19-4288; Rev 2; 2/11

双通道、SiGe、高线性度、1800MHz至2900MHz 下变频混频器，带有LO缓冲器

MAX19997A

概述

MAX19997A双通道下变频混频器是通用的高集成度、多功能下变频器，可为1800MHz至2900MHz基站应用提供高线性度和低噪声系数。MAX19997A完全支持2300MHz至2900MHz的WiMAX™、LTE、WCS以及MMDS无线基础设施应用中的低端和高端LO注入架构，低端配置下可提供8.7dB增益、+24dBm输入IP3和10.3dB NF，高端配置下可提供8.7dB增益、+24dBm输入IP3和10.4dB NF。每个RF端口外加一个调谐元件(并联电感)，可将高端LO注入架构的范围进一步向下扩展至1800MHz。

该器件在RF和LO端口集成有非平衡变压器，此外器件还包含一个LO缓冲器、两个双平衡混频器和一对差分IF输出放大器。MAX19997A需要一个典型值为0dBm的LO驱动，电源电流保证低于420mA，以达到预期的线性度指标。

MAX19997A采用紧凑的6mm x 6mm、36引脚、薄型QFN无铅封装，带有裸焊盘。在T_C = -40°C至+85°C的扩展级温度范围内，可保证电气性能。

应用

2.3GHz WCS基站

2.5GHz WiMAX和LTE基站

2.7GHz MMDS基站

UMTS/WCDMA和cdma2000® 3G基站

PCS1900和EDGE基站

PHS/PAS基站

固定宽带无线接入

无线本地环路

个人移动无线装置

军用系统

特性

- ♦ 1800MHz至2900MHz RF频率范围
- ♦ 1950MHz至3400MHz LO频率范围
- ♦ 50MHz至550MHz IF频率范围
- ♦ 支持低端和高端LO注入
- ♦ 8.7dB转换增益
- ♦ +24dBm输入IP3
- ♦ 10.3dB噪声系数
- ♦ +11.3dBm输入1dB压缩点
- ♦ P_{RF} = -10dBm时，具有70dBc (典型值)的2 x 2杂散抑制
- ♦ 双通道理想用于分集接收器应用
- ♦ 集成LO缓冲器
- ♦ 内部LO和RF非平衡变压器支持单端输入
- ♦ -3dBm至+3dBm的低LO驱动
- ♦ 引脚兼容于MAX19999 3000MHz至4000MHz混频器
- ♦ 引脚相似于MAX9995/MAX9995A和MAX19995/MAX19995A 1700MHz至2200MHz混频器以及MAX9985/MAX9985A和MAX19985/MAX19985A 700MHz至1000MHz混频器
- ♦ 42dB通道间隔离
- ♦ 采用+5.0V或+3.3V单电源供电
- ♦ 外部电流设置电阻允许折中选择混频器的低功耗/低性能工作模式

定购信息

PART	TEMP RANGE	PIN-PACKAGE
MAX19997AETX+	-40°C to +85°C	36 Thin QFN-EP*
MAX19997AETX+T	-40°C to +85°C	36 Thin QFN-EP*

+表示无铅(Pb)/符合RoHS标准的封装。
**EP = 裸焊盘。*
T = 卷带包装。

WiMAX是WiMAX论坛的商标。
cdma2000是电信工业协会的注册商标。

引脚配置/功能框图在数据资料的最后给出。

双通道、SiGe、高线性度、1800MHz至2900MHz 下变频混频器，带有LO缓冲器

ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND ....-0.3V to +5.5V
RF_, LO to GND ....-0.3V to +0.3V
IFM_, IFD_, IFM_SET, IFD_SET, LO_ADJ_M, LO_ADJ_D to GND ....-0.3V to (V_{CC} + 0.3V)
RF_, LO Input Power ....+15dBm
RF_, LO Current (RF and LO is DC shorted to GND through balun) 50mA
Continuous Power Dissipation (Note 1) 8.7W
Operating Case Temperature Range (Note 4) ....T_C = -40°C to +85°C
Junction Temperature ....+150°C
Storage Temperature Range ....-65°C to +150°C
Lead Temperature (soldering, 10s) ....+300°C
Soldering Temperature (reflow) ....+260°C

PACKAGE THERMAL CHARACTERISTICS

Junction-to-Ambient Thermal Resistance (θ_{JA}) (Notes 2, 3) ....38°C/W
Junction-to-Case Thermal Resistance (θ_{JC}) (Notes 1, 3) ....7.4°C/W

Note 1: Based on junction temperature $T_J = T_C + (\theta_{JC} \times V_{CC} \times I_{CC})$. This formula can be used when the temperature of the exposed pad is known while the device is soldered down to a PCB. See the *Applications Information* section for details. The junction temperature must not exceed +150°C.
Note 2: Junction temperature $T_J = T_A + (\theta_{JA} \times V_{CC} \times I_{CC})$. This formula can be used when the ambient temperature of the PCB is known. The junction temperature must not exceed +150°C.
Note 3: Package thermal resistances were obtained using the method described in JEDEC specification JESD51-7, using a four-layer board. For detailed information on package thermal considerations, refer to **china.maxim-ic.com/thermal-tutorial**.
Note 4: T_C is the temperature on the exposed pad of the package. T_A is the ambient temperature of the device and PCB.

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.

+5.0V SUPPLY DC ELECTRICAL CHARACTERISTICS

(*Typical Application Circuit* optimized for the **standard RF band (see Table 1)**, no input RF or LO signals applied, V_{CC} = +4.75V to +5.25V, T_C = -40°C to +85°C. Typical values are at V_{CC} = +5.0V, T_C = +25°C, unless otherwise noted. R1, R4 = 750Ω, R2, R5 = 698Ω.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage	V_{CC}		4.75	5.00	5.25	V
Supply Current	I_{CC}	Total supply current		388	420	mA

+3.3V SUPPLY DC ELECTRICAL CHARACTERISTICS

(*Typical Application Circuit* optimized for the **standard RF band (see Table 1)**, no input RF or LO signals applied, V_{CC} = +3.0V to +3.6V, T_C = -40°C to +85°C. Typical values are at V_{CC} = +3.3V, T_C = +25°C, unless otherwise noted. R1, R4 = 1.1kΩ, R2, R5 = 845Ω.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage	V_{CC}		3.0	3.3	3.6	V
Supply Current	I_{CC}	Total supply current, V_{CC} = +3.3V		279	310	mA

RECOMMENDED AC OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
RF Frequency Without External Tuning	f_{RF}	(Note 5)	2400		2900	MHz
RF Frequency with External Tuning	f_{RF}	See Table 2 for an outline of tuning elements optimized for 1950MHz operation; optimization at other frequencies within the 1800MHz to 2400MHz range can be achieved with different component values; contact the factory for details	1800		2400	MHz
LO Frequency	f_{LO}	(Notes 5, 6)	1950		3400	MHz
IF Frequency	f_{IF}	Using Mini-Circuits TC4-1W-17 4:1 transformer as defined in the *Typical Application Circuit*, IF matching components affect the IF frequency range (Notes 5, 6)	100		550	MHz
		Using alternative Mini-Circuits TC4-1W-7A 4:1 transformer, IF matching components affect the IF frequency range (Notes 5, 6)	50		250	
LO Drive Level	P_{LO}		-3		+3	dBm

+5.0V SUPPLY, HIGH-SIDE LO INJECTION AC ELECTRICAL CHARACTERISTICS

(*Typical Application Circuit* optimized for the **standard RF band (see Table 1)**, V_{CC} = +4.75V to +5.25V, RF and LO ports are driven from 50Ω sources, P_{LO} = -3dBm to +3dBm, P_{RF} = -5dBm, f_{RF} = 2300MHz to 2900MHz, f_{LO} = 2650MHz to 3250MHz, f_{IF} = 350MHz, $f_{RF} < f_{LO}$, T_C = -40°C to +85°C. Typical values are at V_{CC} = +5.0V, P_{RF} = -5dBm, P_{LO} = 0dBm, f_{RF} = 2600MHz, f_{LO} = 2950MHz, f_{IF} = 350MHz, T_C = +25°C, unless otherwise noted.) (Note 7)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Conversion Gain	G_C	f_{RF} = 2400MHz to 2900MHz, T_C = +25°C (Notes 8, 9, 10)	8.1	8.7	9.3	dB
Conversion Gain Flatness		f_{RF} = 2305MHz to 2360MHz		0.15		dB
		f_{RF} = 2500MHz to 2570MHz		0.15		
		f_{RF} = 2570MHz to 2620MHz		0.1		
		f_{RF} = 2500MHz to 2690MHz		0.15		
		f_{RF} = 2700MHz to 2900MHz		0.15		
Gain Variation Over Temperature	TC_{CG}	f_{RF} = 2300MHz to 2900MHz, T_C = -40°C to +85°C		-0.01		dB/°C
Input Compression Point	IP_{1dB}	(Notes 8, 9, 11)	9.6	11.3		dBm
Third-Order Input Intercept Point	IIP3	$f_{RF1} - f_{RF2}$ = 1MHz, P_{RF} = -5dBm per tone (Notes 8, 9)	22.0	24		dBm
		f_{RF} = 2600MHz, $f_{RF1} - f_{RF2}$ = 1MHz, P_{RF} = -5dBm per tone, T_C = +25°C (Notes 8, 9)	22.5	24		
Third-Order Input Intercept Point Variation Over Temperature		$f_{RF1} - f_{RF2}$ = 1MHz, T_C = -40°C to +85°C		±0.3		dBm

+5.0V SUPPLY, HIGH-SIDE LO INJECTION AC ELECTRICAL CHARACTERISTICS (continued)

(*Typical Application Circuit* optimized for the **standard RF band (see Table 1)**, V_{CC} = +4.75V to +5.25V, RF and LO ports are driven from 50Ω sources, P_{LO} = -3dBm to +3dBm, P_{RF} = -5dBm, f_{RF} = 2300MHz to 2900MHz, f_{LO} = 2650MHz to 3250MHz, f_{IF} = 350MHz, $f_{RF} < f_{LO}$, T_C = -40°C to +85°C. Typical values are at V_{CC} = +5.0V, P_{RF} = -5dBm, P_{LO} = 0dBm, f_{RF} = 2600MHz, f_{LO} = 2950MHz, f_{IF} = 350MHz, T_C = +25°C, unless otherwise noted.) (Note 7)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Noise Figure	NF_{SSB}	Single sideband, no blockers present f_{RF} = 2400MHz to 2900MHz (Note 6, 8, 10)		10.4	12.5	dB
		Single sideband, no blockers present, f_{RF} = 2400MHz to 2900MHz , T_C = +25°C (Note 6, 8, 10)		10.4	11.4	
Noise Figure Temperature Coefficient	TC_{NF}	Single sideband, no blockers present, T_C = -40°C to +85°C		0.018		dB/°C
Noise Figure Under Blocking Conditions	NF_B	$f_{BLOCKER}$ = 2412MHz, $P_{BLOCKER}$ = 8dBm, f_{RF} = 2600MHz, f_{LO} = 2950MHz, P_{LO} = 0dBm, V_{CC} = +5.0V, T_C = +25°C (Notes 8, 12)		22.5	25	dB
2LO - 2RF Spur	2 x 2	f_{RF} = 2600MHz, f_{LO} = 2950MHz, P_{RF} = -10dBm, f_{SPUR} = f_{LO} - 175MHz (Note 8)	62	69		dBc
		f_{RF} = 2600MHz, f_{LO} = 2950MHz, P_{RF} = -5dBm, f_{SPUR} = f_{LO} - 175MHz (Notes 8, 9)	57	64		
3LO - 3RF Spur	3 x 3	f_{RF} = 2600MHz, f_{LO} = 2950MHz, P_{RF} = -10dBm, f_{SPUR} = f_{LO} - 116.67MHz, T_C = +25°C (Note 8)	73	84		dBc
		f_{RF} = 2600MHz, f_{LO} = 2950MHz, P_{RF} = -5dBm, f_{SPUR} = f_{LO} - 116.67MHz, T_C = +25°C (Notes 8, 9)	63	74		
RF Input Return Loss		LO on and IF terminated into a matched impedance		14		dB
LO Input Return Loss		RF and IF terminated into a matched impedance		13		dB
IF Output Impedance	Z_{IF}	Nominal differential impedance at the IC's IF outputs		200		Ω
IF Output Return Loss		RF terminated into 50Ω, LO driven by 50Ω source, IF transformed to 50Ω using external components shown in the *Typical Application Circuit*		21		dB

+5.0V SUPPLY, HIGH-SIDE LO INJECTION AC ELECTRICAL CHARACTERISTICS (continued)

(*Typical Application Circuit* optimized for the **standard RF band (see Table 1)**, V_{CC} = +4.75V to +5.25V, RF and LO ports are driven from 50Ω sources, P_{LO} = -3dBm to +3dBm, P_{RF} = -5dBm, f_{RF} = 2300MHz to 2900MHz, f_{LO} = 2650MHz to 3250MHz, f_{IF} = 350MHz, $f_{RF} < f_{LO}$, T_C = -40°C to +85°C. Typical values are at V_{CC} = +5.0V, P_{RF} = -5dBm, P_{LO} = 0dBm, f_{RF} = 2600MHz, f_{LO} = 2950MHz, f_{IF} = 350MHz, T_C = +25°C, unless otherwise noted.) (Note 7)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
RF-to-IF Isolation				25		dB
LO Leakage at RF Port		(Notes 8, 9)		-28		dBm
2LO Leakage at RF Port				-33		dBm
LO Leakage at IF Port				-18.5		dBm
Channel Isolation		RFMAIN (RFDIV) converted power measured at IFDIV (IFMAIN) relative to IFMAIN (IFDIV), all unused ports terminated to 50Ω	38.5	43		dB

+5.0V SUPPLY, LOW-SIDE LO INJECTION AC ELECTRICAL CHARACTERISTICS

(*Typical Application Circuit* optimized for the **standard RF band (see Table 1)**, V_{CC} = +4.75V to +5.25V, RF and LO ports are driven from 50Ω sources, P_{LO} = -3dBm to +3dBm, P_{RF} = -5dBm, f_{RF} = 2300MHz to 2900MHz, f_{LO} = 1950MHz to 2550MHz, f_{IF} = 350MHz, $f_{RF} > f_{LO}$, T_C = -40°C to +85°C. Typical values are at V_{CC} = +5.0V, P_{RF} = -5dBm, P_{LO} = 0dBm, f_{RF} = 2600MHz, f_{LO} = 2250MHz, f_{IF} = 350MHz, T_C = +25°C, unless otherwise noted.) (Note 7)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Conversion Gain	G_C	f_{RF} = 2400MHz to 2900MHz, T_C = +25°C (Notes 8, 9, 10)	8.1	8.7	9.3	dB
Conversion Gain Flatness		f_{RF} = 2305MHz to 2360MHz		0.2		dB
		f_{RF} = 2500MHz to 2570MHz		0.15		
		f_{RF} = 2570MHz to 2620MHz		0.2		
		f_{RF} = 2500MHz to 2690MHz		0.25		
		f_{RF} = 2700MHz to 2900MHz		0.25		
Gain Variation Over Temperature	TC_{CG}	f_{RF} = 2300MHz to 2900MHz, T_C = -40°C to +85°C		-0.01		dB/°C
Input Compression Point	IP_{1dB}	(Notes 6, 8, 11)	9.6	11.3		dBm
Third-Order Input Intercept Point	IIP3	$f_{RF1} - f_{RF2}$ = 1MHz, P_{RF} = -5dBm per tone (Notes 8, 9)	21.6	23		dBm
		f_{RF} = 2600MHz, $f_{RF1} - f_{RF2}$ = 1MHz, P_{RF} = -5dBm per tone, T_C = +25°C (Notes 8, 9)	22	23.8		dBm
Third-Order Input Intercept Point Variation Over Temperature		$f_{RF1} - f_{RF2}$ = 1MHz, T_C = -40°C to +85°C		±0.3		dBm

+5.0V SUPPLY, LOW-SIDE LO INJECTION AC ELECTRICAL CHARACTERISTICS (continued)

(*Typical Application Circuit* optimized for the **standard RF band (see Table 1)**, V_{CC} = +4.75V to +5.25V, RF and LO ports are driven from 50Ω sources, P_{LO} = -3dBm to +3dBm, P_{RF} = -5dBm, f_{RF} = 2300MHz to 2900MHz, f_{LO} = 1950MHz to 2550MHz, f_{IF} = 350MHz, $f_{RF} > f_{LO}$, T_C = -40°C to +85°C. Typical values are at V_{CC} = +5.0V, P_{RF} = -5dBm, P_{LO} = 0dBm, f_{RF} = 2600MHz, f_{LO} = 2250MHz, f_{IF} = 350MHz, T_C = +25°C, unless otherwise noted.) (Note 7)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Noise Figure	NF_{SSB}	Single sideband, no blockers present f_{RF} = 2400MHz to 2900MHz (Notes 6, 8)		10.3	13.0	dB
		Single sideband, no blockers present, f_{RF} = 2400MHz to 2900MHz, T_C = +25°C (Notes 6, 8)		10.3	11.3	
Noise Figure Temperature Coefficient	TC_{NF}	Single sideband, no blockers present, T_C = -40°C to +85°C		0.018		dB/°C
Noise Figure Under Blocking Conditions	NF_B	$f_{BLOCKER}$ = 2793MHz, $P_{BLOCKER}$ = 8dBm, f_{RF} = 2600MHz, f_{LO} = 2250MHz, P_{LO} = 0dBm, Vcc = +5.0V, T_C = +25°C (Notes 6, 8, 12)		22	25	dB
2RF-2LO Spur	2 x 2	f_{RF} = 2600MHz, f_{LO} = 2250MHz, P_{RF} = -10dBm, f_{SPUR} = f_{LO} + 175MHz, T_C = +25°C (Note 8)	62	67		dBc
		f_{RF} = 2600MHz, f_{LO} = 2250MHz, P_{RF} = -5dBm, f_{SPUR} = f_{LO} + 175MHz, T_C = +25°C (Notes 8, 9)	57	62		
3RF-3LO Spur	3 x 3	f_{RF} = 2600MHz, f_{LO} = 2250MHz, P_{RF} = -10dBm, f_{SPUR} = f_{LO} + 116.67MHz, T_C = +25°C (Note 8)	78	83		dBc
		f_{RF} = 2600MHz, f_{LO} = 2250MHz, P_{RF} = -5dBm, f_{SPUR} = f_{LO} + 116.67MHz, T_C = +25°C (Notes 8, 9)	68	73		
RF Input Return Loss		LO on and IF terminated into a matched impedance		16		dB
LO Input Return Loss		RF and IF terminated into a matched impedance		11.5		dB
IF Output Impedance	Z_{IF}	Nominal differential impedance at the IC's IF outputs		200		Ω
IF Output Return Loss		RF terminated into 50Ω, LO driven by 50Ω source, IF transformed to 50Ω using external components shown in the *Typical Application Circuit*		20		dB

+5.0V SUPPLY, LOW-SIDE LO INJECTION AC ELECTRICAL CHARACTERISTICS (continued)

(*Typical Application Circuit* optimized for the **standard RF band (see Table 1)**, V_{CC} = +4.75V to +5.25V, RF and LO ports are driven from 50Ω sources, P_{LO} = -3dBm to +3dBm, P_{RF} = -5dBm, f_{RF} = 2300MHz to 2900MHz, f_{LO} = 1950MHz to 2550MHz, f_{IF} = 350MHz, $f_{RF} > f_{LO}$, T_C = -40°C to +85°C. Typical values are at V_{CC} = +5.0V, P_{RF} = -5dBm, P_{LO} = 0dBm, f_{RF} = 2600MHz, f_{LO} = 2250MHz, f_{IF} = 350MHz, T_C = +25°C, unless otherwise noted.) (Note 7)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
RF-to-IF Isolation				23.5		dB
LO Leakage at RF Port		(Notes 8, 9)		-31	-24	dBm
2LO Leakage at RF Port				-27		dBm
LO Leakage at IF Port				-9.6		dBm
Channel Isolation		RFMAIN (RFDIV) converted power measured at IFDIV (IFMAIN) relative to IFMAIN (IFDIV), all unused ports terminated to 50Ω (Notes 8, 9)	38.5	42		dB

+3.3V SUPPLY, LOW-SIDE LO INJECTION AC ELECTRICAL CHARACTERISTICS

(*Typical Application Circuit* optimized for the **standard RF band (see Table 1)**. Typical values are at V_{CC} = +3.3V, P_{RF} = -5dBm, P_{LO} = 0dBm, f_{RF} = 2600MHz, f_{LO} = 2250MHz, f_{IF} = 350MHz, T_C = +25°C, unless otherwise noted.) (Note 7)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Conversion Gain	G_C	(Note 9)		8.5		dB
Conversion Gain Flatness		f_{RF} = 2305MHz to 2360MHz		0.2		dB
		f_{RF} = 2500MHz to 2570MHz		0.15		
		f_{RF} = 2570MHz to 2620MHz		0.15		
		f_{RF} = 2500MHz to 2690MHz		0.25		
		f_{RF} = 2700MHz to 2900MHz		0.15		
Gain Variation Over Temperature	TC_{CG}	f_{RF} = 2300MHz to 2900MHz, T_C = -40°C to +85°C		-0.01		dB/°C
Input Compression Point	IP_{1dB}			7.7		dBm
Third-Order Input Intercept Point	IIP3	f_{RF1} - f_{RF2} = 1MHz, P_{RF} = -5dBm per tone		19.7		dBm
Third-Order Input Intercept Variation Over Temperature		f_{RF1} - f_{RF2} = 1MHz, T_C = -40°C to +85°C		±0.5		dBm
Noise Figure	NF_{SSB}	Single sideband, no blockers present		9.7		dB
Noise Figure Temperature Coefficient	TC_{NF}	Single sideband, no blockers present, T_C = -40°C to +85°C		0.018		dB/°C

+3.3V SUPPLY, LOW-SIDE LO INJECTION AC ELECTRICAL CHARACTERISTICS (continued)

(*Typical Application Circuit* optimized for the **standard RF band (see Table 1)**. Typical values are at V_{CC} = +3.3V, P_{RF} = -5dBm, P_{LO} = 0dBm, f_{RF} = 2600MHz, f_{LO} = 2250MHz, f_{IF} = 350MHz, T_C = +25°C, unless otherwise noted.) (Note 7)

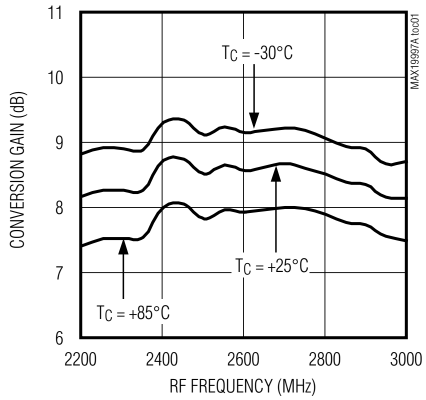
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
2RF-2LO Spur	2 x 2	P_{RF} = -10dBm, f_{SPUR} = f_{LO} + 175MHz		74		dBc
		P_{RF} = -5dBm, f_{SPUR} = f_{LO} + 175MHz		69		
3RF-3LO Spur	3 x 3	P_{RF} = -10dBm, f_{SPUR} = f_{LO} + 116.67MHz		74		dBc
		P_{RF} = -5dBm, f_{SPUR} = f_{LO} + 116.67MHz		64		
RF Input Return Loss		LO on and IF terminated into a matched impedance		16		dB
LO Input Return Loss		RF and IF terminated into a matched impedance		11		dB
IF Output Impedance	Z_{IF}	Nominal differential impedance at the IC's IF outputs		200		Ω
IF Output Return Loss		RF terminated into 50Ω, LO driven by 50Ω source, IF transformed to 50Ω using external components shown in the *Typical Application Circuit*		26		dB
RF-to-IF Isolation				25		dB
LO Leakage at RF Port				-36		dBm
2LO Leakage at RF Port				-31		dBm
LO Leakage at IF Port				-13.5		dBm
Channel Isolation		RFMAIN (RFDIV) converted power measured at IFDIV (IFMAIN) relative to IFMAIN (IFDIV), all unused ports terminated to 50Ω		42		dB

Note 5: Operation outside this range is possible, but with degraded performance of some parameters. See the *Typical Operating Characteristics*.
Note 6: Not production tested.
Note 7: All limits reflect losses of external components, including a 0.8dB loss at f_{IF} = 350MHz due to the 4:1 impedance transformer. Output measurements taken at the IF outputs of *Typical Application Circuit*.
Note 8: Guaranteed by design and characterization.
Note 9: 100% production tested for functional performance.
Note 10: RF frequencies below 2400MHz require external RF tuning similar to components listed in Table 2.
Note 11: Maximum reliable continuous input power applied to the RF or IF port of this device is +12dBm from a 50Ω source.
Note 12: 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 Application Note 2021: *Specifications and Measurement of Local Oscillator Noise in Integrated Circuit Base Station Mixers*.

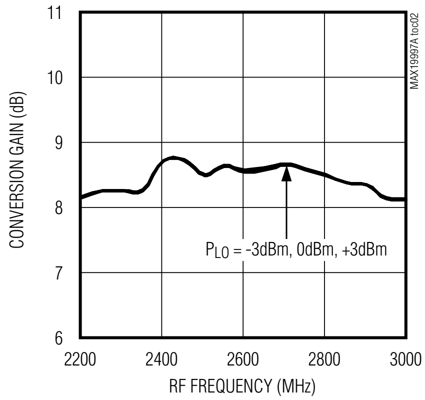
典型工作特性

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +5.0V, LO is high-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

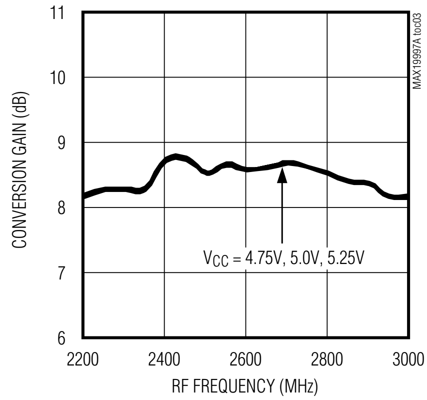
CONVERSION GAIN vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



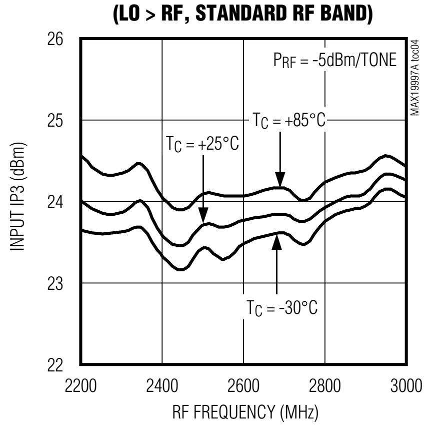
CONVERSION GAIN vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



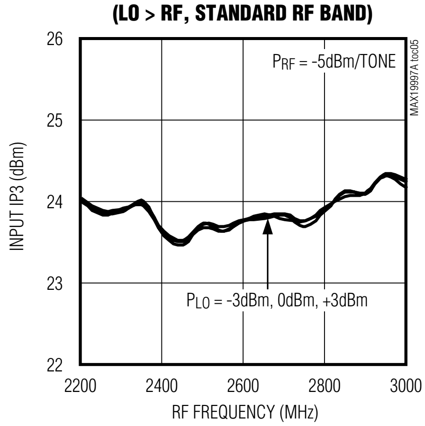
CONVERSION GAIN vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



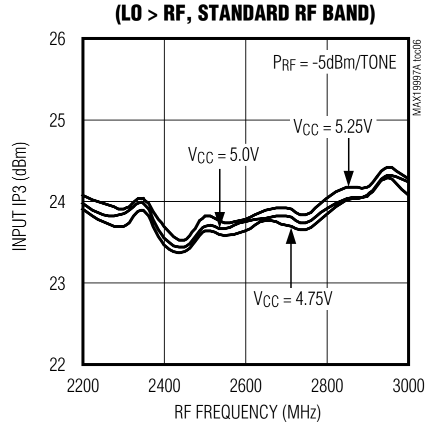
INPUT IP3 vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



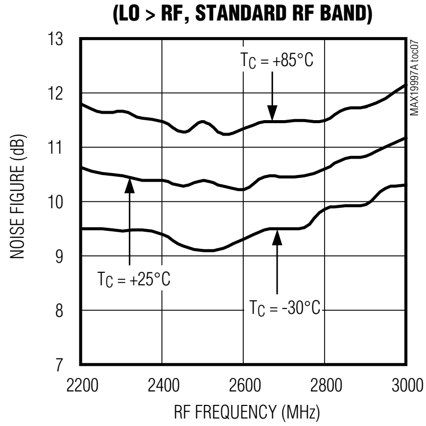
INPUT IP3 vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



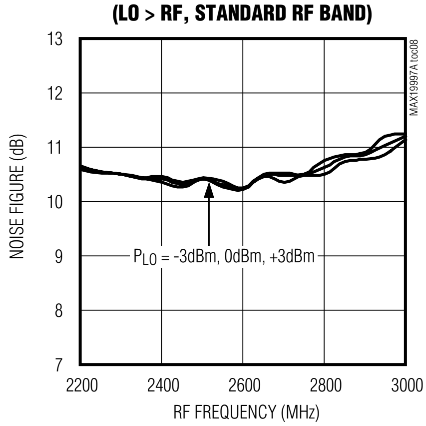
INPUT IP3 vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



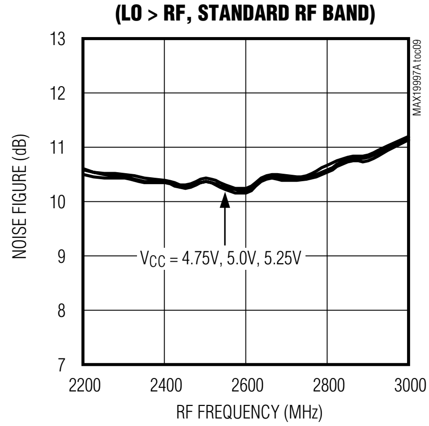
NOISE FIGURE vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



NOISE FIGURE vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



NOISE FIGURE vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)

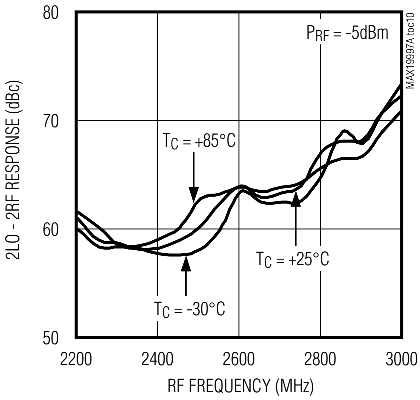


双通道、SiGe、高线性度、1800MHz至2900MHz 下变频混频器，带有LO缓冲器

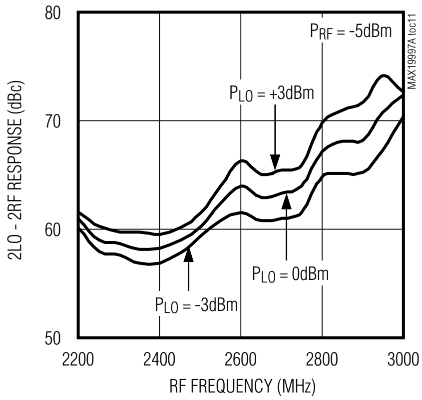
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +5.0V, LO is high-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

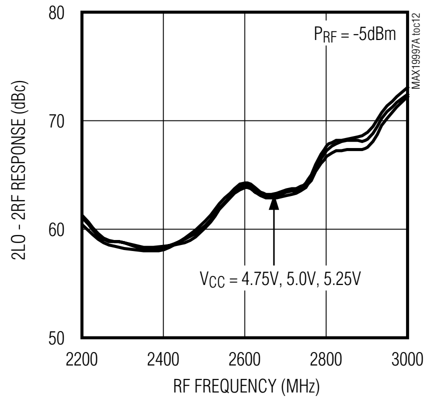
2LO - 2RF RESPONSE vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



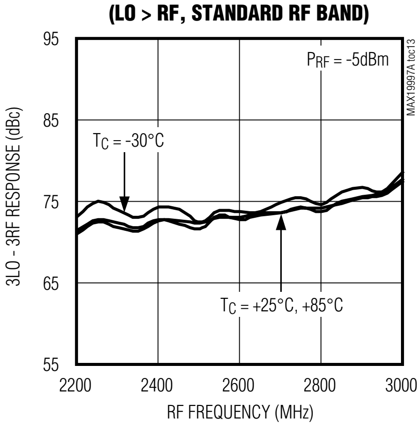
2LO - 2RF RESPONSE vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



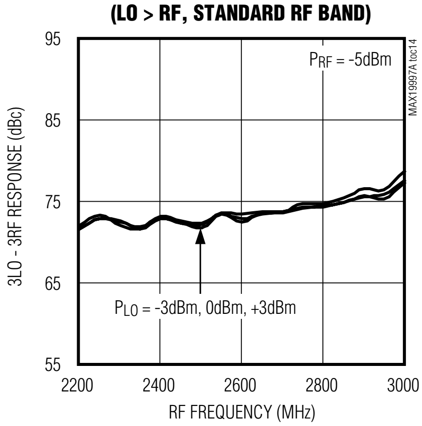
2LO - 2RF RESPONSE vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



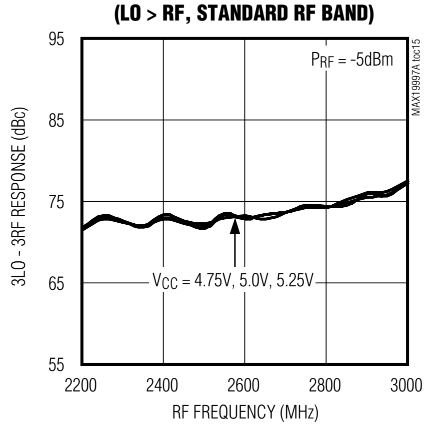
3LO - 3RF RESPONSE vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



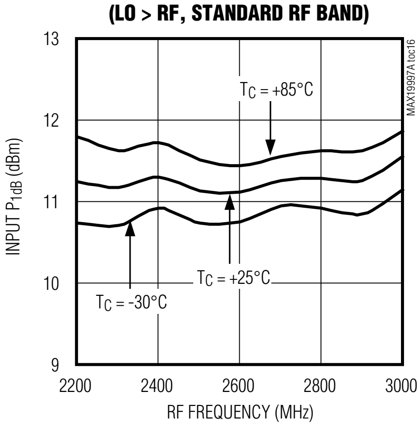
3LO - 3RF RESPONSE vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



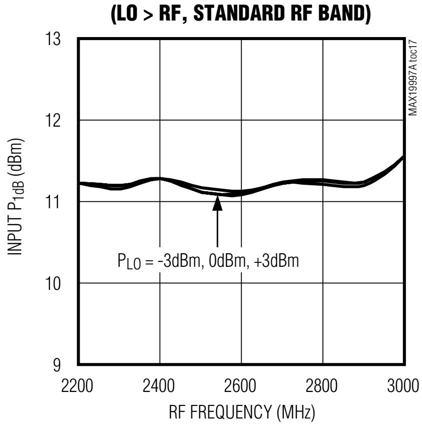
3LO - 3RF RESPONSE vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



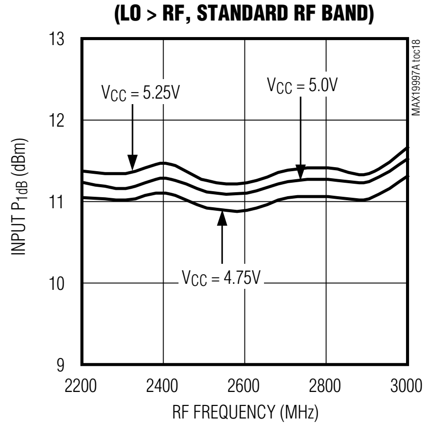
INPUT P_{1dB} vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



INPUT P_{1dB} vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



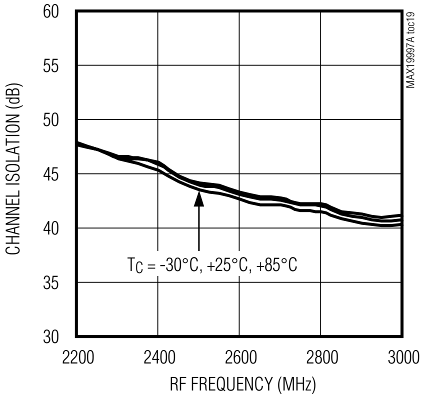
INPUT P_{1dB} vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



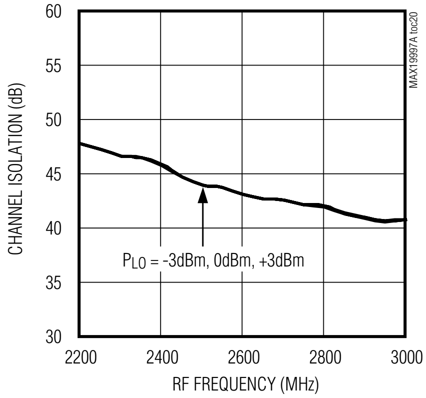
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +5.0V, LO is high-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

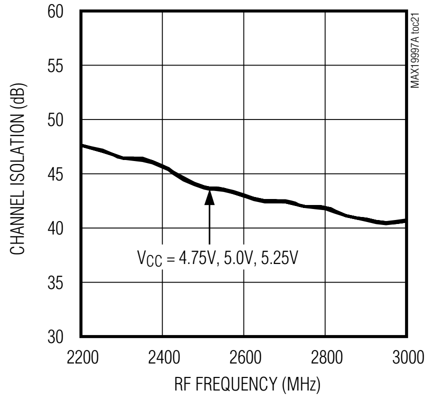
CHANNEL ISOLATION vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



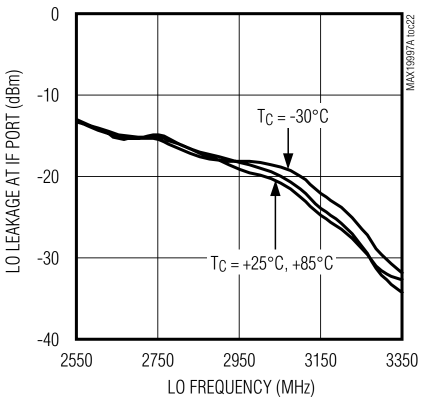
CHANNEL ISOLATION vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



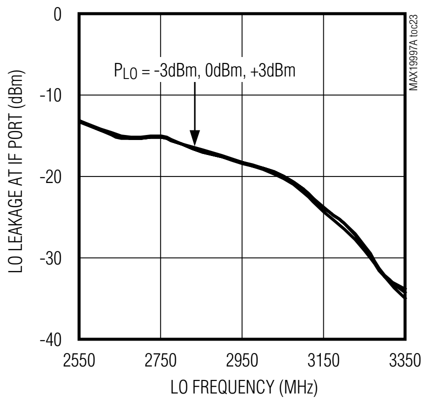
CHANNEL ISOLATION vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



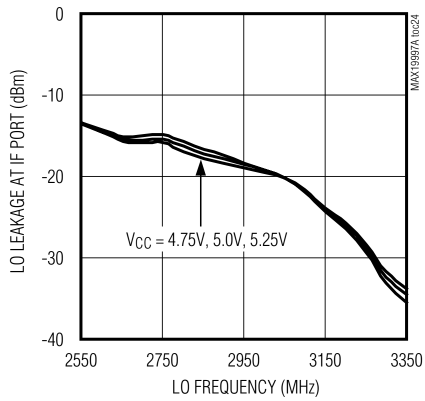
LO LEAKAGE AT IF PORT vs. LO FREQUENCY (LO > RF, STANDARD RF BAND)



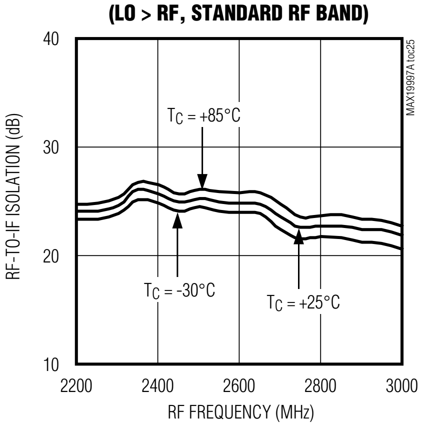
LO LEAKAGE AT IF PORT vs. LO FREQUENCY (LO > RF, STANDARD RF BAND)



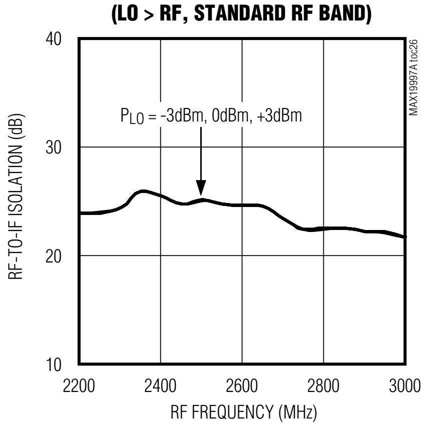
LO LEAKAGE AT IF PORT vs. LO FREQUENCY (LO > RF, STANDARD RF BAND)



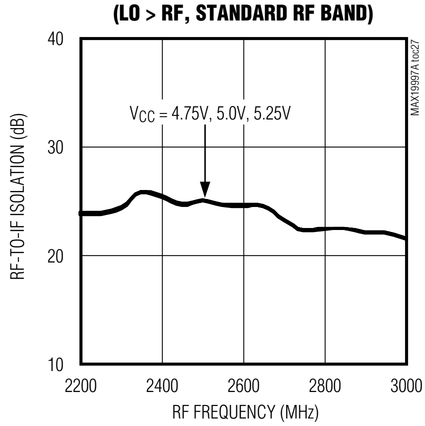
RF-TO-IF ISOLATION vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



RF-TO-IF ISOLATION vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



RF-TO-IF ISOLATION vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



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典型工作特性(续)

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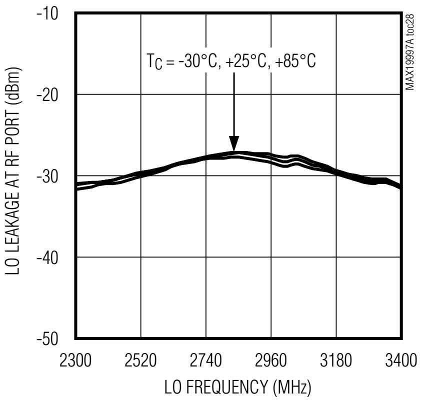
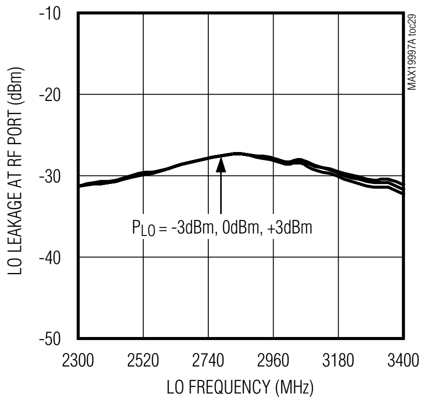
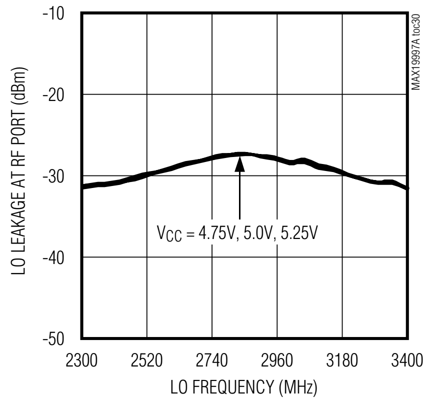
LO LEAKAGE AT RF PORT vs. LO FREQUENCY (LO > RF, STANDARD RF BAND)



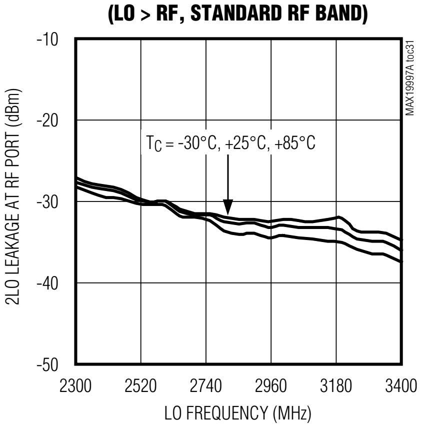
LO LEAKAGE AT RF PORT vs. LO FREQUENCY (LO > RF, STANDARD RF BAND)



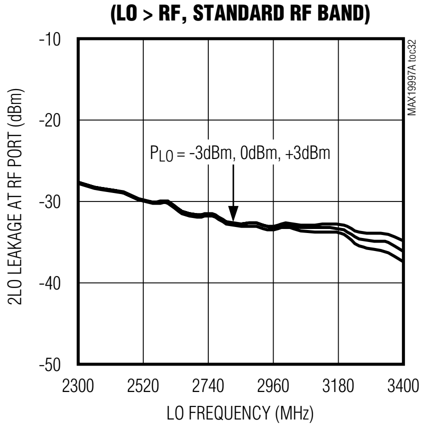
LO LEAKAGE AT RF PORT vs. LO FREQUENCY (LO > RF, STANDARD RF BAND)



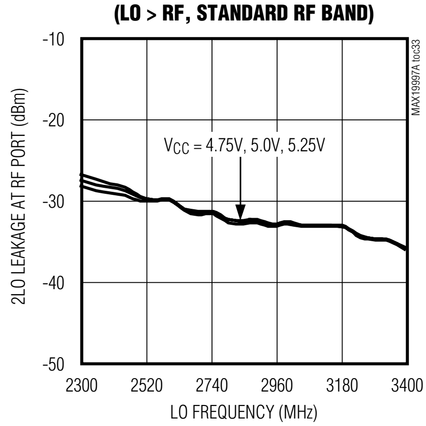
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY (LO > RF, STANDARD RF BAND)



2LO LEAKAGE AT RF PORT vs. LO FREQUENCY (LO > RF, STANDARD RF BAND)



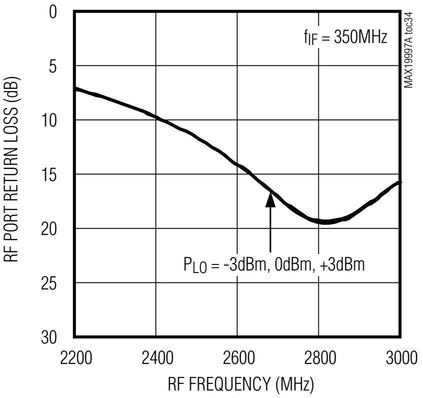
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY (LO > RF, STANDARD RF BAND)



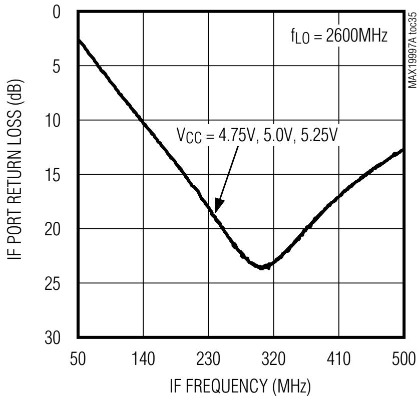
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +5.0V, LO is high-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

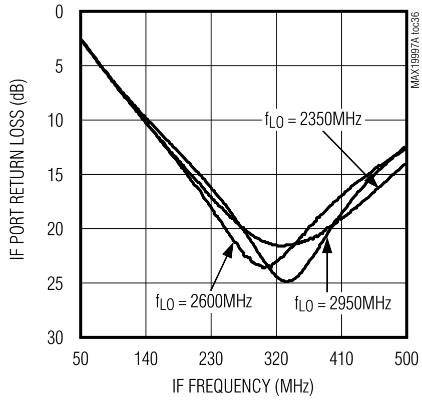
RF PORT RETURN LOSS vs. RF FREQUENCY (LO > RF, STANDARD RF BAND)



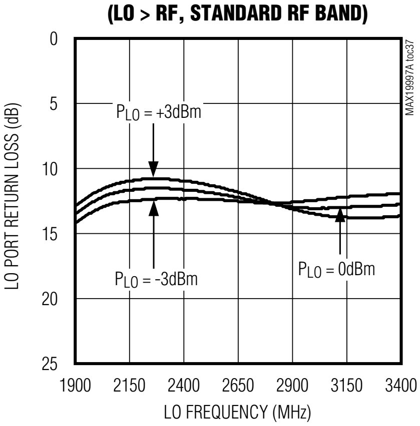
IF PORT RETURN LOSS vs. IF FREQUENCY (LO > RF, STANDARD RF BAND)



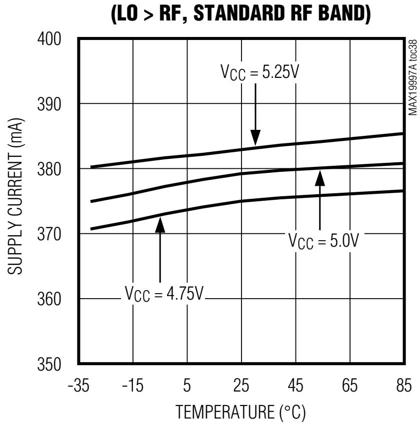
IF PORT RETURN LOSS vs. IF FREQUENCY (LO > RF, STANDARD RF BAND)



LO PORT RETURN LOSS vs. LO FREQUENCY (LO > RF, STANDARD RF BAND)



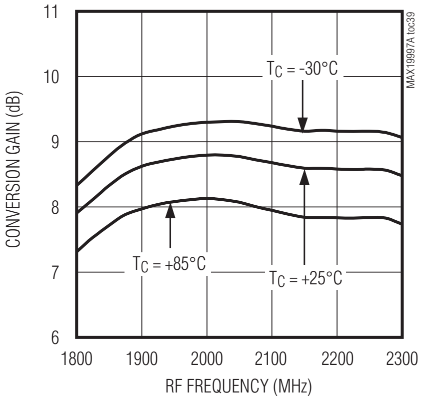
SUPPLY CURRENT vs. TEMPERATURE (T_C) (LO > RF, STANDARD RF BAND)



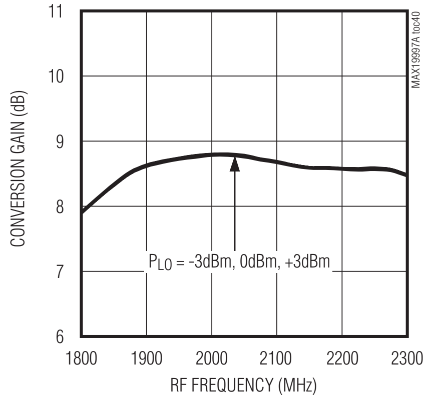
典型工作特性(续)

(*Typical Application Circuit*, **extended RF band (see Table 2), V_{CC} = +5.0V, LO is high-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

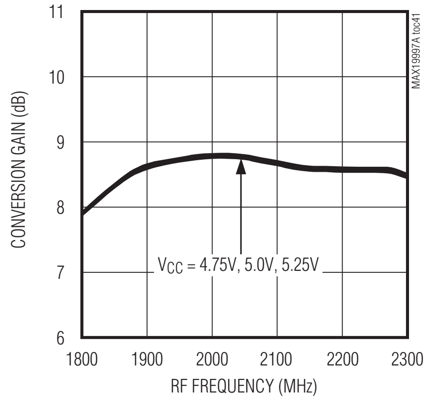
CONVERSION GAIN vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



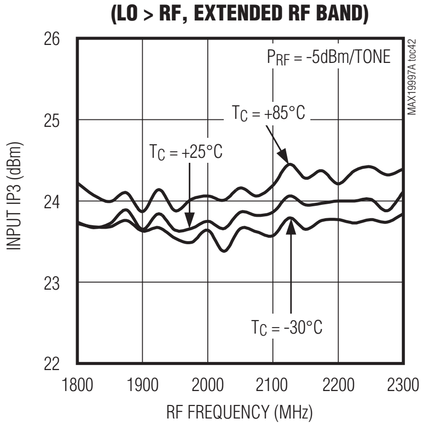
CONVERSION GAIN vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



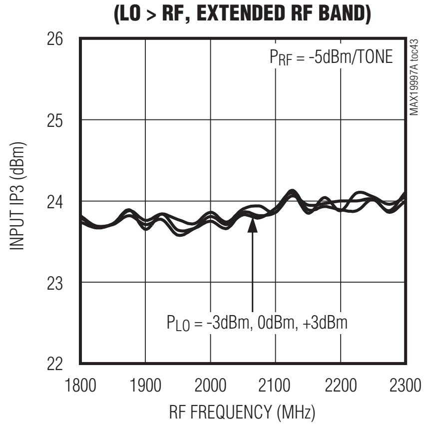
CONVERSION GAIN vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



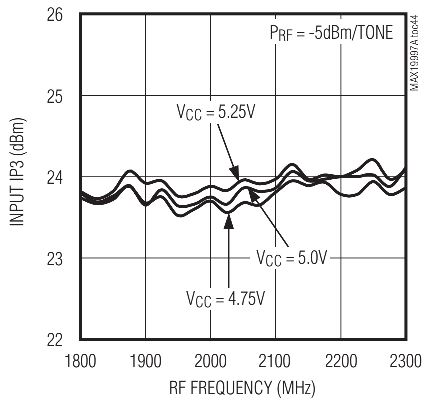
INPUT IP3 vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



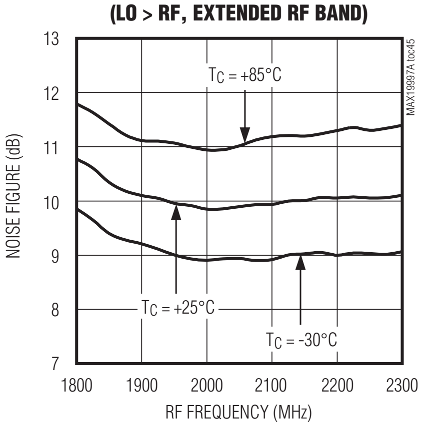
INPUT IP3 vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



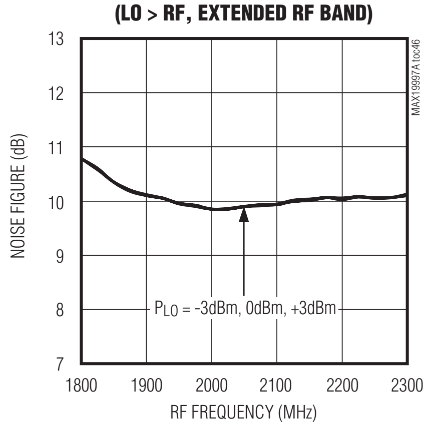
INPUT IP3 vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



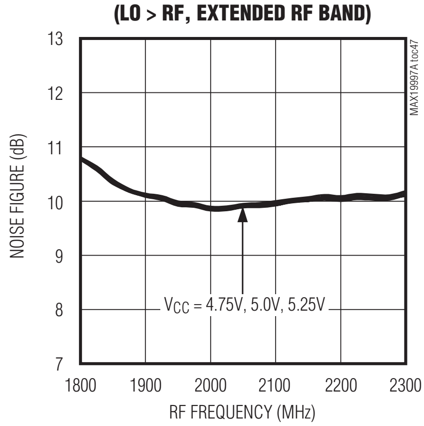
NOISE FIGURE vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



NOISE FIGURE vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



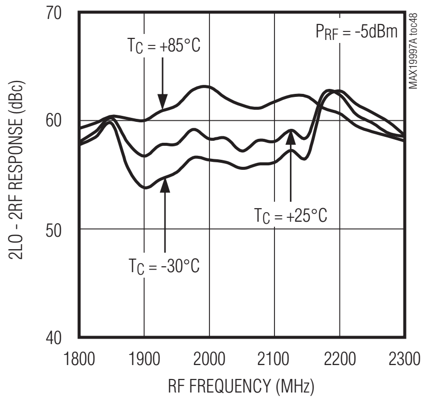
NOISE FIGURE vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



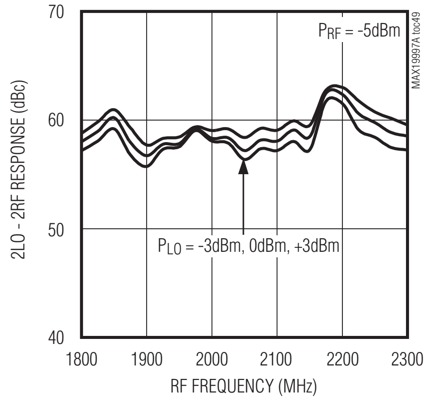
典型工作特性(续)

(*Typical Application Circuit*, **extended RF band (see Table 2), V_{CC} = +5.0V, LO is high-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

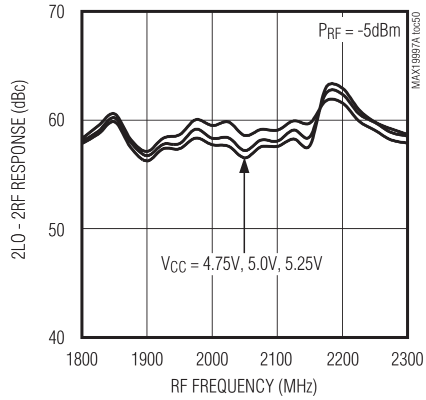
2LO - 2RF RESPONSE vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



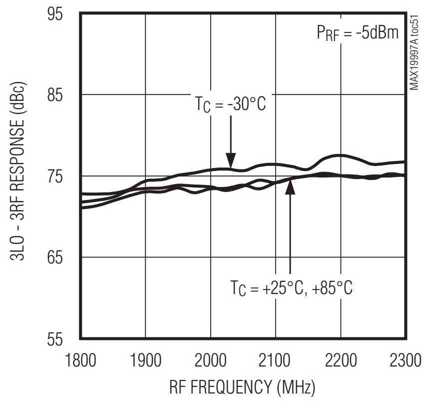
2LO - 2RF RESPONSE vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



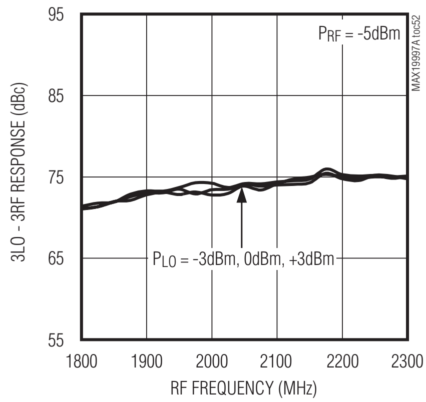
2LO - 2RF RESPONSE vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



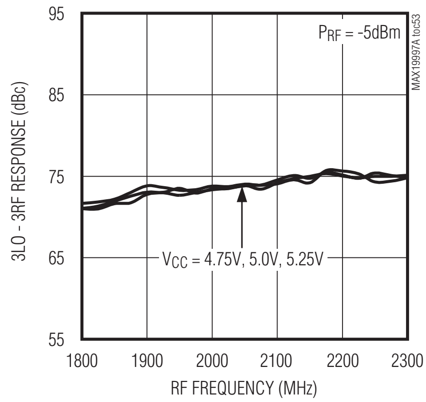
3LO - 3RF RESPONSE vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



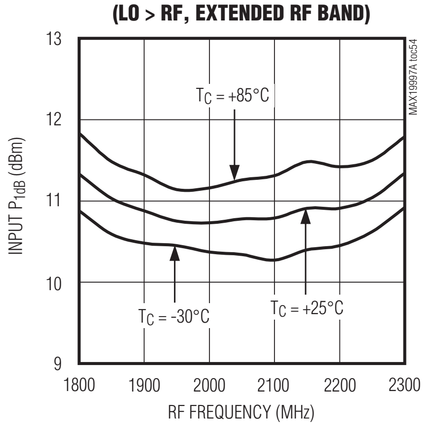
3LO - 3RF RESPONSE vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



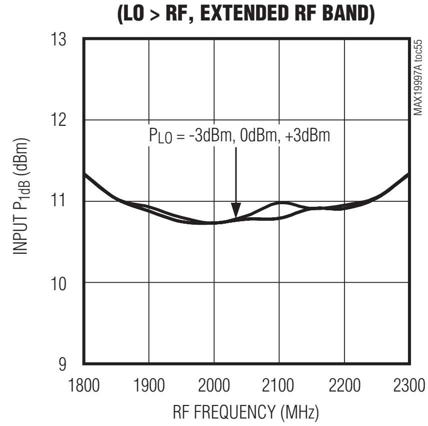
3LO - 3RF RESPONSE vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



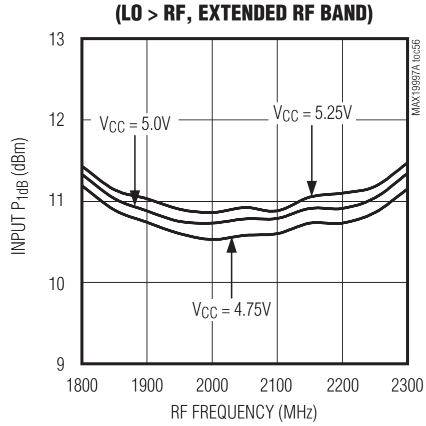
INPUT P_{1dB} vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



INPUT P_{1dB} vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



INPUT P_{1dB} vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



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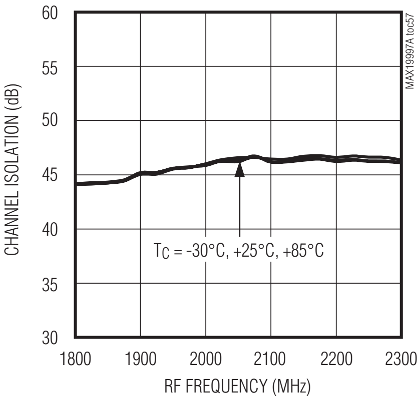
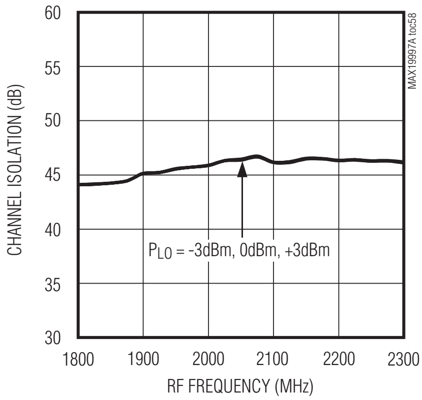
典型工作特性(续)

(*Typical Application Circuit*, **extended RF band (see Table 2), V_{CC} = +5.0V, LO is high-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

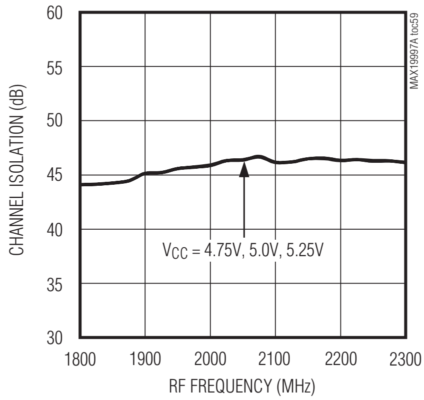
CHANNEL ISOLATION vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



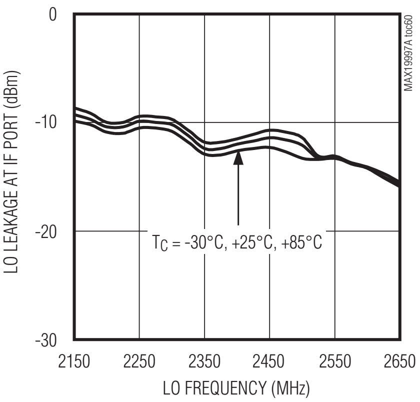
CHANNEL ISOLATION vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



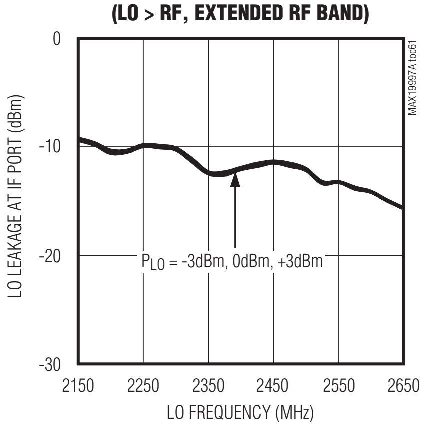
CHANNEL ISOLATION vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



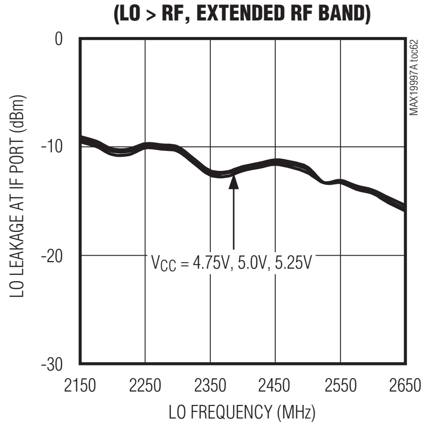
LO LEAKAGE AT IF PORT vs. LO FREQUENCY (LO > RF, EXTENDED RF BAND)



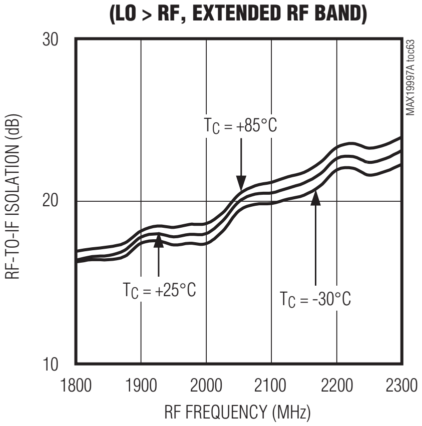
LO LEAKAGE AT IF PORT vs. LO FREQUENCY (LO > RF, EXTENDED RF BAND)



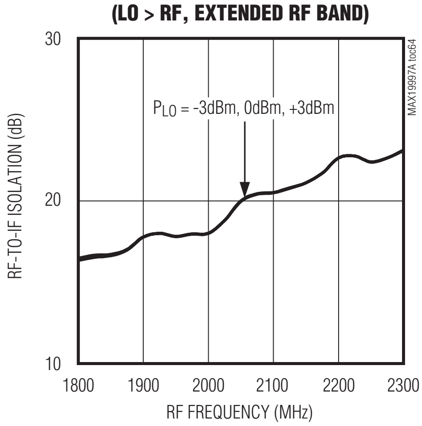
LO LEAKAGE AT IF PORT vs. LO FREQUENCY (LO > RF, EXTENDED RF BAND)



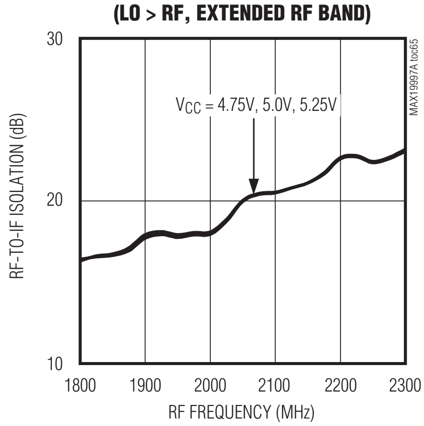
RF-TO-IF ISOLATION vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



RF-TO-IF ISOLATION vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



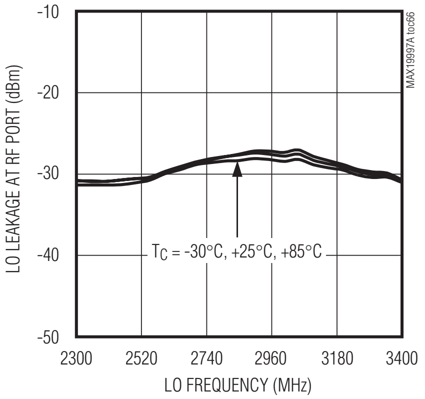
RF-TO-IF ISOLATION vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



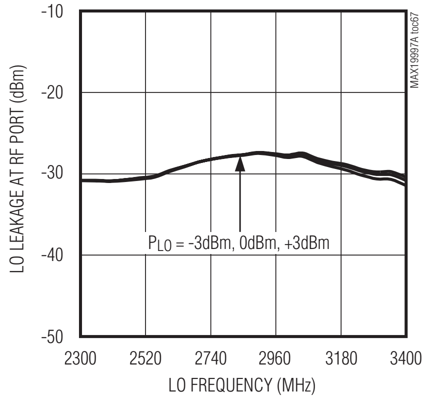
典型工作特性(续)

(*Typical Application Circuit*, **extended RF band (see Table 2), V_{CC} = +5.0V, LO is high-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

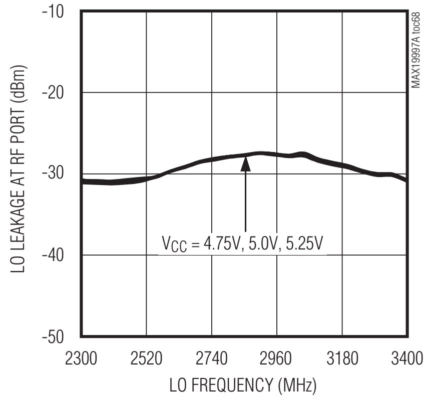
LO LEAKAGE AT RF PORT vs. LO FREQUENCY (LO > RF, EXTENDED RF BAND)



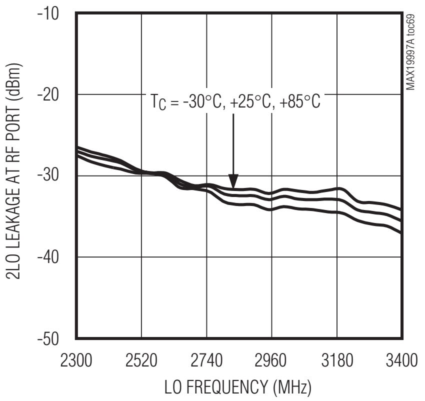
LO LEAKAGE AT RF PORT vs. LO FREQUENCY (LO > RF, EXTENDED RF BAND)



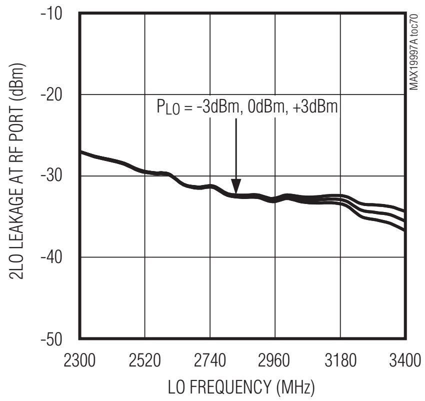
LO LEAKAGE AT RF PORT vs. LO FREQUENCY (LO > RF, EXTENDED RF BAND)



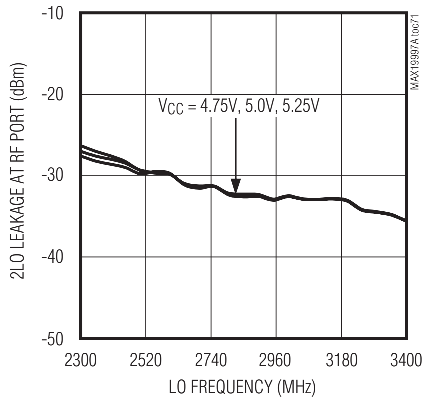
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY (LO > RF, EXTENDED RF BAND)



2LO LEAKAGE AT RF PORT vs. LO FREQUENCY (LO > RF, EXTENDED RF BAND)



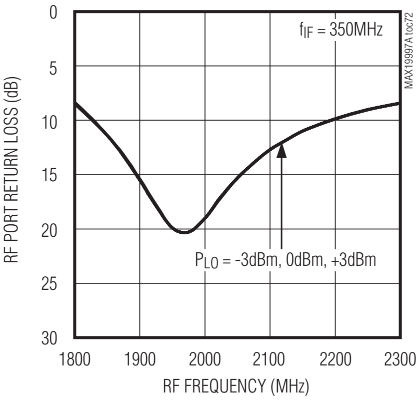
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY (LO > RF, EXTENDED RF BAND)



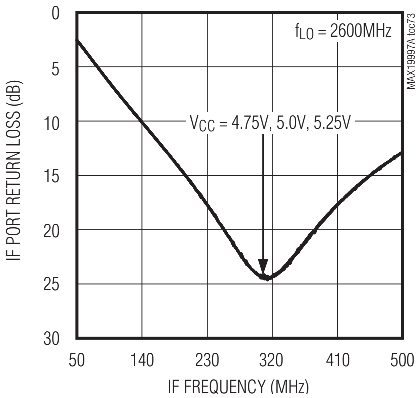
典型工作特性(续)

(*Typical Application Circuit*, **extended RF band (see Table 2), V_{CC} = +5.0V, LO is high-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

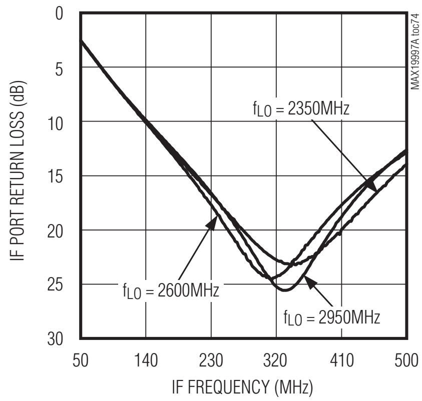
RF PORT RETURN LOSS vs. RF FREQUENCY (LO > RF, EXTENDED RF BAND)



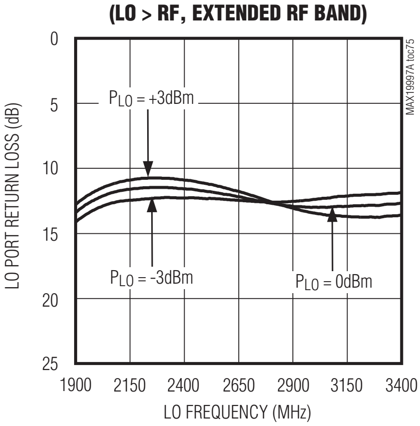
IF PORT RETURN LOSS vs. IF FREQUENCY (LO > RF, EXTENDED RF BAND)



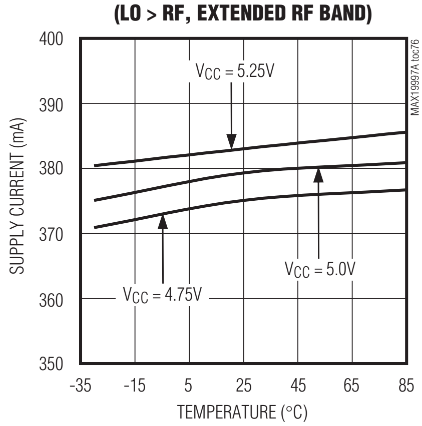
IF PORT RETURN LOSS vs. IF FREQUENCY (LO > RF, EXTENDED RF BAND)



LO PORT RETURN LOSS vs. LO FREQUENCY (LO > RF, EXTENDED RF BAND)



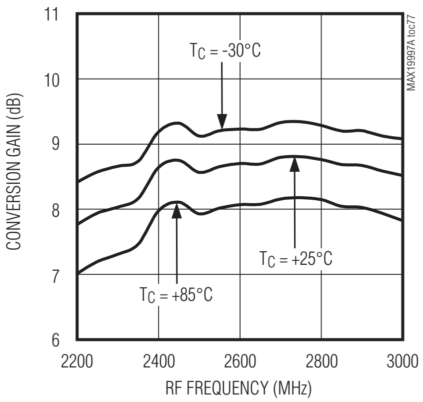
SUPPLY CURRENT vs. TEMPERATURE (T_C) (LO > RF, EXTENDED RF BAND)



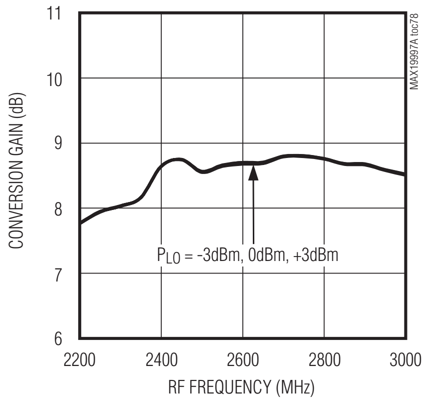
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +5.0V, LO is low-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

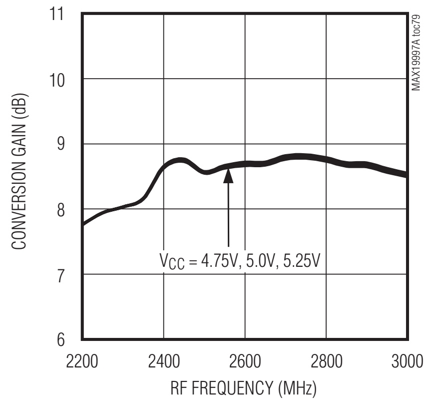
CONVERSION GAIN vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



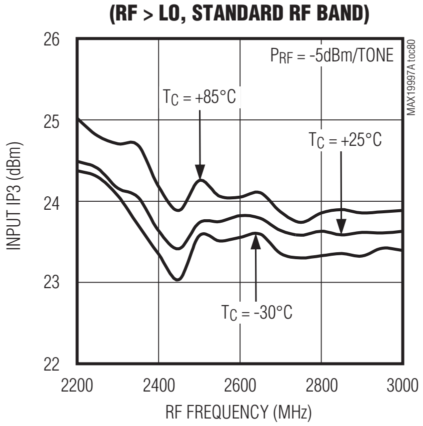
CONVERSION GAIN vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



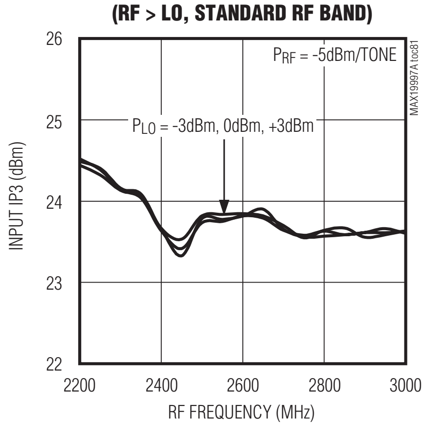
CONVERSION GAIN vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



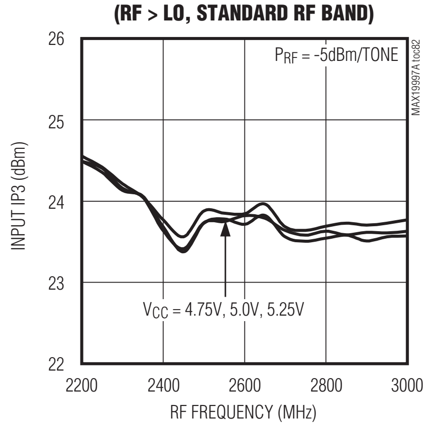
INPUT IP3 vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



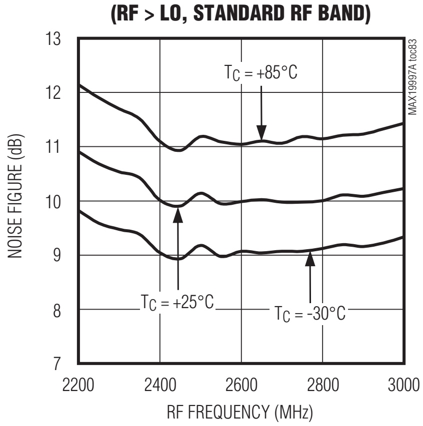
INPUT IP3 vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



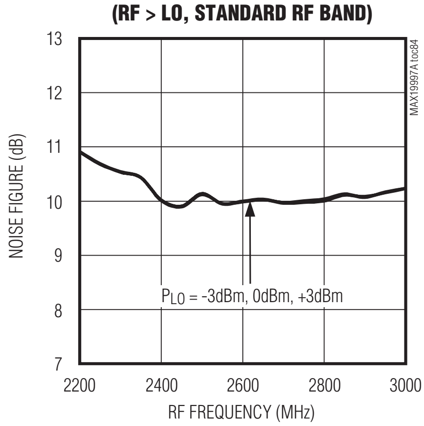
INPUT IP3 vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



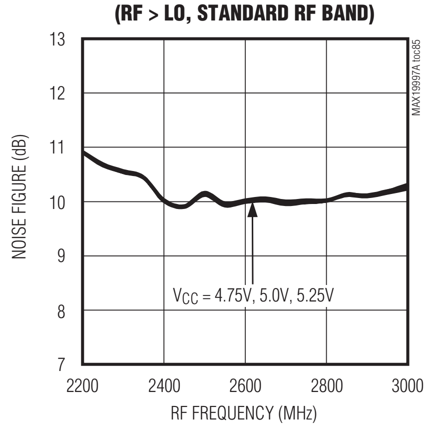
NOISE FIGURE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



NOISE FIGURE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



NOISE FIGURE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)

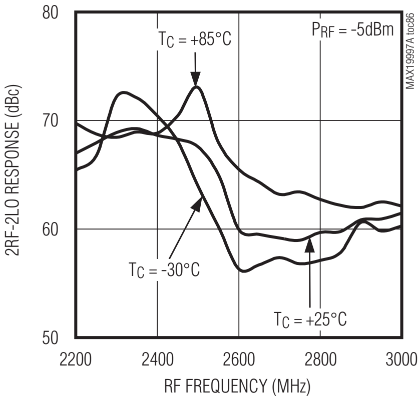


双通道、SiGe、高线性度、1800MHz至2900MHz下变频混频器，带有LO缓冲器

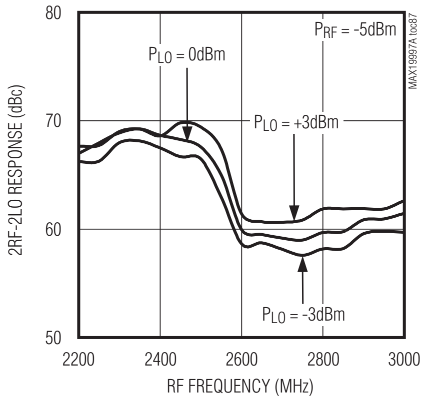
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +5.0V, LO is low-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

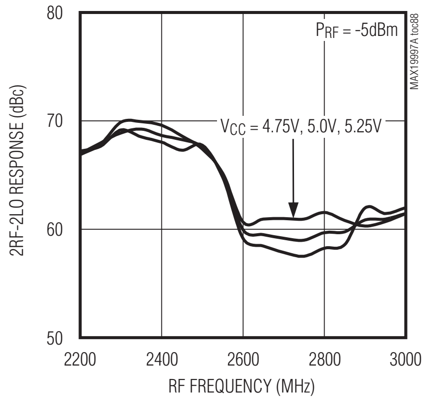
2RF-2LO RESPONSE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



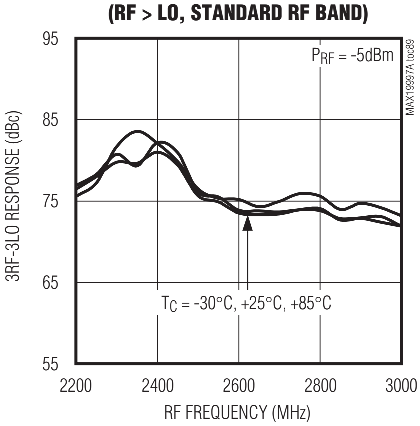
2RF-2LO RESPONSE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



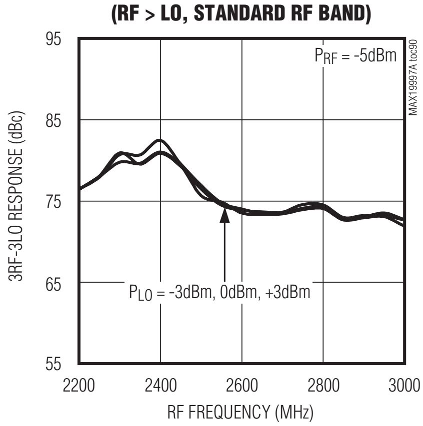
2RF-2LO RESPONSE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



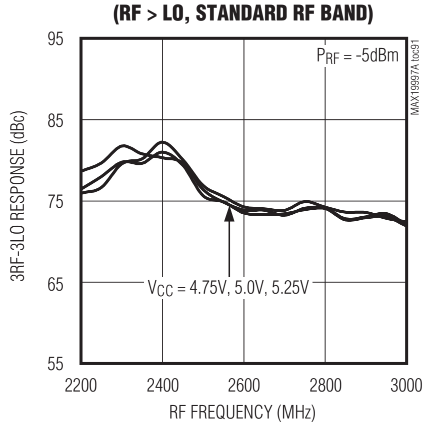
3RF-3LO RESPONSE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



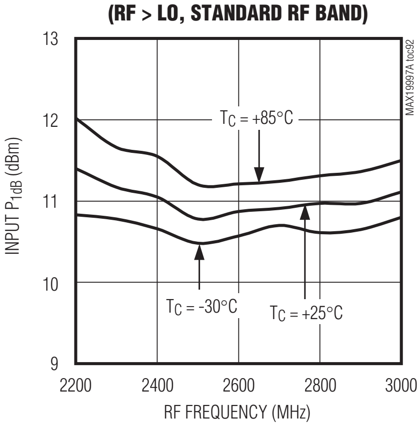
3RF-3LO RESPONSE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



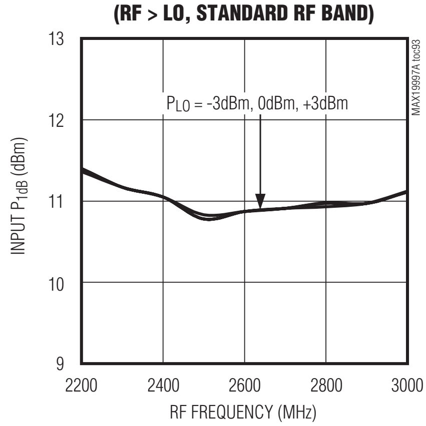
3RF-3LO RESPONSE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



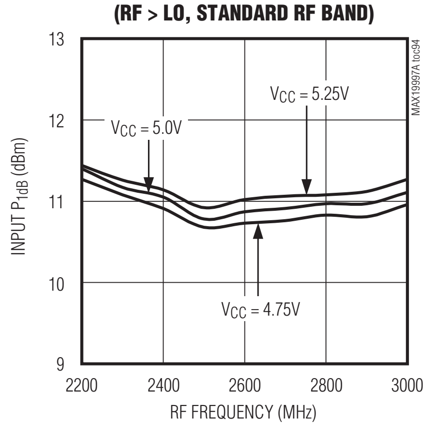
INPUT P_{1dB} vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



INPUT P_{1dB} vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



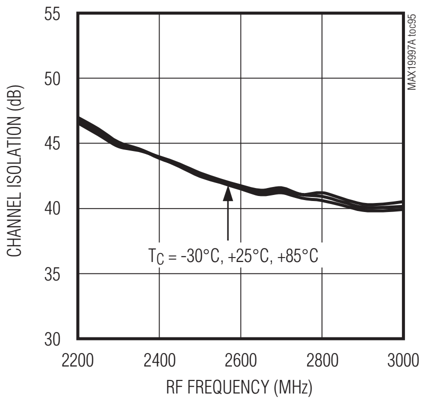
INPUT P_{1dB} vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



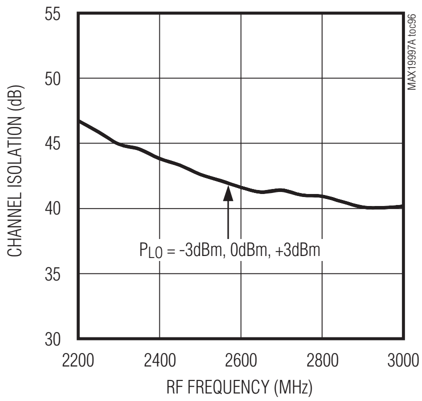
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +5.0V, LO is low-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

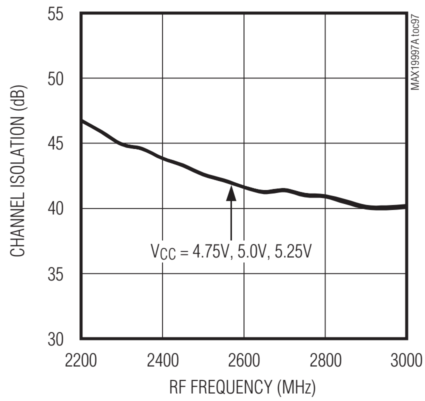
CHANNEL ISOLATION vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



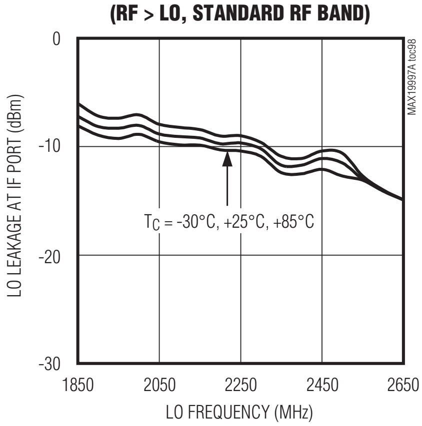
CHANNEL ISOLATION vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



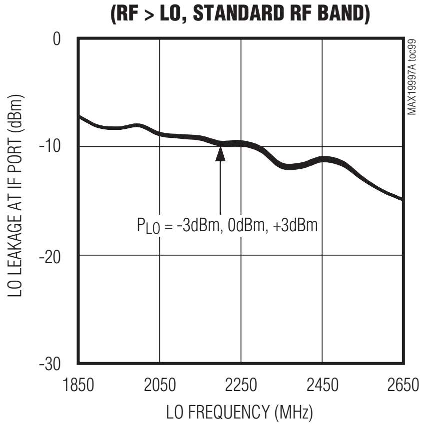
CHANNEL ISOLATION vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



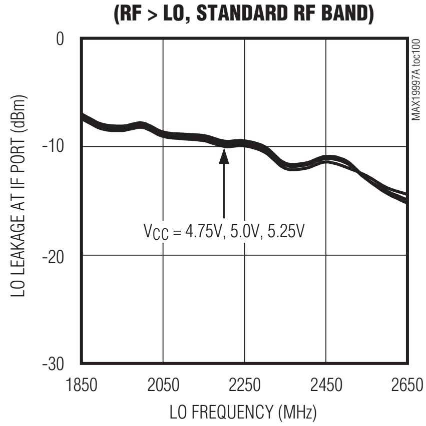
LO LEAKAGE AT IF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



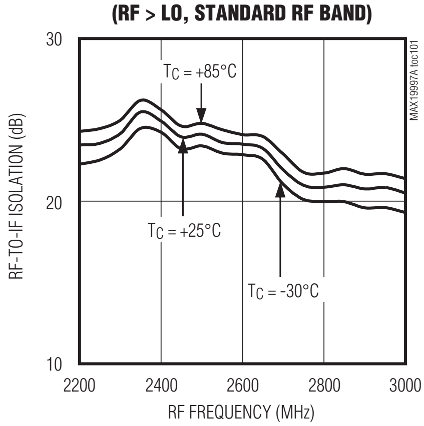
LO LEAKAGE AT IF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



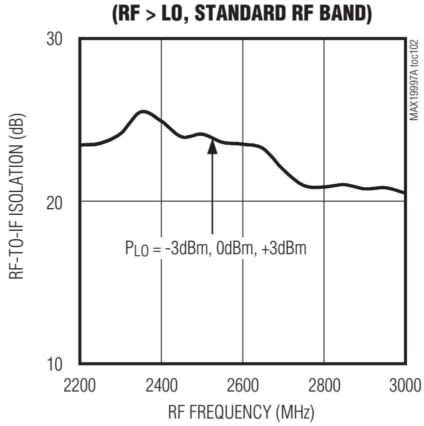
LO LEAKAGE AT IF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



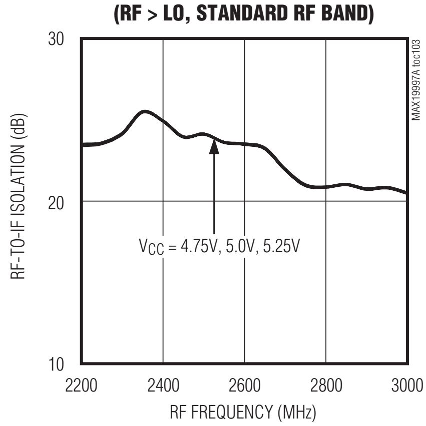
RF-TO-IF ISOLATION vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



RF-TO-IF ISOLATION vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



RF-TO-IF ISOLATION vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



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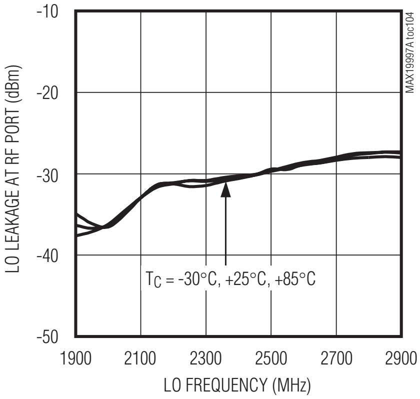
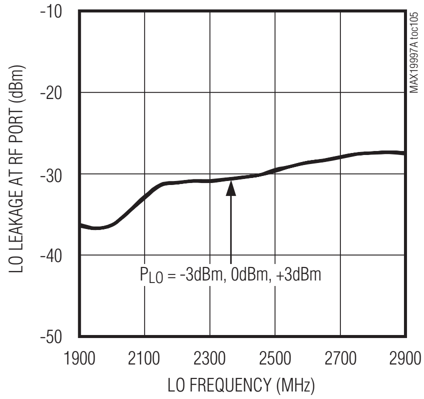
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +5.0V, LO is low-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

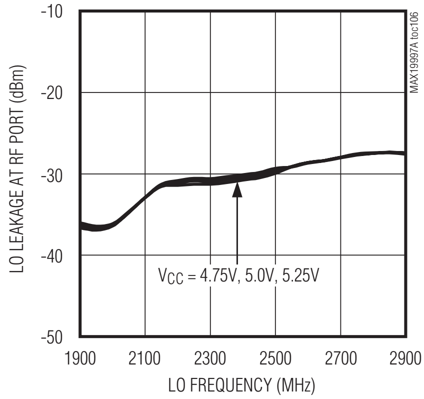
LO LEAKAGE AT RF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



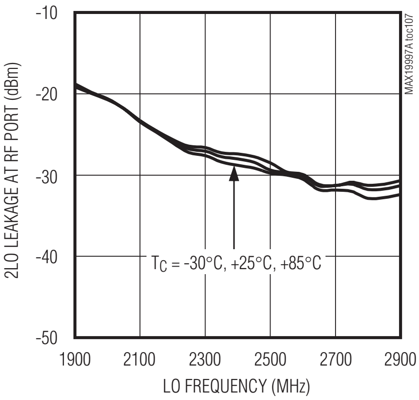
LO LEAKAGE AT RF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



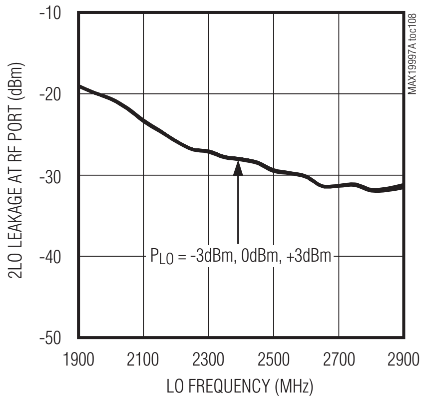
LO LEAKAGE AT RF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



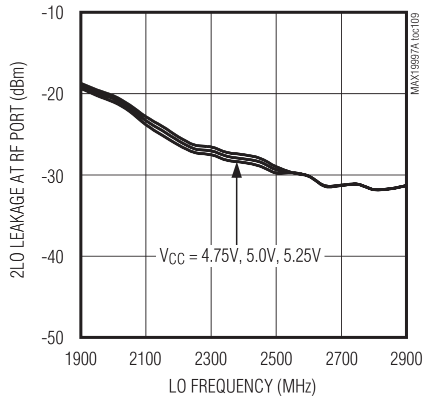
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



2LO LEAKAGE AT RF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



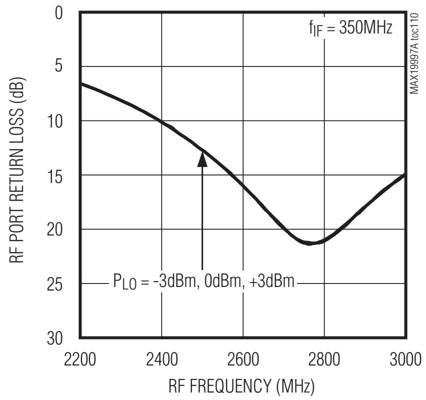
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



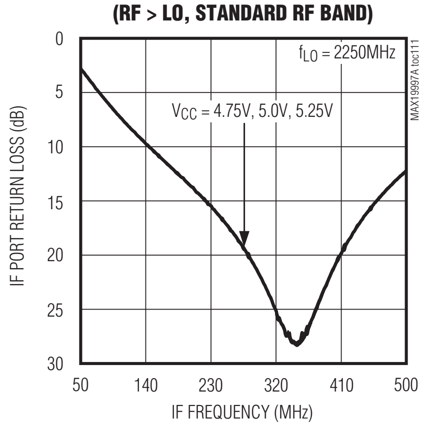
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +5.0V, LO is low-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

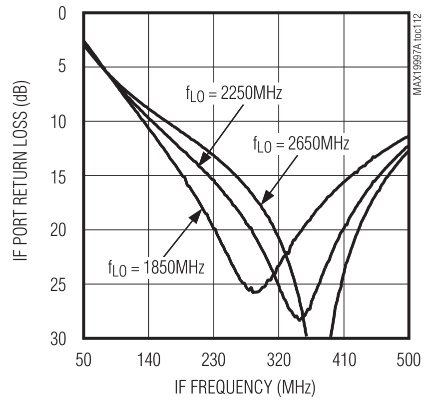
RF PORT RETURN LOSS vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



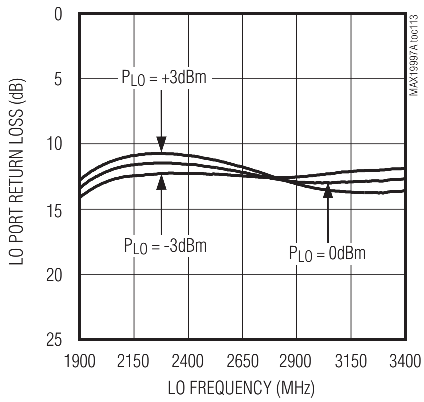
IF PORT RETURN LOSS vs. IF FREQUENCY (RF > LO, STANDARD RF BAND)



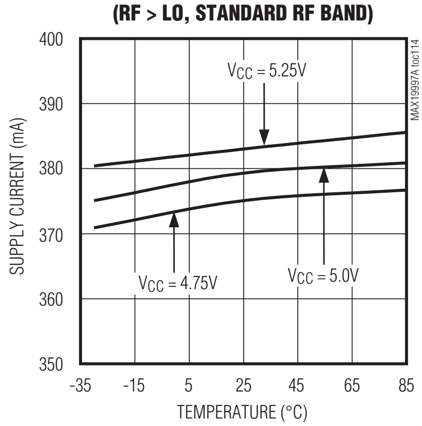
IF PORT RETURN LOSS vs. IF FREQUENCY (RF > LO, STANDARD RF BAND)



LO PORT RETURN LOSS vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



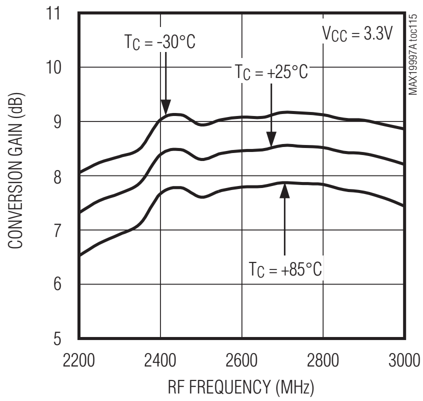
SUPPLY CURRENT vs. TEMPERATURE (T_C) (RF > LO, STANDARD RF BAND)



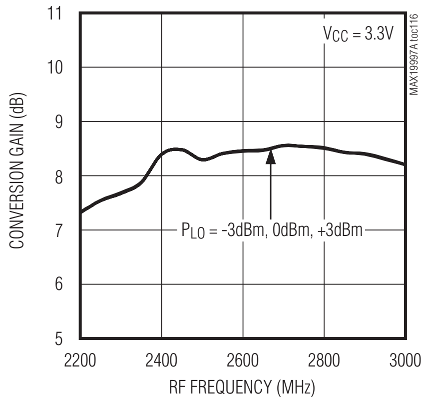
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +3.3V, LO is low-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

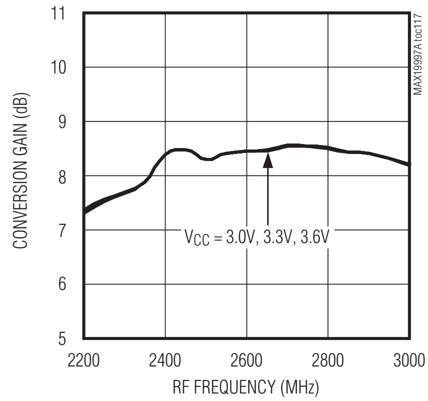
CONVERSION GAIN vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



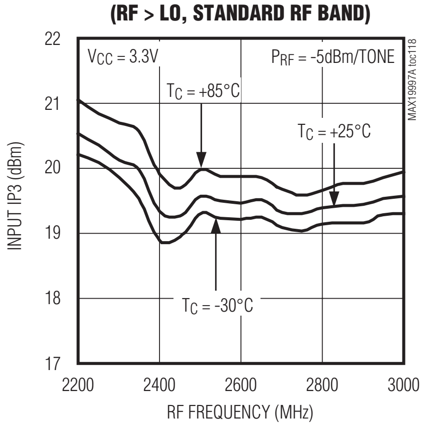
CONVERSION GAIN vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



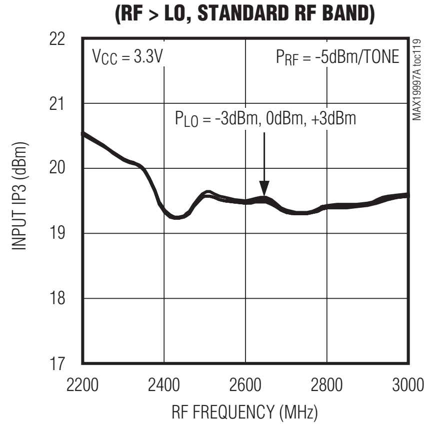
CONVERSION GAIN vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



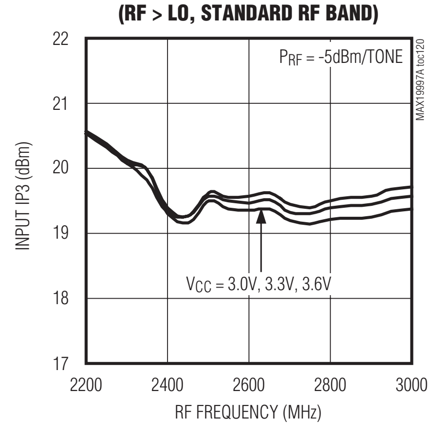
INPUT IP3 vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



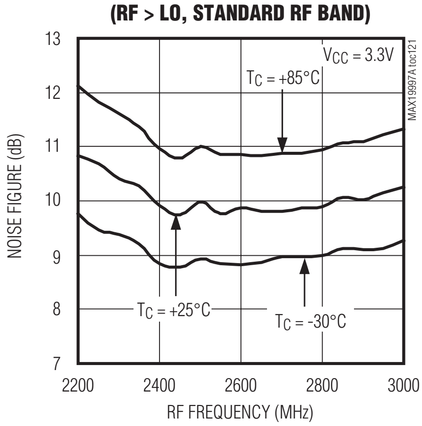
INPUT IP3 vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



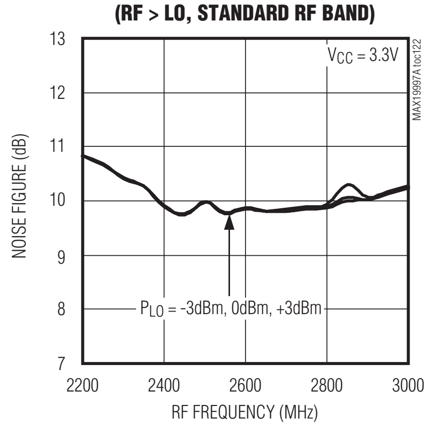
INPUT IP3 vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



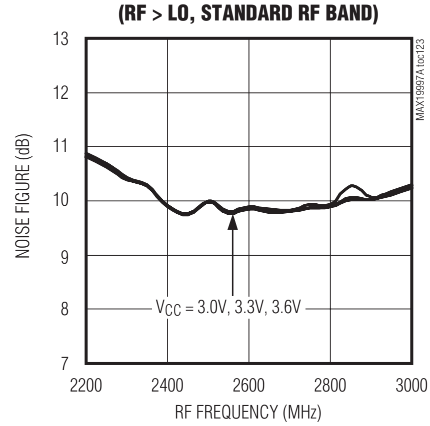
NOISE FIGURE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



NOISE FIGURE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



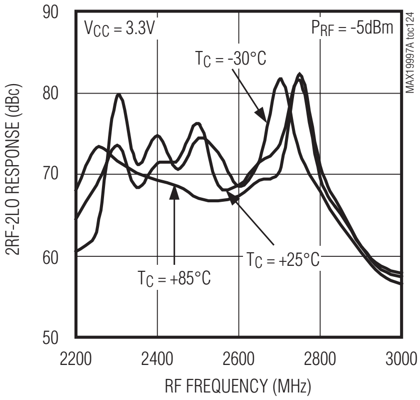
NOISE FIGURE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



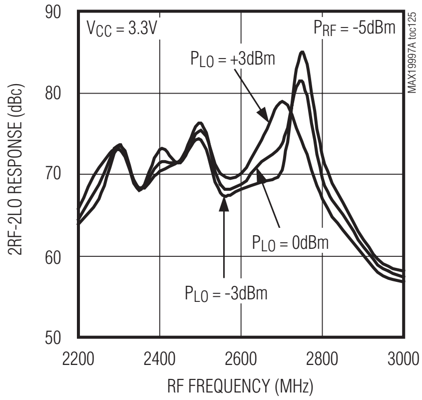
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +3.3V, LO is low-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

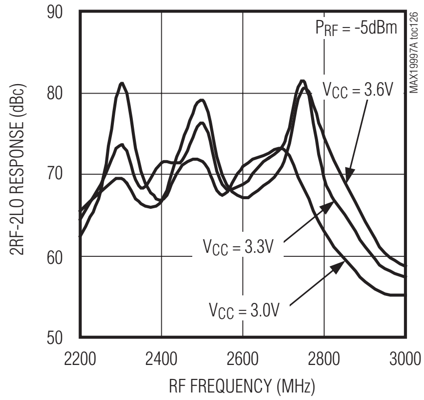
2RF-2LO RESPONSE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



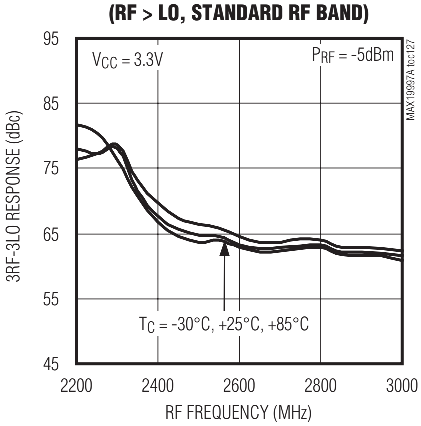
2RF-2LO RESPONSE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



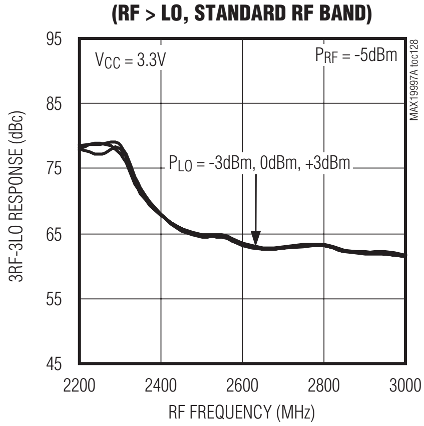
2RF-2LO RESPONSE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



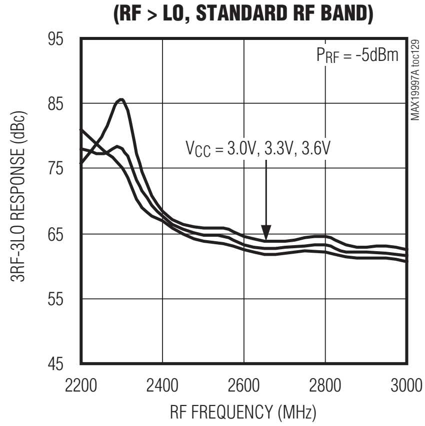
3RF-3LO RESPONSE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



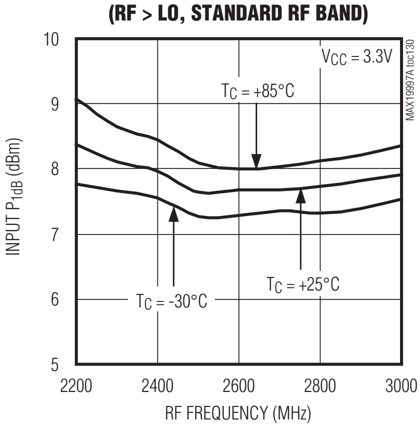
3RF-3LO RESPONSE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



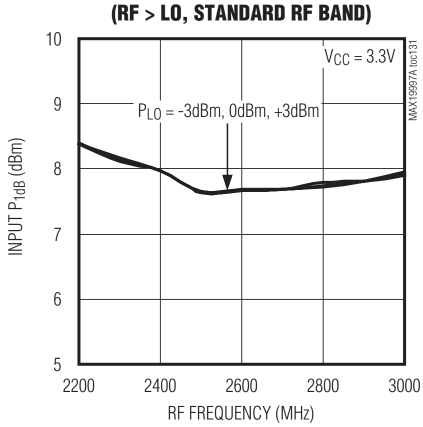
3RF-3LO RESPONSE vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



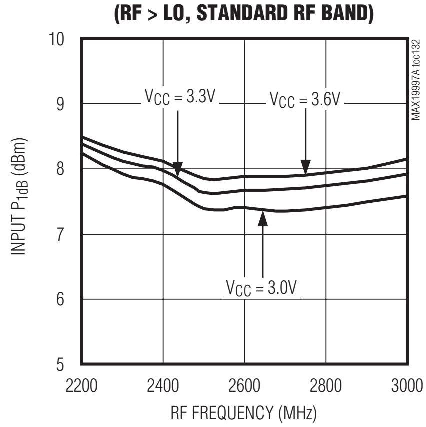
INPUT P_{1dB} vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



INPUT P_{1dB} vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



INPUT P_{1dB} vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)

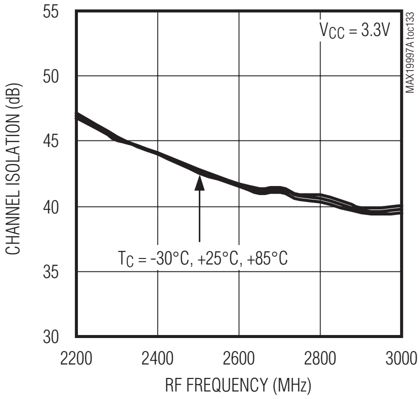


双通道、SiGe、高线性度、1800MHz至2900MHz下变频混频器，带有LO缓冲器

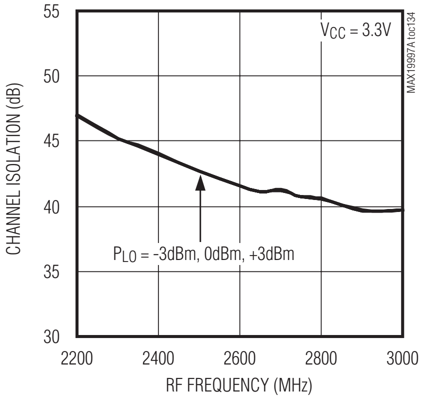
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +3.3V, LO is low-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

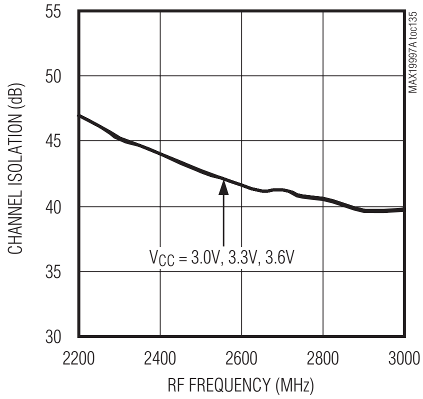
CHANNEL ISOLATION vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



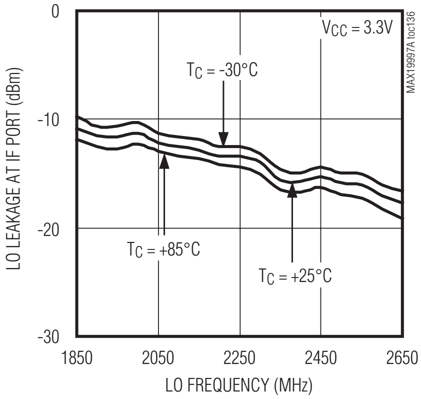
CHANNEL ISOLATION vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



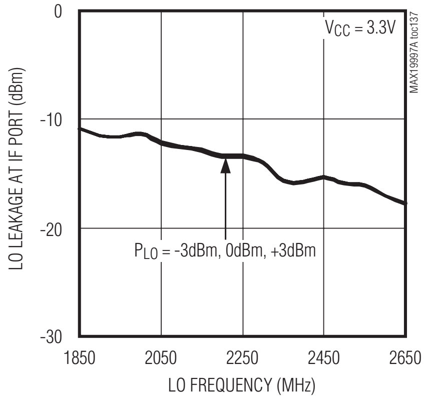
CHANNEL ISOLATION vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



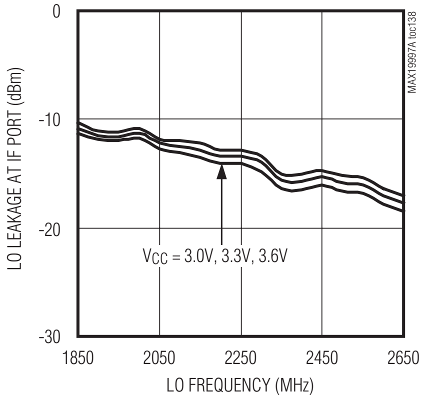
LO LEAKAGE AT IF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



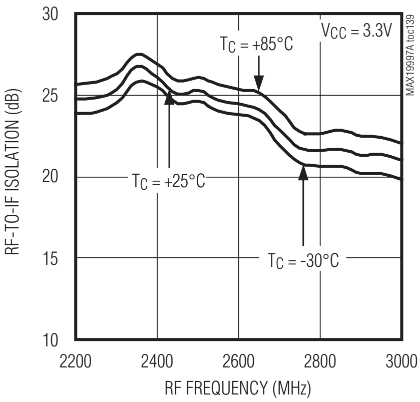
LO LEAKAGE AT IF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



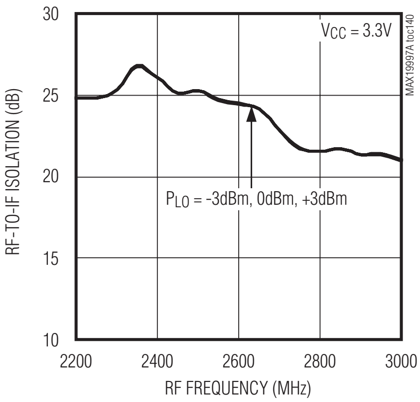
LO LEAKAGE AT IF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



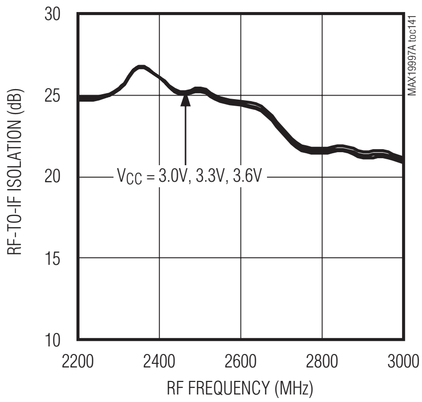
RF-TO-IF ISOLATION vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



RF-TO-IF ISOLATION vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



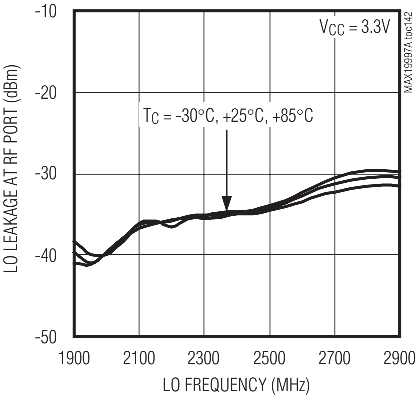
RF-TO-IF ISOLATION vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



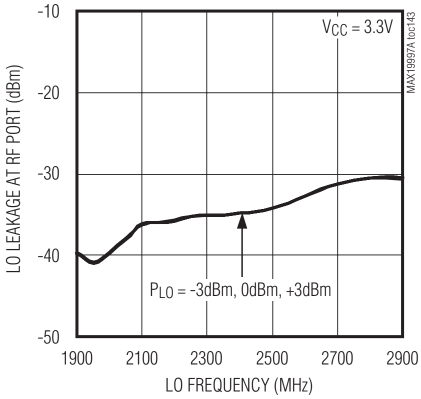
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +3.3V, LO is low-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

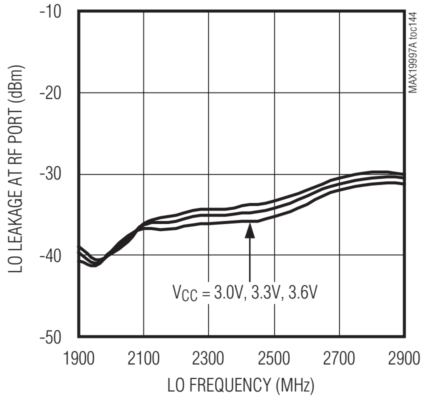
LO LEAKAGE AT RF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



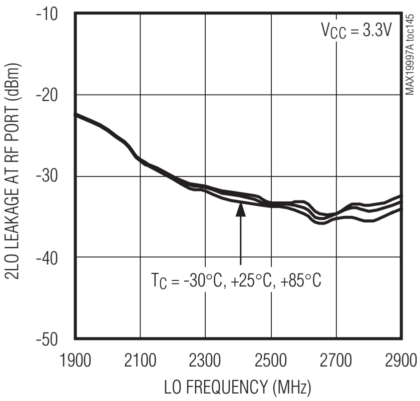
LO LEAKAGE AT RF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



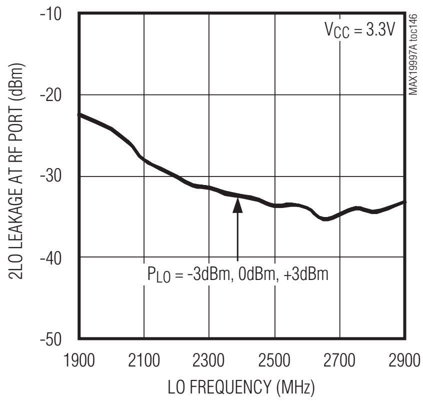
LO LEAKAGE AT RF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



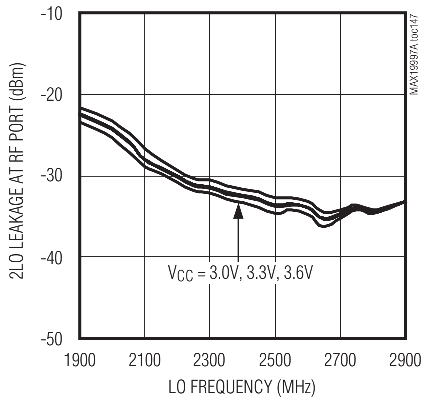
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



2LO LEAKAGE AT RF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



2LO LEAKAGE AT RF PORT vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)

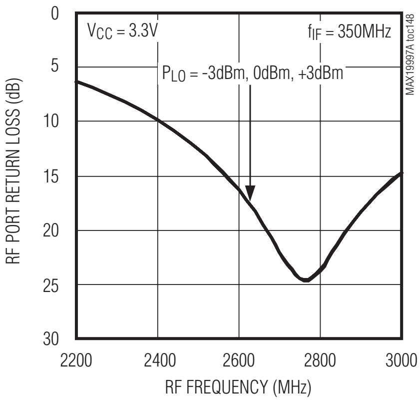


双通道、SiGe、高线性度、1800MHz至2900MHz下变频混频器，带有LO缓冲器

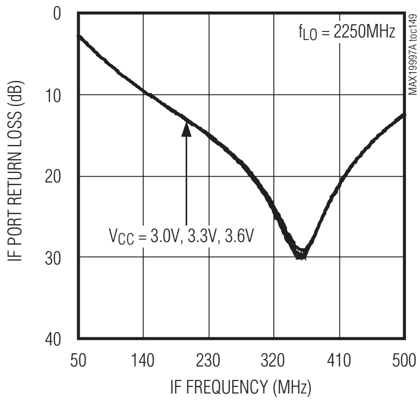
典型工作特性(续)

(*Typical Application Circuit*, **standard RF band (see Table 1), V_{CC} = +3.3V, LO is low-side injected** for a 350MHz IF, P_{LO} = 0dBm, P_{RF} = -5dBm, T_C = +25°C, unless otherwise noted.)

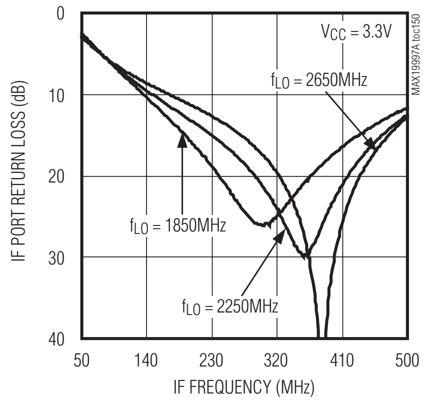
RF PORT RETURN LOSS vs. RF FREQUENCY (RF > LO, STANDARD RF BAND)



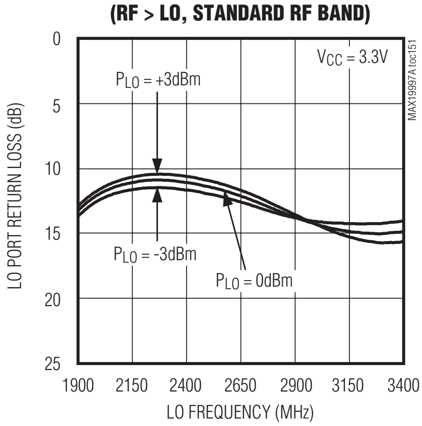
IF PORT RETURN LOSS vs. IF FREQUENCY (RF > LO, STANDARD RF BAND)



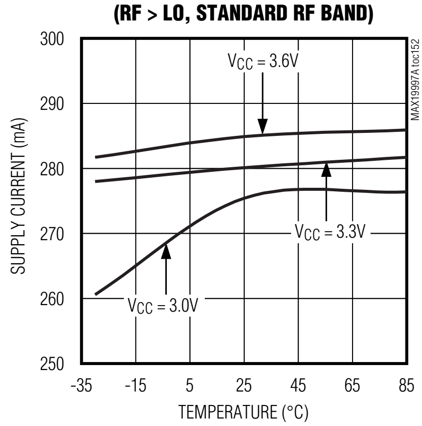
IF PORT RETURN LOSS vs. IF FREQUENCY (RF > LO, STANDARD RF BAND)



LO PORT RETURN LOSS vs. LO FREQUENCY (RF > LO, STANDARD RF BAND)



SUPPLY CURRENT vs. TEMPERATURE (T_C) (RF > LO, STANDARD RF BAND)



引脚说明

引脚	名称	功能
1	RFMAIN	主通道RF输入。内部匹配为50Ω，需要一个输入隔直电容。
2, 5, 6, 8, 12, 15, 18, 23, 28, 31, 34	GND	地，内部没有连接，可以将这些引脚接地或浮空。
3, 7, 20, 22, 24–27	GND	地，内部连接至裸焊盘，将所有地引脚与裸焊盘(EP)连接在一起。
4, 10, 16, 21, 30, 36	V_{CC}	电源，旁路电容应尽可能靠近该引脚放置(参见*典型应用电路*)。
9	RFDIV	分集通道RF输入。内部匹配为50Ω，需要一个输入隔直电容。
11	IFD_SET	IF分集放大器的偏置控制。在该引脚与地之间连接一个电阻来设置分集IF放大器的偏置电流。
13, 14	IFD+, IFD-	分集混频器差分IF输出。各引脚均需通过上拉电感连接至V_{CC} (参见*典型应用电路*)。
17	LO_ADJ_D	LO分集放大器的偏置控制。在该引脚与地之间连接一个电阻设置分集LO放大器的偏置电流。
19	LO	本振输入，该输入端在内部匹配为50Ω，需要一个输入隔直电容。
29	LO_ADJ_M	LO主放大器的偏置控制。在该引脚与地之间连接一个电阻来设置LO主放大器的偏置电流。
32, 33	IFM-, IFM+	主混频器差分IF输出。各引脚均需通过上拉电感连接至V_{CC} (参见*典型应用电路*)。
35	IFM_SET	IF主放大器的偏置控制。在该引脚与地之间连接一个电阻设置IF主放大器的偏置电流。
—	EP	裸焊盘，内部连接至GND，使用多个接地过孔将该焊盘焊接到一个PCB盘，为器件与PCB地层之间提供好的散热通道。多个接地过孔还有助于改善RF性能。

详细说明

MAX19997A双通道下变频混频器能够为多种1800MHz至2900MHz基站应用提供高线性度和低噪声系数。器件完全支持2300MHz至2900MHz的WiMAX、LTE、WCS以及MMDS无线基础设施应用中的低端和高端LO注入架构。在每个RF端口增加一个调谐元件(并联电感)，其高端LO注入架构还可以支持WCDMA、cdma2000和PCS1900应用。

MAX19997A能够工作在1950MHz至3400MHz LO范围以及50MHz至550MHz IF范围。集成非平衡变压器和匹配电路允许50Ω单端接口与RF和LO端口连接。集成LO缓冲器可以为混频器核提供较强的驱动能力，将MAX19997A输入端所需的LO驱动减小到-3dBm至+3dBm。IF端口配合差分输出，有效改善了2RF - 2LO (低端注入)和2LO - 2RF (高端注入)性能。

RF输入和非平衡变压器

MAX19997A的两个RF输入(RFMAIN和RFDIV)结合串联隔直流电容，均匹配在50Ω。输入端通过每个通道的片上非平衡变压器内部直流短接到地，因此需要隔直电容。使用22pF隔直流电容时，在整个2600MHz至2900MHz的RF频率范围内，RF端口的输入回波损耗典型值为15dB。

在每个RF端口增加一个调谐元件，MAX19997A的RF频率范围还可以向下拓展到1800MHz。对于1950MHz的RF应用，可以分别在第1引脚和第9引脚与地之间连接一个12nH的并联电感，另外，还需要将隔直流电容(C1和C8)从22pF更换为1pF，详细信息请参考*典型应用电路*。

LO输入、缓冲器和非平衡变压器

两级内部LO缓冲器允许较宽范围的输入功率驱动LO。在-3dBm至+3dBm LO信号功率范围内，确保各项指标在规定的范围内。片上低损耗非平衡变压器和LO缓冲器配合使用，驱动双平衡混频器。LO输入端与IF输出端之间的所有接口和匹配元件均已集成在芯片上。

高线性度混频器

MAX19997A的核心电路由两个双平衡、高性能无源混频器组成。片上LO缓冲器具有较大的LO摆幅，可提供优异的线性度指标。对于覆盖2300MHz至2900MHz频段的低端LO注入架构，与集成IF放大器配合使用时，级联后的IIP3、2RF - 2LO抑制和NF的典型值分别为+24dBm (IIP3)、-67dBc和10.3dB。对于高端LO注入架构(覆盖频率为2300MHz至2900MHz)可以获得同等的级联特性，IIP3、2LO - 2RF抑制和NF典型值分别为+24dBm (IIP3)、-73dBc和10.4dB。

差分IF输出放大器

MAX19997A混频器具有50MHz至550MHz的IF频率范围，差分、集电极开路IF输出端口需要通过外部电感上拉至V_{CC}。这些电感与IC的并联电容、PCB上的元件以及PCB本身的寄生电容产生谐振，使IF匹配电路优化在所要求的频率。值得注意的是：这些差分IF输出能够改善2RF - 2LO和2LO - 2RF抑制指标，单端IF应用需要一个4:1的非平衡变压器，将200Ω的差分电阻转换成50Ω单端输出。在非平衡变压器之后，电压驻波比(VSWR)为1.2:1。

应用信息

输入和输出匹配

RF和LO输入端在内部匹配为50Ω，在2400MHz至2900MHz的RF频率范围内无需匹配元件。RF和LO输入端只需通过隔直电容连接。

必要时，每个RF端口增加两个外部匹配元件，RF工作频段能够扩展至1800MHz，详细信息请参考*典型应用电路*和表2。

IF输出阻抗为200Ω (差分)。为方便评估，通过外部低损耗4:1 (阻抗比)非平衡变压器将该阻抗转化成50Ω单端输出(参见*典型应用电路*)。

降低功耗模式

MAX19997A的每个通道均具有两个引脚(LO_ADJ_ _，IF_ _SET)，允许通过外部电阻设置内部偏置电流。电阻的标称值如表1和表2所示。增大电阻值可降低功耗，但代价是性能有所下降。如果没有±1%精度的电阻，可以采用±5%的电阻替代。

选择+3.3V为混频器供电也可以显著降低功耗，这种方式可以将整体功耗降低53%，功耗与性能的对应关系请参考*+3.3V Supply, Low-Side LO Injection AC Electrical Characteristics*和*典型工作特性*中与+3.3V供电相关的特性曲线。

布局考虑

合理的PCB设计是任何RF/微波电路的一个重要部分。RF信号线应尽可能短，以减小损耗、辐射和电感。为获得最佳性能，接地引脚须直接与封装底部的裸焊盘连接。

PCB上的裸焊盘**必须**连接至PCB的地层。建议采用多个过孔将该焊盘连接至地层。这种方法能为器件提供一个良好的RF/散热路径。将器件封装底部的裸焊盘焊接至PCB。电路板布局请参考MAX19997A评估板，Gerber文件可从china.maxim-ic.com申请。

电源旁路

合理的电源旁路对高频电路的稳定性至关重要。如*典型应用电路*所示，对各V_{CC}引脚使用电容旁路。

裸焊盘的RF/散热考虑

MAX19997A采用36引脚、薄型QFN-EP封装，其裸焊盘(EP)提供了一个与管芯之间的低热阻通路。在安装MAX19997A的PCB与EP之间保持良好的热传递通道非常重要。此外，EP应通过一个低电感路径接地。EP**必须**直接或通过一系列电镀过孔焊接至PCB的地层。

表1. 标准RF频段应用电路的元件值(优化于2400MHz至2900MHz频率范围)

DESIGNATION	QTY	DESCRIPTION	COMPONENT SUPPLIER
C1, C8	2	22pF microwave capacitors (0402)	Murata Electronics North America, Inc.
C14	1	1.5pF microwave capacitor (0402)	Murata Electronics North America, Inc.
C4, C9, C13, C15, C17, C18	6	0.01µF microwave capacitors (0402)	Murata Electronics North America, Inc.
C10, C11, C12, C19, C20, C21	6	82pF microwave capacitors (0603)	Murata Electronics North America, Inc.
L1, L2, L3, L4	4	120nH wire-wound high-Q inductors* (0805)	Coilcraft, Inc.
L7, L8	0	Not used	—
R1, R4	2	750Ω ±1% resistors (0402). Use for **V_{CC} = +5.0V** applications. Larger values can be used to reduce power at the expense of some performance loss. See the *Typical Operating Characteristics* section.	Digi-Key Corp.
		1.1kΩ ±1% resistors (0402). Use for **V_{CC} = +3.3V** applications. Larger values can be used to reduce power at the expense of some performance loss. See the *Typical Operating Characteristics* section.	Digi-Key Corp.
R2, R5	2	698Ω ±1% resistors (0402). Use for **V_{CC} = +5.0V** applications. Larger values can be used to reduce power at the expense of some performance loss. See the *Typical Operating Characteristics* section.	Digi-Key Corp.
		845Ω ±1% resistors (0402). Use for **V_{CC} = +3.3V** applications. Larger values can be used to reduce power at the expense of some performance loss. See the *Typical Operating Characteristics* section.	Digi-Key Corp.
R3, R6	2	0Ω resistors (1206). These resistors can be increased in value to reduce power dissipation in the device, but reduces the compression point. Full P_{1dB} performance achieved using 0Ω.	Digi-Key Corp.
T1, T2	2	4:1 IF baluns (TC4-1W-17+)	Mini-Circuits
U1	1	MAX19997A IC (36 TQFN-EP)	Maxim Integrated Products, Inc.

*对于200MHz IF频率，使用390nH (0805)电感。详细信息请与工厂联系。

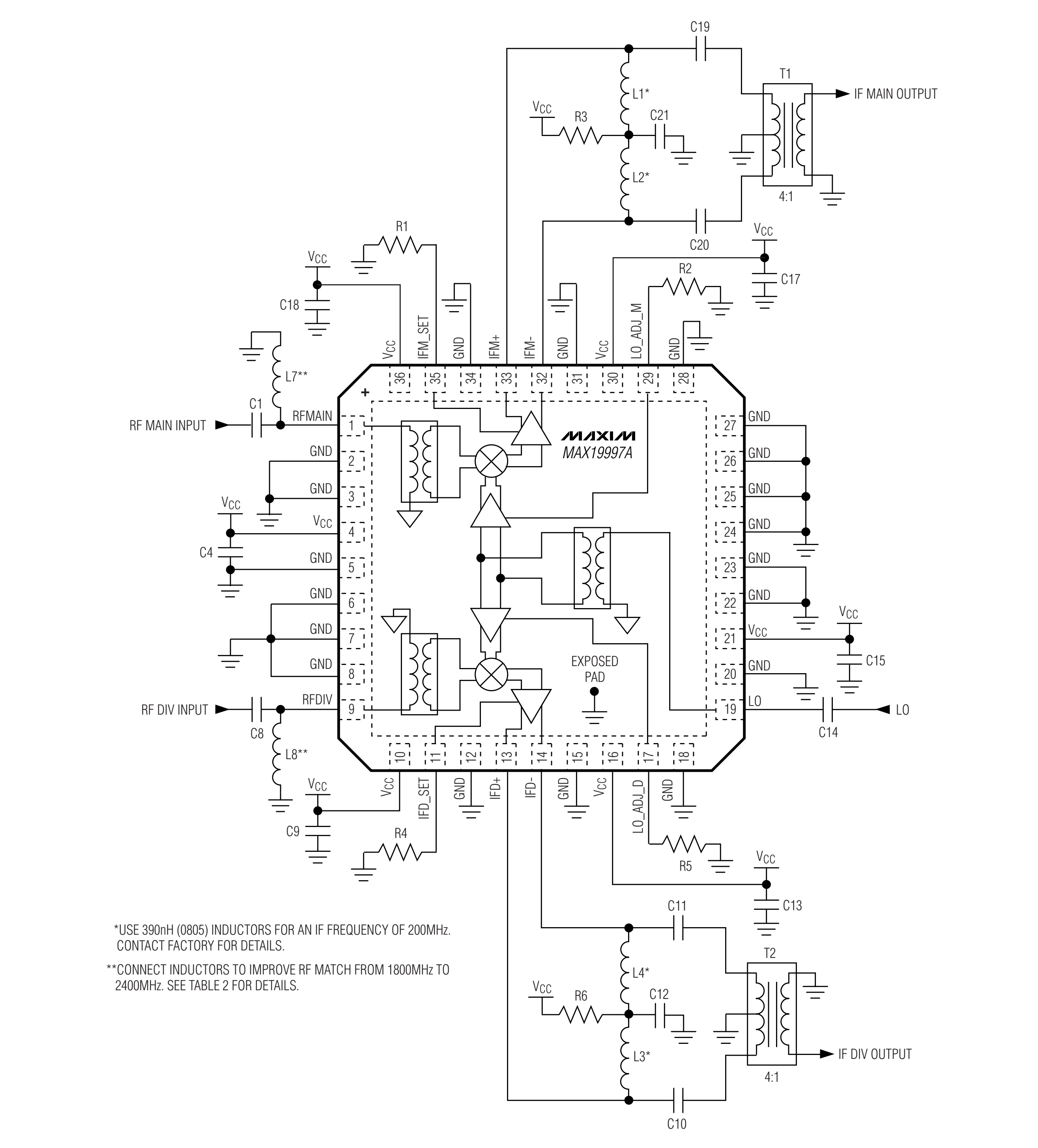
双通道、SiGe、高线性度、1800MHz至2900MHz 下变频混频器，带有LO缓冲器

表2. 扩展RF频段应用电路的元件值(优化于1950MHz)

DESIGNATION	QTY	DESCRIPTION	COMPONENT SUPPLIER
C1, C8	2	1pF microwave capacitors (0402)	Murata Electronics North America, Inc.
C14	1	1.5pF microwave capacitor (0402)	Murata Electronics North America, Inc.
C4, C9, C13, C15, C17, C18	6	0.01µF microwave capacitors (0402)	Murata Electronics North America, Inc.
C10, C11, C12, C19, C20, C21	6	82pF microwave capacitors (0603)	Murata Electronics North America, Inc.
L1, L2, L3, L4	4	120nH wire-wound high-Q inductors* (0805)	Coilcraft, Inc.
L7, L8	2	12nH inductor (0402). Use to improve RF match from 1800MHz to 2400MHz. Connect L7 and L8 from pins 1 and 9, respectively, to ground.	Coilcraft, Inc.
R1, R4	2	750Ω ±1% resistors (0402). Use for **V_{CC} = +5.0V** applications. Larger values can be used to reduce power at the expense of some performance loss. See the *Typical Operating Characteristics* section.	Digi-Key Corp.
R2, R5	2	698Ω ±1% resistors (0402). Use for **V_{CC} = +5.0V** applications. Larger values can be used to reduce power at the expense of some performance loss. See the *Typical Operating Characteristics* section.	Digi-Key Corp.
R3, R6	2	0Ω resistors (1206). These resistors can be increased in value to reduce power dissipation in the device, but reduces the compression point. Full P_{1dB} performance achieved using 0Ω.	Digi-Key Corp.
T1, T2	2	4:1 IF balun (TC4-1W-17+)	Mini-Circuits
U1	1	MAX19997A IC (36 TQFN-EP)	Maxim Integrated Products, Inc.

*对于200MHz IF频率，使用390nH (0805)电感。详细信息请与工厂联系。

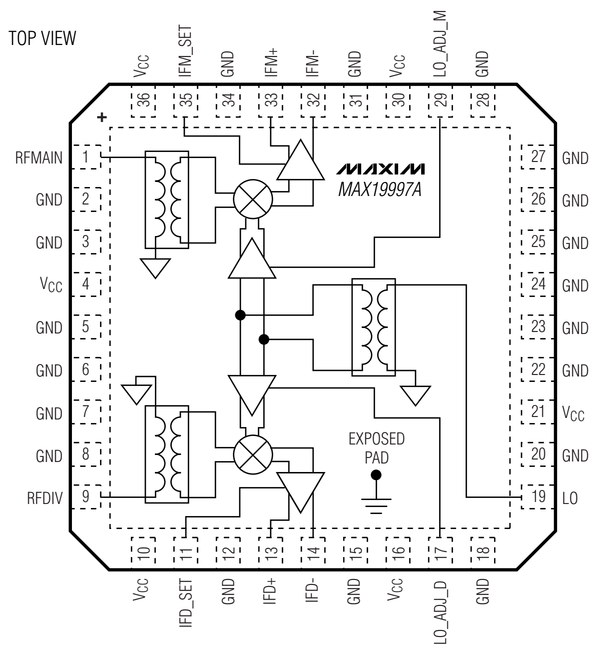
典型应用电路



*USE 390nH (0805) INDUCTORS FOR AN IF FREQUENCY OF 200MHz. CONTACT FACTORY FOR DETAILS.

**CONNECT INDUCTORS TO IMPROVE RF MATCH FROM 1800MHz TO 2400MHz. SEE TABLE 2 FOR DETAILS.

引脚配置/功能框图



6mm x 6mm THIN QFN (EXPOSED PAD)

EXPOSED PAD ON THE BOTTOM OF THE PACKAGE.

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(器件封装)，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
36引脚薄型QFN-EP	T3666+2	21-0141	90-0049

修订历史

修订号	修订日期	说明	修改页
0	10/08	最初版本。	—
1	9/10	对格式式进行了细微的修改。	2, 3, 4, 10, 15, 29, 30, 34
2	2/11	增加了IF频率范围(从50MHz至550MHz)。	1, 3, 29, 30

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