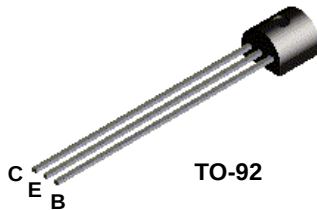
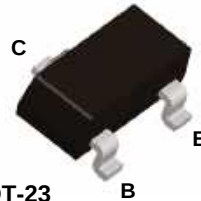


MPSH10



TO-92

MMBTH10



SOT-23
Mark: 3E

NPN RF Transistor

This device is designed for use in low noise UHF/VHF amplifiers, with collector currents in the 100 μ 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 _{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
		MPSH10	*MMBTH10	
P _D	Total Device Dissipation	350	225	mW
	Derate above 25°C	2.8	1.8	mW/°C
R _{θJC}	Thermal Resistance, Junction to Case	125		°C/W
R _{θJA}	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
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OFF CHARACTERISTICS

$V_{(BR)CEO}$	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	$I_C = 4.0 \text{ mA}, V_{CE} = 10 \text{ V},$ $f = 100 \text{ MHz}$	650		MHz
C_{cb}	Collector-Base Capacitance	$V_{CB} = 10 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$		0.7	pF
C_{fb}	Common-Base Feedback Capacitance	$V_{CB} = 10 \text{ V}, I_E = 0, f = 1.0 \text{ MHz}$	0.35	0.65	pF
$\tau_b \cdot C_c$	Collector Base Time Constant	$I_C = 4.0 \text{ mA}, V_{CB} = 10 \text{ V},$ $f = 31.8 \text{ MHz}$		9.0	pS

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

Spice Model

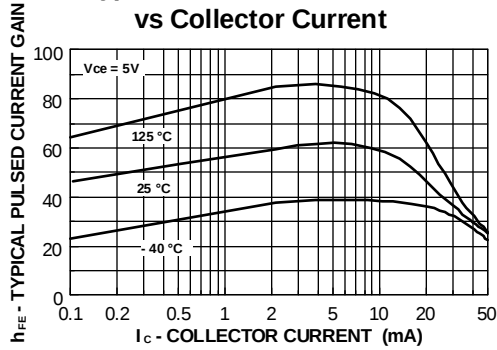
NPN (Is=69.28E-18 Xti=3 Eg=1.11 Vaf=100 Bf=308.6 Ne=1.197 Ise=69.28E-18 Ikf=22.83m Xtb=1.5 Br=1.11 Nc=2 Isc=0 Ikr=0 Rc=4 Cjc=1.042p Mjc=.2468 Vjc=.75 Fc=.5 Cje=1.52p Mje=.3223 Vje=.75 Tr=1.558n Tf=135.8p Itf=.27 Vtf=10 Xtf=30 Rb=10)

NPN RF Transistor (continued)

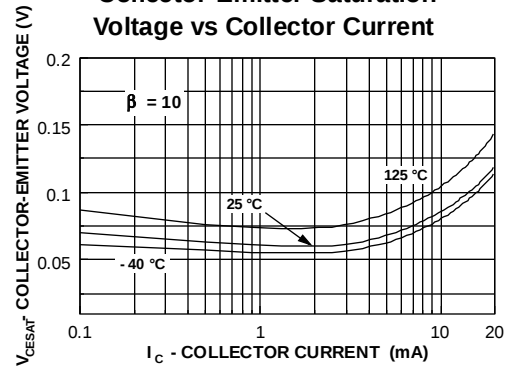
MPSH10 / MMBTH10

Typical Characteristics

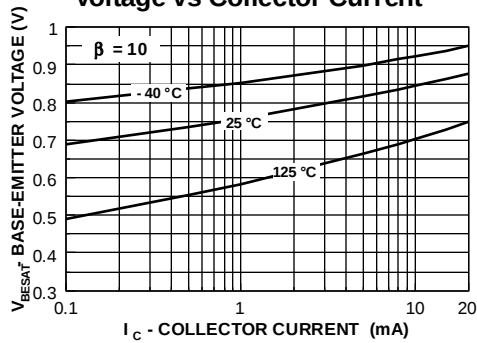
Typical Pulsed Current Gain
vs Collector Current



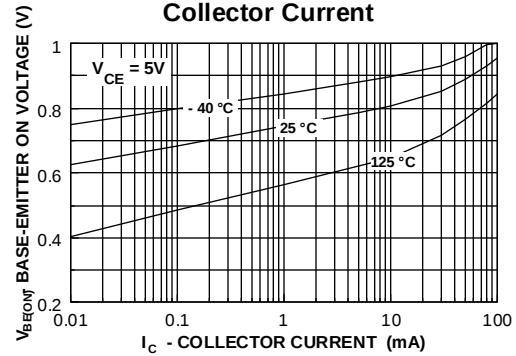
Collector-Emitter Saturation
Voltage vs Collector Current



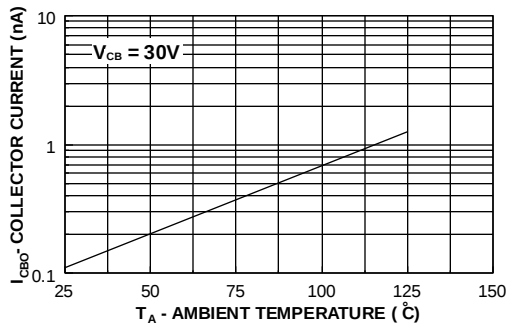
Base-Emitter Saturation
Voltage vs Collector Current



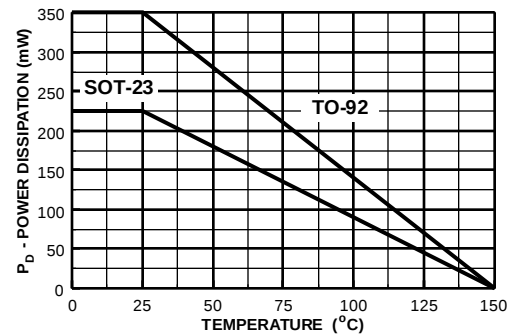
Base-Emitter ON Voltage vs
Collector Current



Collector-Cutoff Current
vs Ambient Temperature

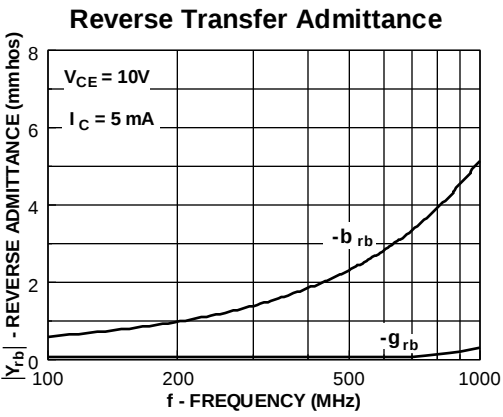
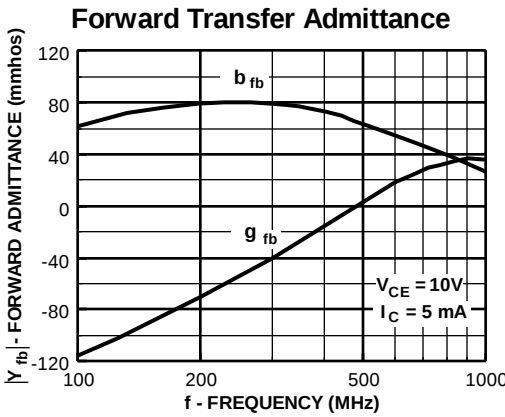
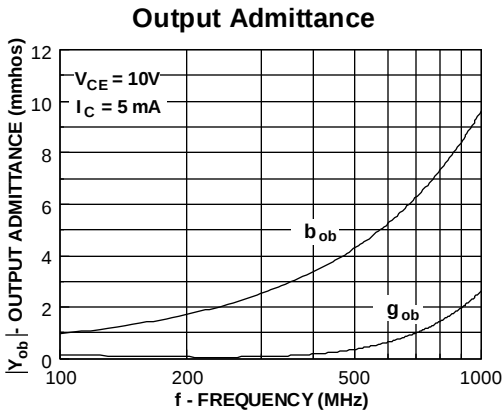
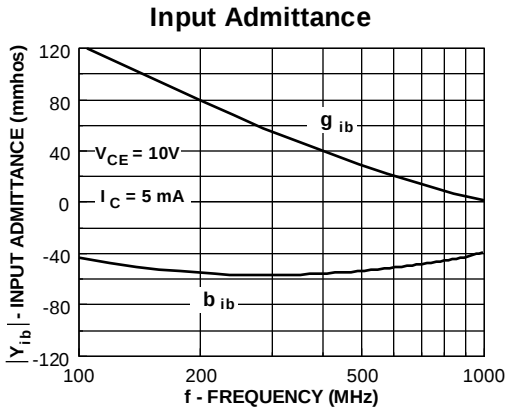


Power Dissipation vs
Ambient Temperature



NPN RF Transistor
(continued)

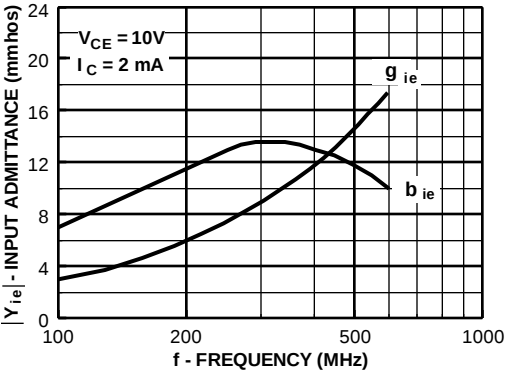
Common Base Y Parameters vs. Frequency



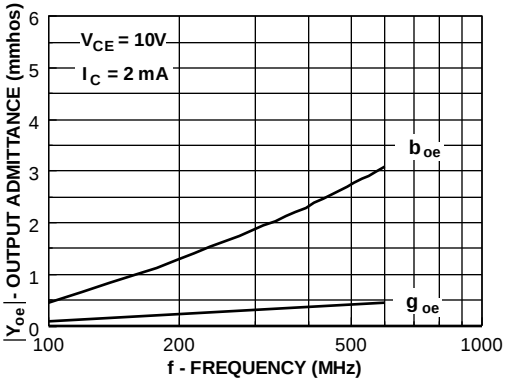
NPN RF Transistor
(continued)

Common Emitter Y Parameters vs. Frequency

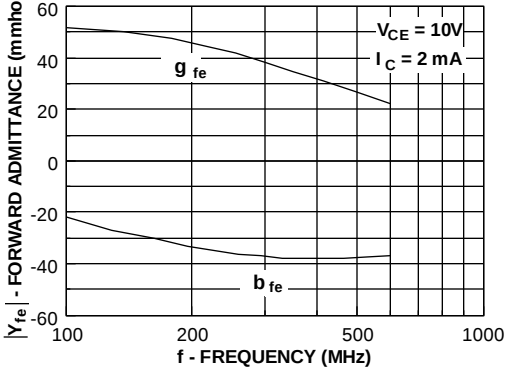
Input Admittance



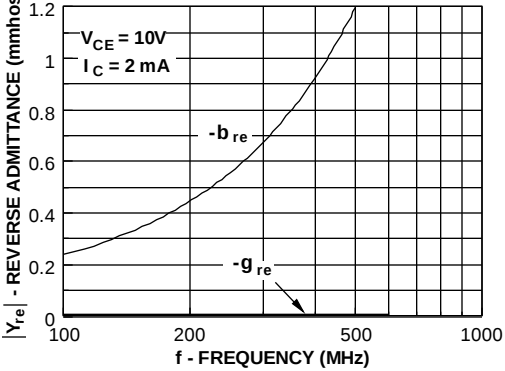
Output Admittance



Forward Transfer Admittance



Reverse Transfer Admittance



100 MHz oscillator circuit schematic. The circuit includes a 12V VCC supply, a 2.0 KΩ resistor, a 10 KΩ resistor, and a 680 Ω resistor. It features two transformers, T1 and T2, with various capacitors (1000 pF, 0.8-10 pF, 2.0 pF, 100 pF) and inductors (L1, L2, L3). A 50 Ω input is connected to the circuit. The output is taken from the secondary of T2 through a 100 pF capacitor and a 1000 pF capacitor. The circuit is powered by a 12V VCC supply.

Legend:

- L1 - L3 turns No. 16 wire, 1/2 inch L x 1/4 inch ID tapped 1 1/2 turns from cold side
- L2 - L6 turns No. 14 wire, 1 inch L x 1/4 inch ID tapped 1 1/2 turns from cold side
- T1 - Pri. 1 turn No. 16 wire
- Sec. 1 turn No. 18 wire

500 mHz Output into 50Ω

NOTE 1: 2 turns No. 16 AWG wire, 3/8 inch OD, 1 1/4 inch long
 NOTE 2: 9 turns No. 22 AWG wire, 3/16 inch OD, 1/2 inch long

FIGURE 2: 500 MHz Oscillator Circuit