MRFX1K80H 175 MHz REFERENCE CIRCUIT

ORDERABLE PART NUMBER: **MRFX1K80H-175MHZ**

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.

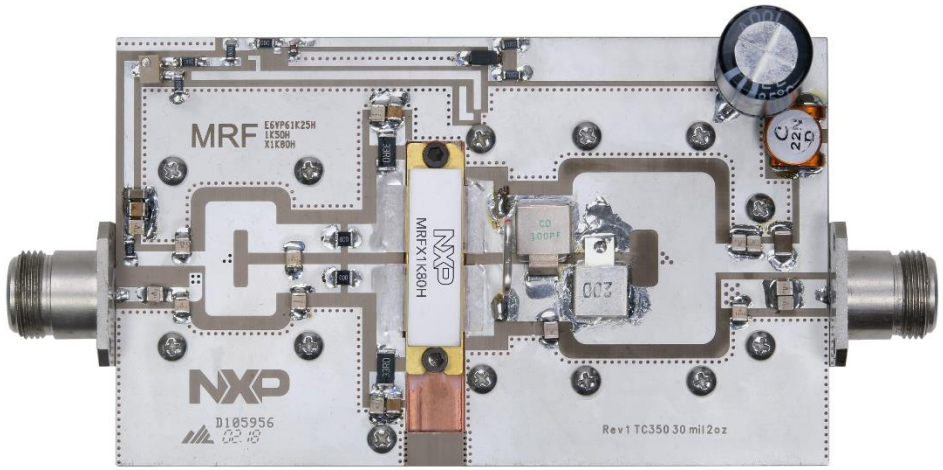
Introduction

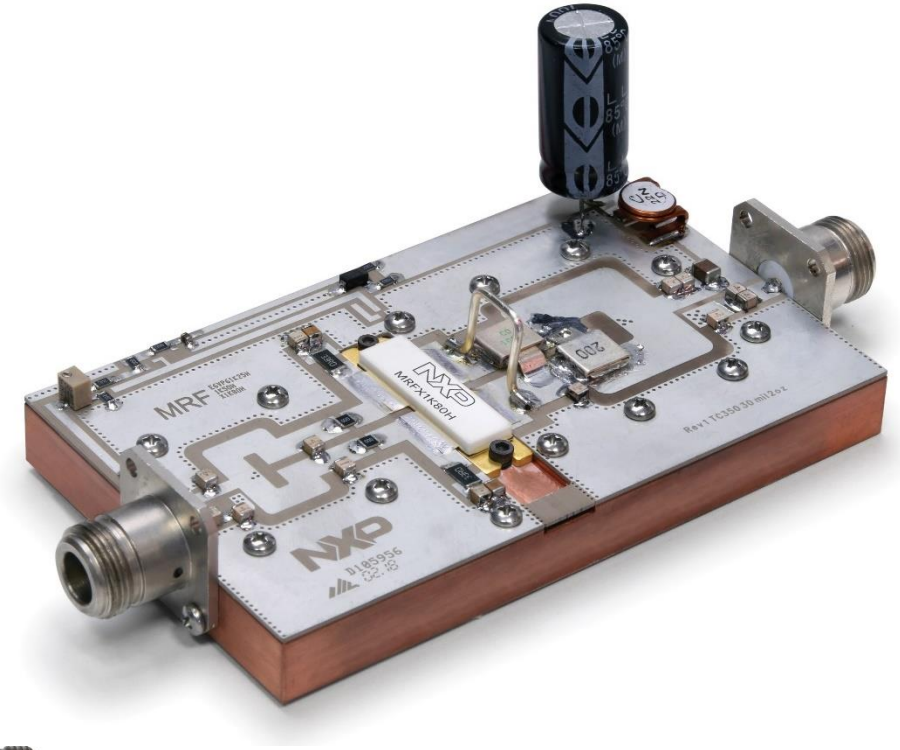
- The NXP MRFX1K80H is a 1.8-400 MHz, 1800 W CW RF power LDMOS transistor housed in an NI-1230 air-cavity ceramic package. Its unmatched input and output allows wide frequency range utilization.
  - Further details about the device, including its data sheet, are available on www.nxp.com/MRFX1K80H.

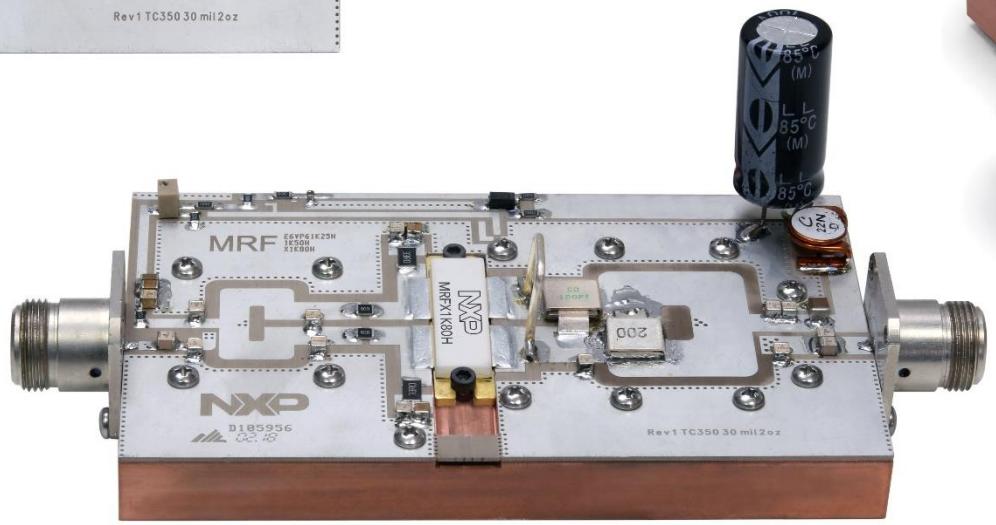
- The following pages describe the 175 MHz reference circuit (evaluation board).
  Its typical application is particle accelerators.

- The reference circuit can be ordered through NXP's distribution partners and etailers using part number MRFX1K80H-175MHZ.

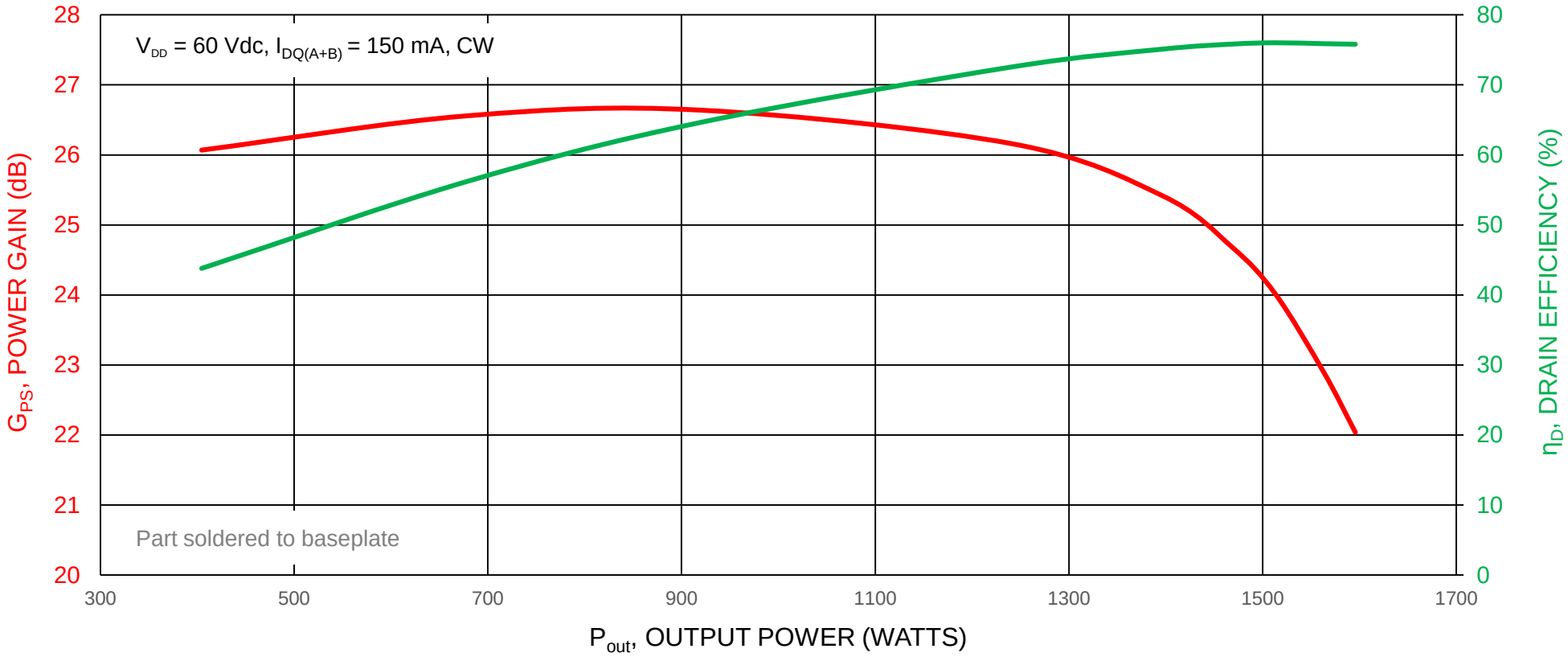
Circuit Overview – 7.62 cm × 12.70 cm (3.0″ × 5.0″)







Typical CW Performance

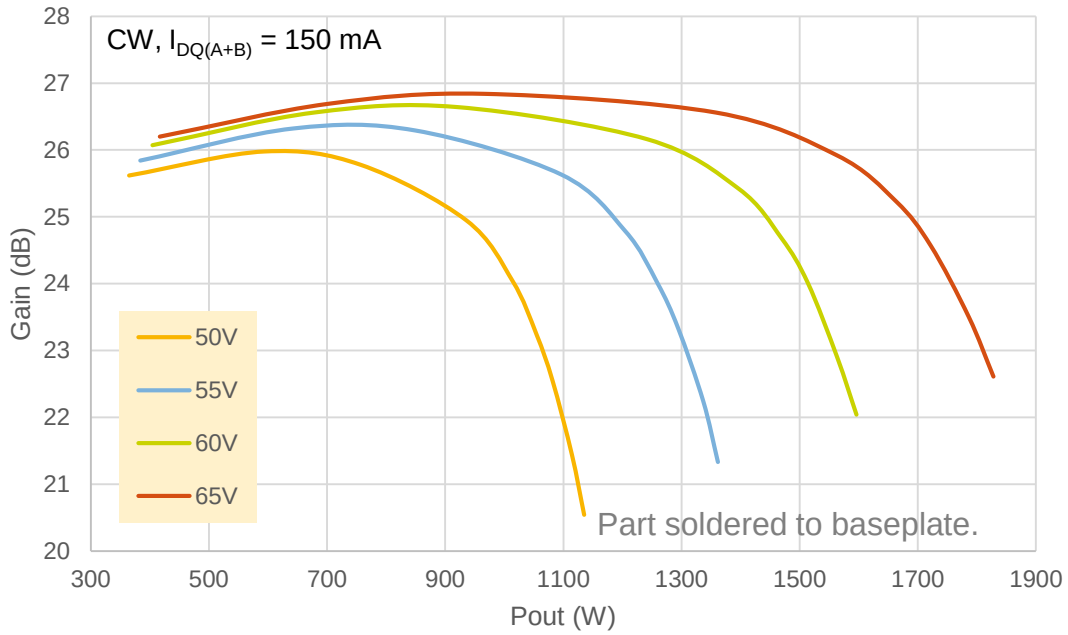


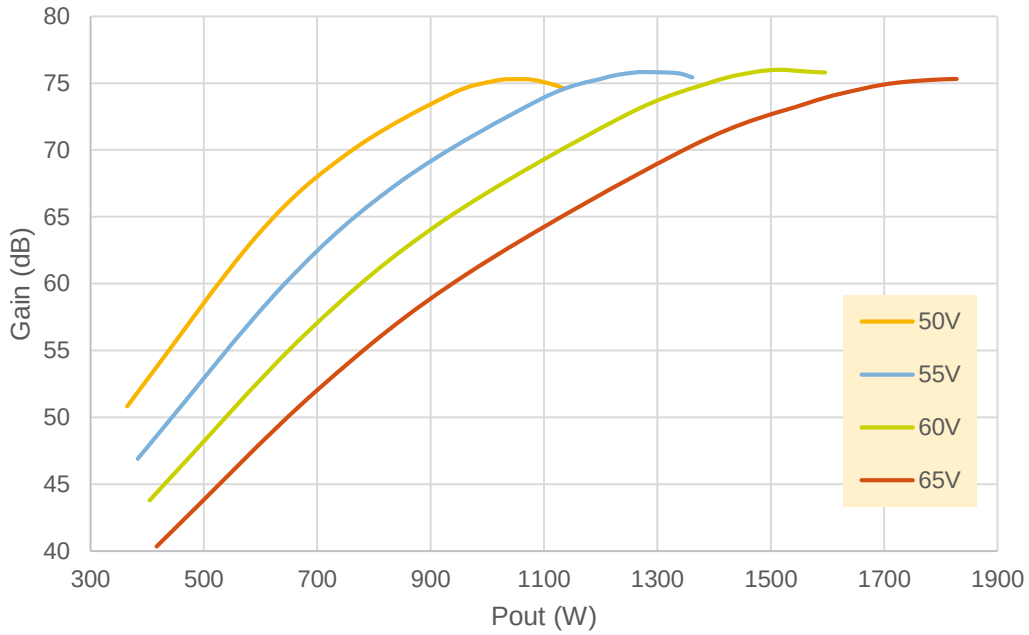
Typical Performance: V_{DD} = 60 Vdc, $I_{DQ(A+B)}$ = 150 mA, P_{in} = 7.0 W (38.4 dBm), CW

Frequency (MHz)	Output Power (W)	Power Gain (dB)	Drain Efficiency (%)
175	1560	23.5	75.9

V_{DD} at 60 V provides a good compromise between efficiency and output power. This circuit, however, is 65 V capable.

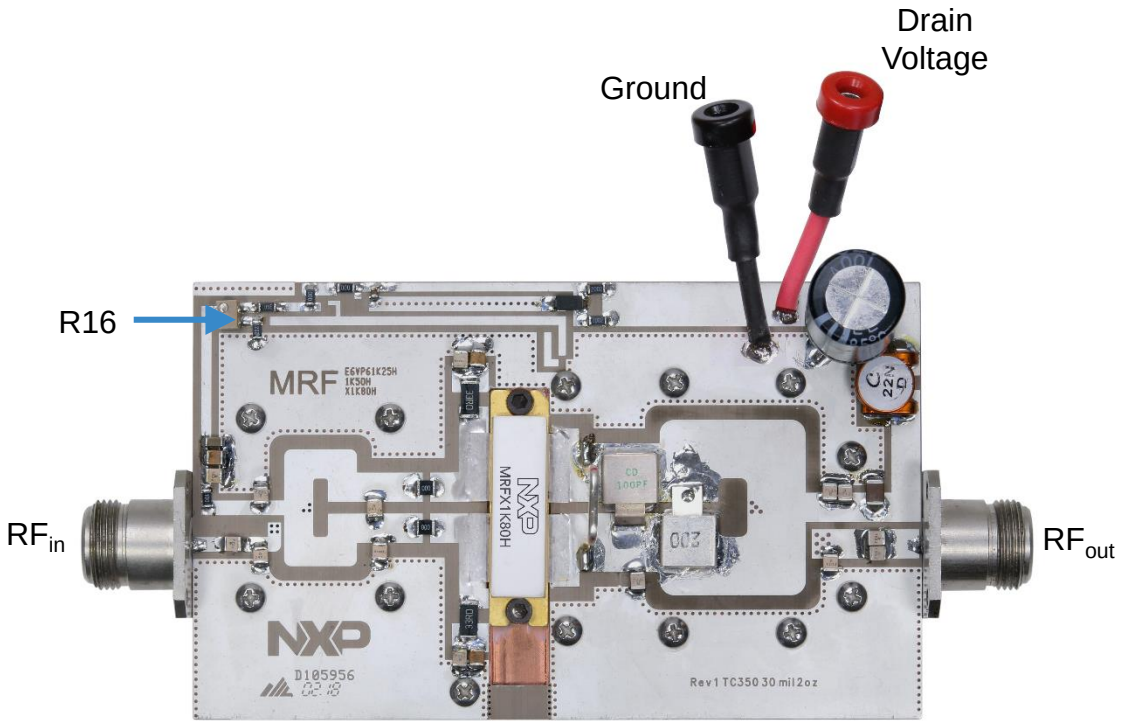
Typical Performance at Different V_{DD}



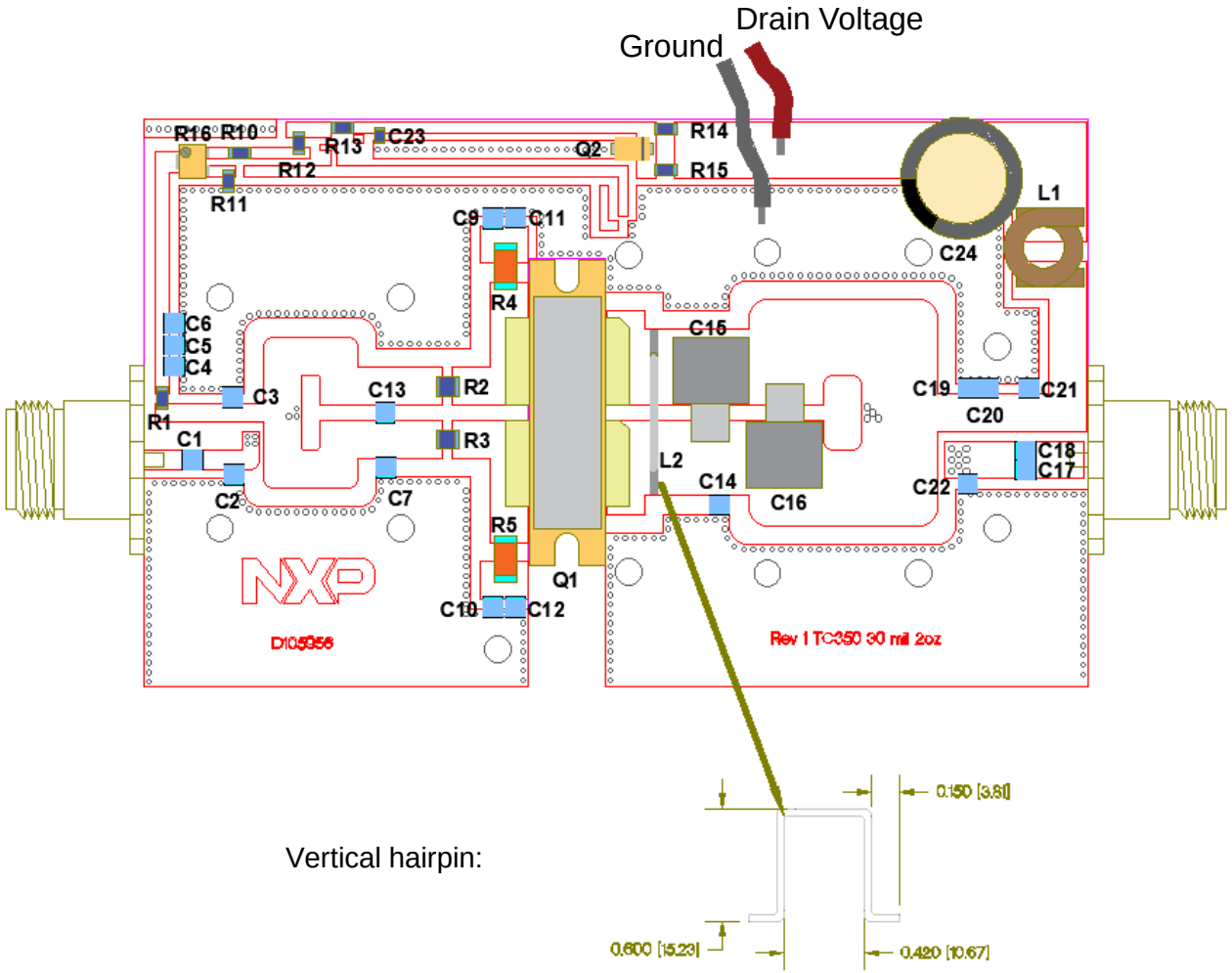


Quick Start

1. Mount the reference circuit onto a heatsink capable of dissipating more than 600 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 1600 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 60 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 R16 potentiometer to modify the gate voltage to adjust the drain quiescent current.
7. Raise the RF input slowly to 7.0 W (38.4 dBm).
8. Check the RF output power (typically 1560 W peak), the drain current (around 34 A peak for this power level) and the temperature of the board.



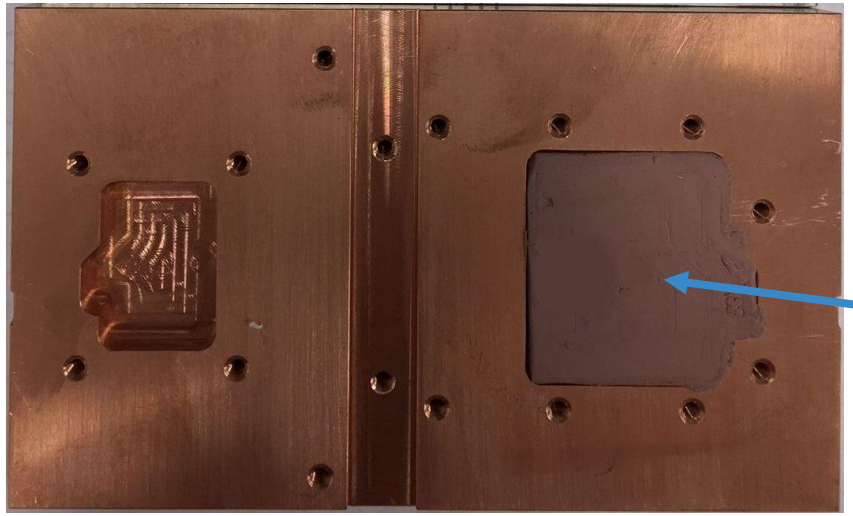
Component Placement Reference



Vertical hairpin:

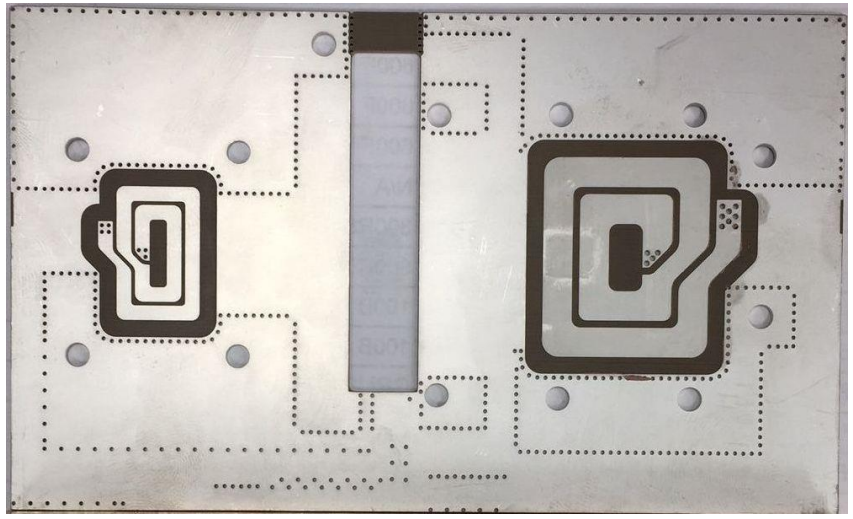
Assembly Details

- Copper baseplate:



Thermal pad for heat dissipation

- Back side view of the PCB:

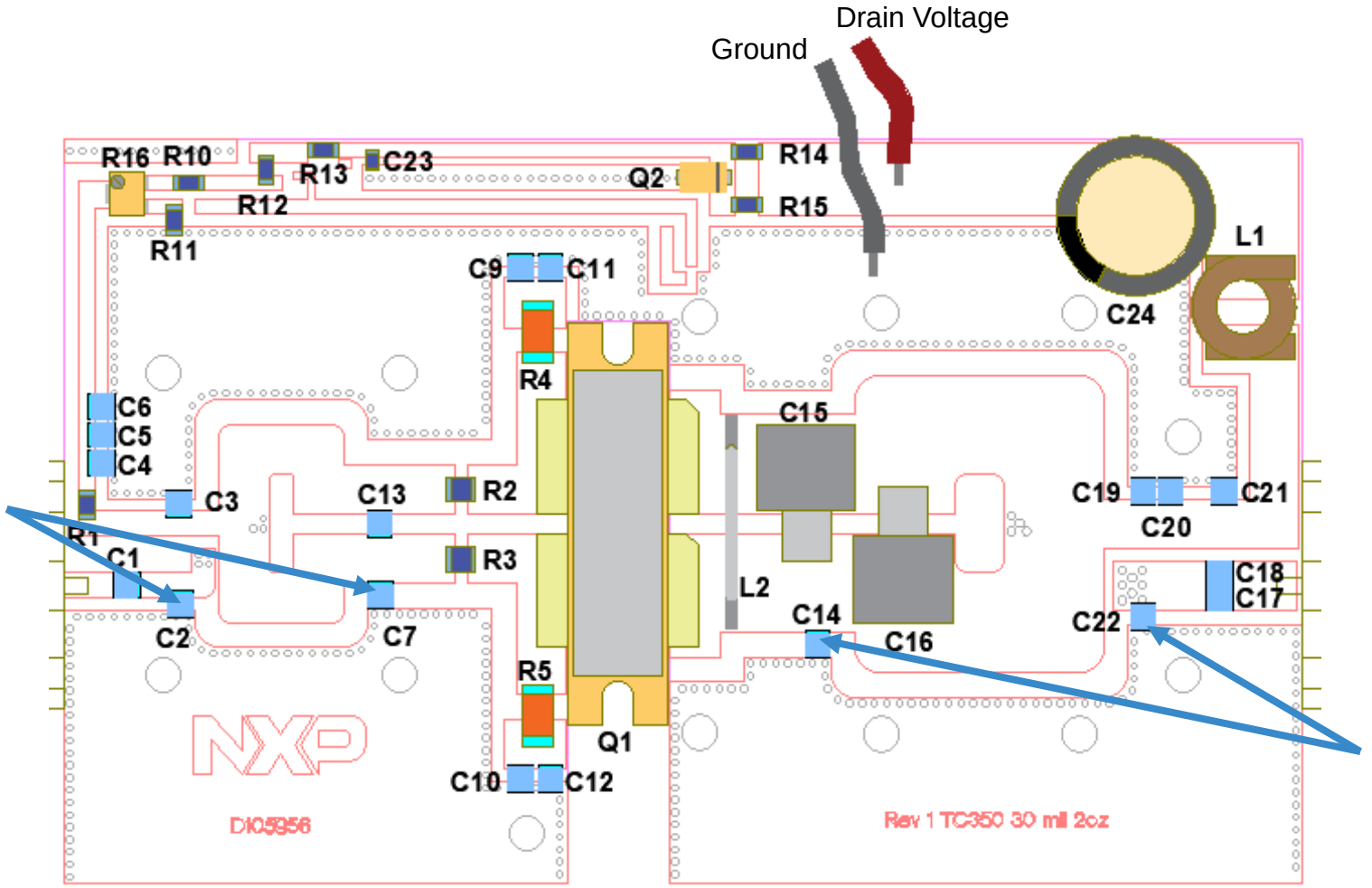


Bill of Materials

Designator	Description	Part Number	Manufacturer
C1,C3,C4,C9,C10,C17,C18	1000 pF chip capacitors	100B102JT50XT	ATC
C2	24 pF chip capacitor	100B240JT500XT	ATC
C5,C11,C12	39,000 pF chip capacitors	200B393KT50XT	ATC
C6	1 µF chip capacitor	GRM31CR72A105KA01L	Murata
C7	68 pF chip capacitor	100B680JT500XT	ATC
C8	DNP	N/A	N/A
C13	240 pF chip capacitor	100B241JT200XT	ATC
C14	47 pF chip capacitor	100B470JT500XT	ATC
C15	100 pF 500 V Mica capacitor	MCM01-009ED101J-F	Cornell Dubilier
C16	200 pF 500 V Mica capacitor	J101-200	RF parts
C19,C20	470 pF chip capacitors	100B471JT200XT	ATC
C21	2.2 µF 100V chip capacitor	GRM32ER72A225KA35L	Murata
C22	12 pF chip capacitor	100B120JT500XT	ATC
C23	1 µF chip capacitor	GRM21BR71H105KA12L	Murata
C24	470 µf 100 V Electrolytic capacitor	MCGPR100V477M16X32-RH	Multicomp
R1	10 Ω 1206 Chip Resistor	CRCW120610R0JNEA	Vishay Dale
R2, R3	0 Ω 1210 Chip Resistors	CRCW12100000Z0EA	Vishay Dale
R4,R5	33 Ω 2512 Chip Resistors	352133RFT	TE Connectivity
R6,R7,R8,R9	DNP	N/A	N/A
R10	24 KΩ 1206 Chip Resistor	CRCW120624K0FKEA	Vishay Dale
R11	12 KΩ 1206 Chip Resistor	CRCW120612K0FNEA	Vishay Dale
R12,R13	0 Ω 1206 Chip Resistors	CRCW12060000Z0EA	Vishay Dale
R14,R15	20 KΩ 1206 Chip Resistors	CRCW120620K0FKEA	Vishay Dale
R16	SMT Trim Pot 5K, (12 turn)	3224W-1-502E	Bourns
L1	22 nH Inductor	1212VS-22NMEB	Coilcraft
L2	1.50 mm Silver Plated Copper Wire	SP1500NT-001	Scientific Wire Company
Q1	LDMOS transistor	MRFX1K80H	NXP
Q2	8.2V Zener Diode	SMAJ4738A	Micro Commercial Co
PCB	TC350 30 mil 2 oz	D105956	MTL
Thermal Pad	TG6050 Series Soft Thermal Conductive Pad	TG6050-150-150-5.0-0	t-Global Technology

Tuning Tips

C2, C7 values will change Gain and IRL response



C14, C22 values will change output power and drain efficiency

Revision History

- The following table summarizes revisions to the content of the MRFX1K80H 175 MHz Reference Circuit zip file.

Revision	Date	Description
0	September 2019	• Initial Release

SECURE CONNECTIONS
FOR A SMARTER WORLD