

Keywords: gps, low-noise amplifier, LNA, RF, gain, noise figure

APPLICATION NOTE 1985

LNA Optimized for GPS (REP024)

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Abstract: The application note describes using the MAX2641 low-noise amplifier (LNA) in GPS. The gain at 1575MHz is 14.7dB, with a noise figure of 1.6dB. Input return loss is 9.5dB. Input third order intercept is -4.3dBm. A photo of the MAX2641 LNA evaluation kit is shown, and both lumped and transmission line implementations are provided.

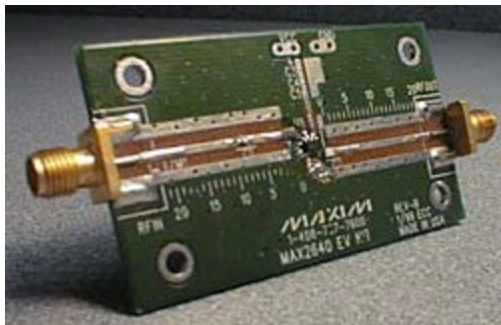
Rapid engineering prototypes are real circuits that Maxim application engineers have built and measured in our labs. They can provide a starting point for new RF designs. They are not available as evaluation kits.

Additional Information:

- [Wireless Product Line Page](#)
- [Quick View Data Sheet for the MAX2641 LNA](#)
- [Applications Technical Support](#)



Click here for an overview of the wireless components used in a typical radio transceiver.



Objective: To provide an optimized solution for a GPS LNA using the MAX2641.

By minimizing passive-component size and maximizing cost performance, the MAX2641 LNA provides an optimized solution for a global positioning system (GPS) low-noise amplifier (LNA). Two reference designs were created with the LNA: one using lumped elements and the other transmission lines for the matching circuits. The lumped-element match consists of replacing the input- and output-impedance transformation lines to the LNA with surface-mount coils, resulting in very similar performance with smaller circuit size but extra-parts cost.

LNA gain is 14.7dB with a 1.6dB noise figure (NF) in the 1575MHz band and an IIP3 of -4.3dBm at 3mA I_{CC}. The input match to the LNA is set for a compromise between gamma-opt and conjugate S11, for a -10dB input return loss. The output match and gain depend partly on the inclusion of a short transmission line at the V_{CC} pin (this is also used in the general-purpose EV board).

The MAX2641 is a low-cost LNA operating from a single +2.7V to +5.5V supply. It consumes only 3.5mA of current, while providing a low noise figure, a high gain, a high-input IP3, and an operating frequency range that extends from 1400MHz to 2500MHz. Typical performance for the MAX2641 LNA is a 14.4dB gain, an input of a -4dBm IP3, and a noise figure of 1.3dB at 1900MHz. This LNA is biased internally and designed for use in the cellular, PCS, GPS, and 2.4GHz ISM frequency band.

MAX2641 LNA Test Conditions

- All tests in room temperature
- IIP3 measurements: Pin = -30dBm, Frf = 1575MHz and 1576MHz (GPS)
- PCS LNA input board loss = 0.2dB
- PCS LNA output board loss = 0.2dB
- VCC: 3.0V

MAX2641 LNA Performance Matrix

Spec Item	Measured Result
DC Supply Current (PCS mode)	3mA
LNA Gain	14.7
LNA NF	1.6
LNA IIP3	-4.3
LNA Rev. Isolation	-34.8
LNA Input Return Loss	-9.5
LNA Output Return Loss	-14.5

[MAX2641 SiGe LNA \(1575MHz\) Transmission Line/Lumped-Element Match](#)

[MAX2641 LNA Bill of Materials \(Transmission Line\)](#)

[MAX2641 SiGe LNA \(1575MHz\) Lumped-Element Match](#)

[MAX2641 LNA Bill of Materials \(Lumped Element\)](#)

Related Parts

MAX2641	300MHz to 2500MHz SiGe Ultra-Low-Noise Amplifiers	Free Samples
MAX2644	2.4GHz SiGe, High IP3 Low-Noise Amplifier	Free Samples

More Information

For Technical Support: <http://www.maximintegrated.com/support>

For Samples: <http://www.maximintegrated.com/samples>

Other Questions and Comments: <http://www.maximintegrated.com/contact>

Application Note 1985: <http://www.maximintegrated.com/an1985>

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