19-3948; Rev 0; 1/06

可提供评估板

MAXIM

高线性度、1700MHz至3000MHz上变频/下变频混频器，带有LO缓冲器/开关

MAX2041

概述

MAX2041高线性度、无源上变频/下变频混频器在1700MHz至3000MHz的RF频率范围内具有7.4dB NF和7.2dB转换损耗，支持UMTS/WCDMA、DCS、PCS和WiMAX基站发射器或接收器应用。下变频和上变频转换器的IIP3典型值均为+33.5dBm。该混频器的LO频率范围为1900MHz至3000MHz，非常适合高端LO注入结构(对于引脚兼容的低端LO注入混频器，请参考MAX2039)。

MAX2041不仅具有出色的线性度和噪声性能，还具有非常高的集成度。器件包括：一个双平衡无源混频器核、双输入LO选择开关和LO缓冲器。MAX2041还集成了非平衡变压器，用于下变频器的单端RF输入(或上变频器的RF输出)以及单端LO输入的转换。MAX2041需要标称值为0dBm的LO驱动，电源电流保证小于145mA。

MAX2041与MAX2031 815MHz至995MHz混频器引脚兼容，只需使用同样的PC板即可方便地实现双频、无源上变频/下变频混频器。

MAX2041采用紧凑的20引脚薄型QFN封装(5mm x 5mm)，带有裸焊盘。工作在-40°C至+85°C扩展级温度范围。

应用

UMTS/WCDMA基站

DCS 1800/PCS 1900 EDGE基站

cdmaOne™和cdma2000®基站

WiMAX基站和企业网络设备

PHS/PAS基站

预失真接收机

固定宽带无线接入

无线本地环路

个人移动通信设备

军用设备

微波链路

数字扩频通信系统

cdmaOne是CDMA开发组织的商标。
cdma2000是电信工业协会的注册商标。

特性

- ♦ 1700MHz至3000MHz的RF频率范围
- ♦ 1900MHz至3000MHz的LO频率范围
- ♦ 1500MHz至2000MHz的LO频率范围(MAX2039)
- ♦ DC至350MHz的IF频率范围
- ♦ 7.2dB的变频损耗
- ♦ +33.5dBm输入IP3
- ♦ +23.3dBm输入1dB压缩点
- ♦ 7.4dB噪声系数
- ♦ 集成LO缓冲器
- ♦ 集成RF和LO非平衡变压器
- ♦ -3dBm至+3dBm低LO驱动
- ♦ 内置SPDT LO开关，LO1至LO2隔离度为43dB，50ns的开关时间
- ♦ 与MAX2031 815MHz到995MHz混频器引脚兼容
- ♦ 外部电流设置电阻提供混频器低功耗/低性能工作模式选项
- ♦ 提供无铅封装

定购信息

PART	TEMP RANGE	PIN-PACKAGE	PKG CODE
MAX2041ETP	-40°C to +85°C	20 Thin QFN-EP* (5mm x 5mm) bulk	T2055-3
MAX2041ETP-T	-40°C to +85°C	20 Thin QFN-EP* (5mm x 5mm) T/R	T2055-3
MAX2041ETP+	-40°C to +85°C	20 Thin QFN-EP* (5mm x 5mm) lead-free bulk	T2055-3
MAX2041ETP+T	-40°C to +85°C	20 Thin QFN-EP* (5mm x 5mm) lead-free T/R	T2055-3

**EP = 裸焊盘。*
T = 卷带封装。
+ = 无铅封装。

引脚配置和典型应用电路见数据资料的最后。

高线性度、1700MHz至3000MHz上变频/下变频混频器，带有LO缓冲器/开关

ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND .....-0.3V to +5.5V
TAP, LOBIAS, LOSEL to GND .....-0.3V to (V_{CC} + 0.3V)
LO1, LO2, IF+, IF- to GND .....-0.3V to +0.3V
IF, LO1, LO2 Input Power .....+15dBm
RF Input Power 20dBm
RF (RF is DC shorted to GND through a balun) 50mA
Continuous Power Dissipation (T_A = +70°C)
20-Pin QFN-EP (derated 20mW/°C above +70°C) 2.2W
θ_{JA} .....+33°C/W
θ_{JC} .....+8°C/W
Operating Temperature Range (Note A) ....T_C = -40°C to +85°C
Junction Temperature .....+150°C
Storage Temperature Range .....-65°C to +165°C
Lead Temperature (soldering, 10s) .....+300°C

Note A: T_C is the temperature on the exposed paddle of the package.

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

(MAX2041 *Typical Application Circuit*, V_{CC} = +4.75V to +5.25V, no RF signals applied, IF+ and IF- DC grounded through a transformer, T_C = -40°C to +85°C. Typical values are at V_{CC} = +5V, T_C = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage	V_{CC}		4.75	5.00	5.25	V
Supply Current	I_{CC}			104	145	mA
LO_SEL Input Logic Low	V_{IL}				0.8	V
LO_SEL Input Logic High	V_{IH}		2			V

AC ELECTRICAL CHARACTERISTICS (DOWNCONVERTER OPERATION)

(MAX2041 *Typical Application Circuit*, V_{CC} = +4.75V to +5.25V, RF and LO ports are driven from 50Ω sources, P_{LO} = -3dBm to +3dBm, P_{RF} = 0dBm, f_{RF} = 1700MHz to 3000MHz, f_{LO} = 1900MHz to 3000MHz, f_{IF} = 200MHz, $f_{LO} > f_{RF}$, T_C = -40°C to +85°C, unless otherwise noted. Typical values are at V_{CC} = +5V, P_{RF} = 0dBm, P_{LO} = 0dBm, f_{RF} = 1900MHz, f_{LO} = 2100MHz, f_{IF} = 200MHz, T_C = +25°C, unless otherwise noted.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
RF Frequency Range	f_{RF}		1700		3000	MHz
LO Frequency Range	f_{LO}	MAX2041	1900		3000	MHz
		MAX2039	1500		2000	
IF Frequency Range	f_{IF}	External IF transformer dependent	DC		350	MHz
Conversion Loss	L_C	P_{RF} < +2dBm		7.2		dB
Loss Variation Over Temperature		T_C = -40°C to +85°C		0.0075		dB/°C
Input Compression Point	P_{1dB}	(Note 2)		23.3		dBm
Input Third-Order Intercept Point	IIP3	Two tones: f_{RF1} = 1900MHz, f_{RF2} = 1901MHz, P_{RF} = 0dBm/tone, f_{LO} = 2100MHz, P_{LO} = 0dBm		33.5		dBm
Input IP3 Variation Over Temperature		T_C = -40°C to +85°C		±0.75		dB
Noise Figure	NF	Single sideband		7.4		dB
Noise Figure Under-Blocking		P_{RF} = 5dBm, f_{RF} = 2000MHz, f_{LO} = 2190MHz, f_{BLOCK} = 2100MHz (Note 3)		19		dB

AC ELECTRICAL CHARACTERISTICS (DOWNCONVERTER OPERATION) (continued)

(MAX2041 *Typical Application Circuit*, V_{CC} = +4.75V to +5.25V, RF and LO ports are driven from 50Ω sources, P_{LO} = -3dBm to +3dBm, P_{RF} = 0dBm, f_{RF} = 1700MHz to 3000MHz, f_{LO} = 1900MHz to 3000MHz, f_{IF} = 200MHz, $f_{LO} > f_{RF}$, T_C = -40°C to +85°C, unless otherwise noted. Typical values are at V_{CC} = +5V, P_{RF} = 0dBm, P_{LO} = 0dBm, f_{RF} = 1900MHz, f_{LO} = 2100MHz, f_{IF} = 200MHz, T_C = +25°C, unless otherwise noted.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
LO Drive			-3		+3	dBm
Spurious Response at IF	2 x 2	2LO - 2RF, P_{RF} = 0dBm		63		dBc
	3 x 3	3LO - 3RF, P_{RF} = 0dBm		69		
LO1 to LO2 Isolation		LO2 selected, 1900MHz < f_{LO} < 2100MHz		49		dB
		LO1 selected, 1900MHz < f_{LO} < 2100MHz		43		
Maximum LO Leakage at RF Port		P_{LO} = +3dBm (Note 4)		-18.5		dBm
Maximum LO Leakage at IF Port		P_{LO} = +3dBm		-30		dBm
Minimum RF-to-IF Isolation				35		dB
LO Switching Time		50% of LOSEL to IF settled to within 2°		50		ns
RF Port Return Loss				18		dB
LO Port Return Loss		LO port selected, LO and IF terminated		16		dB
		LO port unselected, LO and IF terminated		26		
IF Port Return Loss		LO driven at 0dBm, RF terminated into 50Ω		20		dB

AC ELECTRICAL CHARACTERISTICS (UPCONVERTER OPERATION)

(MAX2041 *Typical Application Circuit*, V_{CC} = +4.75V to +5.25V, P_{LO} = -3dBm to +3dBm, P_{IF} = 0dBm, f_{RF} = 1700MHz to 3000MHz, f_{LO} = 1900MHz to 3000MHz, f_{IF} = 200MHz, $f_{RF} = f_{LO} - f_{IF}$, T_C = -40°C to +85°C, unless otherwise noted. Typical values are at V_{CC} = +5V, P_{IF} = 0dBm, P_{LO} = 0dBm, f_{RF} = 1900MHz, f_{LO} = 2100MHz, f_{IF} = 200MHz, T_C = +25°C, unless otherwise noted.) (Note 1)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input Compression Point	P_{1dB}	(Note 2)		23.3		dBm
Input Third-Order Intercept Point	IIP3	Two tones: f_{IF1} = 200MHz, f_{IF2} = 201MHz, P_{IF} = 0dBm/tone, f_{LO} = 1900MHz, P_{LO} = 0dBm		33.5		dBm
LO ± 2IF Spur		LO - 2IF		67		dBc
		LO + 2IF		65		
LO ± 3IF Spur		LO - 3IF		75		dBc
		LO + 3IF		72		
Output Noise Floor		P_{OUT} = 0dBm		-160		dBm/Hz

Note 1: All limits include external component losses. Output measurements taken at IF port for downconverter and RF port for upconverter from the *Typical Application Circuit*.

Note 2: Compression point characterized. It is advisable not to continuously operate the mixer RF or IF input above +15dBm.

Note 3: Measured with external LO source noise filtered so the noise floor is -174dBm/Hz. This specification reflects the effects of all SNR degradations in the mixer, including the LO noise as defined in Maxim *Application Note 2021*.

Note 4: Refer to the MAX2043 for improved LO leakage of -52dBm typical.

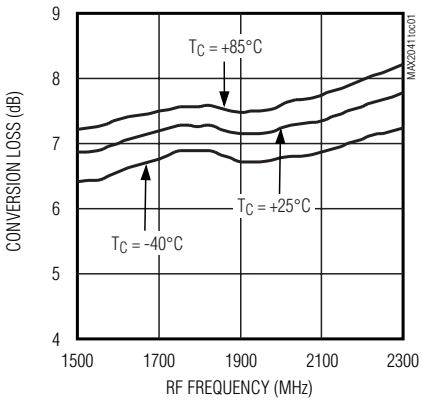
高线性度、1700MHz至3000MHz上变频/下变频混频器，带有LO缓冲器/开关

典型工作特性

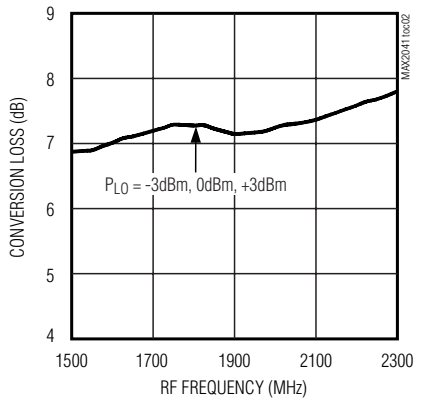
(MAX2041 *Typical Application Circuit*, V_{CC} = +5.0V, P_{LO} = 0dBm, P_{RF} = 0dBm, $f_{LO} > f_{RF}$, f_{IF} = 200MHz, R1 = 549Ω, unless otherwise noted.)

Downconverter Curves

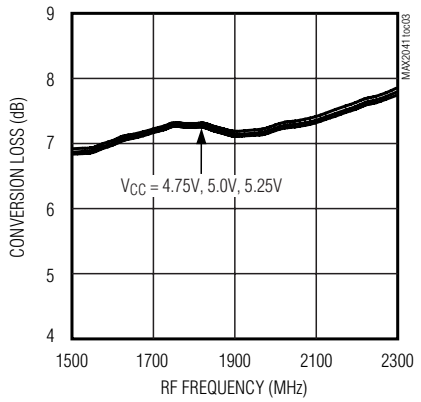
CONVERSION LOSS vs. RF FREQUENCY



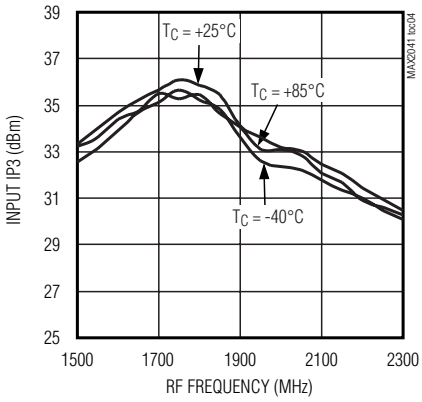
CONVERSION LOSS vs. RF FREQUENCY



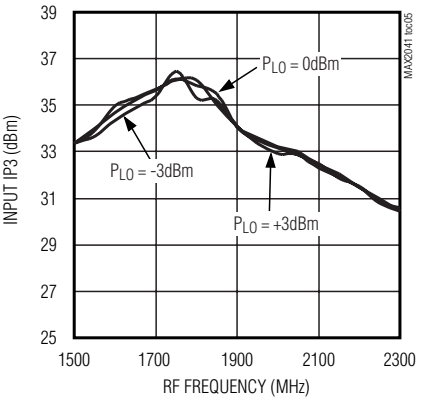
CONVERSION LOSS vs. RF FREQUENCY



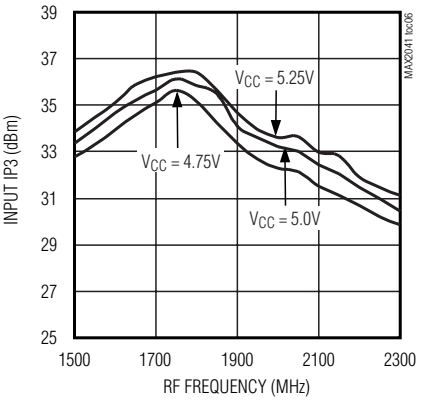
INPUT IP3 vs. RF FREQUENCY



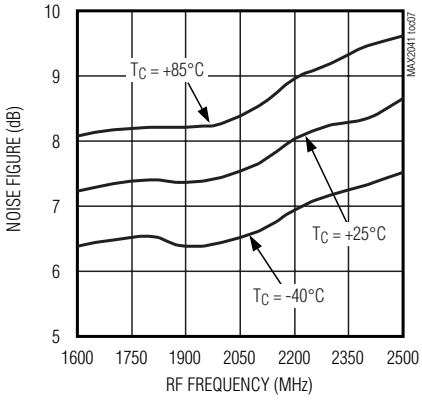
INPUT IP3 vs. RF FREQUENCY



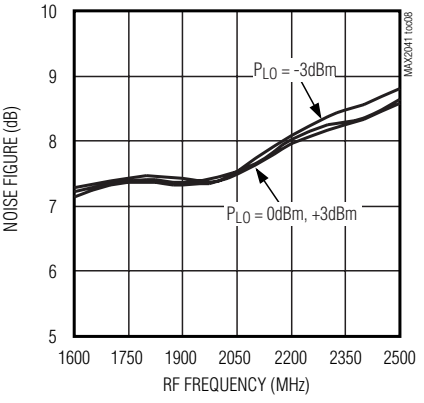
INPUT IP3 vs. RF FREQUENCY



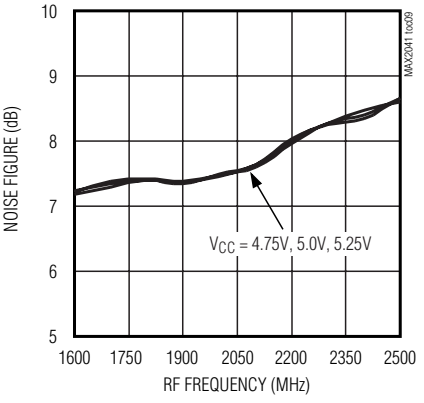
NOISE FIGURE vs. RF FREQUENCY



NOISE FIGURE vs. RF FREQUENCY



NOISE FIGURE vs. RF FREQUENCY

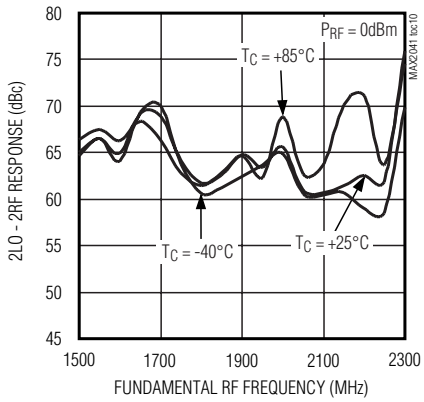


典型工作特性(续)

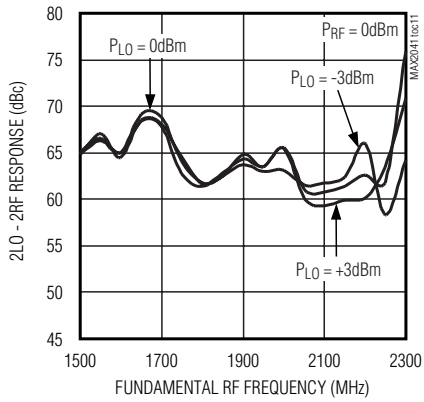
(MAX2041 *Typical Application Circuit*, V_{CC} = +5.0V, P_{LO} = 0dBm, P_{RF} = 0dBm, $f_{LO} > f_{RF}$, f_{IF} = 200MHz, R1 = 549Ω, unless otherwise noted.)

Downconverter Curves

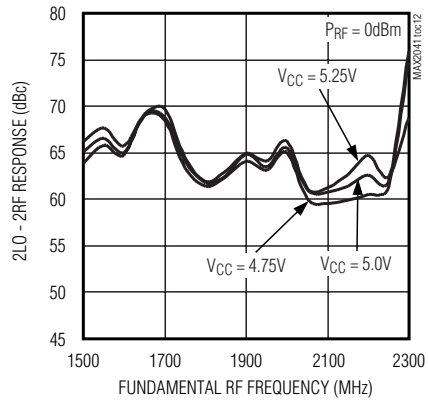
2LO - 2RF RESPONSE vs. RF FREQUENCY (LO1 SELECTED)



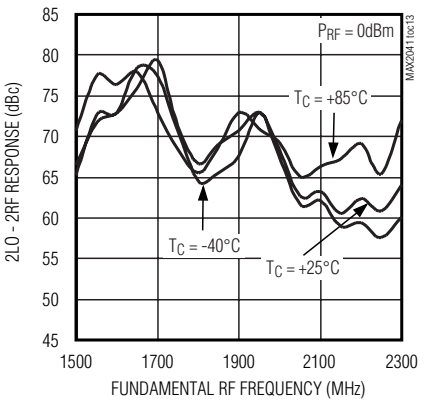
2LO - 2RF RESPONSE vs. RF FREQUENCY (LO1 SELECTED)



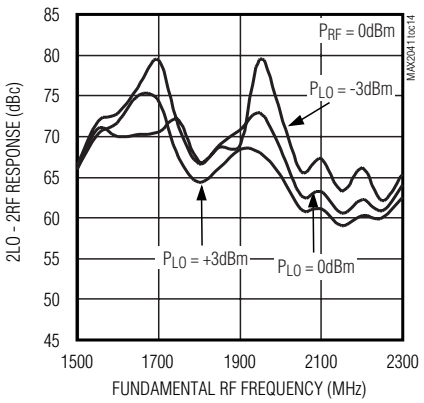
2LO - 2RF RESPONSE vs. RF FREQUENCY (LO1 SELECTED)



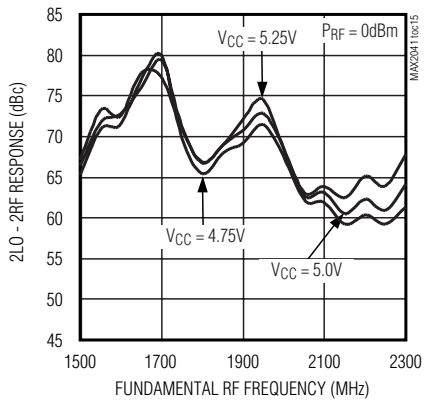
2LO - 2RF RESPONSE vs. RF FREQUENCY (LO2 SELECTED)



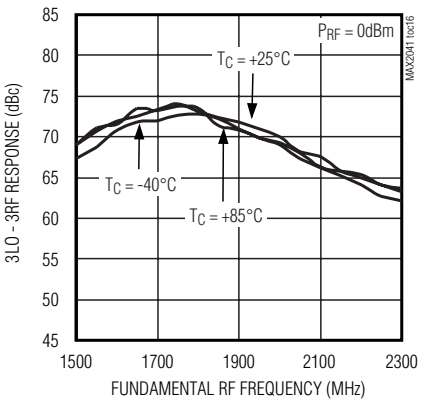
2LO - 2RF RESPONSE vs. RF FREQUENCY (LO2 SELECTED)



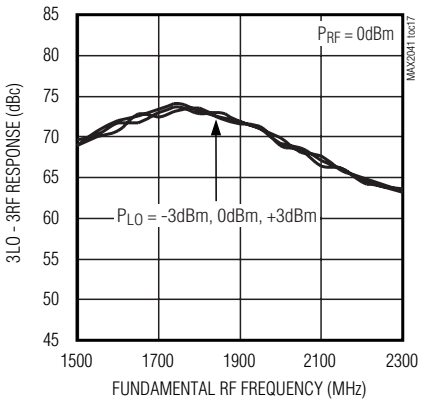
2LO - 2RF RESPONSE vs. RF FREQUENCY (LO2 SELECTED)



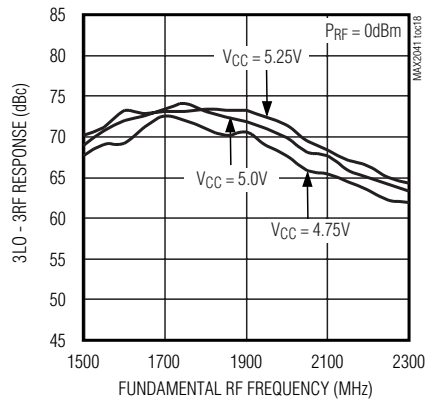
3LO - 3RF RESPONSE vs. RF FREQUENCY



3LO - 3RF RESPONSE vs. RF FREQUENCY



3LO - 3RF RESPONSE vs. RF FREQUENCY



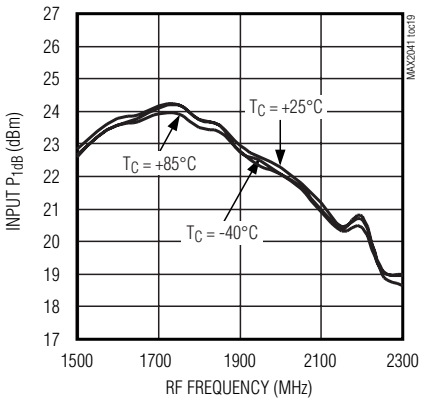
高线性度、1700MHz至3000MHz上变频/下变频混频器，带有LO缓冲器/开关

典型工作特性(续)

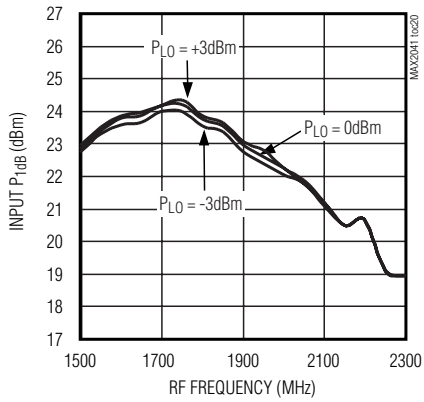
(MAX2041 *Typical Application Circuit*, V_{CC} = +5.0V, P_{LO} = 0dBm, P_{RF} = 0dBm, $f_{LO} > f_{RF}$, f_{IF} = 200MHz, R1 = 549Ω, unless otherwise noted.)

Downconverter Curves

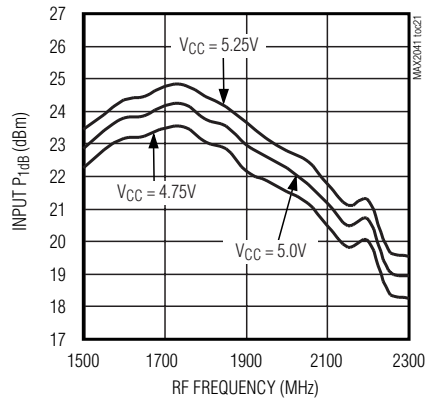
INPUT P_{1dB} vs. RF FREQUENCY



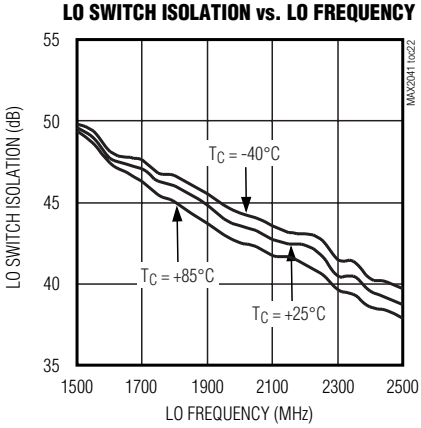
INPUT P_{1dB} vs. RF FREQUENCY



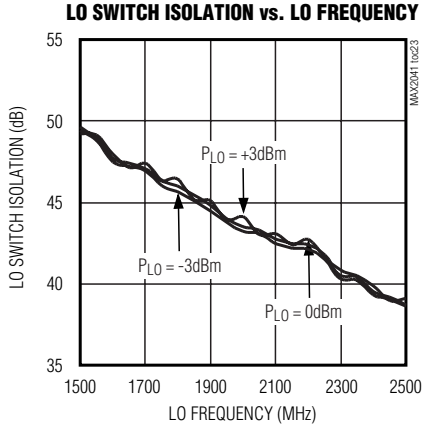
INPUT P_{1dB} vs. RF FREQUENCY



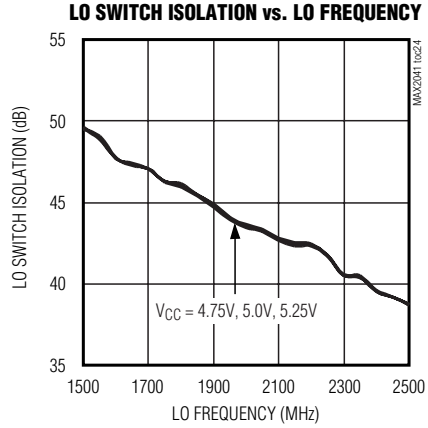
LO SWITCH ISOLATION vs. LO FREQUENCY



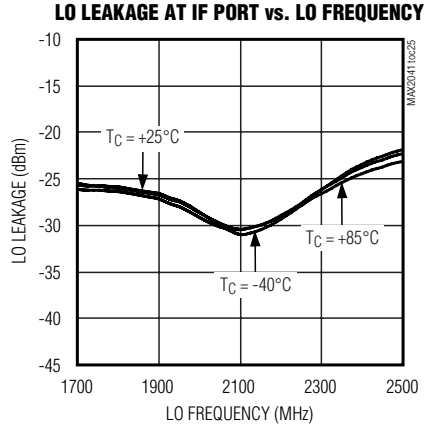
LO SWITCH ISOLATION vs. LO FREQUENCY



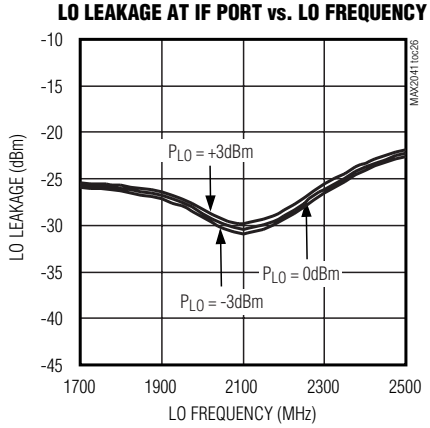
LO SWITCH ISOLATION vs. LO FREQUENCY



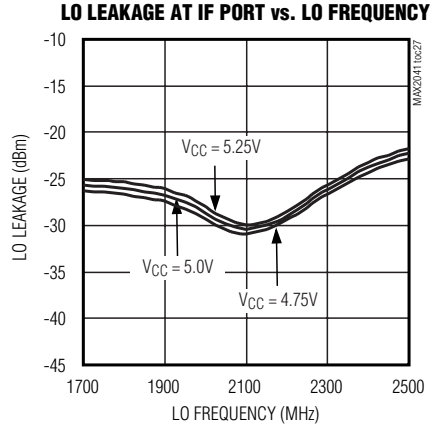
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



LO LEAKAGE AT IF PORT vs. LO FREQUENCY



LO LEAKAGE AT IF PORT vs. LO FREQUENCY

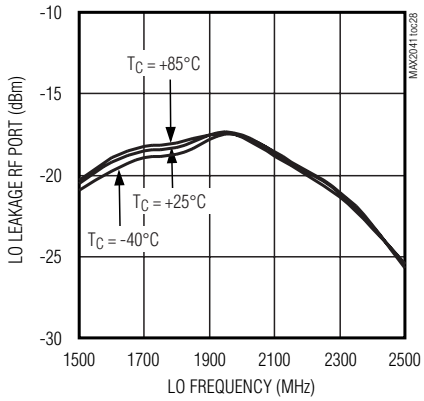


典型工作特性(续)

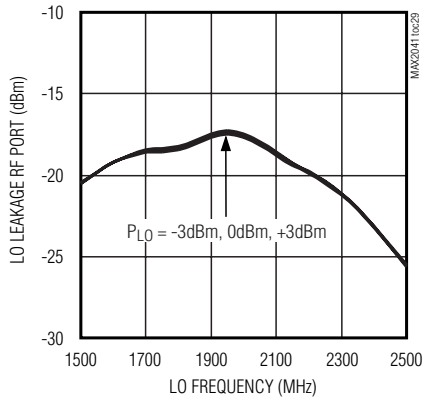
(MAX2041 *Typical Application Circuit*, V_{CC} = +5.0V, P_{LO} = 0dBm, P_{RF} = 0dBm, $f_{LO} > f_{RF}$, f_{IF} = 200MHz, R1 = 549Ω, unless otherwise noted.)

Downconverter Curves

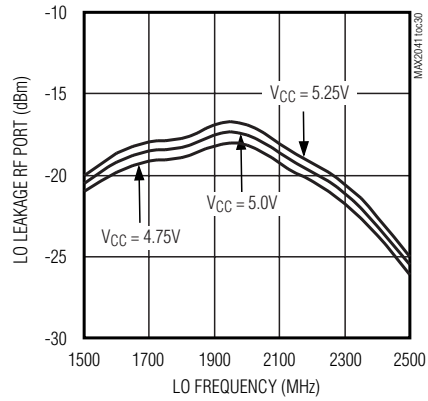
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



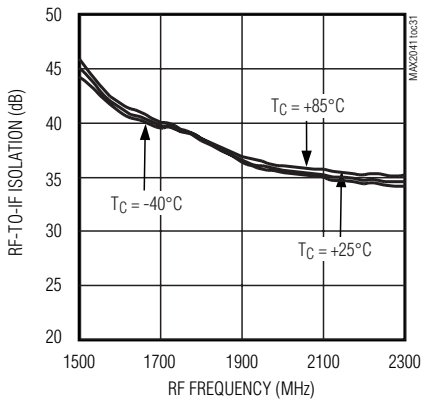
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



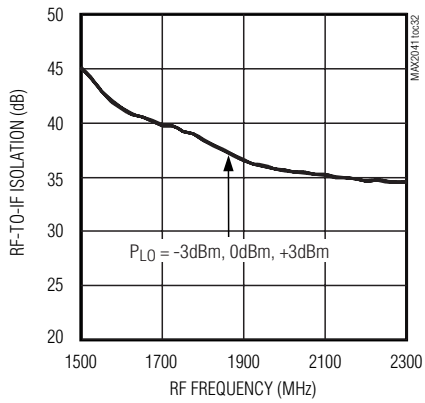
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



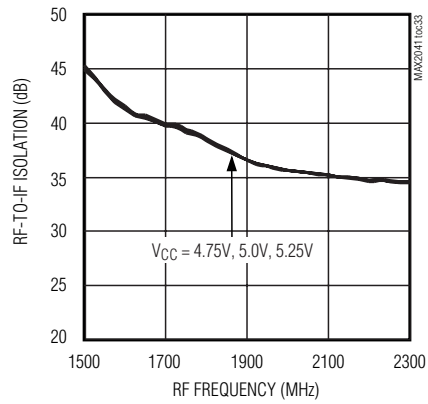
RF-TO-IF ISOLATION vs. RF FREQUENCY



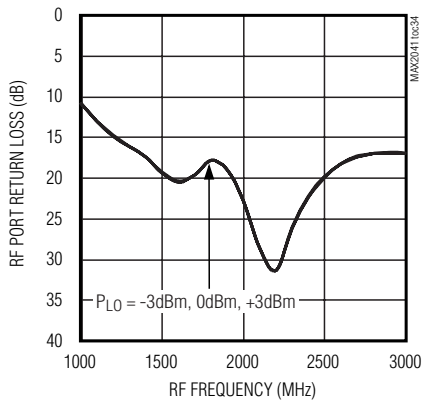
RF-TO-IF ISOLATION vs. RF FREQUENCY



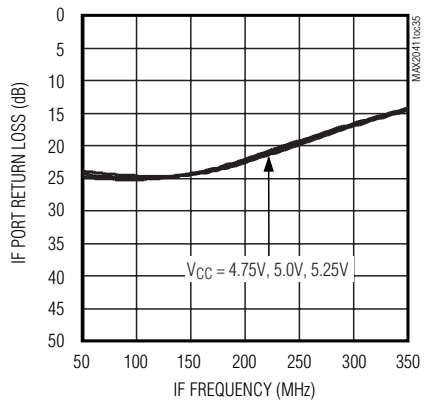
RF-TO-IF ISOLATION vs. RF FREQUENCY



RF PORT RETURN LOSS vs. RF FREQUENCY



IF PORT RETURN LOSS vs. IF FREQUENCY



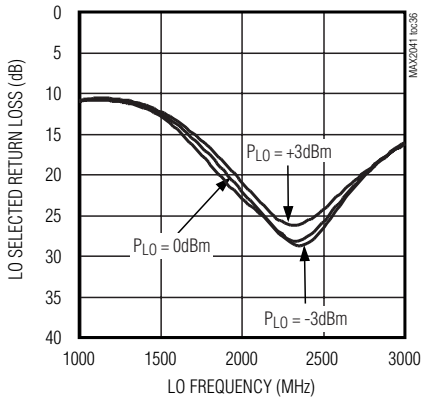
高线性度、1700MHz至3000MHz上变频/下变频混频器，带有LO缓冲器/开关

典型工作特性(续)

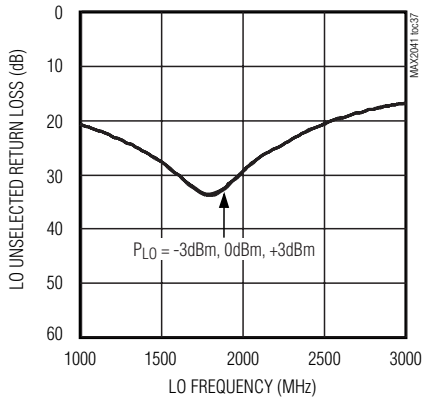
(MAX2041 *Typical Application Circuit*, V_{CC} = +5.0V, P_{LO} = 0dBm, P_{RF} = 0dBm, $f_{LO} > f_{RF}$, f_{IF} = 200MHz, R1 = 549Ω, unless otherwise noted.)

Downconverter Curves

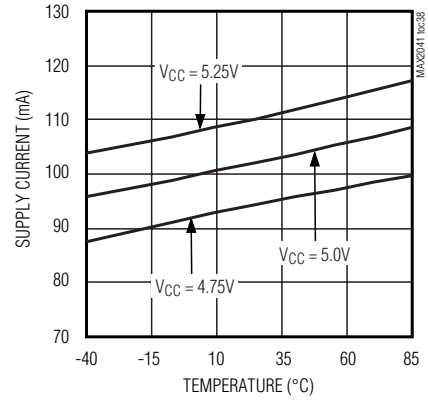
LO SELECTED RETURN LOSS vs. LO FREQUENCY



LO UNSELECTED RETURN LOSS vs. RF FREQUENCY



SUPPLY CURRENT vs. TEMPERATURE (T_C)

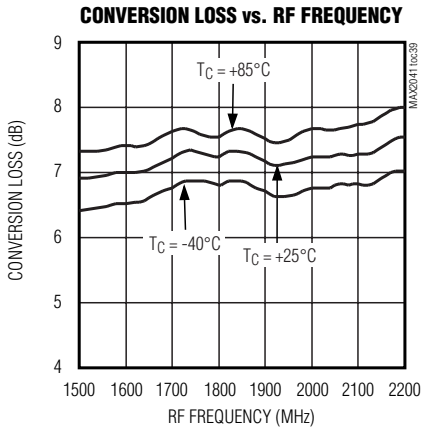


典型工作特性

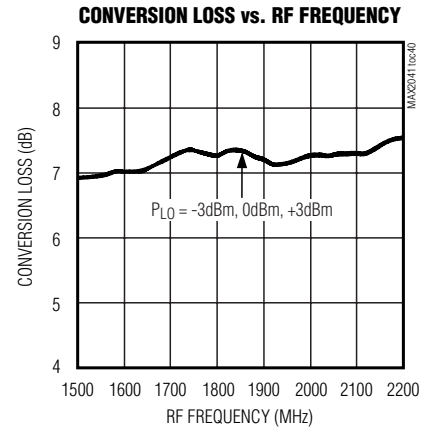
(MAX2041 *Typical Application Circuit*, V_{CC} = +5.0V, P_{LO} = 0dBm, P_{IF} = 0dBm, $f_{RF} = f_{LO} - f_{IF}$, f_{IF} = 200MHz, R1 = 549Ω, unless otherwise noted.)

Upconverter Curves

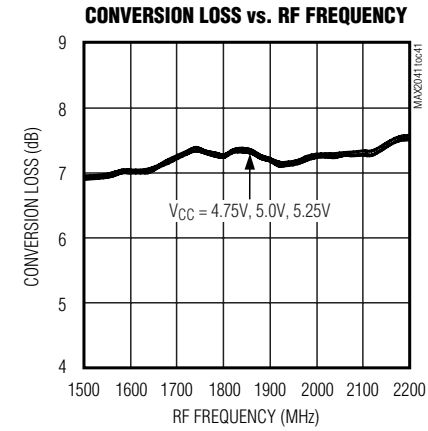
CONVERSION LOSS vs. RF FREQUENCY



CONVERSION LOSS vs. RF FREQUENCY



CONVERSION LOSS vs. RF FREQUENCY

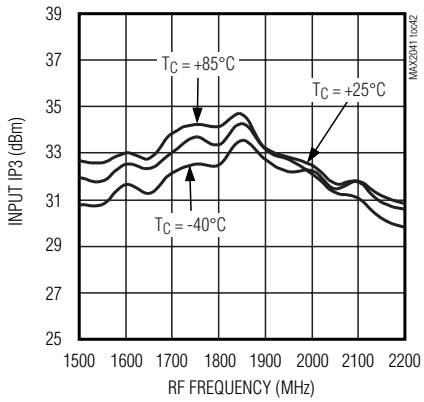


典型工作特性(续)

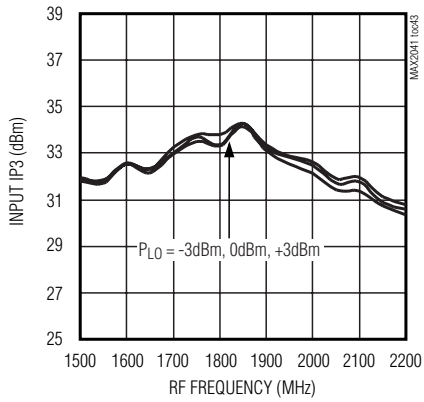
(MAX2041 *Typical Application Circuit*, V_{CC} = +5.0V, P_{LO} = 0dBm, P_{IF} = 0dBm, $f_{RF} = f_{LO} - f_{IF}$, f_{IF} = 200MHz, R1 = 549Ω, unless otherwise noted.)

Upconverter Curves

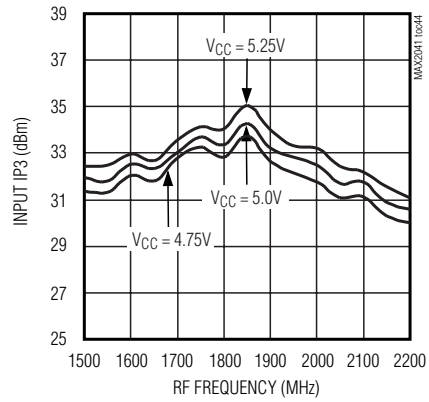
INPUT IP3 vs. RF FREQUENCY



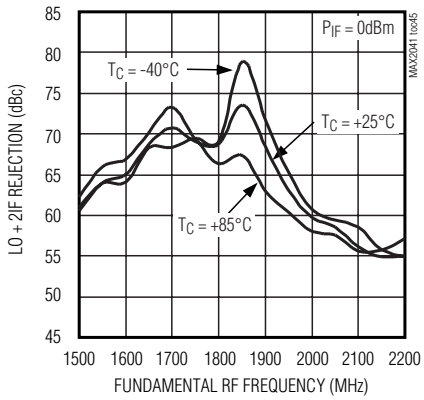
INPUT IP3 vs. RF FREQUENCY



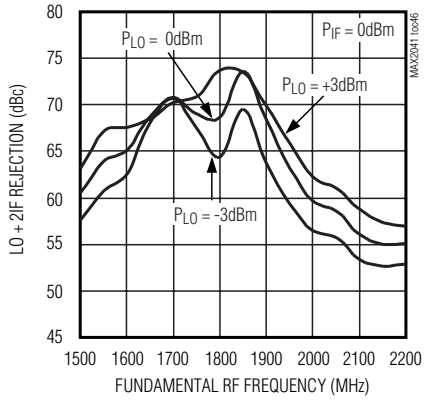
INPUT IP3 vs. RF FREQUENCY



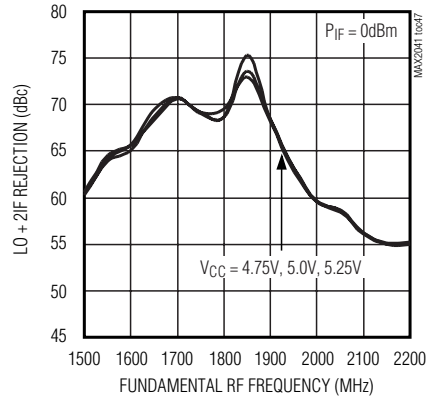
LO + 2IF REJECTION vs. RF FREQUENCY (LO1 SELECTED)



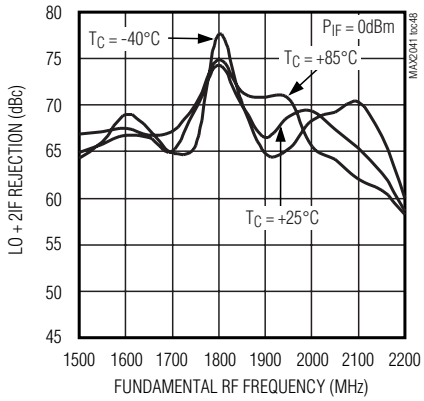
LO + 2IF REJECTION vs. RF FREQUENCY (LO1 SELECTED)



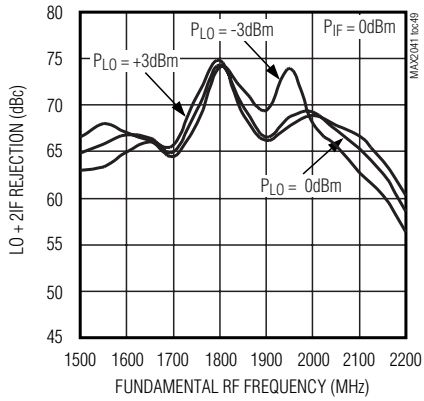
LO + 2IF REJECTION vs. RF FREQUENCY (LO1 SELECTED)



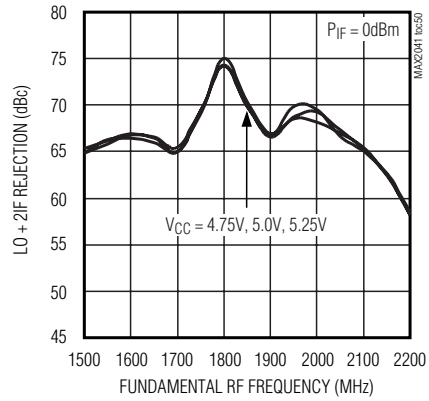
LO + 2IF REJECTION vs. RF FREQUENCY (LO2 SELECTED)



LO + 2IF REJECTION vs. RF FREQUENCY (LO2 SELECTED)



LO + 2IF REJECTION vs. RF FREQUENCY (LO2 SELECTED)



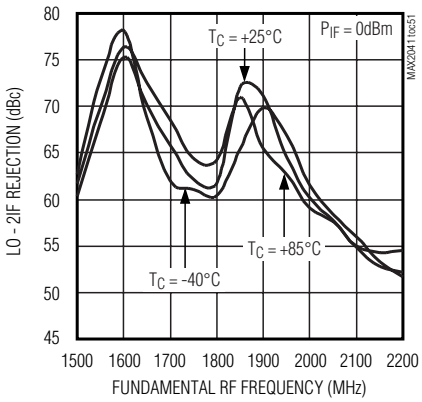
高线性度、1700MHz至3000MHz上变频/下变频混频器，带有LO缓冲器/开关

典型工作特性(续)

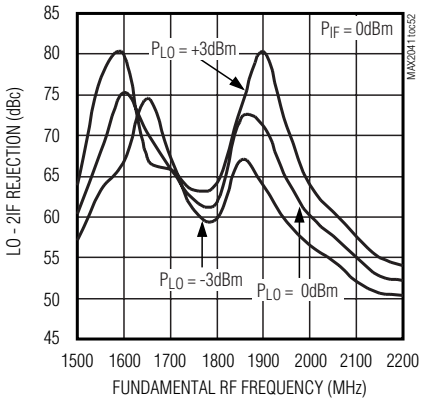
(MAX2041 *Typical Application Circuit*, V_{CC} = +5.0V, P_{LO} = 0dBm, P_{IF} = 0dBm, $f_{RF} = f_{LO} - f_{IF}$, f_{IF} = 200MHz, R1 = 549Ω, unless otherwise noted.)

Upconverter Curves

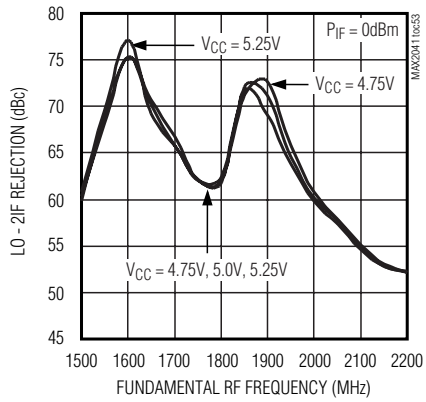
LO - 2IF REJECTION vs. RF FREQUENCY (LO1 SELECTED)



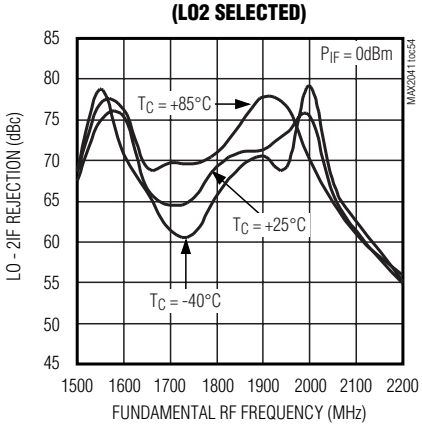
LO - 2IF REJECTION vs. RF FREQUENCY (LO1 SELECTED)



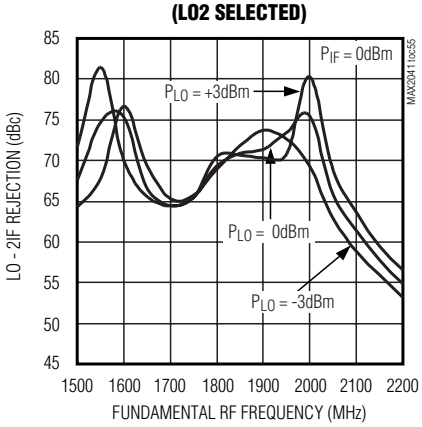
LO - 2IF REJECTION vs. RF FREQUENCY (LO1 SELECTED)



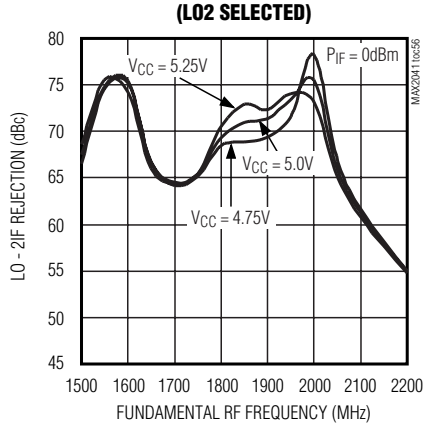
LO - 2IF REJECTION vs. RF FREQUENCY (LO2 SELECTED)



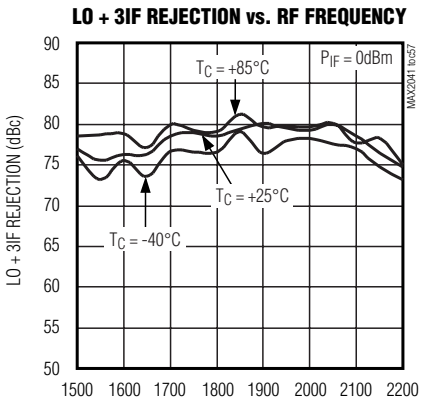
LO - 2IF REJECTION vs. RF FREQUENCY (LO2 SELECTED)



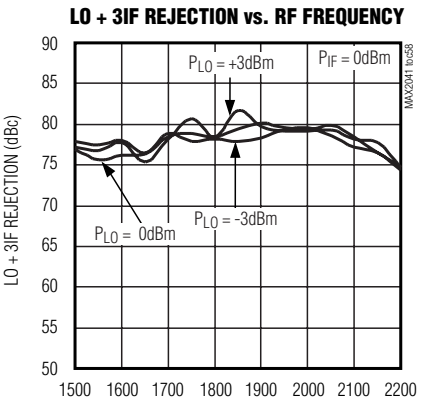
LO - 2IF REJECTION vs. RF FREQUENCY (LO2 SELECTED)



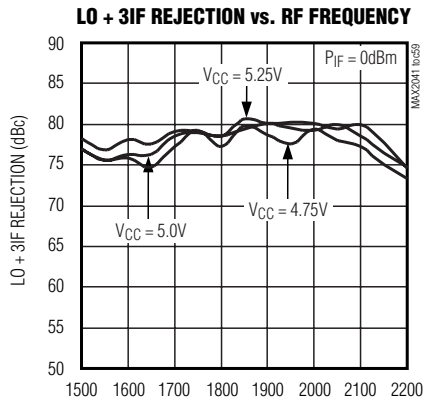
LO + 3IF REJECTION vs. RF FREQUENCY



LO + 3IF REJECTION vs. RF FREQUENCY



LO + 3IF REJECTION vs. RF FREQUENCY

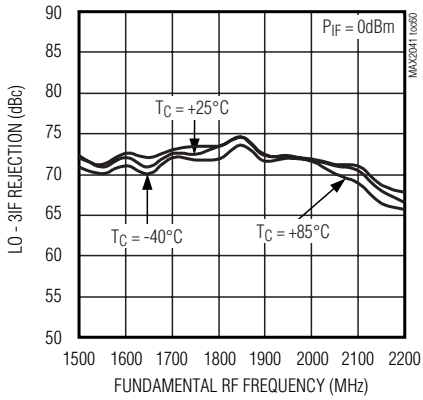


典型工作特性(续)

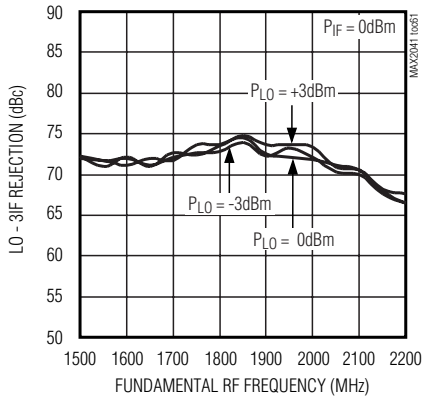
(MAX2041 *Typical Application Circuit*, V_{CC} = +5.0V, P_{LO} = 0dBm, P_{IF} = 0dBm, $f_{RF} = f_{LO} - f_{IF}$, f_{IF} = 200MHz, R1 = 549Ω, unless otherwise noted.)

Upconverter Curves

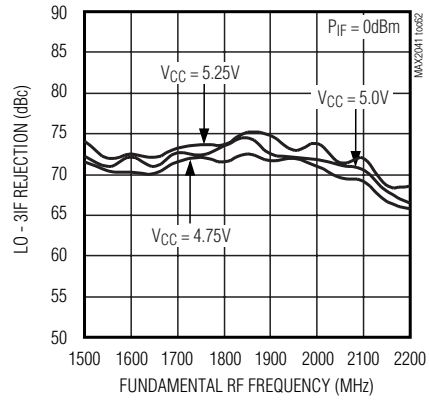
LO - 3IF REJECTION vs. RF FREQUENCY



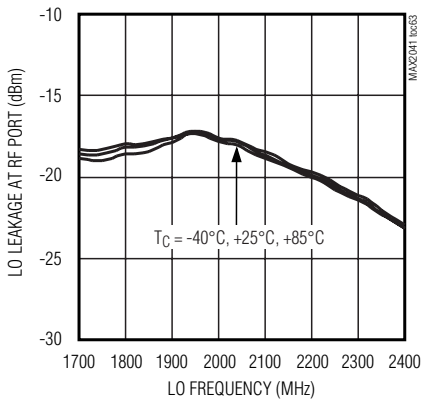
LO - 3IF REJECTION vs. RF FREQUENCY



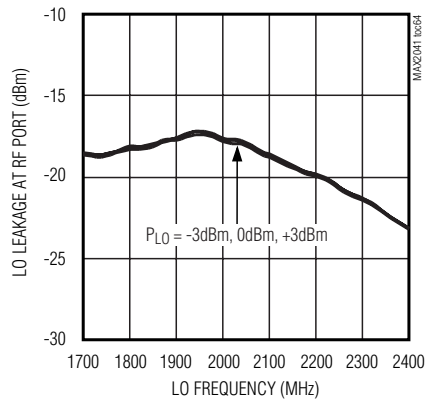
LO - 3IF REJECTION vs. RF FREQUENCY



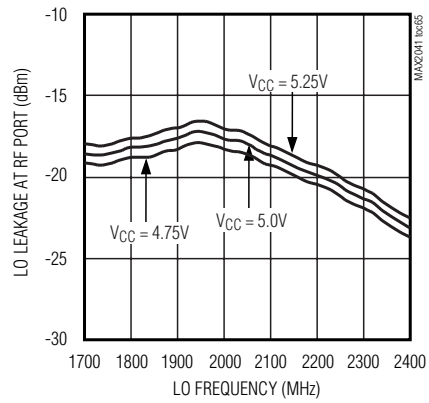
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



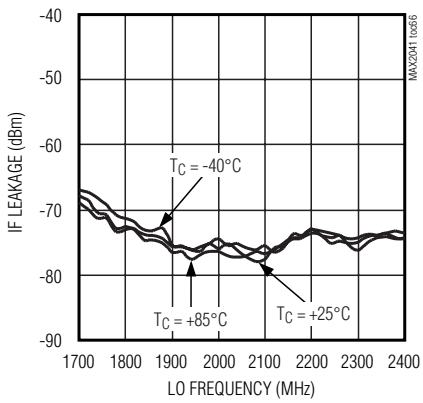
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



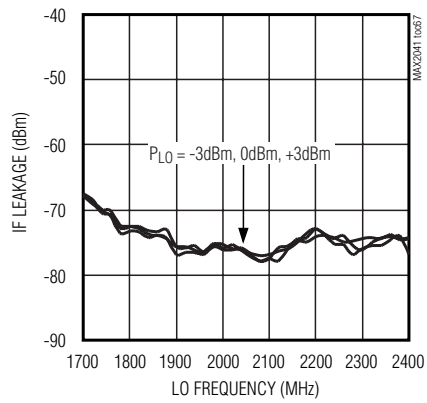
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



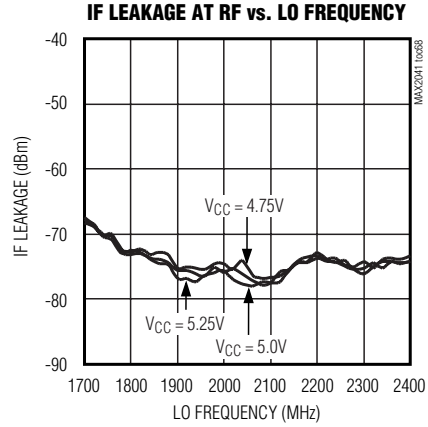
IF LEAKAGE AT RF vs. LO FREQUENCY



IF LEAKAGE AT RF vs. LO FREQUENCY



IF LEAKAGE AT RF vs. LO FREQUENCY



高线性度、1700MHz至3000MHz上变频/下变频混频器，带有LO缓冲器/开关

引脚说明

引脚	名称	功能
1, 6, 8, 14	V_{CC}	电源。将每个V_{CC}引脚都通过电容旁路到地，如*典型应用电路*所示。
2	RF	单端50Ω RF输入/输出。该端口由内部匹配，并通过非平衡变压器直流短路到GND。
3	TAP	内部RF非平衡变压器的中心抽头。在靠近该IC处对地接旁路电容，如*典型应用电路*所示。
4, 5, 10, 12, 13, 16, 17, 20	GND	地。
7	LOBIAS	内部LO缓冲器的偏置电阻。在LOBIAS与电源之间接一个549Ω ±1%的电阻。
9	LOSEL	本振选择，LO1和LO2的逻辑控制输入端。
11	LO1	本振输入1，将LOSEL驱动至低电平选择LO1。
15	LO2	本振输入2，将LOSEL驱动至高电平选择LO2。
18, 19	IF-, IF+	差分IF输入/输出
EP	GND	裸露接地焊盘，该裸焊盘通过多个过孔焊连接到地平面。

详细说明

MAX2041既可作为下变频混频器使用，也可作为上变频混频器使用，具有7.2dB的变频损耗和典型的7.4dB噪声系数。上变频和下变频转换器的IIP3均为+33.5dBm。集成的非平衡变压器和匹配电路实现了RF端口和两个LO端口与50Ω单端接口的连接。RF端口在下变频时作为RF输入，在上变频时作为RF输出。单刀双掷(SPDT)开关在两个LO输入之间切换时具有50ns的开关时间，两个LO之间的隔离度是43dB。此外，集成的LO缓冲器可为混频器核提供高驱动电平，将MAX2041输入所需的LO驱动减小到-3dBm至+3dBm。下变频时，IF端口作为差分输出，可以改善IIP2的性能。上变频时，IF端口作为差分输入。

保证在较宽的频率范围内符合规范要求，可广泛地用于UMTS、cdma2000、2G/2.5G/3G DCS 1800、PCS 1900和WiMAX基站。MAX2041用于1700MHz至3000MHz的RF频率范围、1900MHz至3000MHz的LO频率范围，以及DC至350MHz 的IF频率范围。该器件也可工作在上述频率范围之外，详情请参阅*典型工作特性*。

当LO频率范围为1900MHz至3000MHz时，该器件同样可实现低端LO注入。如果LO频率低于1900MHz，请参考MAX2039。

RF端口和非平衡变压器

当MAX2041作为下变频器使用时，RF输入端内部匹配至50Ω，无需外部匹配元件。由于输入端口通过内部非平衡变压器直流短路到地，所以需要接隔直流电容。在1400MHz至3000MHz频率范围内，RF回波损耗的典型值优于17dB。当MAX2041作为上变频器使用时，同样，RF单端输出匹配至50Ω。

LO输入、缓冲器和非平衡变压器

在1900MHz至3000MHz LO频率范围内，MAX2041既可用于高端本振注入，也可用于低端本振注入。对于LO频率范围是1500MHz至2000MHz的器件，请参阅MAX2039的数据资料。MAX2041还包括内部LO SPDT开关，这一附加功能使其能够用于跳频设计。该开关用来选择两个单端LO端口，允许外部振荡器在开关接通之前建立在特定频率上。LO开关时间典型值小于50ns，能够满足绝大多数GSM应用的要求。如果不使用跳频功能，将开关设置到任意一个LO输入。该开关由数字输入(LOSEL)控制：数字输入为逻辑高电平时，选中LO2；为逻辑低时，选中LO1。为避免这部分电路损坏，数字逻辑施加于LOSEL之前，电压**必须**达到V_{CC} (参见*Absolute Maximum Ratings*)。LO1和LO2输入内部匹配至50Ω，仅需一只22pF的隔直电容。

对于LO驱动，两级内部LO缓冲器允许很宽的输入功率范围。片上低损耗非平衡变压器和LO缓冲器共同驱动双平衡混频器。LO输入与IF输出之间的接口和匹配元件均已集成在芯片内。

高线性度混频器

MAX2041的核心是一个双平衡、高性能的无源混频器。内部LO缓冲器输出的较高摆幅提供出色的线性度。

差分IF

MAX2041混频器的IF频率范围是DC至350MHz。这些差分端口对于提供增强的IIP2性能非常有效。单端IF应用需要一个1:1非平衡变压器将IF 50Ω差分阻抗转化为50Ω单端系统。经过非平衡变压器转换之后，IF回波损耗优于15dB。上变频时，差分IF作为输入端口。用户可在混频器之后接一个差分IF放大器，但此时两个IF引脚需要隔直流。在这种配置中，IF+和IF-引脚需要通过一个大电阻(大约1kΩ)返回到地。将RF TAP (引脚3)接地，并交流耦合IF+和IF-端口(引脚19和18)，也可以构成该接地回路。

应用信息

输入和输出匹配

RF和LO输入端内部匹配至50Ω，无需外接匹配元件。在1400MHz至3000MHz频率范围内，RF端口的典型回波损耗优于17dB；而在1900MHz至3000MHz的频率范围内，LO端口的典型回波损耗优于16dB。RF和LO输入端只需要隔直流电容连接。

IF输出阻抗为50Ω (差分)。为方便评估，用外部低损耗1:1 (阻抗比)非平衡变压器将该阻抗转化为50Ω单端输出(参见*典型应用电路*)。

偏置电阻

LO缓冲器的偏置电流可以通过微调电阻R1进行优化。如果需要降低电流损耗，并允许降低性能指标，请与厂商联系。如果很难找到±1%的偏置电阻，可以用±5%的标准电阻代替。

布局考虑

设计合理的PCB是RF/微波电路的基本要求，需保证RF信号线尽可能短，以减小损耗、辐射和寄生电感。为获得最佳性能，将接地引脚直接连接到封装底部的裸焊盘。PCB的裸焊盘**必须**连接至PCB的地层。连接裸焊盘至PCB地层时，尽可能使用多个接地过孔。这种方法为该器件提供了良好的RF/导热路径。将裸焊盘焊接至PCB器件封装的底部。PCB布局可以参考MAX2041评估板。Gerber文件可在www.maxim-ic.com.cn申请得到。

电源旁路

合理的电源旁路对高频电路的稳定性至关重要。用电容旁路每一个V_{CC}引脚和TAP，如*典型应用电路*所示；参见表1。将TAP的对地旁路电容放置在与TAP引脚相距100mil以内的位置。

表1. 典型应用电路的元件列表

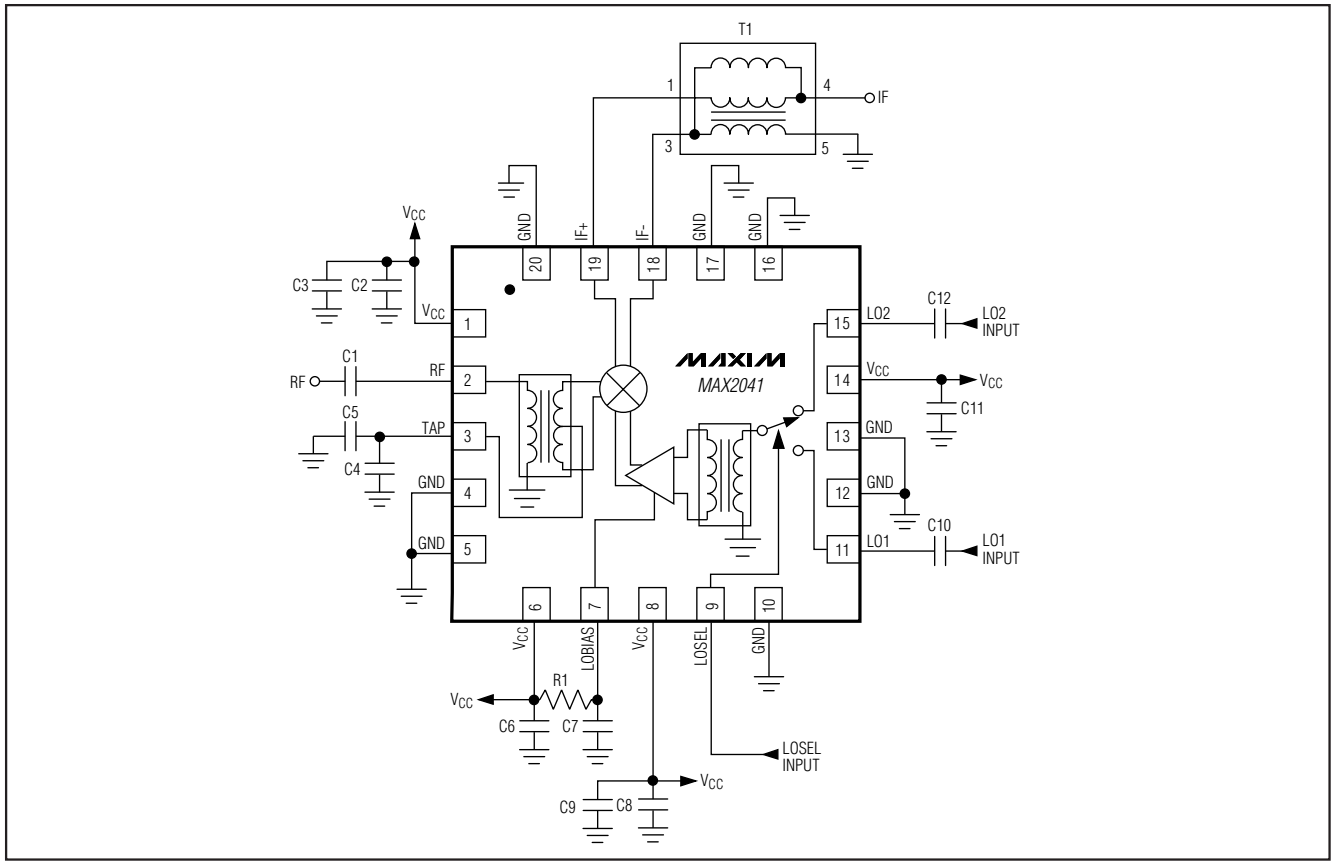
COMPONENT	VALUE	DESCRIPTION
C1	4pF	Microwave capacitor (0603)
C4	10pF	Microwave capacitor (0603)
C2, C6, C7, C8, C10, C12	22pF	Microwave capacitors (0603)
C3, C5, C9, C11	0.01µF	Microwave capacitors (0603)
R1	549Ω	±1% resistor (0603)
T1	1:1 Balun	IF balun with DC grounded ports M/A-COM MABAES0029
U1	MAX2041	Maxim IC

裸焊盘RF/导热考虑事项

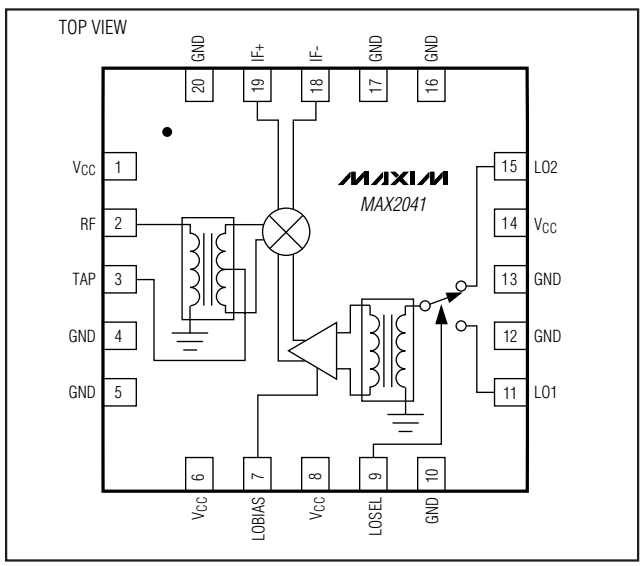
MAX2041 20引脚薄型QFN-EP封装的裸焊盘提供了一条与管芯之间的低热阻路径。设计PCB时，使其通过MAX2041的EP导热很重要。此外，EP与电气地之间还提供了一个低电感路径。裸焊盘**必须**直接或通过一系列电镀过孔连接到PCB的地层。

高线性度、1700MHz至3000MHz上变频/下变频混频器，带有LO缓冲器/开关

典型应用电路



引脚配置



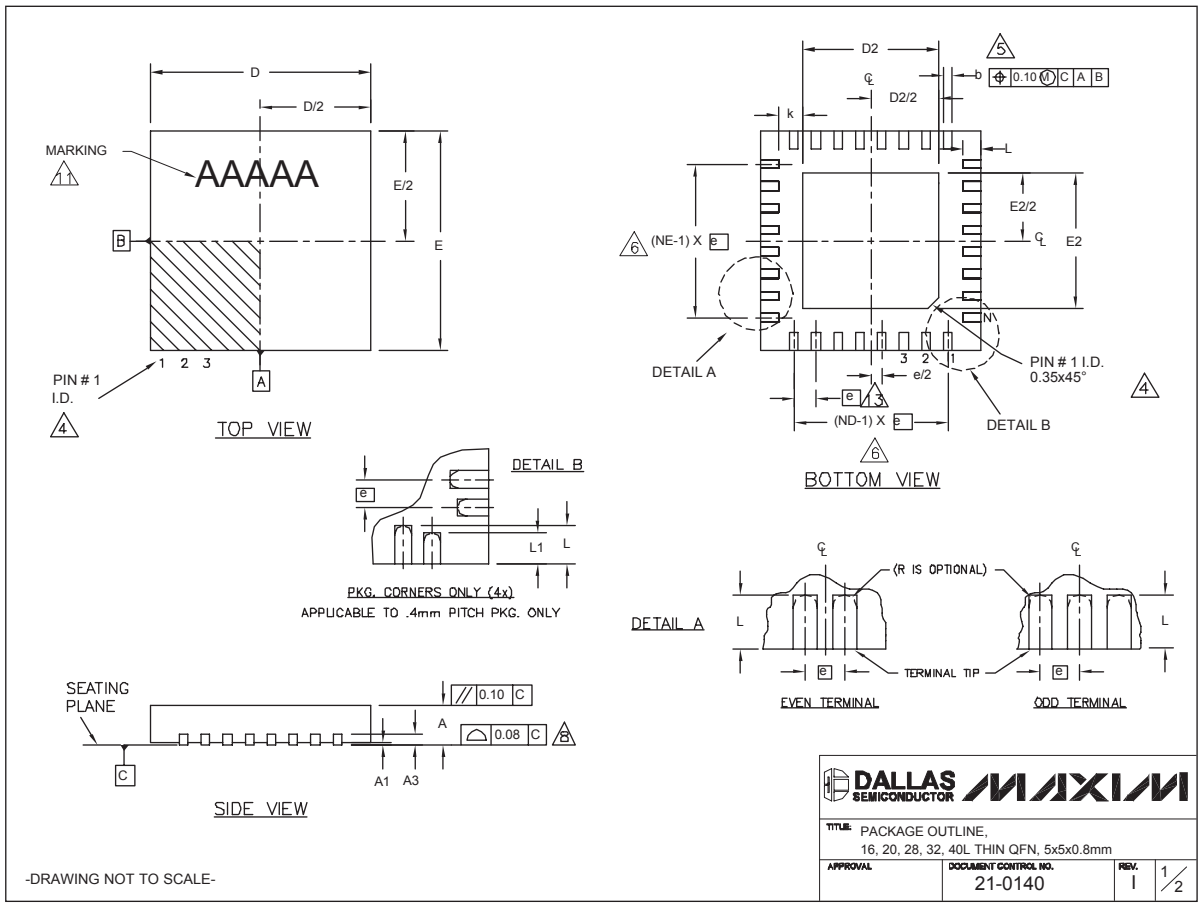
芯片信息

PROCESS: SiGe BiCMOS

封装信息

(本数据资料提供的封装图可能不是最近的规格，如需最近的封装外型信息，请查询 **www.maxim-ic.com.cn/packages**。)

QFN THIN.EPS



封装信息(续)

(本数据资料提供的封装图可能不是最近的规格，如需最近的封装外型信息，请查询 **www.maxim-ic.com.cn/packages**。)

COMMON DIMENSIONS															
PKG.	16L 5x5			20L 5x5			28L 5x5			32L 5x5			40L 5x5		
SYMBOL	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80	0.70	0.75	0.80
A1	0	0.02	0.05	0	0.02	0.05	0	0.02	0.05	0	0.02	0.05	0	0.02	0.05
A3	0.20 REF.			0.20 REF.			0.20 REF.			0.20 REF.			0.20 REF.		
b	0.25	0.30	0.35	0.25	0.30	0.35	0.20	0.25	0.30	0.20	0.25	0.30	0.15	0.20	0.25
D	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10
E	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10	4.90	5.00	5.10
e	0.80 BSC.			0.65 BSC.			0.50 BSC.			0.50 BSC.			0.40 BSC.		
k	0.25	-	-	0.25	-	-	0.25	-	-	0.25	-	-	0.25	0.35	0.45
L	0.30	0.40	0.50	0.45	0.55	0.65	0.45	0.55	0.65	0.30	0.40	0.50	0.40	0.50	0.60
L1	-	-	-	-	-	-	-	-	-	-	-	-	0.30	0.40	0.50
N	16			20			28			32			40		
ND	4			5			7			8			10		
NE	4			5			7			8			10		
JEDEC	WHHB			WHHC			WHHD-1			WHHD-2			-----		

EXPOSED PAD VARIATIONS								
PKG. CODES	D2			E2			L exceptions ±0.15	DOWN BONDS ALLOWED
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.		
T1655-2	3.00	3.10	3.20	3.00	3.10	3.20	**	YES
T1655-3	3.00	3.10	3.20	3.00	3.10	3.20	**	NO
T1655N-1	3.00	3.10	3.20	3.00	3.10	3.20	**	NO
T2055-3	3.00	3.10	3.20	3.00	3.10	3.20	**	YES
T2055-4	3.00	3.10	3.20	3.00	3.10	3.20	**	NO
T2055-5	3.15	3.25	3.35	3.15	3.25	3.35	0.40	YES
T2855-3	3.15	3.25	3.35	3.15	3.25	3.35	**	YES
T2855-4	2.60	2.70	2.80	2.60	2.70	2.80	**	YES
T2855-5	2.60	2.70	2.80	2.60	2.70	2.80	**	NO
T2855-6	3.15	3.25	3.35	3.15	3.25	3.35	**	NO
T2855-7	2.60	2.70	2.80	2.60	2.70	2.80	**	YES
T2855-8	3.15	3.25	3.35	3.15	3.25	3.35	0.40	YES
T2855N-1	3.15	3.25	3.35	3.15	3.25	3.35	**	NO
T3255-3	3.00	3.10	3.20	**3**.00	3.10	3.20	**	YES
T3255-4	3.00	3.10	3.20	**3**.00	3.10	3.20	**	NO
T3255-5	3.00	3.10	3.20	3.00	3.10	3.20	**	YES
T3255N-1	3.00	3.10	3.20	3.00	3.10	3.20	**	NO
T4055-1	3.20	3.30	3.40	3.20	3.30	3.40	**	YES

** SEE COMMON DIMENSIONS TABLE

NOTES:

1. DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.
2. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
3. N IS THE TOTAL NUMBER OF TERMINALS.
4. THE TERMINAL #1 IDENTIFIER AND TERMINAL NUMBERING CONVENTION SHALL CONFORM TO JESD 95-1 SPP-012. DETAILS OF TERMINAL #1 IDENTIFIER ARE OPTIONAL, BUT MUST BE LOCATED WITHIN THE ZONE INDICATED. THE TERMINAL #1 IDENTIFIER MAY BE EITHER A MOLD OR MARKED FEATURE.
5. DIMENSION b APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25 mm AND 0.30 mm FROM TERMINAL TIP.
6. ND AND NE REFER TO THE NUMBER OF TERMINALS ON EACH D AND E SIDE RESPECTIVELY.
7. DEPOPULATION IS POSSIBLE IN A SYMMETRICAL FASHION.
8. COPLANARITY APPLIES TO THE EXPOSED HEAT SINK SLUG AS WELL AS THE TERMINALS.
9. DRAWING CONFORMS TO JEDEC MO220, EXCEPT EXPOSED PAD DIMENSION FOR T2855-3 AND T2855-6.
10. WARPAGE SHALL NOT EXCEED 0.10 mm.
11. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.
12. NUMBER OF LEADS SHOWN ARE FOR REFERENCE ONLY.
13. LEAD CENTERLINES TO BE AT TRUE POSITION AS DEFINED BY BASIC DIMENSION "e", ±0.05.

-DRAWING NOT TO SCALE-

DALLAS SEMICONDUCTOR MAXIM

TITLE: PACKAGE OUTLINE, 16, 20, 28, 32, 40L THIN QFN, 5x5x0.8mm

APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0140	I	2/2

MAXIM北京办事处

北京 8328信箱 邮政编码 100083

免费电话：800 810 0310

电话：010-6211 5199

传真：010-6211 5299