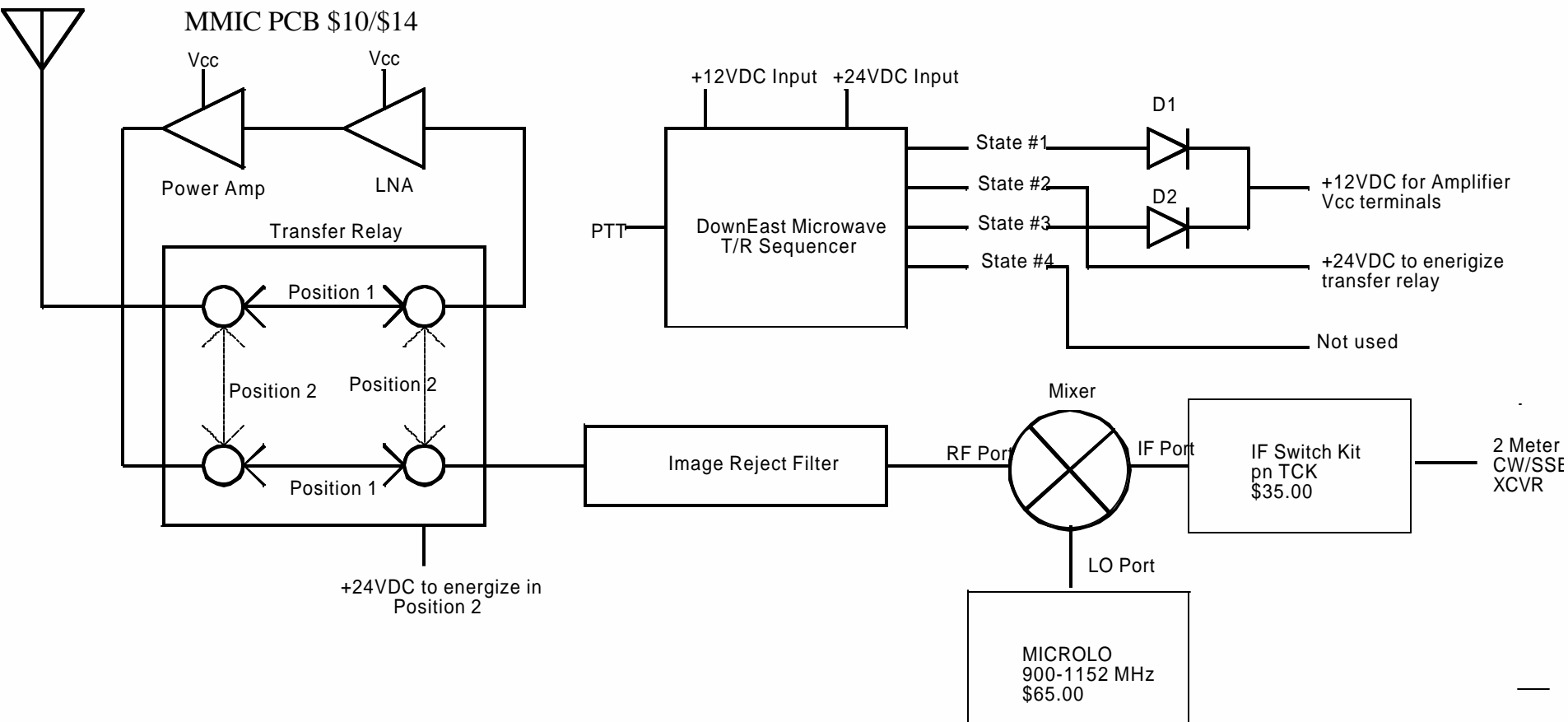
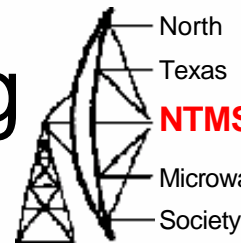


Transverter 102

Al Ward

W5LUA

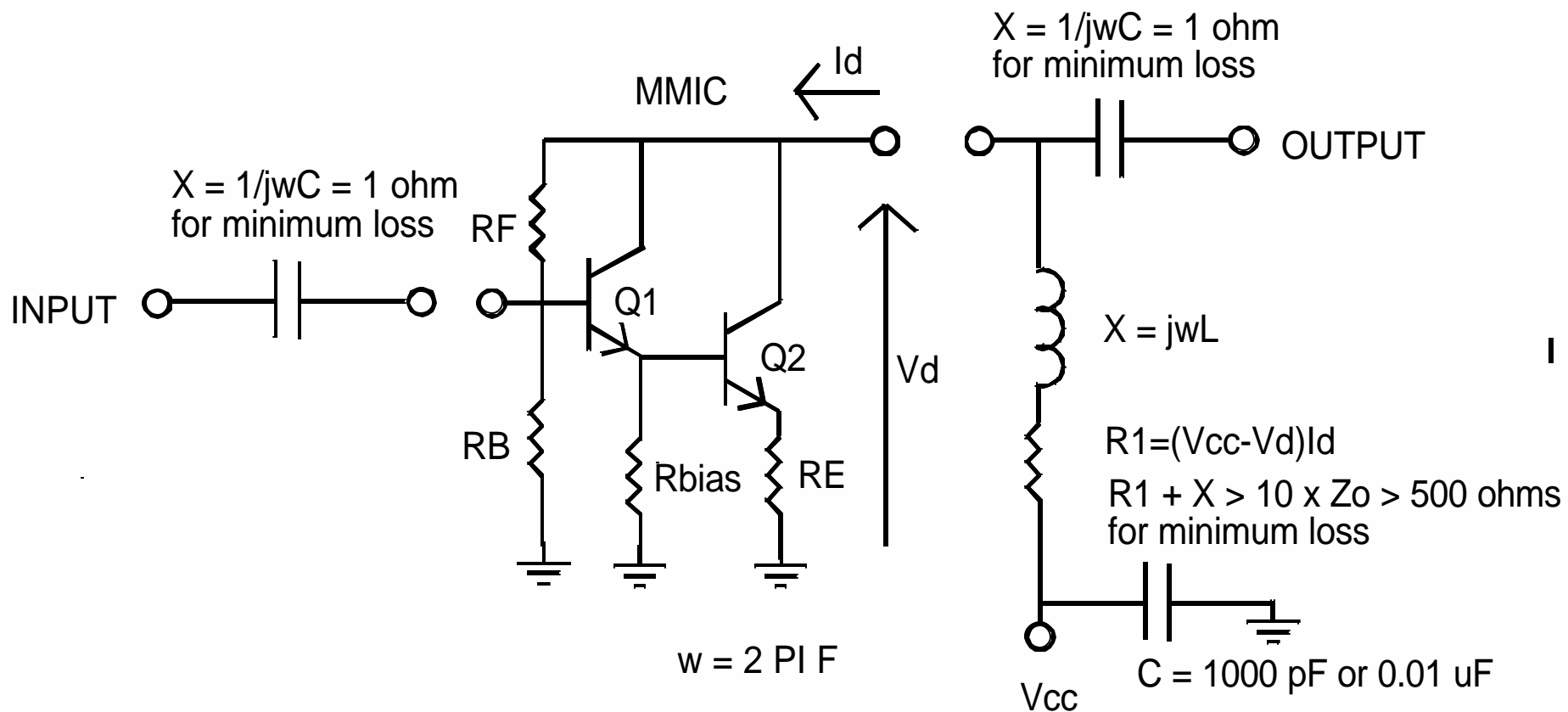
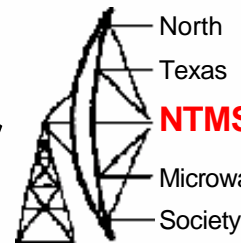
Building a Basic Transverter Using the Modular Approach from DEMI



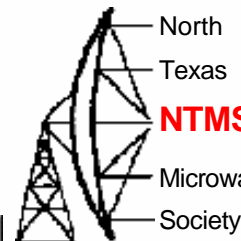
What is an MMIC?

- Monolithic Microwave Integrated Circuit
- Usually 2 or more fets or bipolar junction transistors in cascade or series
- Usually dc coupled internally
- Internally biased for best performance
- Requires external blocking capacitors to isolate from neighboring stages
- Usually requires RF choke to bias device
- Some require current limiting resistor

Silicon Bipolar MMIC Amplifier



Using MMIC Amplifiers



AppCAD - [I-Biased Circuit]

File Calculate Select Parameters Options Help

Main Menu [F8]

Current-Biased Circuit

Frequency

F low

1000 MHz

Calculate [F4]

Design Rule (loss per blocking cap)

☐ 0.01 dB

☒ 0.1 dB (default)

☐ 0.25 dB

☐ 0.5 dB

Note: Click on Cin, Cout to toggle in/out or use Menu Alt-S

Circuit Diagram:

Input: $Z_0 = 50 \Omega$, $C_{in} = 10 \text{ pF}$

MMIC Amplifier: $\theta_{TC} = 125 \text{ } ^\circ\text{C/W}$, $\partial V_d / \partial T = -8 \text{ mV/}^\circ\text{C}$

Biasing: $R_{bias} = 110 \Omega$, $V_s = 12 \text{ V}$, $C_b = 620 \text{ pF}$, I_d

Output: $C_{out} = 10 \text{ pF}$, Z_0

Voltage Levels:

$V_d = \begin{cases} 6.6 \text{ V Max} \\ 5.5 \text{ V Typ} \\ 4.4 \text{ V Min} \end{cases}$

Id Design Goal = 60 mA

Tcase = -25 25 85 $^\circ\text{C}$

Id and Thermal Analysis:

Tcase =	-25 $^\circ\text{C}$	25 $^\circ\text{C}$	85 $^\circ\text{C}$	
$T_j =$	13.1	65.6	129.1	$^\circ\text{C}$
$P_d =$	305.0	325.0	352.8	mW
$I_d \text{ max} =$	65.5	69.1	73.5	mA
$I_d \text{ typ} =$	55.5	59.1	63.5	mA
$I_d \text{ min} =$	45.5	49.1	53.5	mA

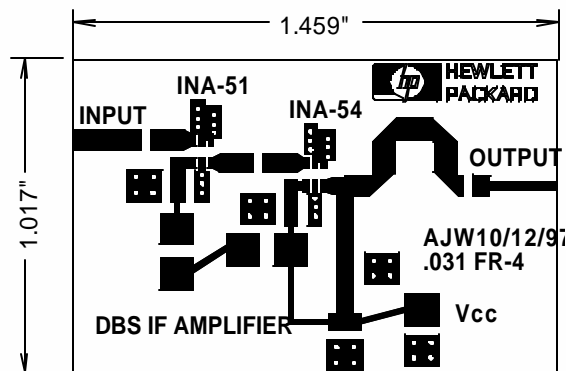
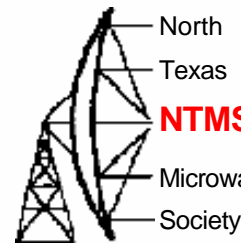
Bias loss = 0.23 dB Pd of Rbias = 593.5 mW

Normal

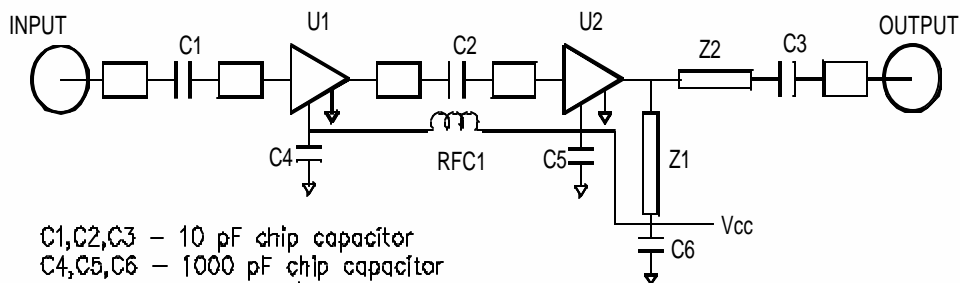
Click for Web: APPLICATION NOTES · MODELS · DESIGN TIPS · DATA SHEETS · S-PARAMETERS

Download at <http://www.semiconductor.agilent.com/>

INA-51063/INA-54063 DBS IF Amplifier

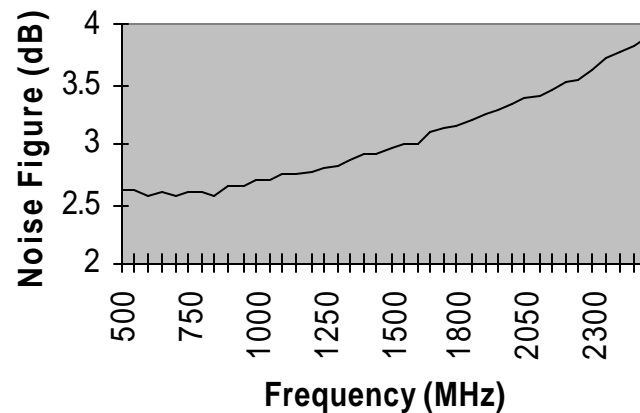
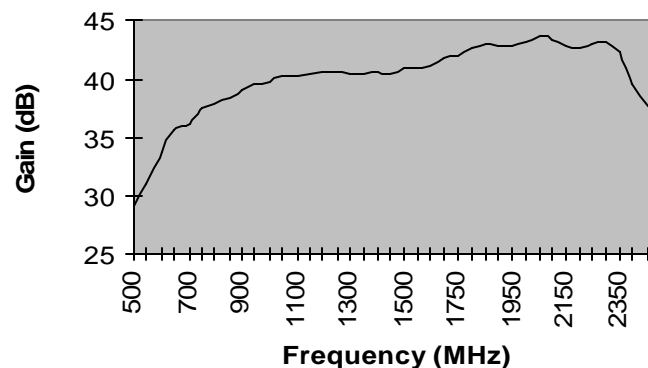


PCB = FR-4
H=.031 inch



C1,C2,C3 - 10 pF chip capacitor
C4,C5,C6 - 1000 pF chip capacitor
RFC1 - 0.33 uH RFC (Coilcraft 1008CS-331)
U1 - Hewlett-Packard INA-51063 MMIC
U2 - Hewlett-Packard INA-54063 MMIC
Z1,Z2 - Matching Network

INA-51063/54063 GAIN WITH MODIFIED
GROUNDS

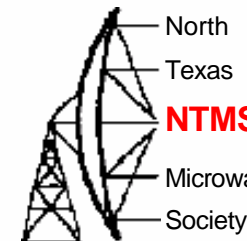


Ref: HP Application Note AN 1139

How far on milliwatts?

- 50 MHz - N6CA has worked several thousand miles on 10 mW
- 144 MHz - W5LUA has worked over 200 miles on SSB with 100 mW
- 3456 MHz - WA5VJB has worked 170 miles with 10 mW
- 10368 MHz - W5HN has worked 30 miles with 100 uW
- 24192 MHz - W5LUA and AA5C have worked at 6 miles with 30uW

DownEast Microwave Transverter Kits



Frequency	IF	Low Power	LP Kit Price	High Power	HP Kit Price*
50 MHz	28 MHz	300mW, pcb kit only	170.00	20W	295.00
144 MHz	28 MHz	300mW, pcb kit only	170.00	25W	295.00
222 MHz	28 MHz	300mW, pcb kit only	170.00	25W	295.00
432 MHz	28 MHz	100mW, pcb kit only	170.00	30W	325.00
902 MHz	144 MHz	10 mW, pcb kit only	195.00	10W	295.00
1296 MHz	144 MHz	10 mW, pcb kit only	175.00	3W	295.00
2304 MHz	144 MHz	20 mW, pcb kit only	160.00	1W	300.00
3456 MHz	144 MHz	20 mW, pcb kit only	160.00	1W	300.00
5760 MHz	144 MHz	10 mW, pcb kit only	135.00	2W	350.00
10368 MHz	144 MHz	>5 mW, pcb kit only	230.00	>5mW	275.00

Note * Includes machined enclosure and connectors