

MRF13750H 915 MHz REFERENCE CIRCUIT

ORDERABLE PART NUMBER: **MRF13750H-915MHZ**



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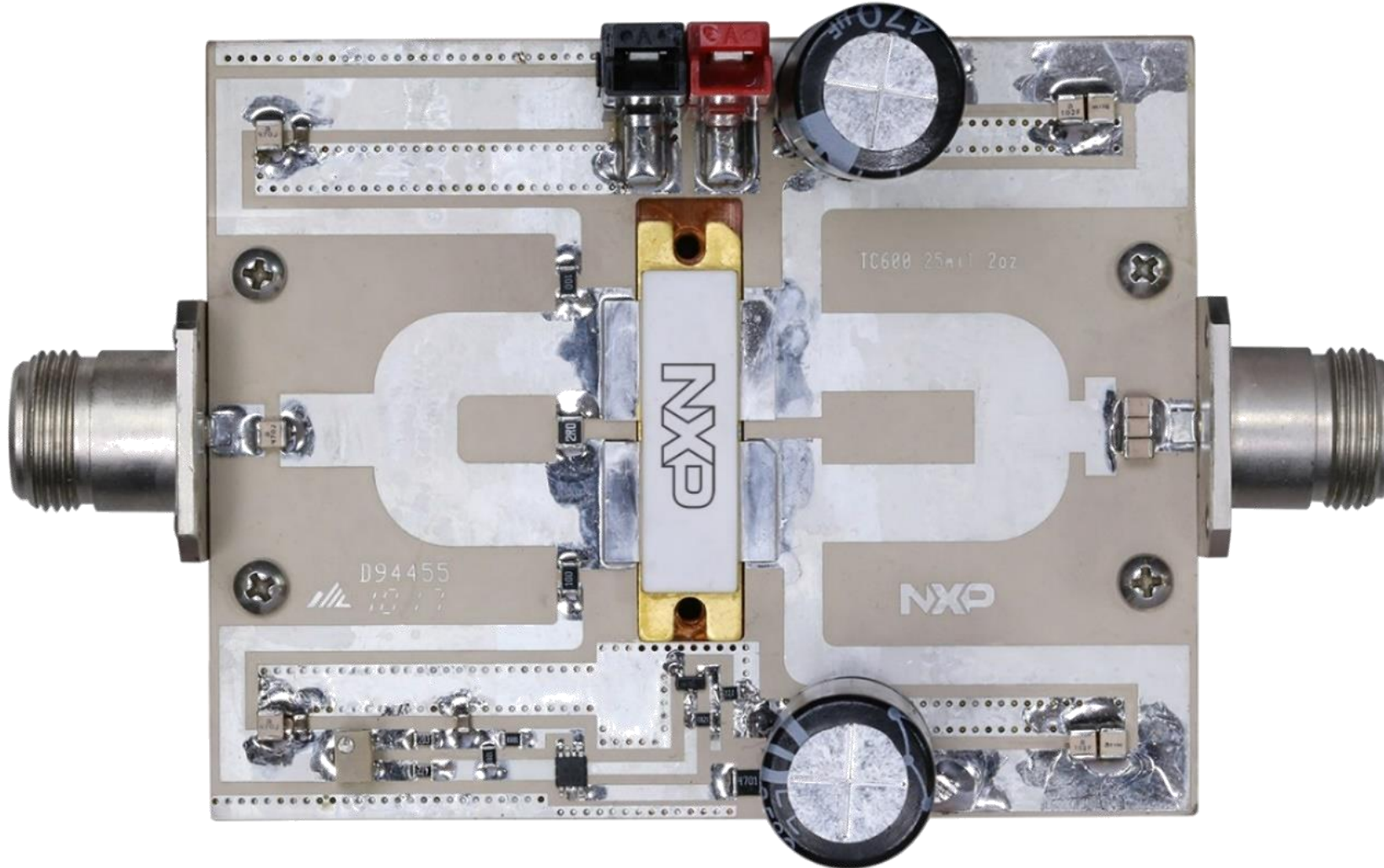
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Introduction

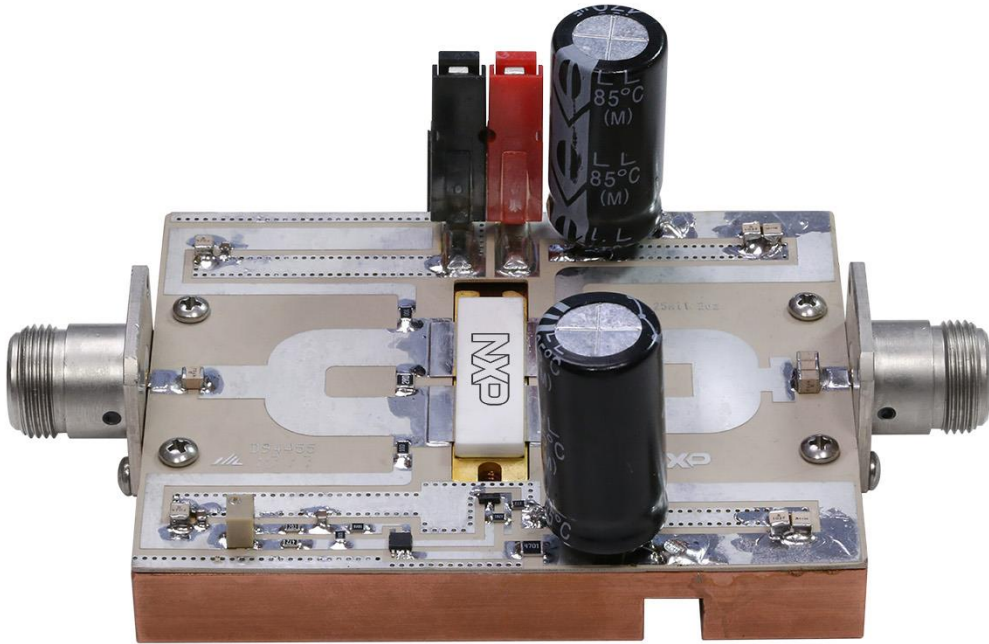
- The NXP MRF13750H is a 700-1300 MHz, 750 W CW RF power LDMOS transistor housed in an NI-1230 air-cavity ceramic package. Its unmatched output allows wide frequency range utilization while its input pre-matching helps simplify PA design.
 - Further details about the device, including its data sheet, are available on www.nxp.com/MRF13750H.
- The following pages describe the 915 MHz reference circuit (evaluation board). Its typical applications are industrial, scientific and medical (ISM), including RF energy.
- The reference circuit can be ordered through NXP's distribution partners and etailers using part number MRF13750H-915MHZ.



Circuit Overview – 7.62 cm x 9.65 cm (3.0" x 3.8")



Assembly Details

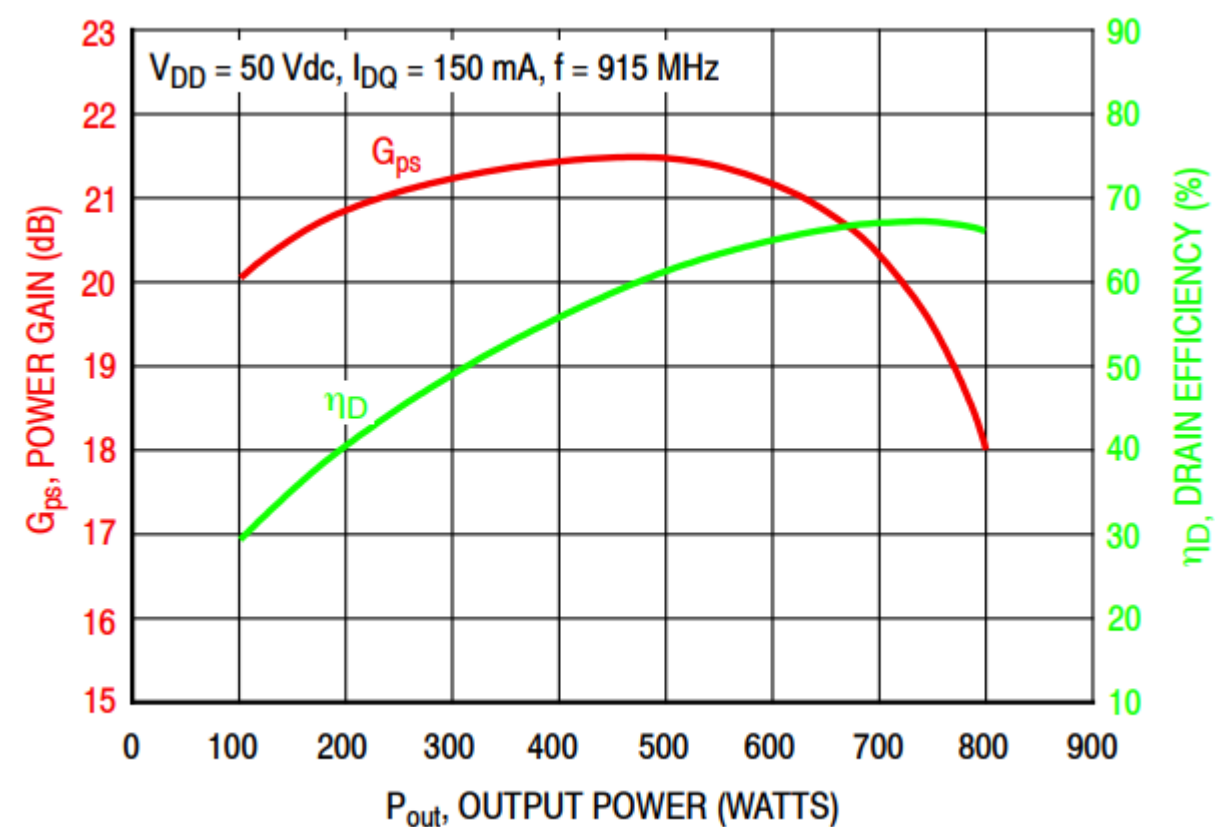
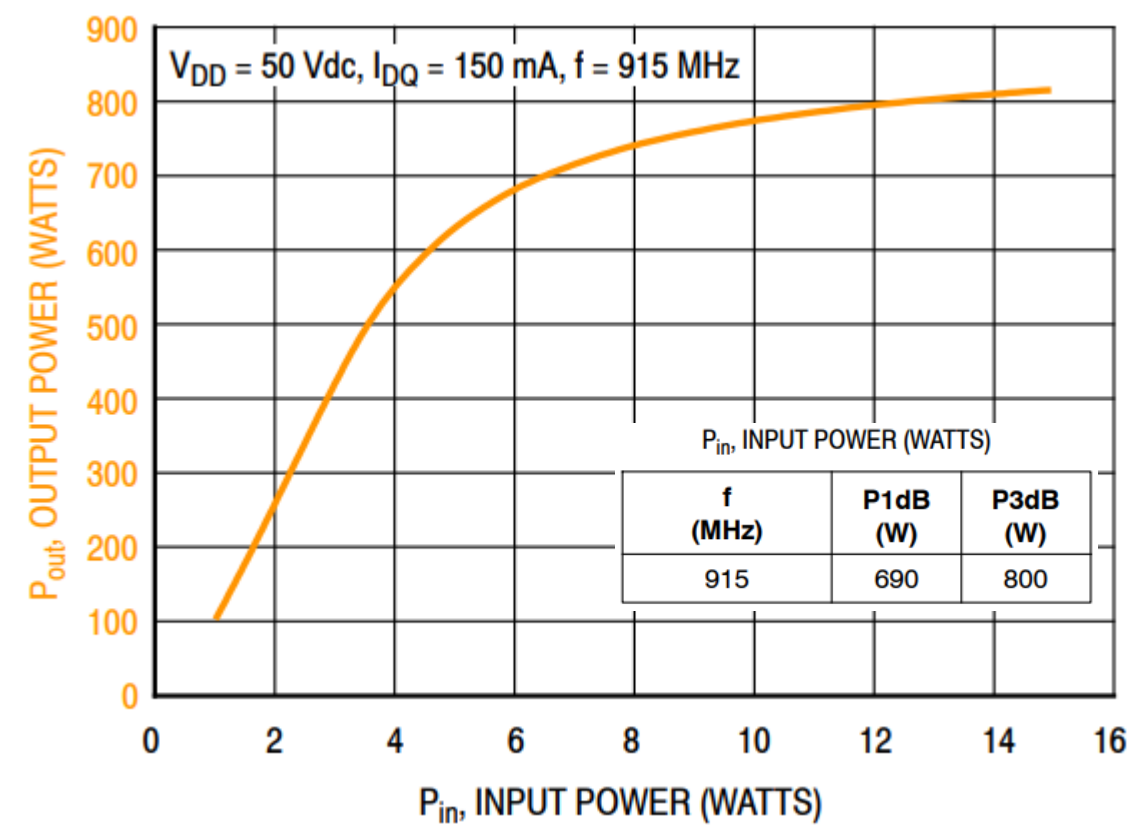


PCB attached to copper baseplate using high temperature solder.
Transistor attached to copper baseplate using low temperature solder.



The wire on the backside of the baseplate connects the second transistor drain.

Typical CW Performance



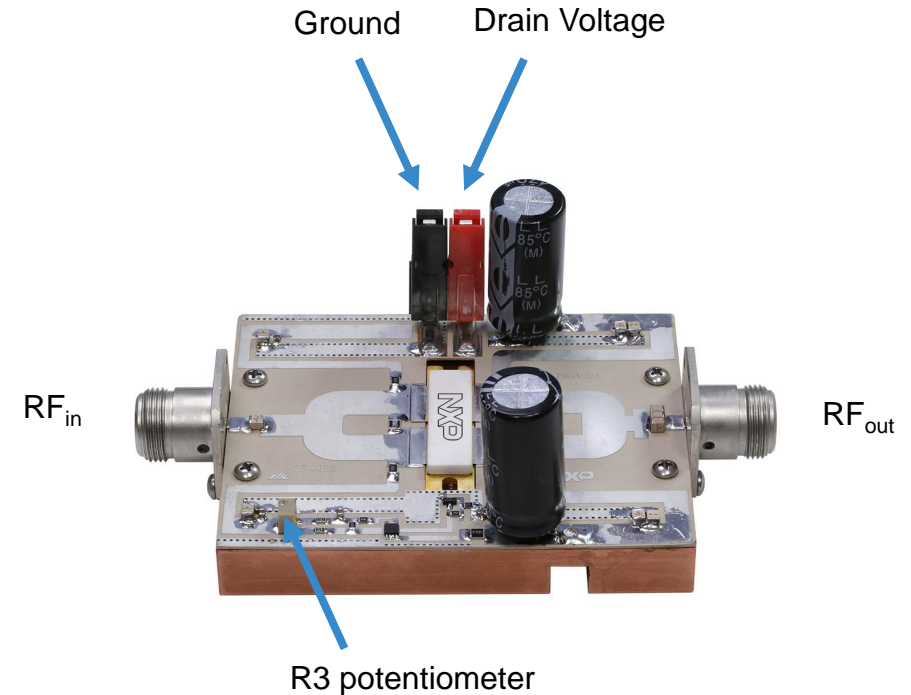
$V_{DD} = 50\text{ Vdc}$, $I_{DQ(A+B)} = 150\text{ mA}$, $P_{in} = 8.8\text{ W}$

Frequency (MHz)	Signal Type	P_{out} (W)	G_{ps} (dB)	η_D (%)
915	CW	750	19.3	67.1

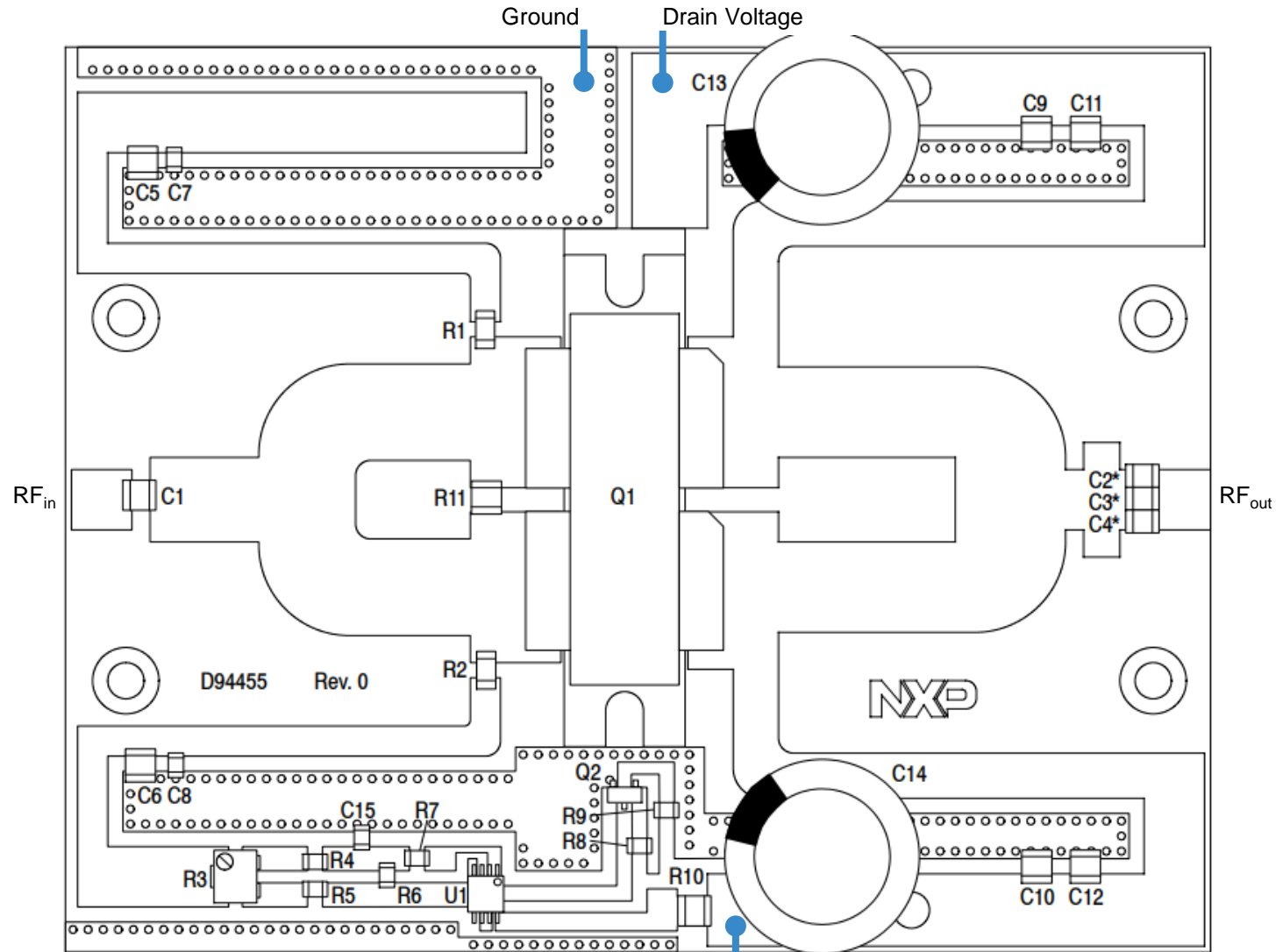


Quick Start

1. Mount the reference circuit onto a heatsink capable of dissipating more than 400 W in order to provide enough thermal dissipation (the baseplate included in this reference circuit is not sufficient to serve as a standalone heatsink).
2. Connect the ground.
3. Terminate the RF output with a 50 ohm load capable of handling more than 750 W.
4. Connect the RF input to a 50 ohm source with the RF off.
5. Connect the drain voltage (V_{DD}) and raise it slowly to 50 V while ensuring that the drain current remains below or equal to the typical drain quiescent current of $I_{DQ(A+B)} = 150$ mA.
6. If needed, adjust the R3 potentiometer to modify the gate voltage to adjust the drain quiescent current.
7. Raise the RF input slowly to 8.8 W (39.4 dBm).
8. Check the RF output power (typically 750 W), the drain current (around 22 A for this power level) and the temperature of the board.



Component Placement Reference



*C2, C3 and C4 are mounted vertically.

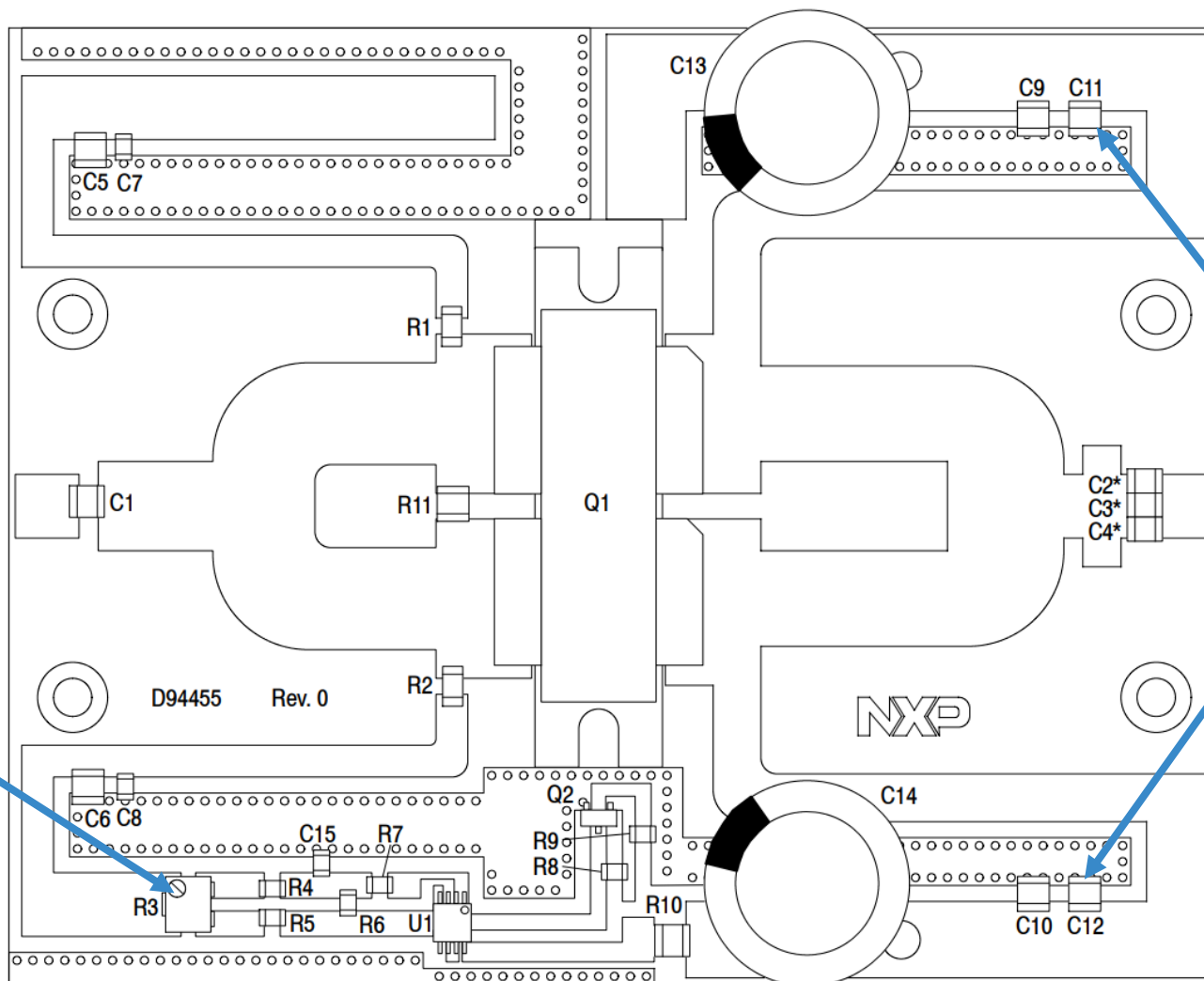
The wire on the backside of the baseplate connects the second transistor drain.

Bill of Materials

Part	Description	Part Number	Manufacturer
C1, C2, C3, C4, C5, C6, C11, C12	47 pF Chip Capacitor	ATC100B470JT500XT	ATC
C7, C8, C15	1 μ F Chip Capacitor	GRM21BR71H105KA12L	Murata
C9, C10	1000 pF Chip Capacitor	ATC100B102JT50XT	ATC
C13, C14	470 μ F, 100 V Electrolytic Capacitor	MCGPR100V477M16X32-RH	Multicomp
Q1	RF Power LDMOS Transistor	MRF13750H	NXP
Q2	NPN Bipolar Transistor	BC847ALT1G	ON Semiconductor
R1, R2	10 Ω , 1/4 W Chip Resistor	CRCW120610R0JNEA	Vishay
R3	5 k Ω Multi-turn Cermet Trimmer Potentiometer	3224W-1-502E	Bourns
R4	20 k Ω , 1/10 W Chip Resistor	RR1220P-203-B-T5	Susumu
R5	4.7 k Ω , 1/10 W Chip Resistor	RR1220P-472-D	Susumu
R6, R8	1.2 k Ω , 1/8 W Chip Resistor	CRCW08051K20FKEA	Vishay
R7	10 Ω , 1/8 W Chip Resistor	CRCW080510R0FKEA	Vishay
R9	2.2 k Ω , 1/8 W Chip Resistor	CRCW08052K20JNEA	Vishay
R10	4.7 k Ω , 1/2 W Chip Resistor	CRCW12104K70FKEA	Vishay
R11	2 Ω , 1/2 W Chip Resistor	ERJ-14YJ2R0U	Panasonic
U1	Voltage Regulator 5 V, Micro8	LP2951ACDMR2G	ON Semiconductor
PCB	Rogers TC600, 0.025", $\epsilon_r = 6.15$	D94455	MTL

Tuning Tips

Turn R3 to adjust quiescent current I_{DQ} (A+B)



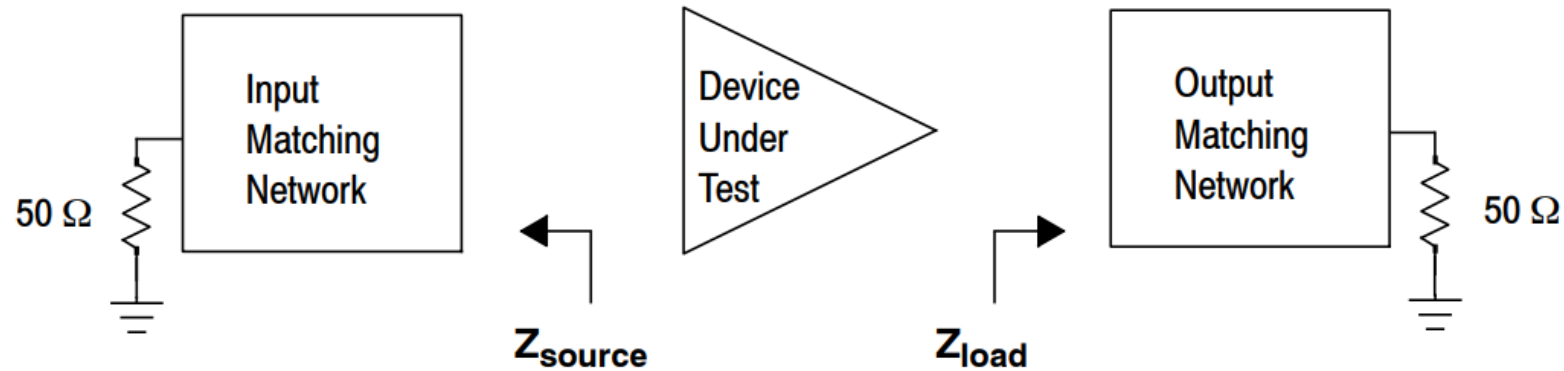
Move C11 and C12 to tune output power vs. efficiency

Impedances

f MHz	Z_{source} Ω	Z_{load} Ω
915	$0.58 + j0.24$	$0.59 + j1.19$

Z_{source} = Test circuit impedance as measured from gate to ground.

Z_{load} = Test circuit impedance as measured from drain to ground.



Revision History

- The following table summarizes revisions to the content of the MRF13750H 915 MHz Reference Circuit zip file.

Revision	Date	Description
0	September 2019	• Initial Release



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