

MAXIM

微型HSPA/LTE低噪声放大器

MAX2666/MAX2668

概述

MAX2666/MAX2668系列低噪声放大器(LNA)适用于HSPA移动式手持设备。该系列LNA提供三种可编程增益,相比传统的两级放大LNA,具有优异的线性度和灵敏度指标。

MAX2666优化用于2100MHz至2200MHz频率范围(波段1、4和10),提供典型值为14.5dB的最大增益。

MAX2668优化用于850MHz至1000MHz频率范围(波段5、6和8),提供典型值为17dB的最大增益。

器件采用微型1mm x 1.5mm、6引脚超薄LGA封装。

应用

HSPA/LTE前端模块
HSPA/LTE前置放大器

特性

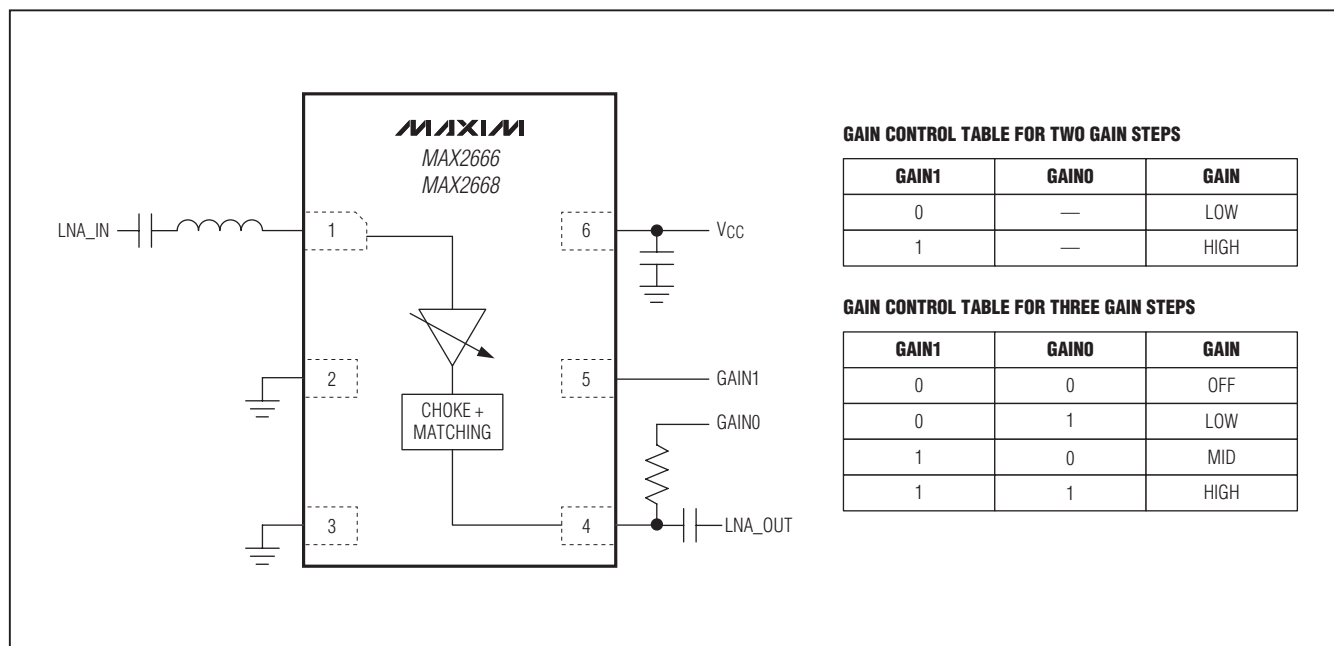
- ◆ 小外形: 1mm x 1.5mm封装
- ◆ 超薄: 0.55mm
- ◆ 低噪声系数
MAX2668为1dB
MAX2666为1.1dB
- ◆ 三级放大提供最佳的阻塞处理特性
- ◆ 电源电流低至3.8mA
- ◆ 较低的BOM成本

订购信息

PART	TEMP RANGE	PIN-PACKAGE
MAX2666EYT+	-40°C to +85°C	6 Ultra-Thin LGA
MAX2668EYT+	-40°C to +85°C	6 Ultra-Thin LGA

+表示无铅(Pb)/符合RoHS标准的封装。

典型工作电路



微型HSPA/LTE低噪声放大器

ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND.....-0.3V to +3.6V
 Other Pins to GND -0.3V to (V_{CC} + 0.3V)
 Maximum Input Power..... +10dBm
 Continuous Power Dissipation (T_A = +70°C)
 Ultra-Thin LGA (derate 2.1mW/°C above +70°C)..... 167mW

Operating Temperature Range..... -40°C to +85°C
 Junction Temperature +150°C
 Storage Temperature Range..... -65°C to +160°C
 Lead Temperature (soldering, 10s) +260°C
 Soldering Temperature (reflow) +260°C



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

(Typical Operating Circuit, MAX2666/MAX2668 Evaluation Kit, GAIN1 = High, GAIN0 = High-Z, V_{CC} = 2.7V to 3.3V, no RF signal applied, T_A = -40°C to +85°C. Typical values are at V_{CC} = 2.85V, T_A = +25°C, unless otherwise noted.) (Note 1)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage		2.7	2.85	3.3	V
Supply Current, High Gain	GAIN_ = 11		3.8		mA
Supply Current, Mid Gain	GAIN_ = 10		3.8		mA
Supply Current, Low Gain	GAIN_ = 01			100	μA
Shutdown Current	GAIN_ = 00			100	μA
Logic-High (V _{IH})		1.2			V
Logic-Low (V _{IL})				0.5	V

AC ELECTRICAL CHARACTERISTICS

(MAX2666/MAX2668 Evaluation Kit, input matching network according to Table 1 (input matching network), GAIN1 = High, GAIN0 = High-Z, V_{CC} = 2.85V, T_A = +25°C, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
MAX2666					
Frequency Range	Bands 1, 4, 10	2110	2140	2170	MHz
Gain	HG mode	10	14.5	17.5	dB
	MG mode, GAIN_ = 10	0	5	8.5	
	LG mode, GAIN_ = 01	-15.5	-12	-9	
Noise Figure	HG mode		1.1		dB
	MG mode, GAIN_ = 10		3		
	LG mode, GAIN_ = 01		12		
Input 3rd-Order Intercept (Note 2)	HG mode		-2		dBm
	MG mode, GAIN_ = 10		4		
	LG mode, GAIN_ = 01		> 20		
Phase Shift with Gain Step			15		Degrees

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AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2666/MAX2668 Evaluation Kit, input matching network according to Table 1 (input matching network), GAIN1 = High, GAIN0 = High-Z, V_{CC} = 2.85V, T_A = +25°C, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
MAX2668 (BAND 8)					
Frequency Range	Band 8	925	942	960	MHz
Gain	HG mode	13.5	17	21	dB
	MG mode, GAIN __ = 10	0	5	8	
	LG mode, GAIN __ = 01	-19	-16	-13	
Noise Figure	HG mode		1		dB
	MG mode, GAIN __ = 10		5		
	LG mode, GAIN __ = 01		16		
Input 3rd-Order Intercept (Note 2)	HG mode		-4		dBm
	MG mode, GAIN __ = 10		2		
	LG mode, GAIN __ = 01		> 18		
Phase Shift with Gain Step			15		Degrees
MAX2668 (BAND 5, BAND 6)					
Frequency Range	Bands 5 and 6	869	881.52	894	MHz
Gain	HG mode	13.5	17	21	dB
	MG mode, GAIN __ = 10	0	5	8	
	LG mode, GAIN __ = 01	-19	-16	-13	
Noise Figure	HG mode		1		dB
	MG mode, GAIN __ = 10		5		
	LG mode, GAIN __ = 01		16		
Input 3rd-Order Intercept (Note 2)	HG mode		-5		dBm
	MG mode, GAIN __ = 10		2		
	LG mode, GAIN __ = 01		> 18		
Phase Shift with Gain Step			15		Degrees

Note 1: Guaranteed by test at T_A = +25°C; guaranteed by design and characterization at T_A = -40°C and T_A = +85°C.

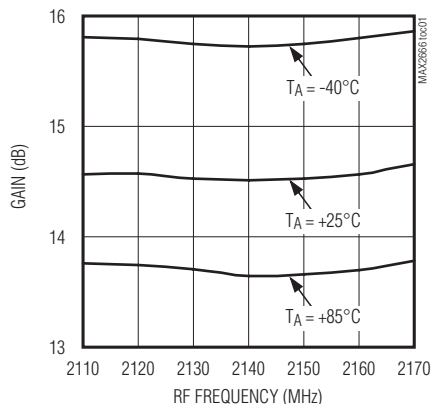
Note 2: -25dBm/tone at high gain, -15dBm/tone at mid gain, -15dBm/tone at low gain. Tone separation less than 5MHz.

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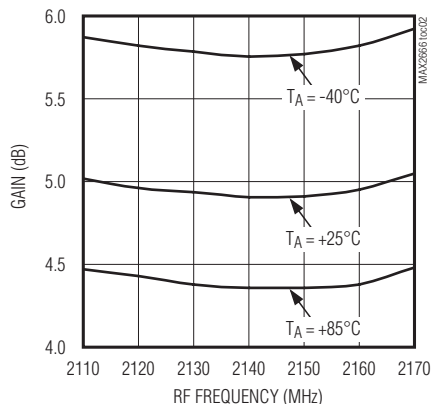
典型工作特性

(MAX2666/MAX2668 Evaluation Kit. Typical values are at $V_{CC} = 2.85V$, $T_A = +25^\circ C$, unless otherwise noted.)

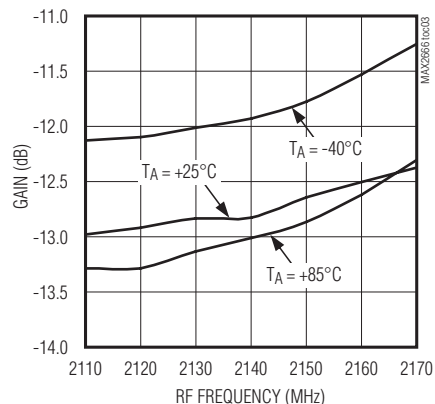
**MAX2666 GAIN
vs. FREQUENCY AND TEMPERATURE
HIGH-GAIN MODE**



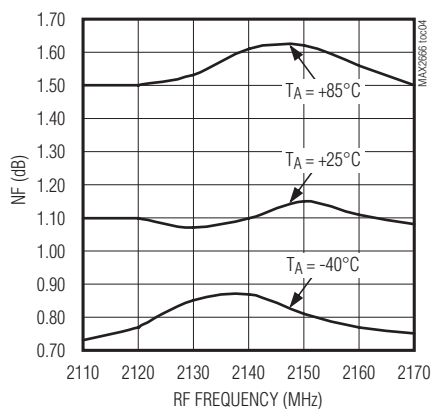
**MAX2666 GAIN
vs. FREQUENCY AND TEMPERATURE
MID-GAIN MODE**



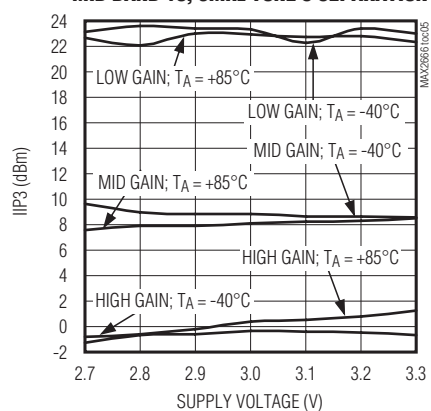
**MAX2666 GAIN
vs. FREQUENCY AND TEMPERATURE
LOW-GAIN MODE**



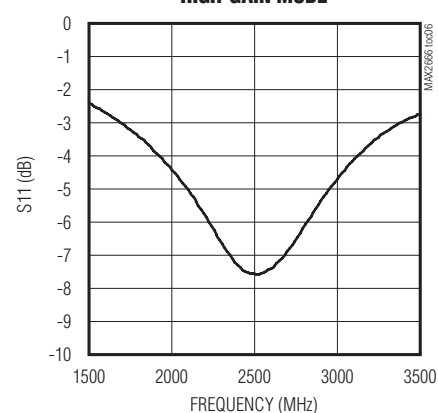
**MAX2666 NOISE FIGURE
vs. FREQUENCY AND TEMPERATURE
HIGH-GAIN MODE**



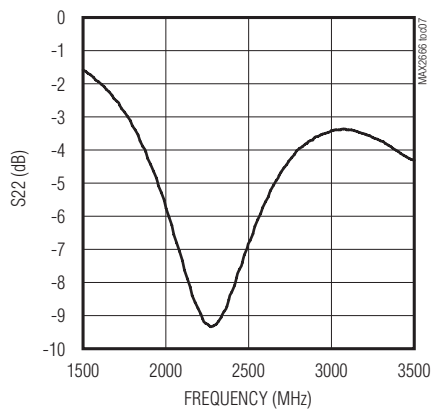
**MAX2666 IIP3 vs. SUPPLY
VOLTAGE AND TEMPERATURE
MID BAND 10; 5MHz TONE'S SEPARATION**



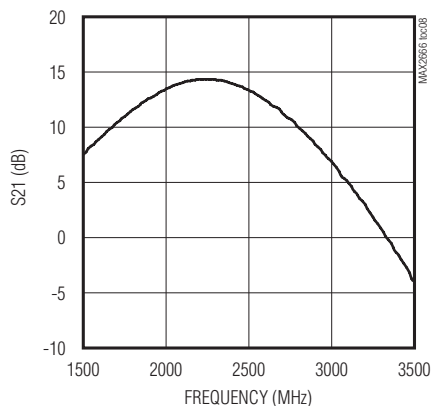
**MAX2666 S11
HIGH-GAIN MODE**



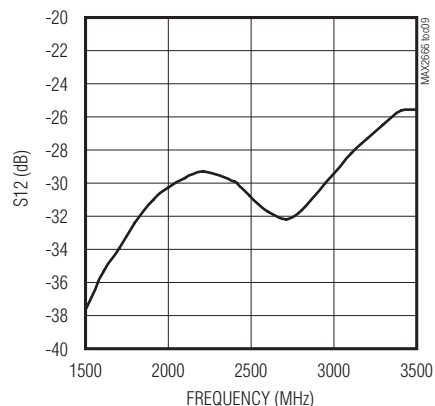
**MAX2666 S22
HIGH-GAIN MODE**



**MAX2666 S21
HIGH-GAIN MODE**



**MAX2666 S12
HIGH-GAIN MODE**



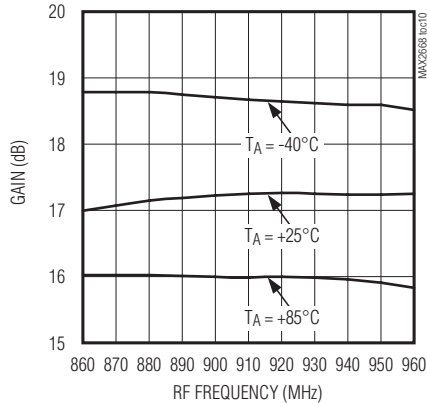
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典型工作特性(续)

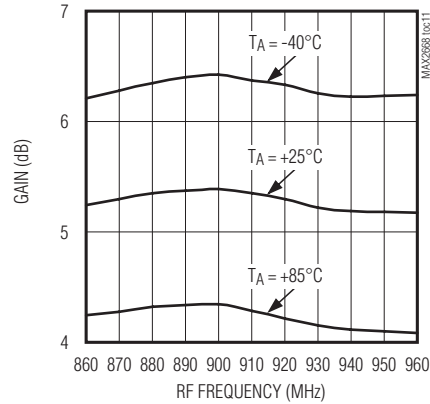
(MAX2666/MAX2668 Evaluation Kit. Typical values are at $V_{CC} = 2.85V$, $T_A = +25^\circ C$, unless otherwise noted.)

MAX2666/MAX2668

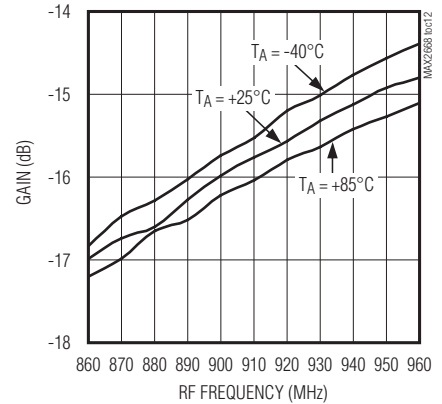
**MAX2668 GAIN
vs. FREQUENCY AND TEMPERATURE
HIGH-GAIN MODE**



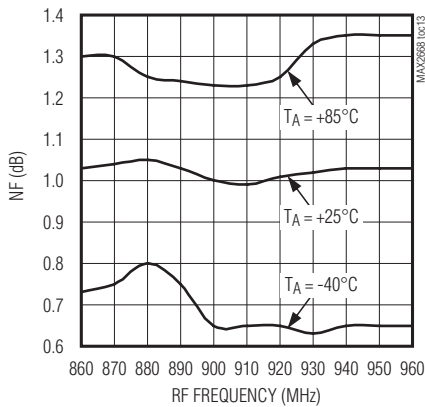
**MAX2668 GAIN
vs. FREQUENCY AND TEMPERATURE
MID-GAIN MODE**



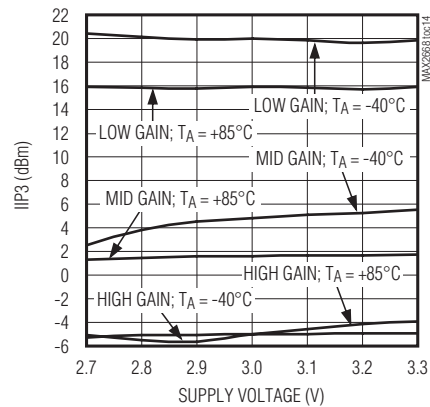
**MAX2668 GAIN
vs. FREQUENCY AND TEMPERATURE
LOW-GAIN MODE**



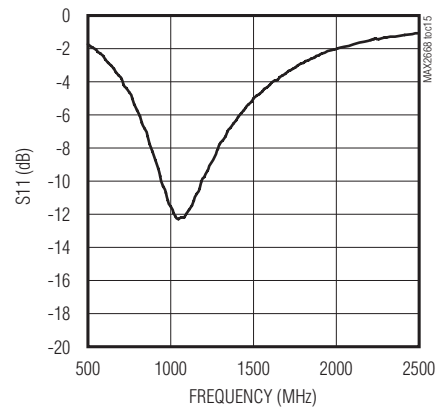
**MAX2668 NOISE FIGURE
vs. FREQUENCY AND TEMPERATURE
HIGH-GAIN MODE**



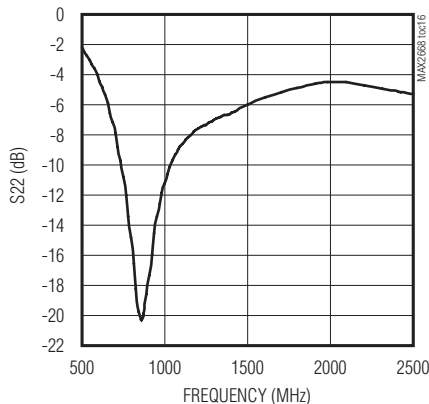
**MAX2668 IIP3 vs. SUPPLY
VOLTAGE AND TEMPERATURE
MID BAND 8; 5MHz TONE'S SEPARATION**



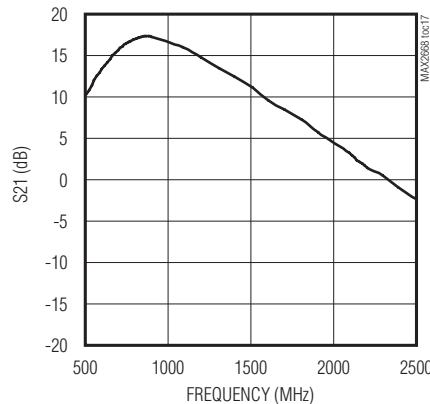
**MAX2668 S11
HIGH-GAIN MODE**



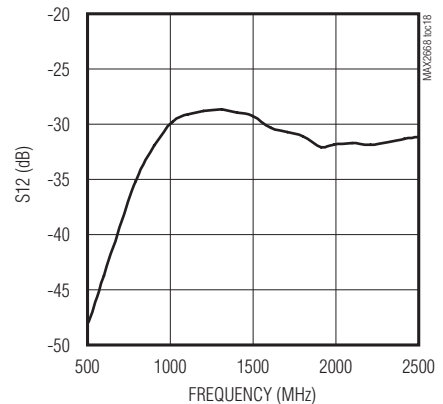
**MAX2668 S22
HIGH-GAIN MODE**



**MAX2668 S21
HIGH-GAIN MODE**

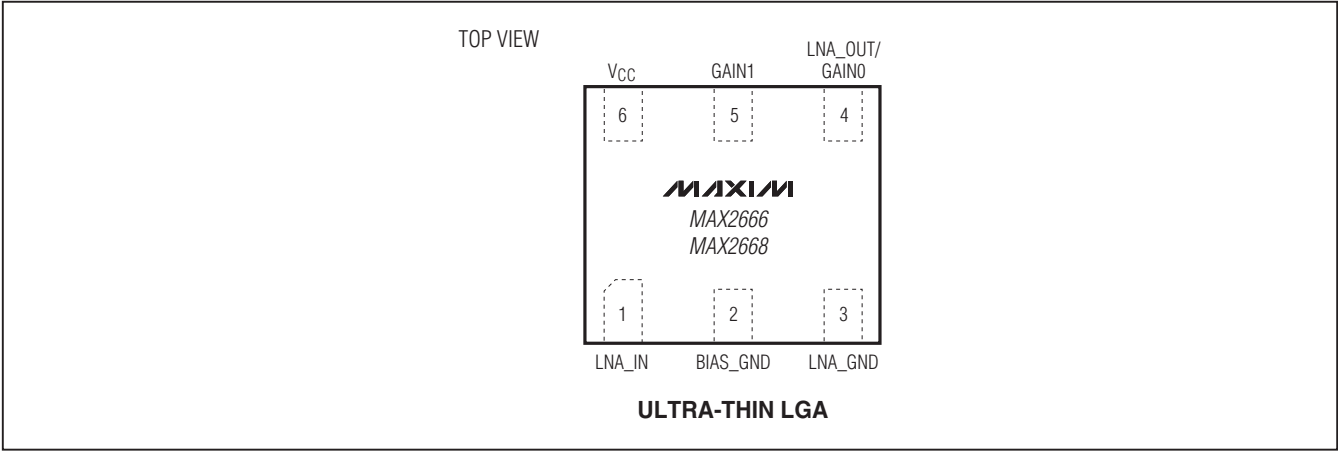


**MAX2668 S12
HIGH-GAIN MODE**



微型HSPA/LTE低噪声放大器

引脚配置



引脚说明

引脚	名称	功能
1	LNA_IN	RF输入，按照表1设置相应波段的匹配。
2	BIAS_GND	直流和偏置地。
3	LNA_GND	RF地。
4	LNA_OUT/GAIN0	RF输出和增益控制，内部匹配至50Ω。通过20kΩ电阻耦合至增益逻辑电路。处于直流开路状态时，该引脚用于建立逻辑高电平自偏置。
5	GAIN1	增益控制，配合GAIN0选择增益模式。必须连接到逻辑高电平或逻辑低电平。
6	VCC	电源电压，通过1000pF电容旁路至地。

微型HSPA/LTE低噪声放大器

详细说明

MAX2666/MAX2668为低功耗LNA，设计用于3G移动系统。器件具有低噪声、高线性度和三级放大电路，采用微小的塑料封装。

输入和输出匹配

器件在输入端需要一个匹配电感，与隔直流电容相串联以获得最佳的NF、增益、IIP3和相位偏移性能。表1给出了推荐的输入匹配网络参数。输出端口内部匹配至50Ω，无需外部匹配元件。在输出端口，外部隔直流电容用于隔离输出端的控制电路。

直流去耦和电路板布局

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V_{CC}，电容应尽可能靠近器件放置。

V_{CC}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。

增益控制

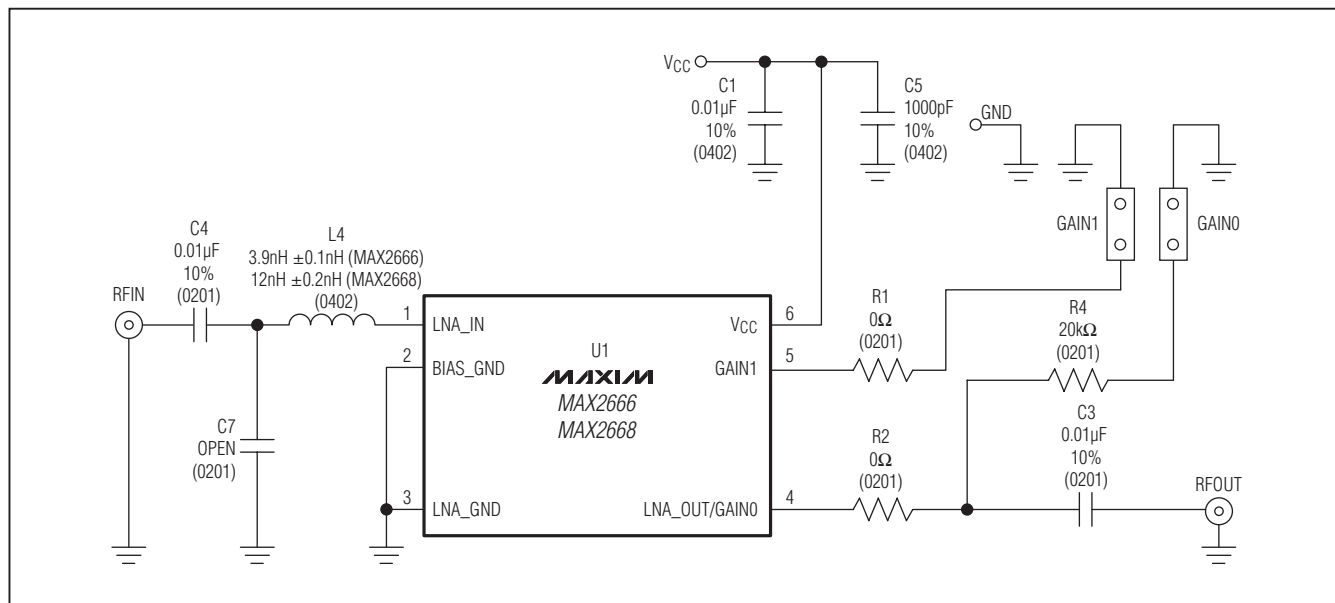
器件的LNA_OUT/GAIN0引脚还用作LNA增益模式的控制引脚，请参考增益控制表。GAIN0逻辑电平通过外部20kΩ电阻设置，外部隔直流电容应该用于隔离该双功能引脚的控制电路(请参考典型工作电路)。GAIN1引脚必须设置为逻辑高电平或逻辑低电平。

关于MAX2666/MAX2668评估板原理图、Gerber数据、PADS布板文件和BOM等信息，请参考china.maxim-ic.com。

表1. 不同波段的匹配元件参数

BAND	SERIES C (nF)	SERIES L (nH)
1, 4, 10	10	3.9
5, 6	10	12
8	10	12

评估板详细应用电路



微型HSPA/LTE低噪声放大器

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引脚超薄 LGA	Y61A1+2	21-0190	90-0233

微型HSPA/LTE低噪声放大器

修订历史

修订号	修订日期	说明	修改页
0	8/10	最初版本。	—

MAX2666/MAX2668

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