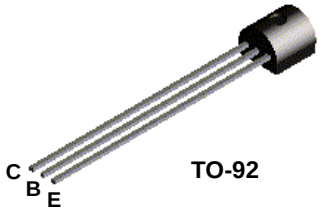
FAIRCHILD SEMICONDUCTOR TM

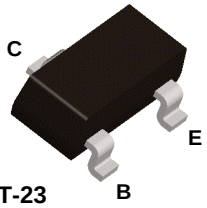
*Discrete POWER & Signal Technologies*

# MPSH11




TO-92

# MMBTH11




SOT-23
Mark: 3G

## NPN RF Transistor

This device is designed for common-emitter low noise amplifier and mixer applications with collector currents in the 100 μA to 10 mA range to 300 MHz, and low frequency drift common-base VHF oscillator applications with high output levels for driving FET mixers. Sourced from Process 47.

## Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $V_{CEO}$ | Collector-Emitter Voltage | 25 | V |
| $V_{CBO}$ | Collector-Base Voltage | 30 | V |
| $V_{EBO}$ | Emitter-Base Voltage | 3.0 | V |
| $I_C$ | Collector Current - Continuous | 50 | mA |
| $T_J$, $T_{stg}$ | 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 |
|---|---|---|---|---|
| | | MPSH11 | *MMBTH11 | |
| $P_D$ | Total Device Dissipation<br>Derate above 25°C | 350<br>2.8 | 225<br>1.8 | mW<br>mW/°C |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case | 125 | | °C/W |
| $R_{\theta JA}$ | 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)

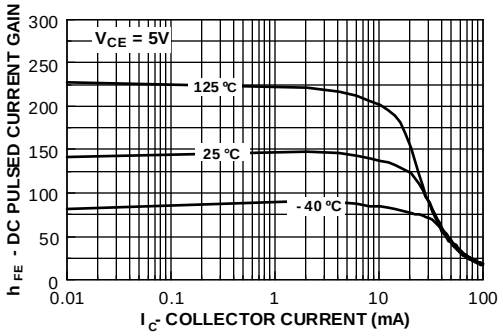
## Electrical Characteristics
TA = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min | Max | Units |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| $V_{(BR)CEO}$ | Collector-Emitter Sustaining Voltage* | $I_C$ = 1.0 mA, $I_B$ = 0 | 25 | | V |
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage | $I_C$ = 100 µA, $I_E$ = 0 | 30 | | V |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage | $I_E$ = 10 µA, $I_C$ = 0 | 3.0 | | V |
| $I_{CBO}$ | Collector Cutoff Current | $V_{CB}$ = 25 V, $I_E$ = 0 | | 100 | nA |
| $I_{EBO}$ | Emitter Cutoff Current | $V_{EB}$ = 2.0 V, $I_C$ = 0 | | 100 | nA |
| **ON CHARACTERISTICS** | | | | | |
| $h_{FE}$ | DC Current Gain | $I_C$ = 4.0 mA, $V_{CE}$ = 10 V | 60 | | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C$ = 4.0 mA, $I_B$ = 0.4 mA | | 0.5 | V |
| $V_{BE(on)}$ | Base-Emitter On Voltage | $I_C$ = 4.0 mA, $V_{CE}$ = 10 V | | 0.95 | V |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | |
| $f_T$ | Current Gain - Bandwidth Product | $I_C$ = 4.0 mA, $V_{CE}$ = 10 V, f = 100 MHz | 650 | | MHz |
| $C_{cb}$ | Collector-Base Capacitance | $V_{CB}$ = 10 V, $I_E$ = 0, f = 1.0 MHz | | 0.7 | pF |
| $C_{rb}$ | Common-Base Feedback Capacitance | $V_{CB}$ = 10 V, $I_E$ = 0, f = 1.0 MHz | 0.6 | 0.9 | pF |
| rb'$C_c$ | Collector Base Time Constant | $I_C$ = 4.0 mA, $V_{CB}$ = 10 V, f = 31.8 MHz | | 9.0 | pS |

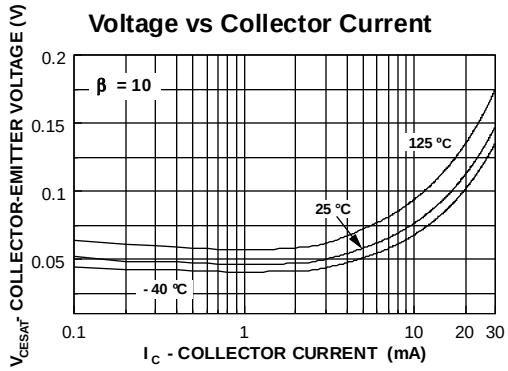
*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

## DC Typical Characteristics

**DC Current Gain vs Collector Current**

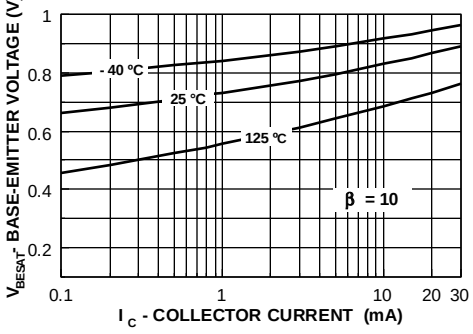



**Collector-Emitter Saturation Voltage vs Collector Current**

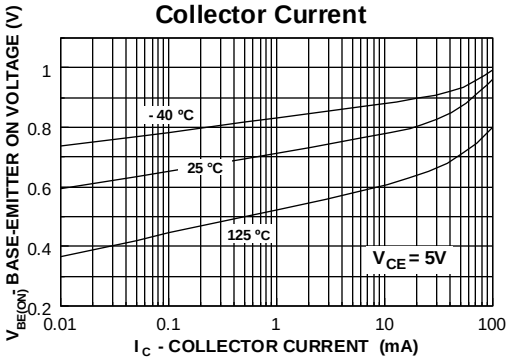


## DC Typical Characteristics (continued)

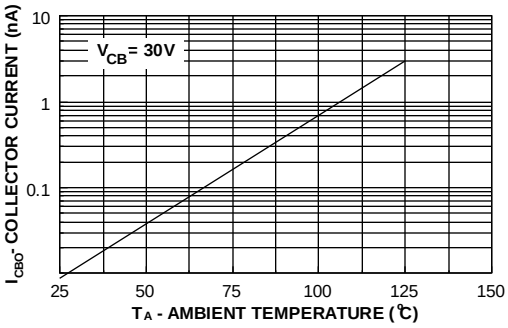
**Base-Emitter Saturation Voltage vs Collector Current**




**Base-Emitter ON Voltage vs Collector Current**

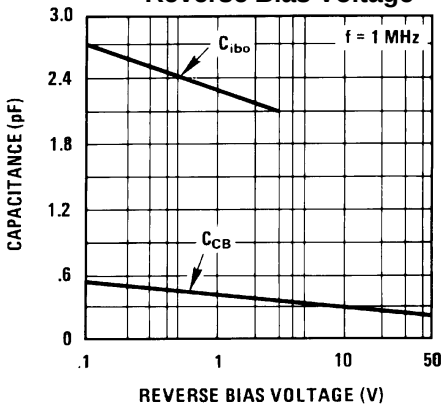



**Collector-Cutoff Current vs Ambient Temperature**

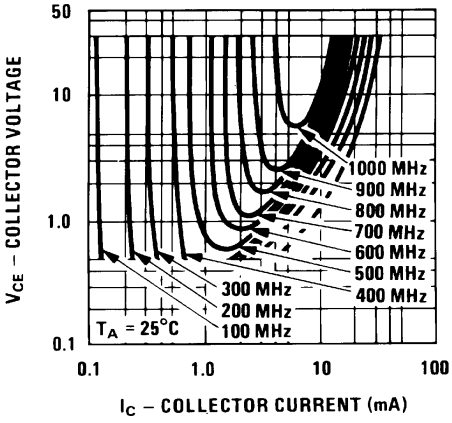



## AC Typical Characteristics

**Capacitance vs. Reverse Bias Voltage**

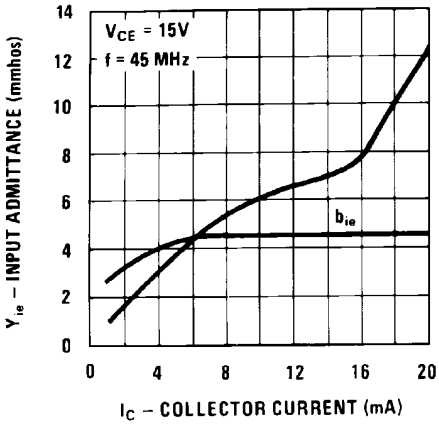



**Contours of Constant Gain Bandwidth Product ($f_T$)**

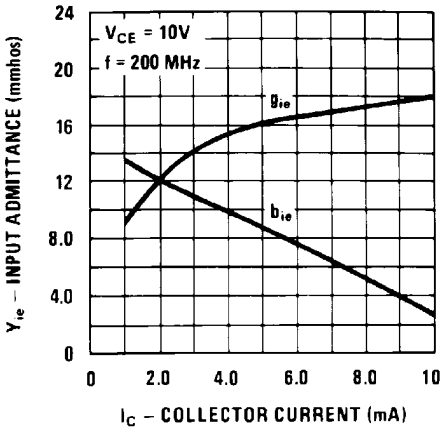


## Common Emitter Y Parameters

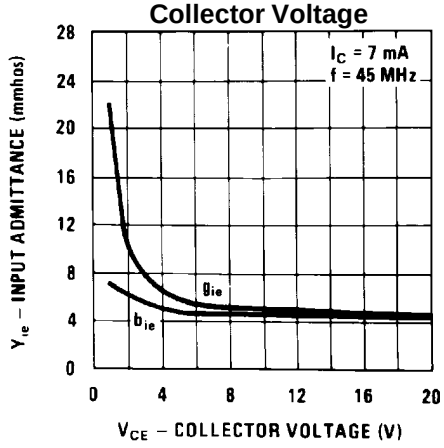
### Input Admittance vs. Collector Current



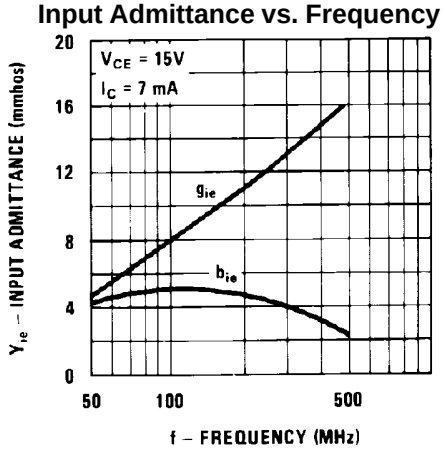

### Input Admittance vs. Collector Current



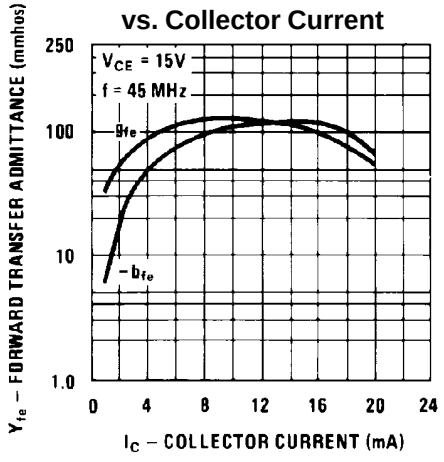

### Input Admittance vs. Collector Voltage



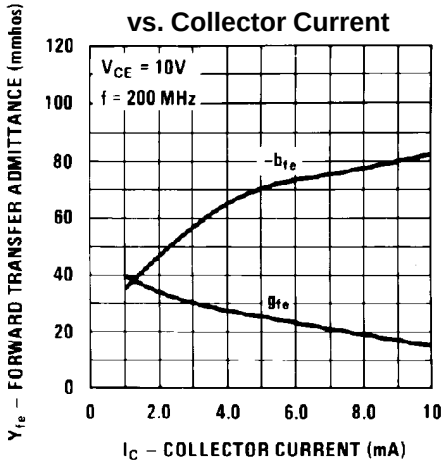

### Input Admittance vs. Frequency




### Forward Transfer Admittance vs. Collector Current

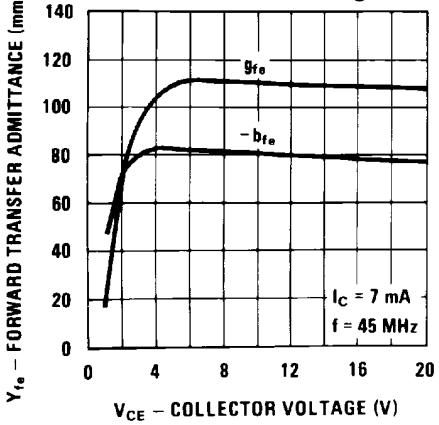



### Forward Transfer Admittance vs. Collector Current

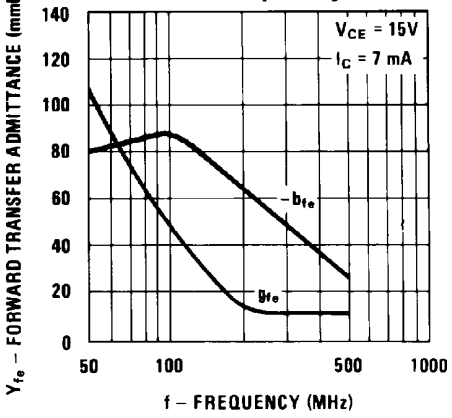


## Common Emitter Y Parameters (continued)

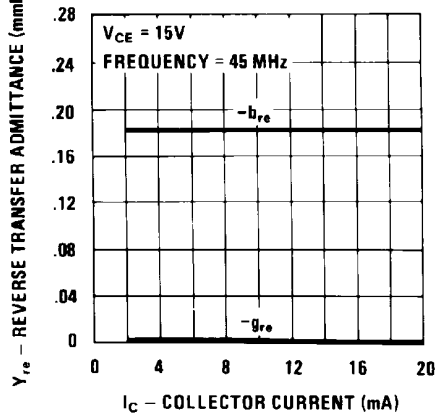
### Forward Transfer Admittance vs. Collector Voltage



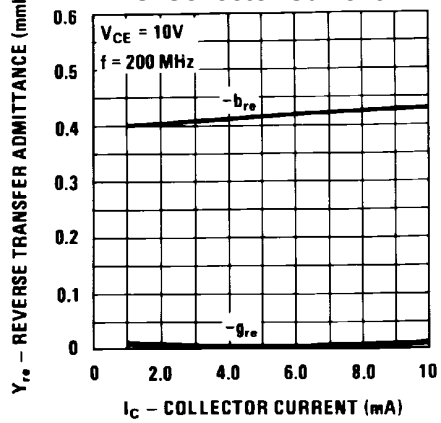

### Forward Transfer Admittance vs. Frequency



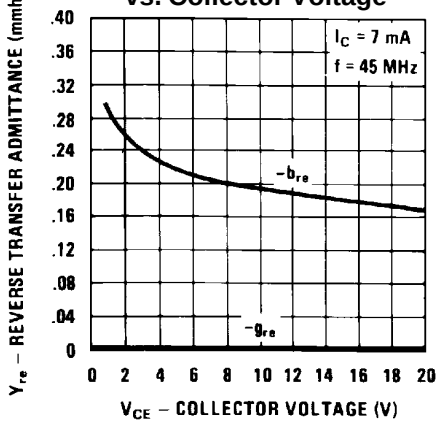

### Reverse Transfer Admittance vs. Collector Current



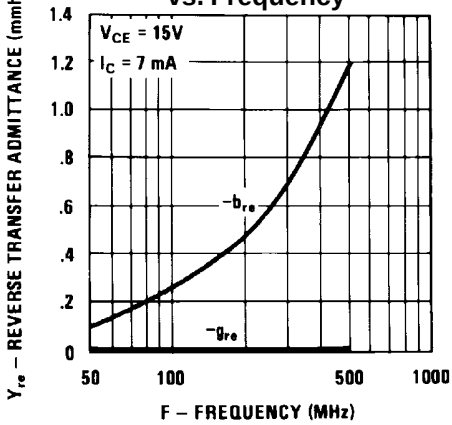

### Reverse Transfer Admittance vs. Collector Current




### Reverse Transfer Admittance vs. Collector Voltage

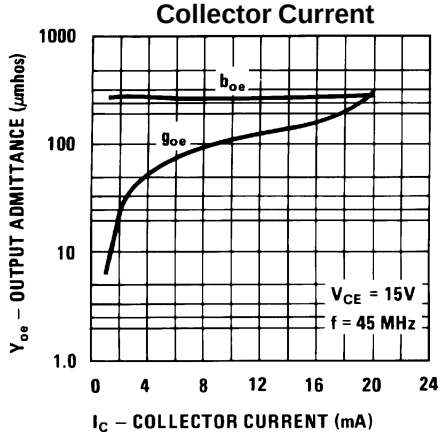



### Reverse Transfer Admittance vs. Frequency

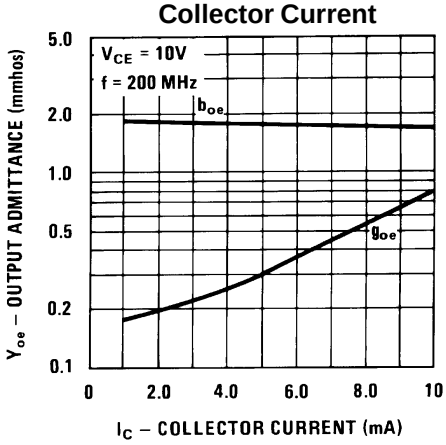


## Common Emitter Y Parameters (continued)

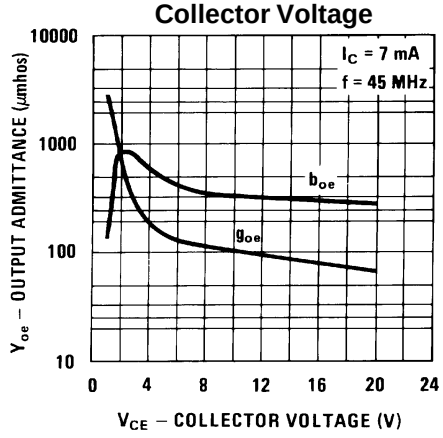
### Output Admittance vs. Collector Current



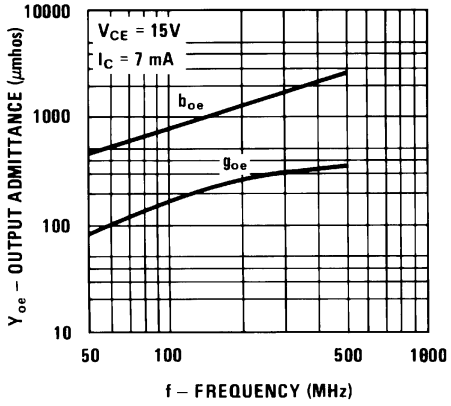

### Output Admittance vs. Collector Current



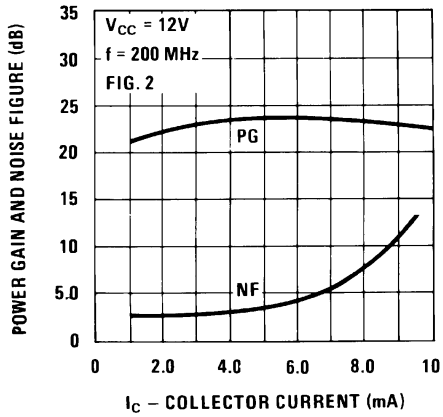

### Output Admittance vs. Collector Voltage



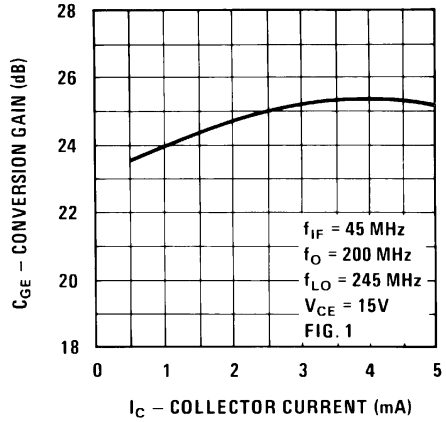

### Output Admittance vs. Frequency



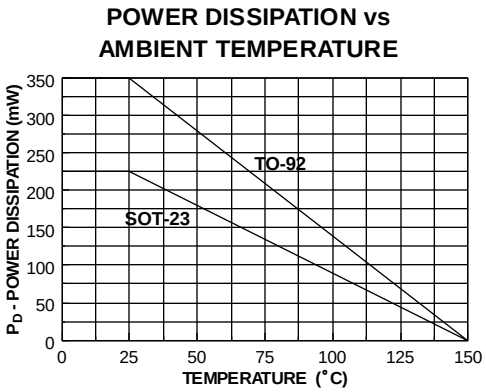

### Power Gain and Noise Figure vs. Collector Current




### Conversion Gain vs. Collector Current



## AC Typical Characteristics




## Test Circuits

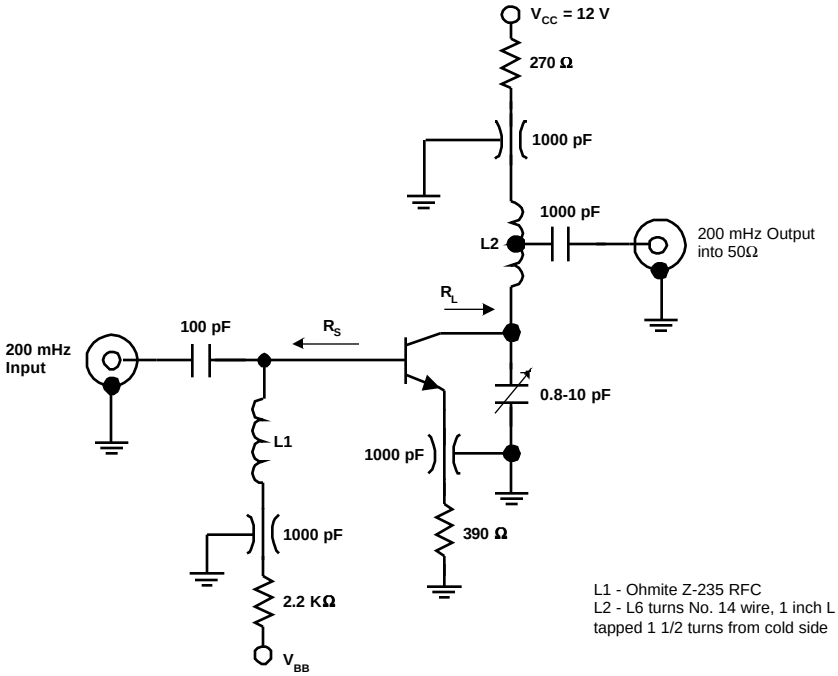



**FIGURE 1: Unneutralized 200 MHz PG NF Test Circuit**

## Test Circuits (continued)

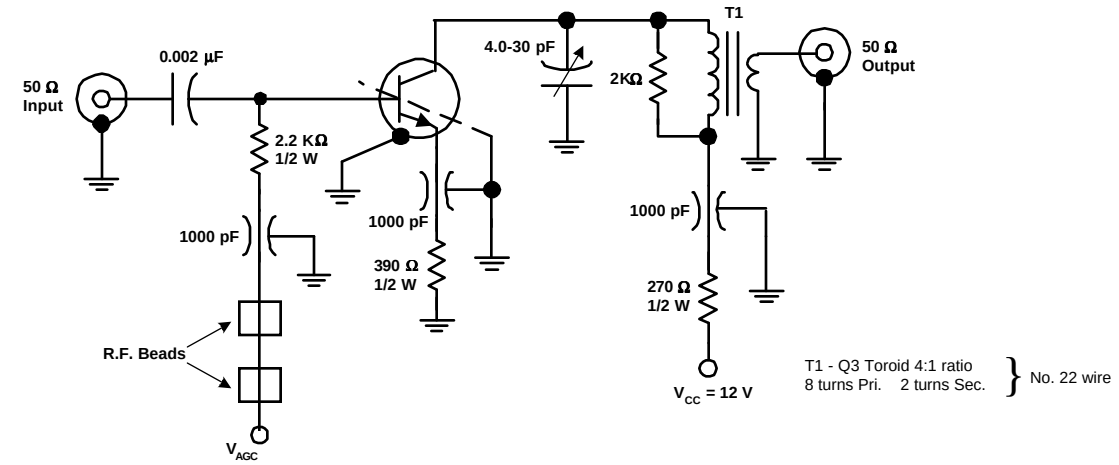



**FIGURE 2: 45 MHz Power Gain Circuit**

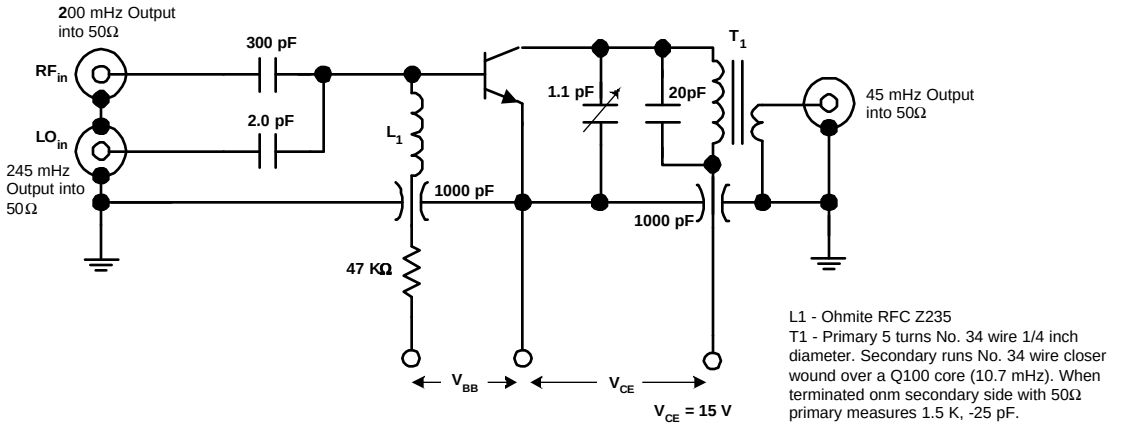



**FIGURE 3: 200 MHz Conversion Gain Test Circuit**