



# MMBTH10

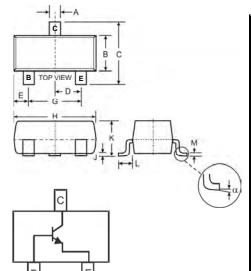
## NPN SURFACE MOUNT VHF/UHF TRANSISTOR

#### **Features**

- Designed for VHF/UHF Amplifier Applications and High Output VHF Oscillators
- High Current Gain Bandwidth Product
- Ideal for Mixer and RF Amplifier Applications with collector currents in the 100µA - 30 mA Range
- Lead, Halogen and Antimony Free, RoHS Compliant "Green" Device (Notes 3 and 4)
- Qualified to AEC-Q101 Standards for High Reliability

## **Mechanical Data**

- Case: SOT-23
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020D
- Terminals: Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Lead Free Plating (Matte Tin Finish annealed over Alloy 42 leadframe).
- Marking Information: K3H, K3Y; See Page 3
- Ordering Information: See Page 3
- Weight: 0.008 grams (approximate)



| SOT-23               |       |              |  |  |  |  |  |  |  |
|----------------------|-------|--------------|--|--|--|--|--|--|--|
| Dim                  | Min   | Max          |  |  |  |  |  |  |  |
| Α                    | 0.37  | 0.51         |  |  |  |  |  |  |  |
| В                    | 1.20  | 1.40         |  |  |  |  |  |  |  |
| C                    | 2.30  | 2.50         |  |  |  |  |  |  |  |
| D                    | 0.89  | 1.03         |  |  |  |  |  |  |  |
| E                    | 0.45  | 0.60<br>2.05 |  |  |  |  |  |  |  |
| G                    | 1.78  |              |  |  |  |  |  |  |  |
| Н                    | 2.80  | 3.00         |  |  |  |  |  |  |  |
| J                    | 0.013 | 0.10         |  |  |  |  |  |  |  |
| K                    | 0.903 | 1.10         |  |  |  |  |  |  |  |
| L                    | 0.45  | 0.61         |  |  |  |  |  |  |  |
| М                    | 0.085 | 0.180        |  |  |  |  |  |  |  |
| α                    | 0°    | 8°           |  |  |  |  |  |  |  |
| All Dimensions in mm |       |              |  |  |  |  |  |  |  |

# Maximum Ratings @TA = 25°C unless otherwise specified

| Characteristic                                   | Symbol                            | Value       | Unit |
|--|-----------------------------------|-------------|------|
| Collector-Base Voltage                           | V <sub>CBO</sub>                  | 30          | V    |
| Collector-Emitter Voltage                        | V <sub>CEO</sub>                  | 25          | V    |
| Emitter-Base Voltage                             | V <sub>EBO</sub>                  | 3.0         | V    |
| Collector Current - Continuous (Note 1)          | I <sub>C</sub>                    | 50          | mA   |
| Power Dissipation (Note 1)                       | P <sub>D</sub>                    | 300         | mW   |
| Thermal Resistance, Junction to Ambient (Note 1) | $R_{	heta JA}$                    | 417         | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

# **Electrical Characteristics** @TA = 25°C unless otherwise specified

|                                      | 0                    |     |      | 11-16 | Total Compilition                                     |  |  |  |  |  |
|--------------------------------------|----------------------|-----|------|-------|---|--|--|--|--|--|
| Characteristic                       | Symbol               | Min | Max  | Unit  | Test Condition  |  |  |  |  |  |
| OFF CHARACTERISTICS (Note 2)         |                      |     |      |       |   |  |  |  |  |  |
| Collector-Emitter Breakdown Voltage  | V <sub>(BR)CEO</sub> | 25  | _    | V     | $I_C = 1 \text{mA}, I_B = 0$                          |  |  |  |  |  |
| Collector-Base Breakdown Voltage     | V <sub>(BR)CBO</sub> | 30  | _    | V     | $I_C = 100 \mu A, I_E = 0$                            |  |  |  |  |  |
| Emitter-Base Breakdown Voltage       | $V_{(BR)EBO}$        | 3.0 | _    | V     | $I_E = 10\mu A, I_C = 0$                              |  |  |  |  |  |
| Collector Cutoff Current             | I <sub>CBO</sub>     | _   | 100  | nA    | $V_{CB} = 25V, I_E = 0$                               |  |  |  |  |  |
| Emitter Cutoff Current               | I <sub>EBO</sub>     | _   | 100  | nA    | $V_{EB} = 2V, I_{C} = 0$                              |  |  |  |  |  |
| ON CHARACTERISTICS (Note 2)          |                      |     |      |       |   |  |  |  |  |  |
| DC Current Gain                      | h <sub>FE</sub>      | 60  | _    | _     | $I_C = 4mA, V_{CE} = 10.0V$                           |  |  |  |  |  |
| Collector-Emitter Saturation Voltage | V <sub>CE(SAT)</sub> | _   | 0.5  | V     | $I_C = 4mA$ , $I_B = 400\mu A$                        |  |  |  |  |  |
| Base-Emitter On Voltage              | V <sub>BE(SAT)</sub> | _   | 0.95 | V     | $I_C = 4mA, V_{CE} = 10.0V$                           |  |  |  |  |  |
| SMALL SIGNAL CHARACTERISTICS         |                      |     |      |       |   |  |  |  |  |  |
| Current Gain-Bandwidth Product       | f <sub>T</sub>       | 650 | _    | MHz   | $V_{CE} = 10V$ , $f = 100MHz$ , $I_{C} = 4mA$         |  |  |  |  |  |
| Collector-Base Capacitance           | C <sub>CB</sub>      | _   | 0.7  | pF    | $V_{CB} = 10V$ , $f = 1.0MHz$ , $I_E = 0$             |  |  |  |  |  |
| Collector-Base Feedback Capacitance  | C <sub>RB</sub>      | _   | 0.65 | pF    | V <sub>CB</sub> = 10V, f = 1.0MHz, I <sub>E</sub> = 0 |  |  |  |  |  |
| Collector-Base Time Constant         | Rb'Cc                | _   | 9    | ps    | $V_{CB} = 10V$ , $f = 31.8MHz$ , $I_{C} = 4mA$        |  |  |  |  |  |

Notes:

- 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.
- Short duration pulse test used to minimize self-heating effect.
- No purposefully added lead. Halogen and Antimony Free.
- Product manufactured with Data Code V9 (week 33, 2008) and newer are built with Green Molding Compound. Product manufactured prior to Date V9 are built with Non-Green Molding Compound and may contain Halogens or Sb<sub>2</sub>O<sub>3</sub> Fire Retardants.



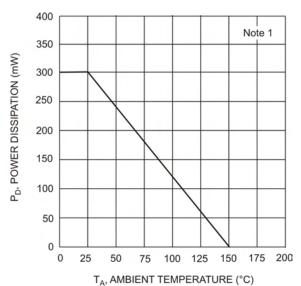
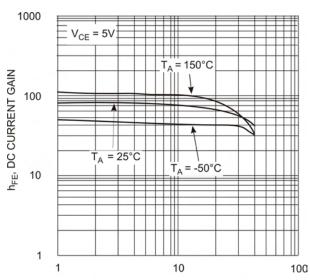
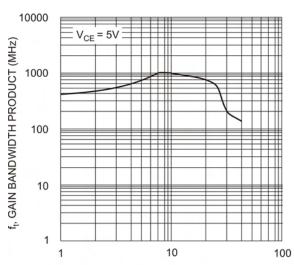


Fig. 1, Max Power Dissipation vs Ambient Temperature



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



I<sub>C</sub>, COLLECTOR CURRENT (mA) Fig. 5, Gain Bandwidth Product vs Collector Current

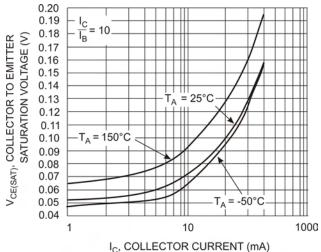


Fig. 2 Collector Emitter Saturation Voltage vs. Collector Current

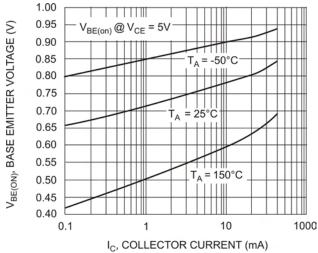


Fig. 4 Base Emitter Voltage vs. Collector Current

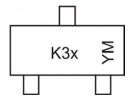


## **Ordering Information** (Note 5)

| Device      | Packaging | Shipping         |  |  |  |
|-------------|-----------|------------------|--|--|--|
| MMBTH10-7-F | SOT-23    | 3000/Tape & Reel |  |  |  |

Notes: 5. For packaging details, go to our website at http://www.diodes.com/datasheets/ap02007.pdf.

# **Marking Information**



K3x = Product Type Marking Code, e.g. K3H YM = Date Code Marking

Y = Year ex: N = 2002M = Month ex: 9 = September

Date Code Key

| Date Code N | Су   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Year        | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| Code        | J    | K    | L    | М    | N    | Р    | R    | S    | Т    | U    | V    | W    | Χ    | Υ    | Z    |
| Month       | Jan  | Fe   | b I  | Mar  | Apr  | May  | Ju   | n    | Jul  | Aug  | Sep  | Oc   | t N  | Nov  | Dec  |
| Code        | 1    | 2    |      | 3    | 4    | 5    | 6    |      | 7    | 8    | 9    | 0    |      | N    | D    |

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