MRF13750H 1300 MHz REFERENCE CIRCUIT

ORDERABLE PART NUMBER: **MRF13750H-1300**

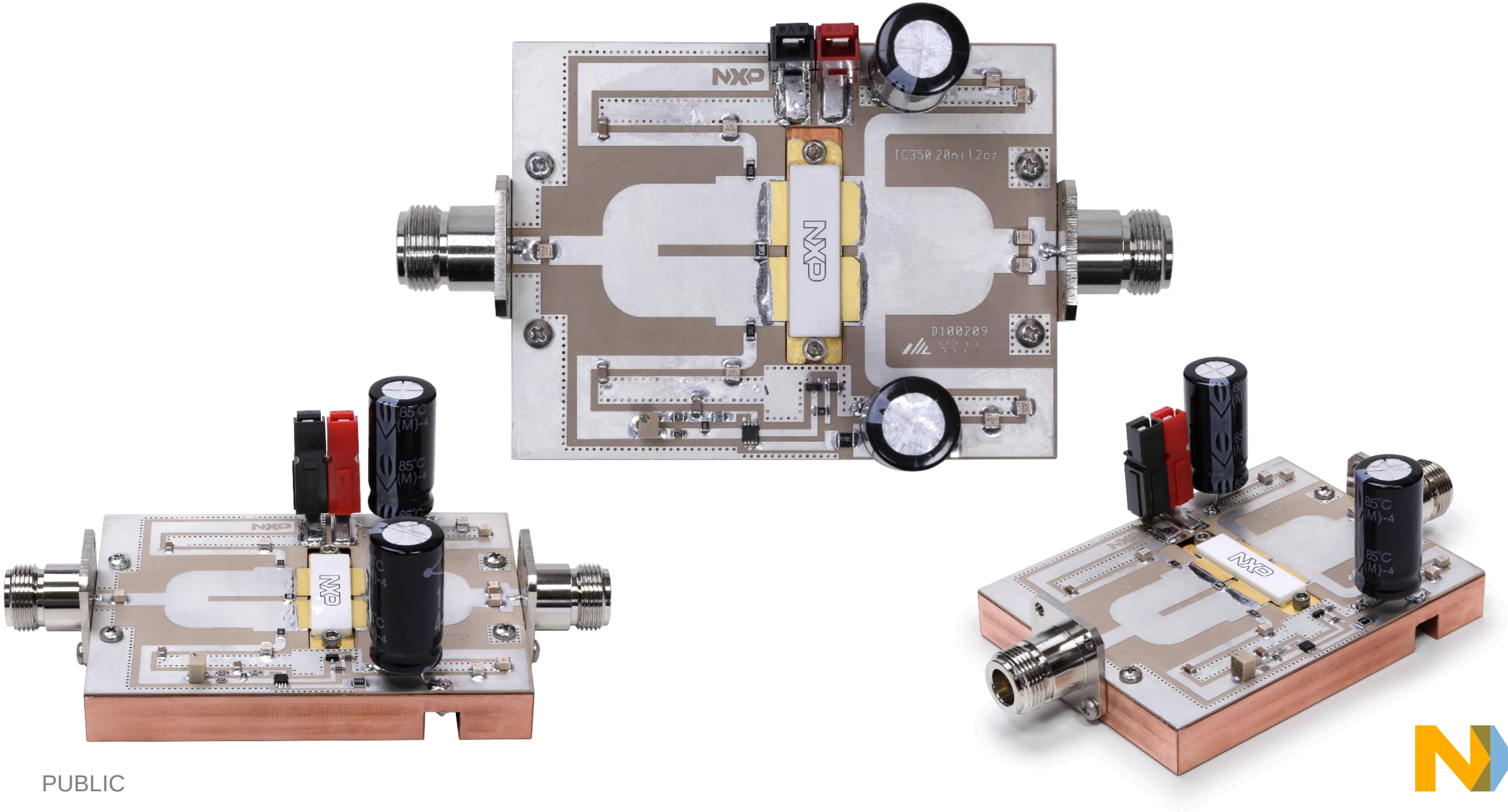
Introduction

- 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.

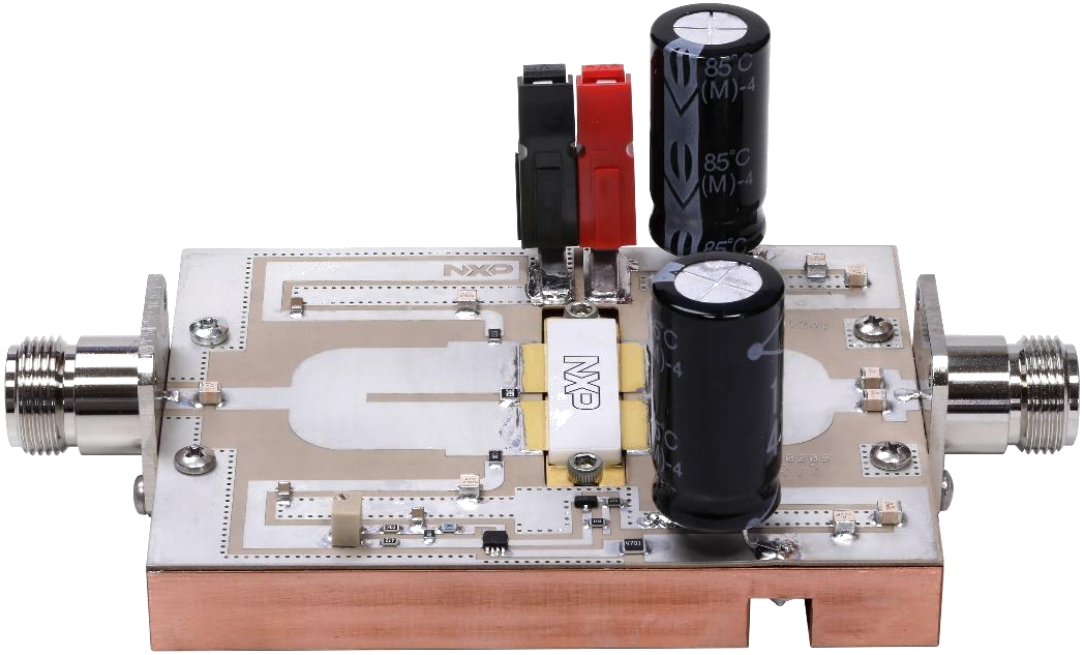
- The following pages describe the 1300 MHz reference circuit (evaluation board).
  Its typical application is particle accelerators.

- The reference circuit can be ordered through NXP's distribution partners and etailers using part number MRF13750H-1300.

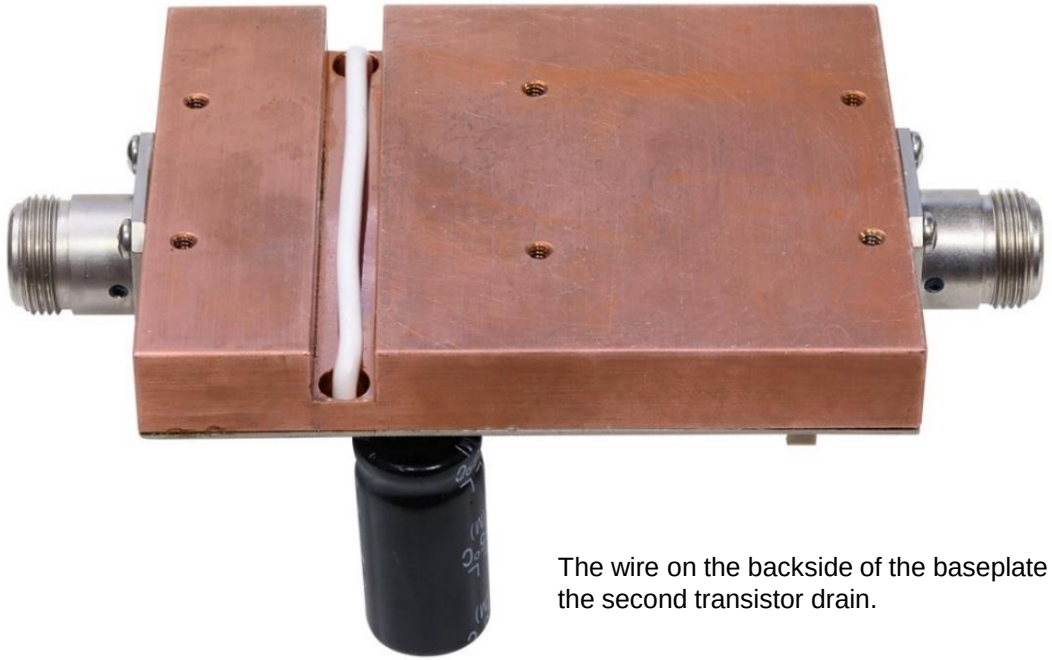
Circuit Overview – 7.62 cm x 9.91 cm (3.0″ × 3.9″)



Assembly Details

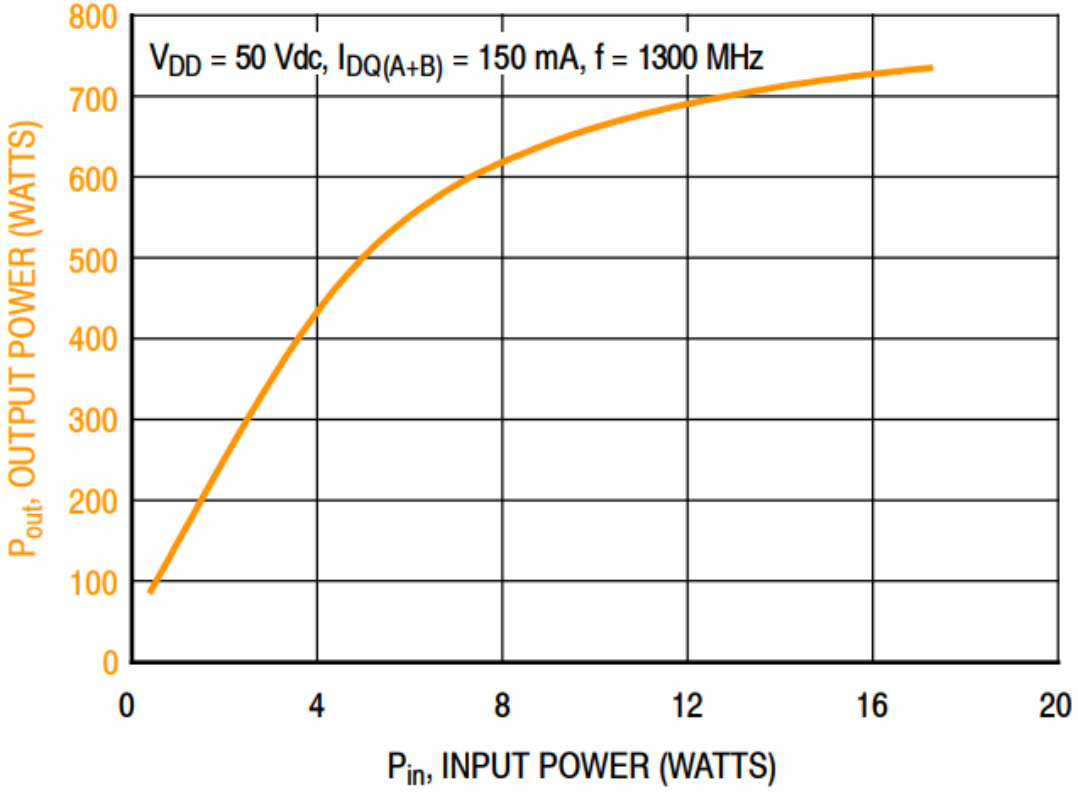


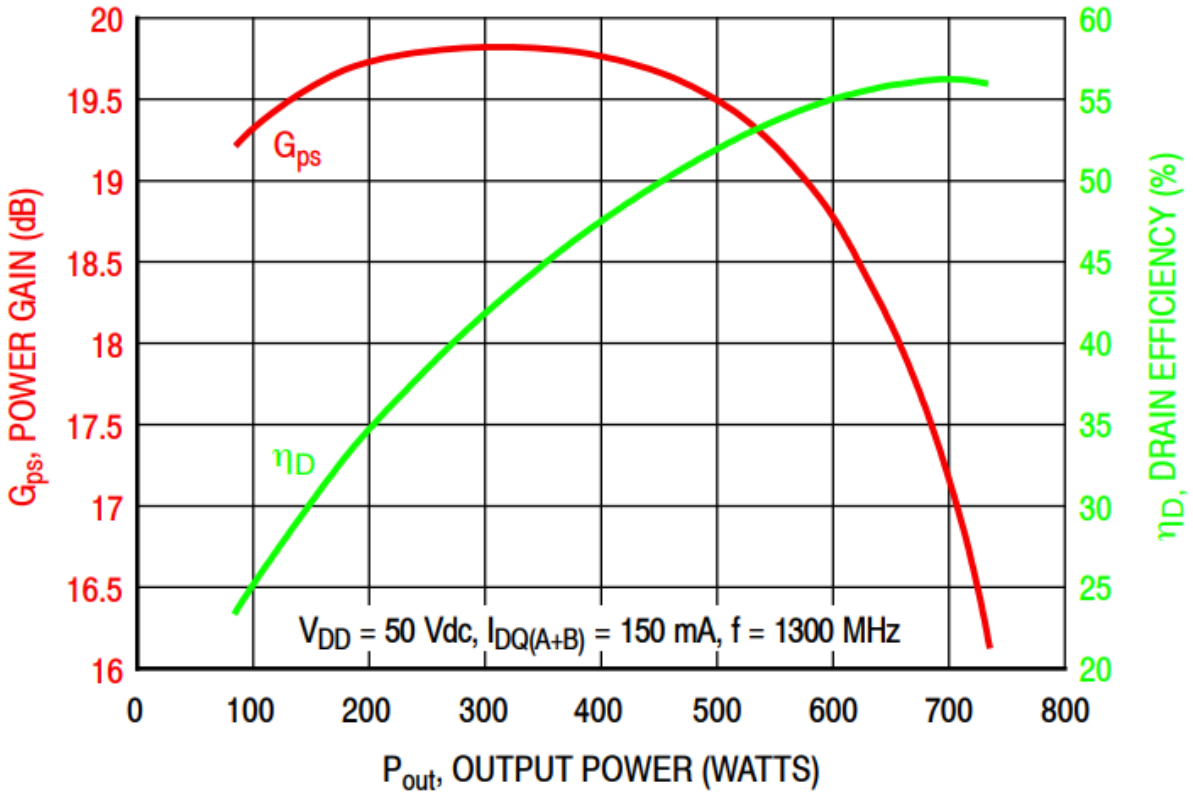
PCB attached to copper baseplate using high temperature solder.
Transistor attached to copper baseplate using low temperature solder.



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

Typical CW Performance



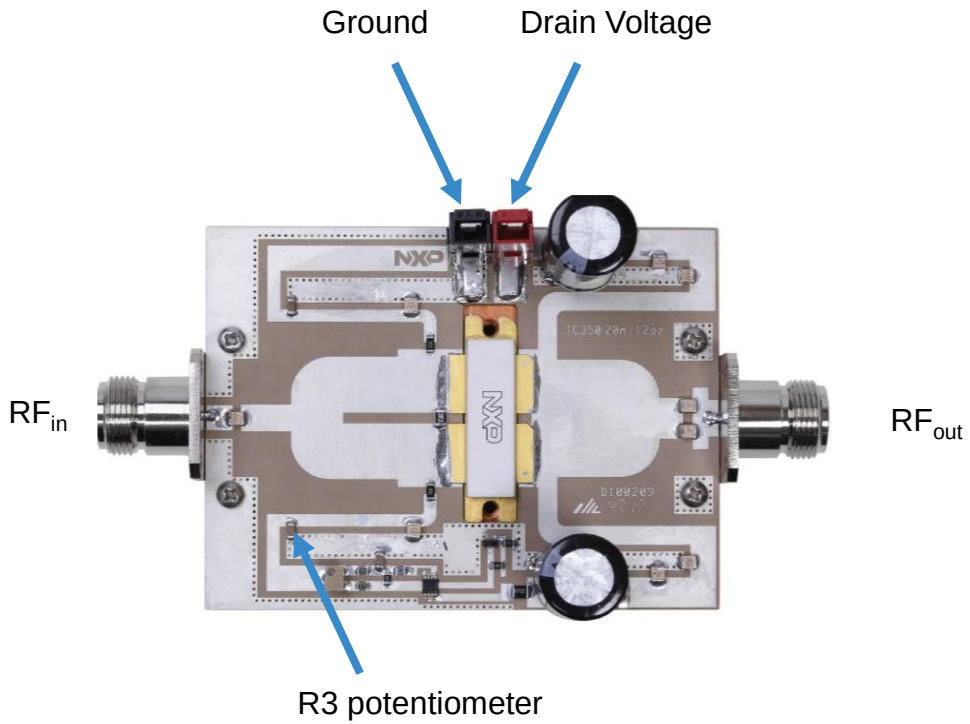


Typical Performance: V_{DD} = 750 Vdc, $I_{DQ(A+B)}$ = 150 mA, P_{in} = 13.3 W (41.2 dBm), CW

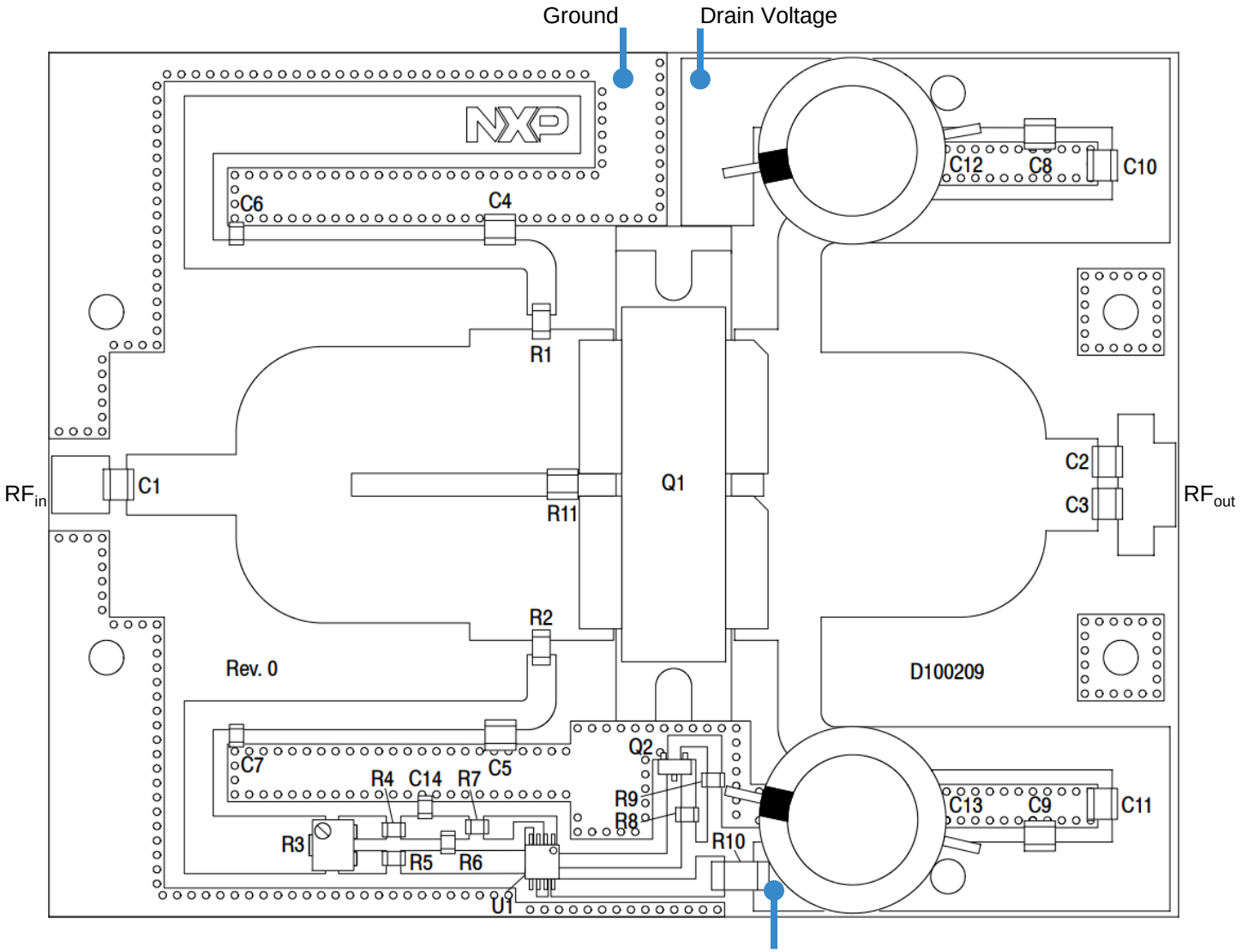
Frequency (MHz)	Signal Type	P_{out} (W)	G_{ps} (dB)	η_D (%)
1300	CW	700	17.2	56.0

Quick Start

1. Mount the reference circuit onto a heatsink capable of dissipating more than 600 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 dissipating more than 700 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 13.3 W (41.2 dBm).
8. Check the RF output power (typically 700 W), the drain current (around 25 A for this power level) and the temperature of the board.



Component Placement Reference

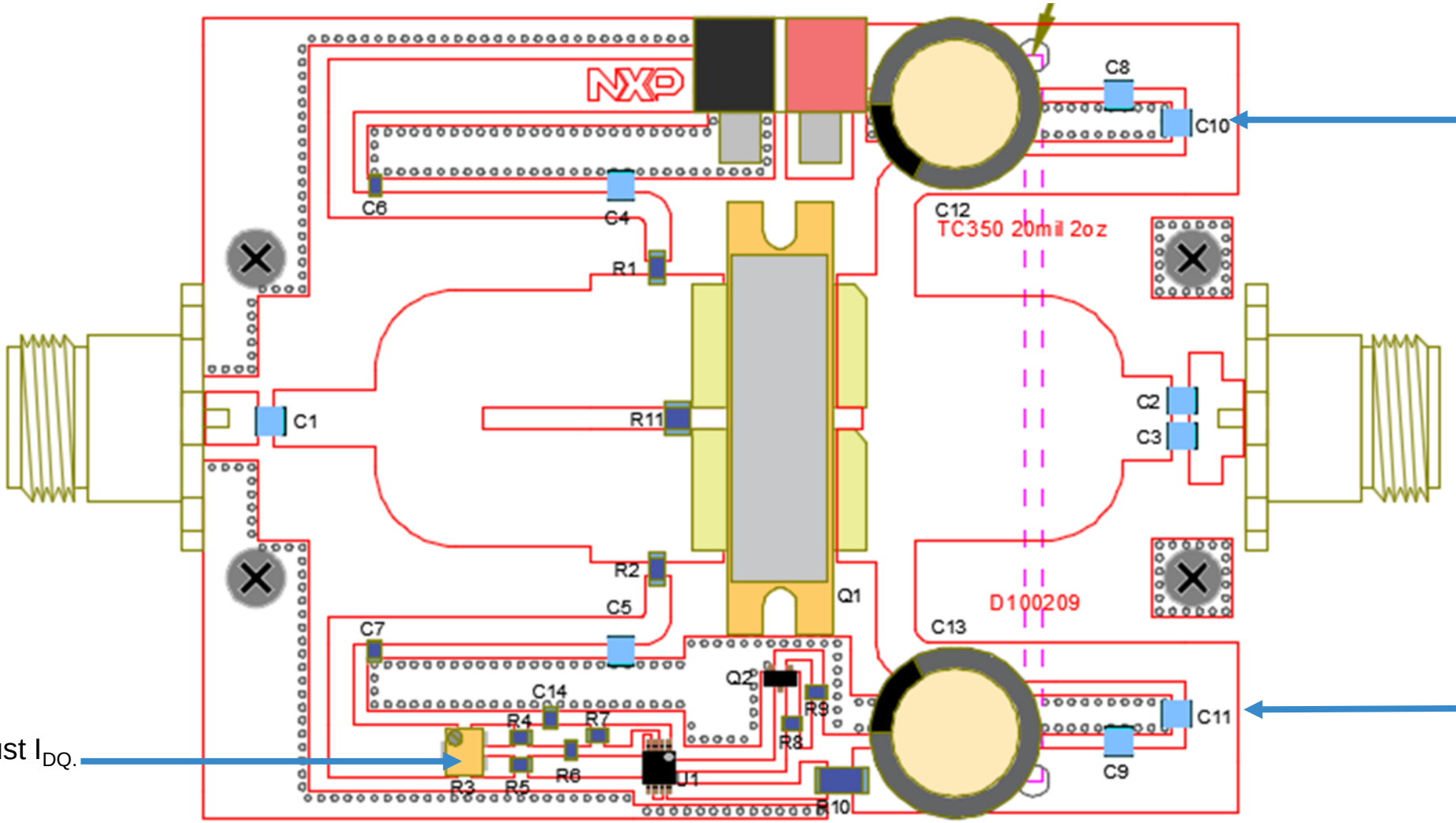


The wire on the backside of the baseplate connects the second transistor drain.

Bill of Materials

Part	Description	Part Number	Manufacturer
C1, C4, C5, C10, C11	24 pF Chip Capacitor	ATC100B240JT500XT	ATC
C2, C3	18 pF Chip Capacitor	ATC100B180JT500XT	ATC
C6, C7, C14	1 μF Chip Capacitor	GRM21BR71H105KA12L	Murata
C8, C9	1000 pF Chip Capacitor	ATC100B102JT50XT	ATC
C12, C13	470 μF, 100 V Electrolytic Capacitor	MCGPR100V477M16X32-RH	Multicomp
R1, R2	10 Ω, 1/4 W Chip Resistor	CRCW120610R0JNEA	Vishay
R3	5 kΩ Multi−turn Cermet Trimmer Potentiometer	3224W-1-502E	Bourns
R4	20 kΩ, 1/8 W Chip Resistor	CRCW080520K0FKEA	Vishay
R5	4.7 kΩ, 1/8 W Chip Resistor	CRCW08054K70FKEA	Vishay
R6, R8	1.2 kΩ, 1/8 W Chip Resistor	CRCW08051K20FKEA	Vishay
R7	10 Ω, 1/8 W Chip Resistor	CRCW080510R0FKEA	Vishay
R9	2.2 kΩ, 1/8 W Chip Resistor	CRCW08052K20JNEA	Vishay
R10	4.7 kΩ, 1/2 W Chip Resistor	CRCW12104K70FKEA	Vishay
R11	3.3 Ω, 1/2 W Chip Resistor	ERJ-14YJ3R3U	Panasonic
Q1	RF Power LDMOS Transistor	MRF13750H	NXP
Q2	NPN Bipolar Transistor	BC847ALT1G	ON Semiconductor
U1	Voltage Regulator 5 V, Micro8	LP2951ACDMR2G	ON Semiconductor
PCB	Arlon TC350, 0.020″, ε_r = 3.5	D100209	MTL

Tuning Tips



Move C10 and C11 to tune output power vs. efficiency

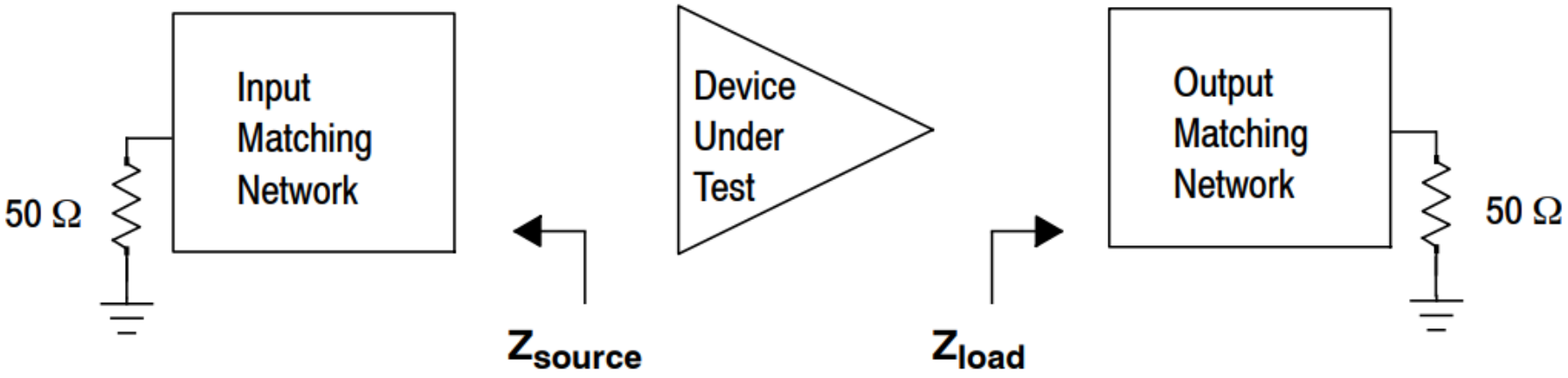
Turn R3 to adjust $I_{DQ.}$

Impedances

f MHz	Z_{source} Ω	Z_{load} Ω
1300	0.64 + j1.92	0.39 + j0.92

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 1300 MHz Reference Circuit zip file.

Revision	Date	Description
0	September 2019	• Initial Release

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