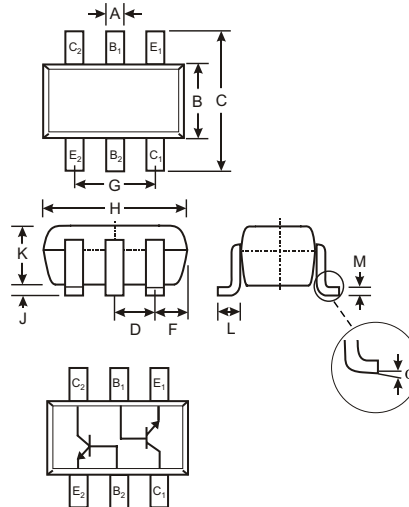


### Features

- Epitaxial Planar Die Construction
- Ideal for Low Power Amplification and Switching
- Ultra-Small Surface Mount Package
- Also Available in Lead Free Version

### Mechanical Data

- Case: SOT-363, Molded Plastic
- Case Material - UL Flammability Rating Classification 94V-0
- Moisture sensitivity: Level 1 per J-STD-020A
- Terminals: Solderable per MIL-STD-202, Method 208
- Also Available in Lead Free Plating (Matte Tin Finish). Please see Ordering Information, Note 3, on Page1
- Terminal Connections: See Diagram
- Marking (See Page 2): K6N
- Ordering & Date Code Information: See Page 2
- Weight: 0.006 grams (approx.)



| SOT-363              |              |      |
|----------------------|--------------|------|
| Dim                  | Min          | Max  |
| A                    | 0.10         | 0.30 |
| B                    | 1.15         | 1.35 |
| C                    | 2.00         | 2.20 |
| D                    | 0.65 Nominal |      |
| F                    | 0.30         | 0.40 |
| H                    | 1.80         | 2.20 |
| J                    | —            | 0.10 |
| K                    | 0.90         | 1.00 |
| L                    | 0.25         | 0.40 |
| M                    | 0.10         | 0.25 |
| $\alpha$             | 0°           | 8°   |
| All Dimensions in mm |              |      |

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

| Characteristic                          | Symbol          | MMDT3904    | Unit               |
|-----------------------------------------|-----------------|-------------|--------------------|
| Collector-Base Voltage                  | $V_{CBO}$       | 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 1)              | $P_d$           | 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 | $^\circ\text{C}$   |

### Ordering Information (Note 2)

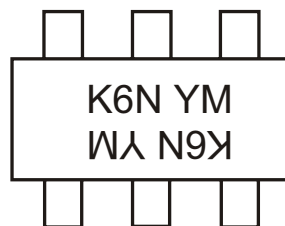
| Device     | Packaging | Shipping         |
|------------|-----------|------------------|
| MMDT3904-7 | SOT-363   | 3000/Tape & Reel |

- Notes:
1. Device mounted on FR-4 PCB; 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>.
  2. For Packaging Details, go to our website at <http://www.diodes.com/datasheets/ap02007.pdf>.
  3. For Lead Free version (with Lead Free terminal finish) part number, please add "-F" suffix to part number above.  
Example: MMDT3904-7-F.

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

| Characteristic                       | Symbol        | Min                         | Max                     | Unit             | Test Condition                                                                                                                                                                                                                                    |
|--------------------------------------|---------------|-----------------------------|-------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>OFF CHARACTERISTICS (Note 4)</b>  |               |                             |                         |                  |                                                                                                                                                                                                                                                   |
| Collector-Base Breakdown Voltage     | $V_{(BR)CBO}$ | 60                          | —                       | V                | $I_C = 10\mu\text{A}$ , $I_E = 0$                                                                                                                                                                                                                 |
| Collector-Emitter Breakdown Voltage  | $V_{(BR)CEO}$ | 40                          | —                       | V                | $I_C = 1.0\text{mA}$ , $I_B = 0$                                                                                                                                                                                                                  |
| Emitter-Base Breakdown Voltage       | $V_{(BR)EBO}$ | 5.0                         | —                       | V                | $I_E = 10\mu\text{A}$ , $I_C = 0$                                                                                                                                                                                                                 |
| Collector Cutoff Current             | $I_{CEX}$     | —                           | 50                      | nA               | $V_{CE} = 30\text{V}$ , $V_{EB(OFF)} = 3.0\text{V}$                                                                                                                                                                                               |
| Base Cutoff Current                  | $I_{BL}$      | —                           | 50                      | nA               | $V_{CE} = 30\text{V}$ , $V_{EB(OFF)} = 3.0\text{V}$                                                                                                                                                                                               |
| <b>ON CHARACTERISTICS (Note 4)</b>   |               |                             |                         |                  |                                                                                                                                                                                                                                                   |
| DC Current Gain                      | $h_{FE}$      | 40<br>70<br>100<br>60<br>30 | —<br>—<br>300<br>—<br>— | —                | $I_C = 100\mu\text{A}$ , $V_{CE} = 1.0\text{V}$<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 | $V_{CE(SAT)}$ | —                           | 0.20<br>0.30            | 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>—                   | 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                   | $C_{obo}$     | —                           | 4.0                     | pF               | $V_{CB} = 5.0\text{V}$ , $f = 1.0\text{MHz}$ , $I_E = 0$                                                                                                                                                                                          |
| Input Capacitance                    | $C_{ibo}$     | —                           | 8.0                     | pF               | $V_{EB} = 0.5\text{V}$ , $f = 1.0\text{MHz}$ , $I_C = 0$                                                                                                                                                                                          |
| Input Impedance                      | $h_{ie}$      | 1.0                         | 10                      | k $\Omega$       | $V_{CE} = 10\text{V}$ , $I_C = 1.0\text{mA}$ ,<br>$f = 1.0\text{kHz}$                                                                                                                                                                             |
| Voltage Feedback Ratio               | $h_{re}$      | 0.5                         | 8.0                     | $\times 10^{-4}$ |                                                                                                                                                                                                                                                   |
| Small Signal Current Gain            | $h_{fe}$      | 100                         | 400                     | —                |                                                                                                                                                                                                                                                   |
| Output Admittance                    | $h_{oe}$      | 1.0                         | 40                      | $\mu\text{S}$    |                                                                                                                                                                                                                                                   |
| Current Gain-Bandwidth Product       | $f_T$         | 300                         | —                       | MHz              | $V_{CE} = 20\text{V}$ , $I_C = 10\text{mA}$ ,<br>$f = 100\text{MHz}$                                                                                                                                                                              |
| Noise Figure                         | NF            | —                           | 5.0                     | dB               | $V_{CE} = 5.0\text{V}$ , $I_C = 100\mu\text{A}$ ,<br>$R_S = 1.0\text{k}\Omega$ , $f = 1.0\text{kHz}$                                                                                                                                              |
| <b>SWITCHING CHARACTERISTICS</b>     |               |                             |                         |                  |                                                                                                                                                                                                                                                   |
| Delay Time                           | $t_d$         | —                           | 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                            | $t_r$         | —                           | 35                      | ns               |                                                                                                                                                                                                                                                   |
| Storage Time                         | $t_s$         | —                           | 200                     | ns               | $V_{CC} = 3.0\text{V}$ , $I_C = 10\text{mA}$ ,<br>$I_{B1} = I_{B2} = 1.0\text{mA}$                                                                                                                                                                |
| Fall Time                            | $t_f$         | —                           | 50                      | ns               |                                                                                                                                                                                                                                                   |

Notes: 4. Short duration test pulse used to minimize self-heating.

**Marking Information**


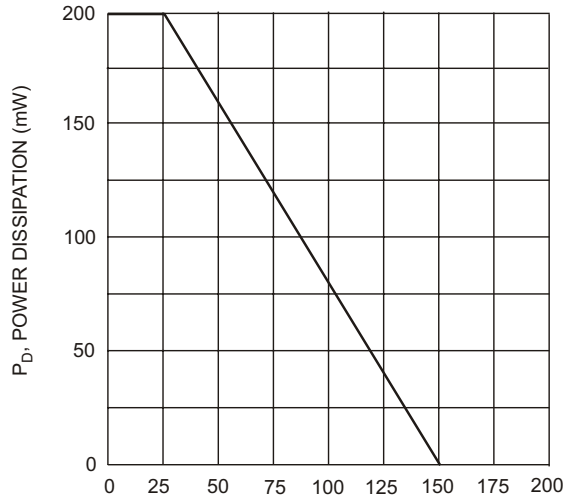
K6N = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year ex: N = 2002  
 M = Month ex: 9 = September

**Date Code Key**

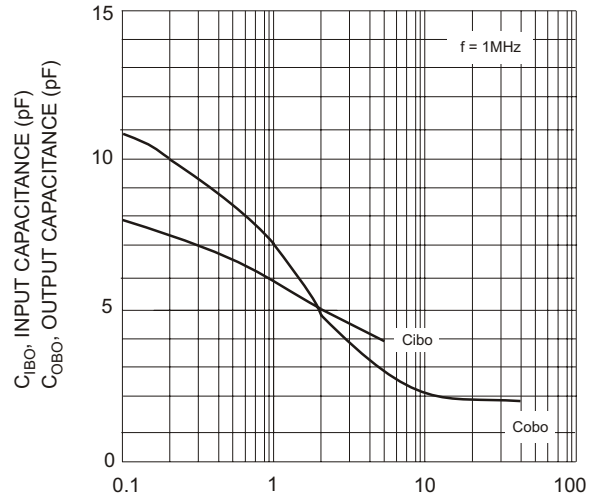
| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Code | J    | K    | L    | M    | N    | P    | R    | S    | T    | U    | V    | W    |

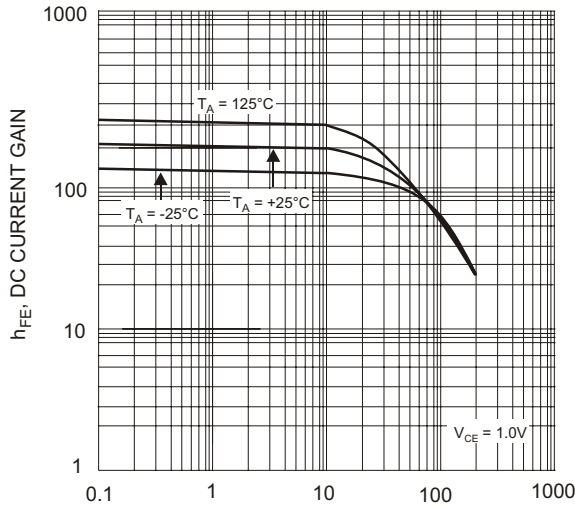
| Month | Jan | Feb | March | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Code  | 1   | 2   | 3     | 4   | 5   | 6   | 7   | 8   | 9   | O   | N   | D   |



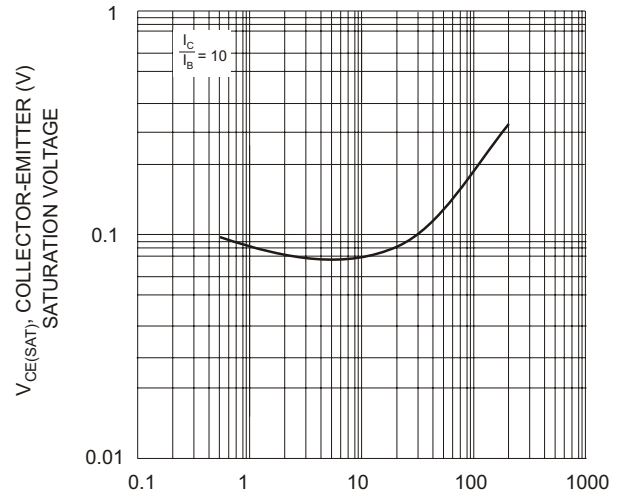
$T_A$ , AMBIENT TEMPERATURE (°C)  
Fig. 1, Max Power Dissipation vs Ambient Temperature



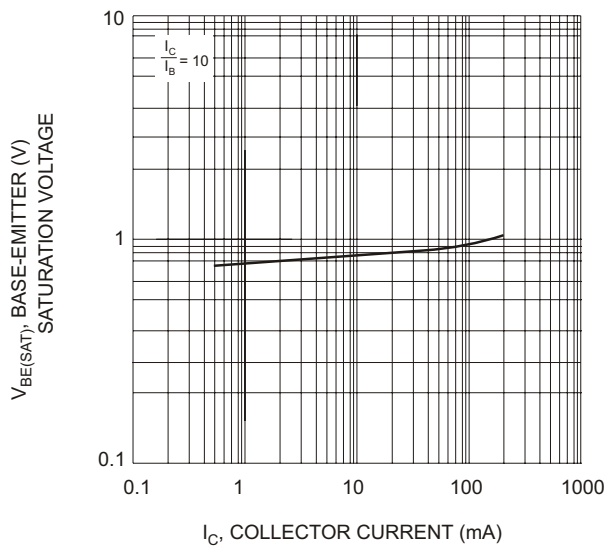
$V_{CB}$ , COLLECTOR-BASE VOLTAGE (V)  
Fig. 2, Input and Output Capacitance vs. Collector-Base Voltage



$I_C$ , COLLECTOR CURRENT (mA)  
Fig. 3, Typical DC Current Gain vs Collector Current



$I_C$ , COLLECTOR CURRENT (mA)  
Fig. 4, Typical Collector-Emitter Saturation Voltage vs. Collector Current



$I_C$ , COLLECTOR CURRENT (mA)  
Fig. 5, Typical Base-Emitter Saturation Voltage vs. Collector Current