

MAXIM

GPS/GNSS超低噪声系数LNA

概述

特性

MAX2667/MAX2669是高增益、低噪声放大器(LNA)，设计用于GPS L1、Galileo和GLONASS应用。器件采用Maxim先进的SiGe工艺，在提供高增益和超低噪声系数的同时，使输入参考1dB压缩点以及三阶截点最大化。

器件采用+1.6V至+3.3V单电源供电，MAX2667优化用于低电流设计、MAX2669优化用于高线性度设计。关断模式下，器件的电源电流降至10 μ A以下。器件采用超小尺寸、无铅并符合RoHS标准的0.86mm x 1.26mm x 0.65mm晶片级封装(WLP)。

- ◆ 高功率增益: 19dB (MAX2667)
- ◆ 超低噪声系数: 0.65dB
- ◆ 集成50 Ω 输出匹配电路
- ◆ 低电源电流: 4.1mA (MAX2667)
- ◆ 较宽的电源电压范围: 1.6V至3.3V
- ◆ 较少的材料清单: 2个电感、3个电容和1个电阻
- ◆ 小尺寸封装: 0.86mm x 1.26mm
- ◆ 薄外形: 0.65mm
- ◆ 0.4mm焊球间距的晶片级封装(WLP)

应用

汽车导航

定位移动设备

远程信息处理(物品跟踪和库存管理)

个人导航设备(PND)

GPS蜂窝电话

笔记本PC/超便携移动PC

娱乐终端、舰队导航

航空电子

手表

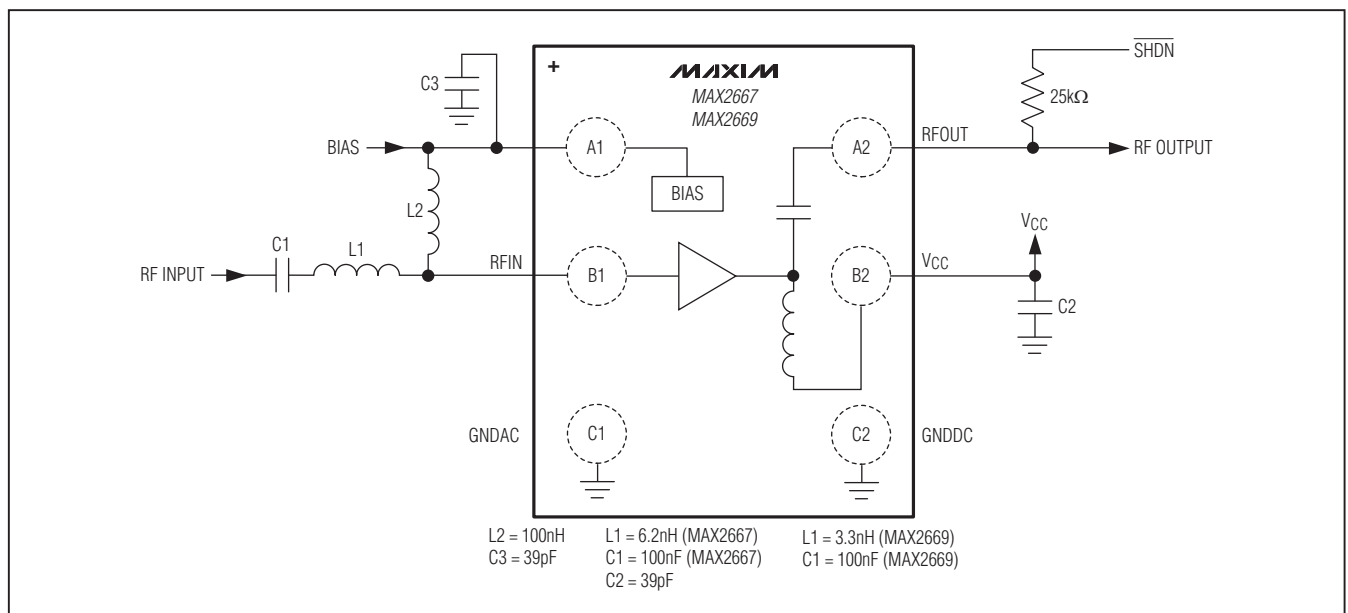
订购信息

PART	TEMP RANGE	PIN-PACKAGE
MAX2667EWT+T	-40°C to +85°C	6 WLP
MAX2669EWT+T	-40°C to +85°C	6 WLP

+表示无铅(Pb)/符合RoHS标准的封装。

T = 卷带包装。

典型应用电路



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ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND₋ -0.3V to +3.6V
 RFOUT and BIAS to GND₋ -0.3V to (Operating V_{CC} + 0.3V)
 Maximum RF Input Power +5dBm
 Continuous Power Dissipation (T_A = +70°C)
 WLP (derates 10.5mW/°C above +70°C) 840mW

Maximum Current into RF Input 10mA
 Operating Temperature Range -40°C to +85°C
 Junction Temperature +150°C
 Storage Temperature Range -65°C to +160°C
 Soldering Temperature (reflow) (Note 1) +260°C

Note 1: Refer to Application Note 1891: *Wafer-level packaging (WLP) and its applications.*



CAUTION! ESD SENSITIVE DEVICE

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

(MAX2667/MAX2669 EV kit. V_{CC} = 1.6V to 3.3V, no RF signals are applied, T_A = -40°C to +85°C. Typical values are at V_{CC} = 2.85V and T_A = +25°C, unless otherwise noted.) (Note 2)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Supply Voltage			1.6	2.85	3.3	V
Supply Current	SHDN = high	MAX2667	4.1			mA
		MAX2669	7.7			
	Shutdown mode, SHDN = low				10	μA
Digital Input Logic-High	T _A = +25°C		1.2			V
Digital Input Logic-Low	T _A = +25°C				0.45	V

AC ELECTRICAL CHARACTERISTICS

(MAX2667/MAX2669 EV kit. V_{CC} = 1.6V to 3.3V, f_{RFIN} = 1575.42MHz, T_A = -40°C to +85°C. Typical values are at V_{CC} = 2.85V and T_A = +25°C, unless otherwise noted.) (Note 2)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
RF Frequency	L1 band		1575.42			MHz
Power Gain	V _{CC} = 2.85V	MAX2667	15.0	19.5		dB
		MAX2669	14.6	17.7		
	V _{CC} = 1.6V	MAX2667	14.8	19.4		
		MAX2669	14.3	17.6		
Noise Figure	V _{CC} = 1.8V		0.65			dB
	V _{CC} = 3.3V		0.65			
In-Band 3rd-Order Input Intercept Point	(Note 3)	MAX2667	-3.5			dBm
		MAX2669	+4.5			
Out-of-Band 3rd-Order Input Intercept Point	(Note 4)	MAX2667	+2.5			dBm
		MAX2669	+8			
Input 1dB Compression Point	(Note 5)	MAX2667	-12.5			dBm
		MAX2669	-10			
Input Return Loss			10			dB
Output Return Loss			15			dB
Reverse Isolation			30			dB

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AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2667/MAX2669 EV kit. $V_{CC} = 1.6V$ to $3.3V$, $f_{RFIN} = 1575.42MHz$, $T_A = -40^{\circ}C$ to $+85^{\circ}C$. Typical values are at $V_{CC} = 2.85V$ and $T_A = +25^{\circ}C$, unless otherwise noted.) (Note 2)

Note 2: Min and max limits guaranteed by test at $T_A = +25^{\circ}C$ and guaranteed by design and characterization at $T_A = -40^{\circ}C$ and $T_A = +85^{\circ}C$.

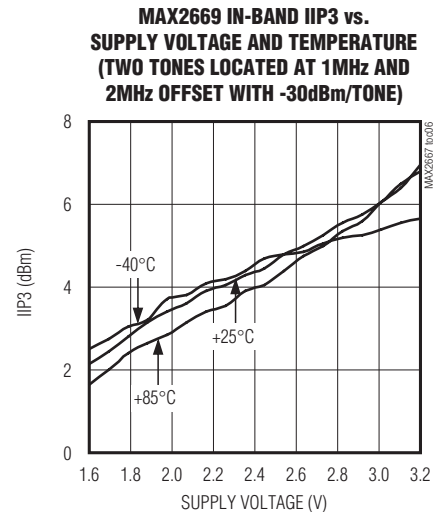
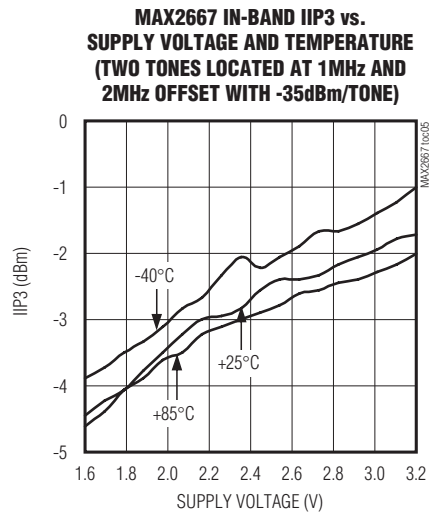
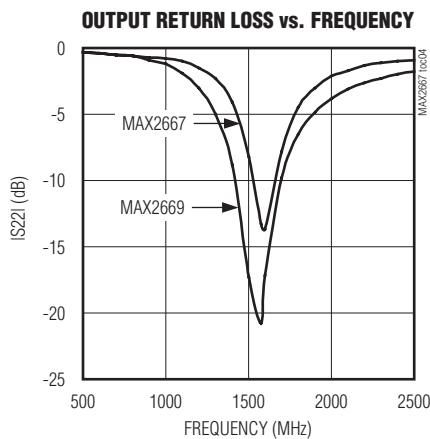
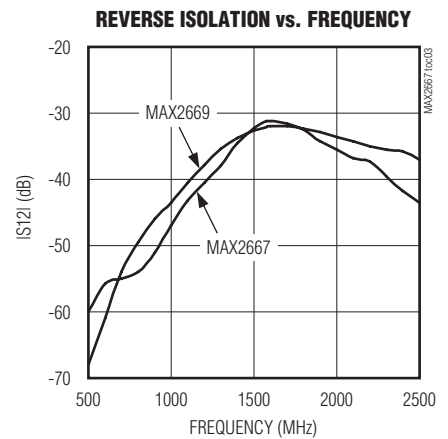
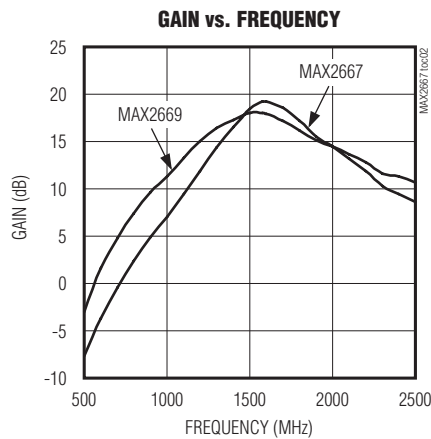
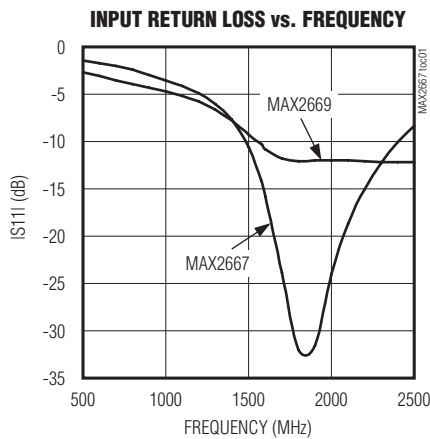
Note 3: Measured with the two tones located at 1MHz and 2MHz offset from the center of the GPS band with $-30dBm$ /tone for MAX2667 and $-27dBm$ /tone for MAX2669.

Note 4: Measured with input tones at 1713MHz ($-25dBm$) and 1851MHz ($-49dBm$).

Note 5: Measured with a tone located at 5MHz offset from the center of the GPS band.

典型工作特性

(MAX2667/MAX2669 EV kit. Typical values are at $V_{CC} = 2.85V$, $f_{RFIN} = 1575.42MHz$, $T_A = +25^{\circ}C$, unless otherwise noted.)

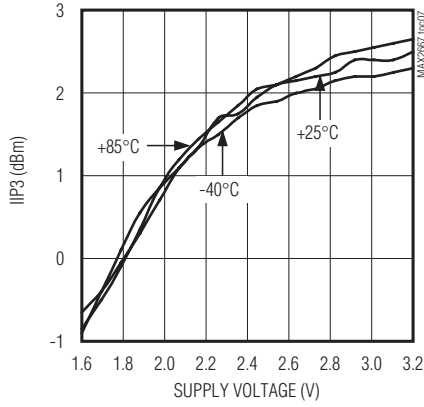


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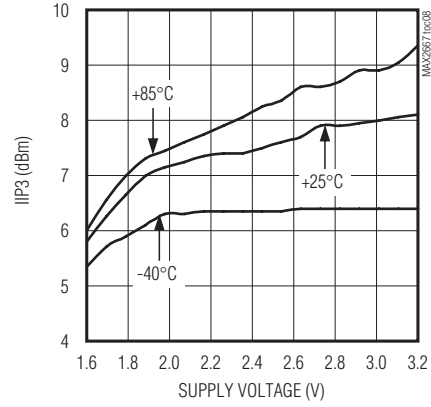
典型工作特性(续)

(MAX2667/MAX2669 EV kit. Typical values are at $V_{CC} = 2.85V$, $f_{RFIN} = 1575.42MHz$, $T_A = +25^{\circ}C$, unless otherwise noted.)

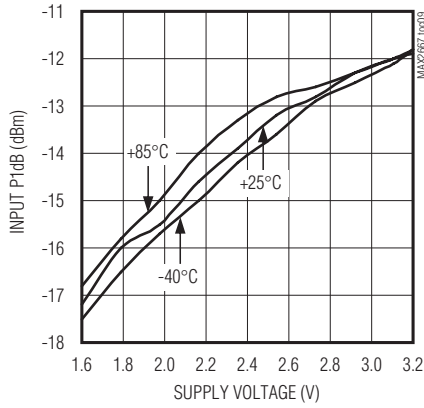
MAX2667 OUT-OF-BAND IIP3 vs. SUPPLY VOLTAGE AND TEMPERATURE
(TONE 1 AT 1713MHz, -25dBm;
TONE 2 AT 1851MHz, -49dBm)



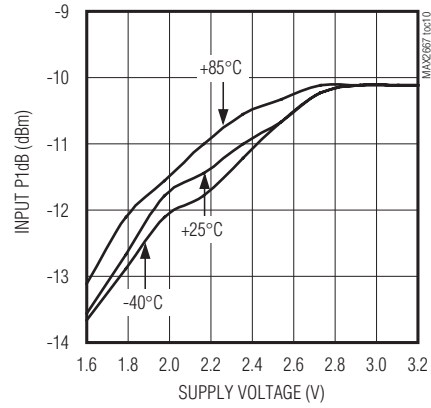
MAX2669 OUT-OF-BAND IIP3 vs. SUPPLY VOLTAGE AND TEMPERATURE
(TONE 1 AT 1713MHz, -25dBm;
TONE 2 AT 1851MHz, -49dBm)



MAX2667 INPUT P1dB COMPRESSION vs. SUPPLY VOLTAGE AND TEMPERATURE



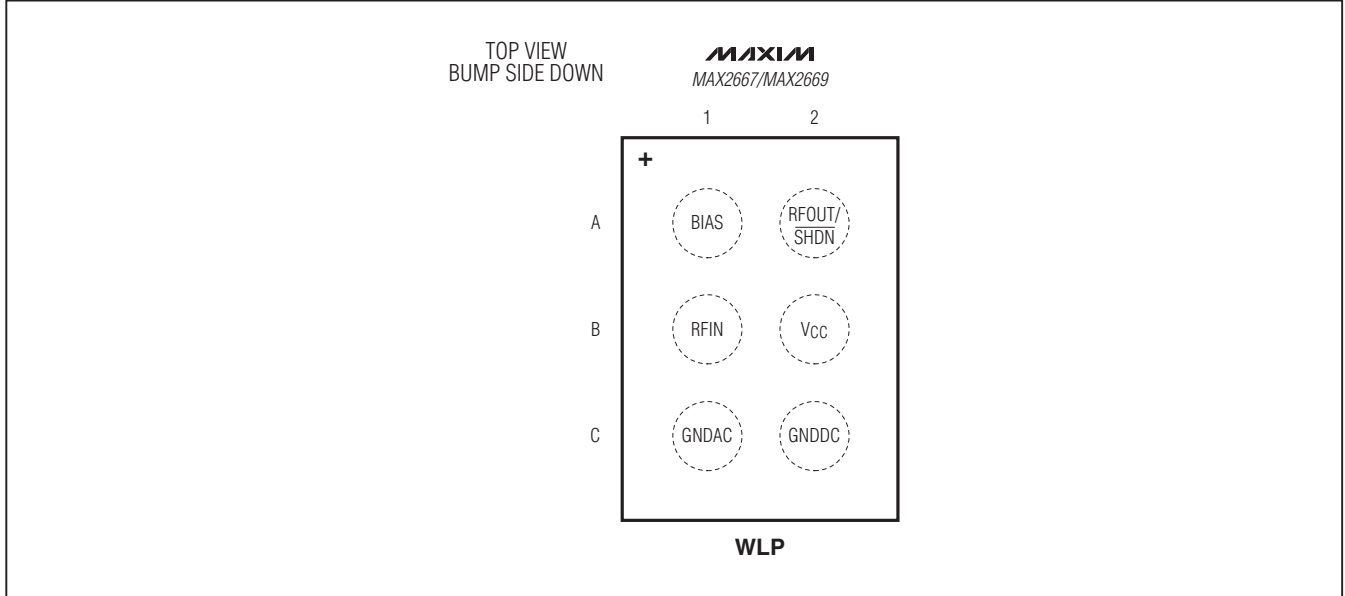
MAX2669 INPUT P1dB COMPRESSION vs. SUPPLY VOLTAGE AND TEMPERATURE



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焊球配置

MAX2667/MAX2669



焊球说明

焊球	名称	功能
A1	BIAS	提供LNA偏置输入。通过一个较大的(100nH)电感连接到B1 (RFIN)，在靠近该引脚处将其旁路至地。
A2	RFOUT/SHDN	RF输出和SHDN逻辑输入。RFOUT在内部匹配至50Ω，内置隔直流电容。SHDN逻辑输入通过25kΩ电阻耦合。
B1	RFIN	RF输入。通过偏置扼流圈连接到A1，并且连接匹配网络和隔直流电容。
B2	VCC	电源电压。通过电容旁路至地，电容应靠近IC放置。
C1	GNDAC	RF通道地。通过过孔连接到第二层PCB地层，过孔应靠近该引脚焊盘放置。
C2	GNDDC	偏置电路地。通过一个 独立于 C1引脚的过孔连接到第二层PCB地层，与C1引脚共用同一接地过孔可能导致稳定性问题。

详细说明

MAX2667/MAX2669是针对GPS L1、Galileo和GLONASS应用设计的LNA。器件具有电源关断控制模式，无需外部电源开关。器件可提供高增益和超低噪声系数。

输入和输出匹配

器件需要外部输入匹配电路，只需一个电感与隔直流电容串联，即可构建输入匹配电路。典型应用电路给出了所推荐的输入匹配网络。这些数值同时优化于增益、噪声系数、回波损耗等性能指标。表1和表2列出了器件的典型S参数和K_f系数。器件内部集成了50Ω输出匹配电路，无需外部匹配元件。输入耦合电容会影响IIP3，选择较小的耦合电容时将产生较低的IIP3。

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关断

器件包含关断功能，可关断整个芯片。当SHDN引脚置为逻辑高电平时，器件处于有效工作模式；当该引脚置为逻辑低电平时，器件处于关断模式。

应用信息

合理设计PCB是任何RF微波电路设计的基础，在所有高频输入和输出采用阻抗受控引线。用去耦电容旁路VCC，电容

应尽可能靠近器件放置。VCC引线较长时，可能需要增加去耦电容，这些增添的电容应远离器件放置。GND_引脚采用适当的接地也非常重要，如果PCB的顶层为RF地，可以将GND_引脚直接连接到该接地层。如果电路板的地不在元件层，则将GND_引脚通过多个过孔连接到电路板地，过孔须尽量靠近器件。

表1. MAX2667器件的典型S参数和K系数

FREQ. (MHz)	S11 MAG (dB)	S11 PHASE (Degrees)	S21 MAG (dB)	S21 PHASE (Degrees)	S12 MAG (dB)	S12 PHASE (Degrees)	S22 MAG (dB)	S22 PHASE (Degrees)	K _f
1000	-2.0	-47.7	6.0	-100.0	-47.5	-148.0	-1.0	-55.0	5.1
1100	-2.1	-48.6	7.4	-100.6	-45.7	-150.0	-1.0	-58.1	3.8
1200	-2.2	-51.6	9.6	-107.3	-42.9	-153.5	-1.4	-65.4	3.1
1300	-2.4	-55.0	12.0	-117.2	-39.6	-160.2	-2.1	-74.1	2.5
1400	-2.7	-58.6	14.0	-129.5	-37.0	-168.5	-3.6	-85.5	2.3
1500	-6.5	-61.9	16.2	-146.5	-34.1	178.5	-7.4	-100.0	2.8
1575	-4.3	-62.3	17.1	-164.2	-32.9	162.8	-15.3	-100.8	2.1
1600	-4.6	-61.6	17.3	-170.6	-32.8	156.6	-20.6	-78.9	2.0
1700	-5.4	-55.3	17.1	165.5	-32.5	136.5	-9.5	10.0	1.8
1800	-5.2	-49.8	15.7	145.8	-33.8	121.6	-4.5	-2.4	1.6
1900	-4.8	-47.3	13.9	135.2	-35.2	113.8	-2.7	-13.2	1.6
2000	-4.5	-46.7	12.7	127.3	-36.7	109.6	-1.8	-21.2	1.5

表2. MAX2669器件的典型S参数和K系数

FREQ. (MHz)	S11 MAG (dB)	S11 PHASE (Degrees)	S21 MAG (dB)	S21 PHASE (Degrees)	S12 MAG (dB)	S12 PHASE (Degrees)	S22 MAG (dB)	S22 PHASE (Degrees)	K _f
1000	-3.0	-57.0	10.8	-120.0	-43.0	-154.0	-1.3	-65.0	3.2
1100	-3.3	-58.2	11.6	-124.5	-42.1	-155.0	-1.6	-70.2	3.3
1200	-3.5	-60.0	13.4	-134.6	-39.3	-160.5	-2.4	-79.6	2.8
1300	-3.8	-62.3	14.9	-148.0	-37.2	-168.3	-4.0	-90.0	2.7
1400	-4.3	-63.3	15.9	-162.3	-35.4	-178.2	-7.3	-101.0	2.7
1500	-4.9	-62.0	16.6	-178.9	-33.9	171.0	-14.5	-100.6	2.6
1575	-5.3	-59.7	16.6	168.0	-33.5	161.7	-19.6	-26.0	2.5
1600	-5.4	-58.5	16.5	163.9	-33.6	157.5	-16.7	-6.0	2.5
1700	-5.5	-53.7	15.8	149.3	-33.6	148.3	-9.0	3.6	2.3
1800	-5.3	-50.3	14.7	136.8	-34.2	142.5	-5.7	-2.8	2.2
1900	-5.1	-48.0	13.4	130.0	-35.1	139.6	-4.0	-9.6	2.3
2000	-4.9	-46.3	12.7	123.9	-35.8	138.6	-3.0	-15.0	2.1

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表3. MAX2667典型噪声参数($V_{CC} = 2.85V$, $T_A = +25^\circ C$)

FREQUENCY (MHz)	FMIN (dB)	$ \Gamma_{OPT} $	$ \Gamma_{OPT} $ ANGLE	RN (Ω)
1550	0.54	0.48	39.9	8.43
1560	0.55	0.48	40.2	8.42
1570	0.55	0.48	40.5	8.41
1575	0.55	0.48	40.7	8.41
1580	0.55	0.48	40.9	8.40
1590	0.55	0.48	41.2	8.39
1600	0.55	0.48	41.5	8.38

表4. MAX2669典型噪声参数($V_{CC} = 2.85V$, $T_A = +25^\circ C$)

FREQUENCY (MHz)	FMIN (dB)	$ \Gamma_{OPT} $	$ \Gamma_{OPT} $ ANGLE	RN (Ω)
1550	0.57	0.29	76.1	4.53
1560	0.57	0.29	76.6	4.53
1570	0.57	0.29	77.0	4.53
1575	0.57	0.29	77.3	4.52
1580	0.57	0.29	77.5	4.52
1590	0.57	0.29	78.0	4.52
1600	0.57	0.29	78.5	4.52

芯片信息

PROCESS: SiGe BiCMOS

封装信息

如需最近的封装外形信息和焊盘布局, 请查询china.maxim-ic.com/packages。请注意, 封装编码中的“+”、“#”或“-”仅表示RoHS状态。封装图中可能包含不同的尾缀字符, 但封装图只与封装有关, 与RoHS状态无关。

封装类型	封装编码	外形编号	焊盘布局编号
6 WLP	W61B1+1	21-0217	—

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修订历史

修订号	修订日期	说明	修改页
0	9/10	最初版本。	—

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