MRF300AN 40.68 MHz REFERENCE CIRCUIT

ORDERABLE PART NUMBER: **MRF300A-40MHZ**

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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.

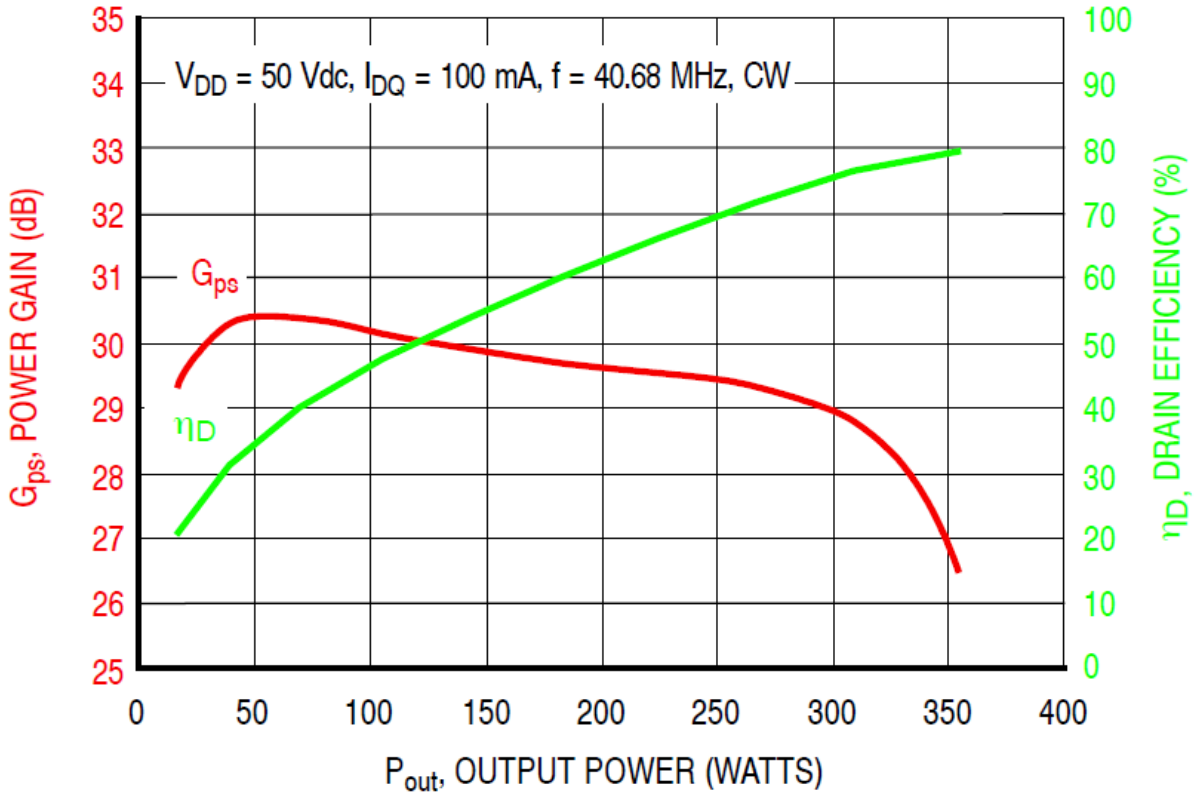
- The following pages describe the 40.68 MHz reference circuit (evaluation board).
  Its typical application are industrial, scientific, medical (ISM), RF Energy and plasma generation.

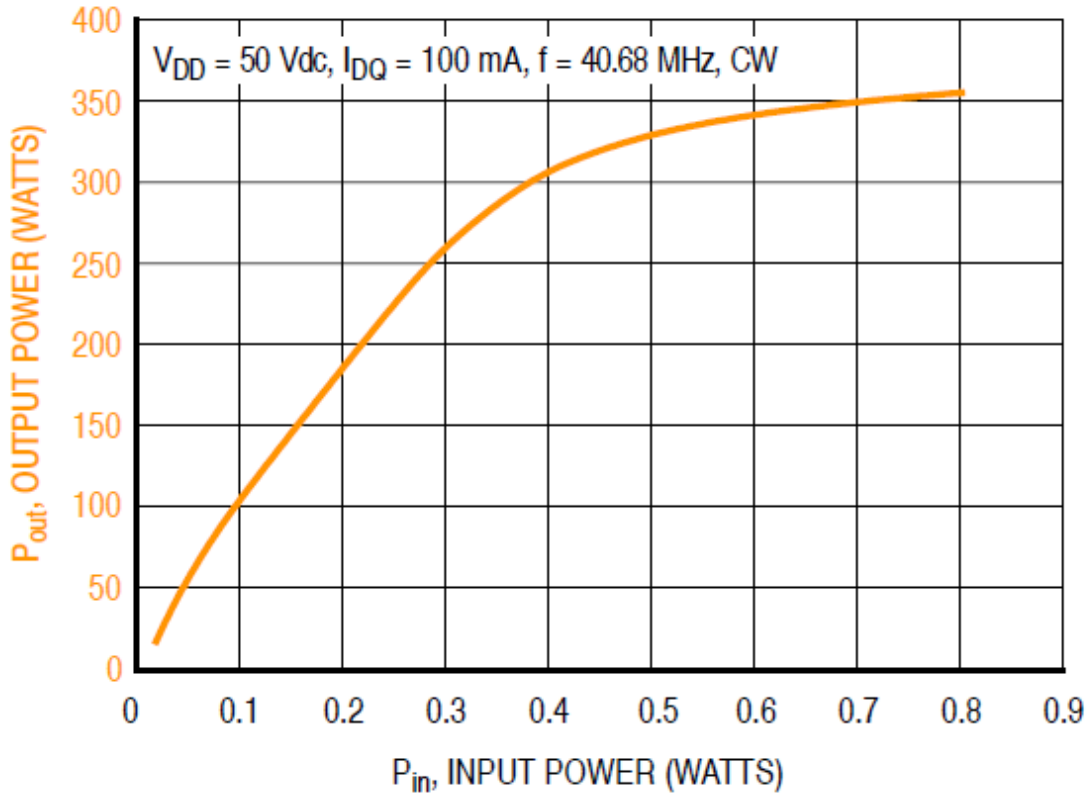
- The reference circuit can be ordered through NXP's distribution partners and etailers using part number MRF300A-40MHZ.

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.

Typical CW Performance 1/2



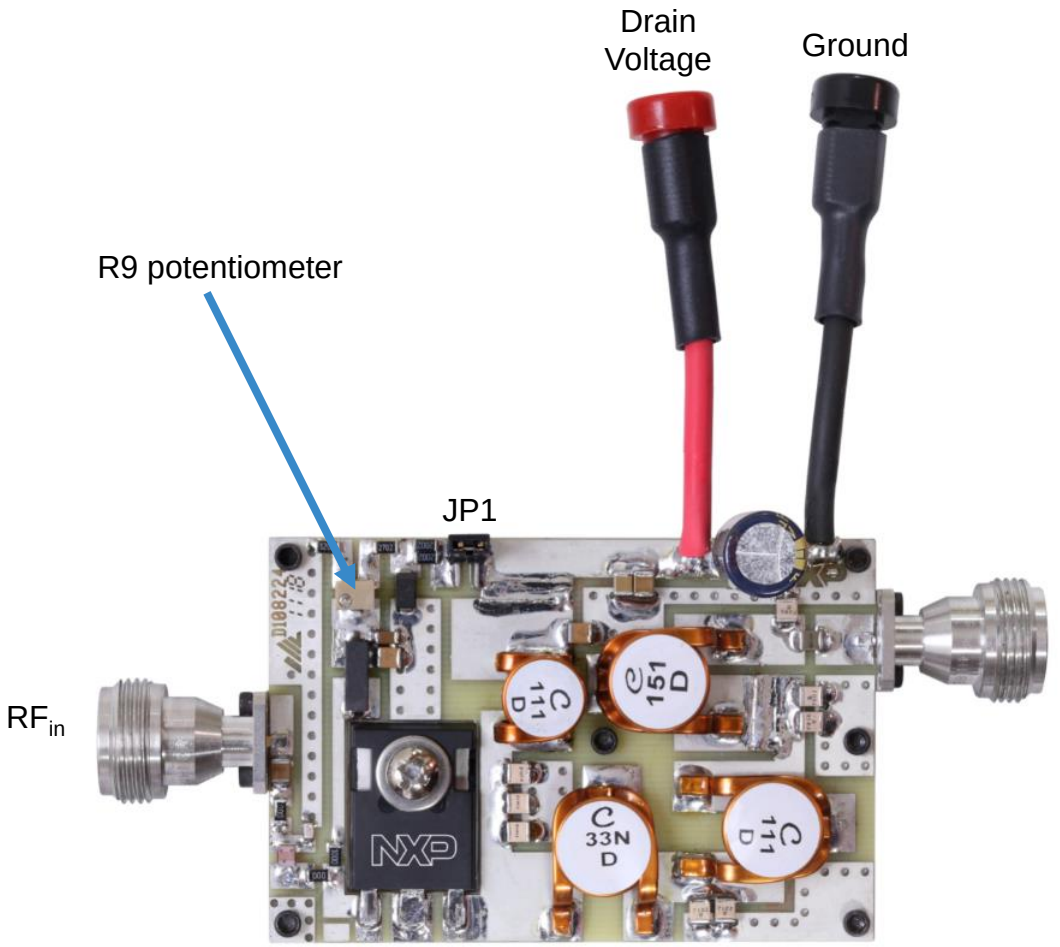


Typical Performance: V_{DD} = 50 Vdc, I_{DQ} = 100 mA, P_{in} = 0.5 W (27 dBm), CW

Frequency (MHz)	Signal Type	Output Power (W)	Power Gain (dB)	Drain Efficiency (%)
40.68	CW	330	28.2	79.0

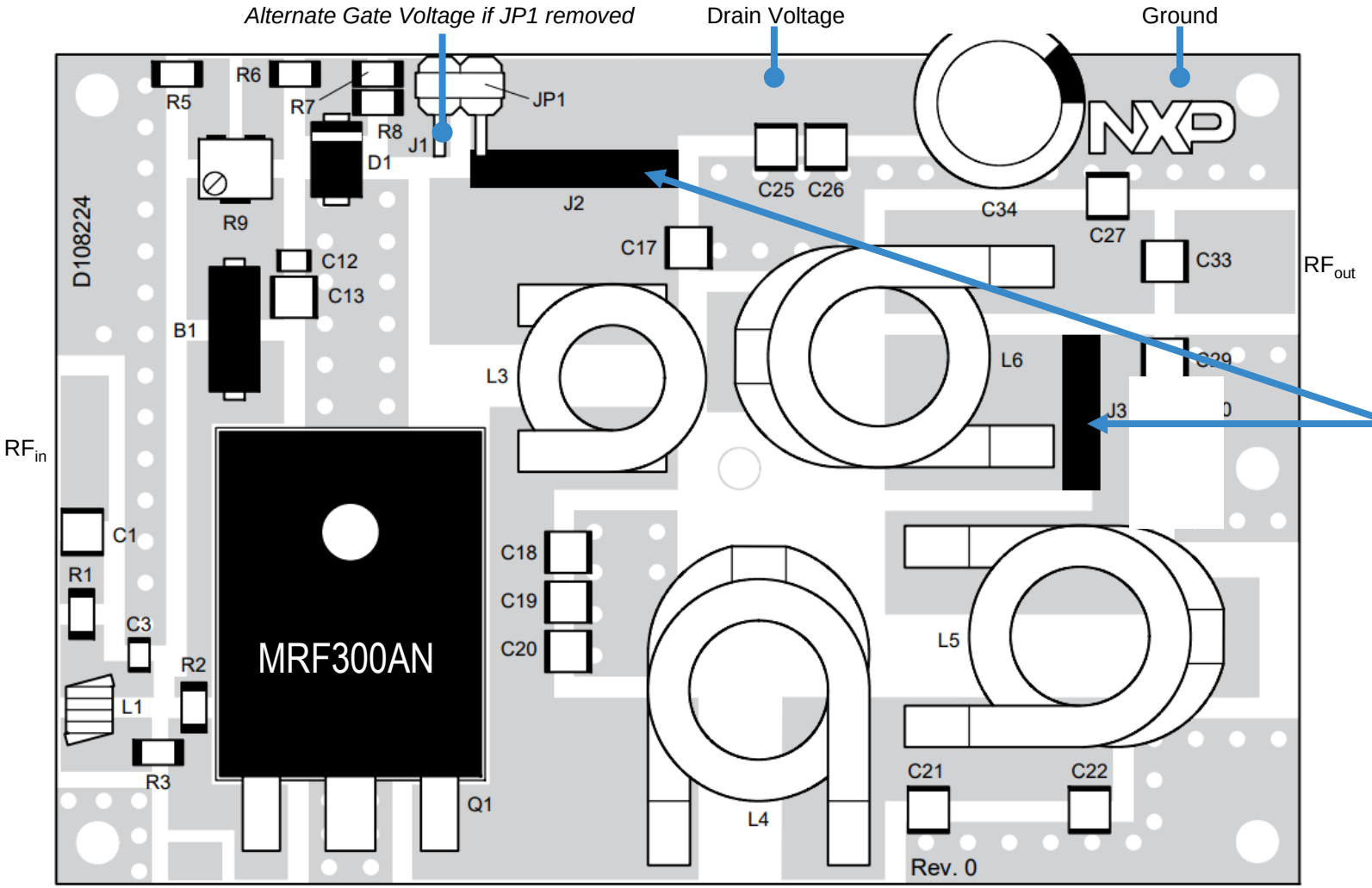
Quick Start

1. Mount the reference circuit onto a heatsink capable of dissipating more than 120 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 R9 potentiometer to modify the gate voltage to adjust the drain quiescent current.
7. Raise the RF input slowly to 0.5 W (27 dBm).
8. Check the RF output power (typically 330 W), the drain current (around 8 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



Note: Component numbers C2, C4–C11, C14–C16, C23, C24, C28, C31, C32, L2 and R4 are not used.

aaa-030512

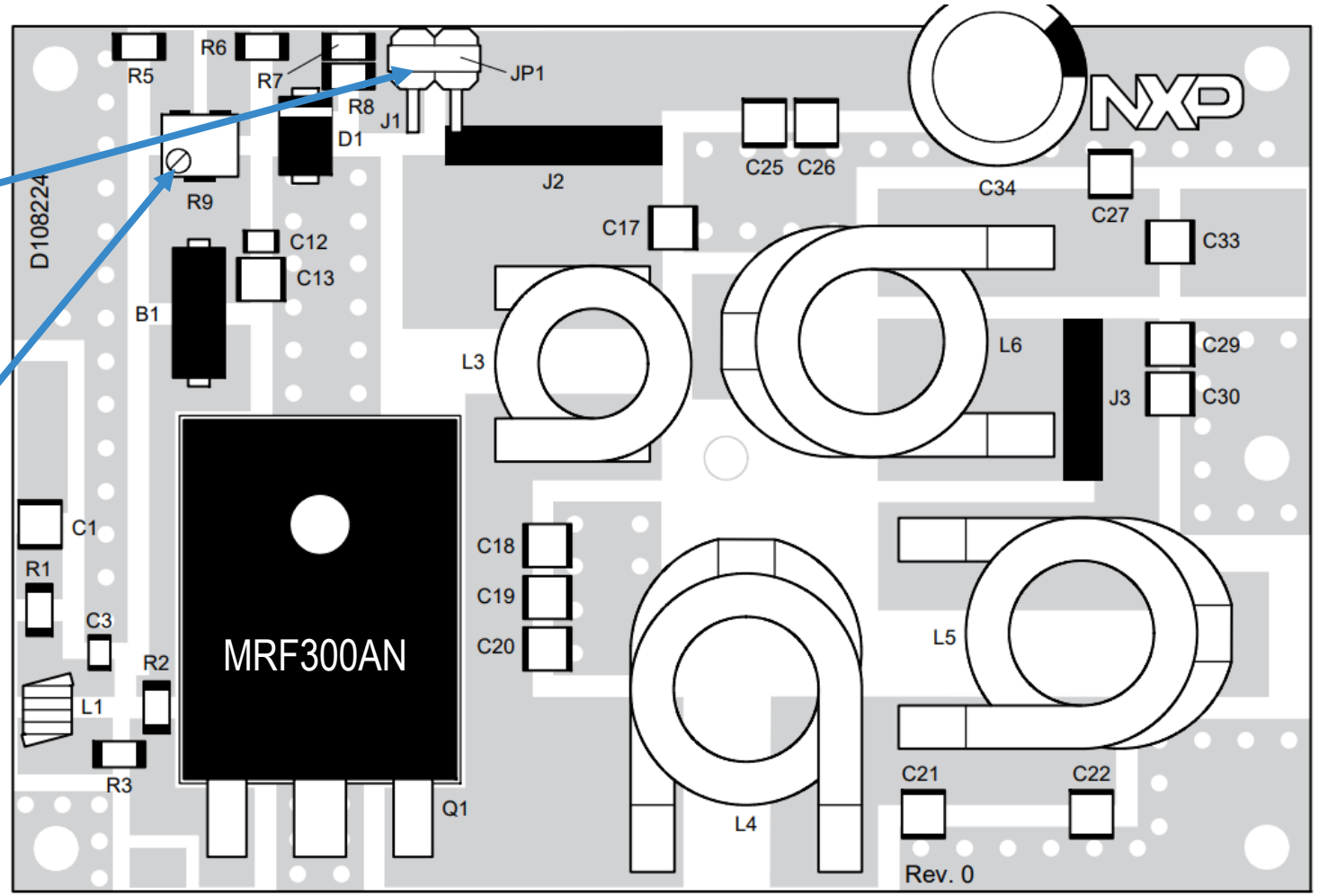
Bill of Materials

Part	Description	Part Number	Manufacturer
B1	Long Ferrite Bead	2743021447	Fair-Rite
C1, C13, C17	22,000 pF Chip Capacitor	ATC200B223KT50XT	ATC
C3	200 pF Chip Capacitor	GQM2195C2A201GB12D	Murata
C12	1 μF Chip Capacitor	GRM31CR72A105KA01L	Murata
C18, C19, C20	68 pF Chip Capacitor	ATC100B680JT500XT	ATC
C21	200 pF Chip Capacitor	ATC100B201JT300XT	ATC
C22	220 pF Chip Capacitor	ATC100B221JT200XT	ATC
C25	0.1 μF Chip Capacitor	GRM32NR72A104KA01B	Murata
C26	10 μF Chip Capacitor	GRM32ER61H106KA12L	Murata
C27	56 pF Chip Capacitor	ATC100B560CT500XT	ATC
C29	75 pF Chip Capacitor	ATC100B750JT500XT	ATC
C30	91 pF Chip Capacitor	ATC100B910JT500XT	ATC
C33	5100 pF Chip Capacitor	ATC700B512KT50XT	ATC
C34	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)	382811-6	TE Connectivity
L1	120 nH Chip Inductor	1008CS-121XJLB	Coilcraft
L3	117 nH Chip Inductor	1212VS-111MEB	Coilcraft
L4	33 nH Chip Inductor	2014VS-33NMEB	Coilcraft
L5	106 nH Chip Inductor	2014VS-111MEB	Coilcraft
L6	155 nH Chip 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
R5	12 kΩ, 1/4 W Chip Resistor	CRCW120612K0FKEA	Vishay
R6	27 kΩ, 1/4 W Chip Resistor	CRCW120627K0FKEA	Vishay
R7, R8	20 kΩ, 1/4 W Chip Resistor	CRCW120620K0FKEA	Vishay
R9	5.0 kΩ Multi-turn Cermet Trimmer Potentiometer	3224W-1-502E	Bourns
PCB	FR4 0.067", ε_r = 4.8, 2 oz. Copper	D108224	MTL

Tuning Tips

Remove JP1 to disable gate bias

Turn R9 to adjust I_{DQ}, clockwise to decrease



Impedances

f MHz	Z_{source} Ω	Z_{load} Ω
40.68	7.83 + j13.51	5.34 + j1.03

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

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

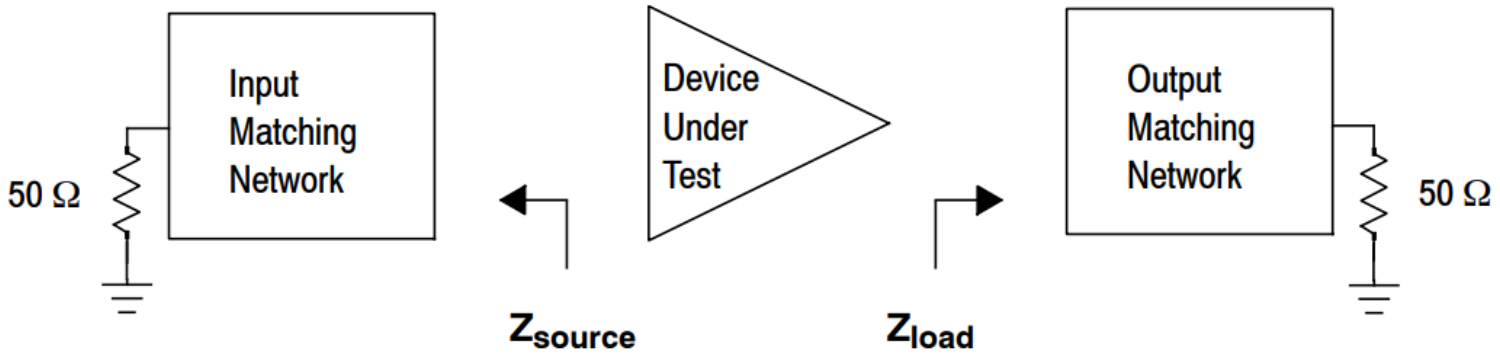


Figure 7. Series Equivalent Source and Load Impedance — 40.68 MHz

Revision History

- The following table summarizes revisions to the content of the MRF300AN 40.68 MHz Reference Circuit zip file:

Revision	Date	Description
0	September 2019	• Initial Release

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