

VHF/UHF低噪声放大器

MAX2664/MAX2665

概述

MAX2664和MAX2665为结构紧凑的VHF/UHF LNA，这些器件集成了宽带LNA和旁路开关。MAX2664可覆盖470MHz至860MHz UHF频率范围；MAX2665则支持75MHz至230MHz VHF频率范围。

每款器件均具有零功率旁路模式，可改善强信号输入下的性能。此外，输出端口在内部匹配至50Ω，只需使用一个外部电感即可将输入端口匹配至50Ω。

MAX2664和MAX2665采用4焊球(0.8mm x 0.8mm x 0.64mm)、无铅、晶片级封装(WLP)。

应用

智能电话/手机
MP3播放器
家庭音频/视频
便携式导航设备
汽车

特性

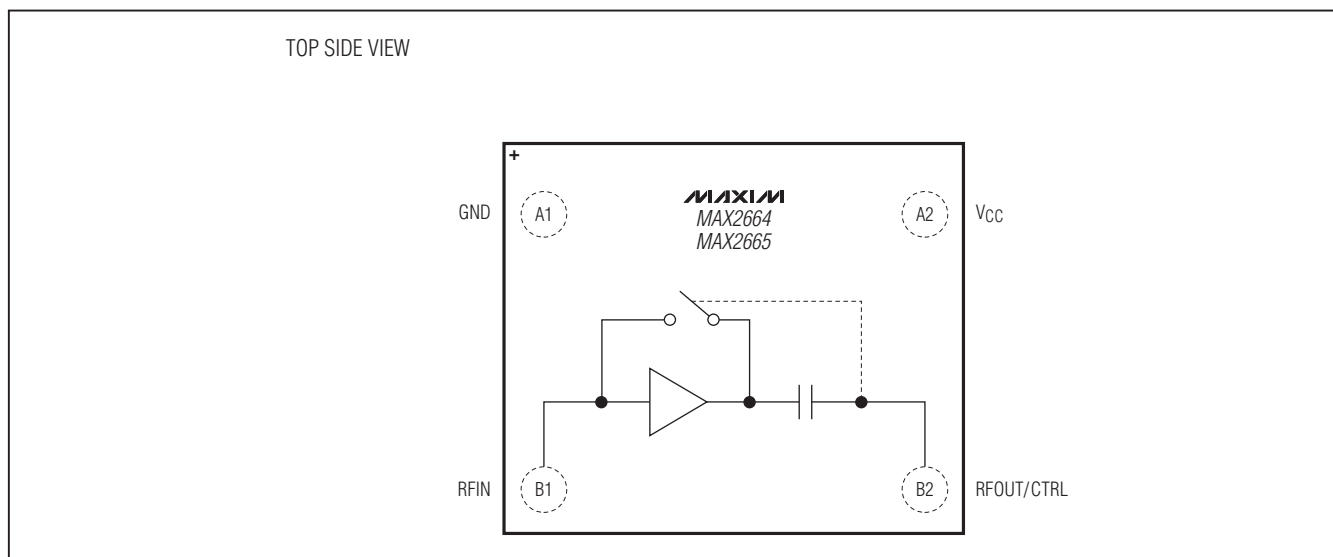
- ◆ UHF和VHF频率范围
MAX2664: 470MHz至860MHz
MAX2665: 75MHz至230MHz
- ◆ 低噪声系数
MAX2664: 1.2dB
MAX2665: 1.1dB
- ◆ 高增益: 15dB
- ◆ 零功率旁路模式
- ◆ +2.4V至+3.5V单电源供电
- ◆ 低电流: 3.3mA
- ◆ 小外形: 0.8mm x 0.8mm
- ◆ 超薄: 0.64mm

订购信息

PART	TEMP RANGE	PIN-PACKAGE
MAX2664EWS+	-40°C to +85°C	4 WLP
MAX2665EWS+	-40°C to +85°C	4 WLP

+表示无铅(Pb)/符合RoHS标准的封装。

功能框图

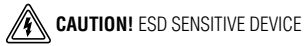


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ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND.....-0.3V to +3.6V
 Other Pins to GND..... -0.3V to (Operating V_{CC} + 0.3V)
 Maximum RF Input Power..... +10dBm
 Short-Circuit Duration: RFIN, RFOUT/CTRL..... 10s
 Continuous Power Dissipation (T_A = +70°C)
 WLP (derates 9.7mW/°C above +70°C).....776mW

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

(MAX2664 and MAX2665 EV kits. V_{CC} = 2.4V to 3.5V, T_A = -40°C to +85°C, no RF signals are applied, RFIN and RFOUT/CTRL are open circuit. Typical values are at V_{CC} = 2.7V and T_A = +25°C, unless otherwise noted.) (Note 1)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage		2.4	2.7	3.5	V
Supply Current	Active mode		3.3		mA
	Bypass mode, logic-low = 0V		1		μA
Digital Input Logic-High		0.7 x V _{CC}			V
Digital Input Logic-Low				0.3 x V _{CC}	V
Digital Input Current		-10		+10	μA

AC ELECTRICAL CHARACTERISTICS

(MAX2664 EV kit. V_{CC} = 2.4V to 3.5V, T_A = -40°C to +85°C, UHF f_{RFIN} = 670MHz. Typical values are at V_{CC} = 2.7V and T_A = +25°C, unless otherwise noted.) (Note 1)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
MAX2664					
Power Gain	Normal mode	11.8	14.8	18	dB
	Bypass mode	-8	-6	-3	
Noise Figure	Normal mode		1.2		dB
	Bypass mode		6		
Third-Order Input Intercept Point (IIP3)	Normal mode (Note 2)		-10		dBm
	Bypass mode (Note 3)		+26		
Input 1dB Compression Point	Normal mode		-5		dBm
	Bypass mode		+7		

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AC ELECTRICAL CHARACTERISTICS

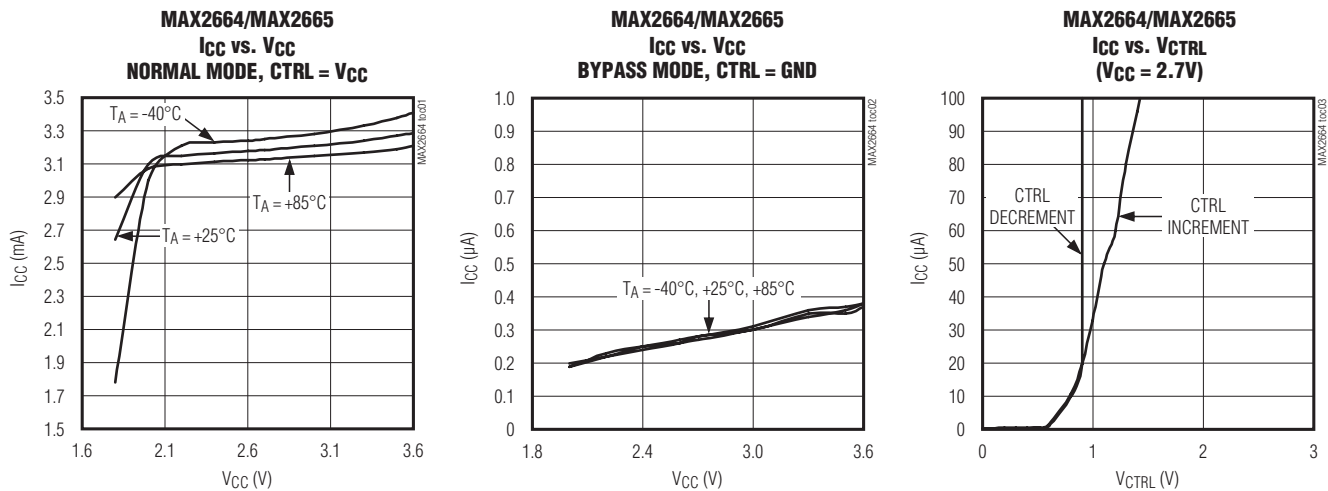
(MAX2665 EV kit. $V_{CC} = 2.4V$ to $3.5V$, $T_A = -40^{\circ}C$ to $+85^{\circ}C$, VHF $f_{RFIN} = 150MHz$. Typical values are at $V_{CC} = 2.7V$ and $T_A = +25^{\circ}C$, unless otherwise noted.) (Note 1)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
MAX2665					
Power Gain	Normal mode	11.8	15.1	18	dB
	Bypass mode	-8	-5.5	-3	
Noise Figure	Normal mode		1.1		dB
	Bypass mode		5.5		
Third-Order Input Intercept Point (IIP3)	Normal mode (Note 4)		-12		dBm
	Bypass mode (Note 5)		+26		
Input 1dB Compression Point	Normal mode		-11		dBm
	Bypass mode		+6		

- Note 1:** 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 2:** Tone-1 = 670MHz (-25dBm), Tone-2 = 676MHz (-25dBm).
- Note 3:** Tone-1 = 670MHz (0dBm), Tone-2 = 676MHz (0dBm).
- Note 4:** Tone-1 = 150MHz (-25dBm), Tone-2 = 156MHz (-25dBm).
- Note 5:** Tone-1 = 150MHz (0dBm), Tone-2 = 156MHz (0dBm).

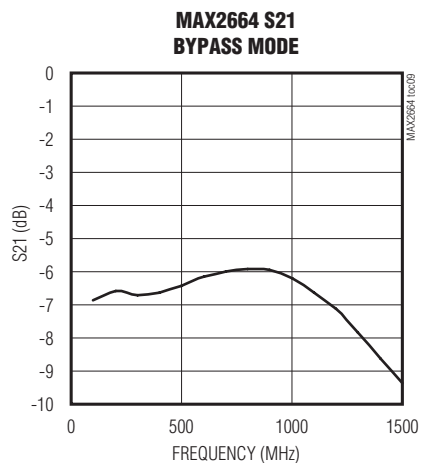
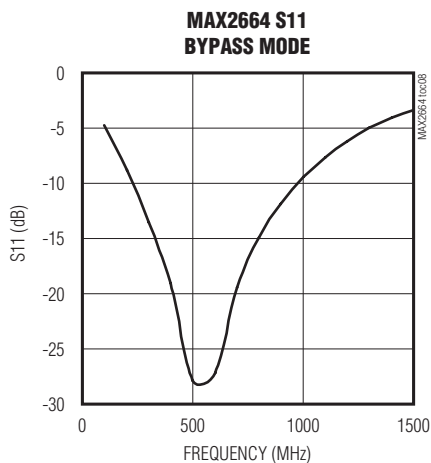
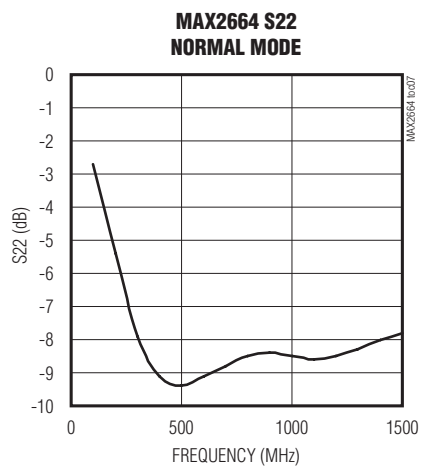
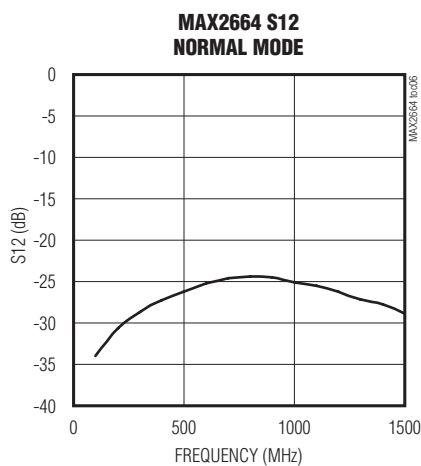
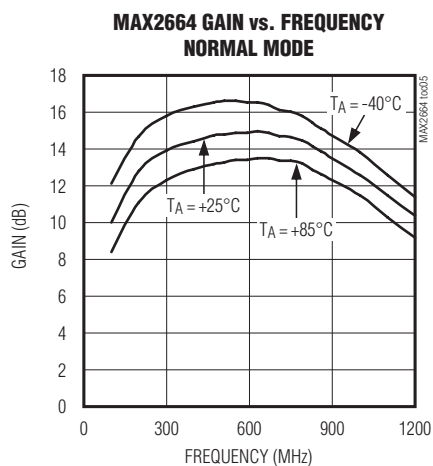
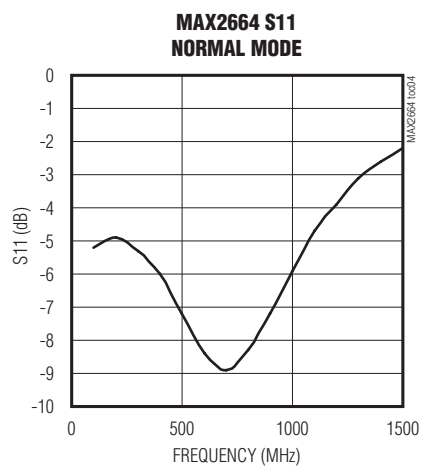
典型工作特性

($T_A = +25^{\circ}C$, unless otherwise noted. MAX2664 and MAX2665 EV kits.)



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典型工作特性(续)

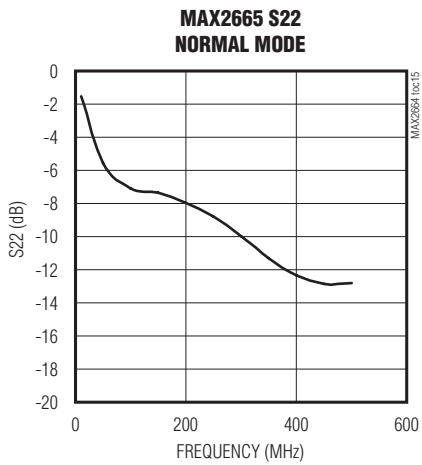
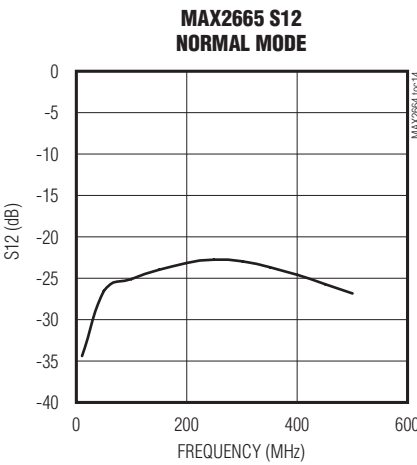
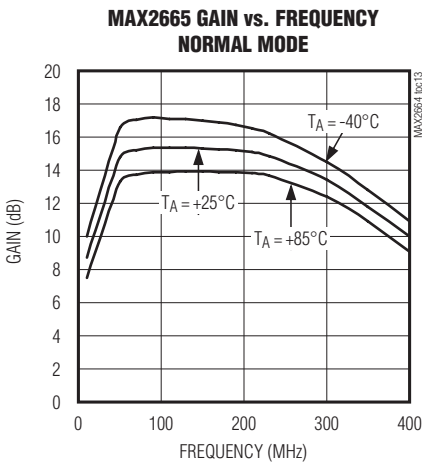
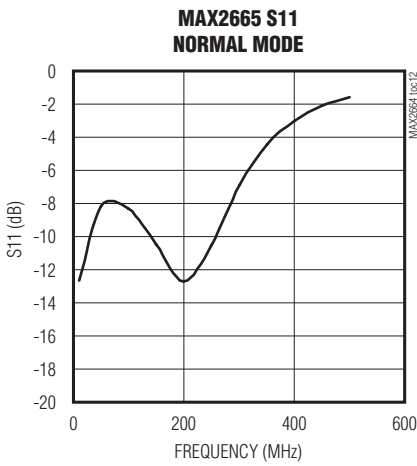
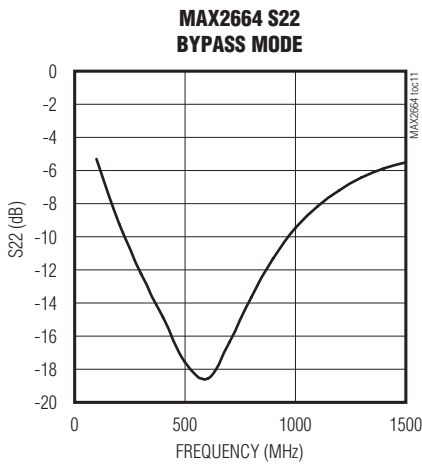
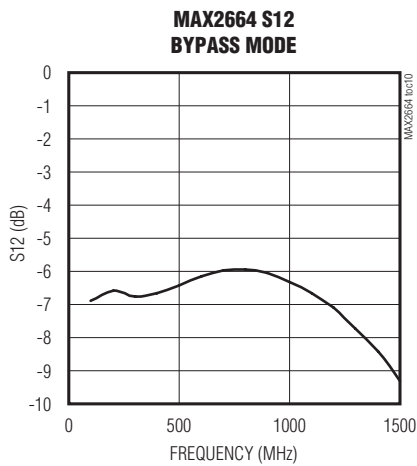
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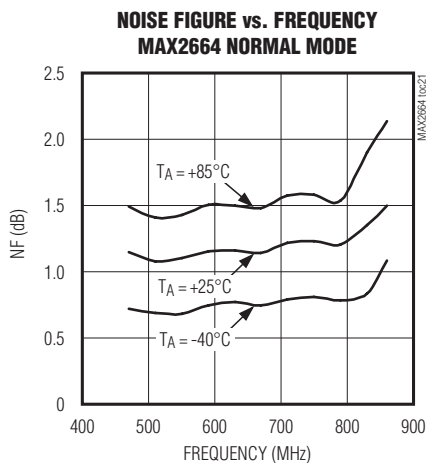
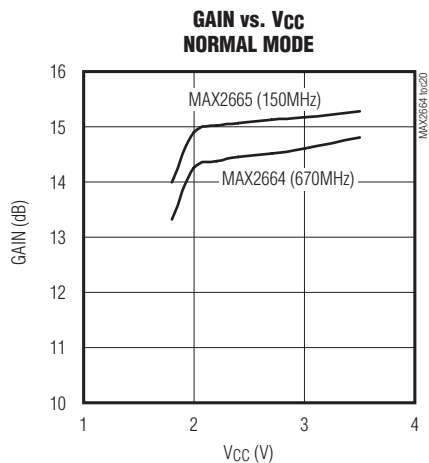
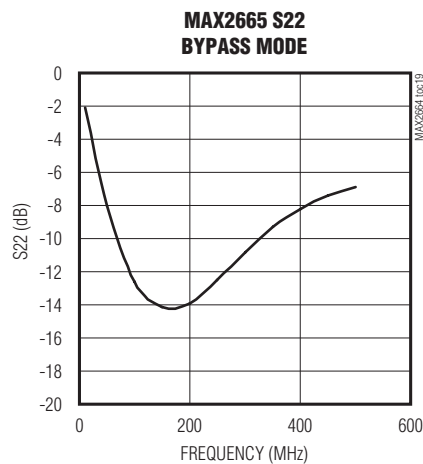
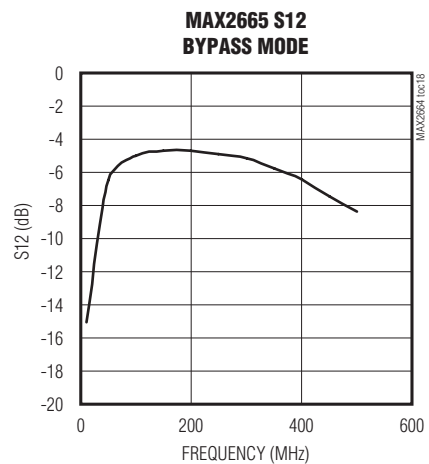
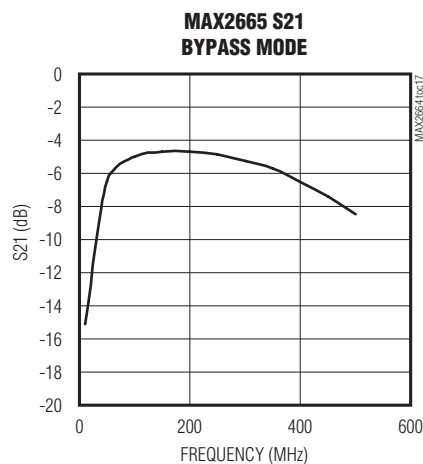
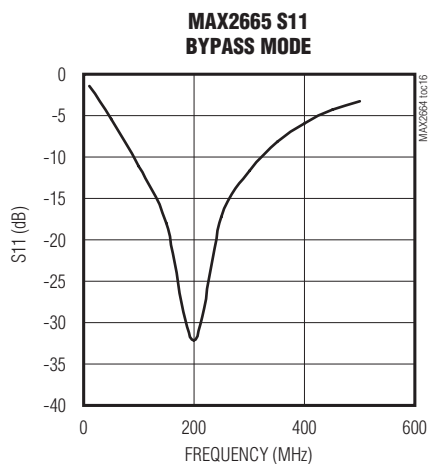
MAX2664/MAX2665

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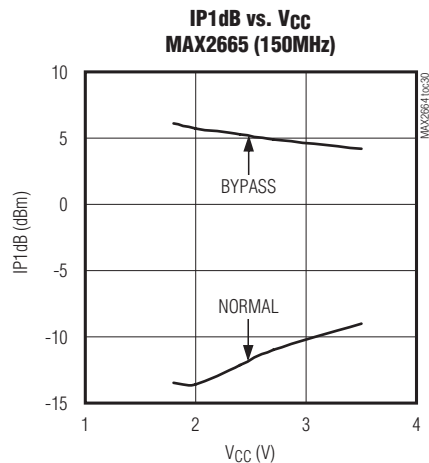
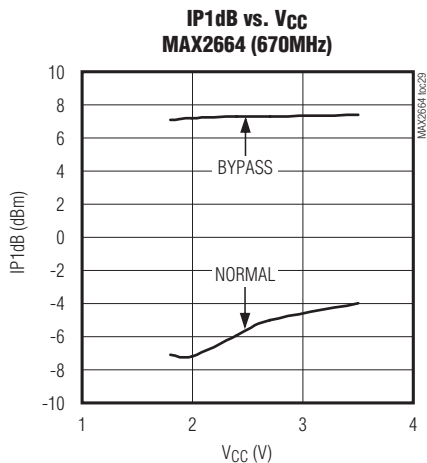
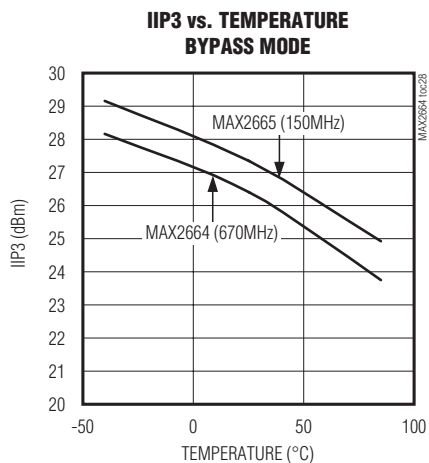
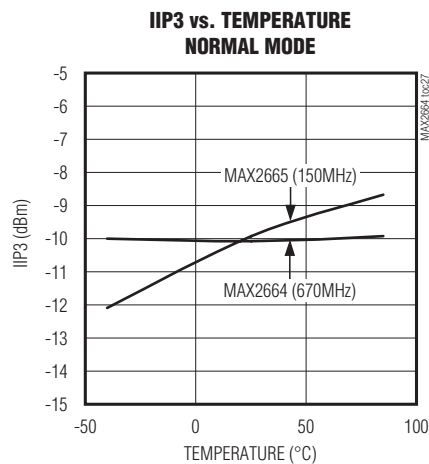
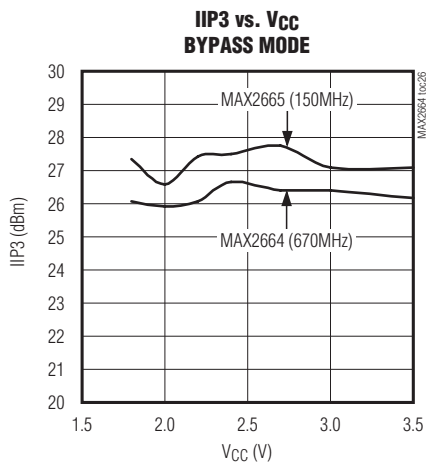
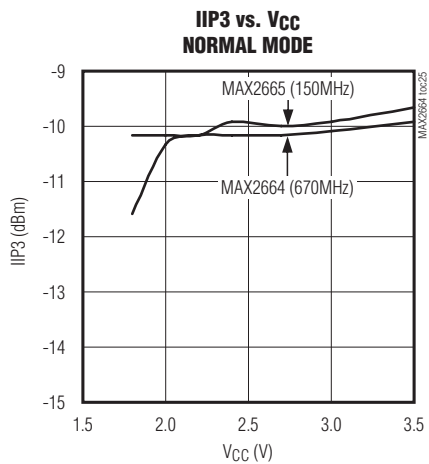
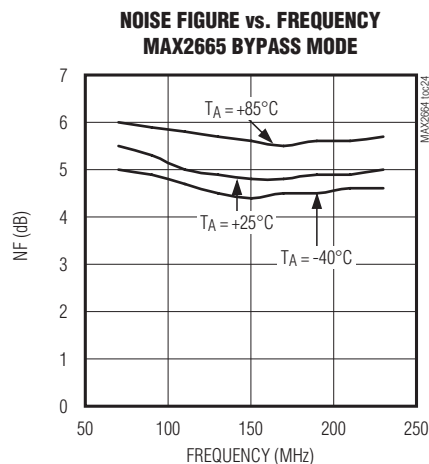
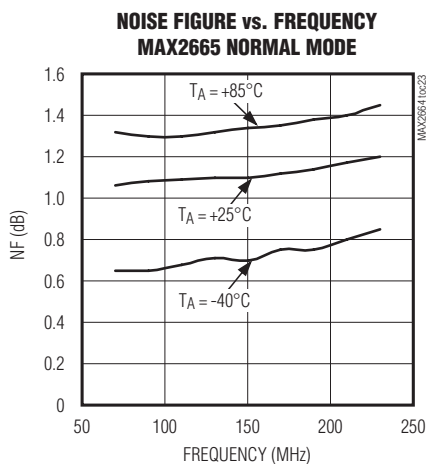
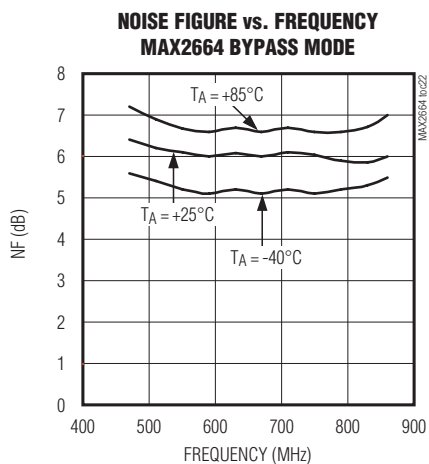
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典型工作特性(续)

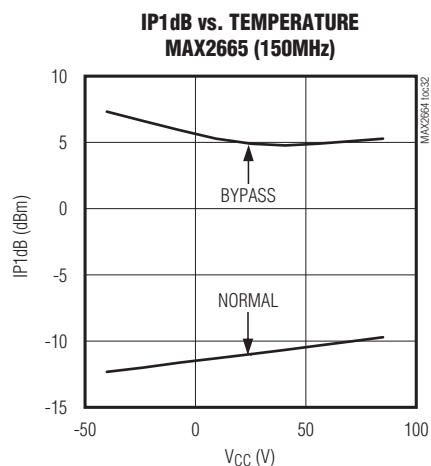
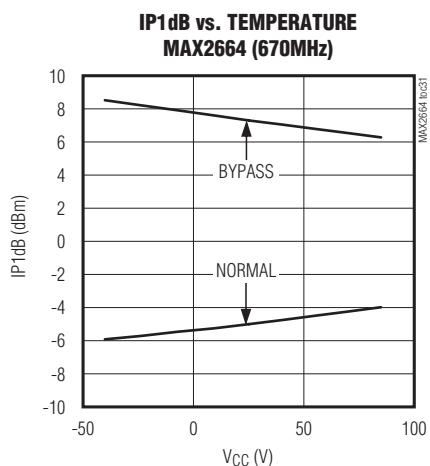
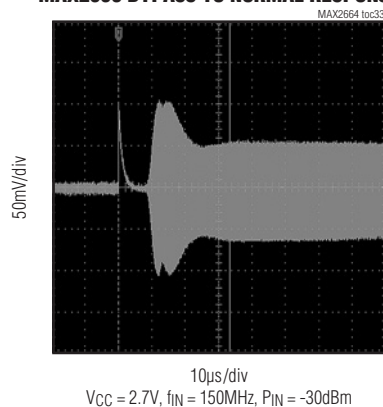
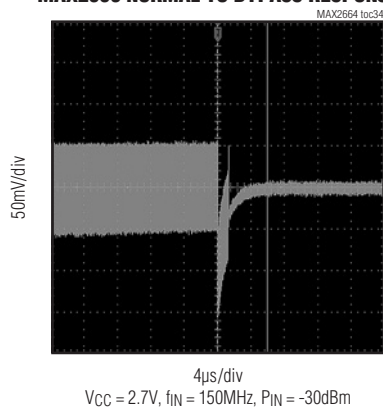
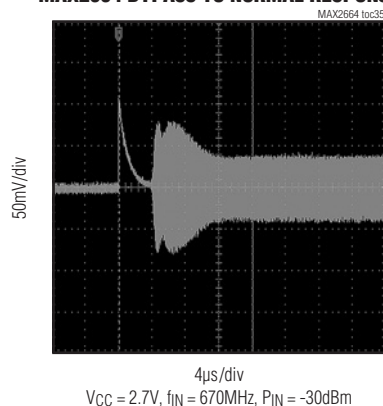
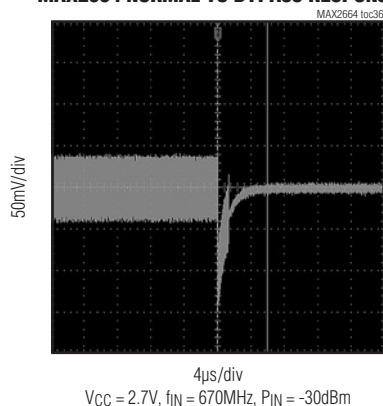
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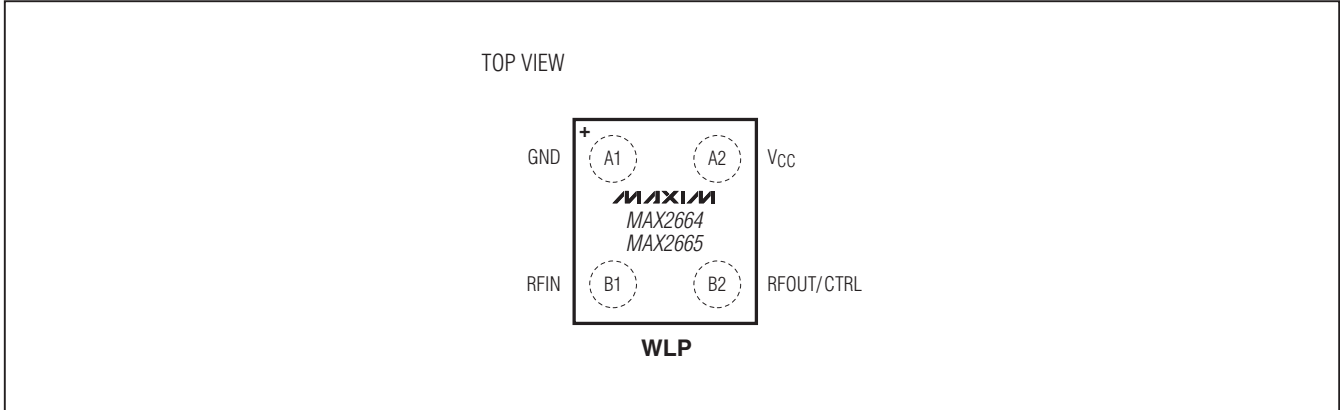
典型工作特性(续)

(T_A = +25°C, unless otherwise noted. MAX2664 and MAX2665 EV kits.)**MAX2665 BYPASS TO NORMAL RESPONSE****MAX2665 NORMAL TO BYPASS RESPONSE****MAX2664 BYPASS TO NORMAL RESPONSE****MAX2664 NORMAL TO BYPASS RESPONSE**

VHF/UHF低噪声放大器

焊球配置

MAX2664/MAX2665



焊球说明

焊球	名称	功能
A1	GND	地。连接到PCB的地平面，保持尽可能小的引线电感。
A2	VCC	电源电压。通过1000pF电容旁路至地，电容应尽可能靠近IC放置。
B1	RFIN	RF输入。需要外部匹配电感和隔直流电容，内部标称直流电压为750mV。
B2	RFOUT/CTRL	RF输出和旁路控制(请参考应用信息部分)。RFOUT在内部匹配于50Ω，内部带有隔直流电容。

详细说明

MAX2664/MAX2665为低功耗LNA，设计用于VHF/UHF系统。器件内部提供LNA旁路控制模式，能够在较大的输入信号功率条件下获得更好的线性特性。器件采用小尺寸WLP封装。

输入和输出匹配

只需一个电感与隔直流电容相串联，即可构成输入匹配网络。典型应用电路给出了推荐的输入匹配网络。这些数值经过优化设计，可同时获得最佳的增益、噪声系数和回波损耗指标。表1和表2列出了典型的器件S参数。器件内部集成了50Ω输出匹配网络，无需外部匹配元件。

VHF/UHF低噪声放大器

表1. MAX2664典型的器件S参数($V_{CC} = 2.7V$ 、 $T_A = +25^{\circ}C$ 、 $Z_0 = 50\Omega$)

FREQUENCY (MHz)	IS11I	S11 ANGLE	IS21I	S21 ANGLE	IS12I	S12 ANGLE	IS22I	S22 ANGLE
470	0.6664	-55.7	4.945	167.1	0.0449	36.7	0.2847	-65.8
500	0.6675	-58.9	4.964	163.9	0.0462	35.5	0.2795	-64.5
530	0.6674	-62.0	4.979	160.8	0.0474	34.9	0.2769	-63.2
560	0.6674	-65.0	4.978	157.8	0.0484	33.6	0.2787	-62.2
590	0.6673	-67.8	4.972	154.8	0.0500	32.4	0.2819	-61.3
620	0.6667	-70.6	4.958	152.0	0.0507	31.0	0.2858	-60.9
650	0.6651	-73.4	4.938	149.1	0.0523	30.8	0.2937	-60.7
680	0.6662	-75.9	4.916	146.3	0.0528	29.5	0.3011	-60.7
710	0.6651	-78.4	4.885	143.7	0.0539	27.9	0.3098	-61.2
740	0.6639	-80.9	4.852	140.9	0.0550	26.6	0.3185	-61.6
770	0.6624	-83.2	4.810	138.2	0.0560	25.6	0.3276	-62.5
800	0.6610	-85.5	4.764	135.7	0.0570	25.1	0.3372	-63.5
830	0.6598	-87.7	4.714	133.1	0.0573	24.0	0.3478	-64.7
860	0.6600	-89.7	4.667	130.7	0.0579	22.1	0.3571	-66.1

表2. MAX2665典型的器件S参数($V_{CC} = 2.7V$ 、 $T_A = +25^{\circ}C$ 、 $Z_0 = 50\Omega$)

FREQUENCY (MHz)	IS11I	S11 ANGLE	IS21I	S21 ANGLE	IS12I	S12 ANGLE	IS22I	S22 ANGLE
60	0.4608	-13.9	5.505	-176.6	0.0519	27.3	0.5060	-32.8
90	0.4944	-29.2	5.564	172.6	0.0546	21.5	0.4518	-33.6
120	0.5160	-42.2	5.507	164.2	0.0571	19.2	0.4270	-35.0
150	0.5368	-53.0	5.366	156.6	0.0593	16.5	0.4181	-38.4
180	0.5601	-62.9	5.173	150.4	0.0612	15.9	0.4036	-41.7
210	0.5800	-71.6	4.979	144.7	0.0630	14.3	0.3948	-45.0
240	0.6006	-79.3	4.783	139.5	0.0649	13.1	0.3870	-48.4

表3. MAX2664器件仿真噪声参数($V_{CC} = 2.7V$ 、 $T_A = +25^{\circ}C$ 、 $Z_0 = 50\Omega$)

FREQUENCY (MHz)	FMIN (dB)	$ \Gamma_{OPT} $	Γ_{OPT} ANGLE	r_n^*
470	1.014	0.2673	47.4	0.1724
500	1.017	0.2680	50.1	0.1709
530	1.021	0.2691	52.8	0.1695
560	1.024	0.2703	55.4	0.1681
590	1.028	0.2718	58.0	0.1667
620	1.032	0.2735	60.6	0.1653
650	1.036	0.2753	63.1	0.1639
680	1.040	0.2774	65.5	0.1626
710	1.045	0.2796	67.9	0.1612
740	1.049	0.2820	70.3	0.1599
770	1.054	0.2845	72.6	0.1586
800	1.059	0.2871	74.9	0.1573
830	1.064	0.2899	77.1	0.1560
860	1.070	0.2927	79.3	0.1547

* r_n 为归一化值。

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表4. MAX2665的典型噪声参数($V_{CC} = 2.7V$ 、 $T_A = +25^{\circ}C$ 、 $Z_0 = 50\Omega$)

FREQUENCY (MHz)	FMIN (dB)	$ \Gamma_{OPT} $	Γ_{OPT} ANGLE	r_n^*
60	0.911	0.1390	34.5	0.1241
90	0.928	0.1458	47.2	0.1240
120	0.940	0.1592	58.1	0.1237
150	0.949	0.1766	67.0	0.1233
180	0.958	0.1962	74.5	0.1227
210	0.967	0.2170	80.7	0.1221
240	0.975	0.2383	86.2	0.1213

* r_n 为归一化值。

有源旁路模式控制

器件的RFOUT/CTRL引脚用于控制LNA的旁路模式。通过外部 $1k\Omega$ 电阻置为逻辑高电平时，使能器件的有源模式。否则，将其连接到逻辑低电平，使能器件的旁路模式。应使用外部隔直流电容，隔离这一双功能引脚的控制(请参考典型应用电路)。

应用信息

合理的PCB设计是RF微波电路的设计关键，所有高频输入和输出须采用阻抗受控引线。通过去耦电容旁路 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。这些附加电容可以放置在远离器件的位置。为GND引脚提供适当的接地平面是基本的设计保障，如果PCB将顶层用作RF地，则将GND引脚直接连接到地平面。对于地平面不在元件层的电路板，可通过多个过孔将GND引脚连接到地平面，过孔应靠近器件放置。

可从china.maxim-ic.com下载MAX2664/MAX2665 S参数、MAX2664/MAX2665评估板原理图、gerber文件、PADS布板文件和BOM表。

表5. 逻辑控制表

RFOUT/CTRL	MODE
High	Active
Low	Bypass

芯片信息

PROCESS: SiGe BiCMOS

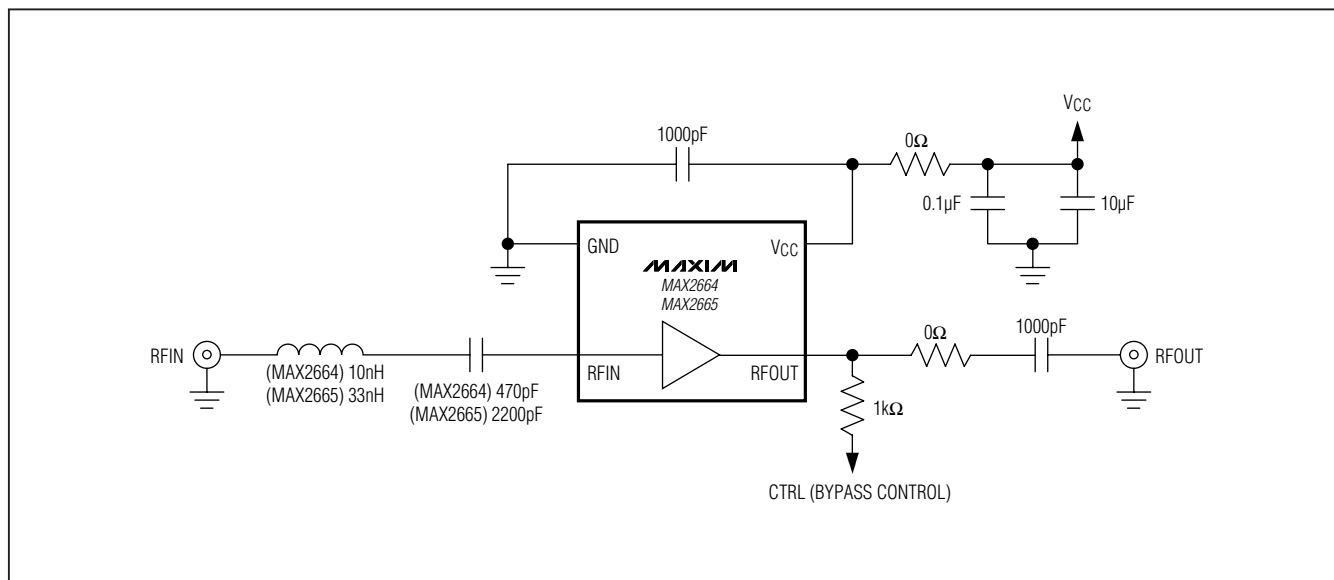
封装信息

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
4 WLP	W40A0+1	21-0480	—

VHF/UHF低噪声放大器

典型应用电路



VHF/UHF低噪声放大器

修订历史

MAX2664/MAX2665

修订号	修订日期	说明	修改页
0	8/10	最初版本。	—

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