

# MRF101AN 13.56 MHz COMPACT REFERENCE CIRCUIT

ORDERABLE PART NUMBER: MRF101AN-13MHZ



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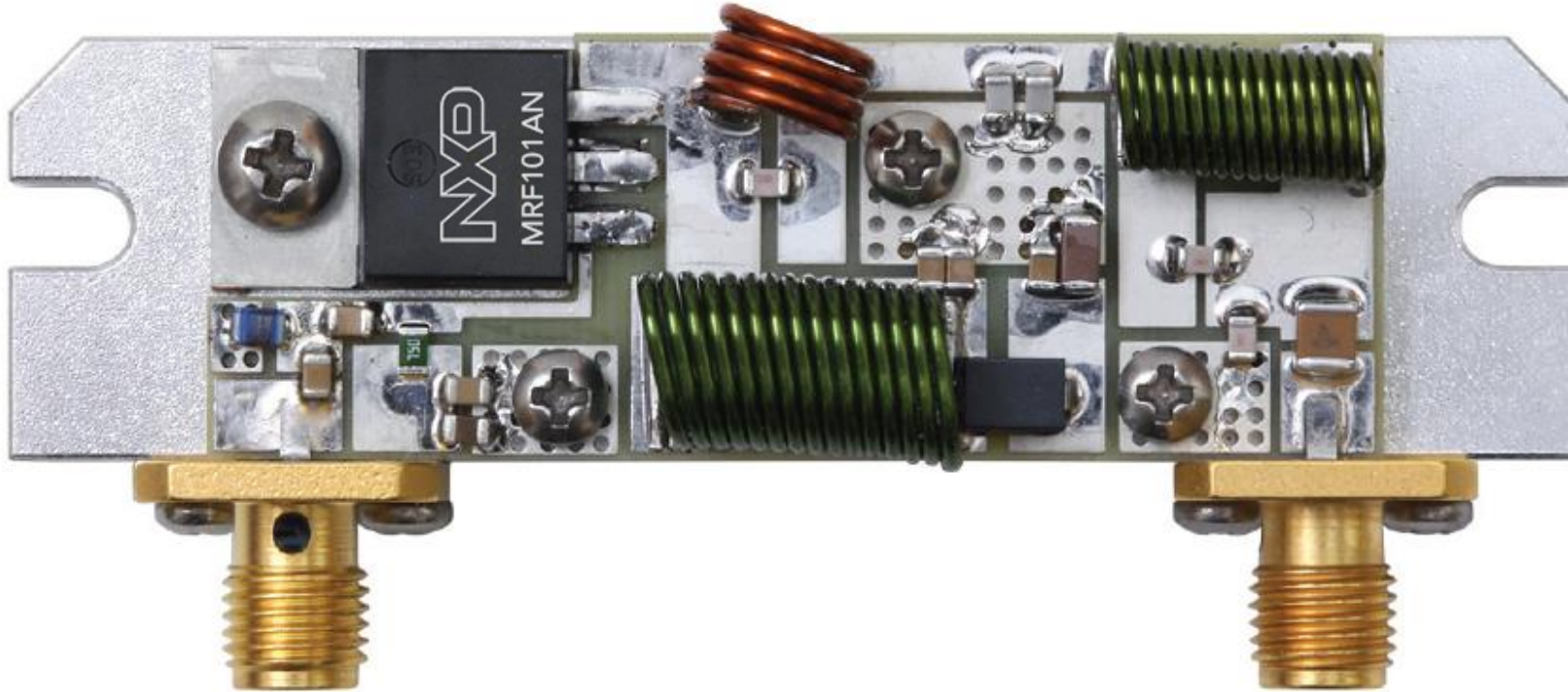
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# Introduction

- The NXP MRF101AN is a 1.8-250 MHz, 100 W CW RF power LDMOS transistor housed in a TO-220 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/MRF101AN](http://www.nxp.com/MRF101AN).
- The following pages describe the 13.56 MHz compact reference circuit (evaluation board). Its typical applications are industrial, scientific, medical (ISM), RF energy and plasma generation.
  - Other reference circuits can be found on [www.nxp.com/MRF101CIRCUITS](http://www.nxp.com/MRF101CIRCUITS).
- The reference circuit can be ordered through NXP's distribution partners and retailers using part number MRF101AN-13MHZ.

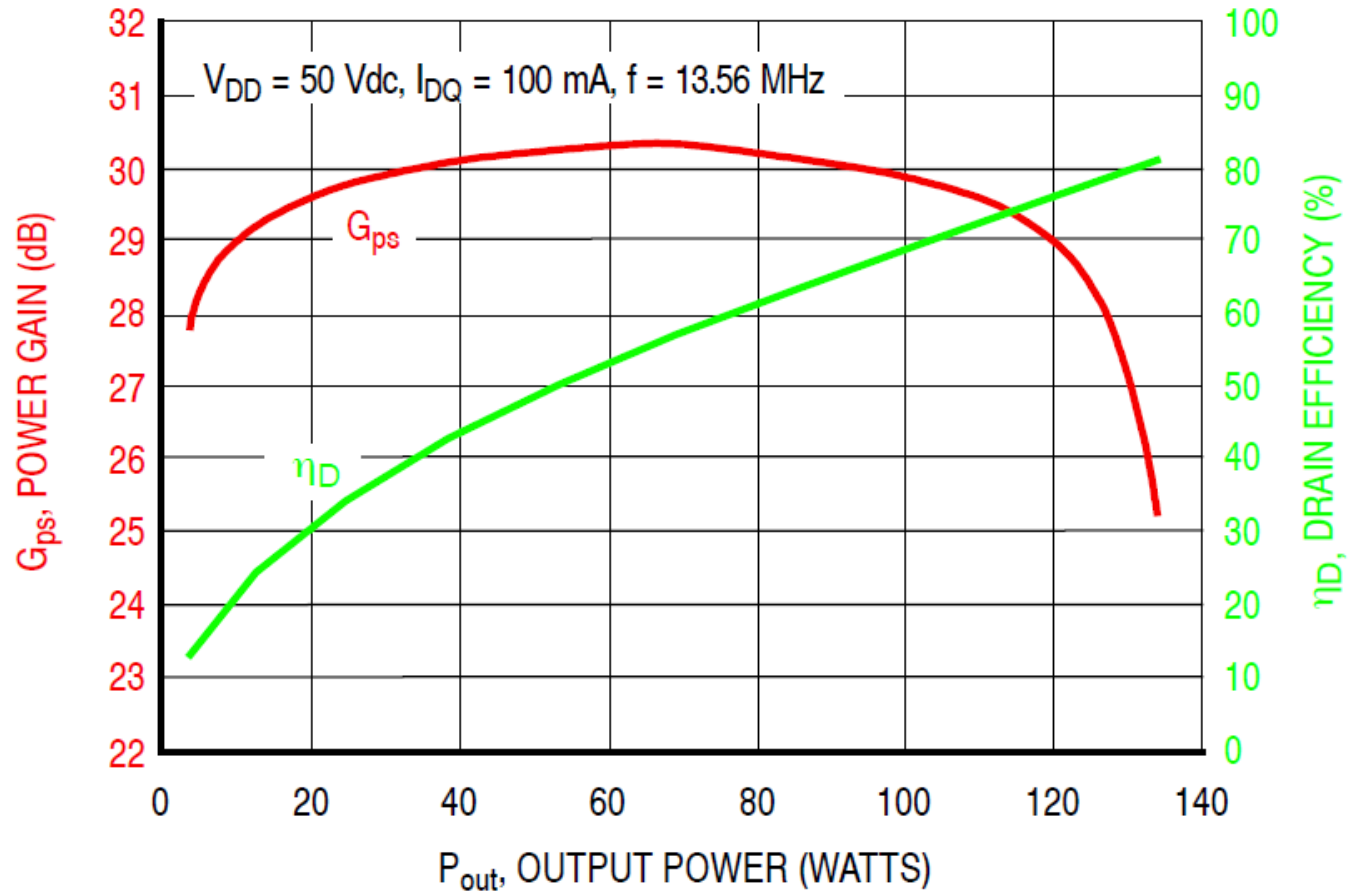


# Circuit Overview – 1.8 cm × 5.0 cm (0.71" × 1.96")



Aluminum baseplate: 1.8 cm × 6.7 cm (0.71" × 2.64")

# Typical CW Performance

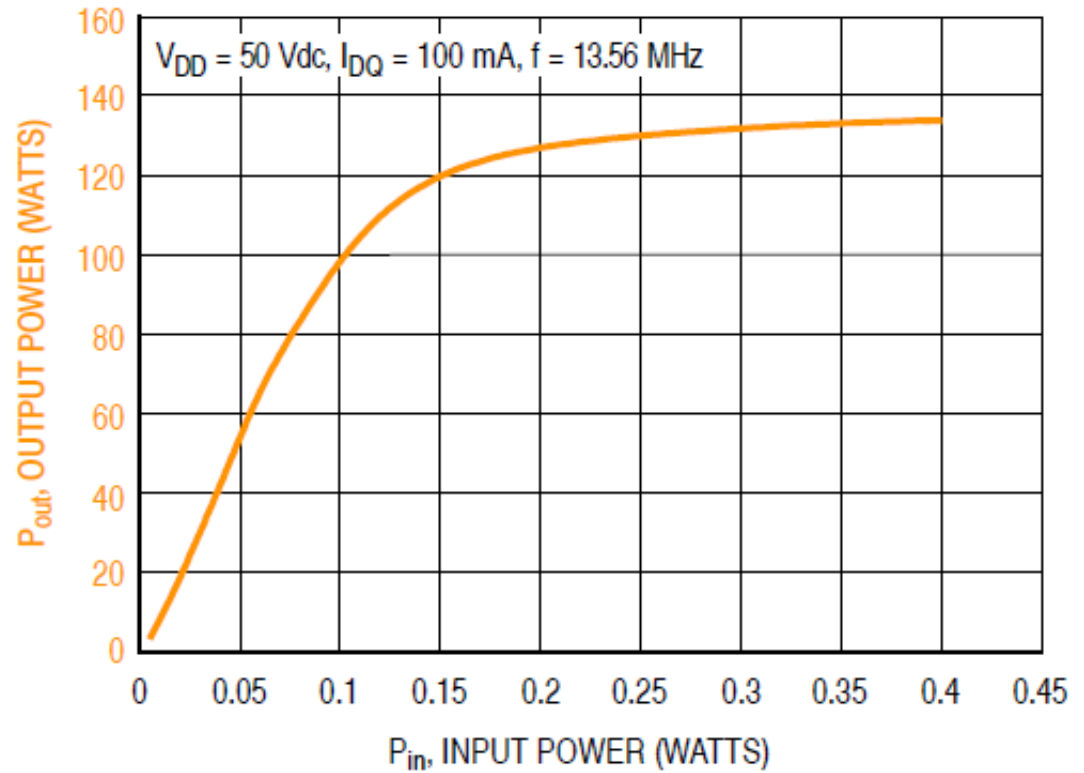
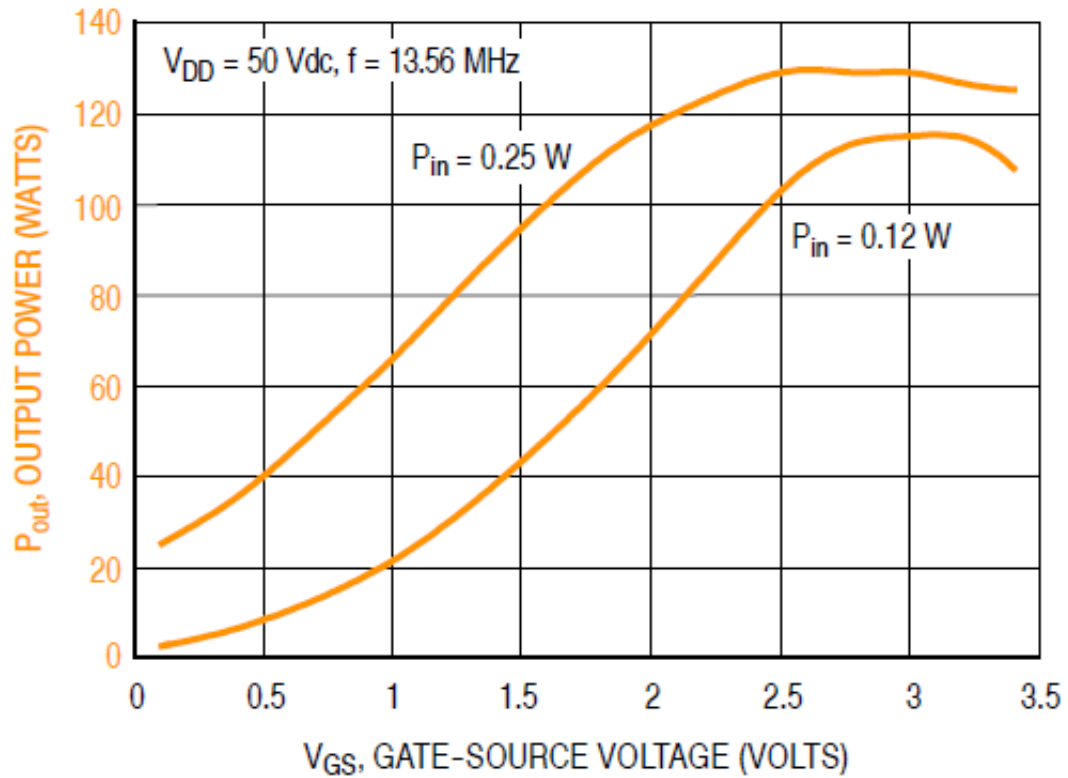


Typical Performance (P3dB):  
 $V_{DD} = 50 \text{ Vdc}$ ,  $I_{DQ} = 100 \text{ mA}$ ,  $P_{in} = 0.25 \text{ W}$  (24 dBm), CW

Frequency (MHz)	Output Power (W)	Power Gain (dB)	Drain Efficiency (%)
13.56	130	27.1	79.6

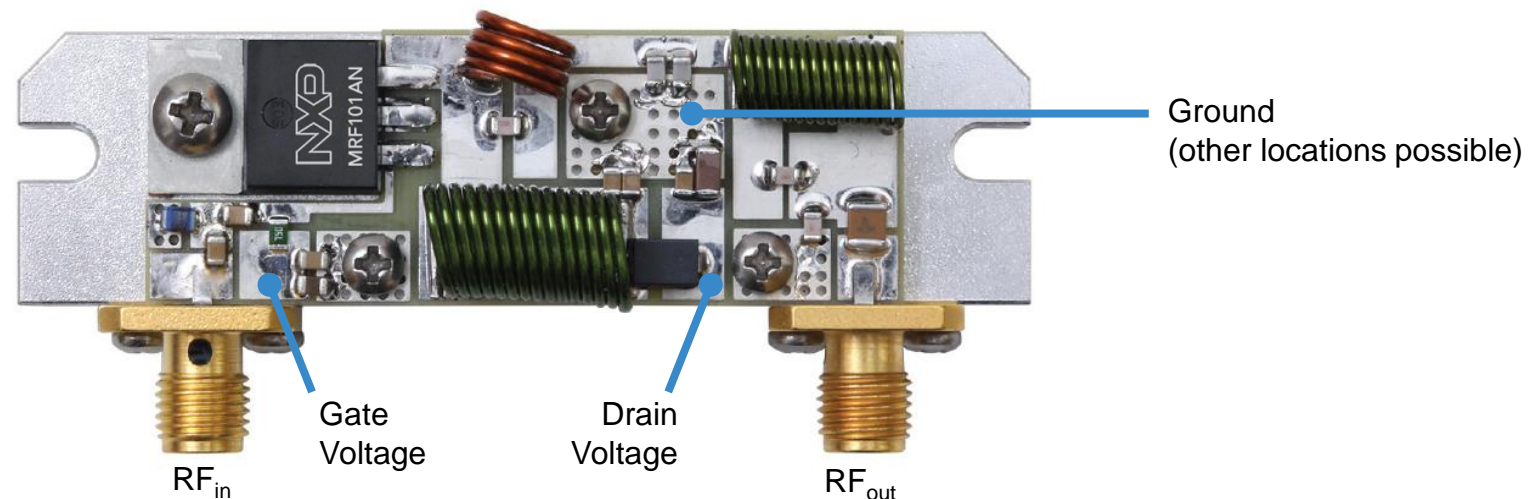


# Typical CW Performance



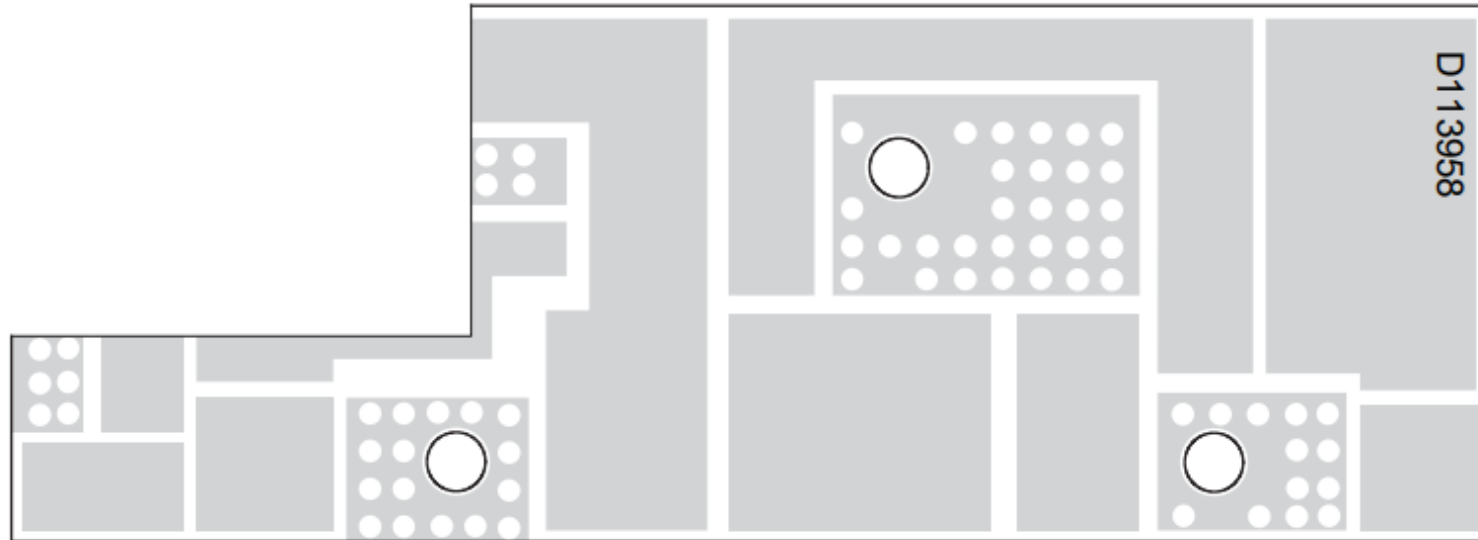
# Quick Start

1. Mount the reference circuit onto a heatsink capable of dissipating more than 50 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. Terminate the RF output with a 50 ohm load capable of handling more than 130 W.
3. Connect the RF input to a 50 ohm source with the RF off.
4. Connect the ground.
5. Connect the gate voltage, set to 0 V.
6. Connect the drain voltage ( $V_{DD}$ ) and raise slowly to 50 V. Current should be 0 A.
7. Raise the gate voltage slowly until the drain current reaches the desired level (drain quiescent current  $I_{DQ} = 100$  mA typically). The gate voltage should be around 2.5 V.
8. Raise the RF input slowly to 0.25 W (24 dBm).
9. Check the RF output power (typically 130 W), the drain current (typically around 3 A for this power level) and the temperature of the board.



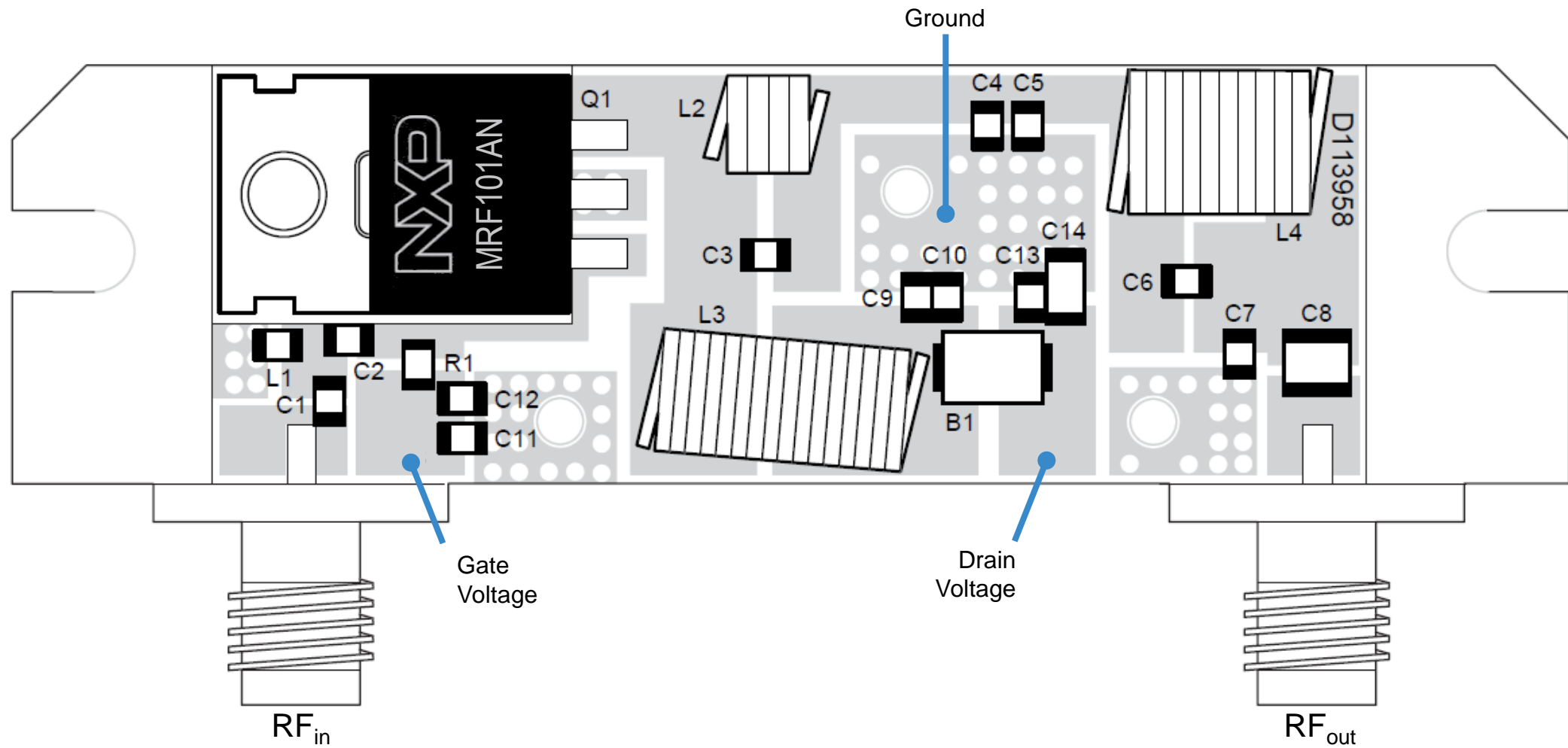
# MRF101AN Compact PCB

Same PCB for all MRF101AN Compact Reference Circuits

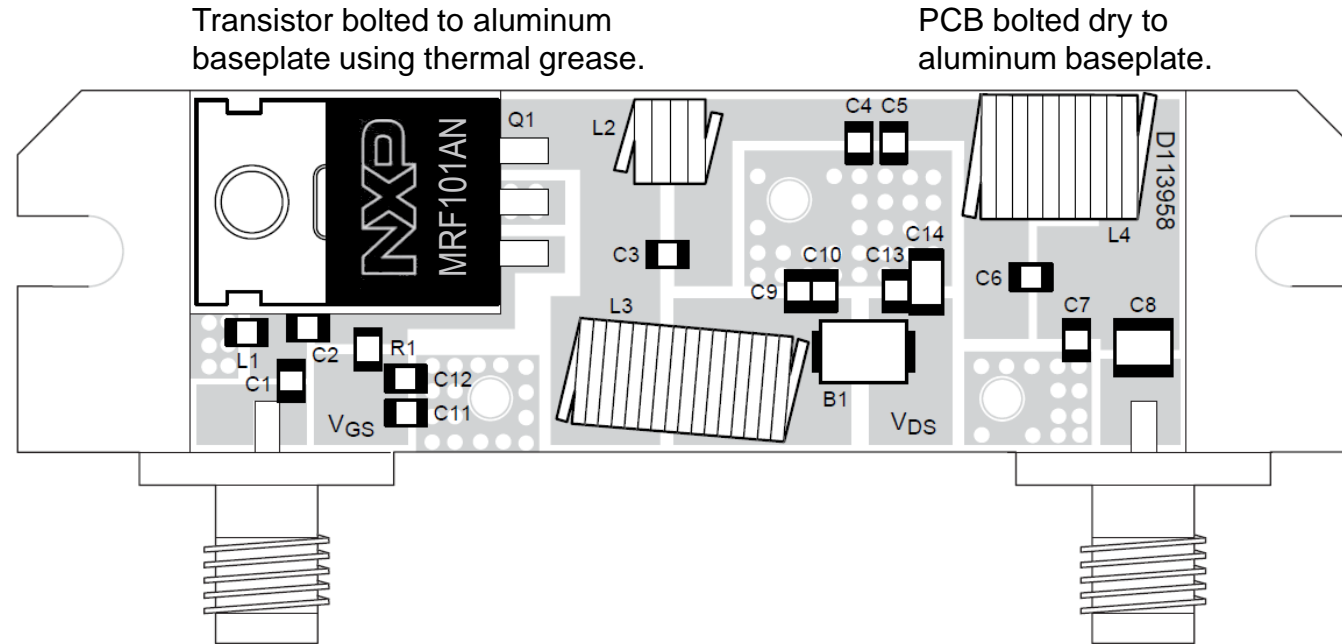




# Component Placement Reference



# Assembly Details



The PCB is screwed to the baseplate with #2-56 screws.

The MRF101AN is screwed to the baseplate with a #4-40 hex screw, a flat washer, a lock washer and thermal grease beneath the transistor.

# Bill of Materials

Part	Description	Part Number	Manufacturer
B1	Short RF Bead	2743019447	Fair-Rite
C1, C2, C9, C10, C12, C13	0.01 $\mu$ F Chip Capacitor	GRM21BR72A103KA01B	Murata
C3	33 pF Chip Capacitor	GQM2195C2E330GB12D	Murata
C4	360 pF Chip Capacitor	GRM2165C2A361JA01D	Murata
C5	390 pF Chip Capacitor	GRM2165C2A391JA01D	Murata
C6	68 pF Chip Capacitor	GQM2195C2E680GB12D	Murata
C7	200 pF Chip Capacitor	GQM2195C2A201GB12D	Murata
C8	0.01 $\mu$ F Chip Capacitor	200B103KT50XT	ATC
C11	1 $\mu$ F Chip Capacitor	GRM21BR71H105KA12L	Murata
C14	1 $\mu$ F Chip Capacitor	C3216X7R2A105K160AA	TDK
L1	820 nH Chip Inductor	0805WL821JT	ATC
L2	4 Turn, #20 AWG, ID = 0.2" Inductor, Hand Wound	8076	Belden
L3	500 nH Square Air Core Inductor	2929SQ-501JE	Coilcraft
L4	330 nH Square Air Core Inductor	2929SQ-331JE	Coilcraft
Q1	RF Power LDMOS Transistor	MRF101AN	NXP
R1	75 $\Omega$ , 1/4 W Chip Resistor	SG73P2ATTD75R0F	KOA Speer
PCB	FR4 0.09", $\epsilon_r = 4.8$ , 2 oz. Copper	D113958	MTL

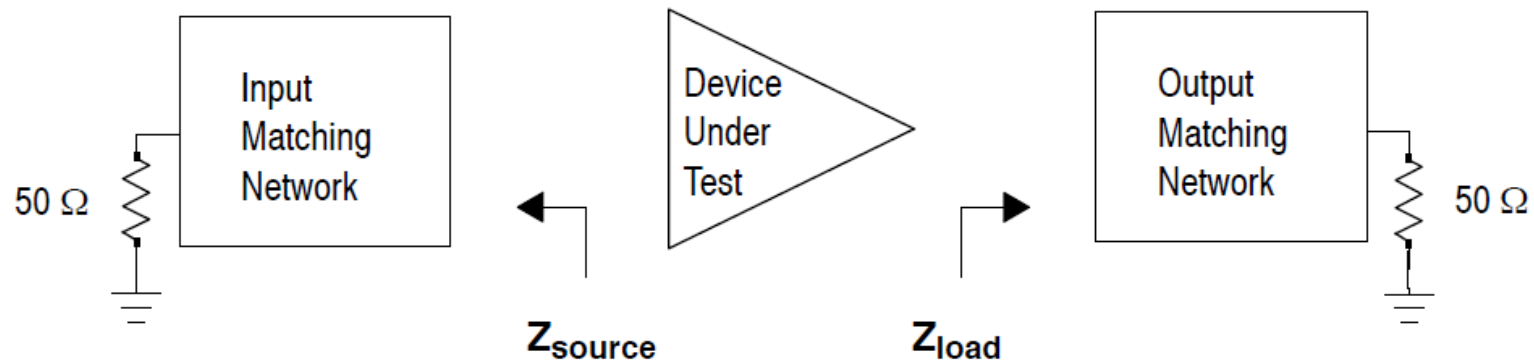


# Impedances

<b>f (MHz)</b>	<b>Z<sub>source</sub> (Ω)</b>	<b>Z<sub>load</sub> (Ω)</b>
13.56	25.3 + j10.2	11.3 – j6.4

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

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



# Revision History

- The following table summarizes revisions to the content of the MRF101AN 13.56 MHz Reference Circuit zip file.

Revision	Date	Description
0	June 2019	<ul style="list-style-type: none"><li>Initial Release</li></ul>
1	September 2019	<ul style="list-style-type: none"><li>Added license statement, general updates to align copy to current standard.</li></ul>



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