RF2368

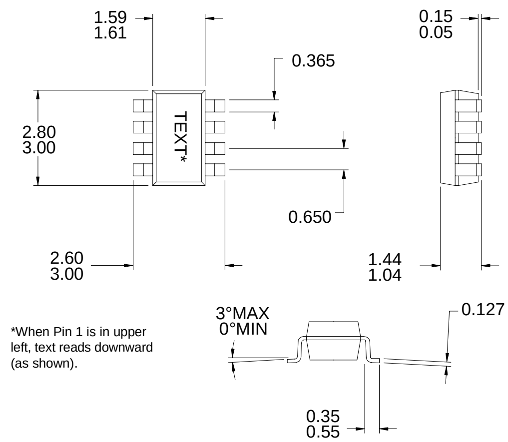
DCS/PCS 2.7V LOW NOISE AMPLIFIER

Typical Applications

- DCS Handsets
- PCS Handsets
- General Purpose Amplification
- Commercial and Consumer Systems

Product Description

The RF2368 is a DCS/PCS low noise amplifier with bypass switch designed for use as a front-end for DCS1800/PCS1900 applications. The LNA is a two-stage amplifier with bypass switch. This amplifier has low noise figure and high linearity in both high gain and bypass/low gain mode.



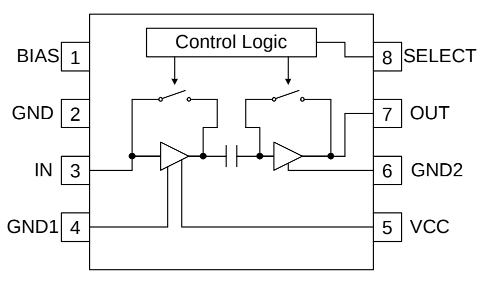
Optimum Technology Matching® Applied

- ☐ Si BJT
- ☑ GaAs HBT
- ☐ GaAs MESFET
- ☐ Si Bi-CMOS
- ☐ SiGe HBT
- ☐ Si CMOS

Package Style: SOT 8 Lead

Features

- Low Noise and High Intercept Point
- Power Down Control
- Switchable Gain



Functional Block Diagram

Ordering Information

RF2368	DCS/PCS 2.7V Low Noise Amplifier
RF2368 PCBA	Fully Assembled Evaluation Board

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Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage	-0.5 to +6.0	V_{DC}
Input RF Level	+10	dBm
Storage Temperature	-40 to +150	°C

Caution! ESD sensitive device.

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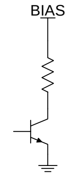
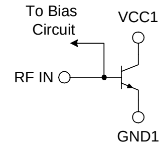
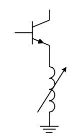
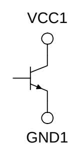
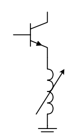
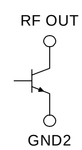
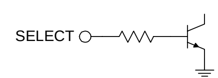
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Operating Range					
Overall Frequency Range	1800		2000	MHz	
Supply Voltage (V_{CC})	2.7	2.78	2.86	V	V_{CC1}, V_{CC2}
Power Down Voltage (V_{BIAS})	2.7	2.78	2.86	V	BIAS
Logic Control Voltage Level	0		2.86	V	SELECT
Operating Ambient Temperature	-40		+85	°C	
Input Impedance		50		Ω	
Output Impedance		50		Ω	
1850MHz Performance High Gain Mode					T=25°C, RF=1850MHz, V_{CC}=BIAS=2.78V, SELECT=0V, Z_{IN}=Z_O=50Ω
Gain	17	18	19	dB	
Gain Variation Over Temperature Range			$\pm$0.5	dB	
Gain Variation Over Frequency Band			$\pm$0.5	dB	
Current Consumption		9.0	9.5	mA	I_{CC}+I_{BIAS}
Noise Figure		1.6	1.7	dB	
Reverse Isolation	15	20		dB	
Input IP3	0.0	+1.0		dBm	
Input P1dB	-13	-10		dB	
1850MHz Performance Bypass Mode					T=25°C, RF=1850MHz, VCC=2.78V, SELECT=2.7V, Z_{IN}=Z_O=50Ω
Gain		-4.5		dB	
Gain Reduction	21	22.5	24	dBc	
Power Down Current			10	μA	
Input IP3	12	15.0		dBm	
Input P1dB	+5	+8		dB	
1960MHz Performance - High Gain Mode					T=25°C, RF=1960MHz, V_{CC}=BIAS=2.78V, SELECT=0V, Z_{IN}=Z_O=50Ω
Gain	15.5	16.5	17.5	dB	
Gain Variation Over Temperature Range			$\pm$0.5	dB	
Gain Variation Over Frequency Band			$\pm$0.5	dB	
Current Consumption		9.0	9.5	mA	I_{CC}+I_{BIAS}
Noise Figure		1.6	1.7	dB	
Reverse Isolation	15	20		dB	
Input IP3	+1	+2		dBm	
Input P1dB	-13	-10		dB	
1960MHz Performance - Bypass Mode					T=25°C, RF=1960MHz, VCC=2.78V, SELECT=2.7V, Z_{IN}=Z_O=50Ω
Gain		-5		dB	
Gain Reduction	20	21.5	23	dBc	
Power Down Current			10	μA	
Input IP3	14.0	17.0		dBm	
Input P1dB	+5	+8		dB	

Pin	Function	Description	Interface Schematic
1	**BIAS**	BIAS is set to the supply voltage at high gain mode. For bypass mode see “Application Notes”.	
2	**GND**		
3	**IN**	DCS1800/PCS1900 RF input pin.	
4	**GND1**	LNA1 emittance inductance. Total inductance is comprised of package+bondwire+L2 on PCB.	
5	**VCC**	Open collector for first stage LNA of DCS1800/PCS1900. It must be biased to V_{CC} through a choke or matching inductor.	
6	**GND2**	LNA2 emittance inductance. Total inductance is comprised of package+bondwire+L4 on PCB.	
7	**OUT**	DCS1800 Amplifier Output pin. This pin is an open-collector output. It must be biased to V_{CC} through a choke or matching inductor. This pin is typically matched to 50Ω with a shunt bias/matching inductor and series blocking/matching capacitor. Refer to application schematics.	
8	**SELECT**	This pin selects high gain. Select $\leq$0.8V, high gain. Select $\geq$1.8V, low gain.	

Application Notes

Bypass Mode Configurations

The RF2368 may be placed into either high gain or bypass mode via the GAIN SELECT pin (pin 8). The high gain state is selected by asserting the GAIN SELECT pin to a voltage level of less than 0.8V. For Bypass operation, there are two possible methods for placing the RF2368 into this low gain state. The table below shows the two possible Bypass configurations.

Bypass Mode Possibilities

Gain Select	BIAS (V)	VCC1 and VCC2 (V)	Current (mA)
2.7	0	2.78	1.4
2.7	2.7	2.78	2.2

For both Bypass configurations, the GAIN SELECT pin must be placed at a level greater than or equal to 1.8V. The difference between the Bypass possibilities is determined by the specific application's ability to change the voltage of the BIAS pin (pin 1) independently of the V_{CC} supply voltage. The advantage of the ability to assert the power down pin to 0V when in Bypass mode is shown by the decreased current draw when in this Bypass configuration.

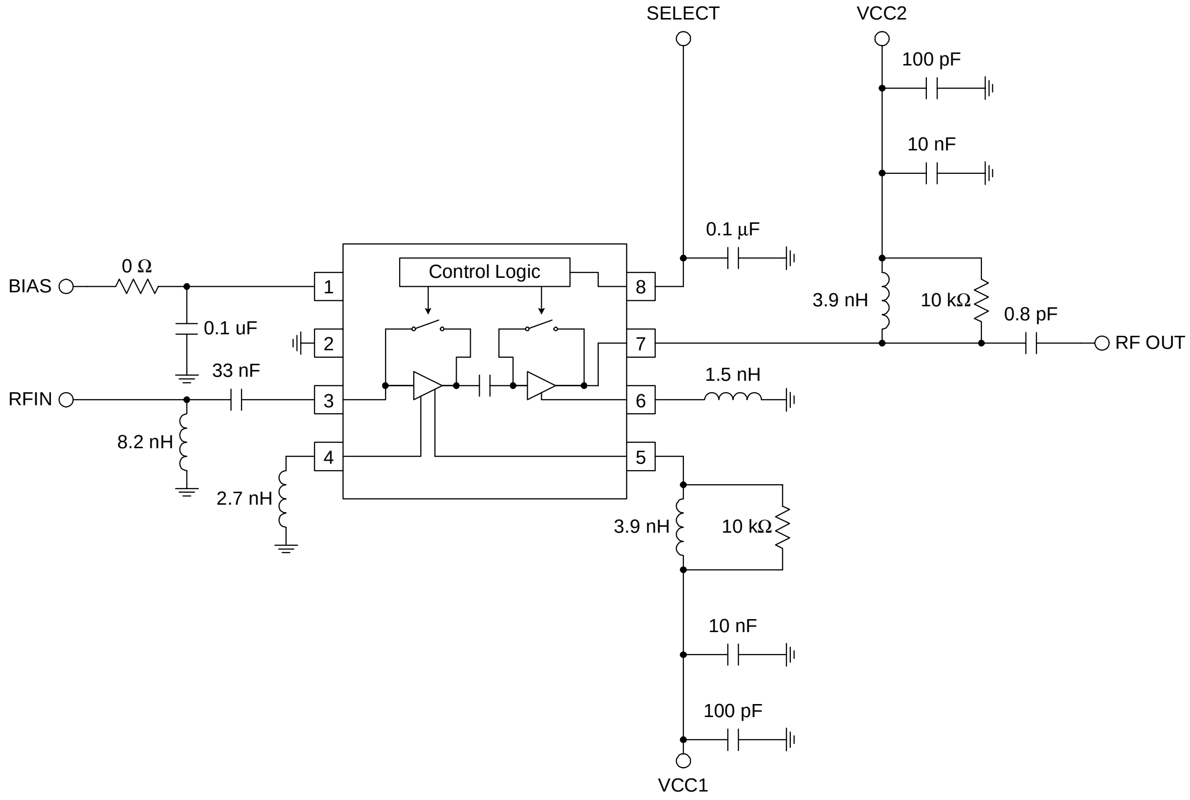
BIAS Pin Resistor

The BIAS pin (pin1) of the RF2368 should be maintained at 2.7V to 2.86V for proper high gain operation. This voltage range ensures the correct bias current will be present at the BIAS pin of the device. However, an external series resistor may be used to allow various operating voltages at this pin (see R1 of the evaluation board schematic). The required value for this resistor may be roughly calculated by using the operating input voltage to the BIAS pin, the desired voltage at the device, and the typical current consumption for the BIAS pin, along with Ohm's law.

For example, assume the design will supply 5.0V to the BIAS pin of the device, but the biasing circuitry internal to the RF2368 requires 2.78V typical, and the BIAS current is known to typically be 0.25mA, then the required value for R1 would be found as follows.

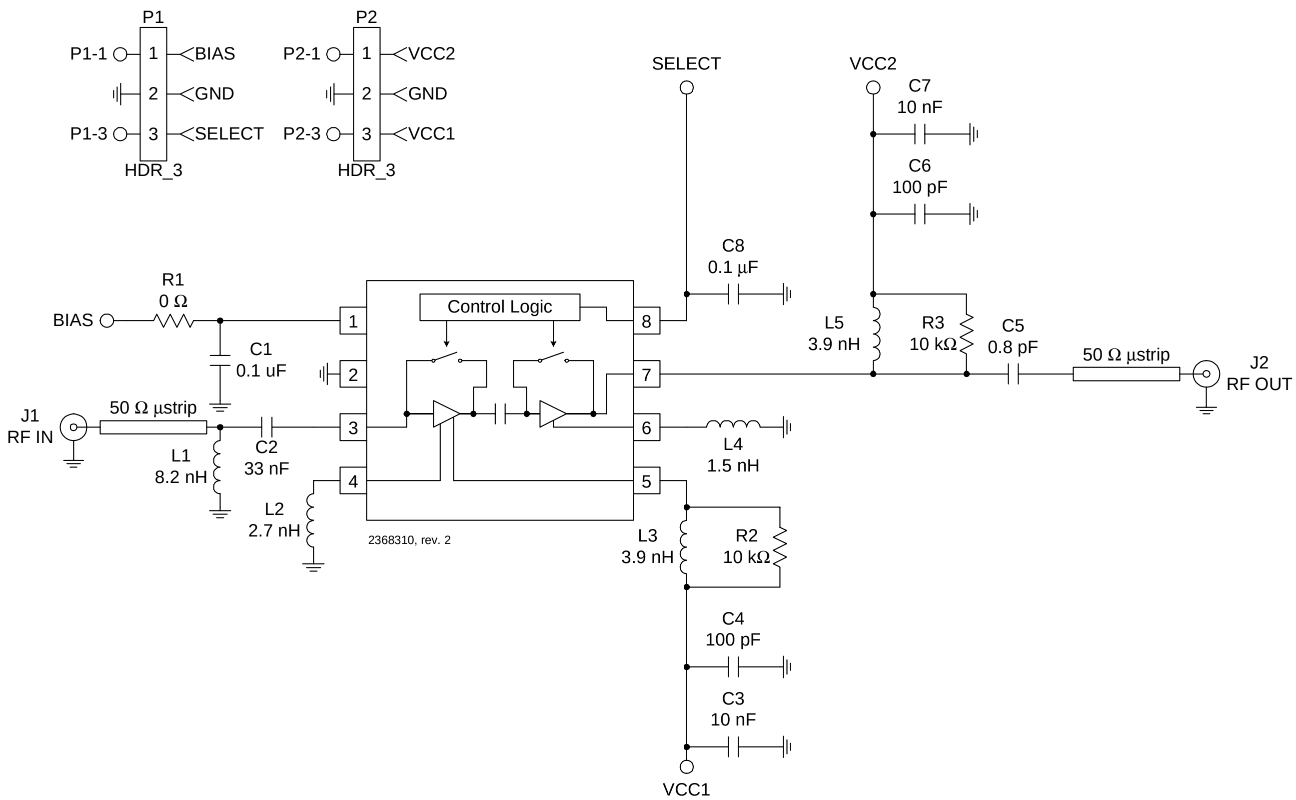
$$\frac{5.0V - 2.78V}{0.25mA} = 8.88k\Omega$$

Application Schematic



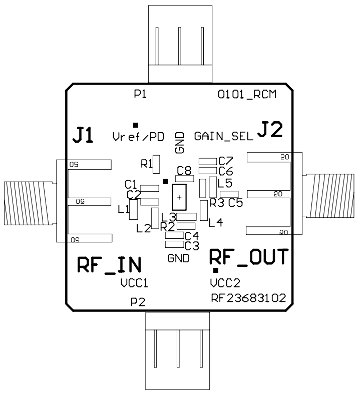
Evaluation Board Schematic - PCS/DCS

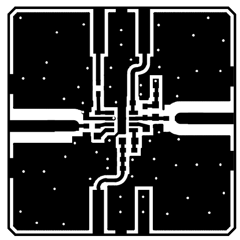
(Download Bill of Materials from www.rfmd.com.)

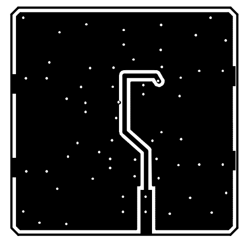


Evaluation Board Layout
Board Size 1” x 1”

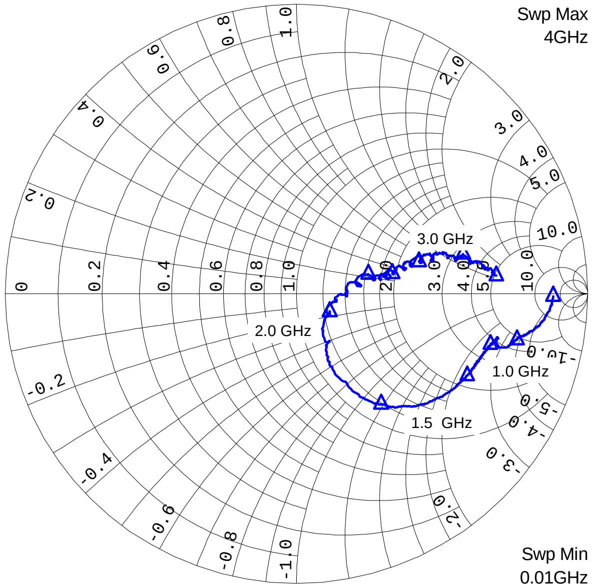
Board Thickness 0.032”, Board Material FR-4



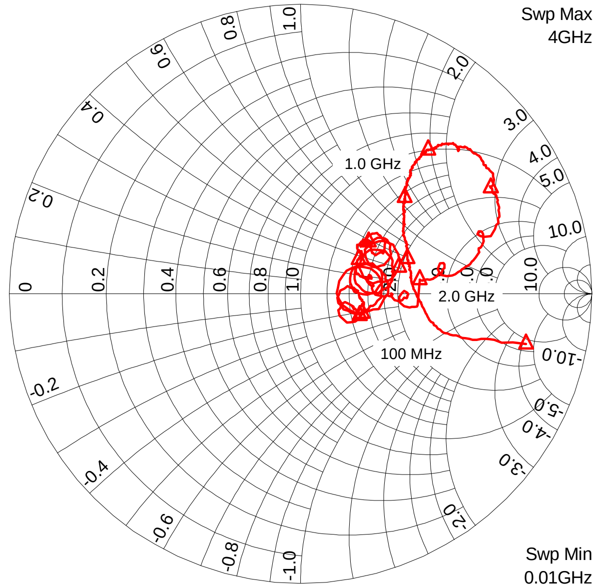




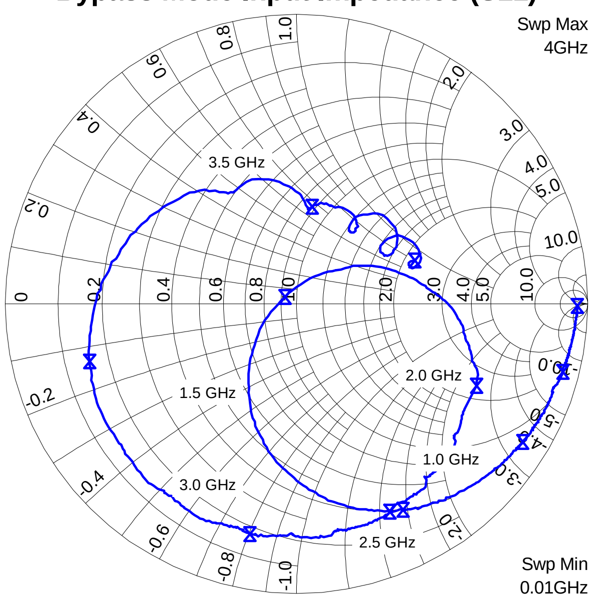
High Gain Mode Input Impedance (S11)



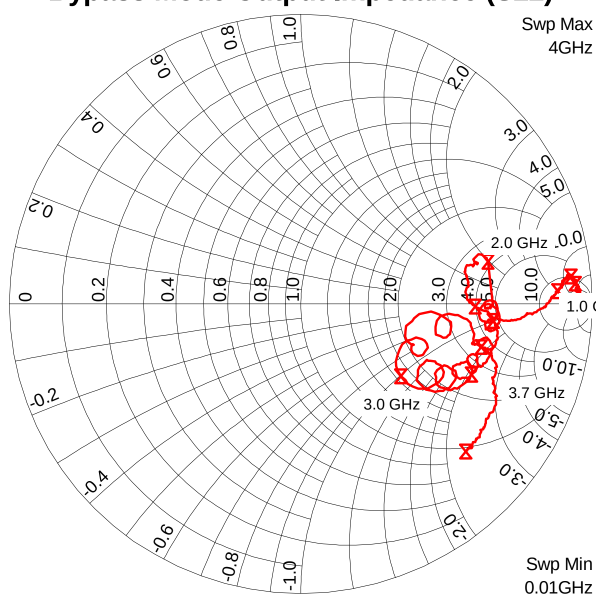
High Gain Mode Output Impedance (S22)



Bypass Mode Input Impedance (S11)



Bypass Mode Output Impedance (S22)



S-Parameter Conditions:
All plots shown were taken at VCC=2.78V and Ambient Temperature=25°C.

Note:
All S11 and S22 plots shown were taken from an RF2368 while on a 2368310 evaluation board. The data was captured without the external input or output tuning components in place, and the reference points at the RF IN and RF OUT pins of the device.