MRFE6VS25GN 960-1215 MHz
REFERENCE CIRCUIT

ORDERABLE PART NUMBER: **MRFE6VS25GN-960**

PUBLIC

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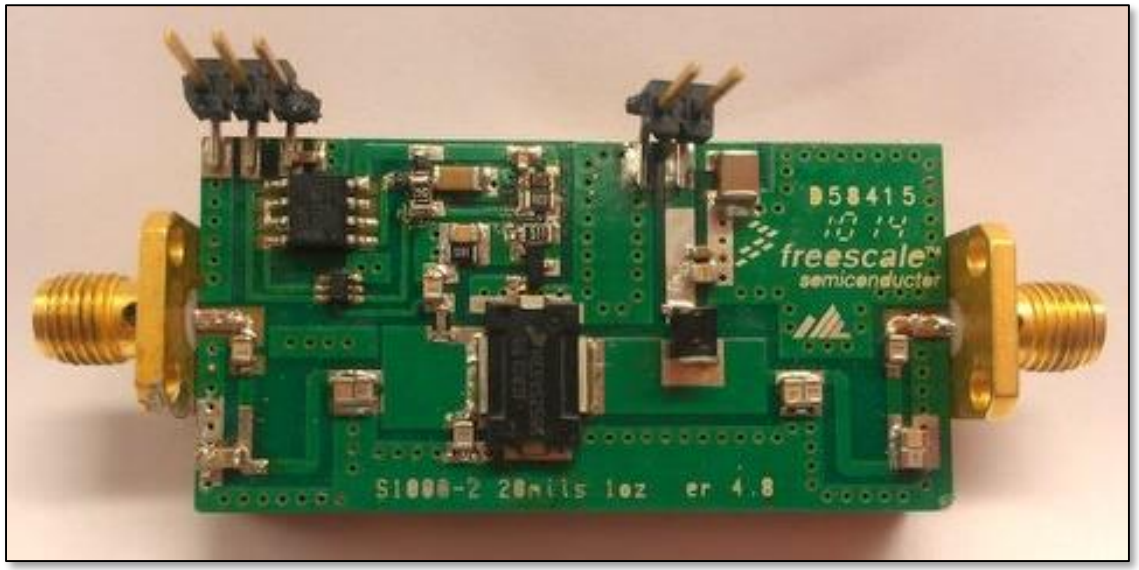
Introduction

- The NXP MRFE6VS25N is a 1.8-2000 MHz, 25 W RF power LDMOS transistor housed in a TO-270 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 here.

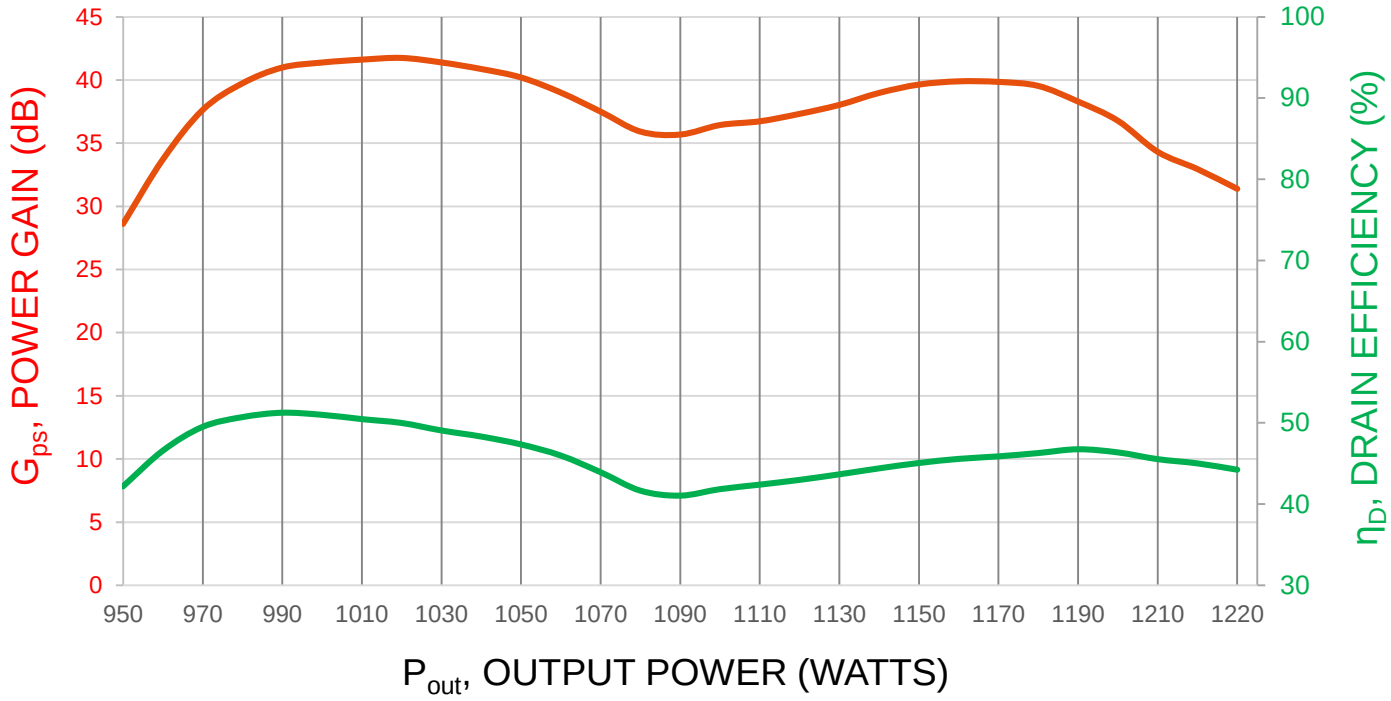
- The following pages describe the 960-1215 MHz MHz reference circuit (evaluation board) using the gull wing version, MRFE6VS25GN.
  Its typical application is a driver for avionics transponders and distance-measuring equipment.

- The reference circuit can be ordered through NXP's distribution partners and etailers using part number MRFE6VS25GN-960.

Circuit Overview – 2.54 cm × 5.08 cm (1.0″ × 2.0″)



Typical Pulse Performance

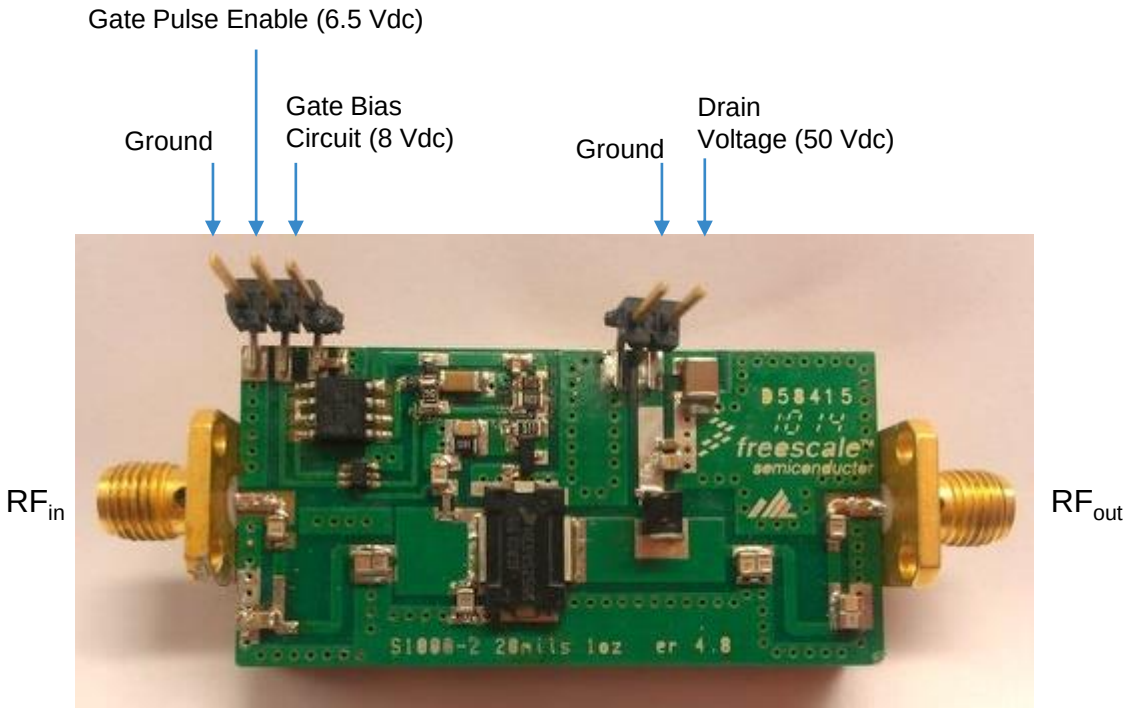


Typical Performance: V_{DD} = 50 Vdc, I_{DQ} = 180 mA, P_{in} = 0.8 W (29.0 dBm), Pulse

Frequency (MHz)	Signal Type	P_{out} (W)	G_{ps} (dB)	η_D (%)
960	Pulse (10 µs, 10% Duty Cycle)	29.8	15.7	48.9
1140		32.9	16.2	43.9
1215		34.6	16.3	54.4

Quick Start

1. Mount the reference circuit onto a heatsink capable of dissipating more than 5 W in order to provide enough thermal dissipation (the circuit is capable for more but has been measured in pulse conditions).
2. Connect the ground.
3. Terminate the RF output with a 50 ohm load capable of handling more than 33 W peak.
4. Connect the RF input to a 50 ohm source with the RF off.
5. Connect the gate bias circuit, set to 0 V.
6. Connect the gate pulse enable, set to 0 V.
7. Connect the drain voltage (V_{DD}) and raise it slowly to 50 V. Current should be 0 A.
8. Raise the gate bias circuit to 8 V.
9. Set gate pulse enable to 6.5 V. The drain quiescent current should typically be I_{DQ} = 180 mA. The gate voltage should be around 2.4 V.
10. Set the RF input to pulse conditions (typically 10 µs pulse width with 10% duty cycle).
11. Raise the RF input slowly to 0.8 W (29.0 dBm) peak.
12. Check the RF output power (typically 33 W peak), the drain current (around 1.5 A peak for this power level) and the temperature of the board.

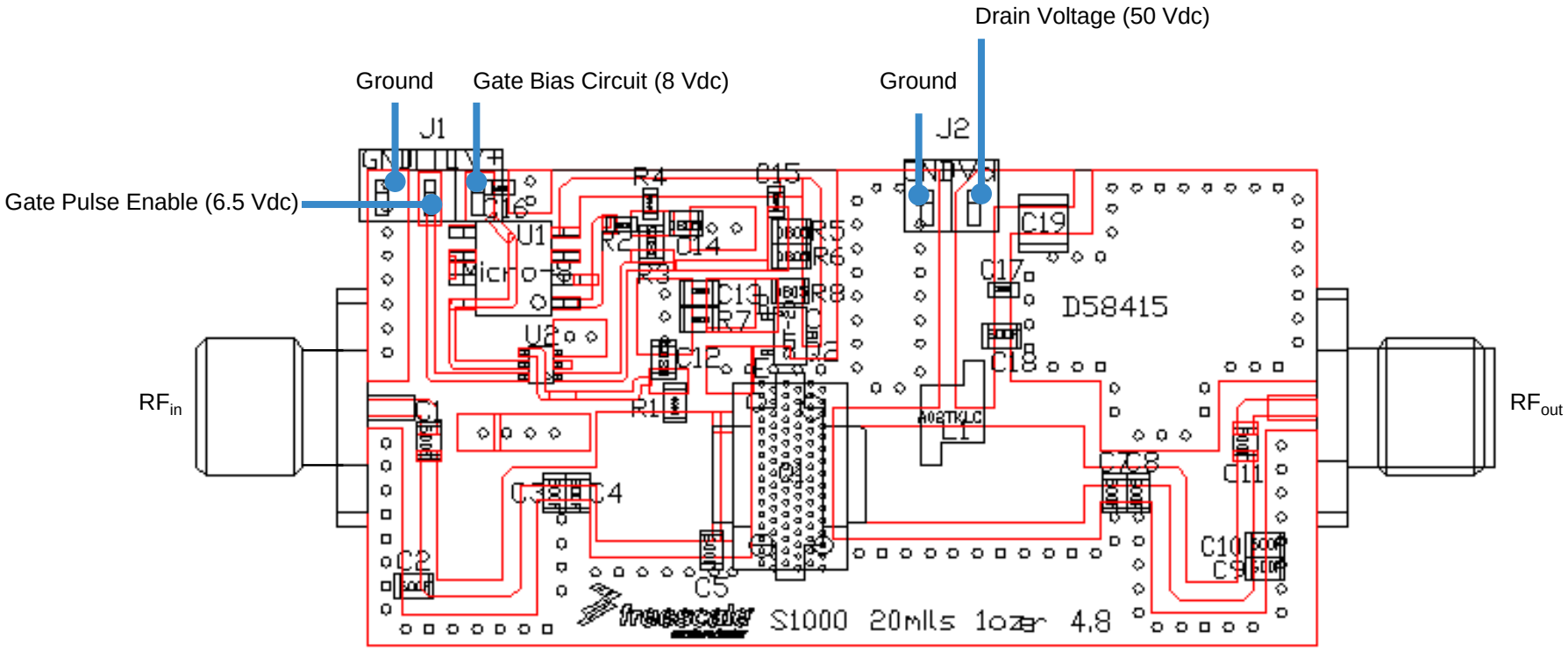


This reference circuit includes a gate pulsing option and temperature compensation circuitry. The 6.5 V Gate Pulse Enable supplies the IC switch. This will apply a constant V_{GS} to the RF LDMOS gate.

Bill of Materials

Designator	Description	Part Number	Manufacturer
C1,C11,C12, C18	240 pF Chip Capacitor	600F241JT250XT	ATC
C2, C8	5.6 pF Chip Capacitor	600F5R6BT250XT	ATC
C3	3 pF Chip Capacitor	600F3R0BT250XT	ATC
C4	15 pF Chip Capacitor	600F150JT250XT	ATC
C5	56 pF Chip Capacitor	600F560JT250XT	ATC
C6	Not Used		ATC
C7	12 pF Chip Capacitor	600F120JT250XT	ATC
C9	4.7 pF Chip Capacitor	600F4R7BT250XT	ATC
C10	0.5 pF Chip Capacitor	600F0R5BT250XT	ATC
C13	1000 pF 250V Chip Capacitor	C2012X7R2E102M	TDK
C14	2.2 µF 16V Chip Capacitor	C1206C225K4RAC	Kemet
C15, C16, C17	1500 pF Chip Capacitor	C0603C152K5RAC-TU	Kemet
C19	1 µf Chip Capacitor	C3225JB2A105KT	TDK
R1	68Ω (5% 1/10W 0805) Chip Resistor	RR1220Q-680-D	Susumu
R2	10Ω (0603 1%) Chip Resistor	CRCW060310R0FKEA	Vishay/Dale
R3, R8	510Ω (5% 1/10W 0805) Chip Resistor	RR1220P-511-B-T5	Susumu
R4	1KΩ (1/16W 0603) Chip Resistor	RR0816P-102-B-T5	Susumu
R5	470Ω (5% 1/10W 0805)	RR1220P-471-B-T5	Susumu
R6	910Ω (5% 1/10W 0805)	RR1220P-911-D	Susumu
R7	1.2KΩ (1/8W 0805)	CRCW08051K20FKEA	Vishay/Dale
L1	5.0 nH, 2 turn Inductor	A02TKLC	Coilcraft
U1	5V IC Regulator	LP2951ACDR2G	ON Semi
U2	IC Switch SPDT	TS5A3159DCKR	TI
Q1	RF Power LDMOS Transistor	MRFE6VS25GN	NXP
Q2	Bipolar Transistor, NPN, 45V	BCW72LT1G	ON Semi
PCB	0.020", εr = 4.8	S1000-2(D58415A)	MTL

Component Placement Reference

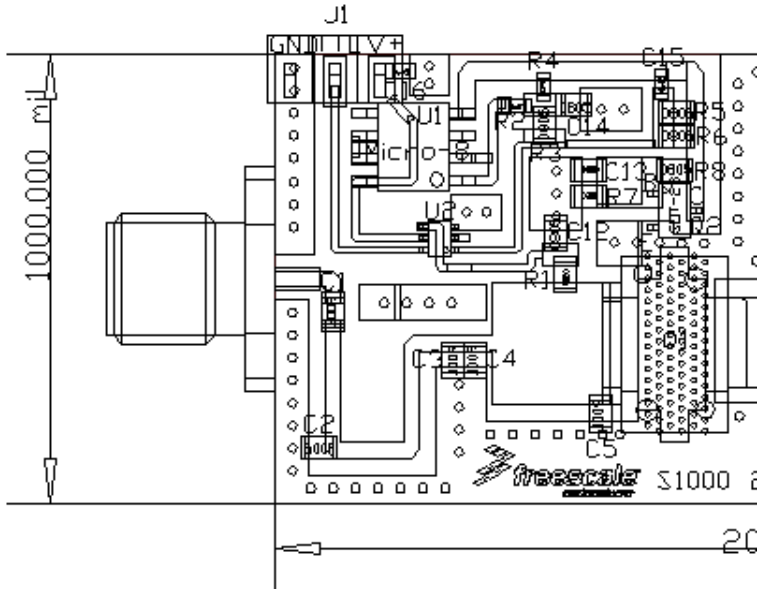


Note: PCBs may have either NXP or Freescale markings. Existing Freescale boards will not migrate to NXP markings unless a board is revised.

Tuning Tips

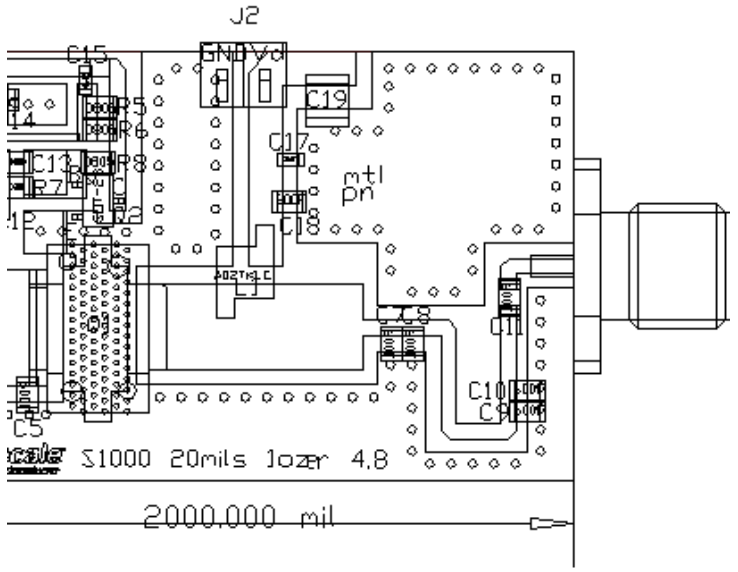
Input Match Tuning

- Move C2 and/or C5 toward the transistor to increase gain at 1215 MHz and away from it to increase gain at 960 MHz.



Output Match Tuning

- Move C9 and/or C10 to flatten the efficiency across the band.



Revision History

- The following table summarizes revisions to the content of the MRFE6VS25GN 960-1215 MHz Reference Circuit zip file.

Revision	Date	Description
0	September 2019	• Initial Release

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