19-5197; Rev 0; 4/10

双通道、SiGe、高线性度、1200MHz至2000MHz下变频混频器，带有LO缓冲器/开关

概述

MAX19994A双通道、下变频混频器可为1200MHz至2000MHz分集接收机应用提供8.4dB转换增益、+25dBm输入IP3、+14dBm输入1dB压缩点以及9.8dB噪声系数。该混频器针对1450MHz至2050MHz LO频率范围进行优化，支持1200MHz至1700MHz和1700MHz至2000MHz RF频率范围的高端和低端LO注入架构。

除具有优异的线性度和噪声指标外，该器件还具有非常高的元件集成度。器件包括两个双平衡无源混频器核、两个LO缓冲器、一个双输入LO选择开关以及一对差分IF输出放大器。片内集成非平衡变压器使器件能够接收单端RF和LO输入。MAX19994A需要一个标称为0dBm的LO驱动，电源电流在V_{CC} = 5.0V时的典型值为330mA、V_{CC} = 3.3V时的典型值为264mA。

MAX19994A与MAX9985/MAX9995/MAX19985A/MAX19993/MAX19995/MAX19995A系列700MHz至2500MHz混频器引脚兼容，与MAX19997A/MAX19999系列1850MHz至4000MHz混频器引脚相似，这使得该系列下变频混频器非常适合多个频段采用相同PCB布局的应用。

器件采用带裸焊盘的6mm x 6mm、36引脚薄型QFN封装。在扩展级温度范围(T_C = -40°C至+85°C)内确保电气性能。

应用

WCDMA/LTE基站

TD-SCDMA基站

GSM/EDGE基站

cdma2000®基站

无线本地环路

固定宽带无线接入

个人移动无线装置

军用系统

特性

- ♦ 1200MHz至2000MHz RF频率范围
- ♦ 1450MHz至2050MHz LO频率范围
- ♦ 50MHz至500MHz IF频率范围
- ♦ 8.4dB (典型值)转换增益
- ♦ 9.8dB (典型值)噪声系数
- ♦ +25dBm (典型值)输入IP3
- ♦ +14dBm (典型值)输入1dB压缩点
- ♦ P_{RF} = -10dBm时，具有68dBc (典型值)的2LO - 2RF杂散抑制
- ♦ 双通道理想用于分集接收机应用
- ♦ 47dB (典型值)通道间隔离
- ♦ -6dBm至+3dBm的低LO驱动
- ♦ 集成LO缓冲器
- ♦ 内部RF和LO非平衡变压器支持单端输入
- ♦ 内置SPDT LO开关，LO-LO隔离度为48dB，开关时间为50ns
- ♦ 引脚兼容于MAX9985/MAX9995/MAX19985A/MAX19993/MAX19995/MAX19995A系列700MHz至2200MHz混频器
- ♦ 引脚相似于MAX19997A/MAX19999系列1850MHz至4000MHz混频器
- ♦ 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
MAX19994AETX+	-40°C to +85°C	36 Thin QFN-EP*
MAX19994AETX+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。

cdma2000是电信工业协会的注册商标。

双通道、SiGe、高线性度、1200MHz至2000MHz 下变频混频器，带有LO缓冲器/开关

ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND...-0.3V to +5.5V
LO1, LO2 to GND..-0.3V to +0.3V
LOSEL to GND ....-0.3V to (V_{CC} + 0.3V)
RFMAIN, RFDIV, and LO_ Input Power .... +15dBm
RFMAIN, RFDIV Current
(RF is DC shorted to GND through a balun) 50mA
Continuous Power Dissipation (Note 1) 8.7W
θ_{JA} (Notes 1, 3)... +38°C/W
θ_{JC} (Notes 2, 3)..7.4°C/W
Operating Case Temperature
Range (Note 4)... -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

Note 1: 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 2: 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 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*, V_{CC} = 4.75V to 5.25V, no input AC signals. T_C = -40°C to +85°C, R1 = R4 = 681Ω, R2 = R5 = 1.82kΩ. Typical values are at V_{CC} = 5.0V, T_C = +25°C, unless otherwise noted. All parameters are production tested.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage	V_{CC}		4.75	5	5.25	V
Supply Current	I_{CC}	Total supply current		330	420	mA
LOSEL Input High Voltage	V_{IH}		2			V
LOSEL Input Low Voltage	V_{IL}				0.8	V
LOSEL Input Current	I_{IH} and I_{IL}		-10		+10	µA

3.3V SUPPLY DC ELECTRICAL CHARACTERISTICS

(*Typical Application Circuit*, V_{CC} = 3.0V to 3.6V, no input AC signals. T_C = -40°C to +85°C, R1 = R4 = 681Ω, R2 = R5 = 1.43kΩ. Typical values are at V_{CC} = 3.3V, T_C = +25°C, unless otherwise noted.)

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		264		mA
LOSEL Input High Voltage	V_{IH}			2		V
LOSEL Input Low Voltage	V_{IL}			0.8		V

RECOMMENDED AC OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
RF Frequency	f_{RF}	C1 = C8 = 39pF (Note 5)	1200		1700	MHz
		C1 = C8 = 1.8pF, L7 = L8 = 4.7nH (Note 5)	1700		2000	
LO Frequency	f_{LO}	(Note 5)	1450		2050	MHz

RECOMMENDED AC OPERATING CONDITIONS (continued)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
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 (Note 5)	100		500	MHz
		Using alternative Mini-Circuits TC4-1W-7A 4:1 transformer as defined in the *Typical Application Circuit*, IF matching components affect the IF frequency range (Note 5)	50		250	
LO Drive Level	P_{LO}	(Note 5)	-6		+3	dBm

5.0V SUPPLY, HIGH-SIDE INJECTION AC ELECTRICAL CHARACTERISTICS

(*Typical Application Circuit* optimized for the **Standard RF Band (see Table 1)**. R1 = R4 = 681Ω, R2 = R5 = 1.82kΩ, V_{CC} = 4.75V to 5.25V, RF and LO ports are driven from 50Ω sources, P_{LO} = -6dBm to +3dBm, P_{RF} = -5dBm, f_{RF} = 1200MHz to 1700MHz, f_{LO} = 1550MHz to 2050MHz, 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} = 1450MHz, f_{LO} = 1800MHz, f_{IF} = 350MHz, T_C = +25°C. All parameters are guaranteed by design and characterization, unless otherwise noted.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Conversion Gain	G_C		6.2	8.4	9.8	dB
		T_C = +25°C (Note 7)	7.0	8.4	9.0	
		T_C = +25°C, f_{RF} = 1427MHz to 1463MHz (Note 7)	7.9	8.4	8.9	
Conversion Gain Flatness	ΔG_C	f_{RF} = 1427MHz to 1463MHz		±0.05		dB
Gain Variation Over Temperature	TC_{CG}	T_C = -40°C to +85°C		-0.01		dB/°C
Input Compression Point	IP_{1dB}	f_{RF} = 1450MHz (Notes 7, 8)	12.6	14.0		dBm
Input Third-Order Intercept Point	IIP3	f_{RF1} - f_{RF2} = 1MHz, P_{RF} = -5dBm per tone	21.5	25.0		dBm
		f_{RF1} - f_{RF2} = 1MHz, P_{RF} = -5dBm per tone, f_{RF} = 1427MHz to 1463MHz, T_C = +25°C (Note 7)	23.0	25.0		
		f_{RF1} - f_{RF2} = 1MHz, P_{RF} = -5dBm per tone, f_{RF} = 1427MHz to 1463MHz	22	25.0		
Input Third-Order Intercept Point Variation Over Temperature	TC_{IIP3}	f_{RF1} - f_{RF2} = 1MHz, P_{RF} = -5dBm per tone, T_C = -40°C to +85°C		±0.75		dBm
Noise Figure (Note 9)	NF_{SSB}	Single sideband, no blockers present		9.8	13	dB
		f_{RF} = 1427MHz to 1463MHz, T_C = +25°C, P_{LO} = 0dBm, single sideband, no blockers present		9.8	11	
		f_{RF} = 1427MHz to 1463MHz, P_{LO} = 0dBm, single sideband, no blockers present		9.8	12.5	
Noise Figure Temperature Coefficient	TC_{NF}	Single sideband, no blockers present, T_C = -40°C to +85°C		0.016		dB/°C
Noise Figure with Blocker	NF_B	$P_{BLOCKER}$ = +8dBm, f_{RF} = 1450MHz, f_{LO} = 1800MHz, $f_{BLOCKER}$ = 1350MHz, P_{LO} = 0dBm, V_{CC} = 5.0V, T_C = +25°C (Notes 9, 10)		20.2	22	dB

双通道、SiGe、高线性度、1200MHz至2000MHz 下变频混频器，带有LO缓冲器/开关

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

(*Typical Application Circuit* optimized for the **Standard RF Band (see Table 1)**. R1 = R4 = 681Ω, R2 = R5 = 1.82kΩ, V_{CC} = 4.75V to 5.25V, RF and LO ports are driven from 50Ω sources, P_{LO} = -6dBm to +3dBm, P_{RF} = -5dBm, f_{RF} = 1200MHz to 1700MHz, f_{LO} = 1550MHz to 2050MHz, 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} = 1450MHz, f_{LO} = 1800MHz, f_{IF} = 350MHz, T_C = +25°C. All parameters are guaranteed by design and characterization, unless otherwise noted.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
2LO - 2RF Spur Rejection (Note 9)	2 x 2	f_{RF} = 1450MHz, f_{LO} = 1800MHz, f_{SPUR} = 1625MHz	P_{RF} = -10dBm	57	68		dBc
			P_{RF} = -5dBm	52	63		
		f_{RF} = 1450MHz, f_{LO} = 1800MHz, f_{SPUR} = 1625MHz, P_{LO} = 0dBm, V_{CC} = 5.0V, T_C = +25°C	P_{RF} = -10dBm	58	68		
			P_{RF} = -5dBm	53	63		
3LO - 3RF Spur Rejection (Note 9)	3 x 3	f_{RF} = 1450MHz, f_{LO} = 1800MHz, f_{SPUR} = 1683.33MHz	P_{RF} = -10dBm	68	84		dBc
			P_{RF} = -5dBm	58	74		
		f_{RF} = 1450MHz, f_{LO} = 1800MHz, f_{SPUR} = 1683.33MHz, P_{LO} = 0dBm, V_{CC} = 5.0V, T_C = +25°C	P_{RF} = -10dBm	70	84		
			P_{RF} = -5dBm	60	74		
RF Input Return Loss		LO and IF terminated into matched impedance, LO “on”			17		dB
LO Input Return Loss		LO port selected, RF and IF terminated into matched impedance			16		dB
		LO port unselected, RF and IF terminated into matched impedance			20		
IF Output Impedance	Z_{IF}	Nominal differential impedance of the 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*			13.0		dB
RF-to-IF Isolation		(Note 7)		19	30		dB
LO Leakage at RF Port		(Note 7)			-42		dBm
2LO Leakage at RF Port		(Note 7)			-30		dBm
LO Leakage at IF Port		(Note 7)			-35		dBm
Channel Isolation (Note 7)		RFMAIN converted power measured at IFDIV relative to IFMAIN, all unused ports terminated to 50Ω		43	47		dB
		RFDIV converted power measured at IFMAIN relative to IFDIV, all unused ports terminated to 50Ω		43	47		
LO-to-LO Isolation		P_{LO1} = +3dBm, P_{LO2} = +3dBm, f_{LO1} = 1800MHz, f_{LO2} = 1801MHz (Note 7)		42	48		dB
LO Switching Time		50% of LOSEL to IF settled within 2 degrees			50		ns

3.3V SUPPLY, HIGH-SIDE INJECTION AC ELECTRICAL CHARACTERISTICS

(*Typical Application Circuit* **optimized for the Standard RF Band (see Table 1)**. R1 = R4 = 681Ω, R2 = R5 = 1.43kΩ. Typical values are at V_{CC} = 3.3V, P_{RF} = -5dBm, P_{LO} = 0dBm, f_{RF} = 1450MHz, f_{LO} = 1800MHz, f_{IF} = 350MHz, T_C = +25°C, unless otherwise noted.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Conversion Gain	G_C	(Note 7)		8.2		dB
Conversion Gain Flatness	ΔG_C	f_{RF} = 1427MHz to 1463MHz		±0.05		dB
Gain Variation Over Temperature	TC_{CG}	T_C = -40°C to +85°C		-0.01		dB/°C
Input Compression Point	IP_{1dB}	(Note 8)		10.6		dBm
Input Third-Order Intercept Point	IIP3	f_{RF1} - f_{RF2} = 1MHz		23.6		dBm
Input Third-Order Intercept Point Variation Over Temperature	TC_{IIP3}	f_{RF1} - f_{RF2} = 1MHz, P_{RF} = -5dBm per tone, T_C = -40°C to +85°C		±0.5		dBm
Noise Figure	NF_{SSB}	Single sideband, no blockers present		9.8		dB
Noise Figure Temperature Coefficient	TC_{NF}	Single sideband, no blockers present, T_C = -40°C to +85°C		0.016		dB/°C
2LO - 2RF Spur Rejection	2 x 2	P_{RF} = -10dBm		68		dBc
		P_{RF} = -5dBm		63		
3LO - 3RF Spur Rejection	3 x 3	P_{RF} = -10dBm		77		dBc
		P_{RF} = -5dBm		67		
RF Input Return Loss		LO and IF terminated into matched impedance, LO "on"		15		dB
LO Input Return Loss		LO port selected, RF and IF terminated into matched impedance		18		dB
		LO port unselected, RF and IF terminated into matched impedance		21		
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*		12.5		dB
RF-to-IF Isolation				31		dB
LO Leakage at RF Port				-49		dBm
2LO Leakage at RF Port				-40		dBm
LO Leakage at IF Port				-35		dBm
Channel Isolation		RFMAIN converted power measured at IFDIV relative to IFMAIN, all unused ports terminated to 50Ω		48		dB
		RFDIV converted power measured at IFMAIN relative to IFDIV, all unused ports terminated to 50Ω		48		
LO-to-LO Isolation		P_{LO1} = +3dBm, P_{LO2} = +3dBm, f_{LO1} = 1800MHz, f_{LO2} = 1801MHz		50		dB
LO Switching Time		50% of LOSEL to IF settled within 2 degrees		50		ns

5.0V SUPPLY, LOW-SIDE INJECTION AC ELECTRICAL CHARACTERISTICS

(*Typical Application Circuit* **optimized for the Extended RF Band (see Table 1)**, R1 = R4 = 681Ω, R2 = R5 = 1.82kΩ. Typical values are at V_{CC} = 5.0V, P_{RF} = -5dBm, P_{LO} = 0dBm, f_{RF} = 1850MHz, f_{LO} = 1500MHz, f_{IF} = 350MHz, T_C = +25°C, unless otherwise noted.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Conversion Gain	G_C			7.9		dB
Conversion Gain Flatness	ΔG_C	f_{RF} = 1700MHz to 2000MHz, over any 100MHz band		±0.06		dB
Gain Variation Over Temperature	TC_{CG}	T_C = -40°C to +85°C		-0.007		dB/°C
Input Compression Point	IP_{1dB}	(Note 8)		13.9		dBm
Input Third-Order Intercept Point	IIP3	f_{RF1} - f_{RF2} = 1MHz		24.9		dBm
Input Third-Order Intercept Point Variation Over Temperature	TC_{IIP3}	f_{RF1} - f_{RF2} = 1MHz, P_{RF} = -5dBm per tone, T_C = -40°C to +85°C		±0.6		dBm
Noise Figure	NF_{SSB}	Single sideband, no blockers present		10.2		dB
Noise Figure Temperature Coefficient	TC_{NF}	Single sideband, no blockers present, T_C = -40°C to +85°C		0.017		dB/°C
2RF - 2LO Spur Rejection	2 x 2	P_{RF} = -10dBm		68		dBc
		P_{RF} = -5dBm		63		
3RF - 3LO Spur Rejection	3 x 3	P_{RF} = -10dBm		87		dBc
		P_{RF} = -5dBm		77		
RF Input Return Loss		LO and IF terminated into matched impedance, LO “on”		14		dB
LO Input Return Loss		LO port selected, RF and IF terminated into matched impedance		29		dB
		LO port unselected, RF and IF terminated into matched impedance		28		
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*		14.5		dB
RF-to-IF Isolation				37		dB
LO Leakage at RF Port				-52		dBm
2LO Leakage at RF Port				-29		dBm
LO Leakage at IF Port				-19.4		dBm
Channel Isolation		RFMAIN converted power measured at IFDIV relative to IFMAIN, all unused ports terminated to 50Ω		43		dB
		RFDIV converted power measured at IFMAIN relative to IFDIV, all unused ports terminated to 50Ω		43		
LO-to-LO Isolation		P_{LO1} = +3dBm, P_{LO2} = +3dBm, f_{LO1} = 1500MHz, f_{LO2} = 1501MHz		54		dB
LO Switching Time		50% of LOSEL to IF settled within 2 degrees		50		ns

Note 5: Not production tested. Operation outside this range is possible, but with degraded performance of some parameters. See the *Typical Operating Characteristics*.

Note 6: All limits reflect losses of external components, including a 0.8dB loss at f_{IF} = 350MHz due to the 4:1 transformer. Output measurements were taken at IF outputs of the *Typical Application Circuit*.

Note 7: 100% production tested for functionality.

Note 8: Maximum reliable continuous input power applied to the RF or IF port of this device is +12dBm from a 50Ω source.

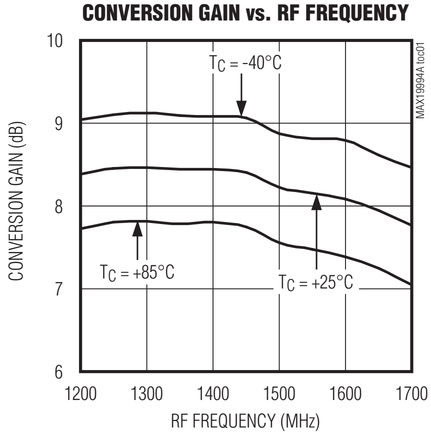
Note 9: Not production tested.

Note 10: 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*.

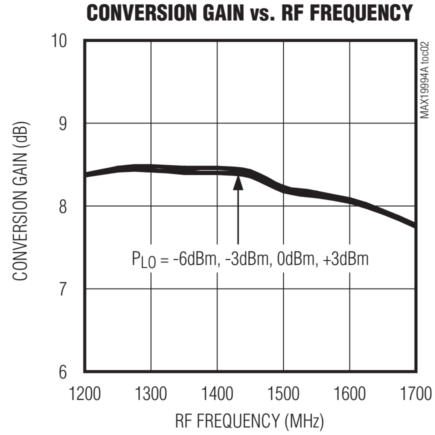
典型工作特性

(*Typical Application Circuit* **optimized for the Standard RF Band (see Table 1). V_{CC} = 5.0V, f_{RF} = 1200MHz to 1700MHz, LO is high-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

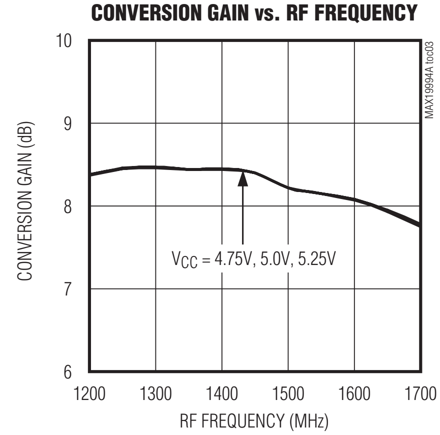
CONVERSION GAIN vs. RF FREQUENCY



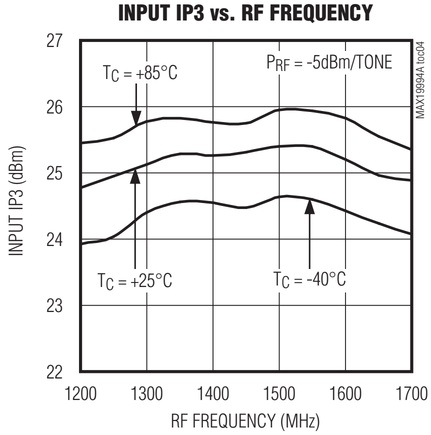
CONVERSION GAIN vs. RF FREQUENCY



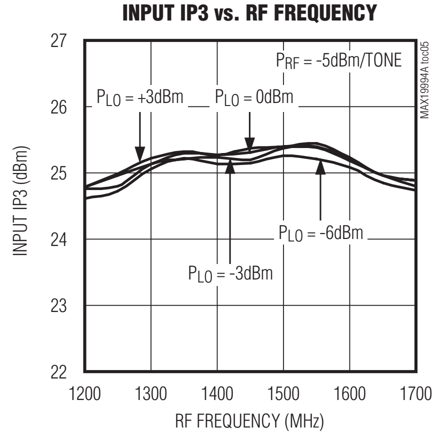
CONVERSION GAIN vs. RF FREQUENCY



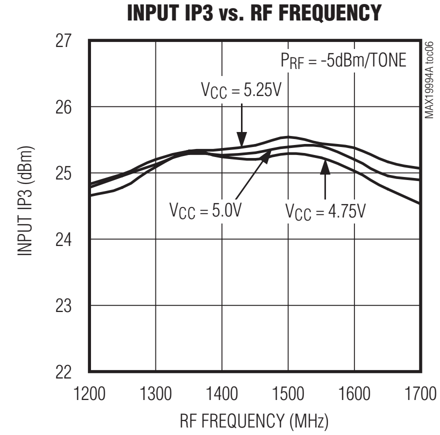
INPUT IP3 vs. RF FREQUENCY



INPUT IP3 vs. RF FREQUENCY



INPUT IP3 vs. RF FREQUENCY

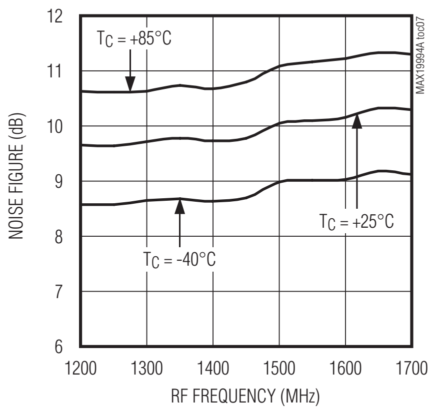


双通道、SiGe、高线性度、1200MHz至2000MHz 下变频混频器，带有LO缓冲器/开关

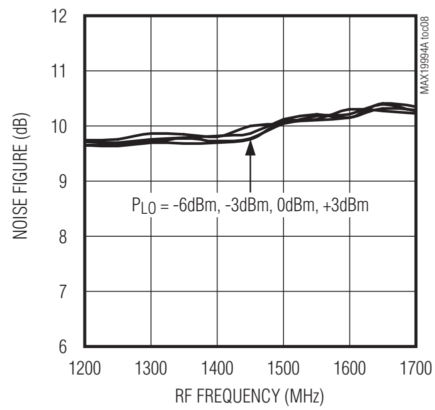
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Standard RF Band (see Table 1). V_{CC} = 5.0V, f_{RF} = 1200MHz to 1700MHz, LO is high-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

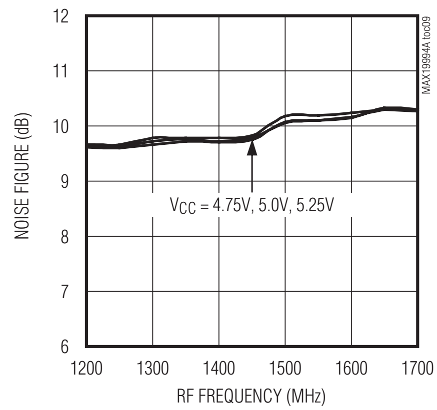
NOISE FIGURE vs. RF FREQUENCY



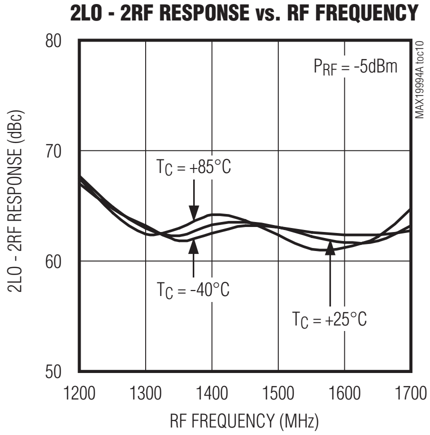
NOISE FIGURE vs. RF FREQUENCY



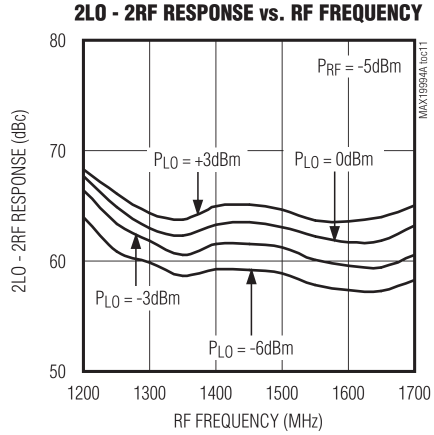
NOISE FIGURE vs. RF FREQUENCY



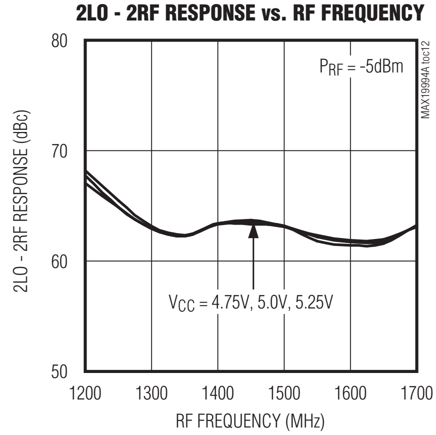
2LO - 2RF RESPONSE vs. RF FREQUENCY



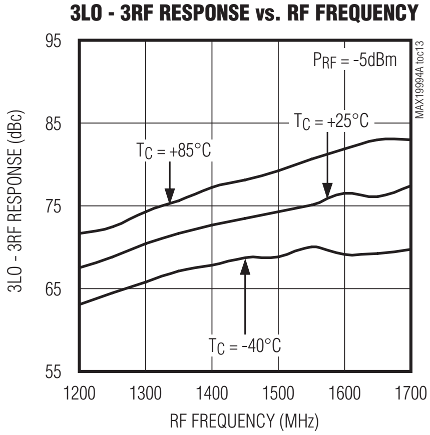
2LO - 2RF RESPONSE vs. RF FREQUENCY



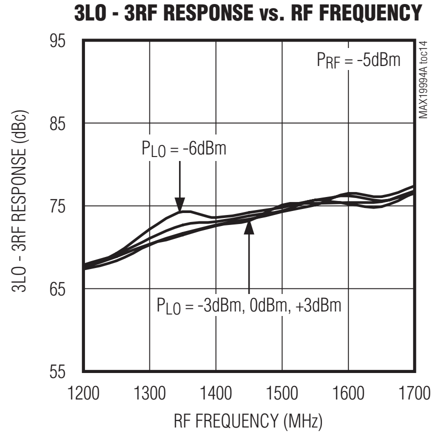
2LO - 2RF RESPONSE vs. RF FREQUENCY



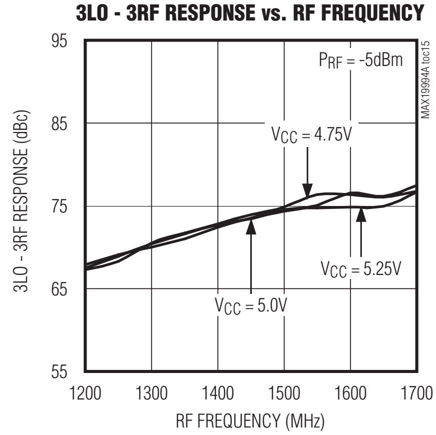
3LO - 3RF RESPONSE vs. RF FREQUENCY



3LO - 3RF RESPONSE vs. RF FREQUENCY



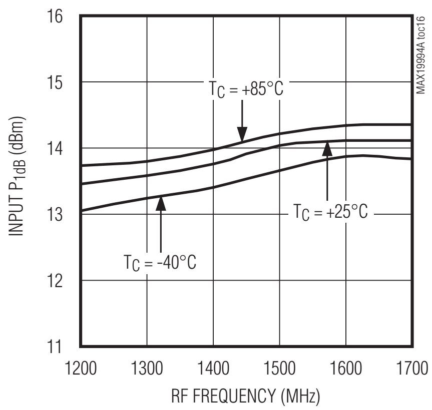
3LO - 3RF RESPONSE vs. RF FREQUENCY



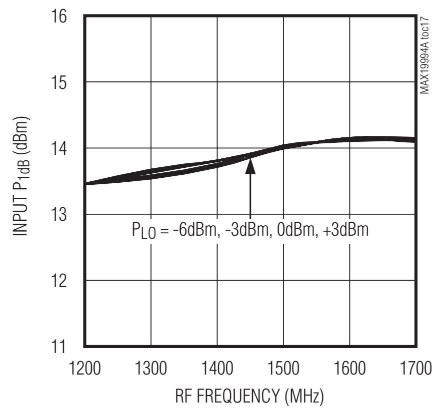
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Standard RF Band (see Table 1). V_{CC} = 5.0V, f_{RF} = 1200MHz to 1700MHz, LO is high-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

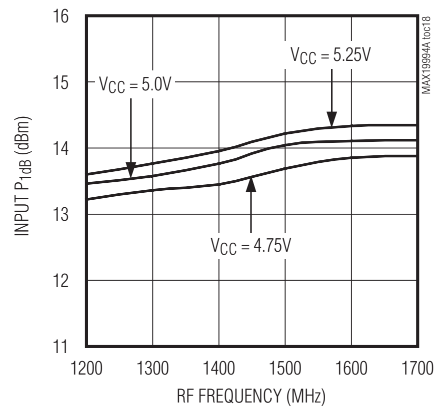
INPUT P1dB vs. RF FREQUENCY



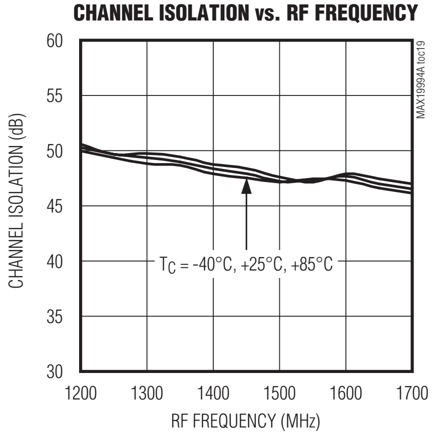
INPUT P1dB vs. RF FREQUENCY



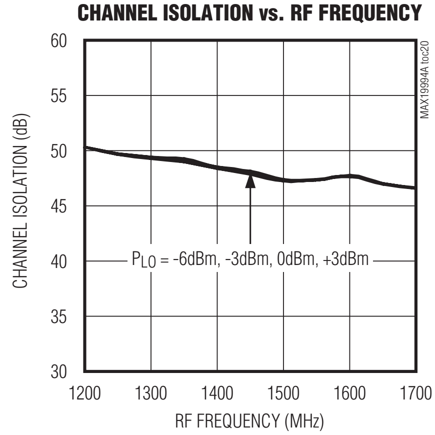
INPUT P1dB vs. RF FREQUENCY



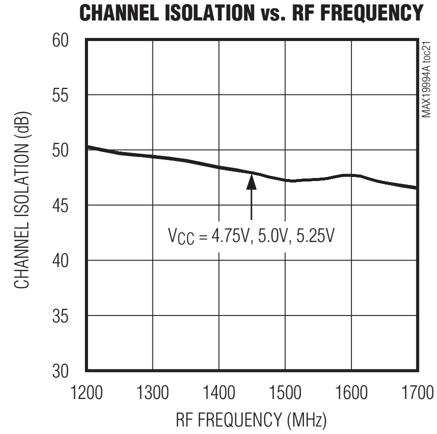
CHANNEL ISOLATION vs. RF FREQUENCY



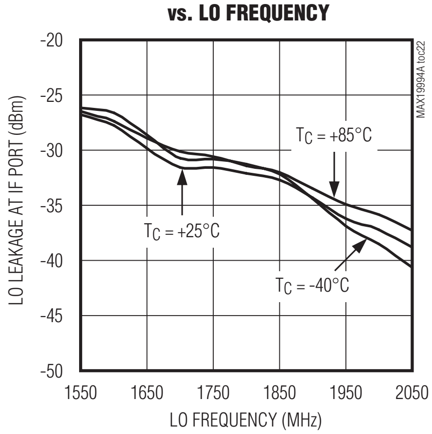
CHANNEL ISOLATION vs. RF FREQUENCY



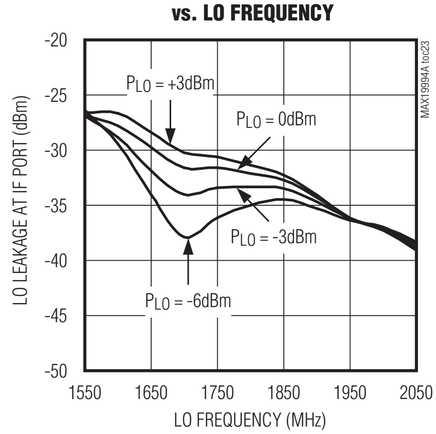
CHANNEL ISOLATION vs. RF FREQUENCY



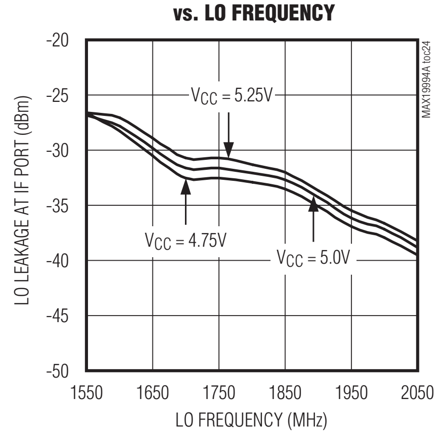
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



LO LEAKAGE AT IF PORT vs. LO FREQUENCY



LO LEAKAGE AT IF PORT vs. LO FREQUENCY

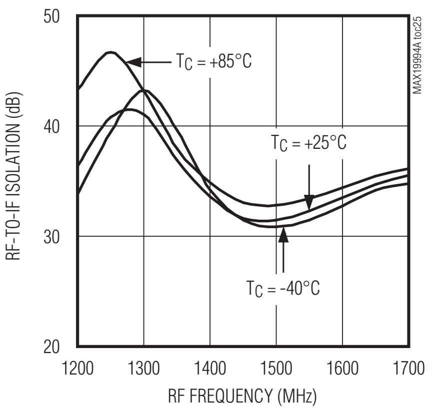


双通道、SiGe、高线性度、1200MHz至2000MHz下变频混频器，带有LO缓冲器/开关

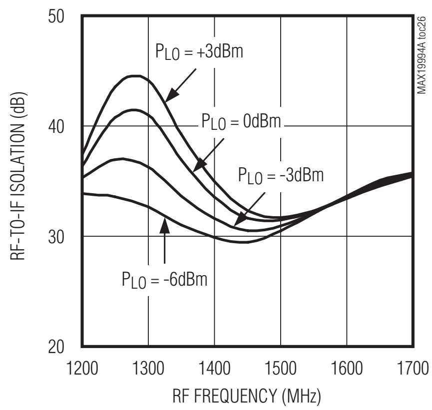
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Standard RF Band (see Table 1). V_{CC} = 5.0V, f_{RF} = 1200MHz to 1700MHz, LO is high-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

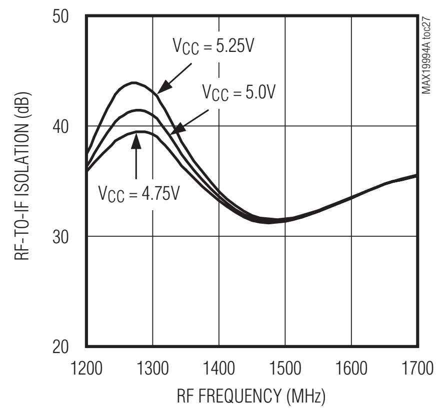
RF-TO-IF ISOLATION vs. RF FREQUENCY



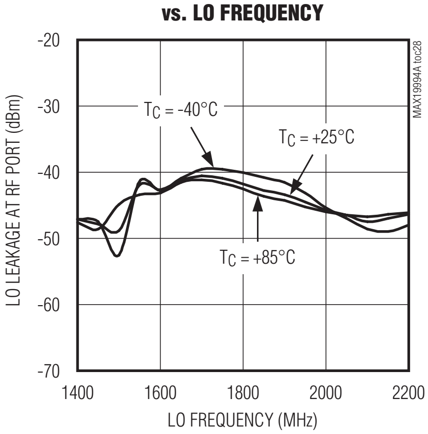
RF-TO-IF ISOLATION vs. RF FREQUENCY



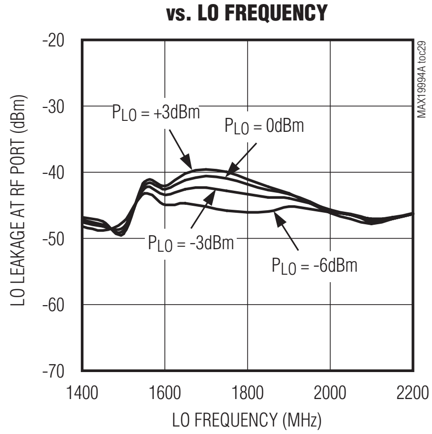
RF-TO-IF ISOLATION vs. RF FREQUENCY



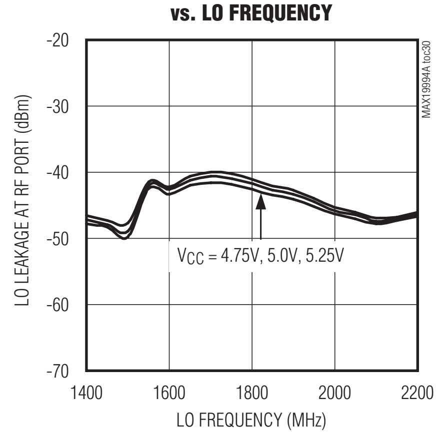
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



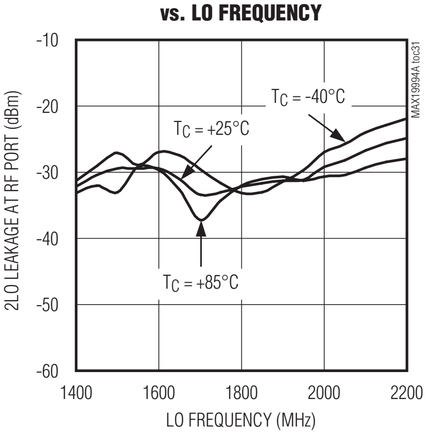
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



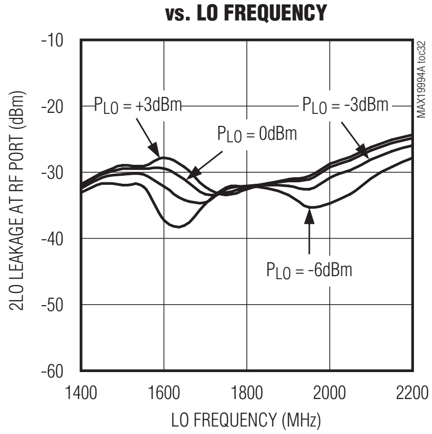
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



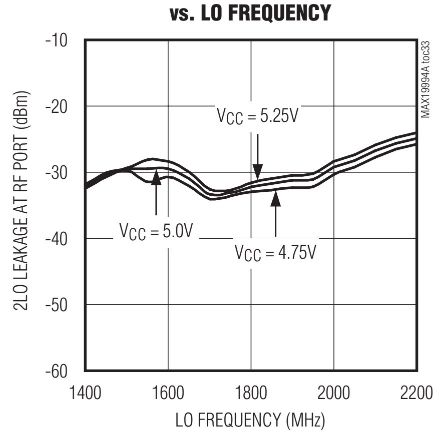
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



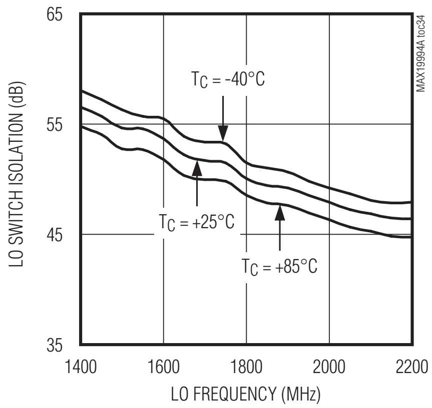
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



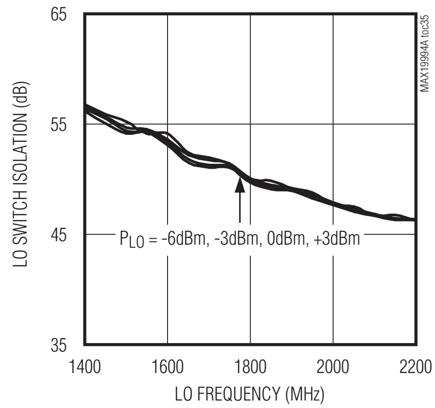
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Standard RF Band (see Table 1).** V_{CC} **= 5.0V,** f_{RF} **= 1200MHz to 1700MHz, LO is high-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

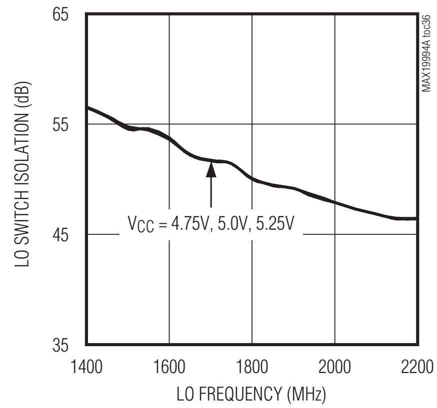
LO SWITCH ISOLATION vs. LO FREQUENCY



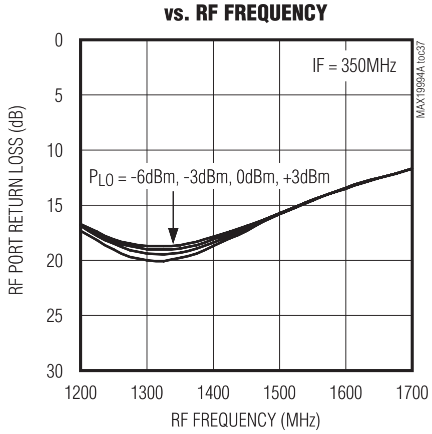
LO SWITCH ISOLATION vs. LO FREQUENCY



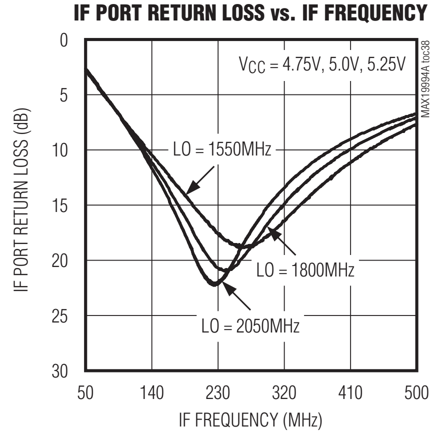
LO SWITCH ISOLATION vs. LO FREQUENCY



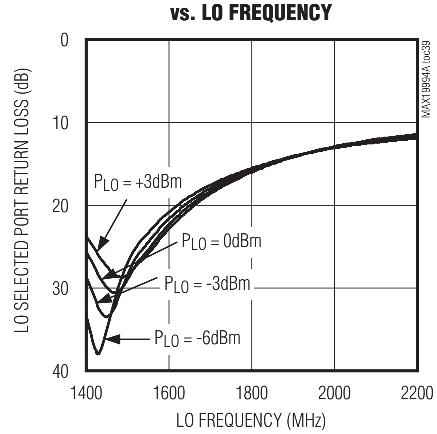
RF PORT RETURN LOSS vs. RF FREQUENCY



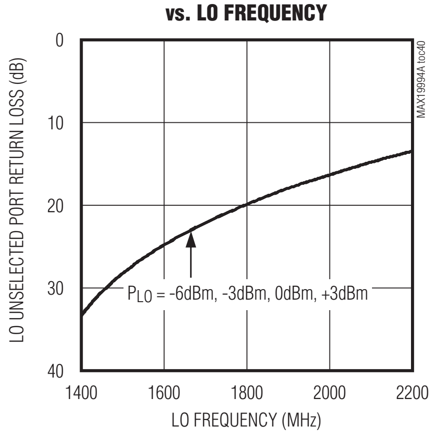
IF PORT RETURN LOSS vs. IF FREQUENCY



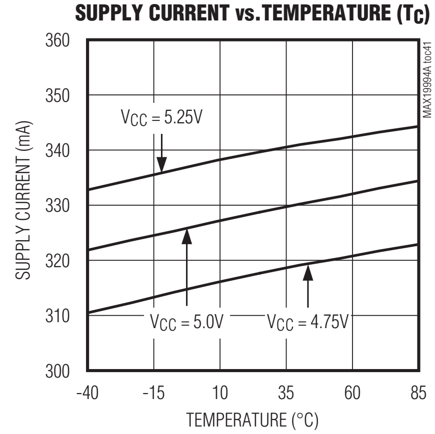
LO SELECTED PORT RETURN LOSS vs. LO FREQUENCY



LO UNSELECTED PORT RETURN LOSS vs. LO FREQUENCY



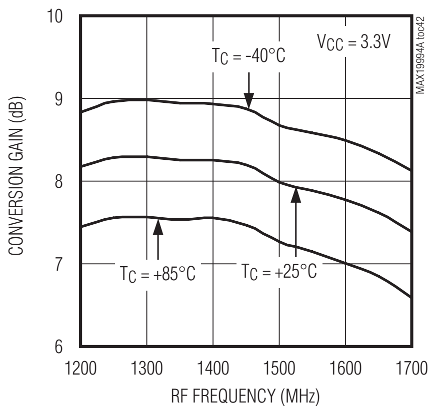
SUPPLY CURRENT vs.TEMPERATURE (T_C)



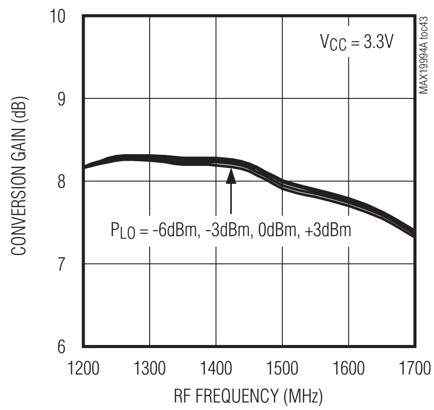
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Standard RF Band (see Table 1). V_{CC} = 3.3V, f_{RF} = 1200MHz to 1700MHz, LO is high-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

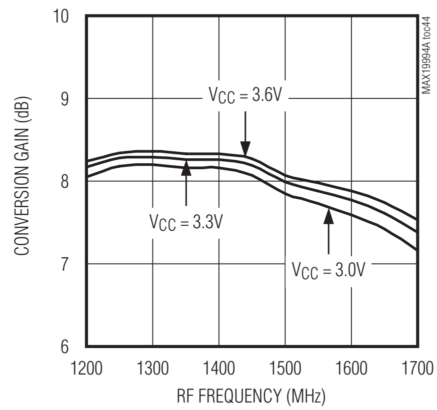
CONVERSION GAIN vs. RF FREQUENCY



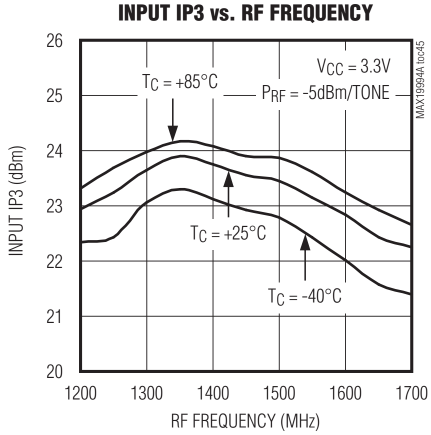
CONVERSION GAIN vs. RF FREQUENCY



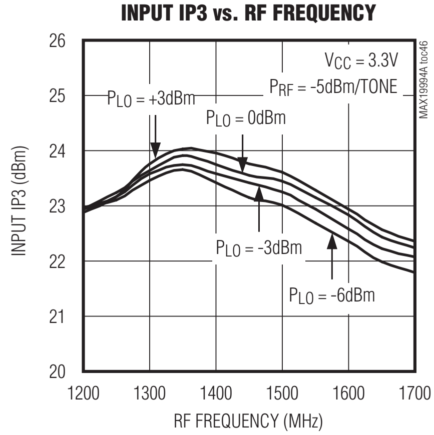
CONVERSION GAIN vs. RF FREQUENCY



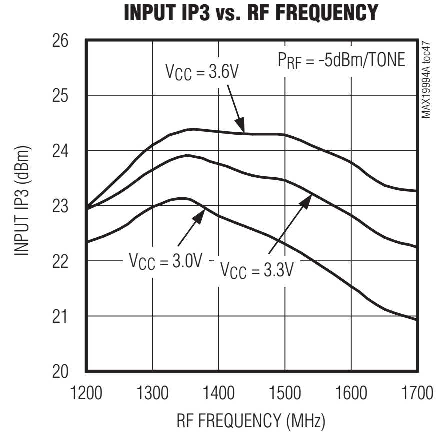
INPUT IP3 vs. RF FREQUENCY



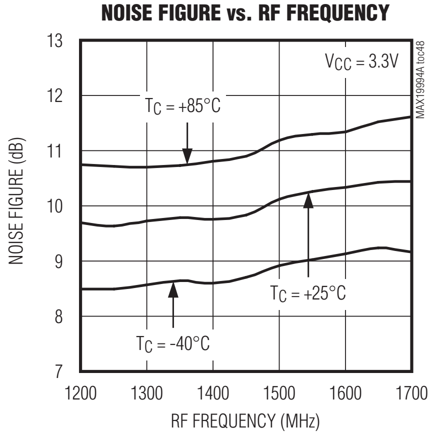
INPUT IP3 vs. RF FREQUENCY



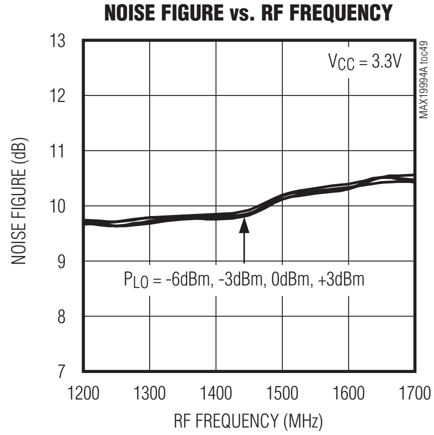
INPUT IP3 vs. RF FREQUENCY



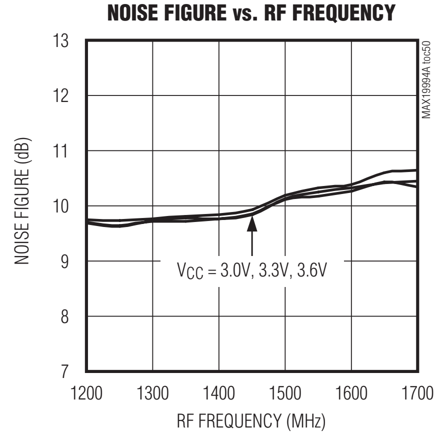
NOISE FIGURE vs. RF FREQUENCY



NOISE FIGURE vs. RF FREQUENCY



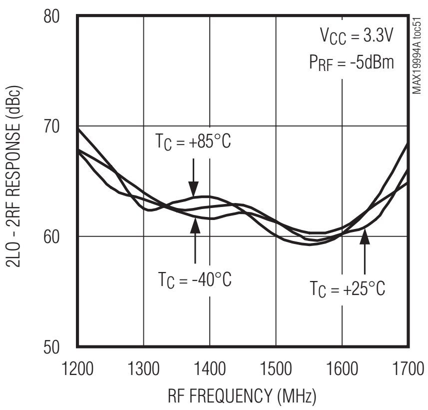
NOISE FIGURE vs. RF FREQUENCY



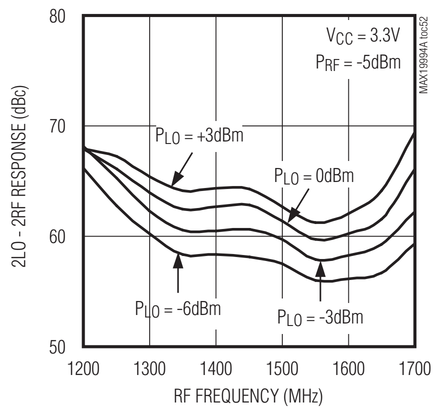
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Standard RF Band (see Table 1). V_{CC} = 3.3V, f_{RF} = 1200MHz to 1700MHz, LO is high-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

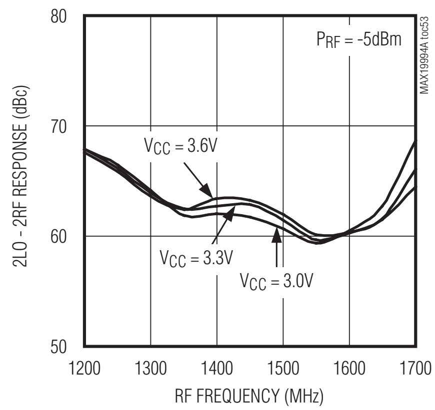
2LO - 2RF RESPONSE vs. RF FREQUENCY



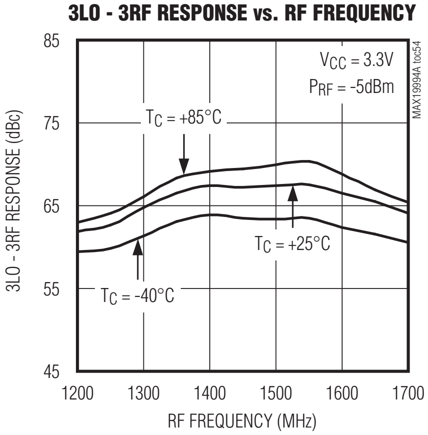
2LO - 2RF RESPONSE vs. RF FREQUENCY



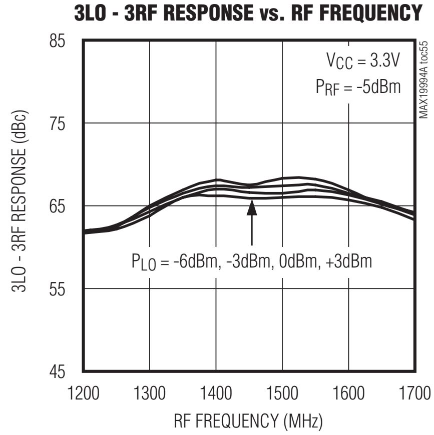
2LO - 2RF RESPONSE vs. RF FREQUENCY



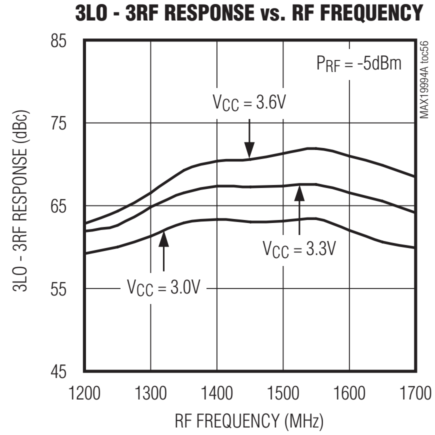
3LO - 3RF RESPONSE vs. RF FREQUENCY



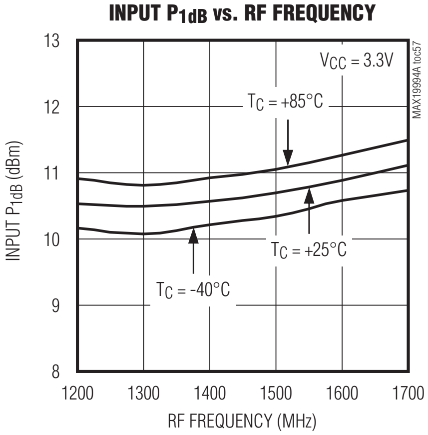
3LO - 3RF RESPONSE vs. RF FREQUENCY



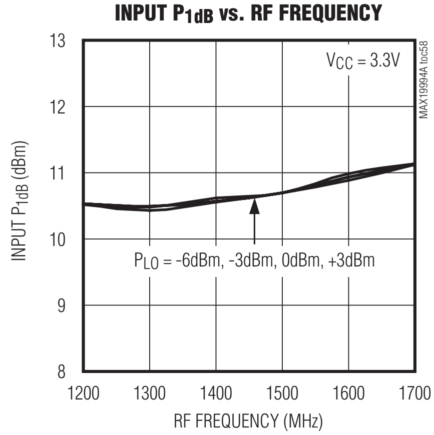
3LO - 3RF RESPONSE vs. RF FREQUENCY



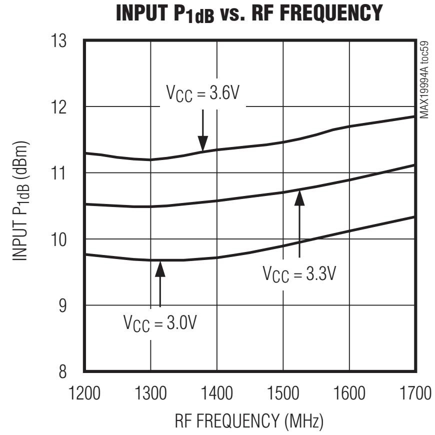
INPUT P_{1dB} vs. RF FREQUENCY



INPUT P_{1dB} vs. RF FREQUENCY



INPUT P_{1dB} vs. RF FREQUENCY

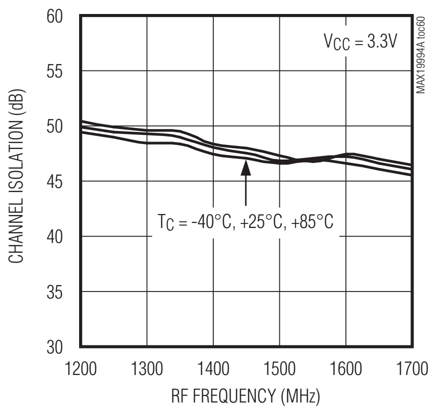


双通道、SiGe、高线性度、1200MHz至2000MHz 下变频混频器，带有LO缓冲器/开关

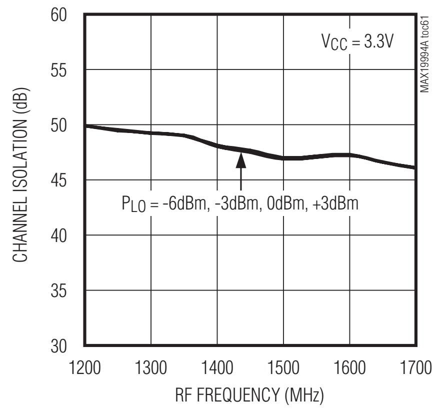
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Standard RF Band (see Table 1). V_{CC} = 3.3V, f_{RF} = 1200MHz to 1700MHz, LO is high-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

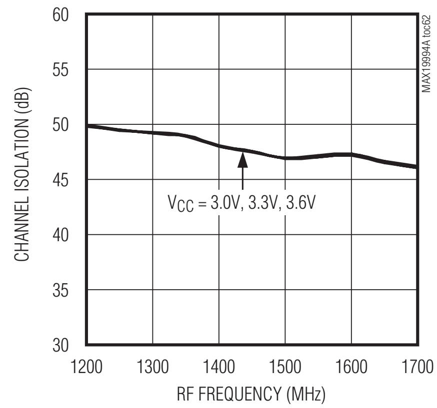
CHANNEL ISOLATION vs. RF FREQUENCY



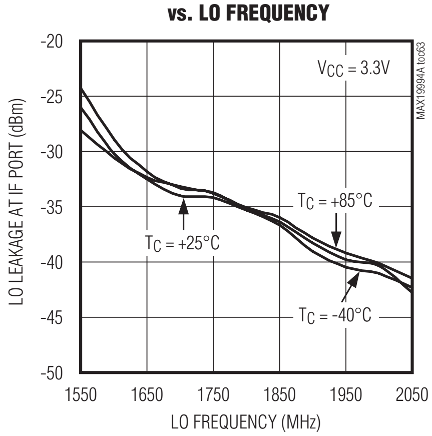
CHANNEL ISOLATION vs. RF FREQUENCY



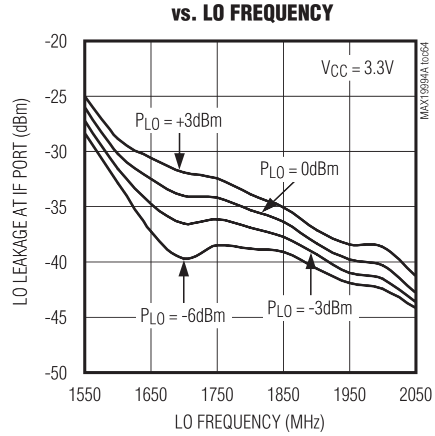
CHANNEL ISOLATION vs. RF FREQUENCY



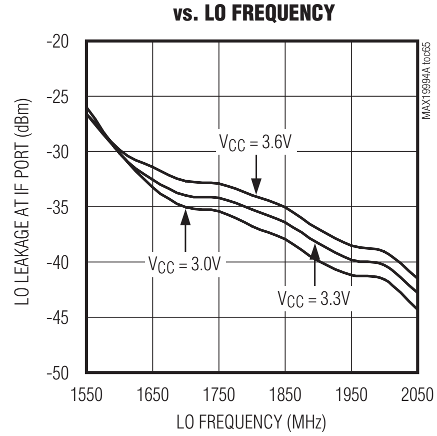
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



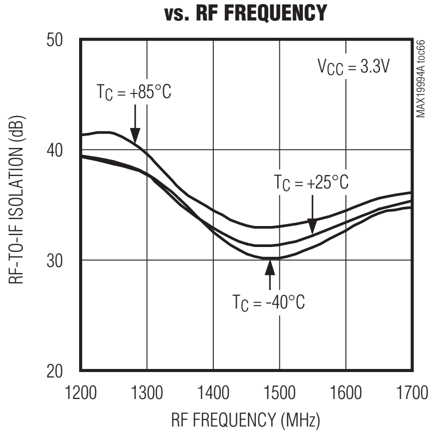
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



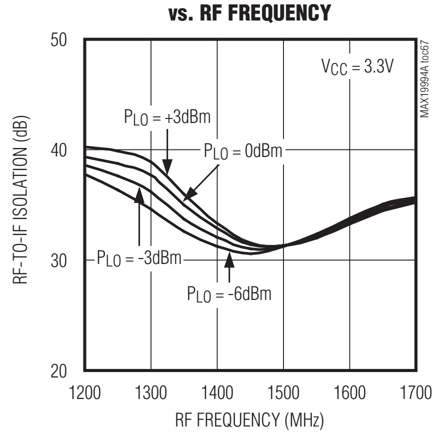
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



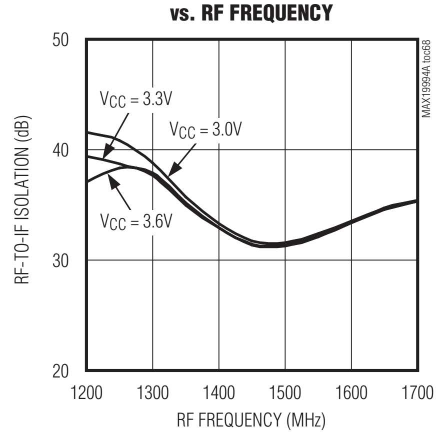
RF-TO-IF ISOLATION vs. RF FREQUENCY



RF-TO-IF ISOLATION vs. RF FREQUENCY



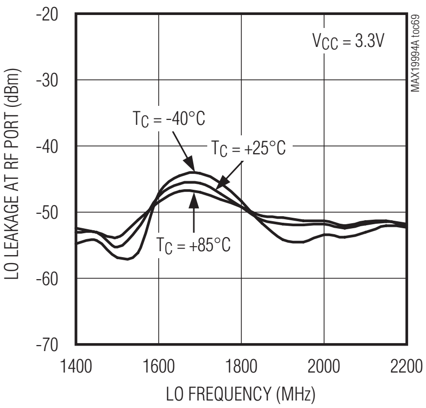
RF-TO-IF ISOLATION vs. RF FREQUENCY



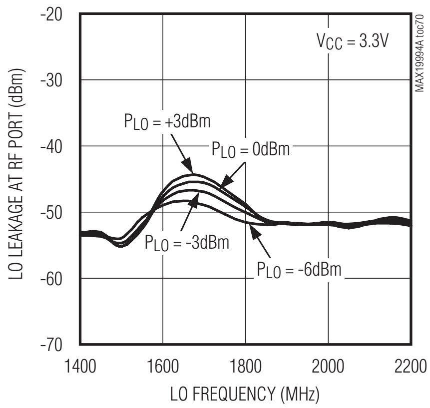
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Standard RF Band (see Table 1). V_{CC} = 3.3V, f_{RF} = 1200MHz to 1700MHz, LO is high-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

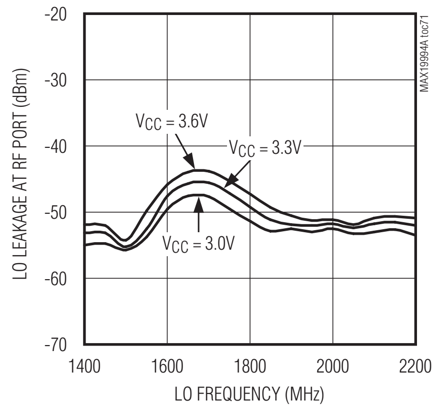
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



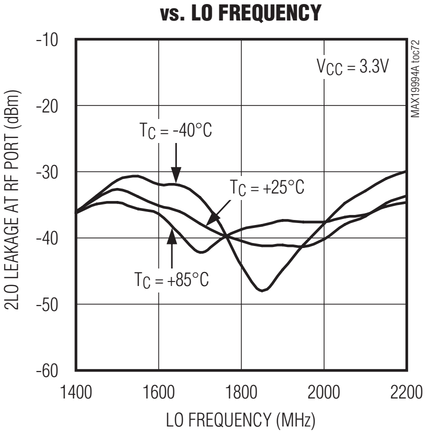
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



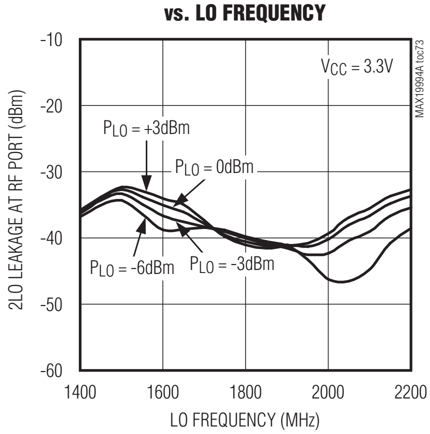
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



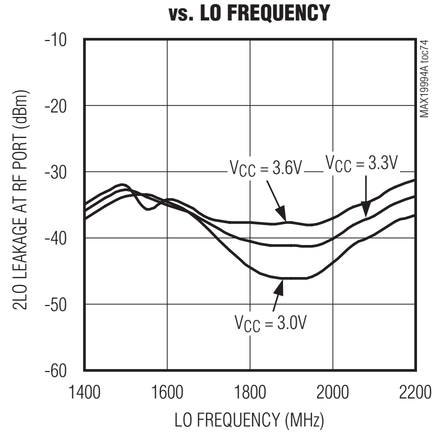
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



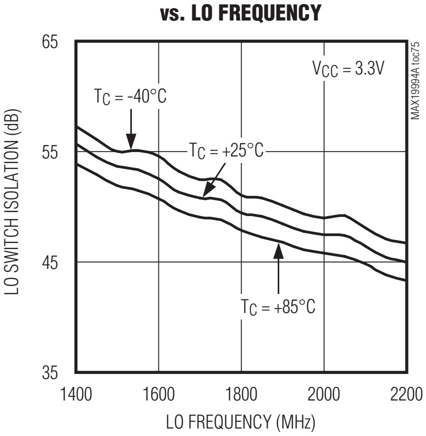
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



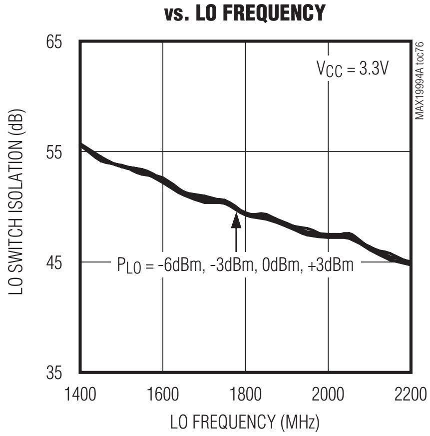
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



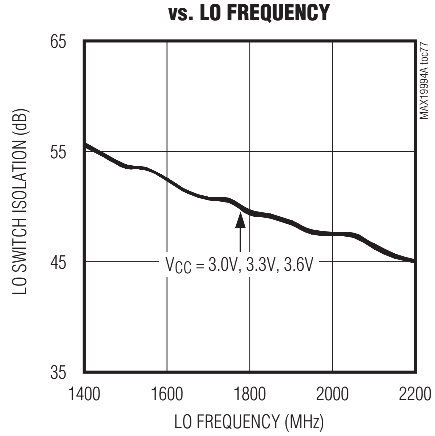
LO SWITCH ISOLATION vs. LO FREQUENCY



LO SWITCH ISOLATION vs. LO FREQUENCY



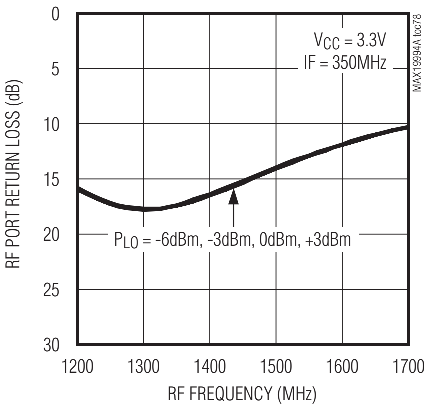
LO SWITCH ISOLATION vs. LO FREQUENCY



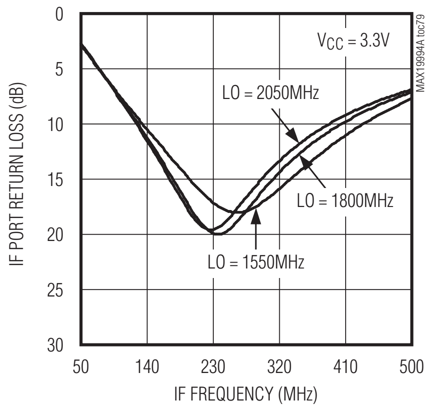
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Standard RF Band (see Table 1). V_{CC} = 3.3V, f_{RF} = 1200MHz to 1700MHz, LO is high-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

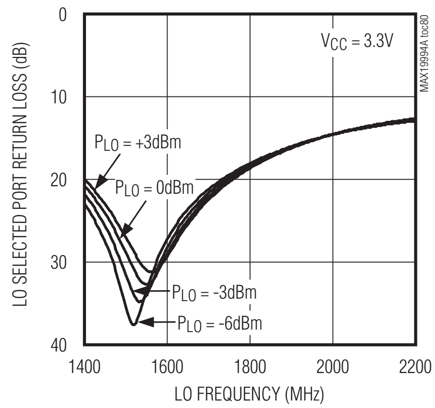
RF PORT RETURN LOSS vs. RF FREQUENCY



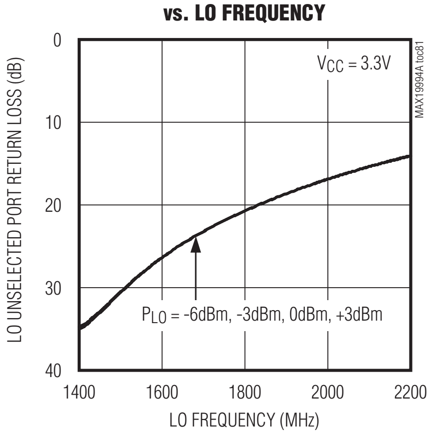
IF PORT RETURN LOSS vs. IF FREQUENCY



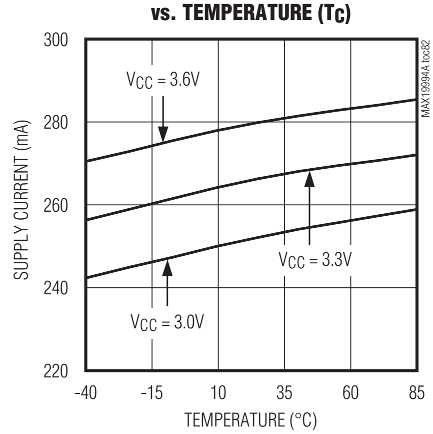
LO SELECTED PORT RETURN LOSS vs. LO FREQUENCY



LO UNSELECTED PORT RETURN LOSS vs. LO FREQUENCY



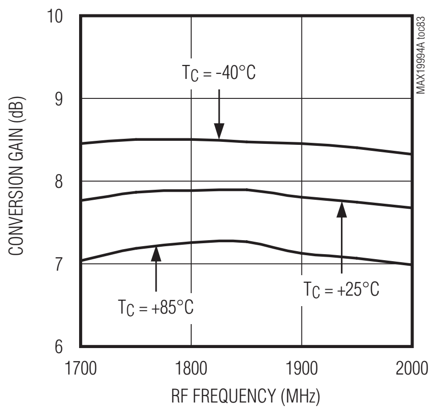
SUPPLY CURRENT vs. TEMPERATURE (T_C)



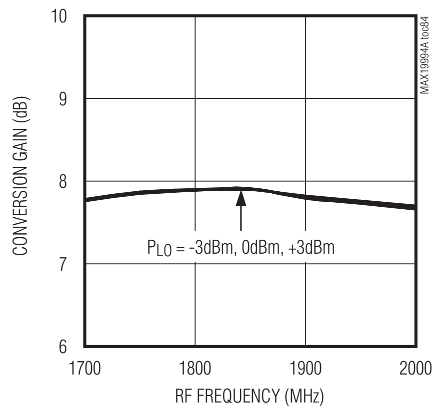
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Extended RF Band (see Table 1). V_{CC} = 5.0V, f_{RF} = 1700MHz to 2000MHz, LO is low-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

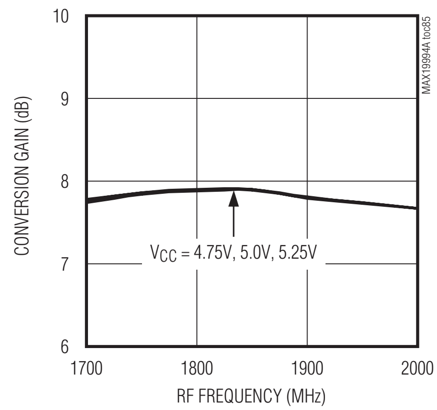
CONVERSION GAIN vs. RF FREQUENCY



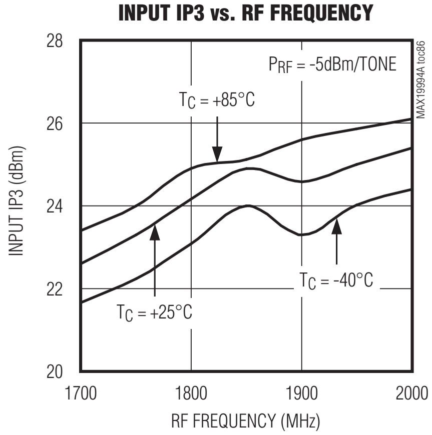
CONVERSION GAIN vs. RF FREQUENCY



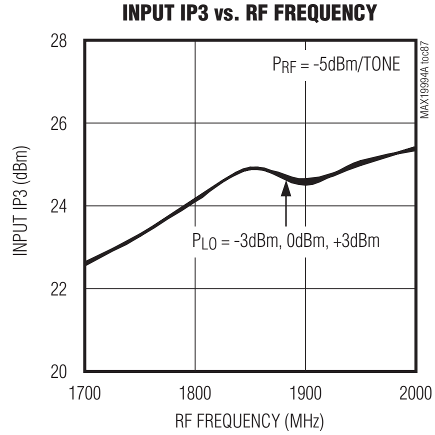
CONVERSION GAIN vs. RF FREQUENCY



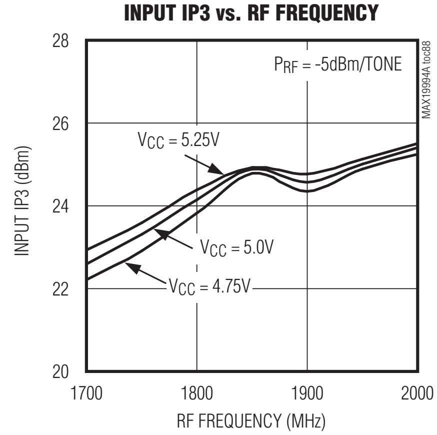
INPUT IP3 vs. RF FREQUENCY



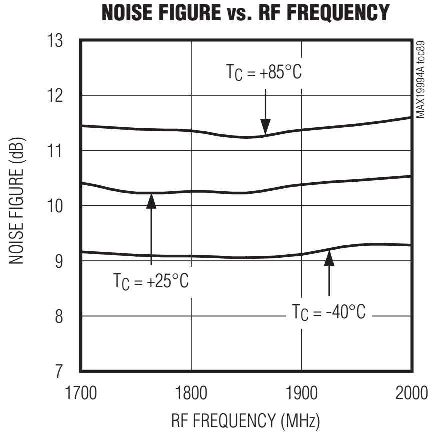
INPUT IP3 vs. RF FREQUENCY



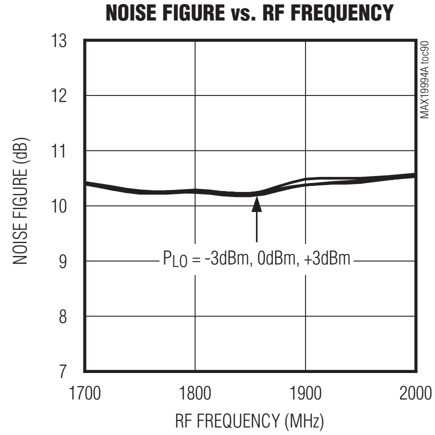
INPUT IP3 vs. RF FREQUENCY



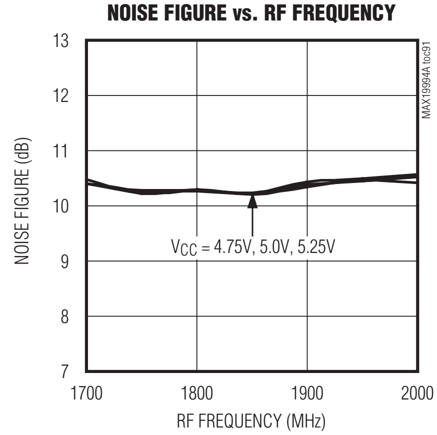
NOISE FIGURE vs. RF FREQUENCY



NOISE FIGURE vs. RF FREQUENCY



NOISE FIGURE vs. RF FREQUENCY

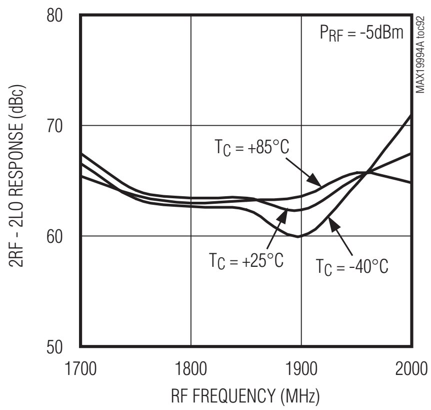


双通道、SiGe、高线性度、1200MHz至2000MHz 下变频混频器，带有LO缓冲器/开关

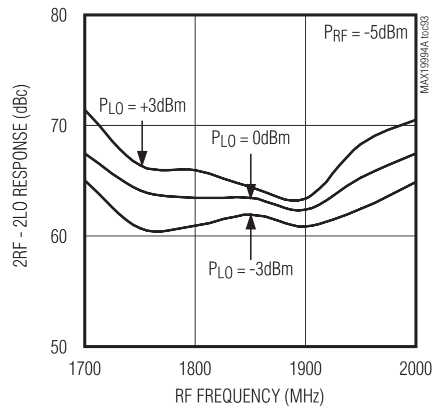
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Extended RF Band (see Table 1). V_{CC} = 5.0V, f_{RF} = 1700MHz to 2000MHz, LO is low-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

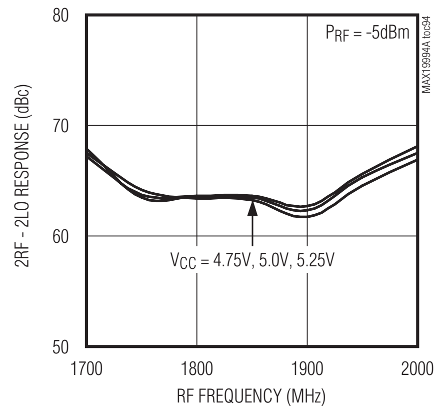
2RF - 2LO RESPONSE vs. RF FREQUENCY



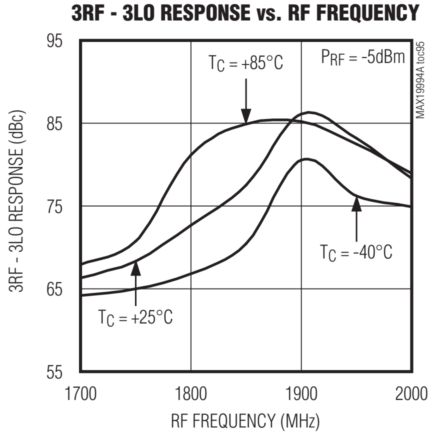
2RF - 2LO RESPONSE vs. RF FREQUENCY



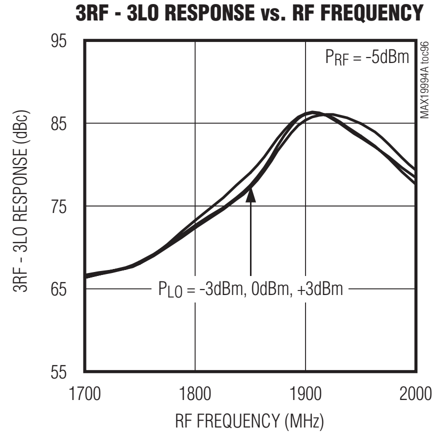
2RF - 2LO RESPONSE vs. RF FREQUENCY



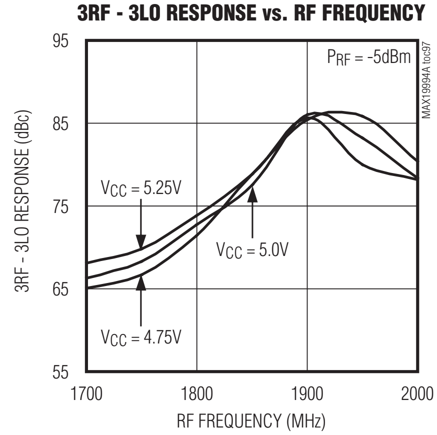
3RF - 3LO RESPONSE vs. RF FREQUENCY



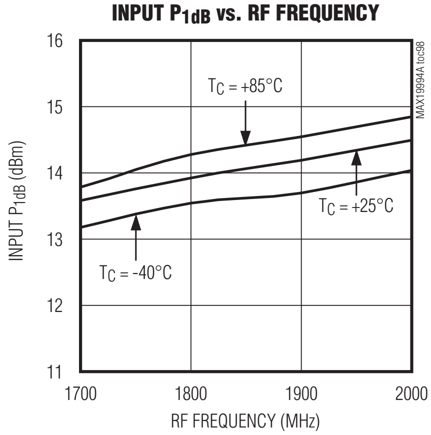
3RF - 3LO RESPONSE vs. RF FREQUENCY



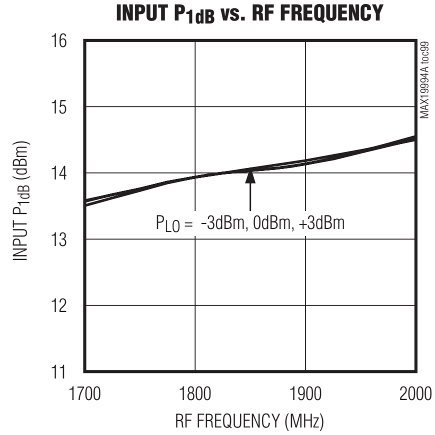
3RF - 3LO RESPONSE vs. RF FREQUENCY



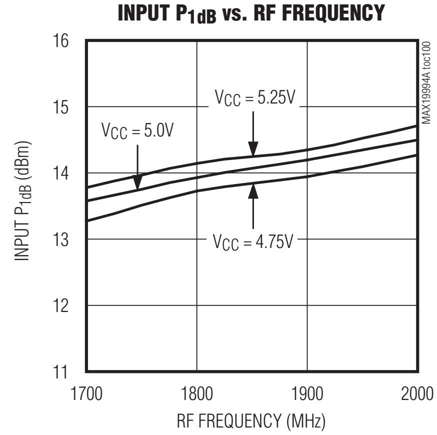
INPUT P_{1dB} vs. RF FREQUENCY



INPUT P_{1dB} vs. RF FREQUENCY



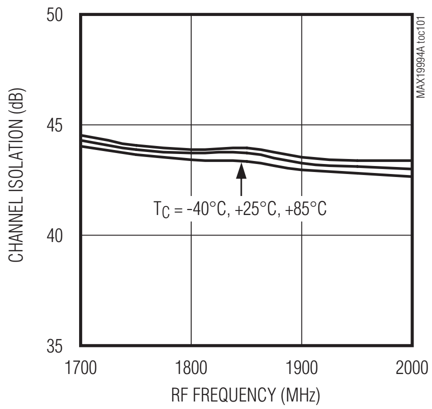
INPUT P_{1dB} vs. RF FREQUENCY



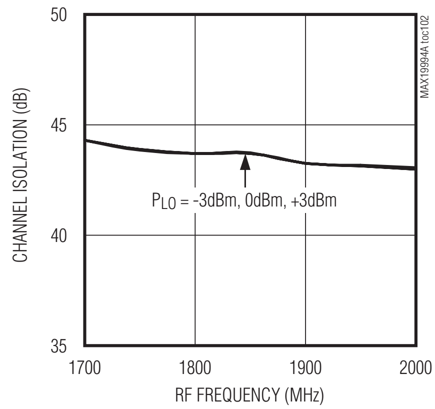
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Extended RF Band (see Table 1). V_{CC} = 5.0V, f_{RF} = 1700MHz to 2000MHz, LO is low-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

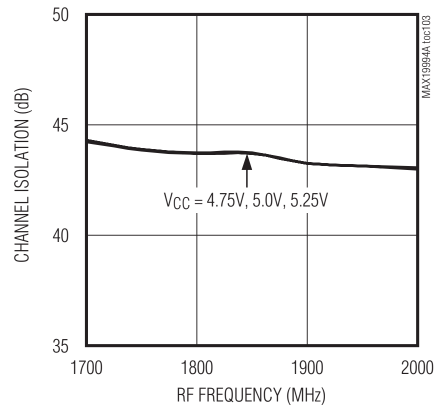
CHANNEL ISOLATION vs. RF FREQUENCY



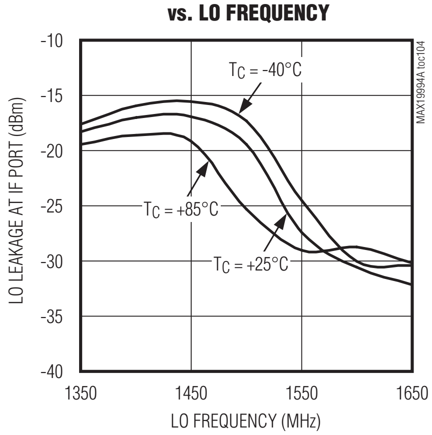
CHANNEL ISOLATION vs. RF FREQUENCY



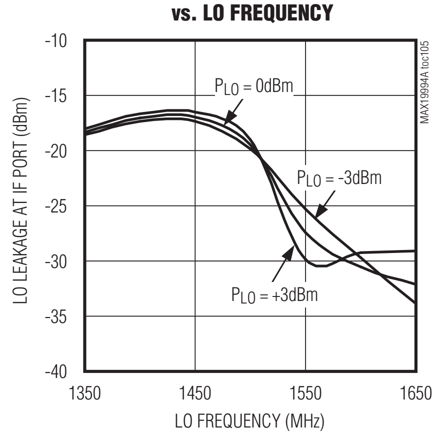
CHANNEL ISOLATION vs. RF FREQUENCY



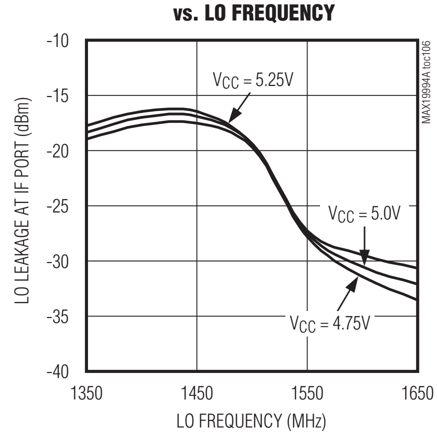
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



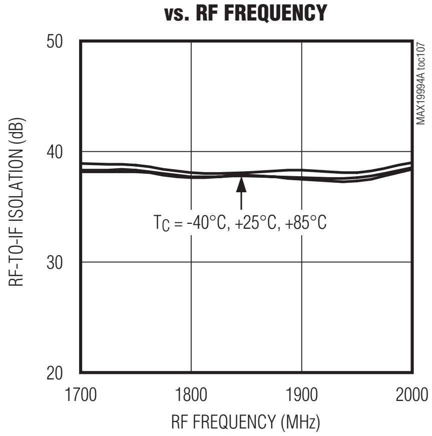
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



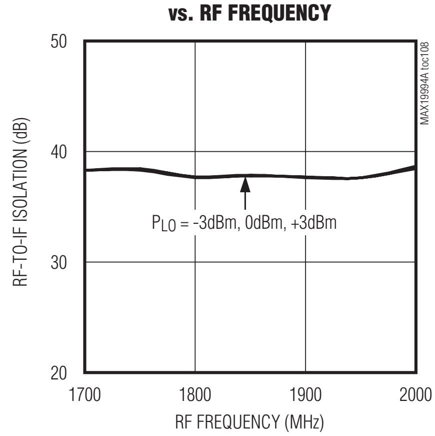
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



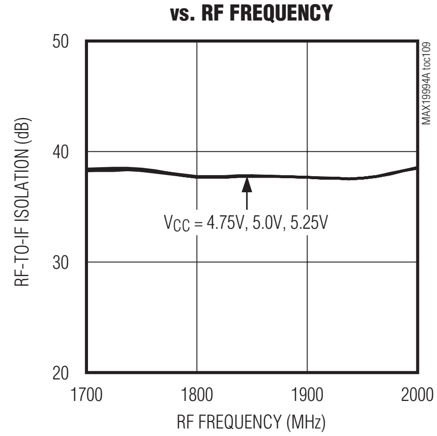
RF-TO-IF ISOLATION vs. RF FREQUENCY



RF-TO-IF ISOLATION vs. RF FREQUENCY



RF-TO-IF ISOLATION vs. RF FREQUENCY

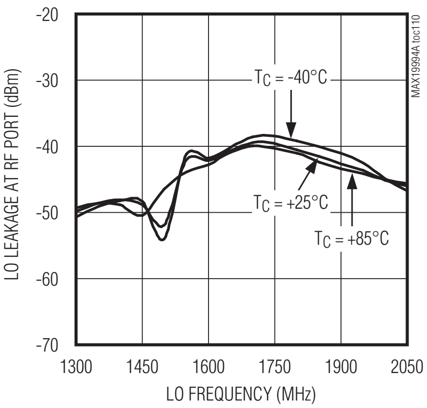


双通道、SiGe、高线性度、1200MHz至2000MHz 下变频混频器，带有LO缓冲器/开关

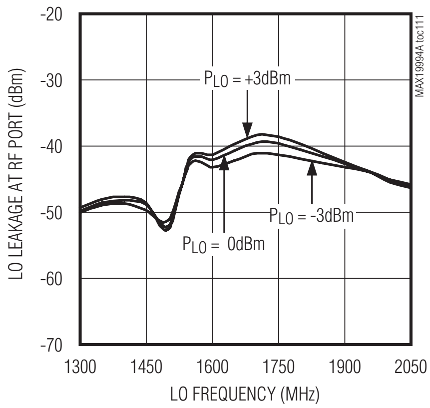
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Extended RF Band (see Table 1). V_{CC} = 5.0V, f_{RF} = 1700MHz to 2000MHz, LO is low-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

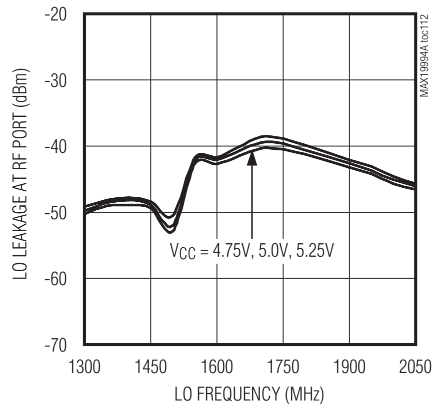
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



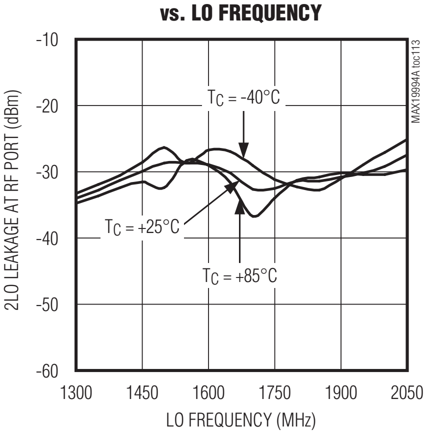
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



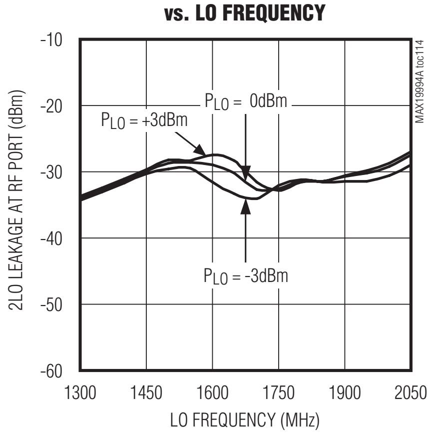
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



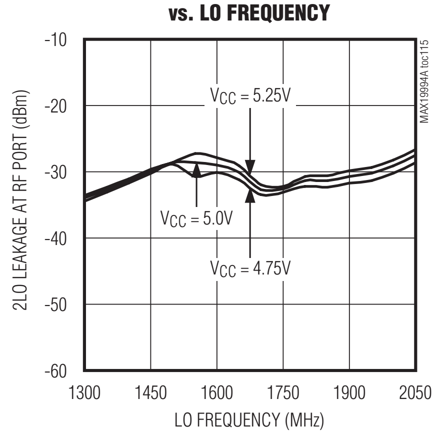
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



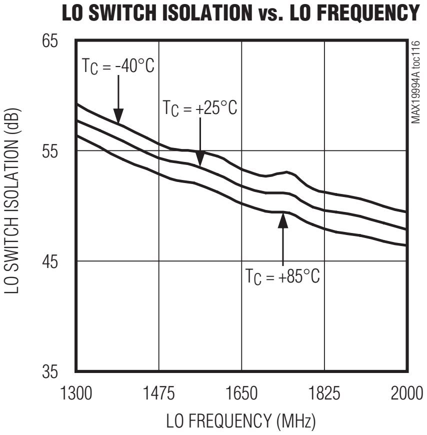
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



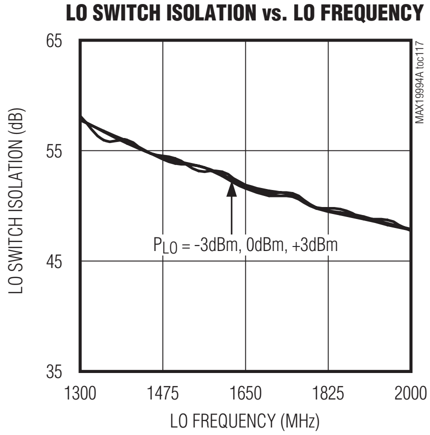
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



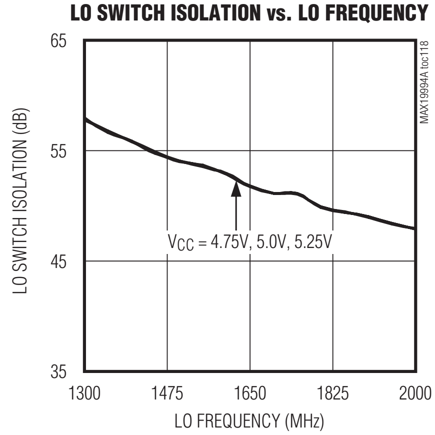
LO SWITCH ISOLATION vs. LO FREQUENCY



LO SWITCH ISOLATION vs. LO FREQUENCY



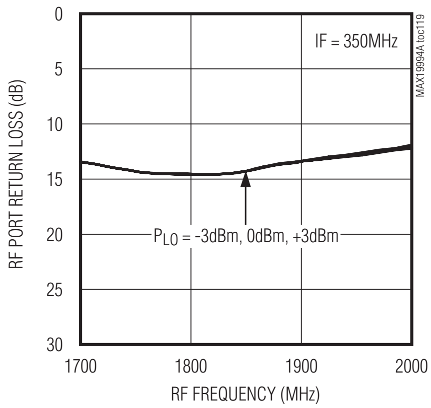
LO SWITCH ISOLATION vs. LO FREQUENCY



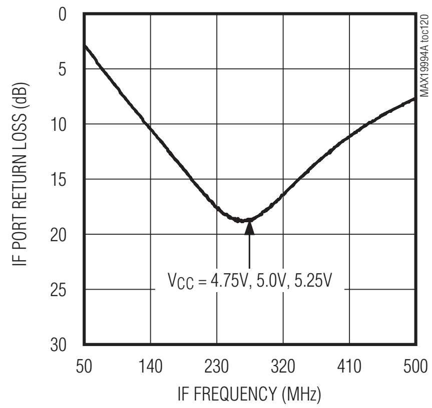
典型工作特性(续)

(*Typical Application Circuit* **optimized for the Extended RF Band (see Table 1). V_{CC} = 5.0V, f_{RF} = 1700MHz to 2000MHz, LO is low-side injected** for a 350MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

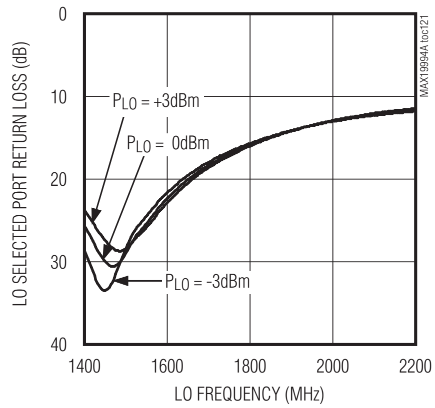
RF PORT RETURN LOSS vs. RF FREQUENCY



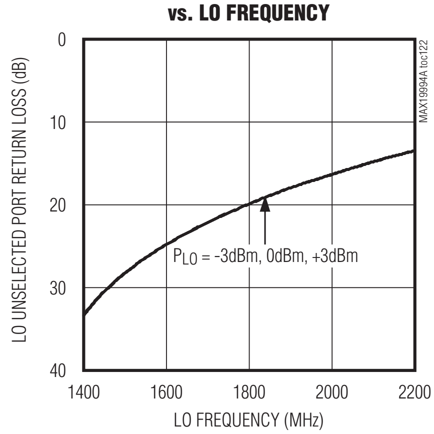
IF PORT RETURN LOSS vs. IF FREQUENCY



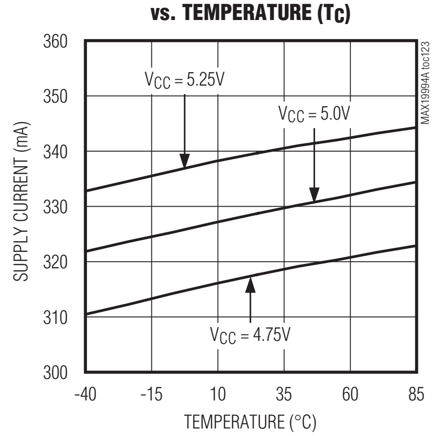
LO SELECTED PORT RETURN LOSS vs. LO FREQUENCY



LO UNSELECTED PORT RETURN LOSS vs. LO FREQUENCY

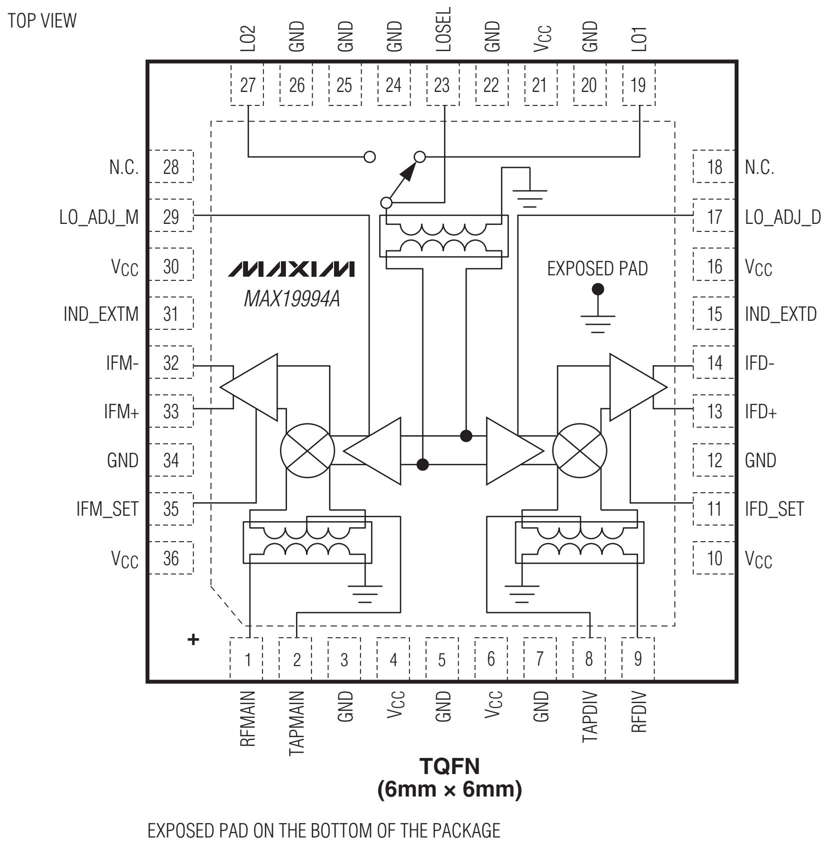


SUPPLY CURRENT vs. TEMPERATURE (T_C)



双通道、SiGe、高线性度、1200MHz至2000MHz下变频混频器，带有LO缓冲器/开关

引脚配置/功能框图



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	TAPMAIN	主通道非平衡变压器的中间抽头。使用尽可能靠近该引脚放置的39pF和0.033μF电容旁路至GND，容值较小的电容离器件较近。
3, 5, 7, 12, 20, 22, 24, 25, 26, 34	GND	地。
4, 6, 10, 16, 21, 30, 36	V_{CC}	电源。使用*典型应用电路*所示电容将其旁路至GND，电容应尽可能靠近引脚放置。
8	TAPDIV	分集通道非平衡变压器的中间抽头。使用尽可能靠近该引脚放置的39pF和0.033μF电容旁路至GND，容值较小的电容离器件较近。

引脚说明(续)

引脚	名称	功能
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(参见*典型应用电路*)。
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*)。
15	IND_EXTD	外部分集电感连接端。该引脚接地，也可以在该引脚与地之间连接一个低ESR的10nH电感，以提高RF与IF之间和LO与IF之间的隔离度(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(参见*典型应用电路*)。
18, 28	N.C.	没有连接，无内部连接。
19	LO1	本振1输入。该输入端在内部匹配为50Ω，需要一个输入隔直电容。
23	LOSEL	本振选择。该引脚为高电平时选择LO1，为低电平时选择LO2。
27	LO2	本振2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(参见*典型应用电路*)。
31	IND_EXTM	外部主电感连接端。该引脚接地，也可以在该引脚与地之间连接一个低ESR的10nH电感，以提高RF与IF之间和LO与IF之间的隔离度(参见*典型应用电路*)。
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(参见*典型应用电路*)。
—	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焊盘，为器件与PCB地层之间提供良好的散热通道。多个接地过孔还有助于改善RF性能。

详细说明

MAX19994A是一款双通道下变频器，设计用于提供8.4dB的转换增益、+25dBm的输入IP3、+14dBm的1dB输入压缩点以及9.8dB的噪声系数。

除具有高线性度性能外，器件还具有非常高的器件集成度。该器件集成有两个双平衡混频器用于双通道下变频。主通道和分集通道都包含非平衡变压器和匹配电路，允许50Ω单端连接至RF端口和两个LO端口。集成的单刀双掷(SPDT)开关在两个LO输入之间的切换时间为50ns，具有48dB的LO至LO隔离度，在RF端具有-42dBm的LO泄漏。此外，集成LO缓冲器可以为各混频器核提供较强的驱动能力，将器件输入端所需的LO驱动减小到-6dBm至+3dBm。两个通道的IF端口配合差分输出进行下变频转换，可有效改善2LO - 2RF性能。

器件优化于1450MHz至2050MHz LO频率范围，混频器支持高端和低端LO注入，分别工作在1200MHz至1700MHz和1700MHz至2000MHz RF输入范围。器件还支持50MHz至500MHz IF范围，外部IF器件可设置更低的频率范围(详细信息请参考*典型工作特性*)。器件也可以工作在上述范围以外，更多信息请参考*典型工作特性*。

双通道、SiGe、高线性度、1200MHz至2000MHz 下变频混频器，带有LO缓冲器/开关

尽管该器件针对1450MHz至2050MHz LO频率范围进行优化，但它同样可以工作在更低的LO频率，支持1200MHz至1700MHz低端LO注入。然而，随着f_{LO}频率的降低，性能有所下降。如需改善低端LO注入的性能，请与工厂联系。

RF端口和非平衡变压器

当器件工作在1200MHz至1700MHz RF频率范围时，主通道和分集通道的RF输入端均在内部匹配为50Ω，无需外部匹配元件。输入端通过片上非平衡变压器内部直流短接到地，因此需要隔直流电容。在整个1200MHz至1700MHz的RF频率范围内，RF端口的输入回波损耗典型值优于15dB。

还可以对器件的RF输入进行匹配，增加两个额外的4.7nH并联电感，使其工作在1700MHz至2000MHz更宽的RF频率范围，详细信息请参考表1。

LO输入、缓冲器和非平衡变压器

器件针对1450MHz至2050MHz的LO频率范围进行了优化。作为一个附加功能，器件包括一个内部LO SPDT开关，可以用于跳频设计。该开关选择两个单端LO端口中的一个，允许外部振荡器在接入之前稳定在一个特定频率上。典型LO切换时间为50ns，远远超过典型GSM应用的要求。如果不使用跳频功能，可以简单地将开关置于任意一个LO输入端。该开关由数字输入(LOSEL)控制：逻辑高电平时选择LO1；逻辑低电平时选择LO2。LO1和LO2输入端在内部匹配为50Ω，只需一个39pF的隔直电容。

LOSEL直接连接到逻辑源，为了避免损坏器件，V_{CC}**必须**在LOSEL加载数字逻辑电平之前上电。对于在V_{CC}之前加载LOSEL信号的应用，可在LOSEL端串联一个1kΩ的电阻来限制输入电流。

主通道和分集通道采用两级LO缓冲器，允许使用宽输入功率范围的LO驱动。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

MAX19994A双通道下变频器的核心由两个双平衡、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。与集成IF放大器配合使用时，级联后的IIP3、2LO - 2RF抑制和噪声系数的典型值分别为+25dBm、68dBc和9.8dB。

差分IF

器件具有50MHz至500MHz的IF频率范围，其低端频率取决于外部IF元件的频率响应。注意：这些差分端口可以改善IIP2性能。单端IF应用需要一个4:1 (阻抗比)的非平衡变压器将200Ω的差分IF阻抗转换为50Ω单端输出。经过非平衡变压器之后，回波损耗的典型值为13dB。用户可以在混频器的IF端口使用差分IF放大器，但是IFD+/IFD-和IFM+/IFM-端口均需要隔直，以防止外部直流进入混频器的IF端口。

应用信息

输入和输出匹配

RF和LO输入端在内部匹配为50Ω，工作在1200MHz至1700MHz和1450MHz至2050MHz频率范围。工作在这两个频段时无需匹配元件。在整个1200MHz至1700MHz的RF频率范围内，RF端口的输入回波损耗典型值优于15dB；而在整个LO范围内，LO端口的回波损耗典型值优于15dB。RF和LO输入端只需通过隔直电容连接。

如果器件工作在1700MHz至2000MHz扩展RF频段，只需将隔直流电容更改为1.8pF，并在每个RF端口增加一个4.7nH的并联电感，详细信息请参考表1。更换上述元件后，在1700MHz至2000MHz频率范围内，RF端口的输入回波损耗典型值优于14dB。

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

器件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约47%，具体细节请参考*3.3V Supply AC Electrical Characteristics*表和*典型工作特性*中与3.3V供电相关的特性曲线。

IND_EXT_电感

在需要改善RF与IF之间和LO与IF之间隔离度的应用中，可以在IND_EXT_ (引脚15和31)与地之间连接一个低ESR电感。如果不需要很高的隔离度，可以用一个0Ω电阻将IND_EXT_连接至地。

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。连接至混频器的负载阻抗必须保证IF_-和IF_+与地之间的电容不会超过几个皮法。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MAX19994A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}引脚和TAPMAIN/TAPDIV引脚使用电容旁路(元件值如表1所示)。将TAPMAIN/TAPDIV的对地旁路电容放置在距相应引脚100mil以内的位置。

裸焊盘的RF/散热考虑

MAX19994A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。在安装器件的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。

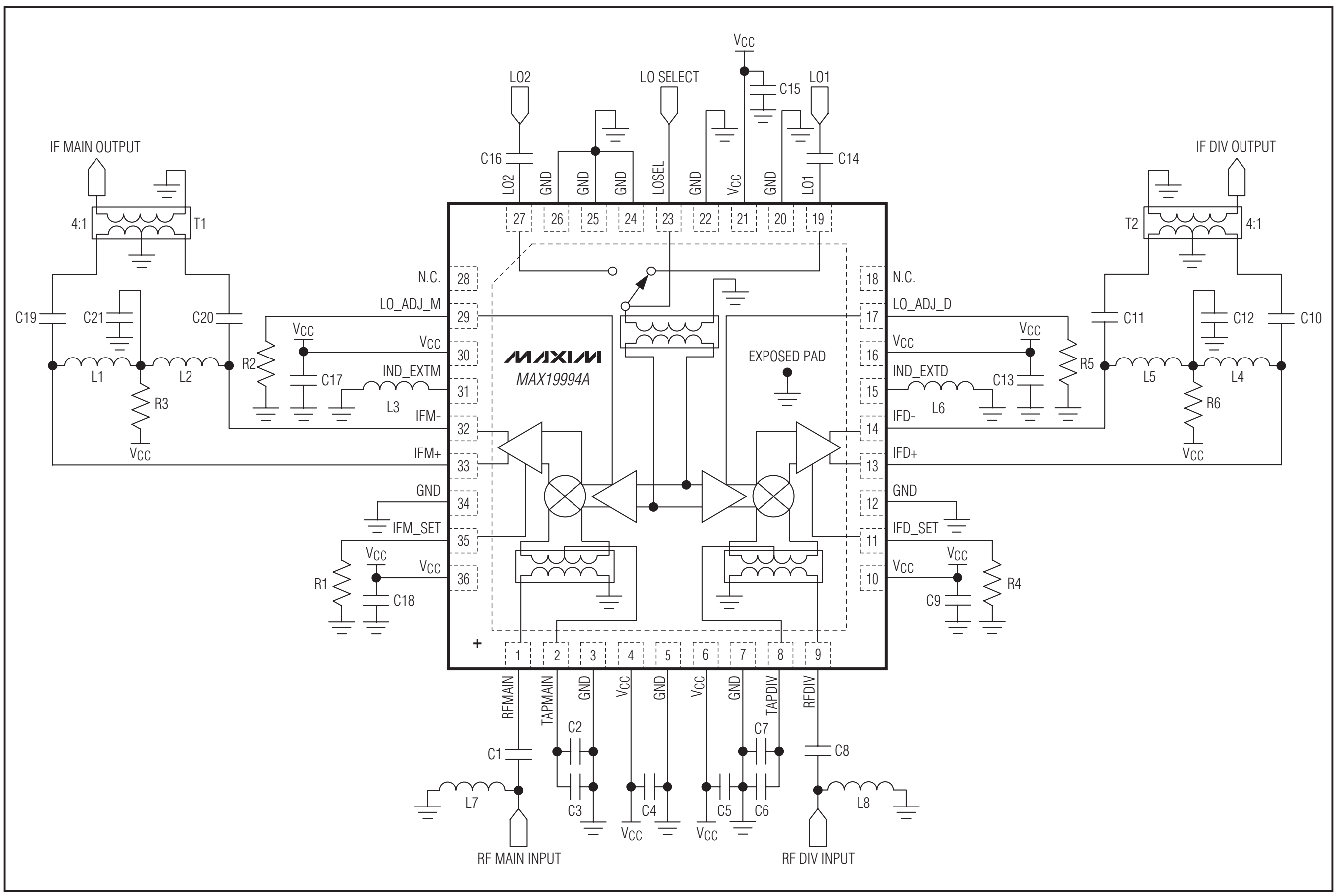
表1. 元件值

DESIGNATION	QTY	DESCRIPTION	COMPONENT SUPPLIER
C1, C8	2	39pF microwave capacitors (0402) 1.8pF for Extended RF Band applications (f_{RF} = 1.7GHz to 2GHz)	Murata Electronics North America, Inc.
C2, C7, C14, C16	4	39pF microwave capacitors (0402)	Murata Electronics North America, Inc.
C3, C6	2	0.033µF microwave capacitors (0603)	Murata Electronics North America, Inc.
C4, C5	2	Not used	—
C9, C13, C15, C17, C18	5	0.01µF microwave capacitors (0402)	Murata Electronics North America, Inc.
C10, C11, C12, C19, C20, C21	6	150pF microwave capacitors (0603)	Murata Electronics North America, Inc.
L1, L2, L4, L5	4	120nH wire-wound, high-Q inductors (0805)	Coilcraft, Inc.
L3, L6	2	10nH wire-wound, high-Q inductors (0603). Smaller values or a 0Ω resistor can be used at the expense of some LO leakage at the IF port and RF-to-IF isolation performance loss.	Coilcraft, Inc.
L7, L8	2	4.7nH inductor (0603). Installed for Extended RF Band applications only (1.7GHz to 2GHz).	TOKO America, Inc.

表1. 元件值(续)

DESIGNATION	QTY	DESCRIPTION	COMPONENT SUPPLIER
R1, R4	2	681Ω ±1% resistors (0402). Used for **V_{CC} = 5.0V** applications. Larger values can be used to reduce power at the expense of some performance loss. 681Ω ±1% resistors (0402). Used for **V_{CC} = 3.3V** applications.	Digi-Key Corp.
R2, R5	2	1.82kΩ ±1% resistors (0402). Used for **V_{CC} = 5.0V** applications. Larger values can be used to reduce power at the expense of some performance loss. 1.43kΩ ±1% resistors (0402). Used for **V_{CC} = 3.3V** applications.	Digi-Key Corp.
R3, R6	2	0Ω resistors (1206)	Digi-Key Corp.
T1, T2	2	4:1 transformers (200:50) TC4-1W-17	Mini-Circuits
U1	1	MAX19994A IC (36 TQFN-EP)	Maxim Integrated Products, Inc.

典型应用电路



芯片信息

PROCESS: SiGe BiCMOS

封装信息

如需最近的封装外形信息和焊盘布局，请查询**china.maxim-ic.com/packages**。请注意，封装编码中的“+”、“#”或“-”仅表示RoHS状态。封装图中可能包含不同的尾缀字符，但封装图只与封装有关，与RoHS状态无关。

封装类型	封装编码	文档编号
36引脚薄型QFN-EP	T3666+2	**21-0141**

双通道、SiGe、高线性度、1200MHz至2000MHz 下变频混频器，带有LO缓冲器/开关

修订历史

修订号	修订日期	说明	修改页
0	4/10	最初版本。	—

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