19-3908; Rev 0; 12/05

可提供评估板

1700MHz至3000MHz高线性度、低LO泄漏、基站Rx/Tx混频器

MAX2043

概述

MAX2043高线性度、无源上变频/下变频混频器可为UMTS/WCDMA、DCS、PCS和WiMAX基站应用提供大约+31dBm的IIP3、+67dBc的LO ± 2IF杂散抑制、7.8dB的噪声系数、7.5dB的转换损耗以及-52dBm的LO泄漏指标。该混频器具有1700MHz至3000MHz的RF频率范围和1900MHz至3000MHz的LO频率范围，非常适合高端LO注入结构。

MAX2043不仅具有出色的线性度和噪声性能，还具有非常高的器件集成度。MAX2043内部集成了RF和LO端口的非平衡变压器、双输入LO选择开关、LO缓冲器和双平衡混频器。片上非平衡变压器可用于下变频器单端RF输入(或上变频器RF输出)以及单端LO输入的转换。MAX2043需要标称值为0dBm的LO驱动，供电电流保证小于108mA。IF端口直流耦合非常适合直接变换或调制。作为上变频器，该器件具有小于-160dBc/Hz的低输出噪声底(发送0dBm RF功率时为-160dBm/Hz)。

MAX2043采用36引脚薄型QFN封装(6mm x 6mm)，带有裸焊盘。可保证工作在-40°C至+85°C扩展级温度范围。

应用

UMTS/WCDMA和3G基站

DCS 1800与EDGE基站

PCS 1900与EDGE基站

cdmaOne™和cdma2000®基站

WiMAX基站和企业网络设备

点到点微波通信系统

无线本地环路

个人移动通信设备

数字扩频通信系统

微波链路

特性

- ♦ +31dBm典型三阶输入截点
- ♦ +23dBm典型输入1dB压缩点
- ♦ 1700MHz至3000MHz RF频率范围
- ♦ 1900MHz至3000MHz LO频率范围
- ♦ DC至350MHz IF频率范围
- ♦ 7.5dB典型变频损耗
- ♦ 7.8dB典型噪声系数
- ♦ -160dBc/Hz LO噪声
- ♦ 在RF端口具有-52dBm的LO泄漏
- ♦ 67dBc LO ± 2IF杂散抑制
- ♦ -3dBm至+6dBm LO驱动
- ♦ +5V单电源供电
- ♦ 内置SPDT LO开关，LO1至LO2隔离度为43dB，50ns开关时间
- ♦ 内置RF和LO非平衡变压器，用于单端输入
- ♦ 外部电流设置电阻提供混频器的低功耗/低性能指标模式选项
- ♦ 提供无铅封装

定购信息

PART	TEMP RANGE	PIN-PACKAGE	PKG CODE
MAX2043ETX	-40°C to +85°C	36 TQFN-EP* (6mm x 6mm)	T3666-2
MAX2043ETX-T	-40°C to +85°C	36 TQFN-EP* (6mm x 6mm)	T3666-2
MAX2043ETX+	-40°C to +85°C	36 TQFN-EP* (6mm x 6mm)	T3666-2
MAX2043ETX+T	-40°C to +85°C	36 TQFN-EP* (6mm x 6mm)	T3666-2

*EP = 裸焊盘。
+表示无铅封装。
T = 卷带包装。

引脚配置和典型应用电路见本数据资料的最后部分。

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

1700MHz至3000MHz高线性度、低LO泄漏、基站Rx/Tx混频器

ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND .....-0.3V to +5.5V
RF (RF is DC shorted to GND through balun).....50mA
LO1, LO2 to GND .....±0.3V
RFTAP, IF+, IF- to GND.....-0.3V to (V_{CC} + 0.3V)
LOSEL to GND .....-0.3V to (V_{CC} + 0.3V)
RF, IF, and LO Input Power** .....+20dBm
LO_ADJ Current.....5mA

Continuous Power Dissipation (T_A = +70°C)
36-Pin TQFN (derated 30.3mW/°C above +70°C) 2200mW
Operating Temperature Range .....-40°C to +85°C
Junction Temperature.....+150°C
θ_{JC} .....+7.4°C/W
θ_{JA} .....+38°C/W
Storage Temperature Range .....-65°C to +150°C
Lead Temperature (soldering, 10s) .....+300°C

***Maximum reliable continuous input power applied to the RF, IF, and LO ports of this device is +15dBm from a 50Ω source.*

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

(MAX2043 *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. A 360Ω resistor is connected from LO_ADJ to GND. 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	5.25	V
Supply Current	I_{CC}	Total supply current		108	140	mA
LOSEL Logic 0 Input Voltage	V_{IL}				0.8	V
LOSEL Logic 1 Input Voltage	V_{IH}		2			V
LOSEL Logic Input Current	I_{IH} and I_{IL}		-10		+10	µA

AC ELECTRICAL CHARACTERISTICS (Downconverter Operation)

(MAX2043 *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, $f_{RF} < f_{LO}$, 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	f_{RF}		1700		3000	MHz
LO Frequency	f_{LO}		1900		3000	MHz
IF Frequency (Notes 1, 2)	f_{IF}		0		350	MHz
Small-Signal Conversion Loss	L_C	DCS 1800: P_{RF} = -10dBm, P_{LO} = 0dBm, f_{IF} = 200MHz, f_{RF} = 1710MHz to 1785MHz		7.5		dB
		PCS 1900: P_{RF} = -10dBm, P_{LO} = 0dBm, f_{IF} = 200MHz, f_{RF} = 1850MHz to 1910MHz		7.5		
		UMTS 2100: P_{RF} = -10dBm, P_{LO} = 0dBm, f_{IF} = 200MHz, f_{RF} = 1920MHz to 1980MHz		7.5		
Conversion Loss Variation from Nominal		DCS 1800: f_{RF} = 1710MHz to 1785MHz		±0.5		dB
		PCS 1900: f_{RF} = 1850MHz to 1910MHz		±0.5		
		UMTS 2100: f_{RF} = 1920MHz to 1980MHz		±0.5		

AC ELECTRICAL CHARACTERISTICS (Downconverter Operation) (continued)

(MAX2043 *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, $f_{RF} < f_{LO}$, 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
Conversion Loss Variation Over Temperature		T_C = -40°C to +85°C		0.0075		dB/°C
Noise Figure, Single Sideband	NF	T_C = +25°C, DCS 1800: f_{RF} = 1710MHz to 1785MHz		7.8		dB
		T_C = +25°C, PCS 1900: f_{RF} = 1850MHz to 1910MHz		7.8		
		T_C = +25°C, UMTS 2100: f_{RF} = 1920MHz to 1980MHz		7.8		
Noise Figure Under Blocking Condition (Note 3)		$P_{BLOCKER}$ = +5dBm at 2100MHz, f_{RF} = 2000MHz, f_{LO} = 2190MHz, P_{LO} = 0dBm		19		dB
Input Compression Point (Note 4)	IP1dB	High-side injection		+23		dBm
3rd-Order Input Intercept Point	IIP3	High-side injection, f_{RF1} = 1900MHz, f_{RF2} = 1901MHz, 0dBm per tone at RF port		31		dBm
3rd-Order Input Intercept Point Variation		T_C = -40°C to +85°C		±0.75		dB
2LO - 2RF Spur		f_{RF} = 1900MHz, f_{LO} = 2100MHz, f_{SPUR} = 2000MHz, P_{RF} = 0dBm, P_{LO} = 0dBm		63		dBc
3LO - 3RF Spur		f_{RF} = 1900MHz, f_{LO} = 2100MHz, f_{SPUR} = 2033.333MHz, P_{RF} = 0dBm, P_{LO} = 0dBm		67		dBc
LO Drive (Note 5)	P_{LO}		-3	0	+6	dBm
LO1-to-LO2 Port Isolation		P_{LO1} = P_{LO2} = +3dBm, f_{IF} = 200MHz (Note 6)		43		dB
LO Leakage at RF Port		P_{LO} = +3dBm, f_{LO} = 2260MHz		-52	-38	dBm
LO Switching Time		50% of LOSEL to IF settled within 2 degrees		50		ns
LO Leakage at IF Port		P_{LO} = +3dBm		-35		dBm
RF-to-IF Isolation		P_{LO} = +3dBm		38		dB
RF Input Return Loss		LO on and IF terminated		17		dB
LO Input Return Loss		RF and IF terminated		14		dB
IF Return Loss		RF and LO terminated in 50Ω, f_{IF} = 200MHz (Note 7)		20		dB

AC ELECTRICAL CHARACTERISTICS (Upconverter Operation)

(MAX2043 *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} = 2170MHz, f_{LO} = 2260MHz, f_{IF} = 90MHz, T_C = +25°C, unless otherwise noted.) (Note 3)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input Compression Point	IP1dB			23		dBm
3rd-Order Input Intercept Point	IIP3	Two tones: f_{IF1} = 90MHz, f_{IF2} = 91MHz, P_{IF} = +5dBm/tone, f_{LO} = 2230MHz, P_{LO} = 0dBm		28		dBm
LO ± 2IF Spur		LO - 2IF	60	67		dBc
		LO + 2IF	60	69		
LO ± 3IF Spur		LO - 3IF		63		dBc
		LO + 3IF		64		
Output Noise Floor		P_{OUT} = 0dBm		-160		dBm/Hz

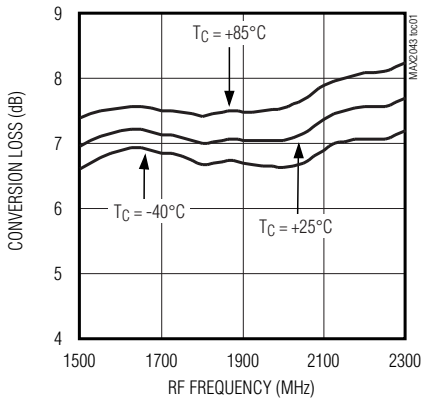
Note 1: All limits reflect losses of external components. Output measurement taken at IF port of *Typical Application Circuit*.
Note 2: The lower IF frequency limit of 0MHz is limited by the external IF transformer.
Note 3: Measured with external LO source noise filtered so its noise floor is not a contributor. Measured with: f_{RF} = 2000MHz, $f_{BLOCKER}$ = 2100MHz, f_{LO} = 2190MHz, using a 190MHz SAW filter on the IF port. 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: Maximum reliable continuous input power applied to the RF or IF port of this device is +15dBm from a 50Ω source.
Note 5: *Typical Operating Characteristics* show LO drive extended to +6dBm
Note 6: Measured IF port at IF frequency. f_{LO1} and f_{LO2} are offset by 1MHz.
Note 7: IF return loss can be optimized by external matching components.

典型工作特性

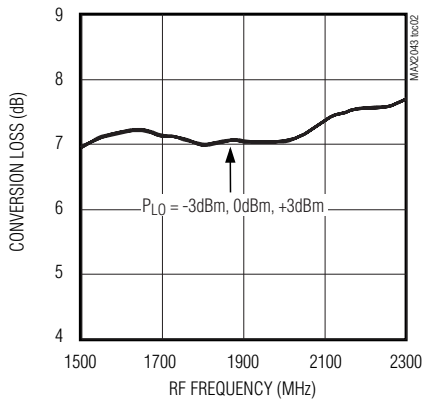
(MAX2043 *Typical Application Circuit*, C2 not installed, RFTAP = GND, V_{CC} = +5.0V, P_{LO} = 0dBm, LOSEL = "0" (LO2 selected), P_{RF} = 0dBm, $f_{LO} > f_{RF}$, f_{IF} = 200MHz, unless otherwise noted.)

Downconverter Curves

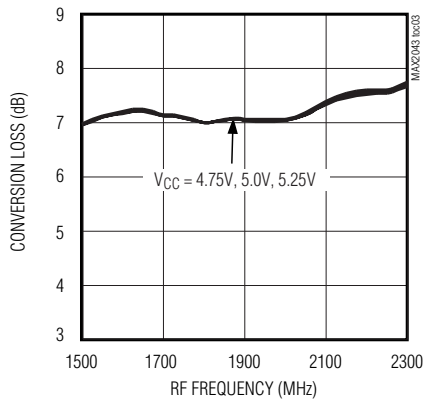
CONVERSION LOSS vs. RF FREQUENCY



CONVERSION LOSS vs. RF FREQUENCY



CONVERSION LOSS vs. RF FREQUENCY

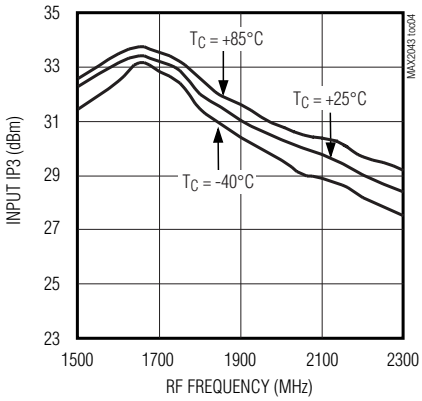


典型工作特性(续)

(MAX2043 *Typical Application Circuit*, C2 not installed, RFTAP = GND, V_{CC} = +5.0V, P_{LO} = 0dBm, LOSEL = "0" (LO2 selected), P_{RF} = 0dBm, $f_{LO} > f_{RF}$, f_{IF} = 200MHz, unless otherwise noted.)

Downconverter Curves

INPUT IP3 vs. RF FREQUENCY



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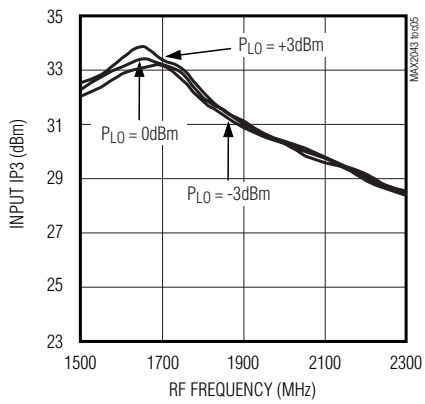

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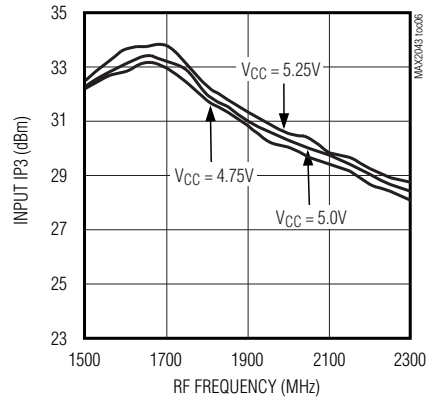
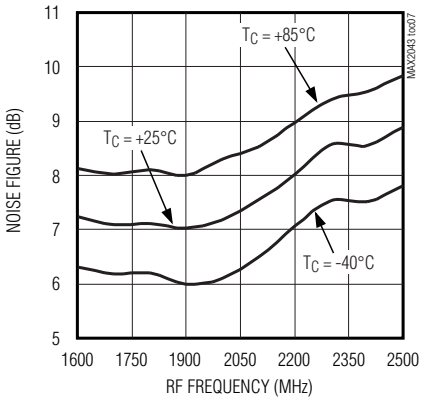


NOISE FIGURE vs. RF FREQUENCY



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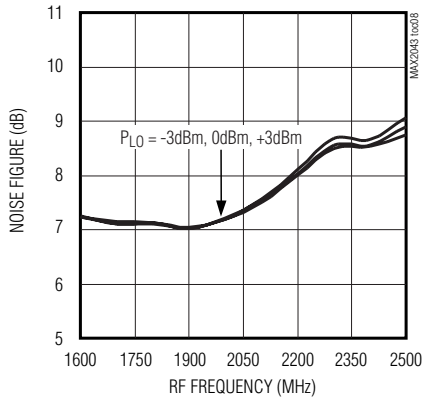
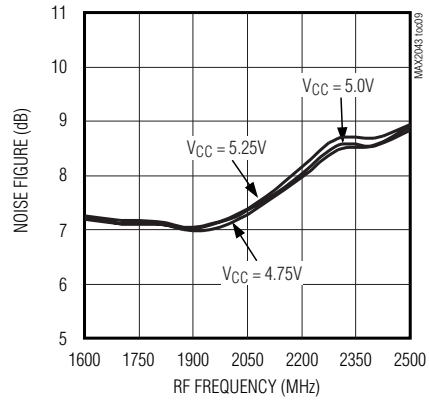
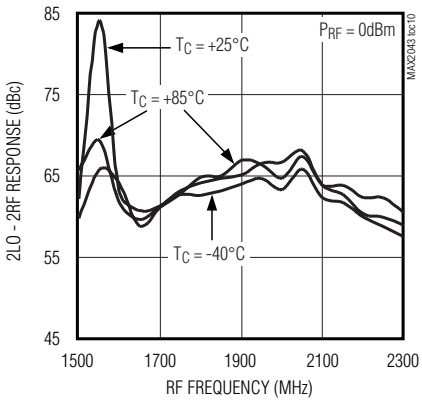


NOISE FIGURE vs. RF FREQUENCY



2LO - 2RF RESPONSE vs. RF FREQUENCY



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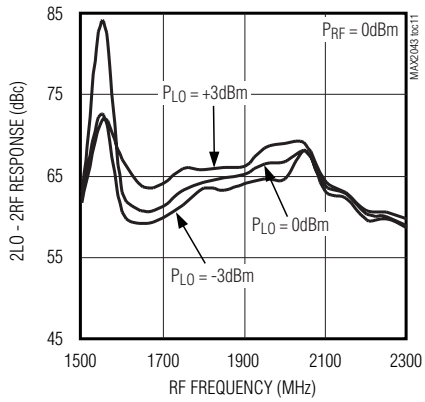

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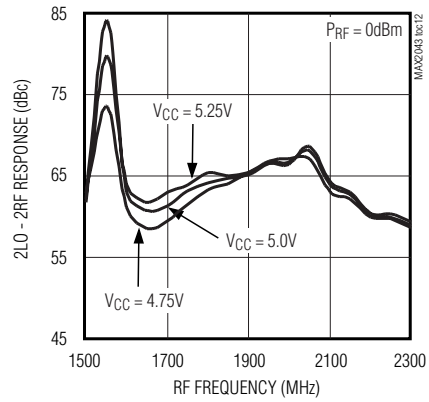


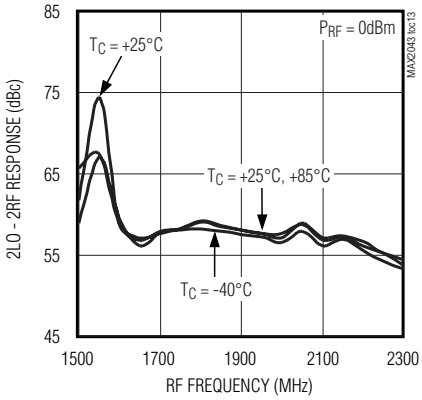
1700MHz至3000MHz高线性度、低LO泄漏、基站Rx/Tx混频器

典型工作特性(续)

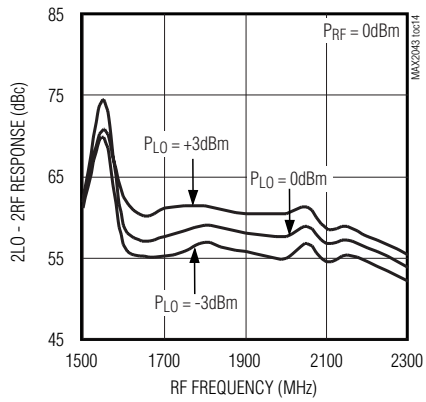
(MAX2043 *Typical Application Circuit*, C2 not installed, RFTAP = GND, V_{CC} = +5.0V, P_{LO} = 0dBm, LOSEL = "0" (LO2 selected), P_{RF} = 0dBm, $f_{LO} > f_{RF}$, f_{IF} = 200MHz, unless otherwise noted.)

Downconverter Curves

2LO - 2RF RESPONSE vs. RF FREQUENCY LOSEL = "1" (LO1 SELECTED)



2LO - 2RF RESPONSE vs. RF FREQUENCY LOSEL = "1" (LO1 SELECTED)



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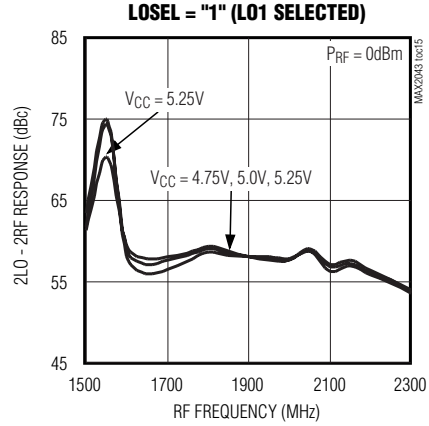
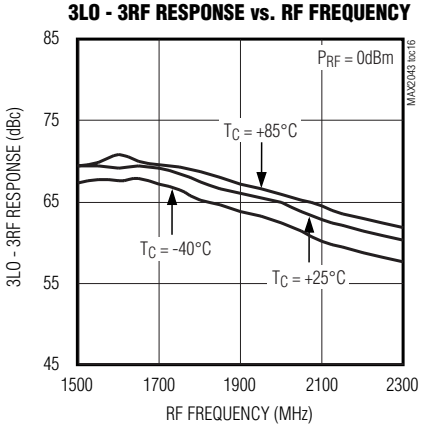
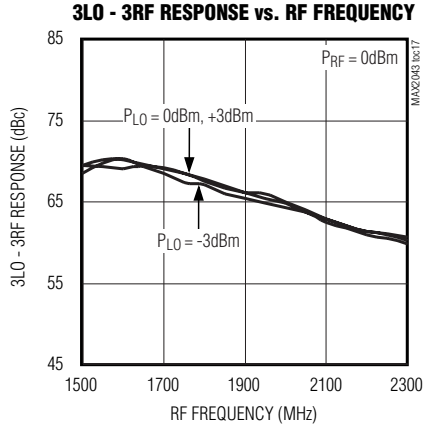


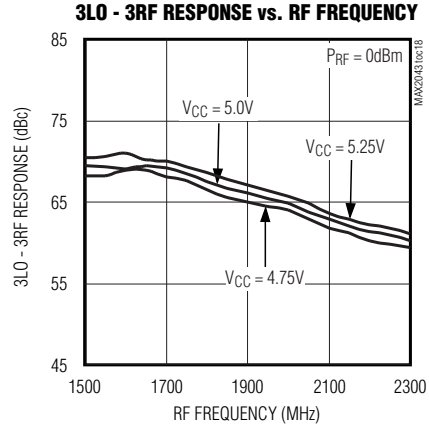
3LO - 3RF RESPONSE vs. RF FREQUENCY



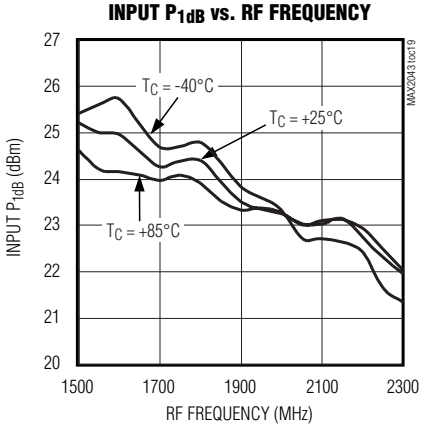
3LO - 3RF RESPONSE vs. RF FREQUENCY



3LO - 3RF RESPONSE vs. RF FREQUENCY



INPUT P_{1dB} vs. RF FREQUENCY



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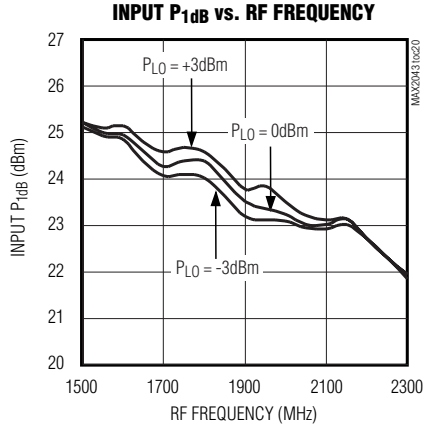

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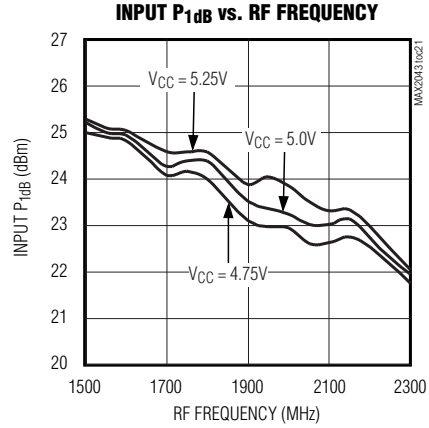

典型工作特性(续)

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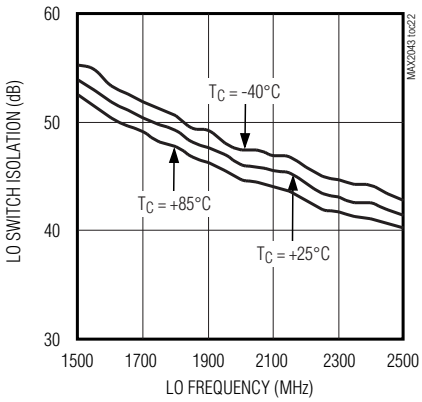
Downconverter Curves

LO SWITCH ISOLATION vs. LO FREQUENCY



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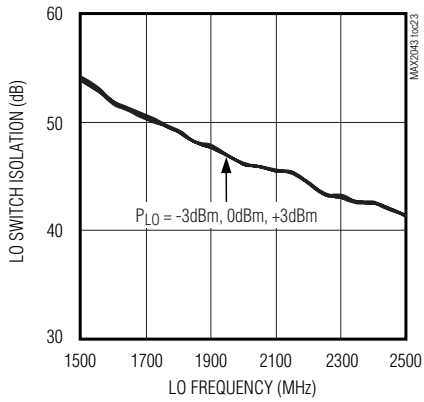
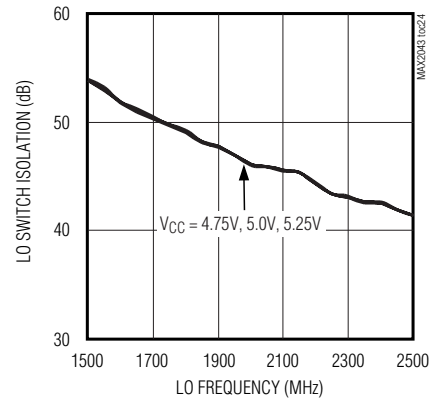
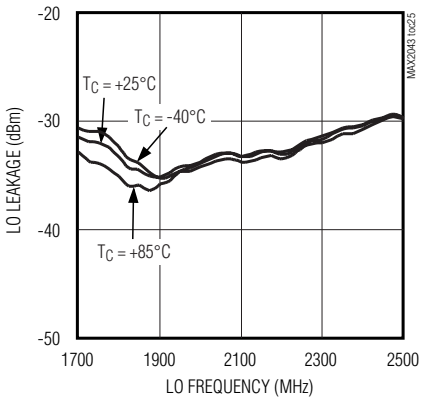


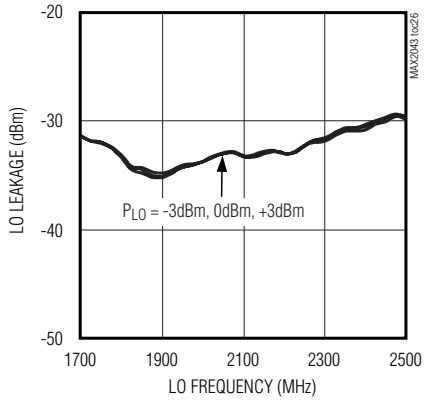
LO SWITCH ISOLATION vs. LO FREQUENCY



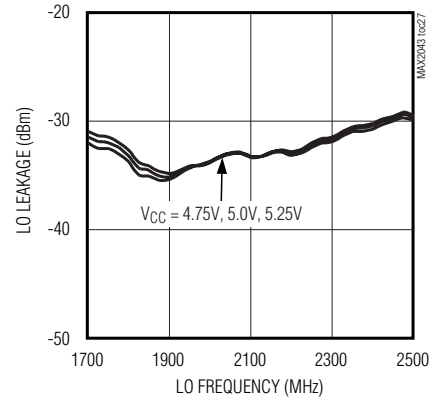
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



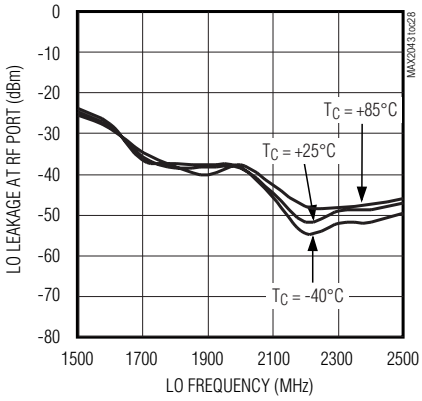
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



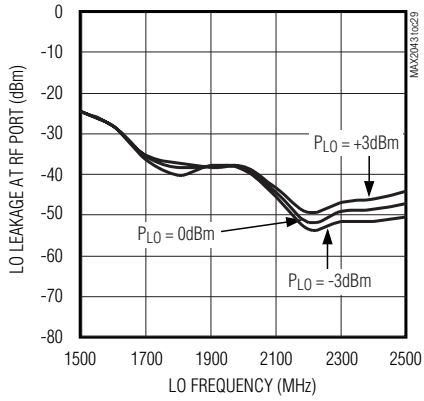
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



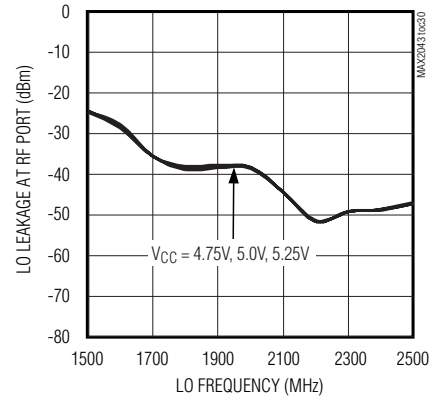
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



LO LEAKAGE AT RF PORT vs. LO FREQUENCY



LO LEAKAGE AT RF PORT vs. LO FREQUENCY



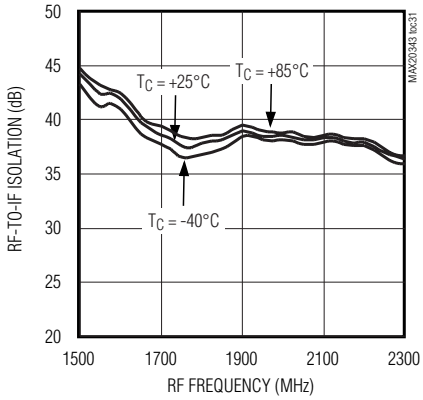
1700MHz至3000MHz高线性度、低LO泄漏、基站Rx/Tx混频器

典型工作特性(续)

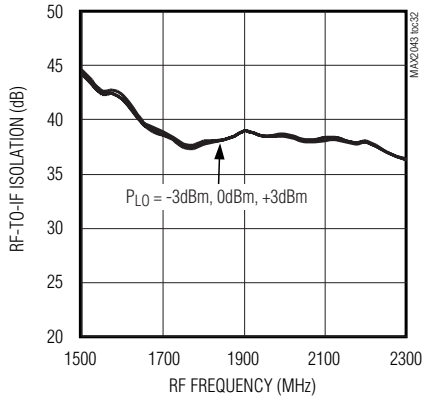
(MAX2043 *Typical Application Circuit*, C2 not installed, RFTAP = GND, V_{CC} = +5.0V, P_{LO} = 0dBm, LOSEL = "0" (LO2 selected), P_{RF} = 0dBm, $f_{LO} > f_{RF}$, f_{IF} = 200MHz, unless otherwise noted.)

Downconverter Curves

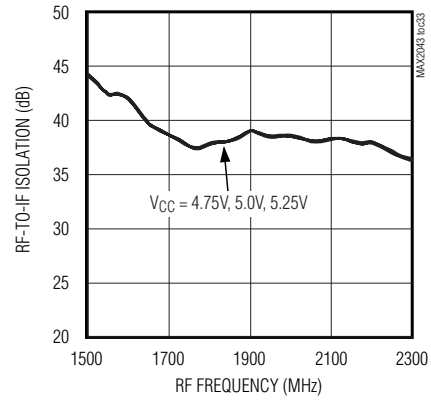
RF-TO-IF ISOLATION vs. RF FREQUENCY



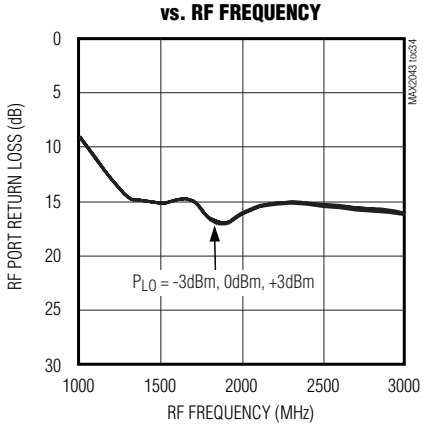
RF-TO-IF ISOLATION vs. RF FREQUENCY



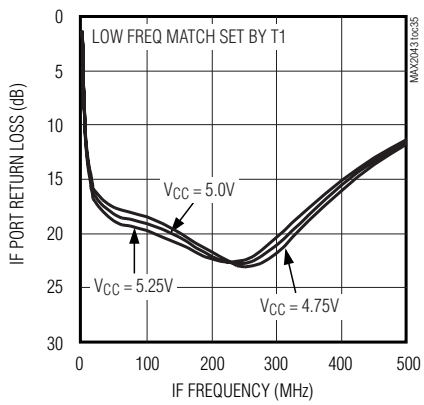
RF-TO-IF ISOLATION vs. RF FREQUENCY



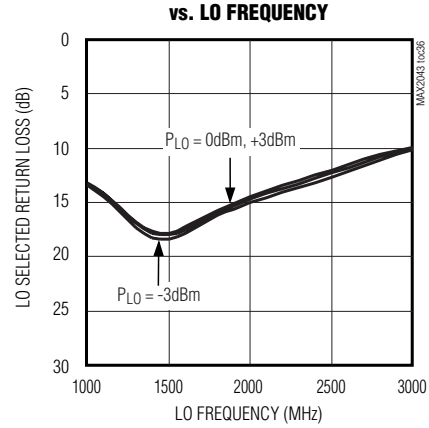
RF PORT RETURN LOSS vs. RF FREQUENCY



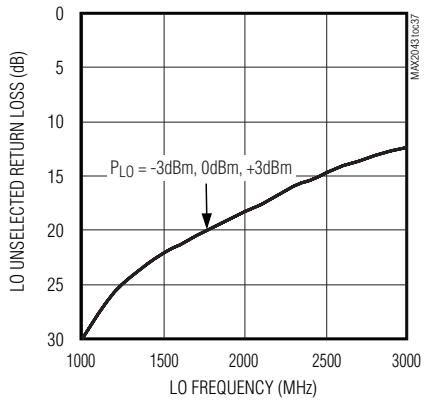
IF PORT RETURN LOSS vs. IF FREQUENCY



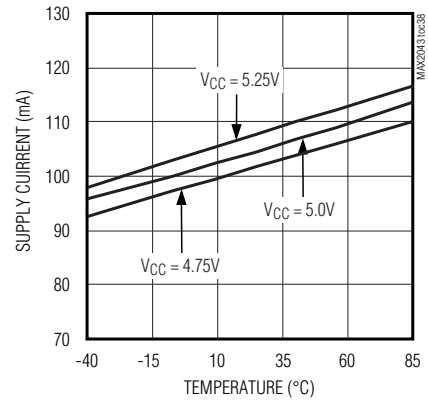
LO SELECTED RETURN LOSS vs. LO FREQUENCY



LO UNSELECTED RETURN LOSS vs. LO FREQUENCY



SUPPLY CURRENT vs. TEMPERATURE (T_C)

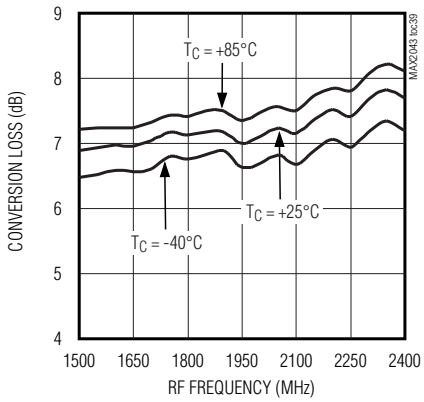


典型工作特性(续)

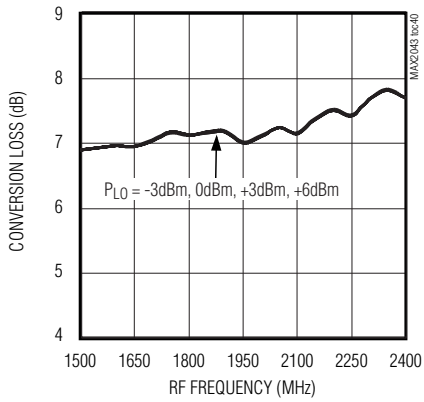
(MAX2043 *Typical Application Circuit*, C2 = 22pF, V_{CC} = +5.0V, P_{LO} = 0dBm, LOSEL = "1" (LO1 selected), P_{IF} = 0dBm, f_{RF} = f_{LO} - f_{IF}, f_{IF} = 90MHz, unless otherwise noted.)

Upconverter Curves

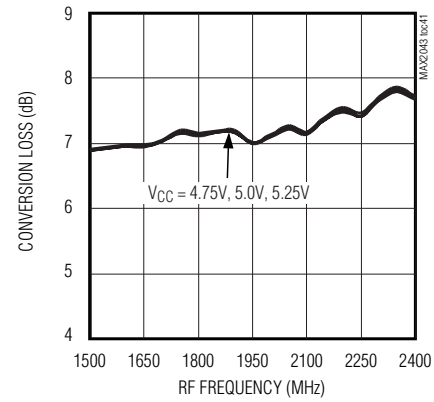
CONVERSION LOSS vs. RF FREQUENCY



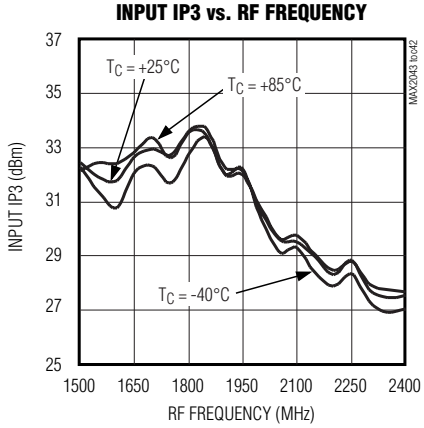
CONVERSION LOSS vs. RF FREQUENCY



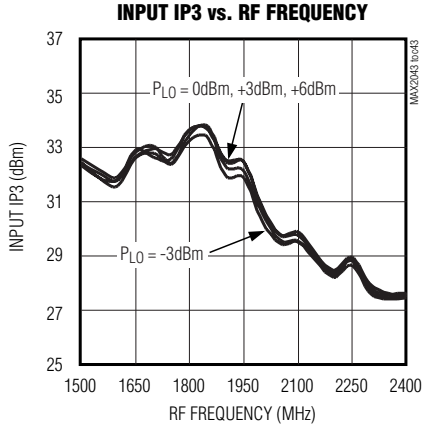
CONVERSION LOSS vs. RF FREQUENCY



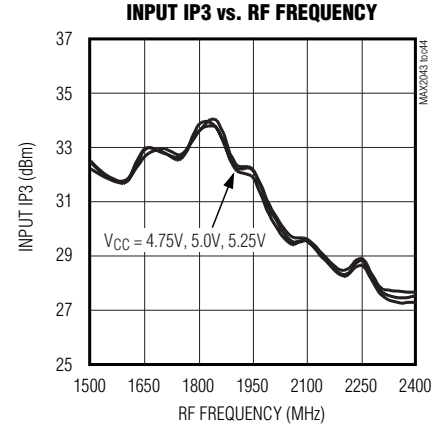
INPUT IP3 vs. RF FREQUENCY



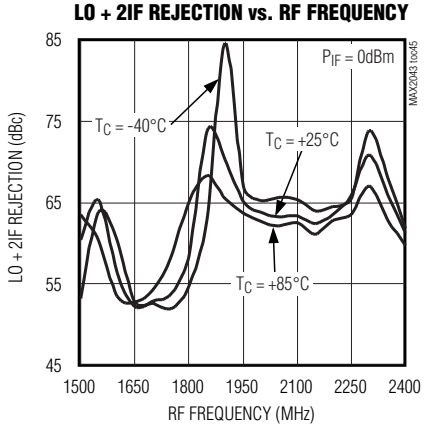
INPUT IP3 vs. RF FREQUENCY



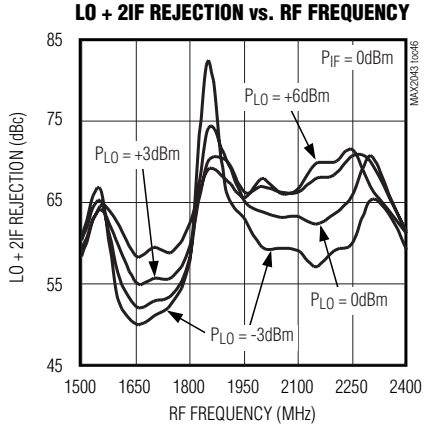
INPUT IP3 vs. RF FREQUENCY



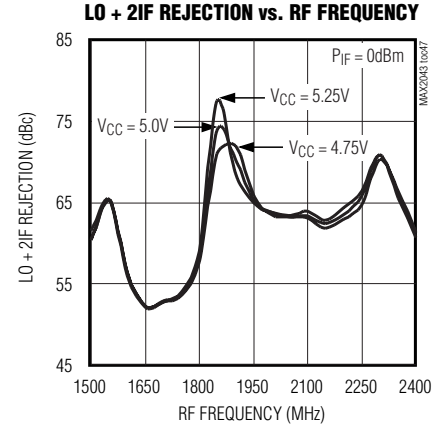
LO + 2IF REJECTION vs. RF FREQUENCY



LO + 2IF REJECTION vs. RF FREQUENCY



LO + 2IF REJECTION vs. RF FREQUENCY



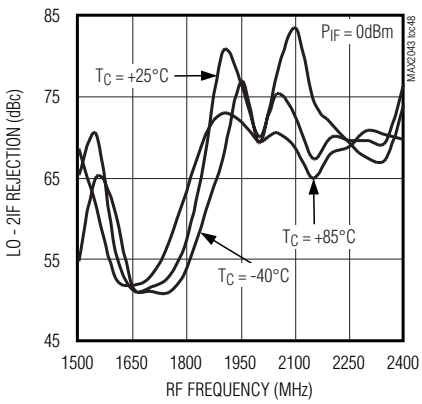
1700MHz至3000MHz高线性度、低LO泄漏、基站Rx/Tx混频器

典型工作特性(续)

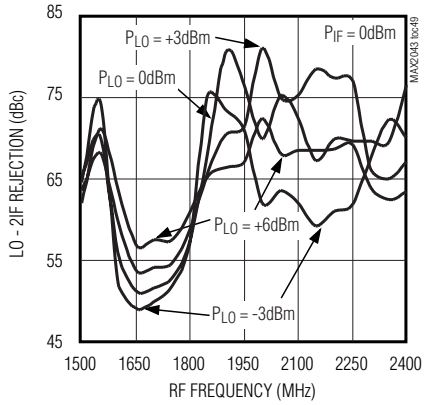
(MAX2043 *Typical Application Circuit*, C2 = 22pF, V_{CC} = +5.0V, P_{LO} = 0dBm, LOSEL = "1" (LO1 selected), P_{IF} = 0dBm, f_{RF} = f_{LO} - f_{IF}, f_{IF} = 90MHz, unless otherwise noted.)

Upconverter Curves

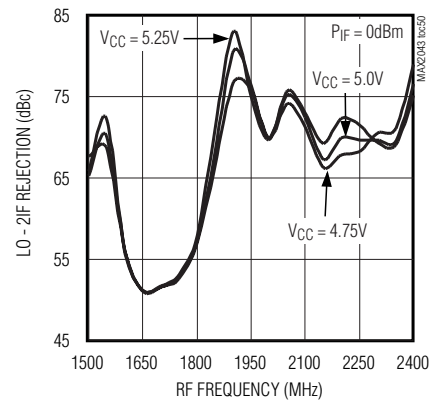
LO - 2IF REJECTION vs. RF FREQUENCY



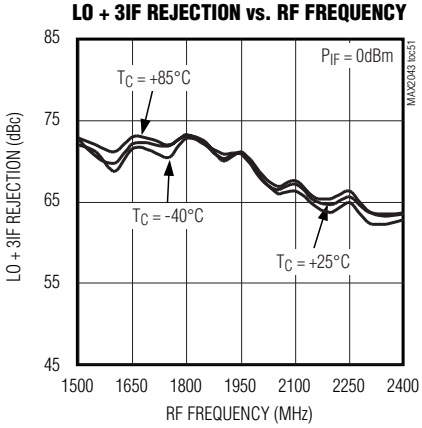
LO - 2IF REJECTION vs. RF FREQUENCY



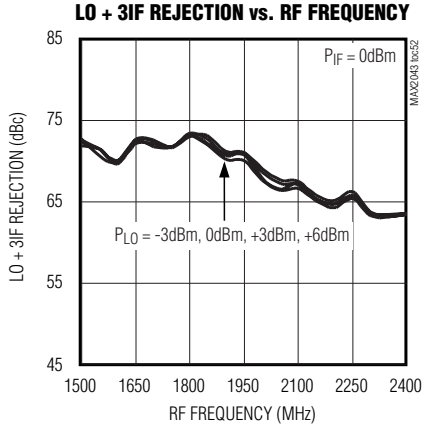
LO - 2IF REJECTION vs. RF FREQUENCY



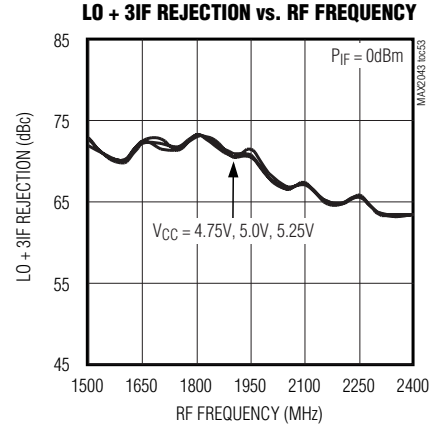
LO + 3IF REJECTION vs. RF FREQUENCY



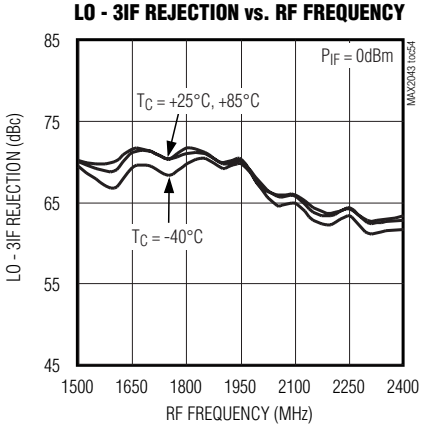
LO + 3IF REJECTION vs. RF FREQUENCY



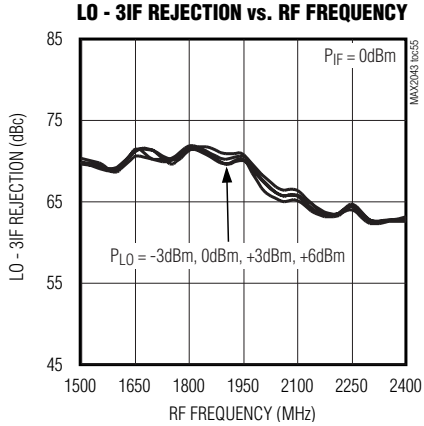
LO + 3IF REJECTION vs. RF FREQUENCY



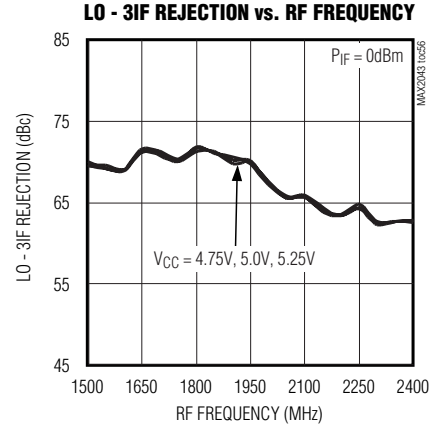
LO - 3IF REJECTION vs. RF FREQUENCY



LO - 3IF REJECTION vs. RF FREQUENCY



LO - 3IF REJECTION vs. RF FREQUENCY

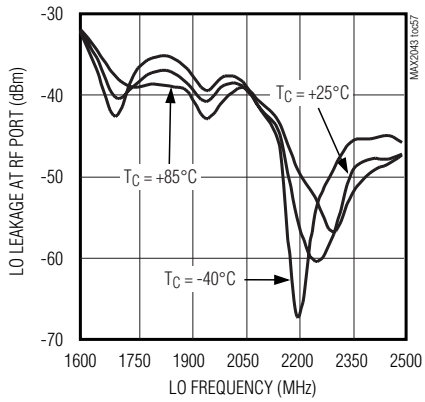


典型工作特性(续)

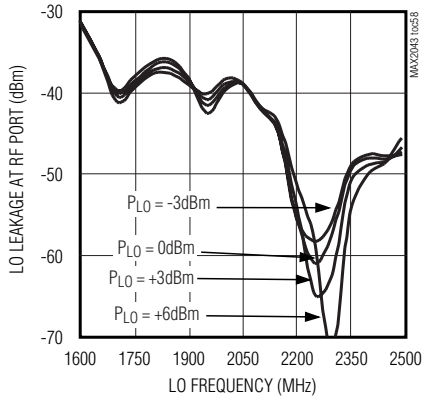
(MAX2043 *Typical Application Circuit*, C2 = 22pF, V_{CC} = +5.0V, P_{LO} = 0dBm, LOSEL = "1" (LO1 selected), P_{IF} = 0dBm, f_{RF} = f_{LO} - f_{IF}, f_{IF} = 90MHz, unless otherwise noted.)

Upconverter Curves

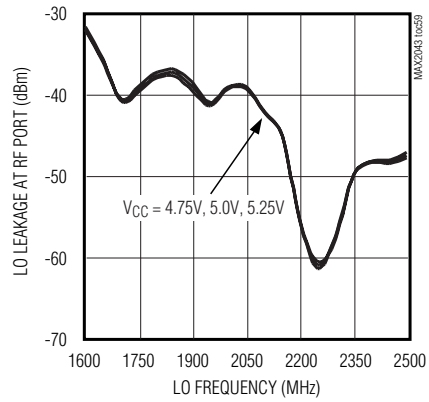
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



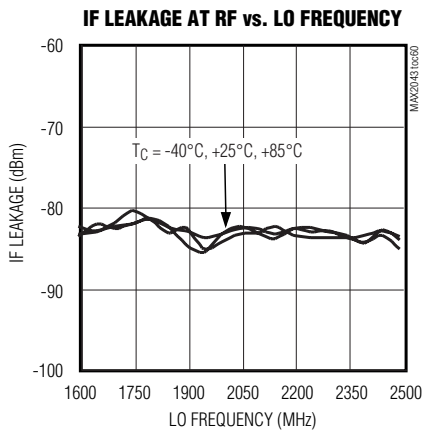
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



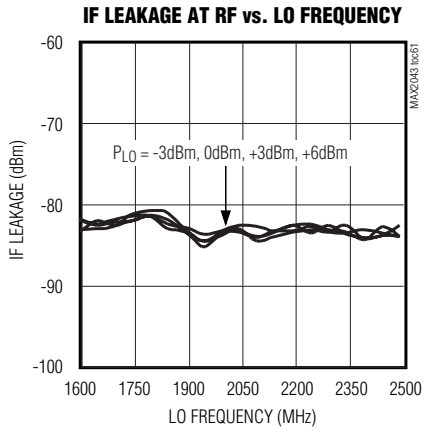
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



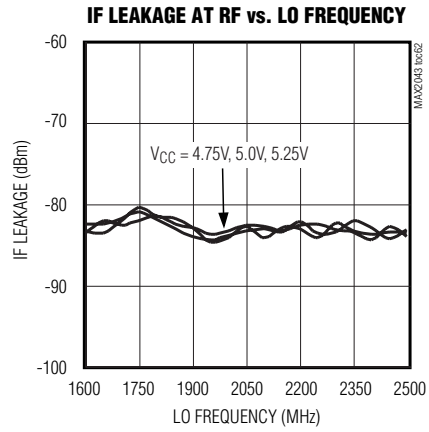
IF LEAKAGE AT RF vs. LO FREQUENCY



IF LEAKAGE AT RF vs. LO FREQUENCY



IF LEAKAGE AT RF vs. LO FREQUENCY



1700MHz至3000MHz高线性度、低LO泄漏、基站Rx/Tx混频器

引脚说明

引脚	名称	功能
1–5, 7, 10, 11, 12, 15, 18, 20, 22, 24, 25, 26, 28, 29, 31–36	GND	这些引脚无外部连接，且可以保持开路或接地。建议将这些引脚接到背面裸焊盘的地，以提高隔离度。
6, 16, 21, 30	V_{CC}	电源连接。连接至外部电源(5V)。用尽可能靠近该引脚安装的0.01µF电容旁路至GND。
8	RFTAP	内部RF非平衡变压器的中心抽头。连接在内部RF非平衡变压器的中心抽头。
9	RF	单端50Ω RF输入/输出。内部直流接地。
13, 14	IF+, IF- (ports)	差分IF端口(50Ω)，0V共模电压。
17	LO_ADJ	调节LO驱动。该引脚与地之间接360Ω ±1%电阻，设置LO驱动器的偏置。该电阻两端的直流电压为1.1V。
19	LO1	本振输入1，将LOSEL驱动至高电平选择LO1。
23	LOSEL	本振选择，逻辑0选择LO2，逻辑1选择LO1。
27	LO2	本振输入2，将LOSEL驱动至低电平选择LO2。
EP	GND	裸焊盘。将裸焊盘通过多个过孔焊接至地。

详细说明

MAX2043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7.5dB的变频损耗和典型的7.8dB的噪声系数。上变频和下变频转换的IIP3均为+31dBm。集成的非平衡变压器和匹配电路实现了RF端口和两个LO端口的50Ω单端连接。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)开关切换两个LO输入时具有50ns的开关时间，两个LO之间的隔离度是43dB，LO泄露为-52dBm。此外，集成的LO缓冲器可为混频器核提供高驱动电平，将MAX2043输入所需的LO驱动减小到-3dBm至+6dBm。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。

在较宽的频率范围内保证符合规范要求，因此，可广泛用于UMTS/WCDMA、2G/2.5G/3G DCS 1800、PCS 1900、cdma2000和WiMAX基站。MAX2043被指定应用在1700MHz至3000MHz的RF输入、1900MHz至3000MHz的LO频率范围，以及0MHz至350MHz的IF频率范围。外部IF元件可设置更低的频率范围。

RF端口和非平衡变压器

当MAX2043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。由于该输入端口通过片上非平衡变压器内部直流短路到地，所以需要连接隔直流电容。在1700MHz至3000MHz频率范围内，RF回波损耗的典型值为15dB。当MAX2043作为上变频器使用时，RF单端输出同样匹配至50Ω。

可以选择在RF端口上安装L-C BPF，以便提高上变频器的性能。

LO输入、缓冲和非平衡变压器

MAX2043经过优化工作于1900MHz至3000MHz的LO频率范围内。MAX2043还内置LO SPDT开关，这一附加功能可实现跳频。该开关用来选择两个单端LO，允许外部振荡器在开关接通之前建立在特定频率。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LO输入。开关由数字输入(LOSEL)控制：数字输入为逻辑高电平时，选中LO1；

为逻辑低电平时，选中LO2。LO1和LO2的输入内部匹配至50Ω，仅需一只22pF的隔直流电容。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}。

两级内部LO缓冲器能够为LO驱动提供较宽的输入功率范围，确保工作在-3dBm至+6dBm的LO驱动信号范围。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

MAX2043的核心是一个双平衡、高性能的无源混频器。内部LO缓冲器输出的较大摆幅有助于提供高线性度指标。

差分IF

MAX2043混频器的IF频率范围是DC至350MHz，其中低端频率受外部IF元件的频率响应影响。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的非平衡变压器将50Ω差分IF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20dB。上变频时，差分IF作为输入端口使用。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，以便阻止外部DC进入混频器的IF端口。混频器需要在RF抽头(短抽头对地)引脚或每个IF差分端口(1kΩ电阻或电感接到每个IF差分引脚与地之间)提供DC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。RF端口的典型回波损耗为17dB；LO端口的典型回波损耗为14dB。RF和LO输入端只需隔直流电容连接。

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引脚17的外接电阻(R1)进行优化。增大电阻可降低缓冲放大器的电流，但会降低性能(特别是IP3)。电阻增大一倍，器件电流可降低一半。

附加调整元件

可通过外部元件进一步改善MAX2034混频器的性能，元件值根据具体应用和频段确定。详细情况请与工厂联系。

布局考虑

设计合理的PCB是RF/微波电路的关键。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MAX2043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；元件列表参见表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。

裸焊盘RF/导热考虑事项

MAX2043 36引脚薄型QFN-EP封装的裸焊盘(EP)提供了一条与管芯之间的低热阻路径。设计PCB时，使其通过MAX2043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焊接到PCB的地层。

1700MHz至3000MHz高线性度、低LO泄漏、基站Rx/Tx混频器

表1. 典型应用电路的元件列表

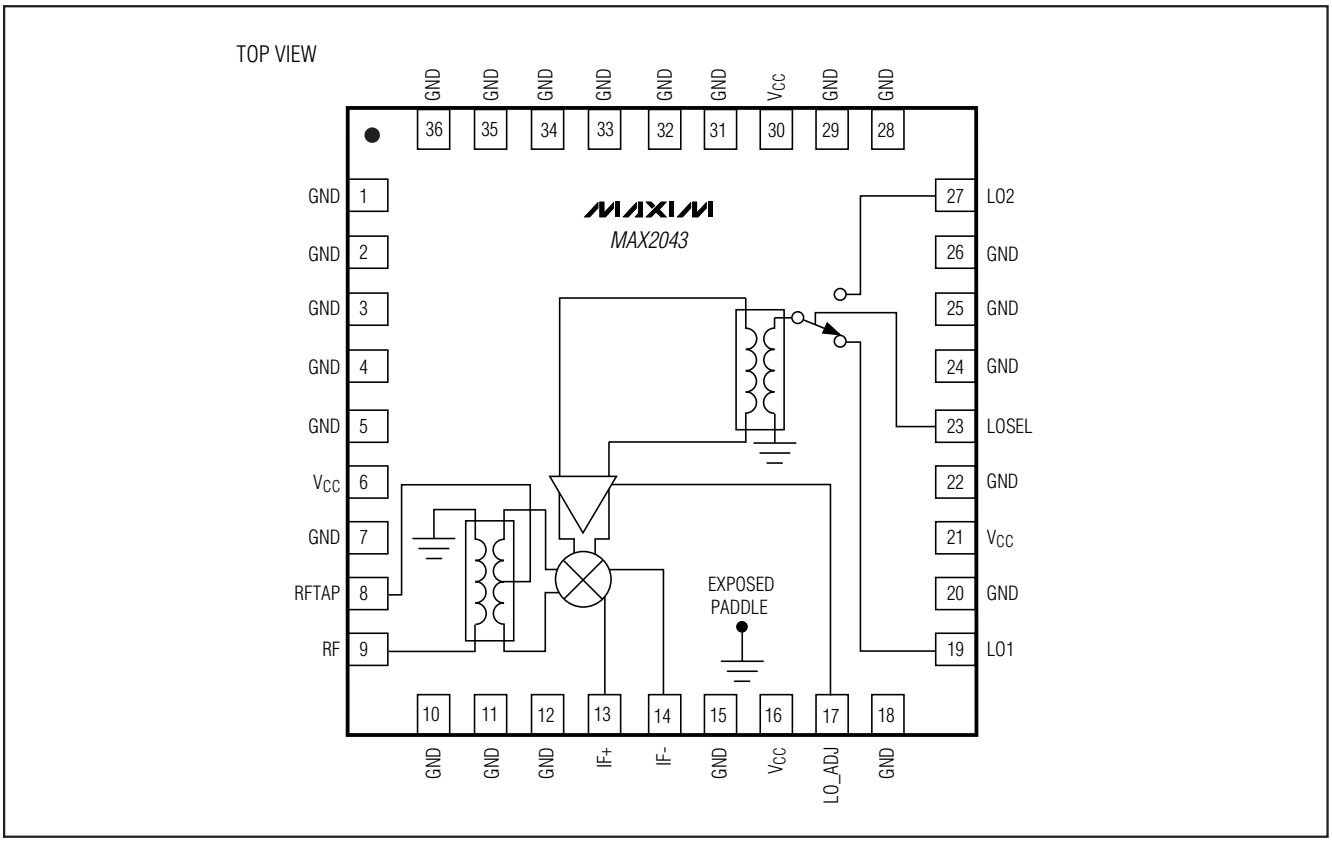
COMPONENT	VALUE	DESCRIPTION
C1	4pF	Microwave capacitor (0402)
C2*, C4, C6, C8	22pF	Microwave capacitors (0402)
C3	Not used	Microwave capacitor (0603)
C5, C7, C9	0.01µF	Microwave capacitors (0402)
R1	360Ω	360Ω ±1% resistor (0402)
T1	1:1	Transformer (50:50) M/A-COM MABAES0029
U1	MAX2043	Maxim IC

*引脚8接地设置为下变频工作。

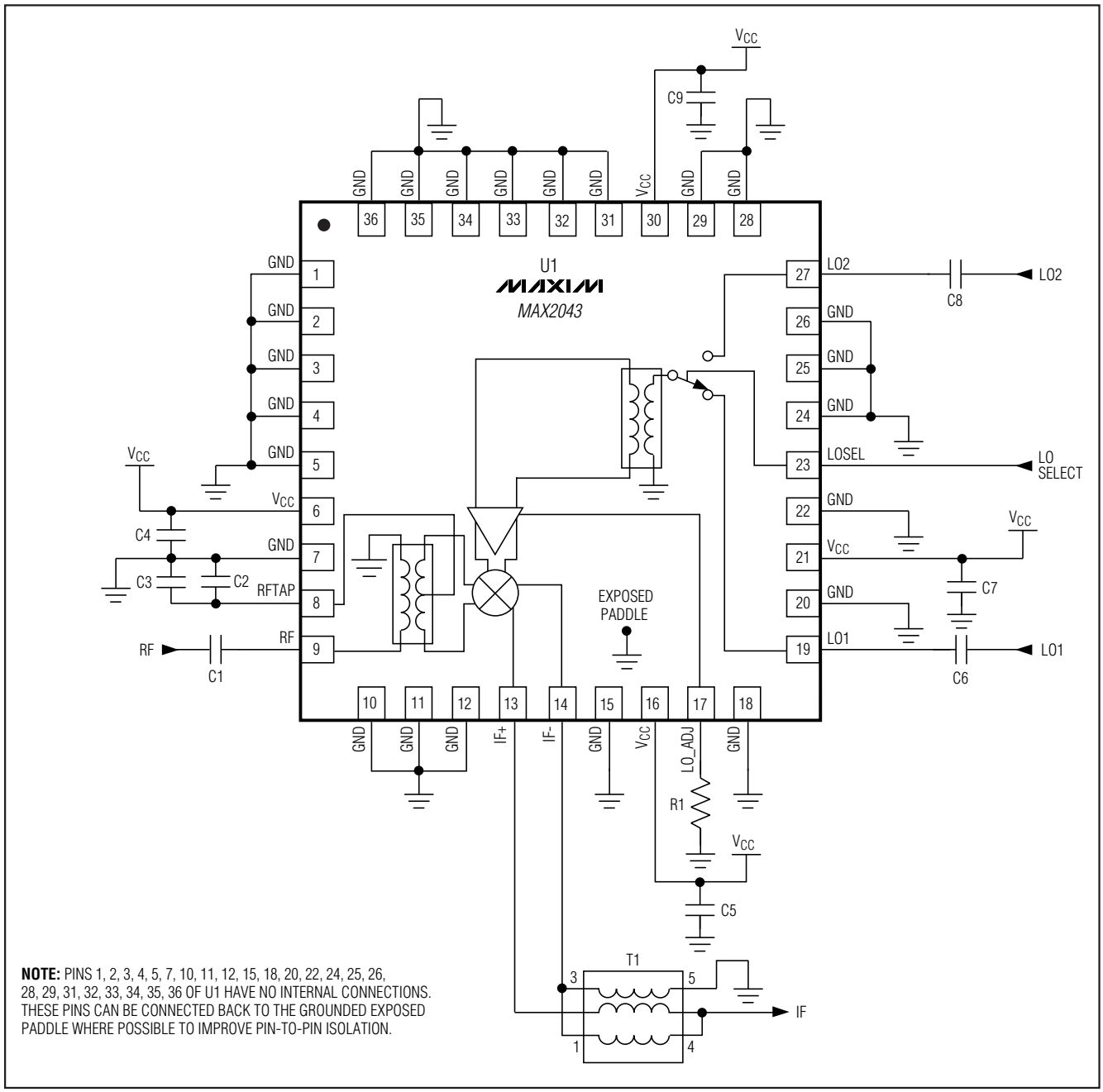
芯片信息

PROCESS: SiGe BiCMOS

引脚配置



典型应用电路

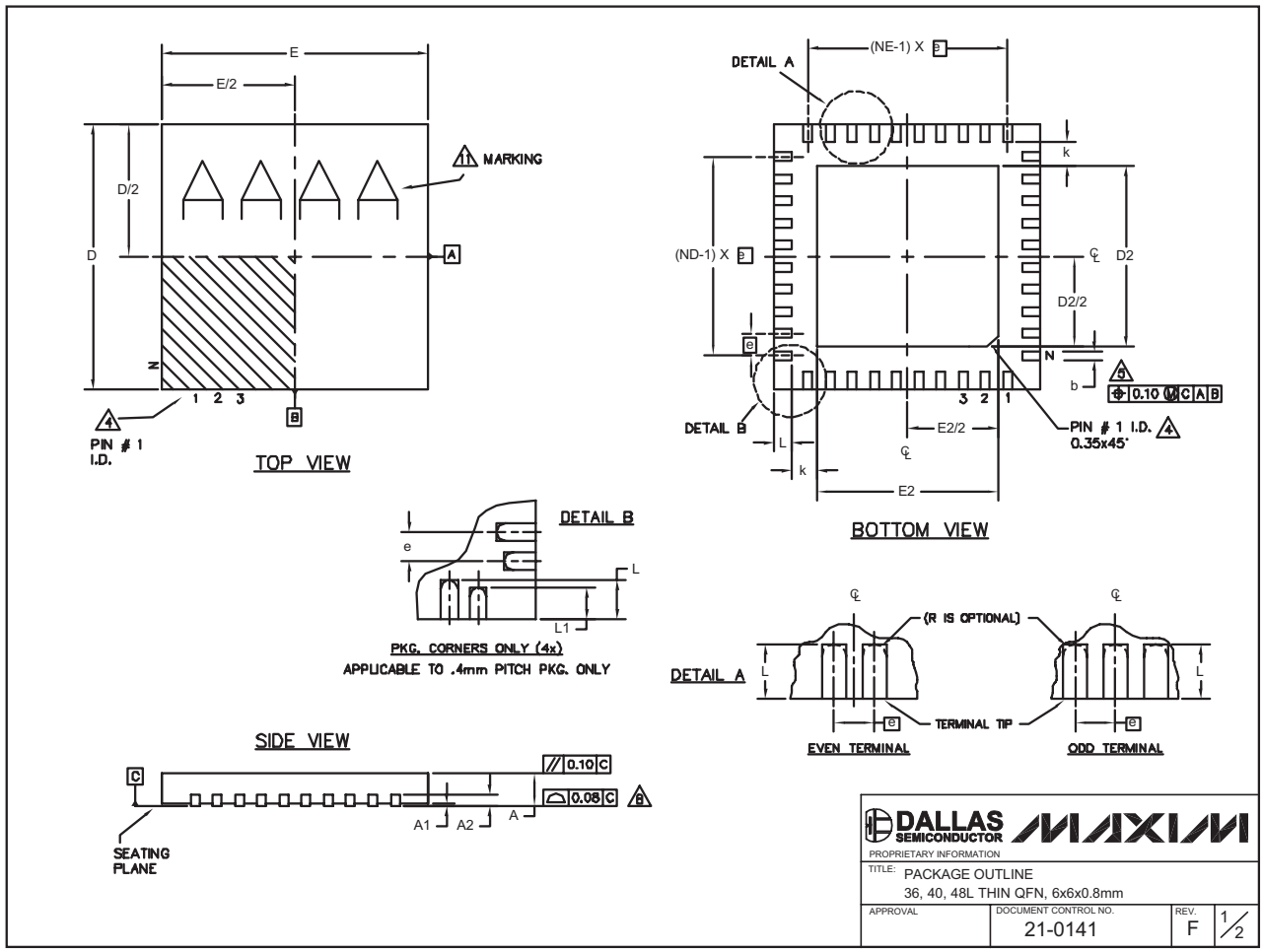

VCC
C9
GND
U1
MAXIM
MAX2043
LO2
C8
LOSEL
LO SELECT
C4
C3
C2
RFTAP
RF
C1
EXPOSED PADDLE
C7
C6
LO1
IF+
IF-
LO_ADJ
R1
C5
T1
IF
NOTE: PINS 1, 2, 3, 4, 5, 7, 10, 11, 12, 15, 18, 20, 22, 24, 25, 26, 28, 29, 31, 32, 33, 34, 35, 36 OF U1 HAVE NO INTERNAL CONNECTIONS. THESE PINS CAN BE CONNECTED BACK TO THE GROUNDED EXPOSED PADDLE WHERE POSSIBLE TO IMPROVE PIN-TO-PIN ISOLATION.

1700MHz至3000MHz高线性度、低LO泄漏、基站Rx/Tx混频器

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.	36L 6x6			40L 6x6			48L 6x6		
SYMBOL	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
A1	0	0.02	0.05	0	0.02	0.05	0	–	0.05
A2	0.20 REF.			0.20 REF.			0.20 REF.		
b	0.20	0.25	0.30	0.20	0.25	0.30	0.15	0.20	0.25
D	5.90	6.00	6.10	5.90	6.00	6.10	5.90	6.00	6.10
E	5.90	6.00	6.10	5.90	6.00	6.10	5.90	6.00	6.10
e	0.50 BSC.			0.50 BSC.			0.40 BSC.		
k	0.25	–	–	0.25	–	–	0.25	0.35	0.45
L	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	36			40			48		
ND	9			10			12		
NE	9			10			12		
JEDEC	WJJD-1			WJJD-2			–		

EXPOSED PAD VARIATIONS							DOWN BONDS ALLOWED
PKG. CODES	D2			E2			
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	
T3666-2	3.60	3.70	3.80	3.60	3.70	3.80	YES
T3666-3	3.60	3.70	3.80	3.60	3.70	3.80	NO
T3666N-1	3.60	3.70	3.80	3.60	3.70	3.80	NO
T4066-2	4.00	4.10	4.20	4.00	4.10	4.20	YES
T4066-3	4.00	4.10	4.20	4.00	4.10	4.20	YES
T4066-4	4.00	4.10	4.20	4.00	4.10	4.20	NO
T4066-5	4.00	4.10	4.20	4.00	4.10	4.20	NO
T4866-1	4.20	4.30	4.40	4.20	4.30	4.40	YES

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 FOR 0.4mm LEAD PITCH PACKAGE T4866-1.
10. WARPAGE SHALL NOT EXCEED 0.10 mm.
11. MARKING IS FOR PACKAGE ORIENTATION REFERENCE ONLY.
12. NUMBER OF LEADS SHOWN FOR REFERENCE ONLY.

DALLAS SEMICONDUCTOR MAXIM

PROPRIETARY INFORMATION

TITLE: PACKAGE OUTLINE
36, 40, 48L THIN QFN, 6x6x0.8mm

APPROVAL	DOCUMENT CONTROL NO.	REV.	
	21-0141	F	2/2

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