MRF300A/BN

1.8 – 150 MHz Two Tone CW

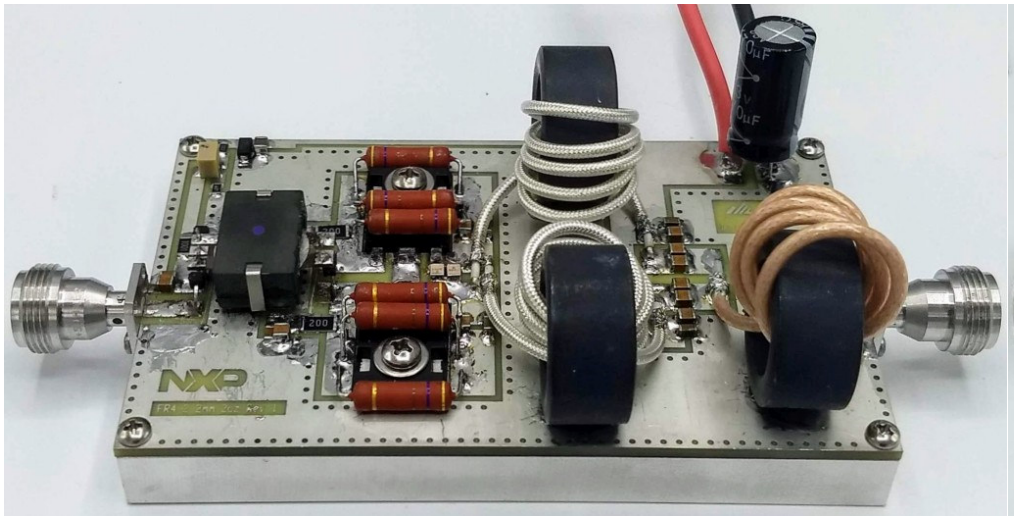
MAR 18, 2019

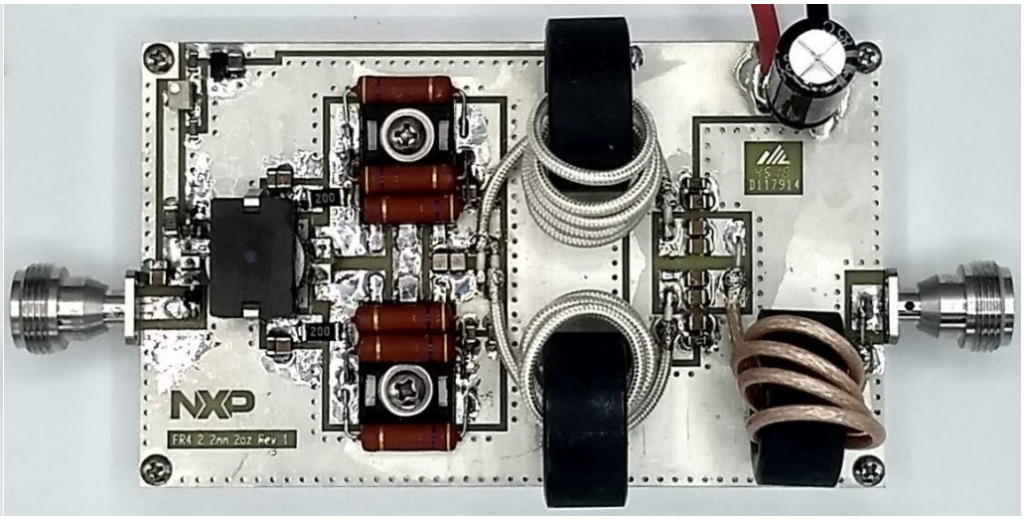
SECURE CONNECTIONS
FOR A SMARTER WORLD

Specifications

- Drain voltage: V_{DD} = 50 V
- Quiescent current: I_{DQ} = 500 mA
- Test signal: Two tone CW, 10 KHz tone spacing
- Test frequencies: 1.8, 3.5, 7, 10, 20, 30, 50, 100, 150 MHz
- Pout = 200 W Average (400W PEP)
  - Gain > 17 dB
  - IRL < -8 dB
  - Eff > 34%
  - IM3_L/U: < -24 dBc (below 1 tone, ie -30 dBc below PEP)

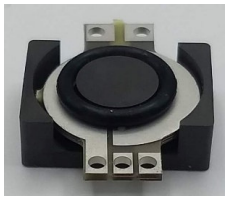
Assembly





Assembly – input transformer (T1)

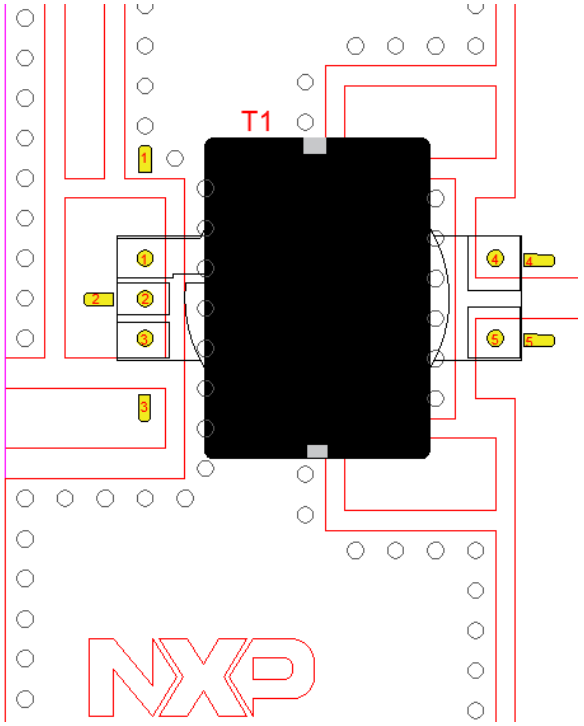
Step 1: Put first O-ring on EQ core



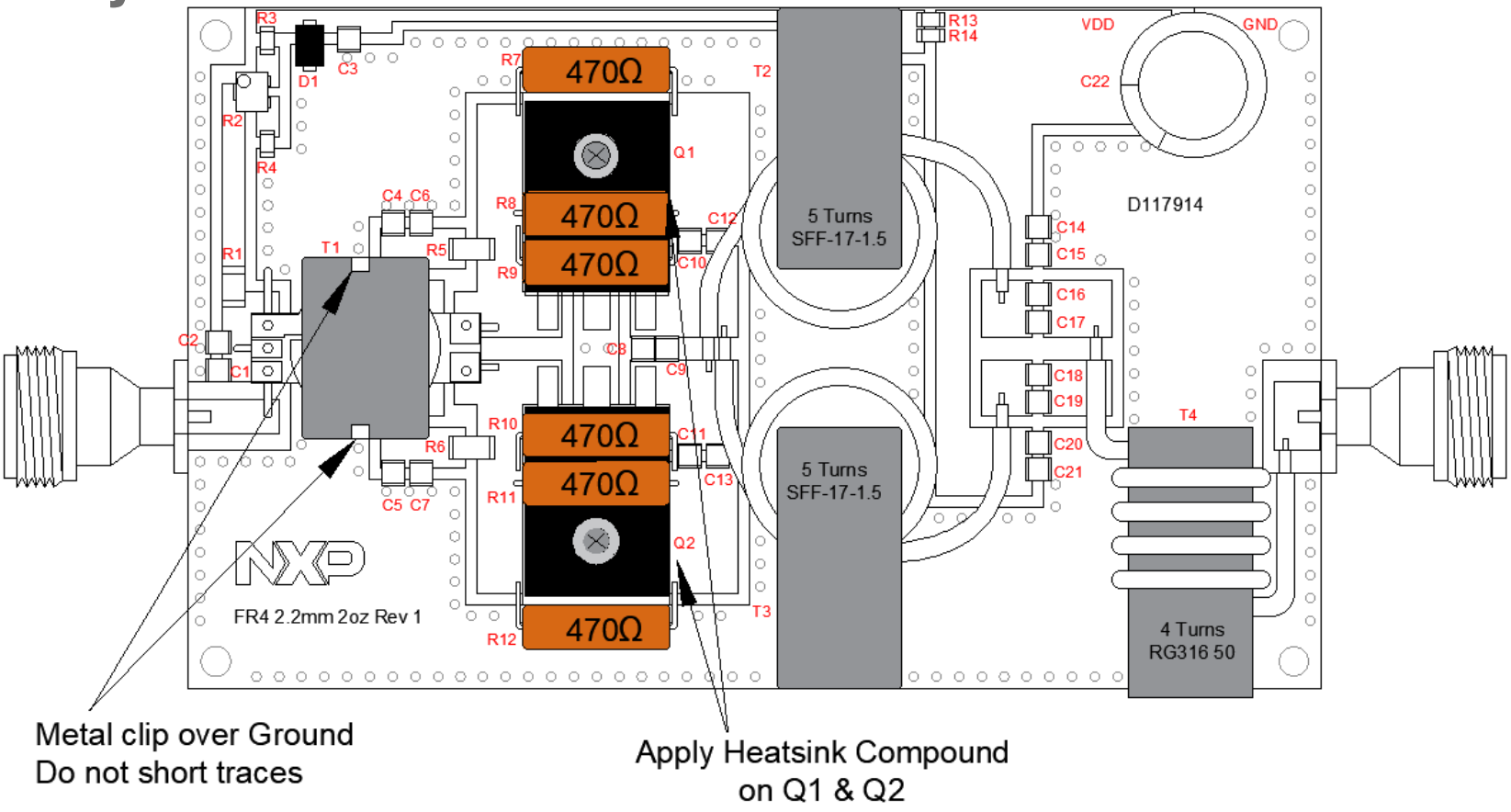
Step 2: Put planar balun (M204548) and second O-ring on EQ core

Step 3: Put plate on top of EQ core

Step 3: Firmly press the whole assembly together and put the clip on until you hear “click” on both edges.



Assembly


R3
D1
C3
R7
470Ω
T2
R2
Q1
R4
C4 C6
R8
470Ω
C12
R1
T1
R5
470Ω
C10
R9
C2
C1
C8
C9
R10
470Ω
C11
R6
C13
C5 C7
R11
Q2
470Ω
T3
R12
FR4 2.2mm 2oz Rev 1
5 Turns
SFF-17-1.5
5 Turns
SFF-17-1.5
R13
R14
VDD
GND
C22
D117914
C14
C15
C16
C17
C18
C19
C20
C21
T4
4 Turns
RG316 50
Metal clip over Ground
Do not short traces
Apply Heatsink Compound
on Q1 & Q2

Bill of Material

Designator	Description	Part Number	Manufacturer
C1,C6,C7,C10,C11,C15,C16 C17,C18,C19,C20	10,000 pF chip capacitors	200B103KT50XT	ATC
C2,C4,C5	1 µf 50 V chip capacitors	GRM31MR71H105KA88L	Murata
C3	10 µf 50 V chip capacitor	GRM32ER61H106KA12L	Murata
C8,C9	30 pF chip capacitors	100B300JT500XT	ATC
C12,C13,C14,C21	1 µf 100 V chip capacitors	GRM31CR72A105KA01L	Murata
C22	470 uF 63V Electrolytic capacitor	MCGPR63V477M13X26	Multicomp
D1	8.2V Zener Diode	SMAJ4738A	Micro Commercial Co
Q1	LDMOS transistor	MRF300AN	NXP
Q2	LDMOS transistor	MRF300BN	NXP
R1	1K Ω 2010 Chip Resistor	CRCW20101K00FKEF	Vishay
R2	SMT Trim Pot 5K, (12 turn)	3224W-1-502E	Bourns
R3	10 KΩ 1206 Chip Resistor	CRCW120610K0JNEA	Vishay
R4	5.6 KΩ 1206 Chip Resistor	CRCW12065K60FKEA	Vishay
R5,R6	20 Ω 2512 Chip Resistors	CRCW251220R0JNEG	Vishay
R7,R8,R9,R10,R11,R12	470Ω, 5% 3W Metal Film Resistors	PR03000204700JAC00	Vishay
R13,R14	20 KΩ 1206 Chip Resistor	CRCW120620K0FKEA	Vishay
T1 Core 1	79 material EQ core	9579200602	Fair-Rite
T1 Core 2	79 material plate	9379054002	Fair-Rite
T1 PCB	1 to 4 planar balun	M204548	MTL
T1 O-ring, X2	EPDM rubber, ID 0.364", OD 0.504"	1289N112	McMaster-Carr
T1 clip	U shaped clip	1779-1293-ND	Digi-Key
T2,T3,T4 Core	61 material Ferrite Toroid	FT-114A-61	Amidon Inc
T2,T3 Cable	0.059" Dia, 17 Ω, Semi-Flex Coax 15" long, 5 turns	SFF-17-1.5	Suzhou Xiangcheng Zhengxu Wires and
T4 Cable	0.098" Dia, PTFE Jacket, 50 Ω, Semi-Flex Coax RG316U. 13" long, 4 turns	RG316 50 ohm	Belden
PCB	FR4 2.2mm 2 oz	D117914	MTL
Baseplate	A300X500T500D00	RFD190029	Machine Shop

Correlation data

Freq (MHz)	Span (MHz)	POUT (W)	GAIN (dB)	IRL (dB)	EFF (%)	IM3L (dBc)	IM3U (dBc)	ID1 (A)	VD1 (V)
1.8	0.01	200.9	24.6	-8.8	42.4	-34.7	-34.9	9.5	50.0
3.5	0.01	200.2	24.9	-12.5	45.0	-35.9	-35.8	8.9	50.0
7	0.01	200.4	24.9	-14.2	45.9	-40.4	-42.6	8.7	50.0
10	0.01	199.5	24.7	-14.7	45.4	-37.1	-39.3	8.8	50.0
20	0.01	200.0	23.6	-17.2	42.7	-30.2	-31.4	9.4	50.0
30	0.01	200.0	22.3	-19.3	40.1	-27.1	-28.1	10.0	50.0
50	0.01	199.5	20.4	-19.7	35.1	-25.8	-26.7	11.4	50.0
100	0.01	199.5	19.9	-26.5	38.5	-28.6	-29.1	10.4	50.0
150	0.01	200.4	18.7	-13.6	48.6	-28.6	-28.9	8.2	50.0

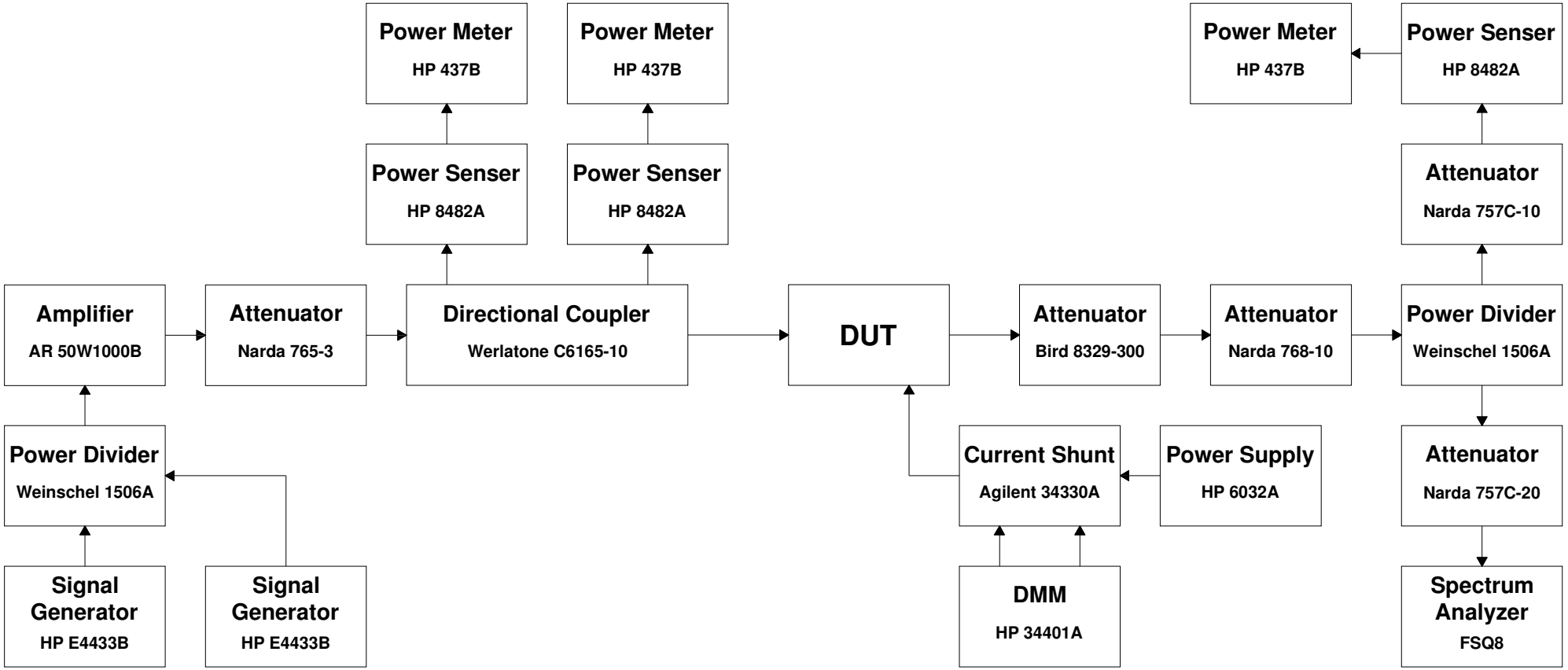
Average power

IMD below 1 tone Per MIL standart

Tuning tips

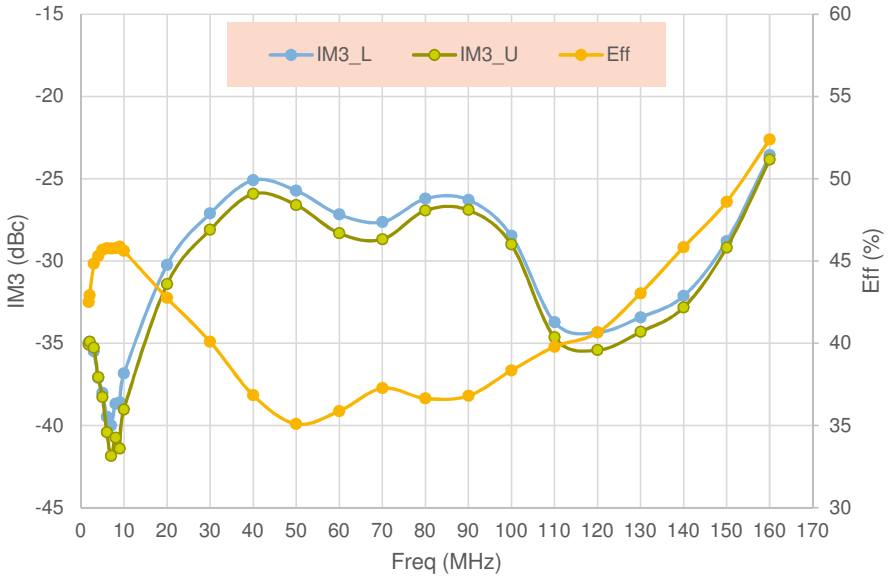
- Set I_{DQ} starts value to 500 mA by adjusting R2
- I_{DQ} affects efficiency and linearity (IM3). Usually higher I_{DQ} gives better linearity and lower efficiency.
- When adjusting R2, the I_{DQ} value should not be lower than 100 mA and higher than 1 A
- R7 – R12 are feedback resistors, they also affect efficiency and linearity. Higher resistor value gives better efficiency and lower linearity.

Test bench Setup



Frequency Sweep

MRF300NA/B push pull
2 tone, Pavg=200W



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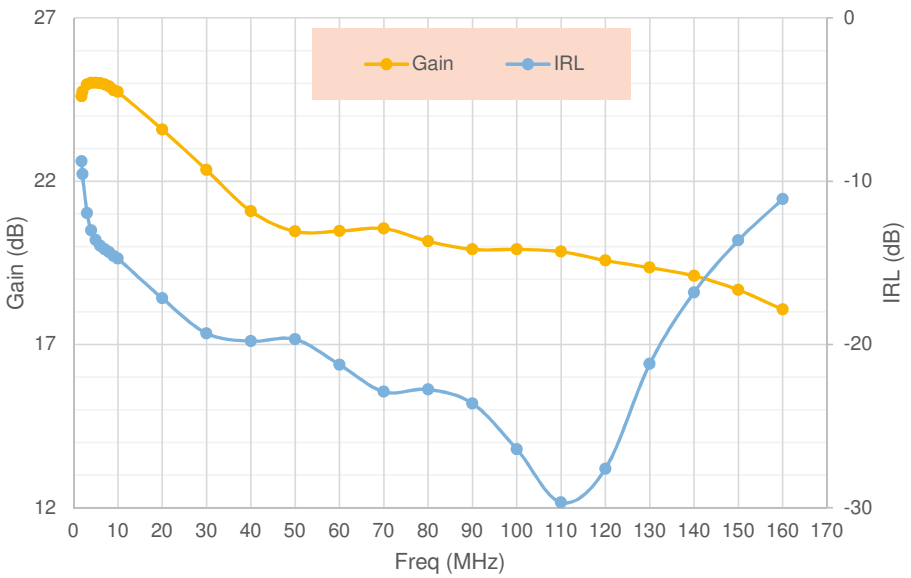

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