Abstract: This application note presents the design of an LNA at 2.45 GHz for WLAN applications meeting 802.11b/g needs. It presents curves that show gain, noise figure, input and output return loss, and linearity.

The MAX2645 is a Silicon Germanium (SiGe) Low-Noise Amplifier (LNA) that features a 25dB gain step, shutdown mode, and adjustable IP3. The LNA has been optimized to improve the sensitivity of CMOS receivers for 2.4GHz, 802.11b and 802.11g applications. The device features +18.7dB of gain, a noise figure of 1.9dB, and an Input IP3 of +0.5dB in High-Gain Mode. In Low-Gain Mode, the LNA has -7.0dB of insertion loss and an Input IP3 of +15.3dB. Supply current is a low 8.9mA in High-Gain Mode, 2.7mA in Low-Gain Mode and typically 0.1uA in Shutdown Mode. The LNA also features an externally adjustable bias control, set with a single resistor, which allows the user to meet minimum linearity requirements while minimizing current consumption. Table 1 below summarizes MAX2645 performance. The schematic for optimizing the MAX2645 for 2.45GHz is represented in Figure 1. Figures 2-6 demonstrate High-Gain, and Low-Gain performance of the LNA versus frequency. For further information, consult the MAX2645 SiGe LNA and MAX2645 EV kit datasheets.

Table 1. MAX2645 SiGe LNA Performance

<table>
<thead>
<tr>
<th>Mode</th>
<th>Supply Current (mA)</th>
<th>Gain (dB)</th>
<th>Noise Figure (dB)</th>
<th>Input IP3 (dBm)</th>
<th>Input Return Loss (dB)</th>
<th>Output Return Loss (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-Gain</td>
<td>8.9</td>
<td>+18.7</td>
<td>1.9</td>
<td>+0.5</td>
<td>-8.3</td>
<td>-15.2</td>
</tr>
<tr>
<td>Low-Gain</td>
<td>2.7</td>
<td>-7.0</td>
<td>14.1</td>
<td>+15.3</td>
<td>-11.3</td>
<td>-8.5</td>
</tr>
</tbody>
</table>

(f = 2.45GHz, VCC = 3.0V, RBias = 20kΩ)
Figure 1. MAX2645 SiGe LNA 2.45GHz LNA schematic.

Figure 2. MAX2645 Gain versus frequency ($V_{CC} = 3.0V$, $R_{BIAS} = 20k\Omega$).
Figure 3. MAX2645 Noise figure versus frequency (VCC = 3.0V, R_BIAS = 20kΩ).

Figure 4. MAX2645 Input IP3 versus frequency (VCC = 3.0V, R_BIAS = 20kΩ).
Figure 5. MAX2645 Input Return Loss Versus Frequency (V\textsubscript{CC} = 3.0V, R\textsubscript{BIAS} = 20k\Omega).

Figure 6. MAX2645 Output return loss (V\textsubscript{CC} = 3.0V, R\textsubscript{BIAS} = 20k\Omega).

Related Parts

MAX2645  3.4GHz to 3.8GHz SiGe Low-Noise Amplifier/PA  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 2874: http://www.maximintegrated.com/an2874
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