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APPLICATION NOTE 4264

Increasing the IP3 of the MAX2659 Low-Noise Amplifier (LNA)

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Abstract: This application note explains how adding a degeneration inductor can improve the IP3 performance of the MAX2659 low-noise amplifier (LNA).

The **MAX2659** is a high-gain, low-noise amplifier (LNA) designed for use in GPS, Galileo, and GLONASS systems. The part is ideal for adding GPS functionality to both stand-alone personal navigation devices and mobile handsets, such as cell phones, smartphones, and PDAs.



[Click here for an overview of the wireless components used in a typical radio transceiver.](#)

While the linearity of the MAX2659 is more than sufficient for most applications, it is possible to improve the device's IP3. This can be accomplished by adding a degeneration inductor between pin 2 (the amplifier's emitter) and ground, as shown in **Figure 1**. While this addition increases IP3 significantly, there is a trade off: the gain will reduce and the noise figure will degrade slightly.

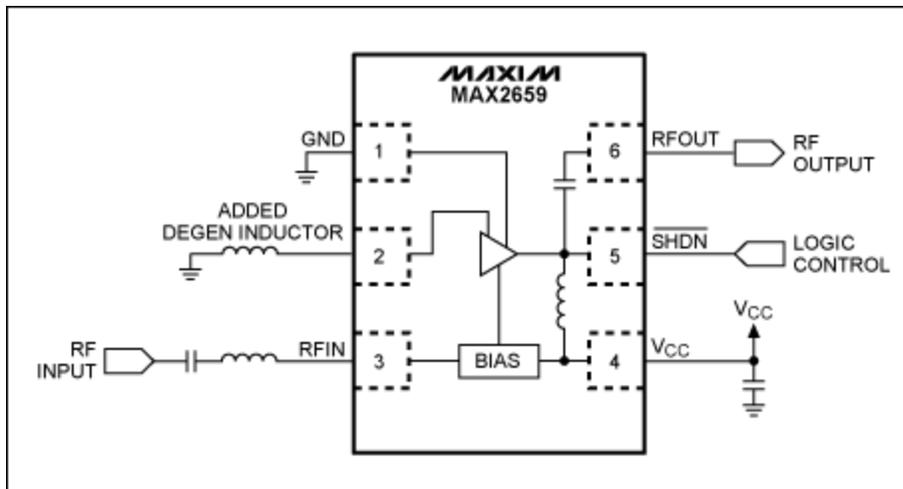


Figure 1. Typical application circuit for increased linearity.

Using a 0.9nH inductor provides a good balance among linearity, gain, and noise figure. Measured

results are shown in **Table 1**. Of course, a different value inductor can be used if more or less linearity is required, although gain and noise figure will change accordingly.

Table 1. Performance of the MAX2659 With and Without a Degeneration Inductor

Degeneration Inductor	I _{CC} (mA)	Gain (dB)	NF (dB)	IP1dB (dBm)	IIP3 (dBm)*
0.9nH	4.0	18.4	1.0	-7.0	6.2
None	4.1	20.5	0.8	-12	-0.5

*Tone 1 was at 1713.42MHz and -17dBm; Tone 2 was at 1851.42MHz and -59dBm.

Related Parts

[MAX2659](#)

GPS/GNSS Low-Noise Amplifier

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