MRF300AN 50 MHz REFERENCE CIRCUIT

ORDERABLE PART NUMBER: **MRF300AN-50MHZ**

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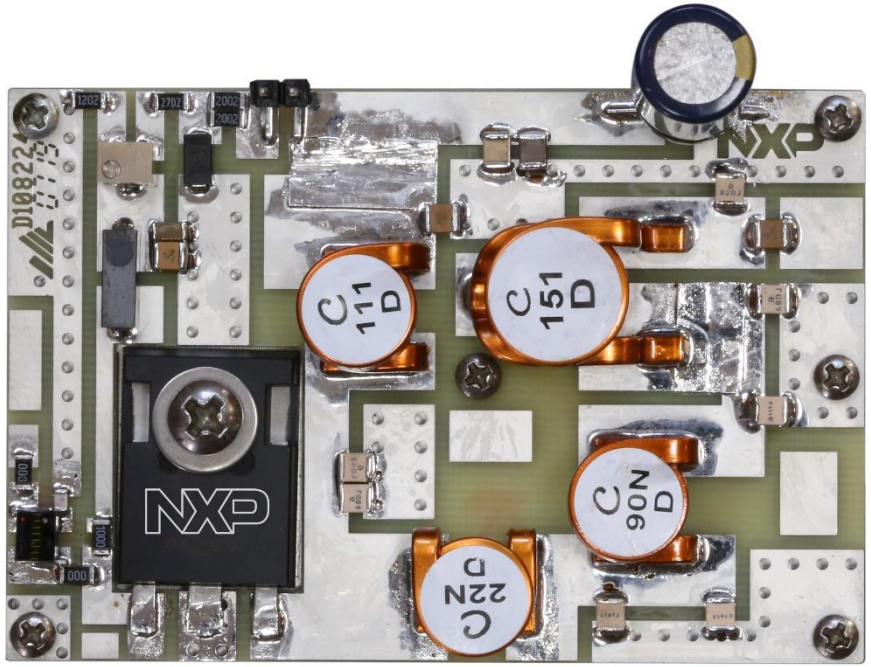
Introduction

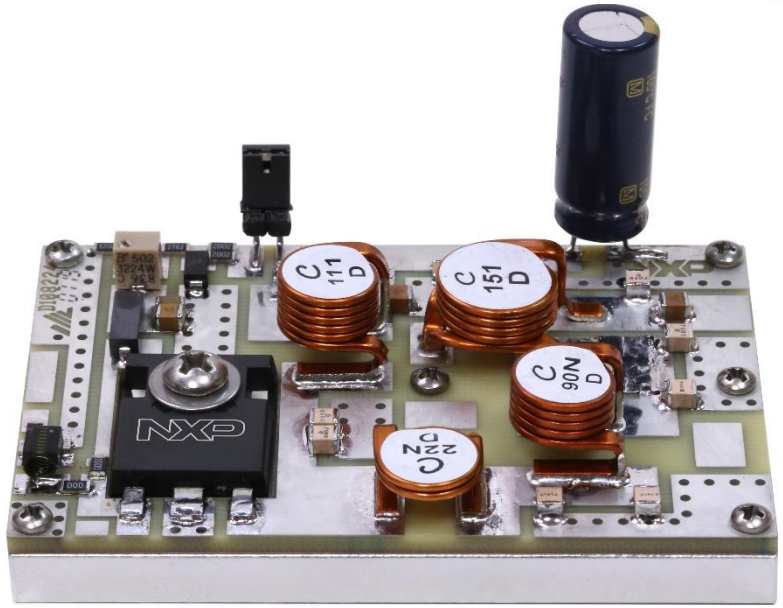
- The NXP MRF300AN is a 1.8-250 MHz, 300 W CW RF power LDMOS housed in a TO-247 over-molded plastic package. Its unmatched input and output allows wide frequency range utilization.
  - Further details about the device, including its data sheet, are available on www.nxp.com/MRF300AN.

- The following pages describe the 50 MHz reference circuit (evaluation board).
  Its typical applications are industrial, wind profiler radars and amateur radio.

- The reference circuit can be ordered through NXP's distribution partners and etailers using part number MRF300AN-50MHZ.

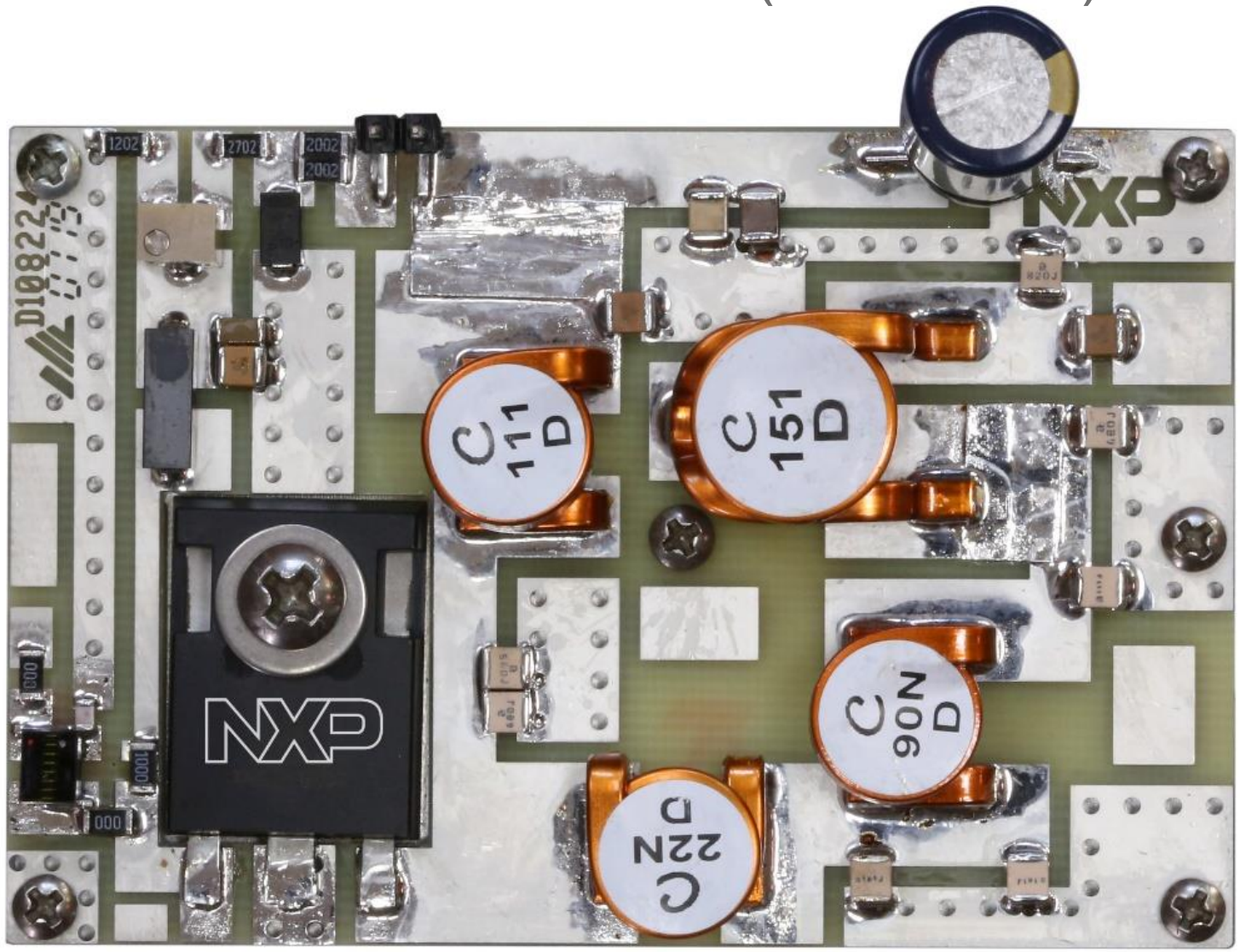
Circuit Overview – 5.08 cm × 7.62 cm (2.0″ × 3.0″)



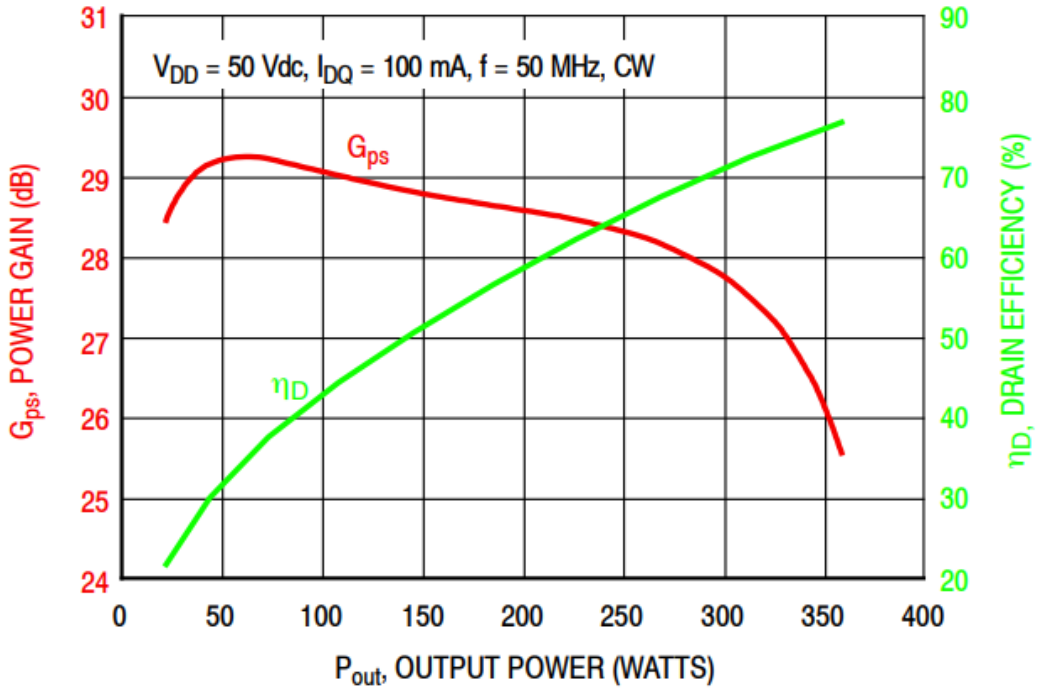


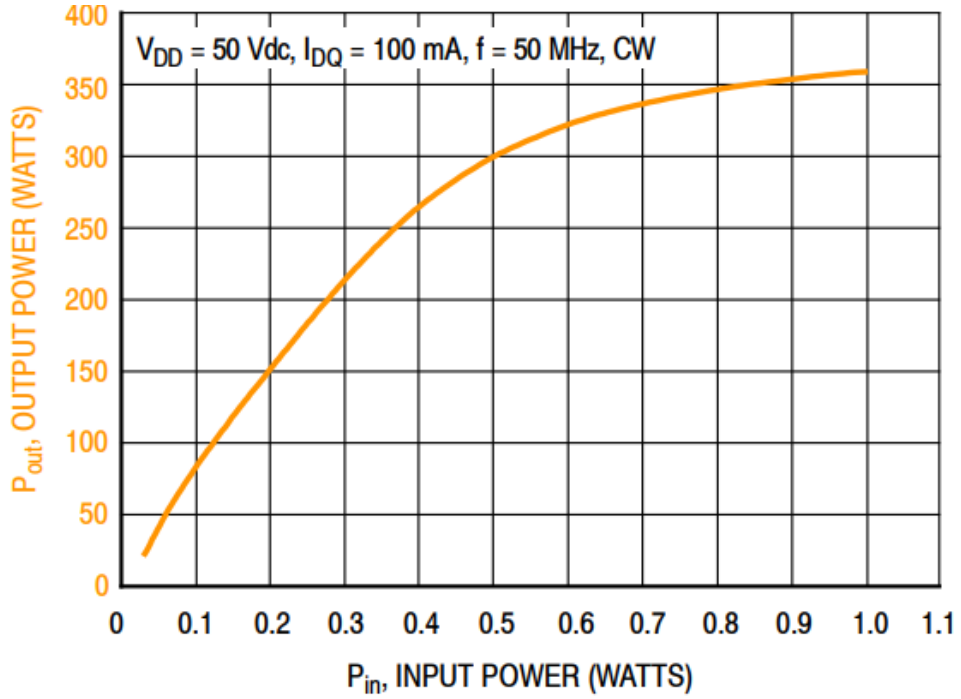
Transistor bolted to aluminum baseplate with thermal grease under it.
PCB bolted to aluminum baseplate with no thermal grease.

Circuit Overview – 5.08 cm × 7.62 cm (2.0″ × 3.0″)



Typical CW Performance



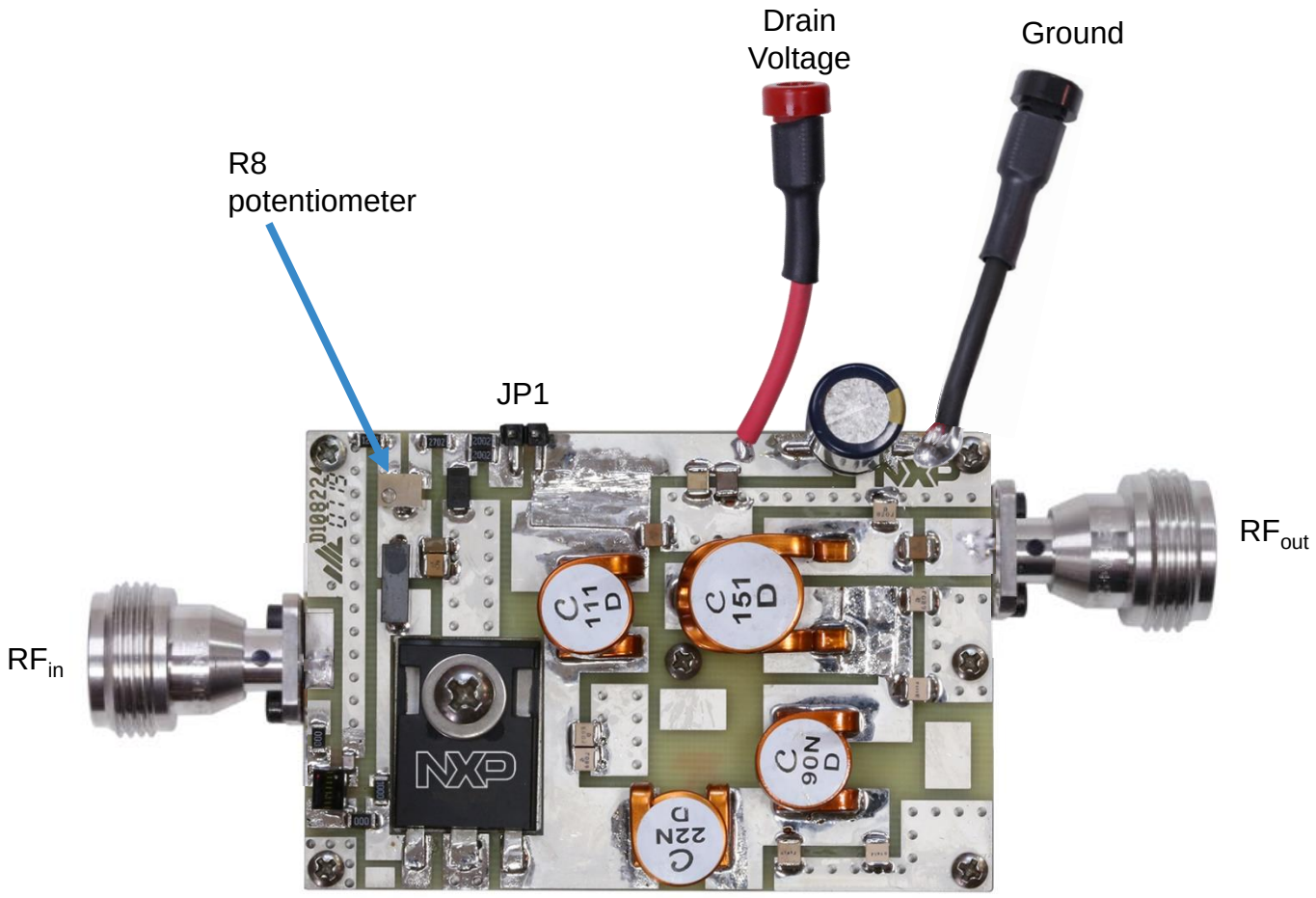


V_{DD} = 50 Vdc, I_{DQ} = 100 mA, P_{in} = 0.6 W, CW

Frequency (MHz)	P_{out} (W)	G_{ps} (dB)	η_D (%)
50	320	27.3	73.0

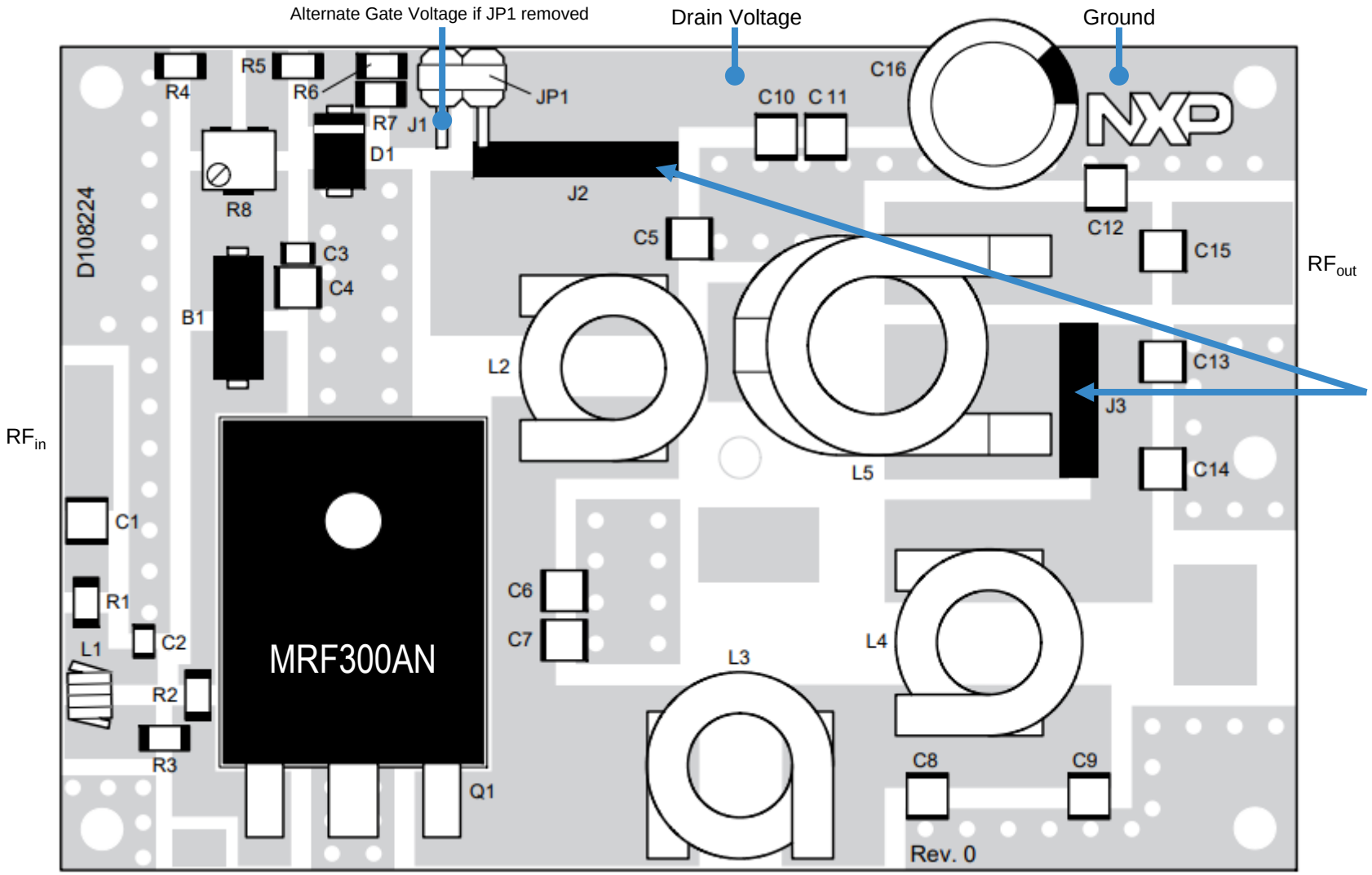
Quick Start

1. Mount the reference circuit onto a heatsink capable of dissipating more than 150 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 330 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} = 100 mA.
6. If needed, adjust the R8 potentiometer to modify the gate voltage to adjust the drain quiescent current.
7. Raise the RF input to 0.6 W (28 dBm).
8. Check the RF output power (typically 330 W), the drain current (around 9 A for this power level) and the temperature of the board.



Alternatively, the jumper JP1 can be removed to supply an external gate voltage on J1 connector.

Component Placement Reference



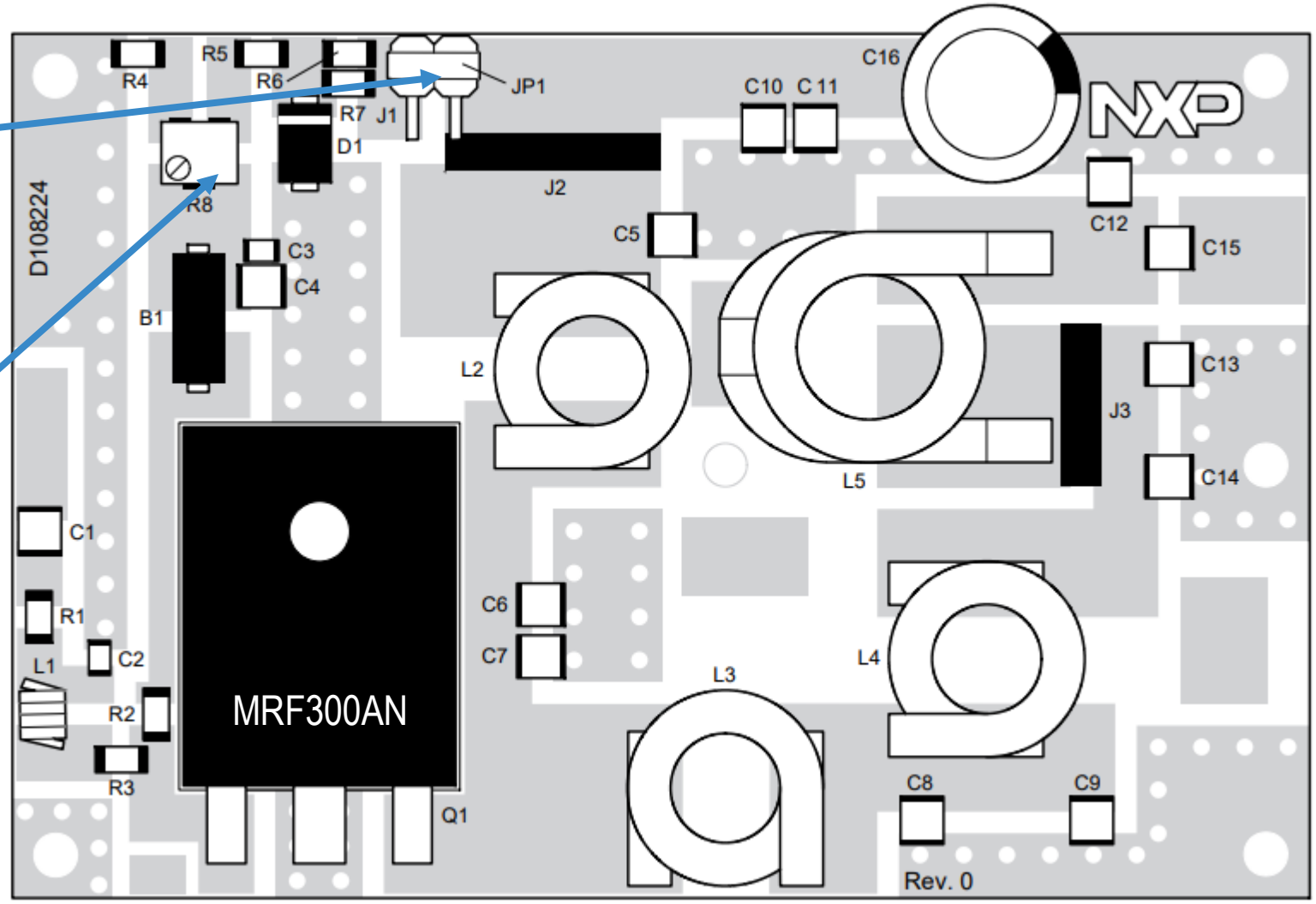
Bill of Materials

Part	Description	Part Number	Manufacturer
B1	Long Ferrite Bead	2743021447	Fair-Rite
C1, C4, C5, C15	10,000 pF Chip Capacitor	200B103KT50XT	ATC
C2	180 pF Chip Capacitor	GQM2195C2A181GB12D	Murata
C3	1 μF Chip Capacitor	GRM31CR72A105KA01L	Murata
C6	56 pF Chip Capacitor	100B560CT500XT	ATC
C7, C13	68 pF Chip Capacitor	100B680JT500XT	ATC
C8, C9	180 pF Chip Capacitor	100B181JT300XT	ATC
C10	0.1 μF Chip Capacitor	12101C104KAT4A	AVX
C11	10 μF Chip Capacitor	GRM32ER61H106KA12L	Murata
C12	82 pF Chip Capacitor	100B820JT500XT	ATC
C14	110 pF Chip Capacitor	100B111JT300XT	ATC
C16	220 μF, 63 V Electrolytic Capacitor	EEU-FC1J221	Panasonic
D1	8.2 V Zener Diode	SMAJ4738A-TP	Micro Commercial Components
J1	Right Angle Breakaway Headers (2 Pins)	9-146305-0	TE Connectivity
J2, J3	Jumper	Copper Foil	
JP1	Shunt (J1)	382811-8	TE Connectivity
L1	82 nH Air Core Inductor	1812SMS-82NJLC	Coilcraft
L2	110 nH Air Core Inductor	1212VS-111MEB	Coilcraft
L3	22 nH Air Core Inductor	1212VS-22NME	Coilcraft
L4	90 nH Air Core Inductor	1212VS-90NME	Coilcraft
L5	150 nH Air Core Inductor	2014VS-151MEB	Coilcraft
Q1	RF Power LDMOS Transistor	MRF300AN	NXP
R1, R3	0 Ω, 1/4 W Chip Resistor	CRCW12060000Z0EA	Vishay
R2	100 Ω, 1/4 W Chip Resistor	CRCW1206100RFKEA	Vishay
R4	12 kΩ, 1/4 W Chip Resistor	CRCW120612K0FNEA	Vishay
R5	27 kΩ, 1/4 W Chip Resistor	CRCW120627K0FKEA	Vishay
R6, R7	20 kΩ, 1/4 W Chip Resistor	CRCW120620K0FKEA	Vishay
R8	5.0 kΩ Multi-turn Cermet Trimmer Potentiometer	3224W-1-502E	Bourns
PCB	FR4 0.087", ε_r = 4.8, 2 oz. Copper	D108224	MTL

Tuning Tips

Remove JP1 to disable gate bias

Turn R8 to adjust I_{DQ}, clockwise to decrease

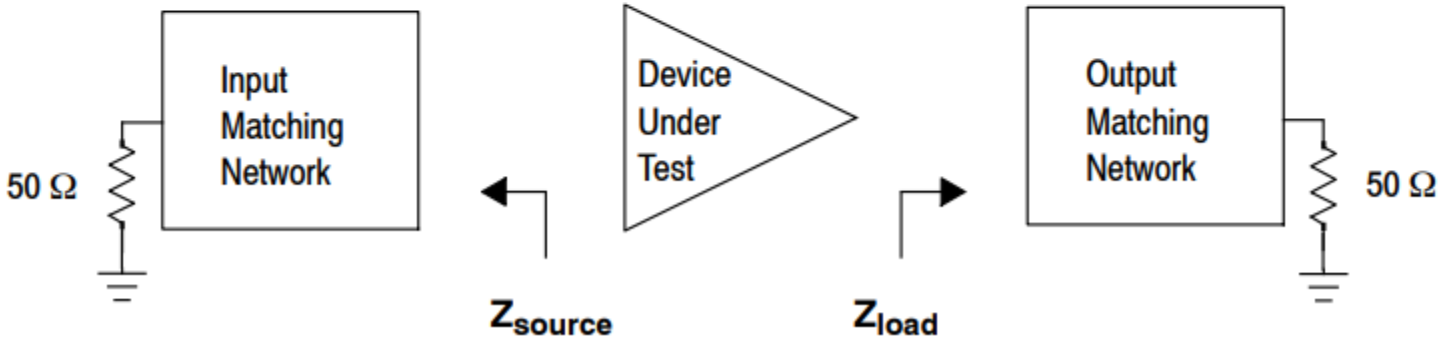


Impedances

f (MHz)	Z_{source} (Ω)	Z_{load} (Ω)
50	6.44 + j12.27	5.05 + j1.36

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 MRF300AN 50 MHz Reference Circuit zip file.

Revision	Date	Description
0	September 2019	• Initial Release

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