

MRFX1K80H 128 MHz REFERENCE CIRCUIT WITH TWO COMBINED TRANSISTORS

ORDERABLE PART NUMBER: MRFX1K80H-128MHZ



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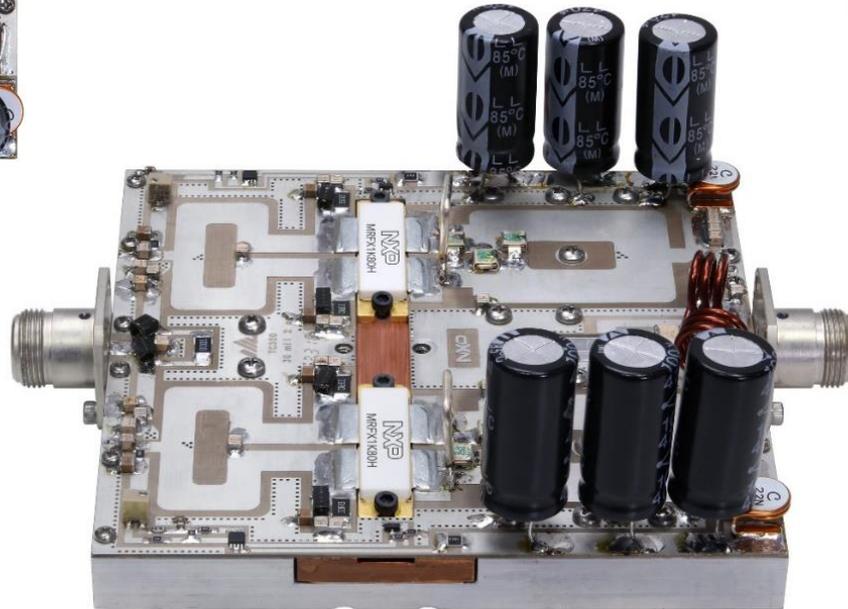
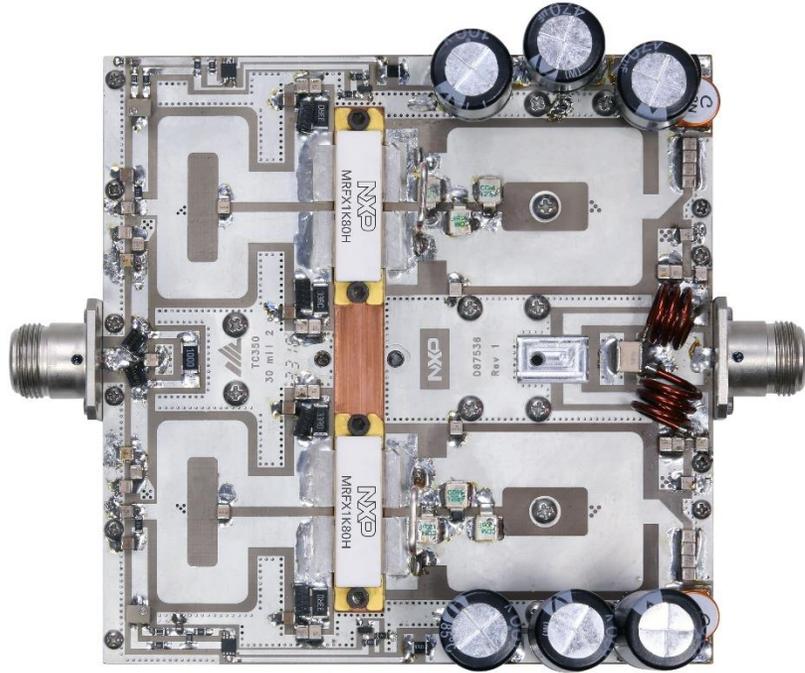
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Introduction

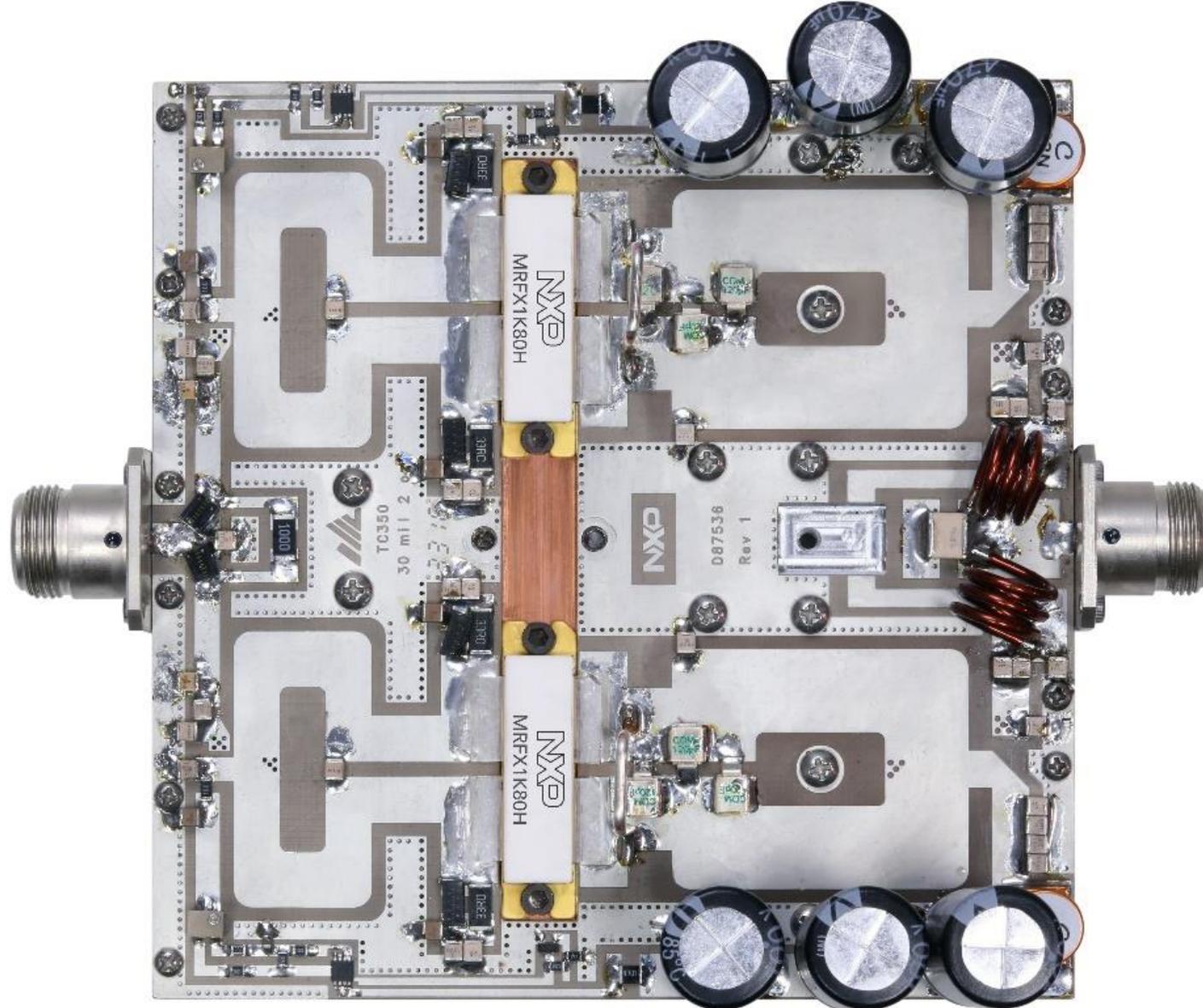
- The NXP MRFX1K80H is a 1.8-400 MHz, 1800 W CW RF power LDMOS transistor housed in an NI-1230 air-cavity ceramic package. Its unmatched input and output allows wide frequency range utilization.
 - Further details about the device, including its data sheet, are available on www.nxp.com/MRFX1K80H.
- The following pages describe the 128 MHz 2-up pulse reference circuit (evaluation board) built with two MRFX1K80H combined with a lumped combiner. Its typical application is MRI.
- The reference circuit can be ordered through NXP's distribution partners and retailers using part number MRFX1K80H-128MHZ.



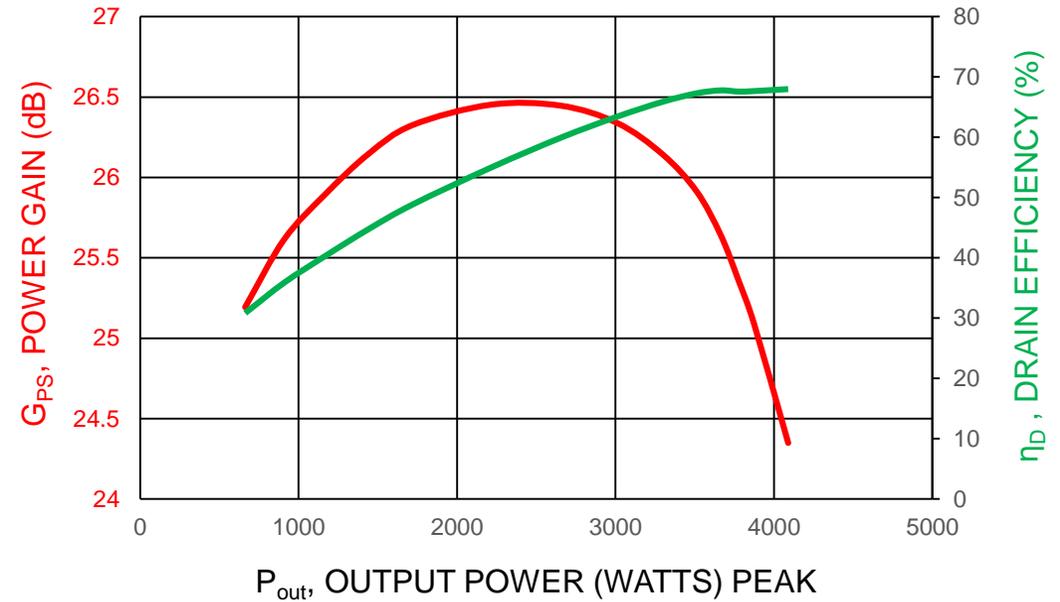
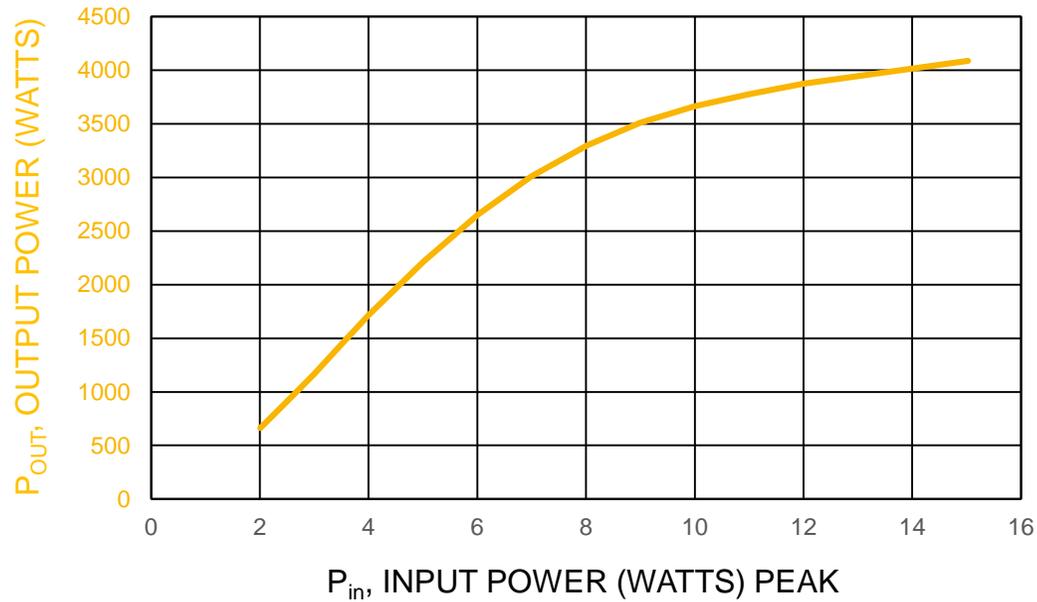
Circuit Overview – 12.7 cm x 12.7 cm (5.0" x 5.0")



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Typical Pulse Performance



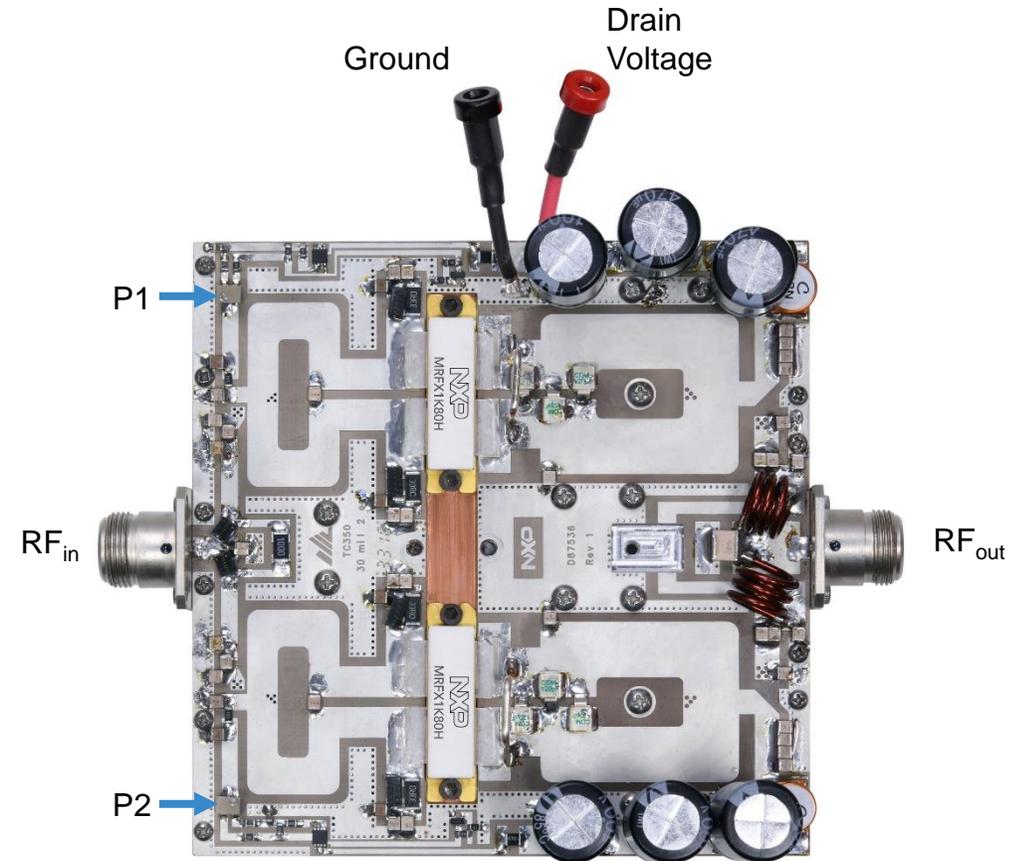
Typical Performance (P1dB): V_{DD} = 65 Vdc, I_{DQ(A+B)} = 320 mA, P_{in} = 11 W (40.4 dBm), Pulse

Frequency (MHz)	Signal Type	Output Power (W)	Power Gain (dB)	Drain Efficiency (%)
128	Pulse (100 μsec, 10% Duty Cycle)	3775 Peak	25.4	67.5



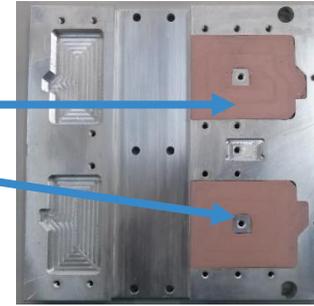
Quick Start

1. Mount the reference circuit onto a heatsink capable of dissipating more than 200 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 3800 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 50 V while ensuring that the drain current remains below or equal to the typical drain quiescent current of $I_{DQ(A+B)} = 320$ mA.
6. If needed, adjust the P1 and P2 potentiometers to modify the gate voltage to adjust the drain quiescent current, equally shared between transistors.
7. Raise the RF input slowly to 11 W peak (40.4 dBm).
8. Check the RF output power (typically 3775 W peak), the drain current (around 86 A peak for this power level) and the temperature of the board.

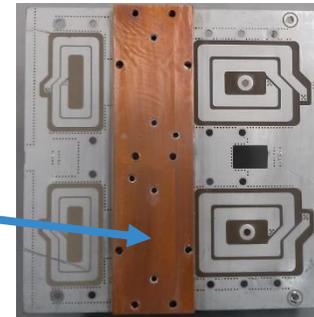


Assembly Details

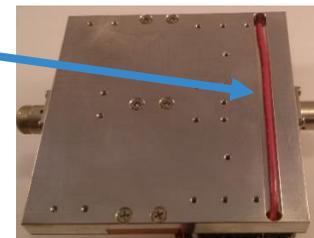
- Aluminum baseplate with thermal pads



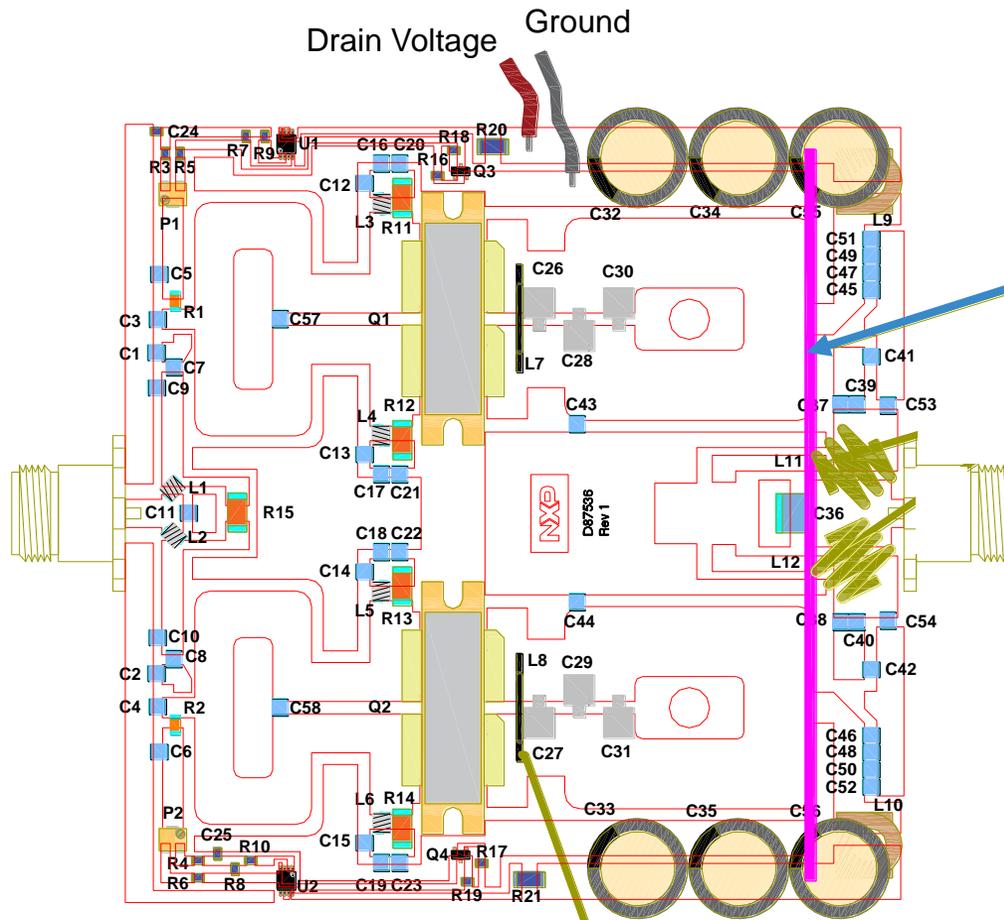
- Copper insert soldered to the backside of the PCB



- The wire on the backside of the baseplate connects the second transistor drain

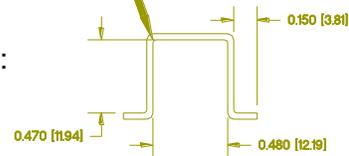


Component Placement Reference



12 AWG wire with Teflon jacket on the back

Vertical hairpin:

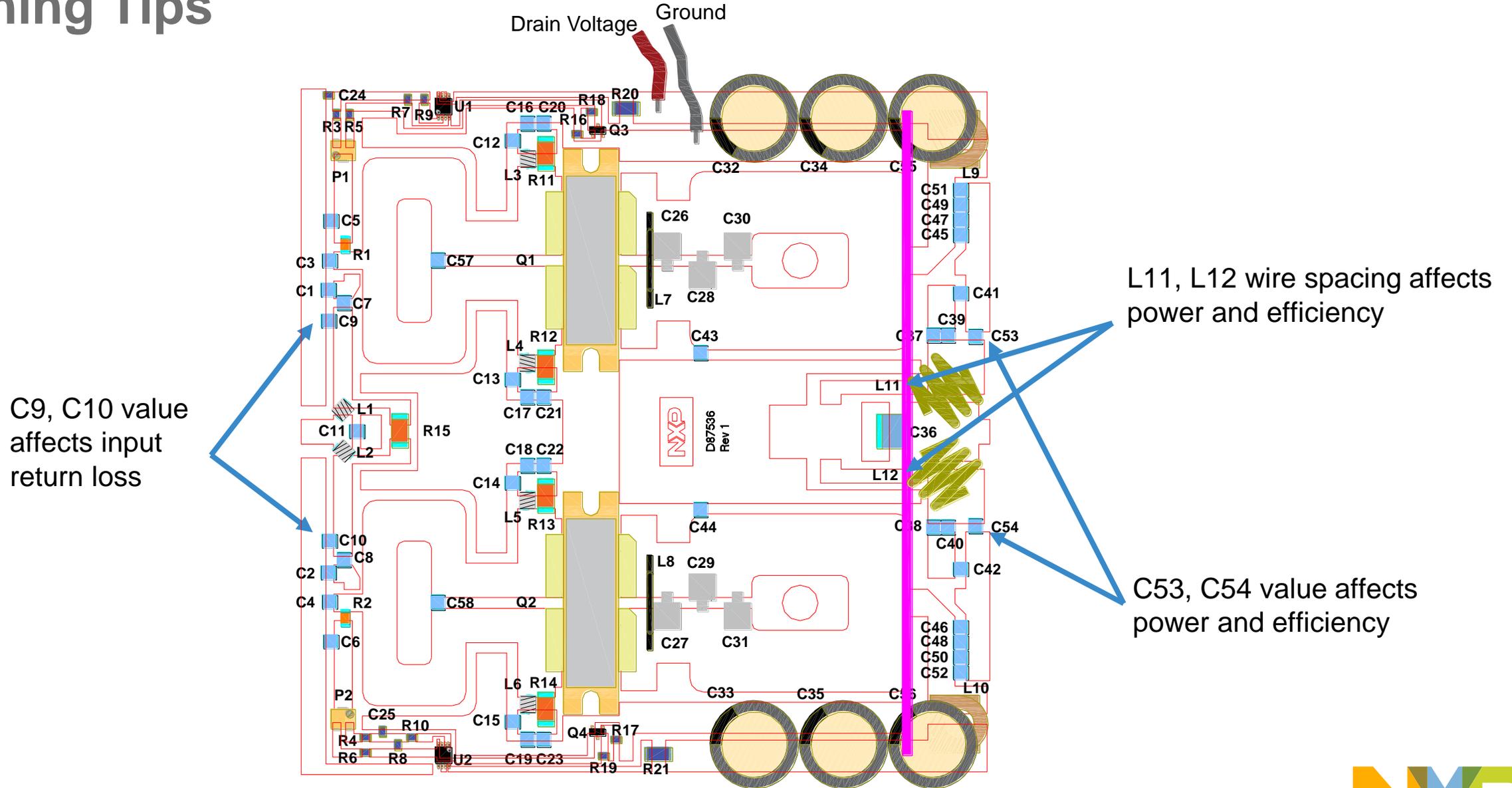


Bill of Materials

Designator	Description	Part Number	Manufacturer
C1,C2	30 pF ATC100B Ceramic Capacitors	100B300JT500XT	ATC
C3,C4,C7,C8,C16,C17,C18,C19,C47,C48,C49,C50,C51,C52	1000 pF ATC100B Ceramic Capacitors	100B102JT50XT	ATC
C5,C6,C12,C13,C14,C15	10,000 pF Ceramic Capacitors	200B103KT50XT	ATC
C9,C10	15 pF Ceramic Capacitors	100B150JT500XT	ATC
C11	27 pF ATC100B Ceramic Capacitor	100B270JT500XT	ATC
C20,C21,C22,C23,C37,C38,C39,C40,C45,C46	470 pF ATC100B Ceramic Capacitors	100B471JT200XT	ATC
C24,C25	1 µF chip capacitors	GRM21BR71H105KA12L	Murata
C26,C27,C28,C29,C30,C31	120 pF 300 V Mica Capacitors	MIN02-002EC121J-F	CDE
C32, C33, C34,C35,C55,C56	470 µf 100 V Electrolytic capacitors	MCGPR100V477M16X32-RH	Multicomp
C36	27 pF Ceramic Capacitor	100C270JT2500XT	ATC
C41,C42	18 pF Ceramic Capacitors	100B180JT500XT	ATC
C43,C44	82 pF ATC100B Ceramic Capacitors	100B820JT500XT	ATC
C53,C54	10 pF Ceramic Capacitors	100B100JT500XT	ATC
C57,C58	120 pF ATC100B Ceramic Capacitors	100B121JT200XT	ATC
L1,L2	82 nH Inductors	1812SMS-82NJLC	Coilcraft
L3,L4,L5,L6	17.5 nH, 6 turn Inductors	B06TJLC	COILCRAFT
L7,L8	1.50 mm Silver Plated Copper Wire	SP1500NT-001	Scientific Wire Company
L9,L10	22 nH Inductors	1212VS-22NMEB	Coilcraft
L11,L12	14 AWG magnet wire, 3 turns, 0.375" ID	8073	Belden
R1,R2	10 Ω 1206 Chip Resistors	CRCW120610R0JNEA	Vishay Dale
R3,R4	20 KΩ 0805 Chip Resistors	RR1220P-203-B-T5	Susumu
R5,R6	10 KΩ 0805 Chip Resistors	CRCW080510K0FKEA	Vishay Dale
R7,R8,R18,R19	1.2 KΩ 0805 Chip Resistors	CRCW08051K20FKEA	Vishay Dale
R9,R10	10 Ω 0805 Chip Resistors	CRCW080510R0FKEA	Vishay Dale
R11,R12,R13,R14	33 Ω 2W 1% 2512 Chip Resistors	1-2176070-3	TE CONNECTIVITY
R15	100 Ω 2512 Chip Resistor	CRCW2512100RFKEG	Vishay Dale
R16,R17	2.2 KΩ 0805 Chip Resistors	CRCW08052K20JNEA	Vishay Dale
R20,R21	4.7 KΩ 1210 Chip Resistors	CRCW12104K70FKEA	Vishay Dale
R22	DNP	N/A	N/A
P1,P2	SMT Trim Pot 5K, (12 turn)	3224W-1-502E	Bourns
Q1,Q2	LDMOS Transistors	MRF1K80H	NXP
Q3,Q4	Discrete Semi's Transistors, NPN	BC847ALT1G	On-Semi
U1,U2	IC 5v regulators (micro8)	LP2951ACDMR2G	On-Semi
PCB	TC350 30 mil 2 oz	D87536	MTL
Wire	12 AWG PTFE Covered Teflon Wire	TEF-12	RF Parts Company
Thermal Pad	TG6050 Series Soft Thermal Conductive Pad	TG6050-150-150-5.0-0	t-Global Technology



Tuning Tips



Revision History

- The following table summarizes revisions to the content of the MRFX1K80H 128 MHz 2-up Reference Circuit zip file:

Revision	Date	Description
0	September 2019	• Initial Release



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