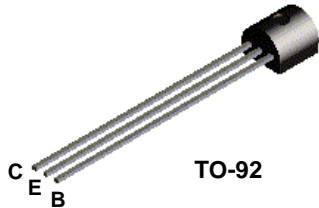
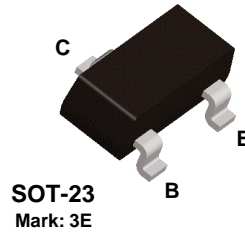


## MPSH10



## MMBTH10



### NPN RF Transistor

This device is designed for use in low noise UHF/VHF amplifiers, with collector currents in the 100  $\mu$ A to 20 mA range in common emitter or common base mode of operations, and in low frequency drift, high output UHF oscillators. Sourced from Process 42.

#### Absolute Maximum Ratings\*

TA = 25°C unless otherwise noted

| Symbol                            | Parameter  | Value       | Units |
|-----------------------------------|--|-------------|-------|
| V <sub>CEO</sub>                  | Collector-Emitter Voltage                        | 25          | V     |
| V <sub>CBO</sub>                  | Collector-Base Voltage                           | 30          | V     |
| V <sub>EBO</sub>                  | Emitter-Base Voltage                             | 3.0         | V     |
| I <sub>C</sub>                    | Collector Current - Continuous                   | 50          | mA    |
| T <sub>J</sub> , T <sub>stg</sub> | Operating and Storage Junction Temperature Range | -55 to +150 | °C    |

\*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

#### NOTES:

- 1) These ratings are based on a maximum junction temperature of 150 degrees C.
- 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

#### Thermal Characteristics

TA = 25°C unless otherwise noted

| Symbol           | Characteristic                          | Max    |          | Units |
|------------------|---|--------|----------|-------|
|                  |   | MPSH10 | *MMBTH10 |       |
| P <sub>D</sub>   | Total Device Dissipation                | 350    | 225      | mW    |
|                  | Derate above 25°C                       | 2.8    | 1.8      | mW/°C |
| R <sub>θJC</sub> | Thermal Resistance, Junction to Case    | 125    |          | °C/W  |
| R <sub>θJA</sub> | Thermal Resistance, Junction to Ambient | 357    | 556      | °C/W  |

\* Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

## NPN RF Transistor

(continued)

### Electrical Characteristics

TA = 25°C unless otherwise noted

| Symbol                     | Parameter                             | Test Conditions                           | Min | Max | Units |
|----------------------------|---------------------------------------|---|-----|-----|-------|
| <b>OFF CHARACTERISTICS</b> |                                       |   |     |     |       |
| $V_{(BR)CEO}$              | Collector-Emitter Sustaining Voltage* | $I_C = 1.0 \text{ mA}, I_B = 0$           | 25  |     | V     |
| $V_{(BR)CBO}$              | Collector-Base Breakdown Voltage      | $I_C = 100 \text{ } \mu\text{A}, I_E = 0$ | 30  |     | V     |
| $V_{(BR)EBO}$              | Emitter-Base Breakdown Voltage        | $I_E = 10 \text{ } \mu\text{A}, I_C = 0$  | 3.0 |     | V     |
| $I_{CBO}$                  | Collector Cutoff Current              | $V_{CB} = 25 \text{ V}, I_E = 0$          |     | 100 | nA    |
| $I_{EBO}$                  | Emitter Cutoff Current                | $V_{EB} = 2.0 \text{ V}, I_C = 0$         |     | 100 | nA    |

### ON CHARACTERISTICS

|               |                                      |   |    |      |   |
|---------------|--------------------------------------|---|----|------|---|
| $h_{FE}$      | DC Current Gain                      | $I_C = 4.0 \text{ mA}, V_{CE} = 10 \text{ V}$ | 60 |      |   |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C = 4.0 \text{ mA}, I_B = 0.4 \text{ mA}$  |    | 0.5  | V |
| $V_{BE(on)}$  | Base-Emitter On Voltage              | $I_C = 4.0 \text{ mA}, V_{CE} = 10 \text{ V}$ |    | 0.95 | V |

### SMALL SIGNAL CHARACTERISTICS

|                 |                                  |  |      |      |     |
|-----------------|----------------------------------|--|------|------|-----|
| $f_T$           | Current Gain - Bandwidth Product | $I_C = 4.0 \text{ mA}, V_{CE} = 10 \text{ V},$<br>$f = 100 \text{ MHz}$  | 650  |      | MHz |
| $C_{cb}$        | Collector-Base Capacitance       | $V_{CB} = 10 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$                    |      | 0.7  | pF  |
| $C_{rb}$        | Common-Base Feedback Capacitance | $V_{CB} = 10 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$                    | 0.35 | 0.65 | pF  |
| $r_b \cdot C_c$ | Collector Base Time Constant     | $I_C = 4.0 \text{ mA}, V_{CB} = 10 \text{ V},$<br>$f = 31.8 \text{ MHz}$ |      | 9.0  | pS  |

\*Pulse Test: Pulse Width  $\leq 300 \text{ } \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

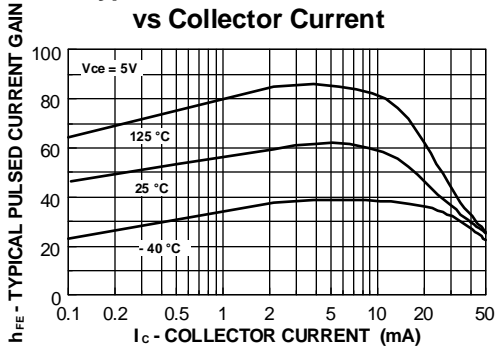
### Spice Model

NPN (Is=69.28E-18 Xti=3 Eg=1.11 Vaf=100 Bf=308.6 Ne=1.197 Ise=69.28E-18 Ikf=22.83m Xtb=1.5 Br=1.11 Nc=2 Isc=0 Ikr=0 Rc=4 Cjc=1.042p Mjc=.2468 Vjc=.75 Fc=.5 Cje=1.52p Mje=.3223 Vje=.75 Tr=1.558n Tf=135.8p Itf=.27 Vtf=10 Xtf=30 Rb=10)

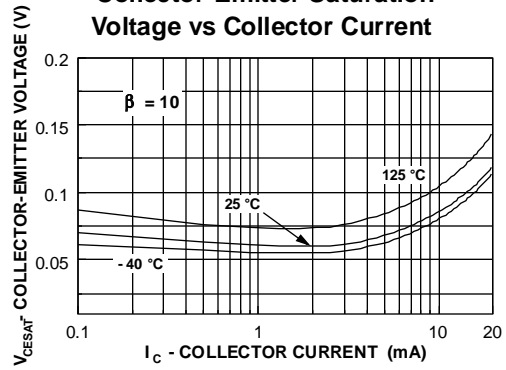
MPSH10 / MMBTH10

Typical Characteristics

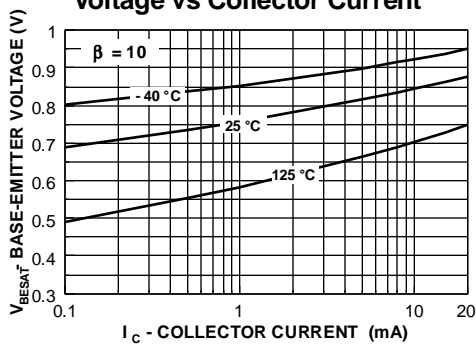
Typical Pulsed Current Gain vs Collector Current



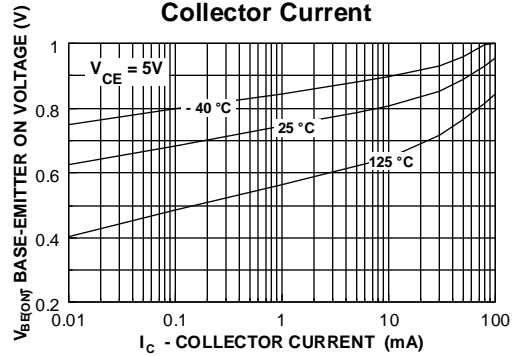
Collector-Emitter Saturation Voltage vs Collector Current



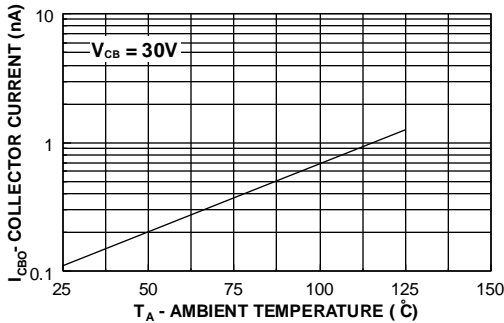
Base-Emitter Saturation Voltage vs Collector Current



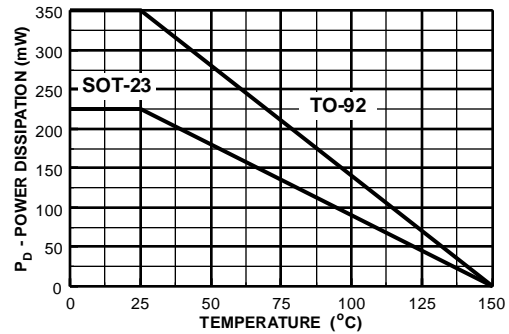
Base-Emitter ON Voltage vs Collector Current



Collector-Cutoff Current vs Ambient Temperature

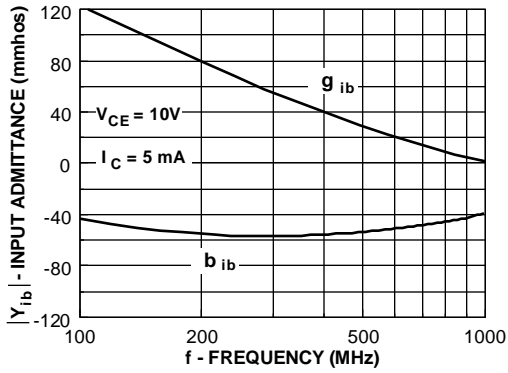


Power Dissipation vs Ambient Temperature

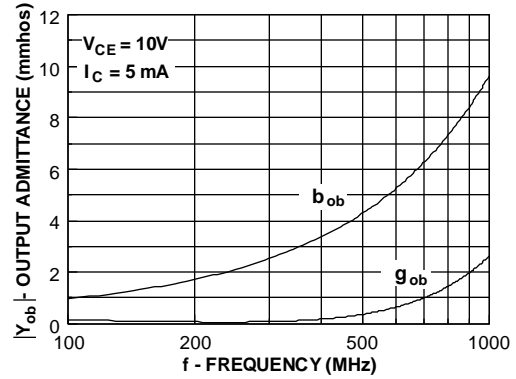


Common Base Y Parameters vs. Frequency

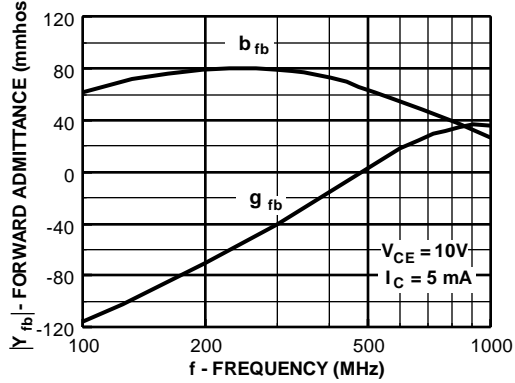
Input Admittance



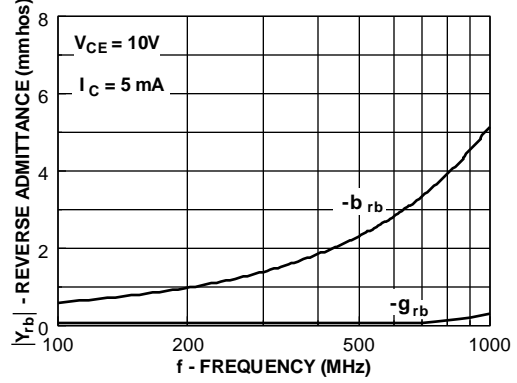
Output Admittance



Forward Transfer Admittance

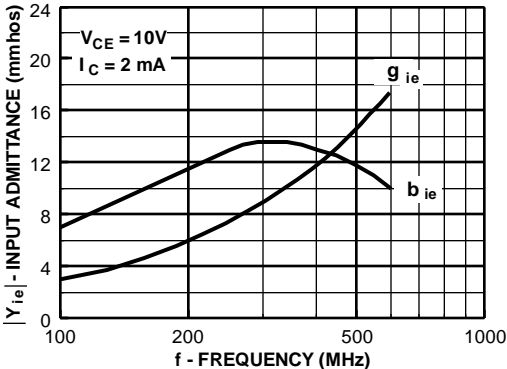


Reverse Transfer Admittance

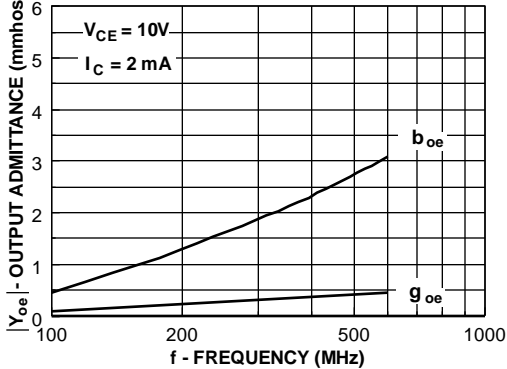


Common Emitter Y Parameters vs. Frequency

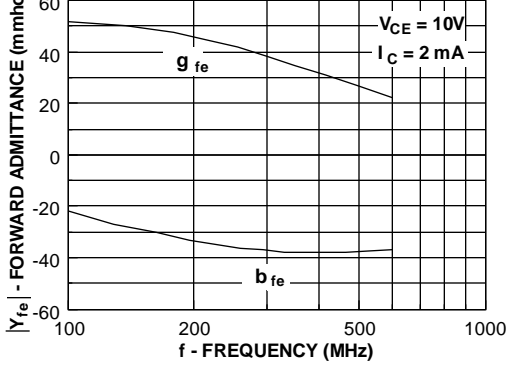
Input Admittance



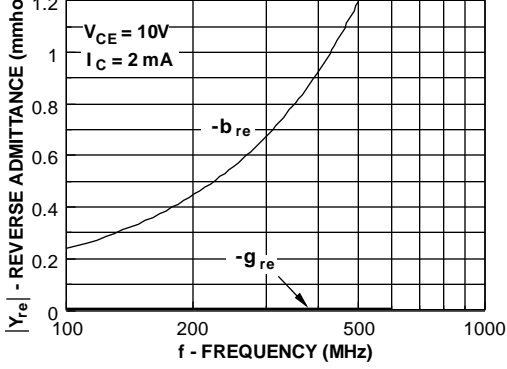
Output Admittance



Forward Transfer Admittance



Reverse Transfer Admittance



Test Circuits

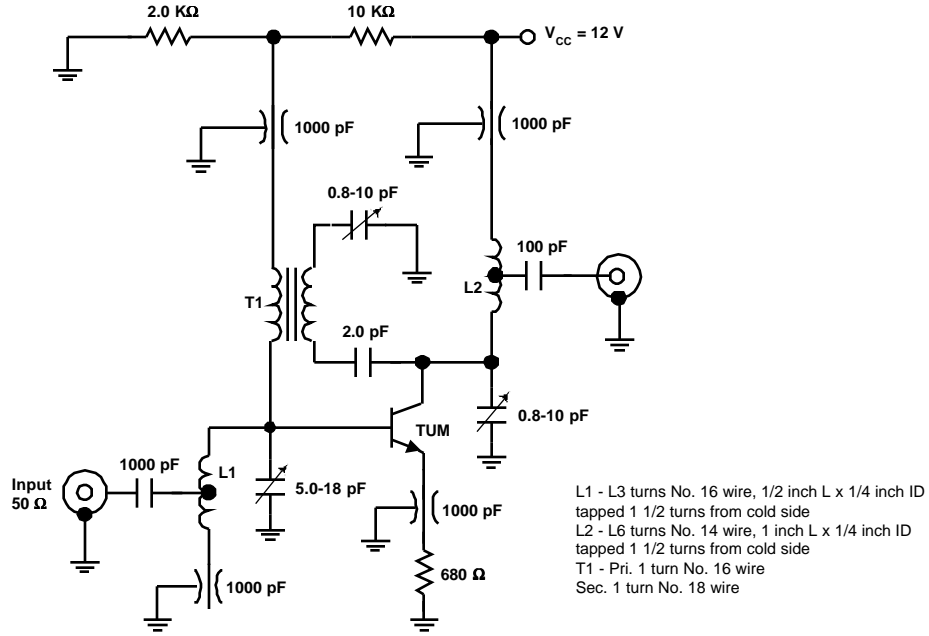


FIGURE 1: Neutralized 200 MHz pF and NF Circuit

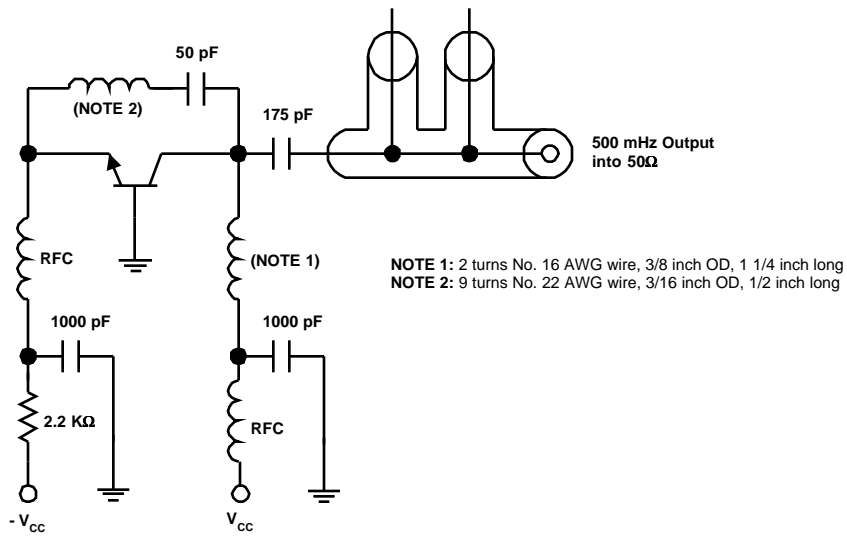


FIGURE 2: 500 MHz Oscillator Circuit