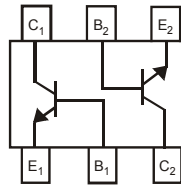
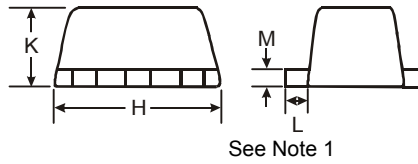
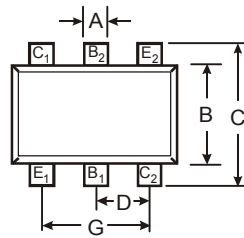


**Features**

- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching
- Ultra-Small Surface Mount Package
- **Lead Free By Design/RoHS Compliant (Note 3)**
- **"Green" Device (Note 4 and 5)**

**Mechanical Data**

- Case: SOT-563
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020C
- Terminals: Finish - Matte Tin annealed over Alloy 42 leadframe. Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Terminals: Lead bearing terminal plating available. See Ordering information Page 3
- Marking Information: KAP, See Page 3
- Ordering Information: See Page 3
- Weight: 0.003 grams (approximate)



| 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 | 0.11 |
| <b>All Dimensions in mm</b> |      |      |      |

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

| Characteristic                          | Symbol          | Value       | Unit               |
|-----------------------------------------|-----------------|-------------|--------------------|
| Collector-Base Voltage                  | $V_{CB0}$       | 60          | V                  |
| Collector-Emitter Voltage               | $V_{CEO}$       | 40          | V                  |
| Emitter-Base Voltage                    | $V_{EBO}$       | 6.0         | V                  |
| Collector Current - Continuous          | $I_C$           | 200         | mA                 |
| Power Dissipation (Note 2)              | $P_d$           | 200         | mW                 |
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 625         | $^\circ\text{C/W}$ |
| Operating and Storage Temperature Range | $T_j, T_{STG}$  | -55 to +150 | $^\circ\text{C}$   |

- Notes:
1. Package is non-polarized. Parts may be on reel in orientation illustrated, 180° rotated, or mixed (both ways).
  2. 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>.
  3. No purposefully added lead.
  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).
  5. Product manufactured with Date Code UO (week 40, 2007) and newer are built with Green Molding Compound. Product manufactured prior to Date Code UO are built with Non-Green Molding Compound and may contain Halogens or Sb2O3 Fire Retardants.

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

| Characteristic                       | Symbol               | Min  | Max          | Unit               | Test Condition                                                                                                                                                                                                                                       |
|--------------------------------------|----------------------|------|--------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS (Note 6)</b>  |                      |      |              |                    |                                                                                                                                                                                                                                                      |
| Collector-Base Breakdown Voltage     | V <sub>(BR)CBO</sub> | 60   | —            | V                  | I <sub>C</sub> = 10μA, I <sub>E</sub> = 0                                                                                                                                                                                                            |
| Collector-Emitter Breakdown Voltage  | V <sub>(BR)CEO</sub> | 40   | —            | V                  | I <sub>C</sub> = 1.0mA, I <sub>B</sub> = 0                                                                                                                                                                                                           |
| Emitter-Base Breakdown Voltage       | V <sub>(BR)EBO</sub> | 5.0  | —            | V                  | I <sub>E</sub> = 10μA, I <sub>C</sub> = 0                                                                                                                                                                                                            |
| Collector Cutoff Current             | I <sub>CEX</sub>     | —    | 50           | nA                 | V <sub>CE</sub> = 30V, V <sub>EB(OFF)</sub> = 3.0V                                                                                                                                                                                                   |
| Base Cutoff Current                  | I <sub>BL</sub>      | —    | 50           | nA                 | V <sub>CE</sub> = 30V, V <sub>EB(OFF)</sub> = 3.0V                                                                                                                                                                                                   |
| <b>ON CHARACTERISTICS (Note 6)</b>   |                      |      |              |                    |                                                                                                                                                                                                                                                      |
| DC Current Gain                      | h <sub>FE</sub>      | 40   | —            | —                  | I <sub>C</sub> = 100μA, V <sub>CE</sub> = 1.0V<br>I <sub>C</sub> = 1.0mA, V <sub>CE</sub> = 1.0V<br>I <sub>C</sub> = 10mA, V <sub>CE</sub> = 1.0V<br>I <sub>C</sub> = 50mA, V <sub>CE</sub> = 1.0V<br>I <sub>C</sub> = 100mA, V <sub>CE</sub> = 1.0V |
|                                      |                      | 70   | —            |                    |                                                                                                                                                                                                                                                      |
|                                      |                      | 100  | 300          |                    |                                                                                                                                                                                                                                                      |
|                                      |                      | 60   | —            |                    |                                                                                                                                                                                                                                                      |
|                                      |                      | 30   | —            |                    |                                                                                                                                                                                                                                                      |
| Collector-Emitter Saturation Voltage | V <sub>CE(SAT)</sub> | —    | 0.20<br>0.30 | V                  | I <sub>C</sub> = 10mA, I <sub>B</sub> = 1.0mA<br>I <sub>C</sub> = 50mA, I <sub>B</sub> = 5.0mA                                                                                                                                                       |
| Base-Emitter Saturation Voltage      | V <sub>BE(SAT)</sub> | 0.65 | 0.85<br>0.95 | V                  | I <sub>C</sub> = 10mA, I <sub>B</sub> = 1.0mA<br>I <sub>C</sub> = 50mA, I <sub>B</sub> = 5.0mA                                                                                                                                                       |
| <b>SMALL SIGNAL CHARACTERISTICS</b>  |                      |      |              |                    |                                                                                                                                                                                                                                                      |
| Output Capacitance                   | C <sub>obo</sub>     | —    | 4.0          | pF                 | V <sub>CB</sub> = 5.0V, f = 1.0MHz, I <sub>E</sub> = 0                                                                                                                                                                                               |
| Input Capacitance                    | C <sub>ibo</sub>     | —    | 8.0          | pF                 | V <sub>EB</sub> = 0.5V, f = 1.0MHz, I <sub>C</sub> = 0                                                                                                                                                                                               |
| Input Impedance                      | h <sub>ie</sub>      | 1.0  | 10           | kΩ                 | V <sub>CE</sub> = 10V, I <sub>C</sub> = 1.0mA,<br>f = 1.0kHz                                                                                                                                                                                         |
| Voltage Feedback Ratio               | h <sub>re</sub>      | 0.5  | 8.0          | x 10 <sup>-4</sup> |                                                                                                                                                                                                                                                      |
| Small Signal Current Gain            | h <sub>fe</sub>      | 100  | 400          | —                  |                                                                                                                                                                                                                                                      |
| Output Admittance                    | h <sub>oe</sub>      | 1.0  | 40           | μS                 |                                                                                                                                                                                                                                                      |
| Current Gain-Bandwidth Product       | f <sub>T</sub>       | 300  | —            | MHz                |                                                                                                                                                                                                                                                      |
| Noise Figure                         | NF                   | —    | 5.0          | dB                 | V <sub>CE</sub> = 5.0V, I <sub>C</sub> = 100μA,<br>R <sub>S</sub> = 1.0kΩ, f = 1.0kHz                                                                                                                                                                |
| <b>SWITCHING CHARACTERISTICS</b>     |                      |      |              |                    |                                                                                                                                                                                                                                                      |
| Delay Time                           | t <sub>d</sub>       | —    | 35           | ns                 | V <sub>CC</sub> = 3.0V, I <sub>C</sub> = 10mA,<br>V <sub>BE(off)</sub> = - 0.5V, I <sub>B1</sub> = 1.0mA                                                                                                                                             |
| Rise Time                            | t <sub>r</sub>       | —    | 35           | ns                 |                                                                                                                                                                                                                                                      |
| Storage Time                         | t <sub>s</sub>       | —    | 200          | ns                 | V <sub>CC</sub> = 3.0V, I <sub>C</sub> = 10mA,<br>I <sub>B1</sub> = I <sub>B2</sub> = 1.0mA                                                                                                                                                          |
| Fall Time                            | t <sub>f</sub>       | —    | 50           | ns                 |                                                                                                                                                                                                                                                      |

Notes: 6. Short duration pulse test used to minimize self-heating effect.

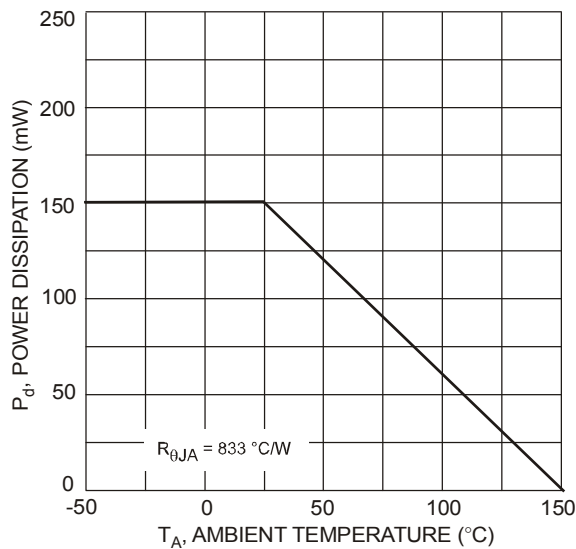


Fig. 1, Derating Curve - Total

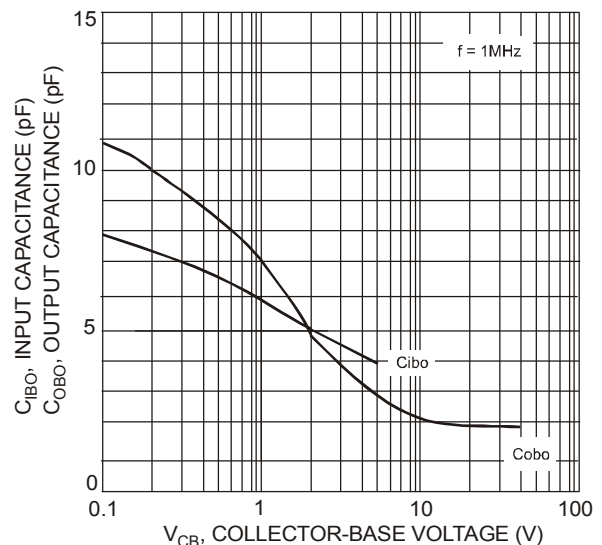


Fig. 2, Input and Output Capacitance vs. Collector-Base Voltage

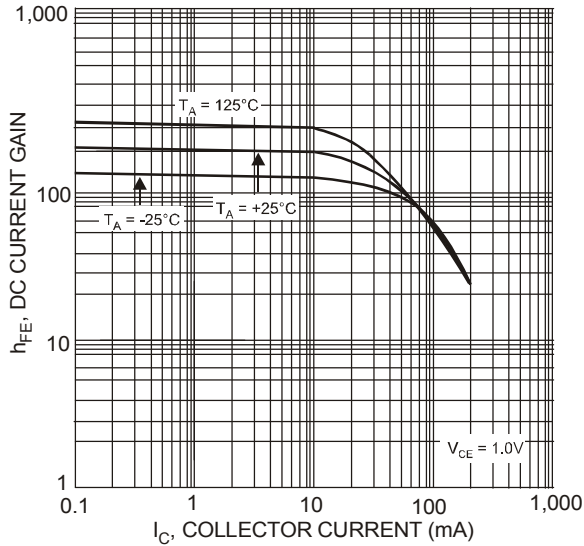


Fig. 3, Typical DC Current Gain vs. Collector Current

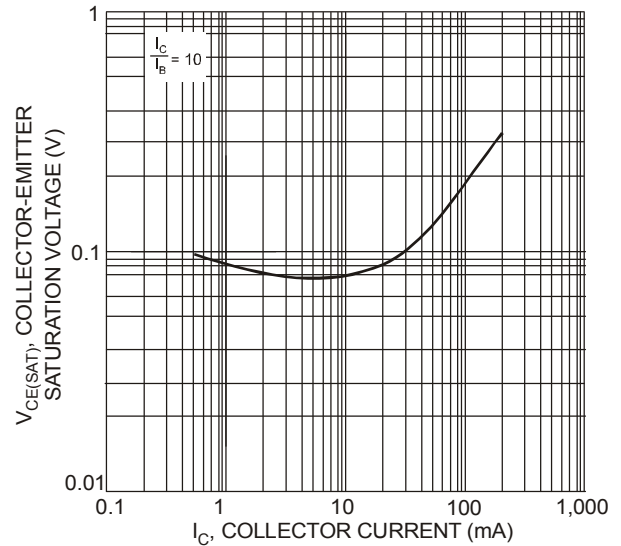


Fig. 4, Typical Collector-Emitter Saturation Voltage vs. Collector Current

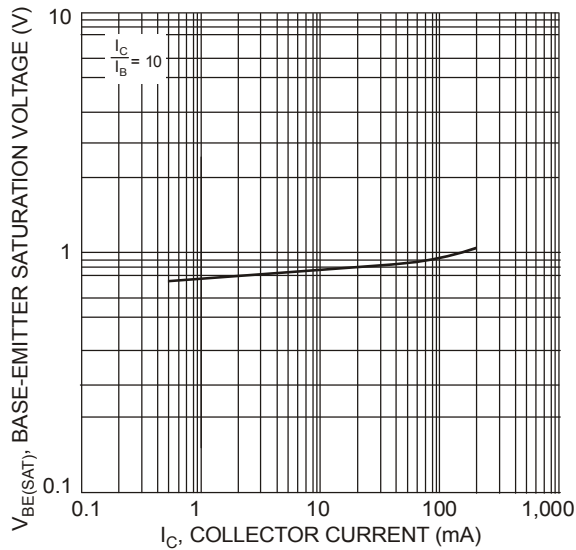


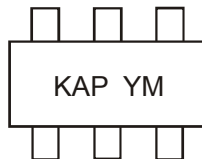
Fig. 5, Typical Base-Emitter Saturation Voltage vs. Collector Current

## Ordering Information (Note 7)

| Device      | Packaging | Shipping         |
|-------------|-----------|------------------|
| MMDT3904V-7 | SOT-563   | 3000/Tape & Reel |

Notes: 7. For packaging details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.

## Marking Information



KAP = 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 | 2010 | 2011 | 2012 |
|------|------|------|------|------|------|------|------|------|------|
| Code | R    | S    | T    | U    | V    | W    | X    | Y    | Z    |

| 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   |

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