# MRF101AN 40.68 MHz COMPACT REFERENCE CIRCUIT

ORDERABLE PART NUMBER: **MRF101AN-40MHZ**

PUBLIC

SECURE CONNECTIONS FOR A SMARTER WORLD

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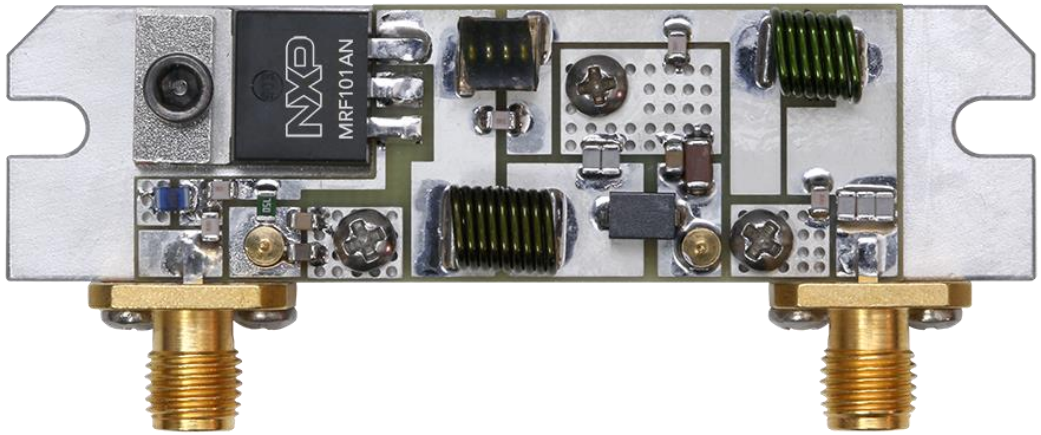
# Introduction

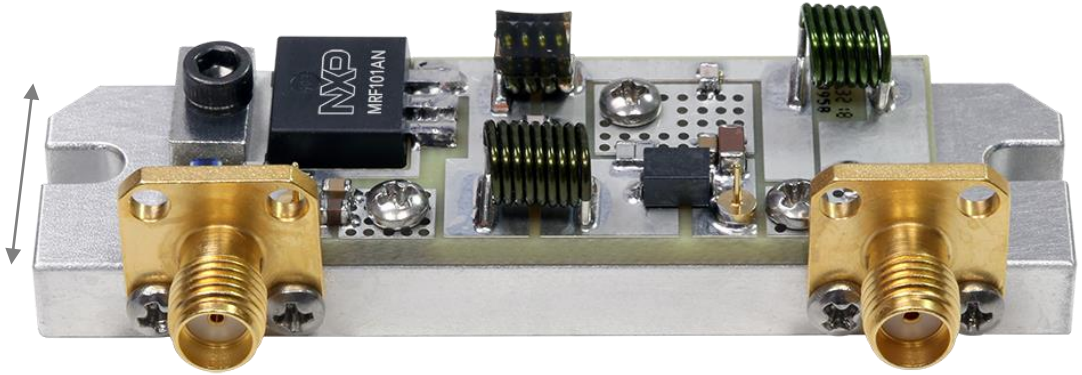
- The NXP MRF101AN is a 1.8-250 MHz, 100 W CW RF power LDMOS transistor housed in a TO-220 over-molded plastic package. Its unmatched input and output allows wide frequency range utilization.
  - Further details about the device, including its data sheet, are available on www.nxp.com/MRF101AN.

- The following pages describe the 40.68 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.

- The reference circuit can be ordered through NXP's distribution partners and etailers using part number MRF101AN-40MHZ.

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

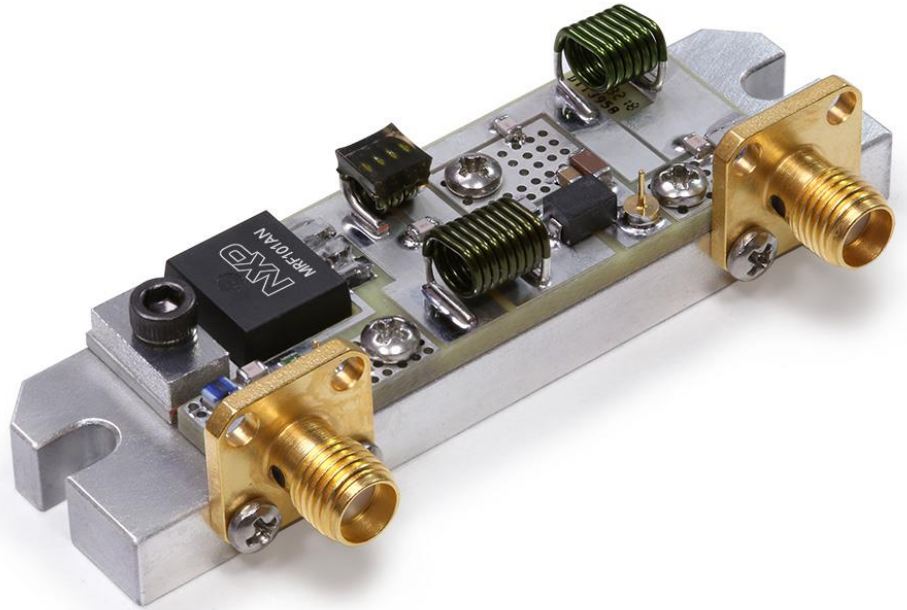



1.8 cm
(0.71″)

5.0 cm (1.96″)

6.7 cm (2.64″)



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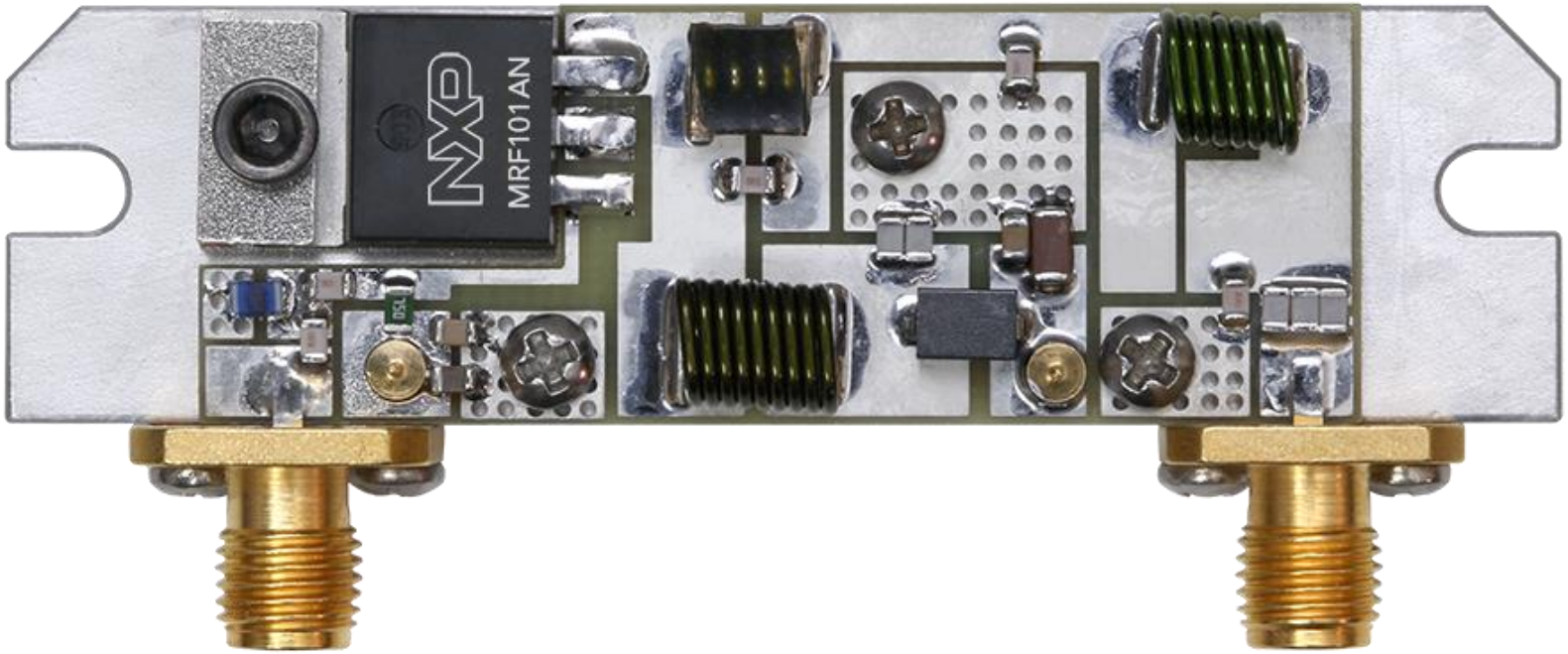
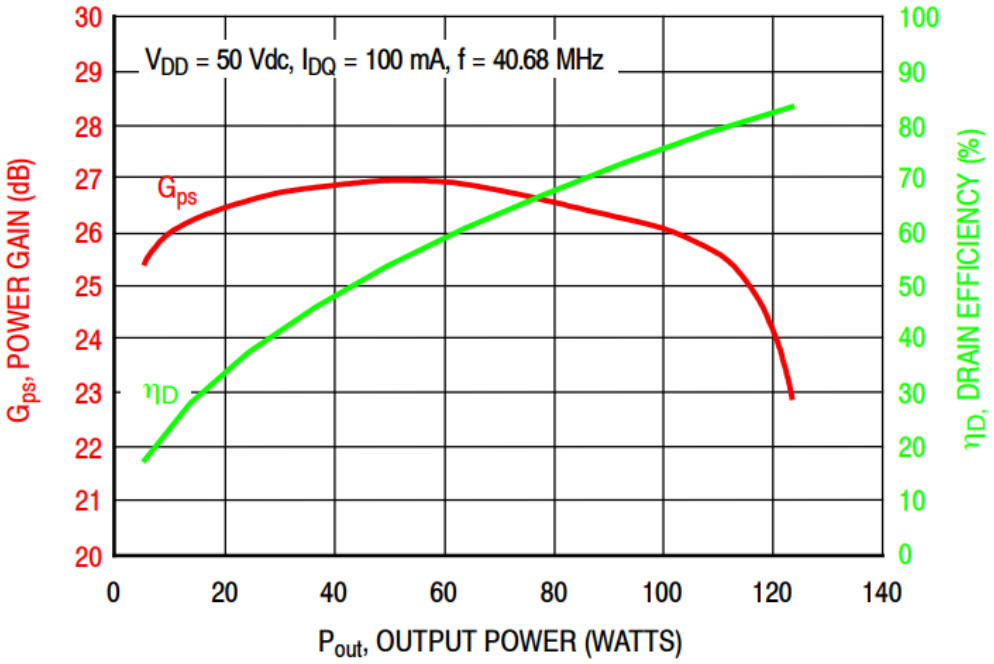
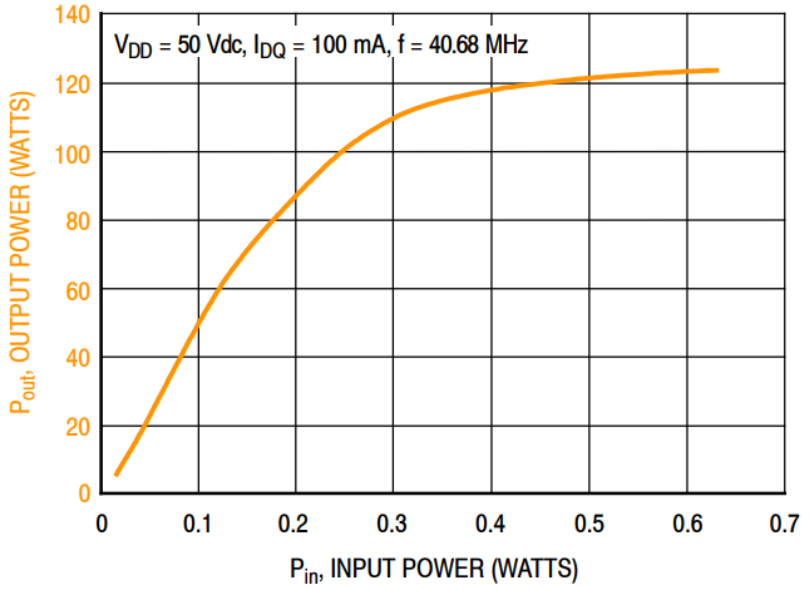
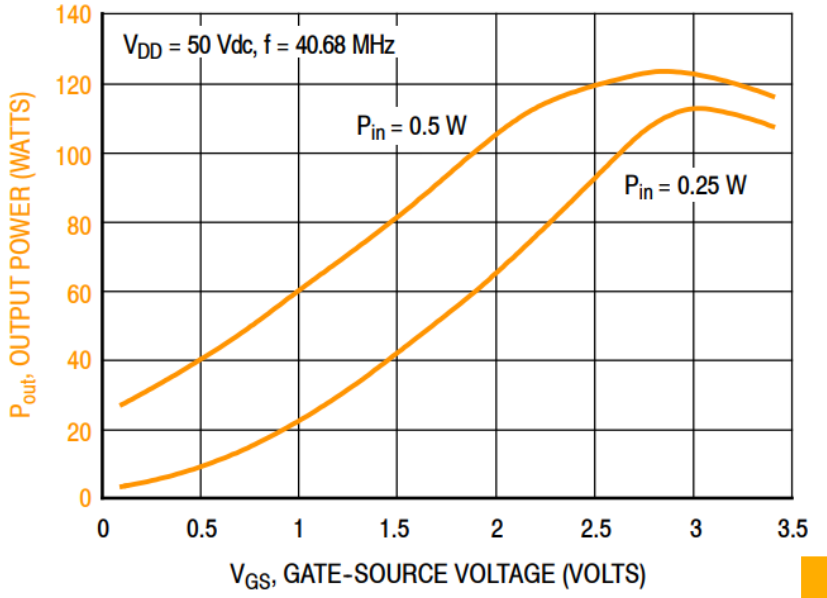



Aluminum baseplate: 1.8 cm × 6.7 cm (0.71″ × 2.64″)

# Typical CW Performance



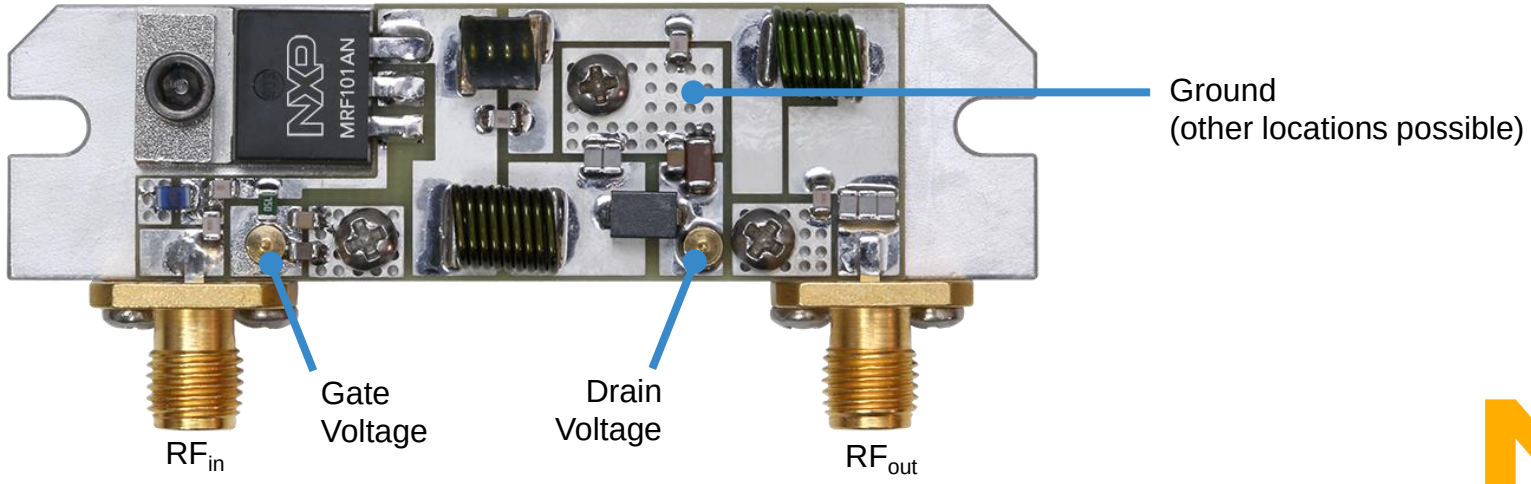




Typical Performance (P3dB): $V_{DD}$ = 50 Vdc, $I_{DQ}$ = 100 mA, $P_{in}$ = 0.5 W (27 dBm), CW

| Frequency (MHz) | Output Power (W) | Power Gain (dB) | Drain Efficiency (%) |
|---|---|---|---|
| 40.68 | 120 | 23.8 | 81.5 |

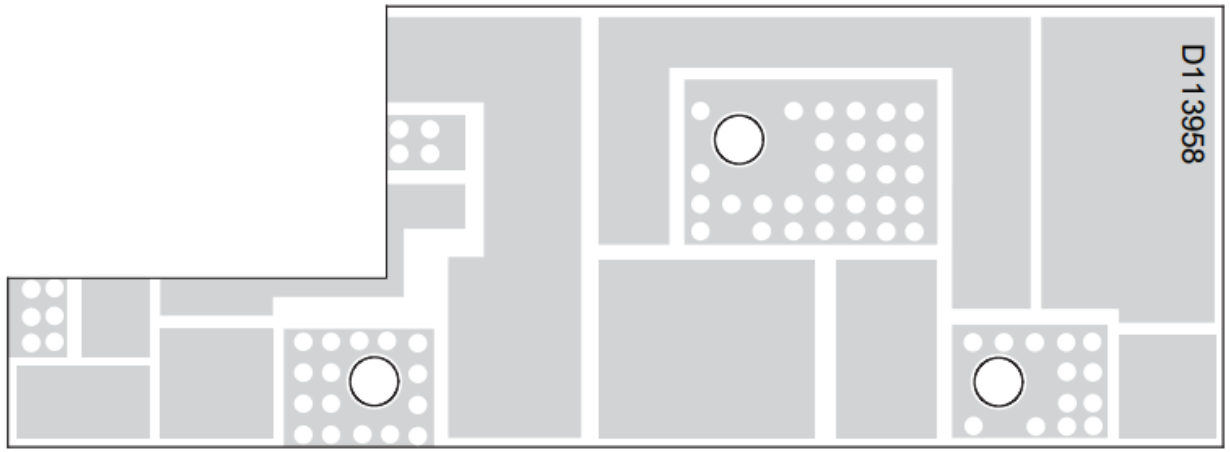
# Quick Start

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 120 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 0.5 W (27 dBm).
9. Check the RF output power (typically 120 W), the drain current (typically around 3 A for this power level) and the temperature of the board.

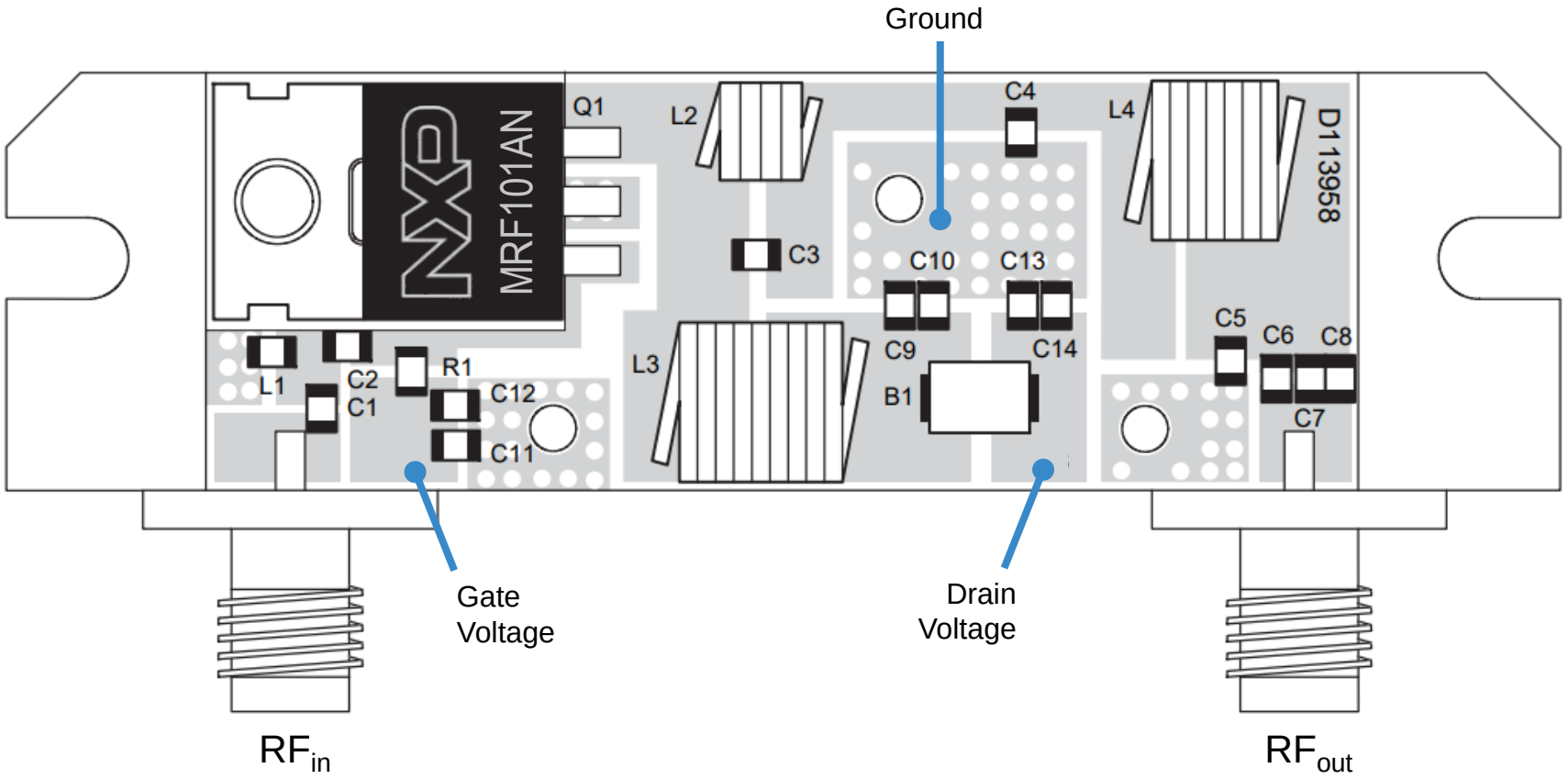


# MRF101AN Compact PCB

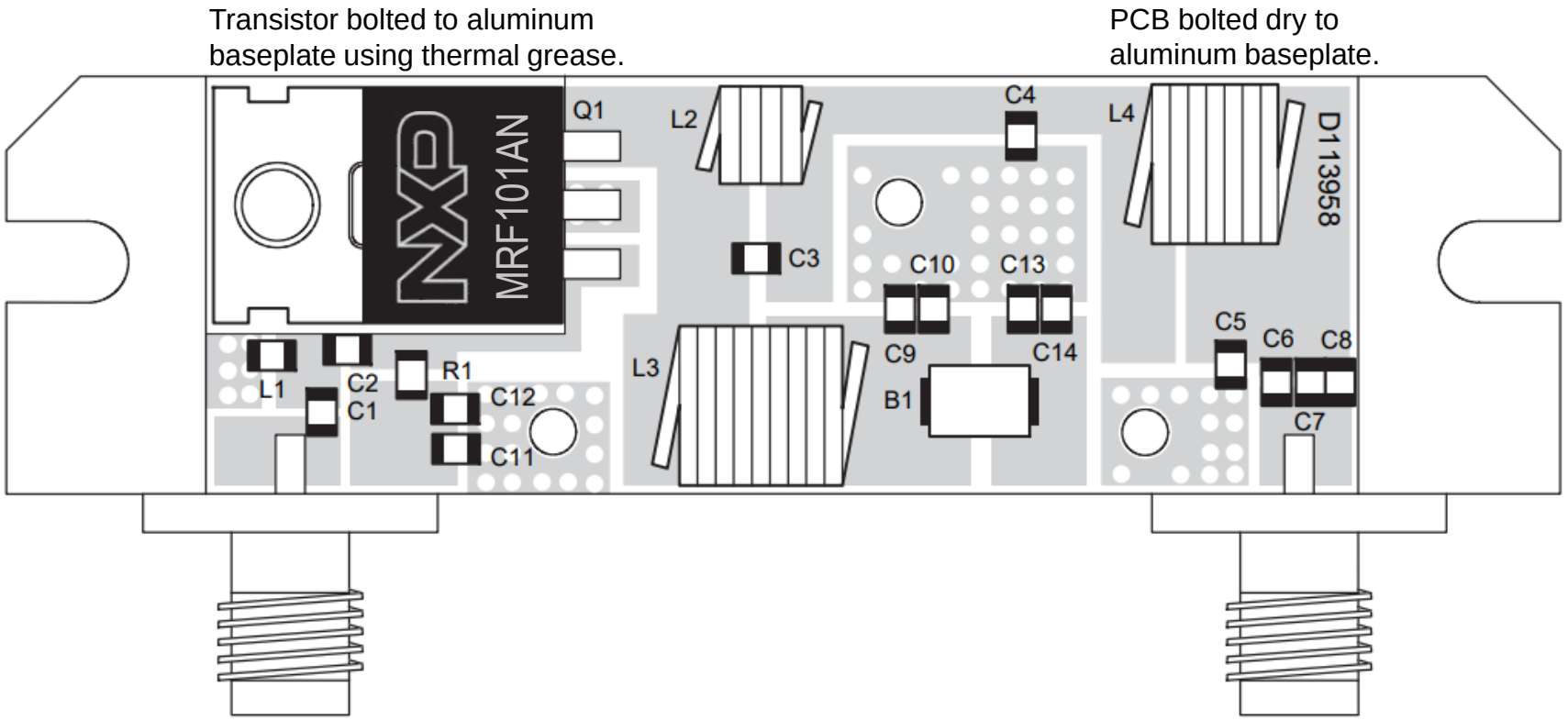
Same PCB for all MRF101AN Compact Reference Circuits



# 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

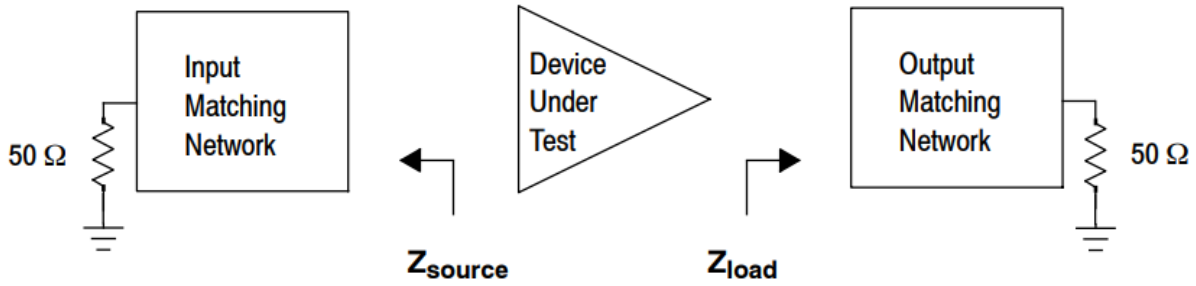
| Part | Description | Part Number | Manufacturer |
|---|---|---|---|
| B1 | Short RF Bead | 2743019447 | Fair-Rite |
| C1, C5 | 82 pF Chip Capacitor | GQM2195C2E820GB12D | Murata |
| C2, C4 | 200 pF Chip Capacitor | GQM2195C2A201GB12D | Murata |
| C3 | 33 pF Chip Capacitor | GQM2195C2E330GB12D | Murata |
| C6, C7, C8, C9, C10 | 1000 pF Chip Capacitor | GRM2165C2A102JA01D | Murata |
| C11 | 1 μF Chip Capacitor | GJ821BR71H105KA12L | Murata |
| C12, C13 | 10 nF Chip Capacitor | GRM21BR72A103KA01B | Murata |
| C14 | 1 μF Chip Capacitor | C3216X7R2A105K160AA | TDK |
| L1 | 150 nH Chip Inductor | 0805WL151JT | ATC |
| L2 | 17.5 nH, 4 Turn Inductor | GA3095-ACL | Coilcraft |
| L3 | 160 nH Square Air Core Inductor | 2222SQ-161JEC | Coilcraft |
| L4 | 110 nH Square Air Core Inductor | 2222SQ-111JEB | Coilcraft |
| Q1 | RF Power LDMOS Transistor | MRF101AN | NXP |
| R1 | 75 Ω, 1/4 W Chip Resistor | SG73P2ATTD75R0F | KOA Speer |
| PCB | FR4 0.09″, $\varepsilon_r$ = 4.8, 2 oz. Copper | D113958 | MTL |

# Impedances

| f<br>MHz | $Z_{source}$<br>Ω | $Z_{load}$<br>Ω |
|---|---|---|
| 40.68 | 24.0 + j12.6 | 14.2 – j2.5 |

$Z_{source}$ = 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 MRF101AN 40.68 MHz Reference Circuit zip file.

| Revision | Date | Description |
|---|---|---|
| 0 | June 2019 | • Initial release |
| 1 | September 2019 | • Added license statement, general updates to align copy to current standard |

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