakdown Voltage  | $V_{(BR)CEO}$ | -40                         | $\infty$                                            | V                | $I_C = -1.0\text{mA}$ , $I_B = 0$                                                                                                                                                                                                                           |
| Emitter-Base Breakdown Voltage       | $V_{(BR)EBO}$ | -5.0                        | $\infty$                                            | V                | $I_E = -10\text{mA}$ , $I_C = 0$                                                                                                                                                                                                                            |
| Collector Cutoff Current             | $I_{CEX}$     | $\infty$                    | -50                                                 | nA               | $V_{CE} = -30\text{V}$ , $V_{EB(OFF)} = -3.0\text{V}$                                                                                                                                                                                                       |
| Base Cutoff Current                  | $I_{BL}$      | $\infty$                    | -50                                                 | nA               | $V_{CE} = -30\text{V}$ , $V_{EB(OFF)} = -3.0\text{V}$                                                                                                                                                                                                       |
| <b>ON CHARACTERISTICS (Note 5)</b>   |               |                             |                                                     |                  |                                                                                                                                                                                                                                                             |
| DC Current Gain                      | $h_{FE}$      | 60<br>80<br>100<br>60<br>30 | $\infty$<br>$\infty$<br>300<br>$\infty$<br>$\infty$ | $\infty$         | $I_C = -100\mu\text{A}$ , $V_{CE} = -1.0\text{V}$<br>$I_C = -1.0\text{mA}$ , $V_{CE} = -1.0\text{V}$<br>$I_C = -10\text{mA}$ , $V_{CE} = -1.0\text{V}$<br>$I_C = -50\text{mA}$ , $V_{CE} = -1.0\text{V}$<br>$I_C = -100\text{mA}$ , $V_{CE} = -1.0\text{V}$ |
| Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | $\infty$                    | -0.25<br>-0.40                                      | 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      | $V_{BE(SAT)}$ | -0.65<br>$\infty$           | -0.85<br>-0.95                                      | 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                   | $C_{obo}$     | $\infty$                    | 4.5                                                 | pF               | $V_{CB} = -5.0\text{V}$ , $f = 1.0\text{MHz}$ , $I_E = 0$                                                                                                                                                                                                   |
| Input Capacitance                    | $C_{ibo}$     | $\infty$                    | 10                                                  | pF               | $V_{EB} = -0.5\text{V}$ , $f = 1.0\text{MHz}$ , $I_C = 0$                                                                                                                                                                                                   |
| Input Impedance                      | $h_{ie}$      | 2.0                         | 12                                                  | kW               | $V_{CE} = 10\text{V}$ , $I_C = 1.0\text{mA}$ ,<br>$f = 1.0\text{kHz}$                                                                                                                                                                                       |
| Voltage Feedback Ratio               | $h_{re}$      | 0.1                         | 10                                                  | $\times 10^{-4}$ |                                                                                                                                                                                                                                                             |
| Small Signal Current Gain            | $h_{fe}$      | 100                         | 400                                                 | $\infty$         |                                                                                                                                                                                                                                                             |
| Output Admittance                    | $h_{oe}$      | 3.0                         | 60                                                  | mS               |                                                                                                                                                                                                                                                             |
| Current Gain-Bandwidth Product       | $f_T$         | 250                         | $\infty$                                            | MHz              | $V_{CE} = -20\text{V}$ , $I_C = -10\text{mA}$ ,<br>$f = 100\text{MHz}$                                                                                                                                                                                      |
| Noise Figure                         | NF            | $\infty$                    | 4.0                                                 | dB               | $V_{CE} = -5.0\text{V}$ , $I_C = -100\text{mA}$ ,<br>$R_S = 1.0\text{kW}$ , $f = 1.0\text{kHz}$                                                                                                                                                             |
| <b>SWITCHING CHARACTERISTICS</b>     |               |                             |                                                     |                  |                                                                                                                                                                                                                                                             |
| Delay Time                           | $t_d$         | $\infty$                    | 35                                                  | ns               | $V_{CC} = -3.0\text{V}$ , $I_C = -10\text{mA}$ ,<br>$V_{BE(off)} = 0.5\text{V}$ , $I_{B1} = -1.0\text{mA}$                                                                                                                                                  |
| Rise Time                            | $t_r$         | $\infty$                    | 35                                                  | ns               |                                                                                                                                                                                                                                                             |
| Storage Time                         | $t_s$         | $\infty$                    | 225                                                 | ns               | $V_{CC} = -3.0\text{V}$ , $I_C = -10\text{mA}$ ,<br>$I_{B1} = I_{B2} = -1.0\text{mA}$                                                                                                                                                                       |
| Fall Time                            | $t_f$         | $\infty$                    | 75                                                  | ns               |                                                                                                                                                                                                                                                             |

Notes: 5. Short duration test pulse used to minimize self-heating.

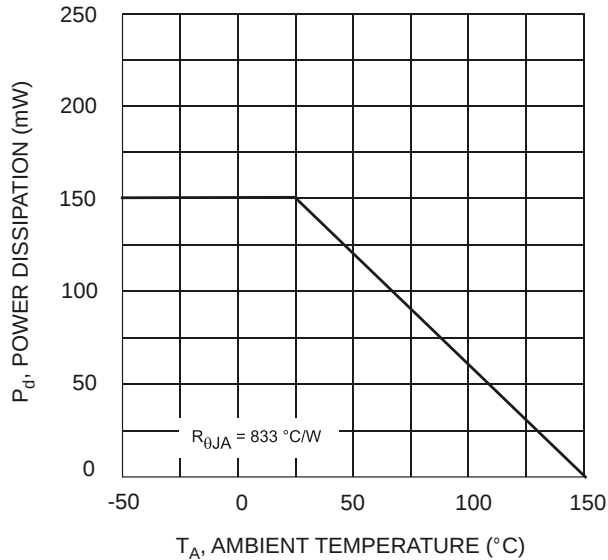


Fig. 1, Derating Curve - Total

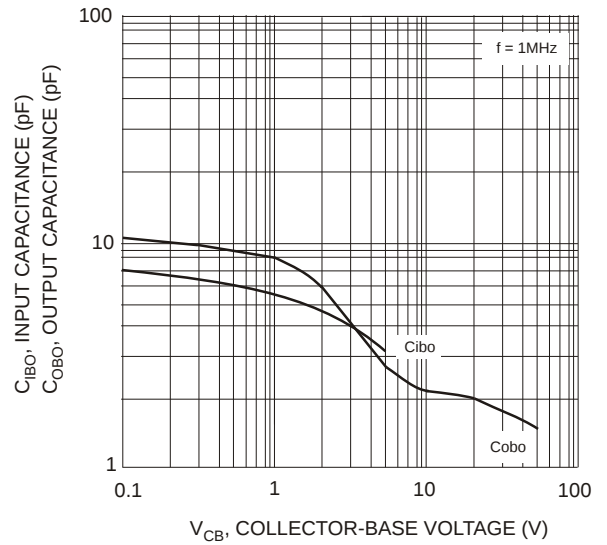


Fig. 2, Input and Output Capacitance vs. Collector-Base Voltage

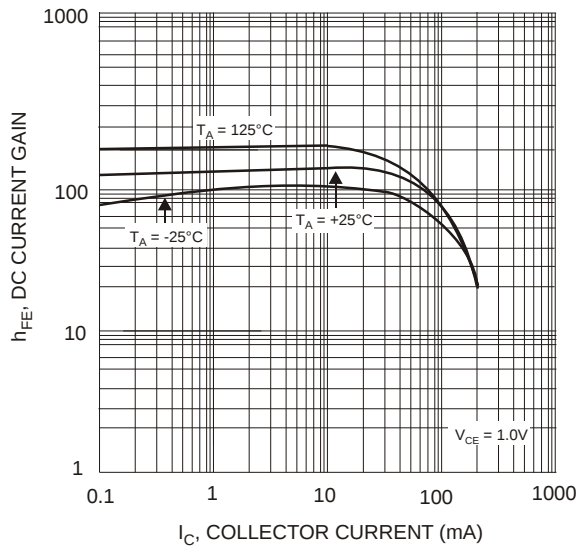


Fig. 3, Typical DC Current Gain vs. Collector Current

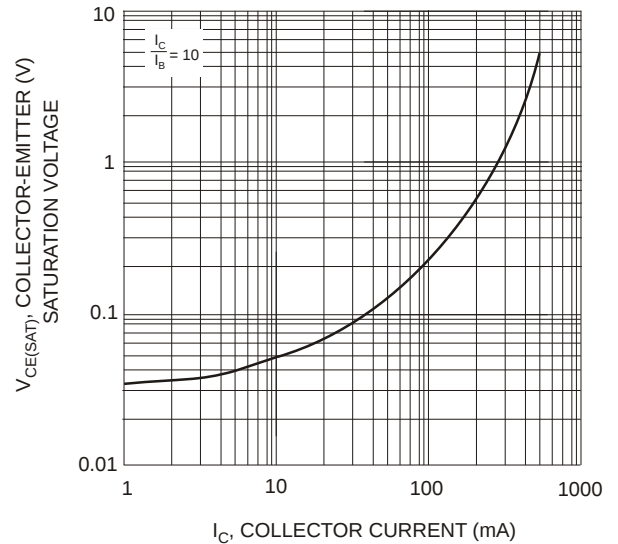


Fig. 4, Typical Collector-Emitter Saturation Voltage vs. Collector Current

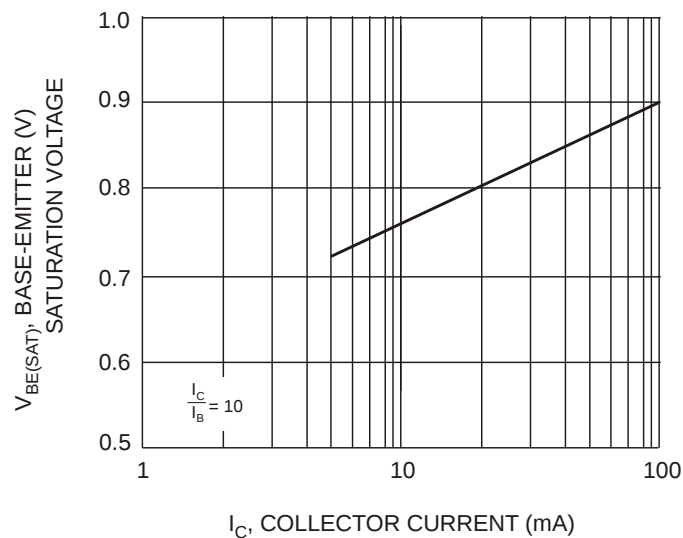
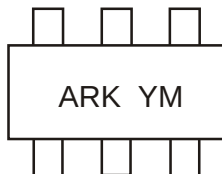


Fig. 5, Typical Base-Emitter Saturation Voltage vs. Collector Current

**Ordering Information** (Note 6)

| Device       | Packaging | Shipping         |
|--------------|-----------|------------------|
| MMDT3906VC-7 | SOT-563   | 3000/Tape & Reel |

Notes: 6. For Packaging Details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

**Marking Information**


ARK = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year ex: R = 2004  
 M = Month ex: 9 = September

Date Code Key

| Year |  |  |  |  |  |  | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|------|--|--|--|--|--|--|------|------|------|------|------|------|
| Code |  |  |  |  |  |  | R    | S    | T    | U    | V    | W    |

| Month | Jan | Feb | March | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | 1   | 2   | 3     | 4   | 5   | 6   | 7   | 8   | 9   | O   | N   | D   |