RF IC Building Block Solutions for GPS

Maxim's family of Silicon Germanium (SiGe) building block RF ICs for implementing an GPS RF-to-IF receiver are described.

There are many commercially available IF-to-baseband IC solutions for GPS applications, and many companies have opted to design their own proprietary ASICs, but lack an RF-to-IF front end for downconverting the transmitted GPS frequency to a low-IF frequency. Maxim has produced several RF ICs that have proved an excellent choice for accomplishing these tasks.

The MAX2654/MAX2655 SiGe LNAs offer high gain, low noise, and high linearity at 1575MHz. Both RF ICs incorporate 50Ω output-matching networks for reduced component count. The MAX2654 RF IC delivers 15.1dB of gain, a noise figure of 1.5dB, and an input third-order intercept point (IIP3) of -7.8dBm. For improved linearity, the MAX2655 RF IC offers 14.1dB of gain, a noise figure of 1.45dB, and an adjustable IIP3 performance of +2.2dBm to +3.8dBm. The supply current for the MAX2654 is a low 5.8mA, whereas the supply current for the MAX2655 is adjustable from 5.9mA to 10.1mA. Both devices also feature a 0.1µA low-power shutdown mode. The MAX2641 SiGe LNA is another excellent choice, offering 15.7dB of gain, an extremely low noise figure of 1.2dB at 1575MHz, and an IIP3 of +1.4dBm. The supply-current draw is a low 3.5mA. The MAX2641 does not offer a low-power shutdown mode or an integrated output-matching network.
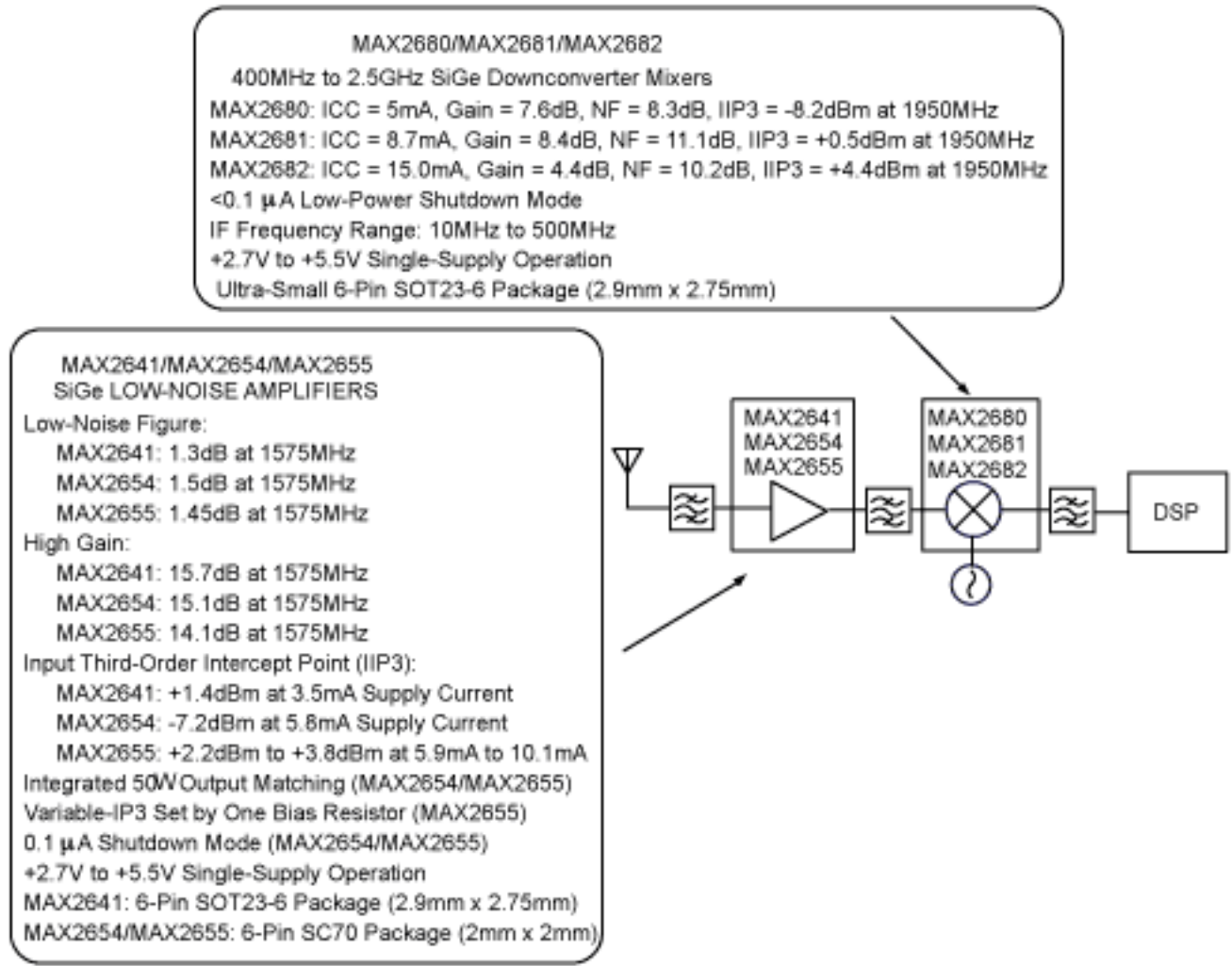
The MAX2680/MAX2681/MAX2682 are a family of Silicon Germanium downconverting mixers that accept RF frequencies in the range of 2.5GHz to 400MHz, which makes it outstanding for GPS applications at 1575MHz. The IF output can be tuned for IF frequencies between 10MHz and 500MHz. See the table below for the performance of the MAX2680, MAX2681, and MAX2682.

Table: GPS Silicon Germanium (SiGe) Downconverter IC Selector Guide

| Part | Supply Current (mA) | Frequency | | | | | |
| | | 900MHz | | | 1950MHz | | |
		IIP3 (dBm)	NF (dB)	Gain (dB)	IIP3 (dBm)	NF (dB)	Gain (dB)
MAX2680	5.0	-12.9	6.3	11.6	-8.2	8.3	7.6
MAX2681	8.7	-6.1	7.0	14.2	+0.5	11.1	8.4

MAX2682	15.0	-1.8	6.5	14.7	+4.4	10.2	10.4

The following block diagram summarizes the important features of the Maxim's various building-block GPS RF ICs.

MAX2680/MAX2681/MAX2682

400MHz to 2.5GHz SiGe Downconverter Mixers
MAX2680: ICC = 5mA, Gain = 7.6dB, NF = 8.3dB, IIP3 = -8.2dBm at 1950MHz
MAX2681: ICC = 8.7mA, Gain = 8.4dB, NF = 11.1dB, IIP3 = +0.5dBm at 1950MHz
MAX2682: ICC = 15.0mA, Gain = 4.4dB, NF = 10.2dB, IIP3 = +4.4dBm at 1950MHz
<0.1 µA Low-Power Shutdown Mode
IF Frequency Range: 10MHz to 500MHz
+2.7V to +5.5V Single-Supply Operation
Ultra-Small 6-Pin SOT23-6 Package (2.9mm x 2.75mm)

MAX2641/MAX2654/MAX2655
SiGe LOW-NOISE AMPLIFIERS
Low-Noise Figure:
    MAX2641: 1.3dB at 1575MHz
    MAX2654: 1.5dB at 1575MHz
    MAX2655: 1.45dB at 1575MHz
High Gain:
    MAX2641: 15.7dB at 1575MHz
    MAX2654: 15.1dB at 1575MHz
    MAX2655: 14.1dB at 1575MHz
Input Third-Order Intercept Point (IIP3):
    MAX2641: +1.4dBm at 3.5mA Supply Current
    MAX2654: -7.2dBm at 5.8mA Supply Current
    MAX2655: +2.2dBm to +3.8dBm at 5.9mA to 10.1mA
Integrated 50Ω Output Matching (MAX2654/MAX2655)
Variable-IP3 Set by One Bias Resistor (MAX2655)
0.1 µA Shutdown Mode (MAX2654/MAX2655)
+2.7V to +5.5V Single-Supply Operation
MAX2641: 6-Pin SOT23-6 Package (2.9mm x 2.75mm)
MAX2654/MAX2655: 6-Pin SC70 Package (2mm x 2mm)

RF ICs for GPS Receivers

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More Information

MAX2641: QuickView -- Full (PDF) Data Sheet -- Free Samples

MAX2654: QuickView -- Full (PDF) Data Sheet -- Free Samples

MAX2655: QuickView -- Full (PDF) Data Sheet -- Free Samples

MAX2680: QuickView -- Full (PDF) Data Sheet -- Free Samples

MAX2681: QuickView -- Full (PDF) Data Sheet -- Free Samples

MAX2682: QuickView -- Full (PDF) Data Sheet -- Free Samples