

# Low-Cost, 900MHz, Low-Noise Amplifier and Downconverter Mixer

## General Description

The MAX2685's low-noise amplifier (LNA) and down-converter mixer comprise the major blocks of an RF front-end receiver. Optimized for 900MHz operation, the device's low noise figure, high gain, and high linearity make it ideal for cellular, cordless, and wireless data applications. A low supply current of 8.5mA (high-gain mode) and 3.8mA (low-gain mode) plus a low operating supply voltage range of +2.7V to +5.5V make it suitable for use in 3-cell NiCd or 1-cell lithium-ion (Li+) battery applications. A low-power shutdown mode further extends battery life by reducing supply current below 0.1 $\mu$ A.

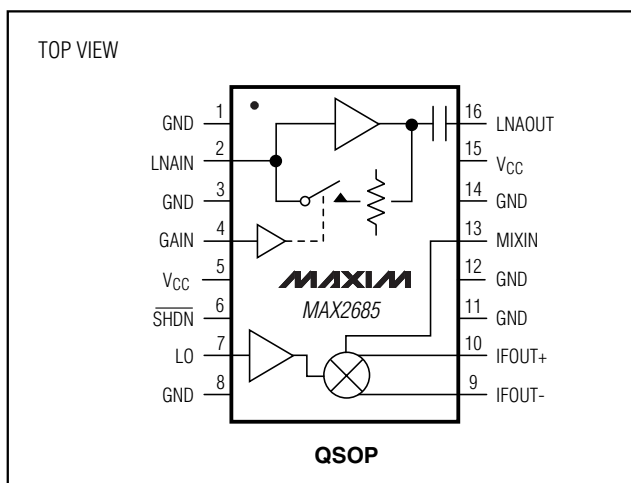
The MAX2685 includes an LNA, LNA bypass switch, downconverter mixer, and local-oscillator (LO) buffer. The LNA has a low noise figure of 1.4dB, a high gain of 15dB, and an input third-order intercept point (IP3) of -4dBm. The mixer has a noise figure of 13dB, a gain of 6dB, and an input IP3 of +7dBm. In addition, an LNA bypass switch allows two levels of gain, reducing power consumption when high gain is not needed.

The downconverter mixer has a single-ended RF input port and differential IF output ports. Differential operation of the IF ports offers improved even-order harmonic rejection and increased immunity to noise. An LO buffer allows the LO port to be driven with only -8dBm of LO power. The MAX2685 is offered in a space-saving 16-pin QSOP package.

## Applications

|                          |                          |
|--------------------------|--------------------------|
| Cellular/Cordless Phones | 900MHz ISM-Band Radios   |
| Wireless Data            | 868MHz European ISM Band |

## Pin Configuration



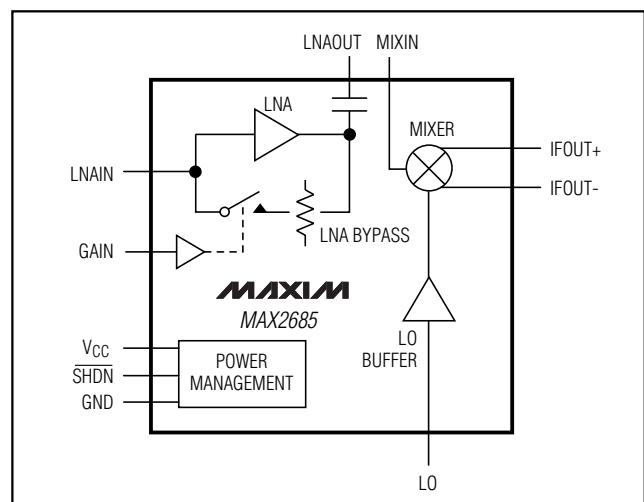
## Features

- ◆ 800MHz to 1000MHz RF Frequency Range
- ◆ +2.7V to +5.5V Single-Supply Operation
- ◆ Integrated LNA + Mixer + LO Buffer
- ◆ Logic-Controlled LNA Bypass Switch Reduces Supply Current
- ◆ LNA Performance (High/Low Gain)
  - Gain: +15dB/-12dB
  - NF: 1.4dB/12dB
  - Input IP3: -4dBm/+16dBm
- ◆ Mixer Performance (High/Low Gain)
  - Gain: 6dB/4.6dB
  - NF: 13dB/12dB
  - Input IP3: +7dBm/-1.5dBm
- ◆ Supply Current
  - 8.5mA (High Gain)
  - 3.8mA (Low Gain)
- ◆ <0.1 $\mu$ A Supply Current in Shutdown Mode
- ◆ 0.8 $\mu$ s Receiver Enable Time

## Ordering Information

| PART       | TEMP. RANGE    | PIN-PACKAGE |
|------------|----------------|-------------|
| MAX2685EEE | -40°C to +85°C | 16 QSOP     |

## Functional Diagram



# Low-Cost, 900MHz, Low-Noise Amplifier and Downconverter Mixer

## ABSOLUTE MAXIMUM RATINGS

|                                      |                                   |   |
|--------------------------------------|-----------------------------------|---|
| V <sub>CC</sub> to GND .....         | -0.3V to +6V                      | Continuous Power Dissipation (T <sub>A</sub> = +70°C) |
| LNAIN Input Power (50Ω source) ..... | +10dBm                            | 16-Pin QSOP (derate 8.3mW/°C above +70°C).....        |
| LO Input Power (50Ω source) .....    | +10dBm                            | 667mW   |
| MIXIN Input Power (50Ω source) ..... | +10dBm                            | Junction Temperature .....                            |
| IFOUT+, IFOUT- to GND .....          | -0.3V to +6V                      | +150°C  |
| LNAOUT to GND .....                  | -0.3V to +6V                      | Operating Temperature Range .....                     |
| GAIN, SHDN to GND .....              | -0.3V to (V <sub>CC</sub> + 0.3V) | -40°C to +85°C  |
|                                      |                                   | Storage Temperature Range .....                       |
|                                      |                                   | -65°C to +150°C                                       |
|                                      |                                   | Lead Temperature (soldering, 10s) .....               |
|                                      |                                   | +300°C  |

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## DC ELECTRICAL CHARACTERISTICS

(V<sub>CC</sub> = +2.7V to +5.5V, V<sub>SHDN</sub> = +2V, V<sub>GAIN</sub> = +2V, LNAIN = LNAOUT = MIXIN = LO = unconnected, IFOUT+ = IFOUT- = V<sub>CC</sub>, T<sub>A</sub> = -40°C to +85°C. Typical values are at T<sub>A</sub> = +25°C and V<sub>CC</sub> = +3V, unless otherwise noted.)

| PARAMETER                | CONDITIONS   | MIN | TYP   | MAX  | UNITS |
|--------------------------|--|-----|-------|------|-------|
| Supply Voltage Range     |  | 2.7 |       | 5.5  | V     |
| Operating Supply Current | GAIN = V <sub>CC</sub> (Note 1)                            |     | 8.5   | 14.1 | mA    |
|                          | GAIN = GND (Note 1)  |     | 3.8   | 6.4  |       |
| Shutdown Supply Current  | SHDN = GND (Note 1)  |     | 0.1   | 1.0  | μA    |
| Logic Input Voltage High | GAIN, SHDN   | 2.0 |       |      | V     |
| Logic Input Voltage Low  | GAIN, SHDN   |     |       | 0.5  | V     |
| Logic Input Current      | V <sub>SHDN</sub> = V <sub>GAIN</sub> = 0 to 5.5V (Note 1) |     | ±0.01 | ±1   | μA    |

## AC ELECTRICAL CHARACTERISTICS

(MAX2685 EV kit, V<sub>CC</sub> = V<sub>SHDN</sub> = +3V, f<sub>LNAIN</sub> = f<sub>MIXIN</sub> = 880MHz, f<sub>LO</sub> = 960MHz, P<sub>LNAIN</sub> = -30dBm, P<sub>LO</sub> = -8dBm, P<sub>MIXIN</sub> = -25dBm, differential IFOUT operation, Z<sub>o</sub> = 50Ω, T<sub>A</sub> = +25°C, unless otherwise noted.)

| PARAMETER                           | CONDITIONS  | MIN | TYP   | MAX   | UNITS |
|-------------------------------------|---|-----|-------|-------|-------|
| <b>LOW-NOISE AMPLIFIER (LNA)</b>    |   |     |       |       |       |
| RF Frequency Range (Note 2)         |   | 800 |       | 1000  | MHz   |
| LNA Gain                            | GAIN = V <sub>CC</sub> (Note 1)   | 13  | 15    | 16.2  | dB    |
|                                     | GAIN = GND (Note 1)   | -14 | -12   | -10.3 |       |
| LNA Gain Variation over Temperature | GAIN = V <sub>CC</sub> , T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub> (Note 3) |     | 0.9   | 1.6   | dB    |
| LNA Noise Figure                    | GAIN = V <sub>CC</sub>  |     | 1.4   |       | dB    |
|                                     | GAIN = GND  |     | 12.2  |       |       |
| LNA Input IP3                       | GAIN = V <sub>CC</sub> (Note 4)   |     | -4.1  |       | dBm   |
|                                     | GAIN = GND (Note 5)   |     | +16.2 |       |       |
| LNA Input 1dB Compression           | GAIN = V <sub>CC</sub>  |     | -18.4 |       | dBm   |
| LNAOUT Port Return Loss             | GAIN = V <sub>CC</sub>  |     | -18.6 |       | dB    |
|                                     | GAIN = GND  |     | -11.3 |       |       |
| <b>DOWNCONVERTER MIXER</b>          |   |     |       |       |       |
| RF Frequency Range (Note 2)         |   | 800 |       | 1000  | MHz   |
| Mixer Conversion Gain               | GAIN = V <sub>CC</sub> (Note 1)   | 4.7 | 6.1   | 7.0   | dB    |
|                                     | GAIN = GND (Note 1)   | 2.5 | 4.6   | 6.0   |       |

# Low-Cost, 900MHz, Low-Noise Amplifier and Downconverter Mixer

## AC ELECTRICAL CHARACTERISTICS (continued)

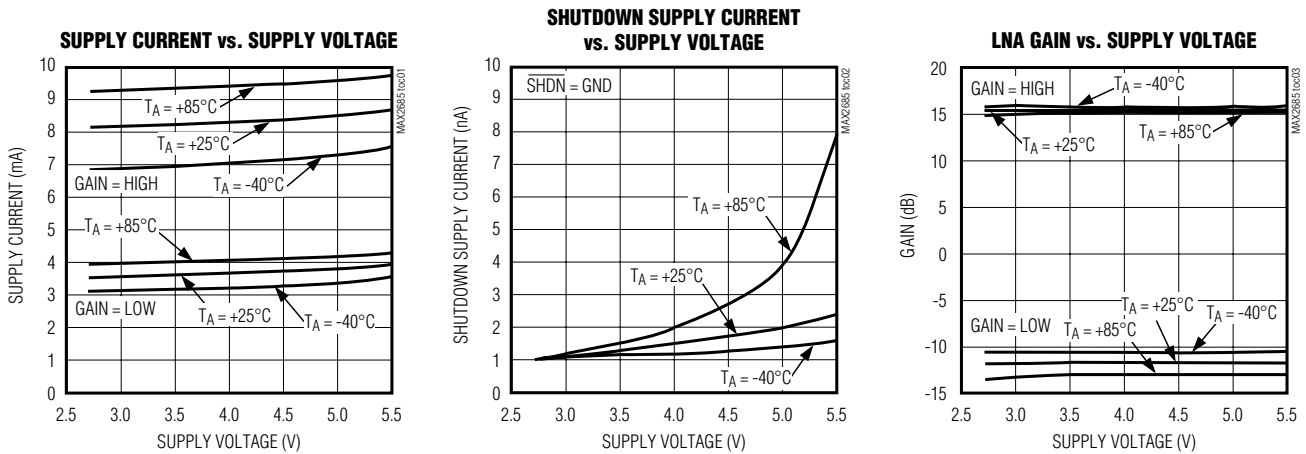
(MAX2685 EV kit,  $V_{CC} = \overline{SHDN} = +3V$ ,  $f_{LNAIN} = f_{MIXIN} = 880MHz$ ,  $f_{LO} = 960MHz$ ,  $P_{LNAIN} = -30dBm$ ,  $P_{LO} = -8dBm$ ,  $P_{MIXIN} = -25dBm$ , differential IFOUT operation,  $Z_o = 50\Omega$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)

| PARAMETER  | CONDITIONS  | MIN | TYP  | MAX | UNITS   |
|--|---|-----|------|-----|---------|
| Mixer Conversion Gain Variation over Temperature | GAIN = $V_{CC}$ , $T_A = T_{MIN}$ to $T_{MAX}$ (Note 3) |     | 1    | 2   | dB      |
| Mixer Noise Figure (SSB)                         | GAIN = $V_{CC}$   |     | 13   |     | dB      |
|  | GAIN = GND  |     | 12.1 |     |         |
| Mixer Input IP3 (Note 6)                         | GAIN = $V_{CC}$   |     | 7    |     | dBm     |
|  | GAIN = GND  |     | -1.5 |     |         |
| LO Port Return Loss                              |   |     | 11   |     | dB      |
| LO-to-LNAIN Isolation                            | $\overline{SHDN} = V_{CC}$ or GND                       |     | 53   |     | dB      |
| LO-to-MIXIN Isolation                            |   |     | 31   |     | dB      |
| LNAOUT-to-MIXIN Isolation                        |   |     | 28   |     | dB      |
| <b>OVERALL SYSTEM</b>                            |   |     |      |     |         |
| Receiver Enable Time                             | (Note 7)  |     | 0.8  |     | $\mu s$ |

- Note 1:** Performance at temperatures greater than or equal to  $+25^\circ C$  are guaranteed by production test; performance at temperatures less than  $+25^\circ C$  are guaranteed by design and characterization.
- Note 2:** This is the recommended operating frequency range.
- Note 3:** Maximum and minimum limits are guaranteed by design and device characterization and are not production tested.
- Note 4:** Two tones at 880MHz and 880.1MHz, -30dBm per tone.
- Note 5:** Two tones at 880MHz and 880.1MHz, -10dBm per tone.
- Note 6:** Two tones at 880MHz and 880.1MHz, -25dBm per tone.
- Note 7:** Time from  $\overline{SHDN} =$  high, until the cascaded receive gain is within 1dB of its final value. Measured with 47pF blocking capacitors on LNAIN and LNAOUT. Matching network removed from IFOUT output.

## Typical Operating Characteristics

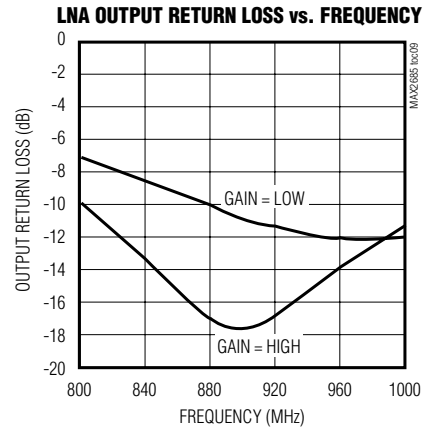
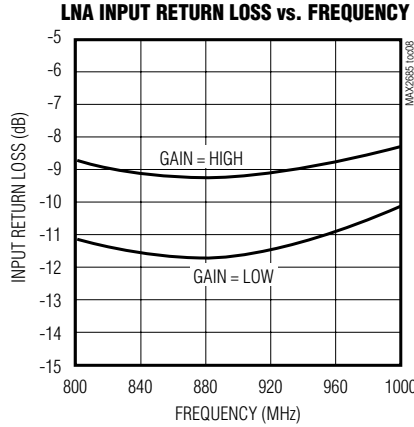
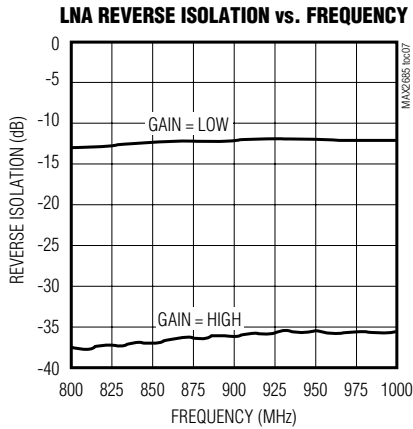
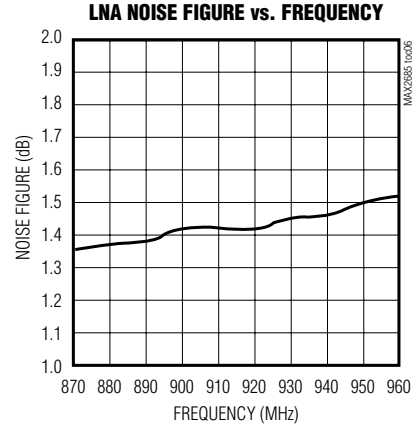
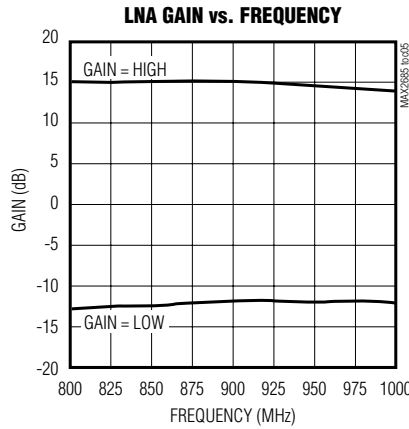
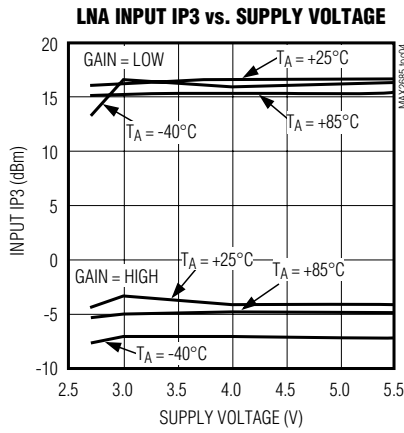
(MAX2685 EV kit,  $V_{CC} = \overline{SHDN} = +3V$ ,  $f_{LNAIN} = f_{MIXIN} = 880MHz$ ,  $f_{LO} = 960MHz$ ,  $P_{LNAIN} = -30dBm$ ,  $P_{LO} = -8dBm$ ,  $P_{MIXIN} = -25dBm$ , differential IFOUT operation,  $Z_o = 50\Omega$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)



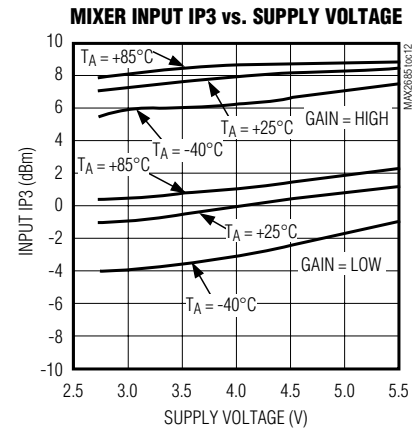
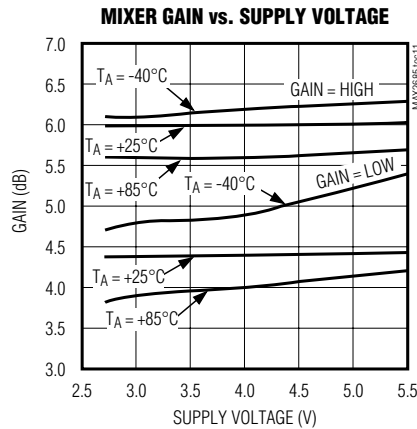
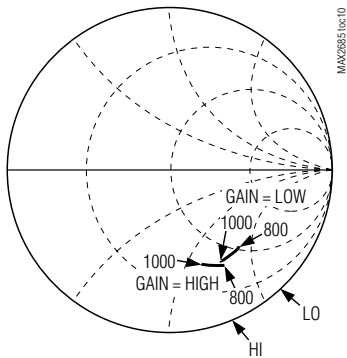
# Low-Cost, 900MHz, Low-Noise Amplifier and Downconverter Mixer

## Typical Operating Characteristics (continued)

(MAX2685 EV kit,  $V_{CC} = V_{SHDN} = +3V$ ,  $f_{LNAIN} = f_{MIXIN} = 880MHz$ ,  $f_{LO} = 960MHz$ ,  $P_{LNAIN} = -30dBm$ ,  $P_{LO} = -8dBm$ ,  $P_{MIXIN} = -25dBm$ , differential IFOUT operation,  $Z_0 = 50\Omega$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)



**LNA S11 vs. FREQUENCY (800MHz to 1000MHz UNMATCHED)**

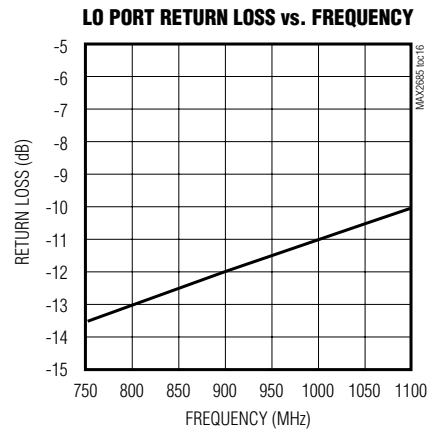
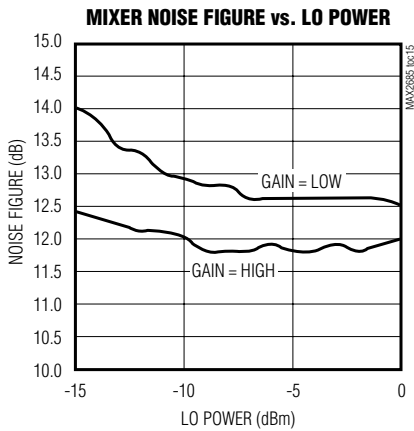
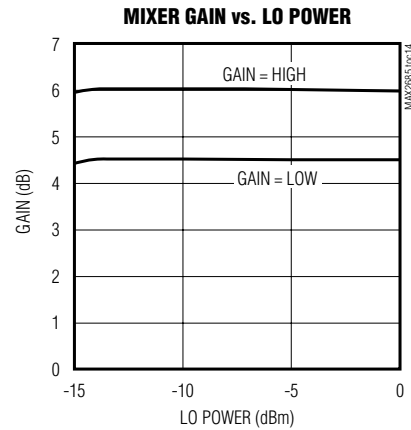
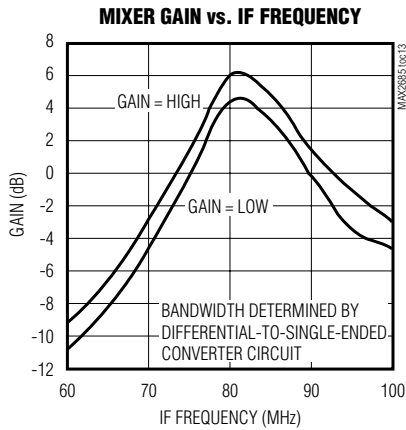


# Low-Cost, 900MHz, Low-Noise Amplifier and Downconverter Mixer

**MAX2685**

## Typical Operating Characteristics (continued)

(MAX2685 EV kit,  $V_{CC} = V_{SHDN} = +3V$ ,  $f_{LNAIN} = f_{MIXIN} = 880MHz$ ,  $f_{LO} = 960MHz$ ,  $P_{LNAIN} = -30dBm$ ,  $P_{LO} = -8dBm$ ,  $P_{MIXIN} = -25dBm$ , differential IFOUT operation,  $Z_0 = 50\Omega$ ,  $T_A = +25^\circ C$ , unless otherwise noted.)



# Low-Cost, 900MHz, Low-Noise Amplifier and Downconverter Mixer

## Pin Description

| PIN                 | NAME                     | FUNCTION   |
|---------------------|--------------------------|--|
| 1, 3, 8, 11, 12, 14 | GND                      | Ground. Connect to ground plane with a low-inductance connection.  |
| 2                   | LNAIN                    | RF Input to LNA and LNA Bypass Switch. Requires an external matching network and a series DC-blocking capacitor.   |
| 4                   | GAIN                     | Gain Control Logic-Level Input. Drive high to enable the LNA, open the LNA bypass switch, and increase the receiver's gain. Drive low to disable the LNA, close the LNA bypass switch, and reduce the receiver's gain. |
| 5, 15               | V <sub>CC</sub>          | Supply Voltage. Bypass V <sub>CC</sub> to GND at each pin with a 47pF capacitor as close to the pin as possible.   |
| 6                   | $\overline{\text{SHDN}}$ | Shutdown Control Logic-Level Input. Drive high or connect to V <sub>CC</sub> for normal operation. Drive low to place the device in low-power shutdown mode.   |
| 7                   | LO                       | Local-Oscillator Input to Downconverter Mixer. Requires a series DC-blocking capacitor and an impedance-setting resistor (typically 75Ω to ground).  |
| 9                   | IFOUT-                   | Inverting Side to Downconverter Mixer's Differential Open-Collector IF Output. Requires a pull-up inductor to V <sub>CC</sub> for proper biasing, as well as a matching network to ensure optimum output power.        |
| 10                  | IFOUT+                   | Noninverting Side of Downconverter Mixer's Differential Open-Collector IF Output. Requires a pull-up inductor to V <sub>CC</sub> for proper biasing, as well as a matching network to ensure optimum output power.     |
| 13                  | MIXIN                    | RF Input to Downconverter Mixer. Requires an external matching network and series DC-blocking capacitor.   |
| 16                  | LNAOUT                   | LNA Output. Internally matched to 50Ω. LNAOUT has an internal blocking capacitor.  |

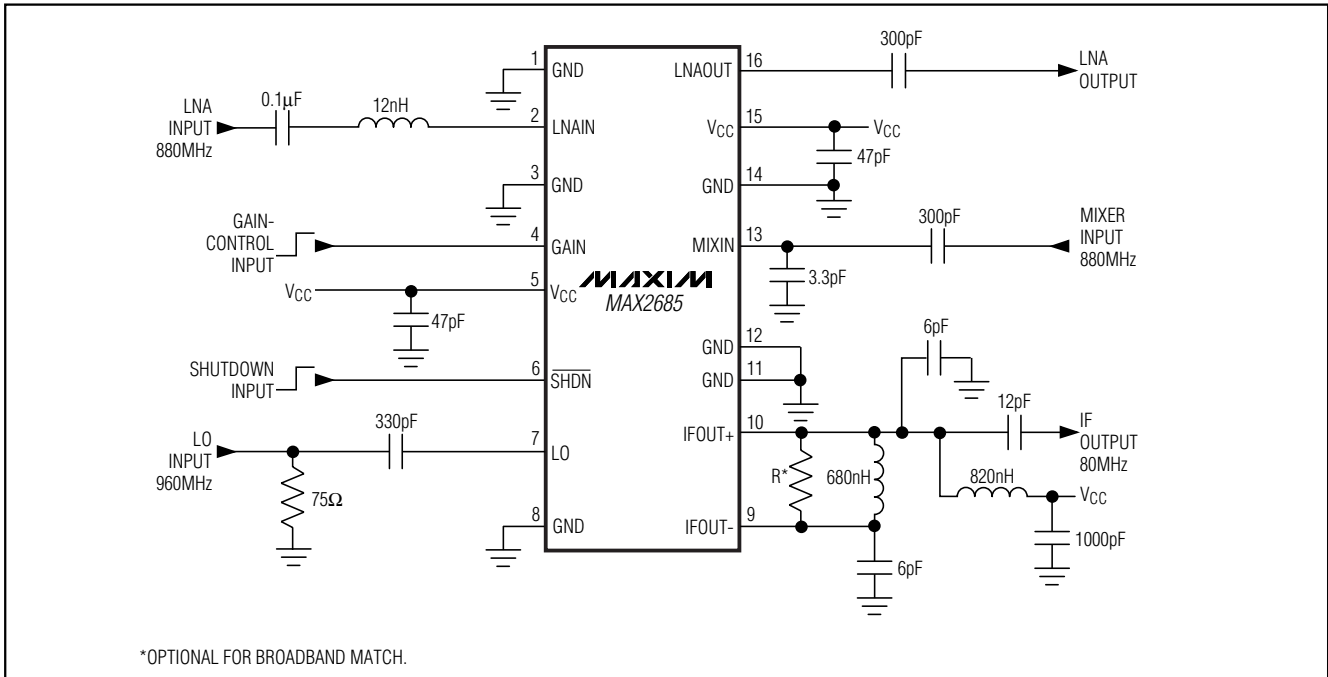


Figure 1. Typical Operating Circuit

# Low-Cost, 900MHz, Low-Noise Amplifier and Downconverter Mixer

## Detailed Description

The MAX2685 consists of five major components: a low-noise amplifier (LNA), an LNA bypass switch, a downconverter mixer, a local-oscillator (LO) buffer, and a power-management block.

### Low-Noise Amplifier (LNA)

The LNA is a wideband, single-ended cascode amplifier that operates over a wide range of frequencies. The input of the LNA (LNAIN) requires an appropriate matching network and a DC-blocking capacitor. The typical operating circuit shown in Figure 1 is optimized for frequencies around 880MHz, requiring only a 0.1 $\mu$ F capacitor in series with a 12nH inductor. See Table 1 for the LNA "S" parameters for matching to other frequencies.

The output of the LNA (LNAOUT) is internally biased to VCC. It is internally matched to 50 $\Omega$  and incorporates an internal DC-blocking capacitor.

### LNA Bypass Switch and Gain Control

When a large input signal is present, enable the LNA bypass function to increase linearity and reduce supply current. Set GAIN low to enable the LNA bypass function.

### Receive Mixer

The downconverter mixer is a wideband, single-balanced design with a low noise figure and high linearity. The RF signal at the MIXIN port is mixed with the signal at the LO port, and is downconverted to an IF frequency at the differential IF port.

### RF Input

The MIXIN input requires a simple external matching network and a series DC-blocking capacitor. See Figure 1 for a matching network example, optimized for 880MHz operation. Table 2 lists mixer "S" parameters for matching to other frequencies.

**Table 1. LNA Typical S-Parameters (VCC = +3V, TA = +25°C)**

| FREQUENCY (MHz)                    | S11  MAG | S11 PHASE (degrees) | S21  MAG | S21 PHASE (degrees) | S12  MAG | S12 PHASE (degrees) | S22  MAG | S22 PHASE (degrees) |
|------------------------------------|----------|---------------------|----------|---------------------|----------|---------------------|----------|---------------------|
| <b>High-Gain Mode (GAIN = VCC)</b> |          |                     |          |                     |          |                     |          |                     |
| 800                                | 0.761    | -64.5               | 4.98     | 177.9               | 0.018    | -163.7              | 0.376    | -107.3              |
| 840                                | 0.753    | -68.6               | 5.06     | 167.2               | 0.022    | -167.1              | 0.264    | -107.0              |
| 880                                | 0.747    | -73.2               | 5.07     | 156.6               | 0.026    | -171.3              | 0.172    | -94.6               |
| 920                                | 0.733    | -78.0               | 4.91     | 146.6               | 0.030    | -175.7              | 0.149    | -62.9               |
| 960                                | 0.719    | -82.8               | 4.68     | 137.7               | 0.035    | 178.0               | 0.200    | -42.4               |
| 1000                               | 0.693    | -87.5               | 4.40     | 130.3               | 0.039    | 171.0               | 0.263    | -38.8               |
| <b>Low-Gain Mode (GAIN = GND)</b>  |          |                     |          |                     |          |                     |          |                     |
| 800                                | 0.625    | -45.6               | 0.188    | 73.0                | 0.191    | 71.9                | 0.483    | -91.3               |
| 840                                | 0.621    | -48.1               | 0.195    | 65.5                | 0.198    | 64.2                | 0.423    | -91.3               |
| 880                                | 0.619    | -50.9               | 0.199    | 58.1                | 0.201    | 56.7                | 0.370    | -89.9               |
| 920                                | 0.611    | -53.3               | 0.200    | 51.6                | 0.202    | 50.3                | 0.337    | -86.1               |
| 960                                | 0.608    | -55.5               | 0.200    | 46.1                | 0.201    | 44.7                | 0.322    | -80.9               |
| 1000                               | 0.607    | -57.5               | 0.200    | 41.2                | 0.200    | 40.0                | 0.317    | -76.7               |

# Low-Cost, 900MHz, Low-Noise Amplifier and Downconverter Mixer

Table 2. Mixer Typical S-Parameters ( $V_{CC} = +3V$ ,  $T_A = +25^{\circ}C$ )

| RF FREQUENCY (MHz)                 | S11 MAG | S11  PHASE (degrees) | IF FREQUENCY (MHz) | S22  MAG (IFOUT+ Port Only) | S22 PHASE (IFOUT+ Port Only) (degrees) |
|------------------------------------|---------|----------------------|--------------------|-----------------------------|--|
| <b>High-Gain Mode (GAIN = VCC)</b> |         |                      |                    |                             |  |
| 800                                | 0.355   | 152.7                | 10                 | 0.996                       | -0.4                                   |
| 840                                | 0.352   | 153.7                | 40                 | 0.994                       | -1.8                                   |
| 880                                | 0.351   | 154.5                | 80                 | 0.993                       | -3.2                                   |
| 920                                | 0.349   | 155.8                | 110                | 0.989                       | -4.2                                   |
| 960                                | 0.352   | 156.2                | 170                | 0.988                       | -6.2                                   |
| 1000                               | 0.353   | 156.9                | 240                | 0.983                       | -8.0                                   |
| <b>Low-Gain Mode (GAIN = GND)</b>  |         |                      |                    |                             |  |
| 800                                | 0.275   | 142.8                | 10                 | 0.996                       | -0.5                                   |
| 840                                | 0.268   | 144.1                | 40                 | 0.995                       | -1.8                                   |
| 880                                | 0.262   | 145.5                | 80                 | 0.993                       | -3.2                                   |
| 920                                | 0.255   | 147.7                | 110                | 0.989                       | -4.2                                   |
| 960                                | 0.254   | 149.0                | 170                | 0.987                       | -6.2                                   |
| 1000                               | 0.245   | 156.9                | 240                | 0.982                       | -7.9                                   |



# Low-Cost, 900MHz, Low-Noise Amplifier and Downconverter Mixer

MAX2685

## Local-Oscillator Input

The LO port is the high-impedance input of the local-oscillator buffer. It requires a series DC-blocking capacitor and a shunt resistor to ground to set the input impedance. See the *Typical Operating Characteristics* for a graph of LO Port Return Loss vs. Frequency.

## IF Output Port

The mixer's downconverted output appears on the differential IFOUT+ and IFOUT- pins. The differential output can be converted to a single-ended output, as shown in the MAX2685 evaluation kit (EV kit). Refer to the *Detailed Description* in the MAX2685 EV kit data sheet.

## Shutdown

Drive  $\overline{\text{SHDN}}$  low to disable all device functions and place the MAX2685 in low-power shutdown mode. Drive  $\overline{\text{SHDN}}$  high or connect it to VCC to enable all device functions.

## Applications Information

### Layout Considerations

A properly designed PC board is an essential part of any RF/microwave circuit. Note the IC's high-frequency inputs and outputs, and be sure to decouple the DC supply and control pins.

For power-supply traces and connections, a star topology works well. Each VCC node in the circuit has its own path to the central VCC node and a decoupling capacitor that provides a low impedance at the RF frequency of interest. The central VCC also has a large decoupling capacitor. This provides good isolation between the different sections of the MAX2685.

## Chip Information

TRANSISTOR COUNT: 295

# Low-Cost, 900MHz, Low-Noise Amplifier and Downconverter Mixer

## Package Information

| DIM | INCHES         |       | MILLIMETERS |       |
|-----|----------------|-------|-------------|-------|
|     | MIN            | MAX   | MIN         | MAX   |
| A   | .061           | .068  | 1.55        | 1.73  |
| A1  | .004           | .0098 | 0.102       | 0.249 |
| A2  | .055           | .061  | 1.40        | 1.55  |
| B   | .008           | .012  | 0.20        | 0.31  |
| C   | .0075          | .0098 | 0.191       | 0.249 |
| D   | SEE VARIATIONS |       |             |       |
| E   | .150           | .157  | 3.81        | 3.99  |
| e   | .025 BSC       |       | 0.635 BSC   |       |
| H   | .230           | .244  | 5.84        | 6.20  |
| h   | .010           | .016  | 0.25        | 0.41  |
| L   | .016           | .035  | 0.41        | 0.89  |
| N   | SEE VARIATIONS |       |             |       |
| X   | SEE VARIATIONS |       |             |       |
| Y   | .071           | .087  | 1.803       | 2.209 |
| α   | 0°             | 8°    | 0°          | 8°    |

| DIM | INCHES |       | MILLIMETERS |       | N     |
|-----|--------|-------|-------------|-------|-------|
|     | MIN.   | MAX.  | MIN.        | MAX.  |       |
| D   | .189   | .196  | 4.80        | 4.98  | 16 AA |
| S   | .0020  | .0070 | 0.05        | 0.18  |       |
| X   | .107   | .123  | 2.72        | 3.12  |       |
| D   | .337   | .344  | 8.56        | 8.74  | 20 AB |
| S   | .0500  | .0550 | 1.270       | 1.397 |       |
| D   | .337   | .344  | 8.56        | 8.74  | 24 AC |
| S   | .0250  | .0300 | 0.635       | 0.762 |       |
| D   | .386   | .393  | 9.80        | 9.98  | 28 AD |
| S   | .0250  | .0300 | 0.635       | 0.762 |       |
| X   | .271   | .287  | 6.88        | 7.29  |       |

NOTES:

1. D & E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
2. MOLD FLASH OR PROTRUSIONS NOT TO EXCEED .006" PER SIDE.
3. HEAT SLUG DIMENSIONS X AND Y APPLY ONLY TO 16 AND 28 LEAD POWER-QSDP PACKAGES.
4. CONTROLLING DIMENSIONS: INCHES.
5. MEETS JEDEC MO137.

OSOP/EPDS

**MAXIM**  
PROPRIETARY INFORMATION  
 TITLE: PACKAGE OUTLINE, QSDP, .150", .025" LEAD PITCH  
 APPROVAL: \_\_\_\_\_ DOCUMENT CONTROL NO. 21-0055 REV C 1/1

Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.

10 Maxim Integrated Products, 120 San Gabriel Drive, Sunnyvale, CA 94086 408-737-7600