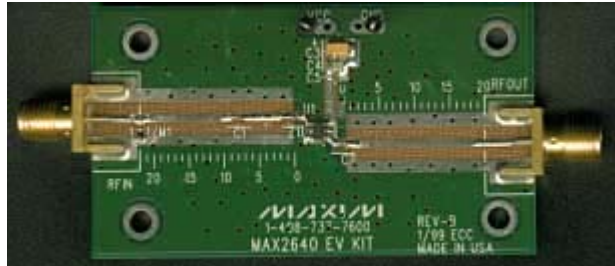


LNA Tuned for the 433.05MHz to 434.79MHz European ISM Band

This application note presents the RF matching circuit to tune the MAX2640 low-noise amplifier (LNA) for 433MHz operation. Input return loss, gain and output return loss results are graphed. The gain is 16.75dB, with -7.6dB input return loss and -19.8dB output return loss.



Additional Information: [Wireless Product Line Page](#)
[Quick View Data Sheet for the MAX2640](#)
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The MAX2640 is a low-cost, ultra-low-noise amplifier (LNA) designed for applications in the cellular, PCS, GPS, 2.4GHz ISM, and European ISM frequency bands. Operating from a single +2.7V to +5.5V supply, these devices consume only 3.5mA of current while providing low noise figure, high gain, high input IP3, and an operating frequency range that extends from 400MHz to 2500MHz.

The European ISM band (433.04MHz to 434.79MHz) is meant for non-specific short range Devices (SRDs). Since equipment developed for this frequency range is exempt from licensing, the potential number of innovative, low cost designs is enormous. In these designs, using a properly tuned ultra-low-noise amplifier greatly increases overall system performance.

Using the proper matching components for a specific frequency range of operation improves the performance of an amplifier. The correct input and output matching components ensure proper transfer of signal and energy from a "source" to a "load." Scattering-parameters (S-parameters) provided for the MAX2640 help determine the proper component values for European ISM band ($f_{\text{CENTER}} = 433.92\text{MHz}$) applications. The S-parameter data can be downloaded from the Maxim website (<http://www.maxim-ic.com/TechSupport/sparameters.htm>).

Along with the S-parameters, the MAX2640 Evaluation kit (EV kit) is available for fast prototyping and testing. Figure 1 and Table 1 show the schematic and components list for an EV kit modified for the European ISM band. Notice that only one output matching component and one input matching component are required (C1 is a DC blocking capacitor).

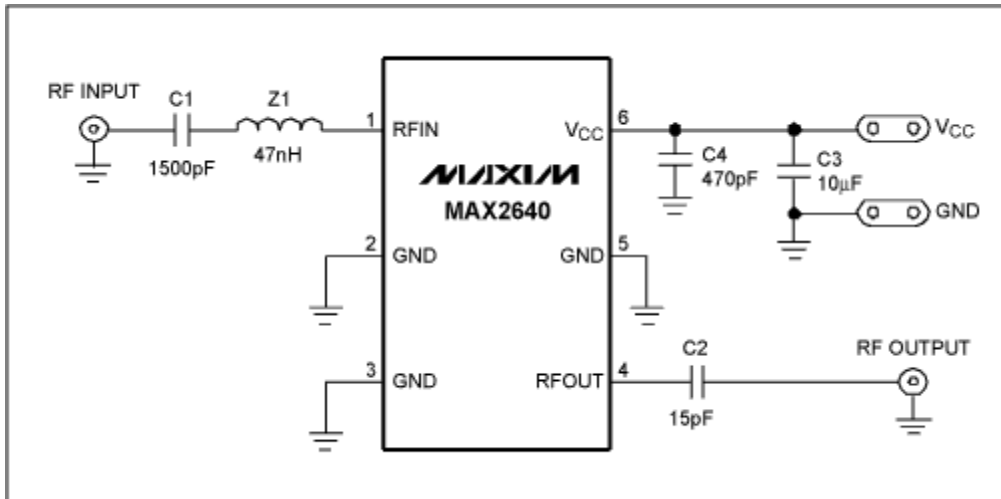


Figure 1. The MAX2640 EV kit schematic for the European ISM band

Table 1. The MAX2640 EV Kit Component List for the European ISM Band

Designation	Qty	Description
C1	1	1500pF ceramic cap (0402) Murata GRP155R71H152KA01B
C2	1	15pF ceramic cap (0402) Murata GRP155561H50JZ01B
C3	1	10µF ceramic cap (1206) AVX TAJA106D010R
C4	1	470pF 5% ceramic cap (0805) Murata GRM40COG471J50V
C5	1	47nH chip inductor (0402) Coilcraft 0402CS-47NX-B6

At $f_{IN} = 433.92\text{MHz}$, the MAX2640 achieves 16.75dB gain, -7.6dB input return loss, and -19.8dB output return loss (see Figure 2). The noise figure reaches a low 1.17dB.

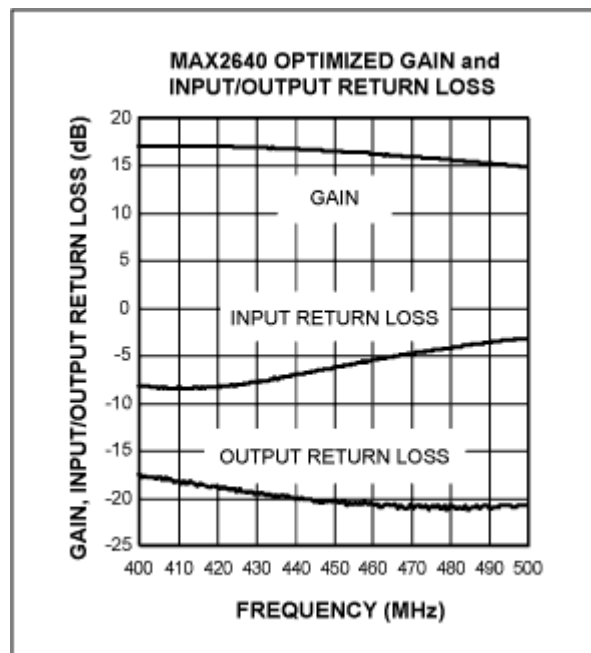


Figure 2. Measured gain, input return loss, and output return loss for the European ISM band

Simulating the same parameters using the MAX2640 S-parameters obtains similar results (Figure 3).

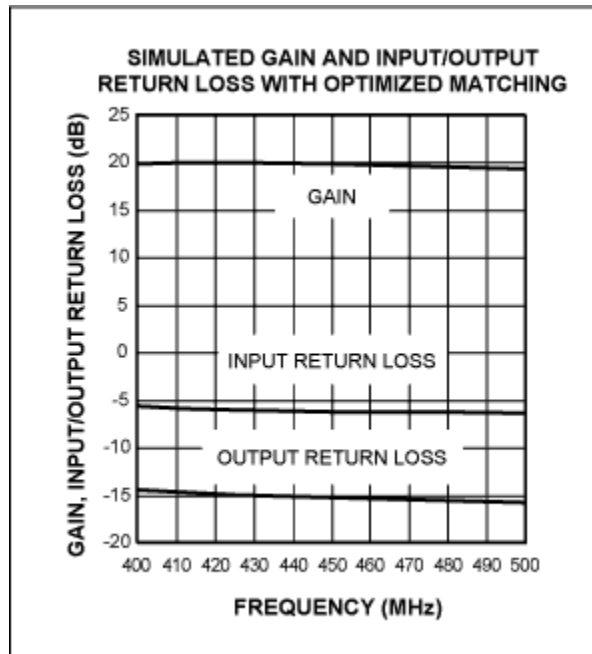


Figure 3. Simulated gain, input/output return loss, and noise figure loss for the European ISM band

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