MRFX1K80H 64 MHz REFERENCE CIRCUIT

ORDERABLE PART NUMBER: **MRFX1K80H-64MHZ**

License

- Open and read the License.pdf included in the same zip file as the document you are currently reading. By using the documentation materials included in this zip file, you indicate that you accept the terms of the agreement.

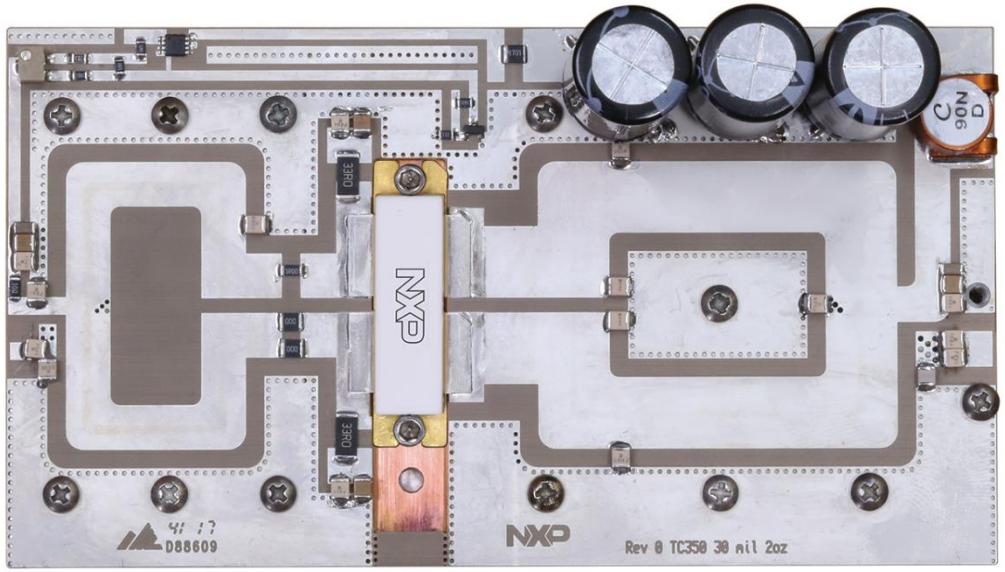
Introduction

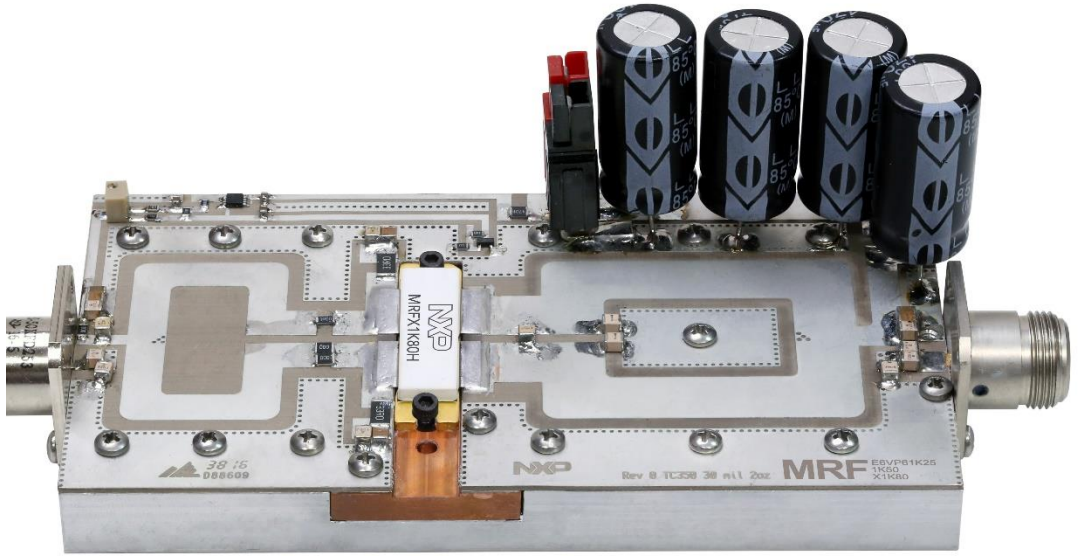
- The NXP MRFX1K80H is a 1.8-400 MHz, 1800 W CW RF power LDMOS transistor housed in an NI-1230 air-cavity ceramic package. Its unmatched input and output allows wide frequency range utilization.
  - Further details about the device, including its data sheet, are available on www.nxp.com/MRFX1K80H.

- The following pages describe the 64 MHz pulse reference circuit (evaluation board).
  Its typical application is MRI.

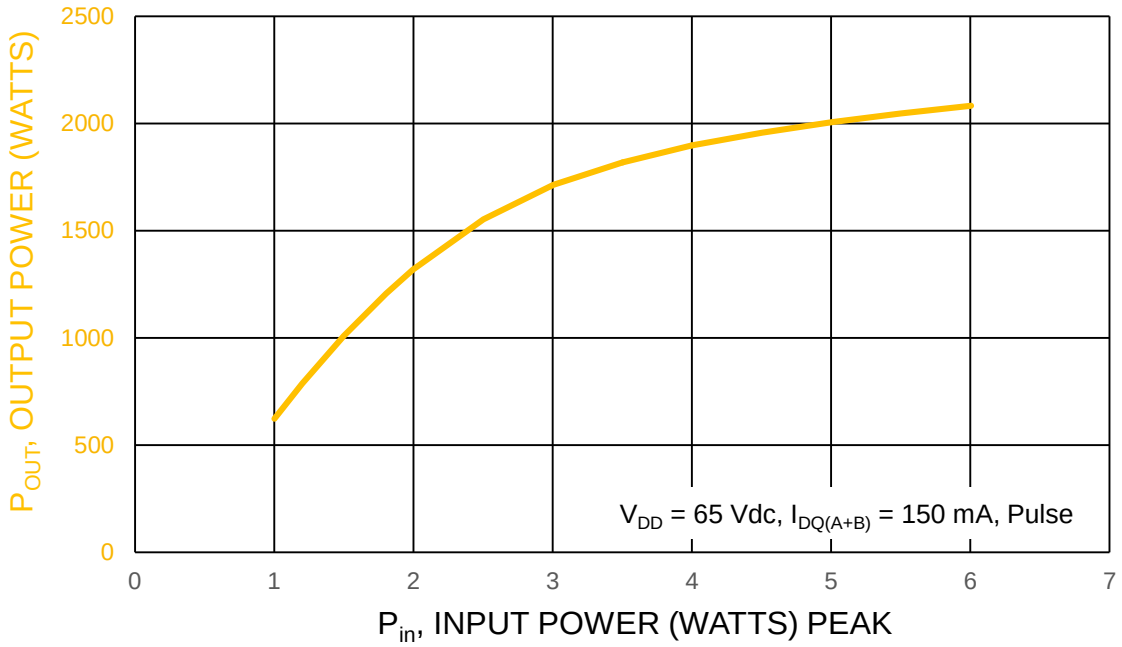
- The reference circuit can be ordered through NXP's distribution partners and etailers using part number MRFX1K80H-64MHZ.

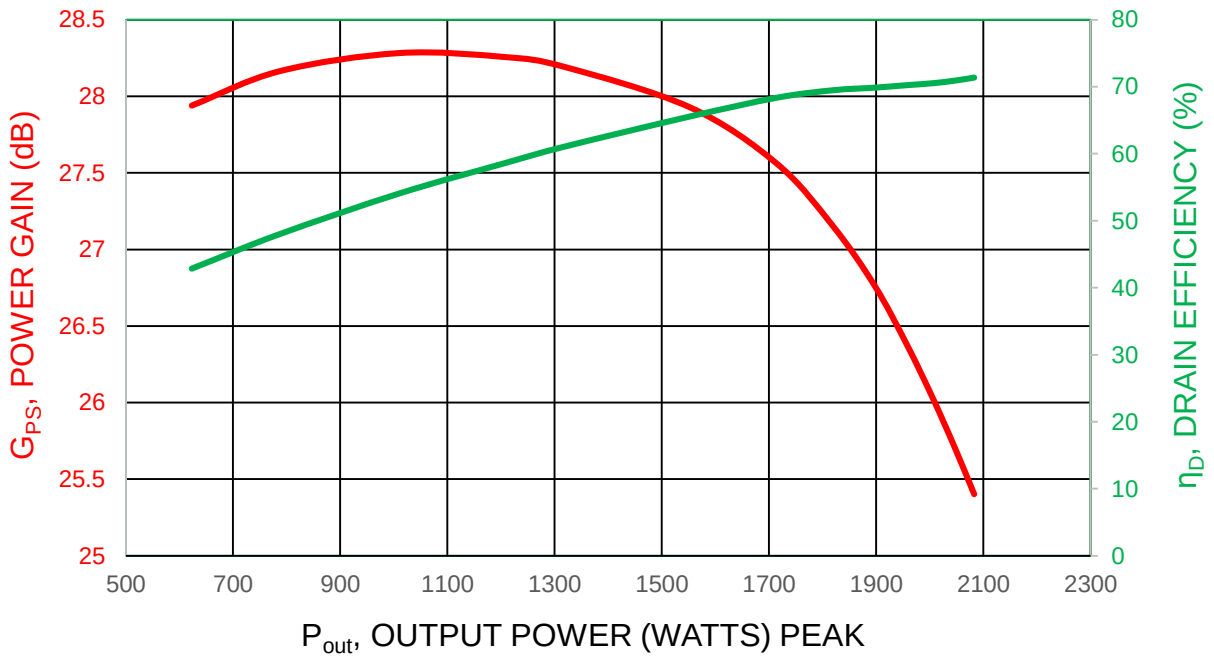
Circuit Overview – 7.62 cm × 13.97 cm (3.0″ × 5.5″)





Typical Pulse Performance



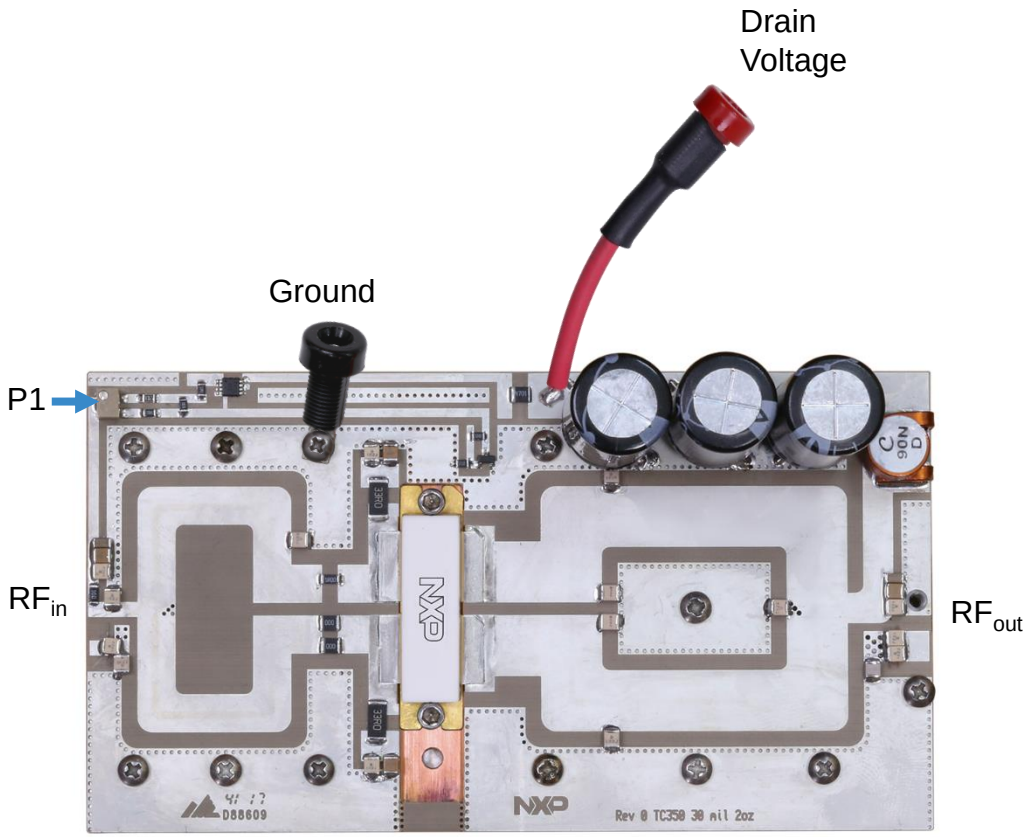


Typical Performance (P1dB): V_{DD} = 65 Vdc, $I_{DQ(A+B)}$ = 150 mA, P_{in} = 4 W Peak (35.4 dBm), Pulse

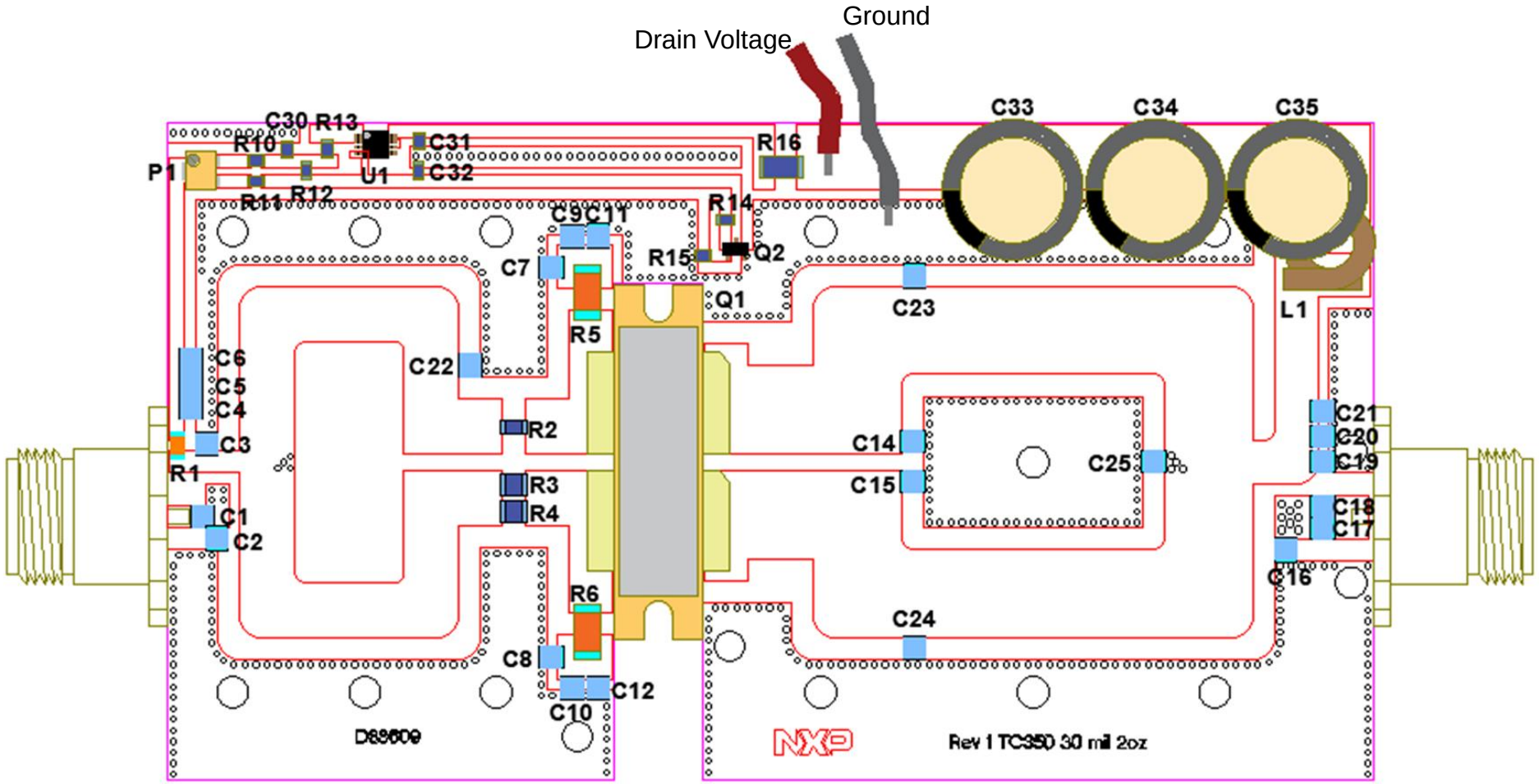
Frequency (MHz)	Signal Type	Output Power (W)	Power Gain (dB)	Drain Efficiency (%)
64	Pulse (100 µsec, 10% Duty Cycle)	1800 Peak	27.1	69.5

Quick Start

1. Mount the reference circuit onto a heatsink capable of dissipating more than 180 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 1800 W peak.
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 65 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 P1 potentiometer to modify the gate voltage to adjust the drain quiescent current.
7. Raise the RF input slowly to 4 W (35.4 dBm) peak.
8. Check the RF output power (typically 1800 W peak), the drain current (around 40 A peak for this power level) and the temperature of the board.



Component Placement Reference



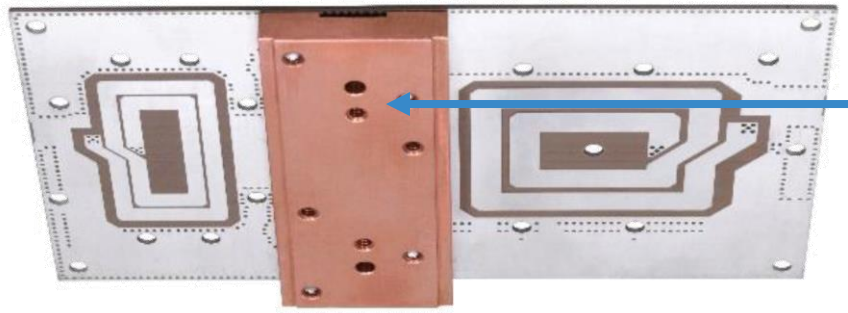
Bill of Materials

Designator	Description	Part Number	Manufacturer
C1,C3,C4,C9,C10,C17,C18,C19	1000 pF chip capacitors	100B102JT50XT	ATC
C2	33 pF chip capacitor	100B330JT500XT	ATC
C5,C11,C12,C20	39,000 pF chip capacitors	200B393KT50XT	ATC
C6,C21	1 µF chip capacitors	GRM31MR72H105KA01L	Murata
C7,C8,C13	DNP	N/A	N/A
C14,C15	91 pF chip capacitors	100B910JT500XT	ATC
C16	62 pF chip capacitor	800B620JT500XT	ATC
C22	82 pF chip capacitor	100B820JT500XT	ATC
C23	39 pF chip capacitor	100B390JT500XT	ATC
C24	68 pF chip capacitor	100B680JT500XT	ATC
C25	47 pF chip capacitor	100B470JT500XT	ATC
C26 to C29	DNP	N/A	N/A
C30,C31,C32	1 µF chip capacitors	GRM31MR71H105KA88L	Murata
C33, C34, C35	470 µf 100 V Electrolytic capacitors	MCGPR100V477M16X32-RH	Multicomp
R1	10 Ω 1206 Chip Resistor	CRCW120610R0JNEA	Vishay Dale
R2	1 Ω 1206 Chip Resistor	CRCW12061R00FKEA	Vishay Dale
R3,R4	0 Ω 1210 Chip Resistor	CRCW12100000Z0EA	Vishay Dale
R5,R6	33 Ω 2512 Chip Resistors	1-2176070-3	TE Connectivity
R7,R8,R9	DNP	N/A	N/A
R10	20 KΩ 0805 Chip Resistor	RR1220P-203-B-T5	Susumu
R11	10 KΩ 0805 Chip Resistor	CRCW080510K0FKEA	Vishay Dale
R12,R14	1.2 KΩ 0805 Chip Resistor	CRCW08051K20FKEA	Vishay Dale
R13	10 Ω 0805 Chip Resistor	CRCW080510R0FKEA	Vishay Dale
R15	2.2 KΩ 0805 Chip Resistor	CRCW08052K20JNEA	Vishay Dale
R16	4.7 KΩ 1210 Chip Resistor	CRCW12104K70FKEA	Vishay Dale
L1	90 nH Inductors	1212VS-90NMEB	Coilcraft
P1	SMT Trim Pot 5K, (12 turn)	3224W-1-502E	Bourns
U1	IC 5v regulator (micro8)	LP2951ACDMR2G	On-Semi
Q1	LDMOS transistor	MRFX1K80H	NXP
Q2	Discrete Semi's Transistors, NPN	BC847ALT1G	On-Semi
PCB	TC350 30 mil 2 oz	D88609	MTL
Thermal Pad	TG6050 Series Soft Thermal Conductive Pad	TG6050-150-150-5.0-0	t-Global Technology

Assembly Details

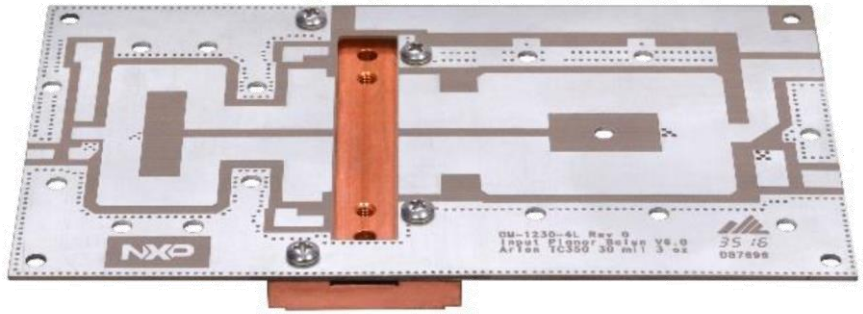
(picture from another reference circuit with different size but similar concept)

- Back side view of the PCB:

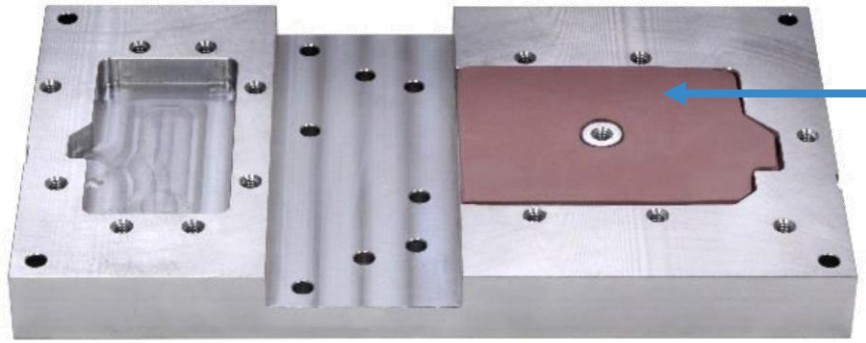


Copper insert soldered to the PCB

- Top side view of the PCB:



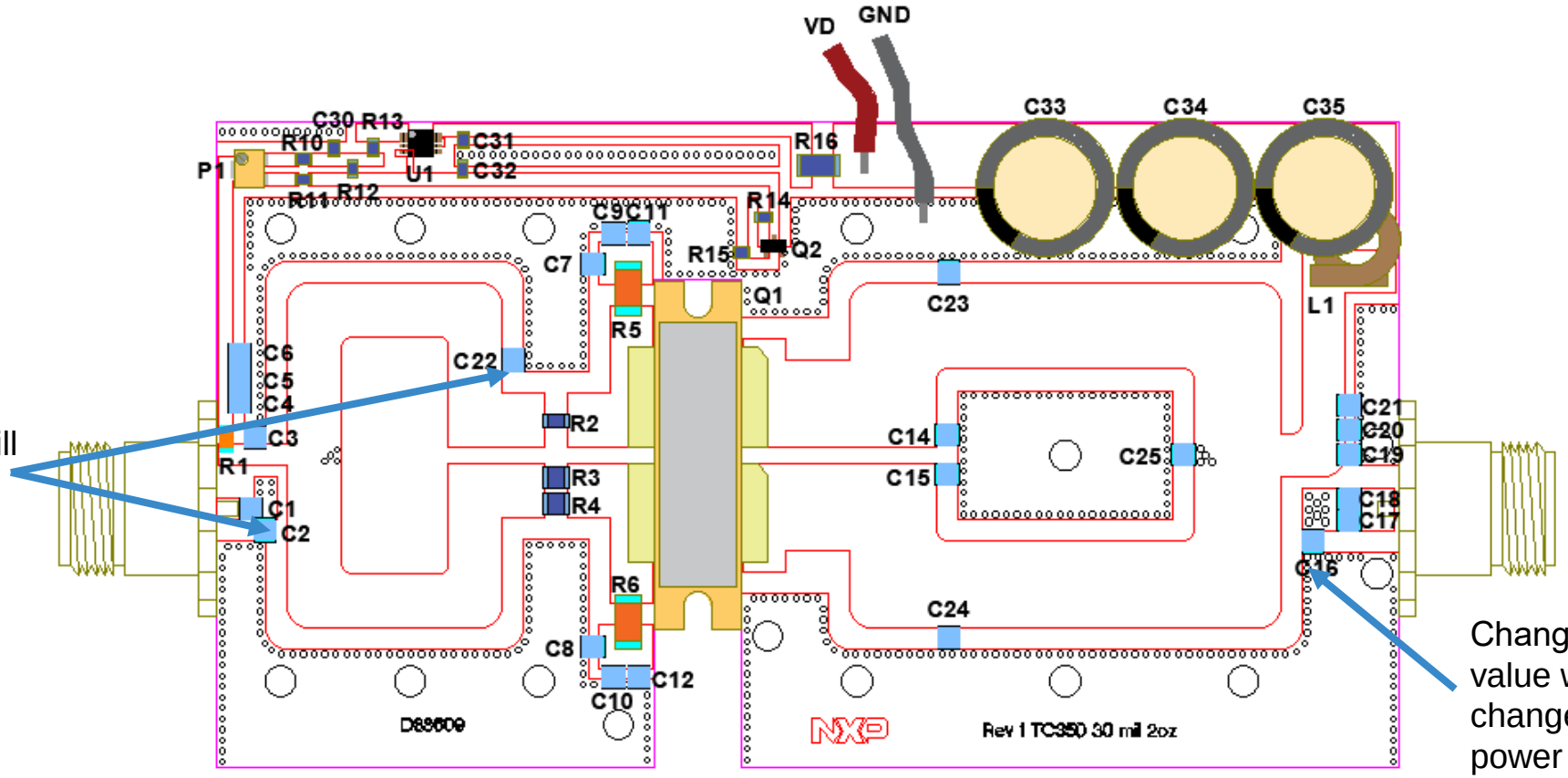
- Aluminum baseplate:



Thermal pad for heat dissipation on the drain side

Tuning Tips

Changing C2, C22 values will change gain response



Changing C16's value will change output power and efficiency

Revision History

- The following table summarizes revisions to the content of the MRFX1K80H 64 MHz Reference Circuit zip file.

Revision	Date	Description
0	September 2019	• Initial Release

SECURE CONNECTIONS
FOR A SMARTER WORLD