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19-4402; Rev 1; 5/09

SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

General Description

The MAX19996A single, high-linearity downconversion mixer provides 8.7dB conversion gain, +24.5dBm IIP3, and 9.8dB noise figure for 2000MHz to 3900MHz WCS, LTE, WiMAX™, and MMDS wireless infrastructure applications. With an ultra-wide LO frequency range of 2100MHz to 4000MHz, the MAX19996A can be used in either low-side or high-side LO injection architectures for virtually all 2.5GHz and 3.5GHz applications. For a 2.5GHz variant tuned specifically for low-side injection, refer to the MAX19996 data sheet.

In addition to offering excellent linearity and noise performance, the MAX19996A also yields a high level of component integration. This device includes a double-balanced passive mixer core, an IF amplifier, and an LO buffer. On-chip baluns are also integrated to allow for single-ended RF and LO inputs. The MAX19996A requires a nominal LO drive of 0dBm, and supply current is typically 230mA at V_{CC} = 5.0V, or 150mA at V_{CC} = 3.3V.

The MAX19996A is pin compatible with the MAX19996 2000MHz to 3000MHz mixer. The device is also pin similar with the MAX9984/MAX9986/MAX9986A 400MHz to 1000MHz mixers and the MAX9993/MAX9994/MAX9996 1700MHz to 2200MHz mixers, making this entire family of downconverters ideal for applications where a common PCB layout is used for multiple frequency bands.

The MAX19996A is available in a compact 5mm x 5mm, 20-pin thin QFN with an exposed pad. Electrical performance is guaranteed over the extended -40°C to +85°C temperature range.

Applications

2.3GHz WCS Base Stations

2.5GHz WiMAX and LTE Base Stations

2.7GHz MMDS Base Stations

3.5GHz WiMAX and LTE Base Stations

Fixed Broadband Wireless Access

Wireless Local Loop

Private Mobile Radios

Military Systems

Features

- **2000MHz to 3900MHz RF Frequency Range**
- **2100MHz to 4000MHz LO Frequency Range**
- **50MHz to 500MHz IF Frequency Range**
- **8.7dB Conversion Gain**
- **9.8dB Noise Figure**
- **+24.5dBm Typical Input IP3**
- **11dBm Typical Input 1dB Compression Point**
- **67dBc Typical 2LO-2RF Spurious Rejection at P_{RF} = -10dBm**
- **Integrated LO Buffer**
- **Integrated RF and LO Baluns for Single-Ended Inputs**
- **Low -3dBm to +3dBm LO Drive**
- **Pin Compatible with the MAX19996 2000MHz to 3000MHz Mixer**
- **Pin Similar with the MAX9993/MAX9994/MAX9996 Series of 1700MHz to 2200MHz Mixers and the MAX9984/MAX9986/MAX9986A Series of 400MHz to 1000MHz Mixers**
- **Single 5.0V or 3.3V Supply**
- **External Current-Setting Resistors Provide Option for Operating Device in Reduced-Power/Reduced-Performance Mode**

Ordering Information

PART	TEMP RANGE	PIN-PACKAGE
MAX19996AETP+	-40°C to +85°C	20 Thin QFN-EP*
MAX19996AETP+T	-40°C to +85°C	20 Thin QFN-EP*

+Denotes a lead(Pb)-free/RoHS-compliant package.

**EP = Exposed pad.*

T = Tape and reel.

Pin Configuration/Functional Diagram appears at end of data sheet.

WiMAX is a trademark of WiMAX Forum.

SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND .....-0.3V to +5.5V
IF+, IF-, LO to GND .....-0.3V to (V_{CC} + 0.3V)
RF, LO Input Power .....+12dBm
RF, LO Current (RF and LO is DC shorted to GND through a balun).....50mA
Continuous Power Dissipation (Note 1) 5.0W
θ_{JA} (Notes 2, 3).....+38°C/W
θ_{JC} (Notes 1, 3).....13°C/W
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

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 **www.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, unless otherwise noted. Typical values are at V_{CC} = 5.0V, T_C = +25°C, all parameters are production tested.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Voltage	V_{CC}		4.75	5.0	5.25	V
Supply Current	I_{CC}			230	245	mA

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, unless otherwise noted. Typical values are at V_{CC} = 3.3V, T_C = +25°C, parameters are guaranteed by design and not production tested, 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, V_{CC} = 3.3V		150		mA

RECOMMENDED AC OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
RF Frequency Range	f_{RF}	*Typical Application Circuit* with C1 = 8.2pF, see Table 1 for details (Note 5)	2000		3000	MHz
		Typical Application Circuit with C1 = 1.5pF, see Table 1 for details (Note 5)	3000		3900	
LO Frequency	f_{LO}	(Note 5)	2100		4000	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 (Note 5)	100		500	MHz
		Using 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	P_{LO}		-3	0	+3	dBm

5.0V SUPPLY AC ELECTRICAL CHARACTERISTICS—f_{RF} = 2300MHz TO 2900MHz, HIGH-SIDE LO INJECTION

(*Typical Application Circuit* with tuning elements outlined in **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_{IF} = 300MHz, f_{LO} = 2600MHz to 3200MHz, $f_{RF} < f_{LO}$, T_C = -40°C to +85°C. Typical values are for T_C = +25°C, V_{CC} = 5.0V, P_{LO} = 0dBm, f_{RF} = 2600MHz, f_{LO} = 2900MHz, f_{IF} = 300MHz. All parameters are guaranteed by design and characterization, unless otherwise noted.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Small-Signal Conversion Gain		f_{RF} = 2300MHz to 2900MHz, T_C = +25°C (Note 7)	7.9	8.7	9.2	dB
Gain Variation vs. Frequency	ΔG_C	f_{RF} = 2305MHz to 2360MHz		0.1		dB
		f_{RF} = 2500MHz to 2570MHz		0.1		
		f_{RF} = 2570MHz to 2620MHz		0.1		
		f_{RF} = 2500MHz to 2690MHz		0.2		
		f_{RF} = 2700MHz to 2900MHz		0.3		
Conversion Gain Temperature Coefficient	TC_{CG}	T_C = -40°C to +85°C		-0.012		dB/°C
Single Sideband Noise Figure	NF_{SSB}	No blockers present		9.8	12	dB
		f_{RF} = 2600MHz, f_{IF} = 300MHz, P_{LO} = 0dBm, V_{CC} = +5.0V, T_C = +25°C, no blockers present		9.8	10.5	
Noise Figure Temperature Coefficient	TC_{NF}	f_{RF} = 2300MHz to 2900MHz, single sideband, no blockers present, T_C = -40°C to +85°C		0.018		dB/°C
Noise Figure Under Blocking	NF_B	+8dBm blocker tone applied to RF port, f_{RF} = 2600MHz, f_{LO} = 2900MHz, $f_{BLOCKER}$ = 2400MHz, P_{LO} = 0dBm, V_{CC} = +5.0V, T_C = +25°C (Note 8)		18	22	dB

SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

5.0V SUPPLY AC ELECTRICAL CHARACTERISTICS—f_{RF} = 2300MHz TO 2900MHz, HIGH-SIDE LO INJECTION (continued)

(*Typical Application Circuit* with tuning elements outlined in **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_{IF} = 300MHz, f_{LO} = 2600MHz to 3200MHz, $f_{RF} < f_{LO}$, T_C = -40°C to +85°C. Typical values are for T_C = +25°C, V_{CC} = 5.0V, P_{LO} = 0dBm, f_{RF} = 2600MHz, f_{LO} = 2900MHz, f_{IF} = 300MHz. All parameters are guaranteed by design and characterization, unless otherwise noted.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Input 1dB Compression Point	IP_{1dB}	T_C = +25°C (Note 9)		9.5	11		dBm
		f_{RF} = 2600MHz T_C = +25°C (Notes 7, 9)		10	11		
Third-Order Input Intercept Point	IIP3	f_{RF1} - f_{RF2} = 1MHz, P_{RF1} = P_{RF2} = -5dBm, T_C = +25°C (Note 7)		22.5	24.5		dBm
IIP3 Variation with T_C		f_{RF} = 2300MHz to 2900MHz, f_{RF1} - f_{RF2} = 1MHz, P_{RF1} = P_{RF2} = -5dBm, T_C = -40°C to +85°C			±0.3		dB
2LO-2RF Spur Rejection	2 x 2	f_{SPUR} = f_{LO} - 150MHz	P_{RF} = -10dBm	60	67		dBc
			P_{RF} = -5dBm	55	62		
3LO-3RF Spur Rejection	3 x 3	f_{SPUR} = f_{LO} - 100MHz	P_{RF} = -10dBm	75	85		dBc
			P_{RF} = -5dBm	65	75		
RF Input Return Loss	RL_{RF}	LO on and IF terminated into a matched impedance			17.5		dB
LO Input Return Loss	RL_{LO}	RF and IF terminated into a matched impedance			19.5		dB
IF Output Impedance	Z_{IF}	Nominal differential impedance at the IC's IF outputs			200		Ω
IF Output Return Loss	RL_{IF}	RF terminated into 50Ω, LO driven by 50Ω source, IF transformed to 50Ω using external components shown in the *Typical Application Circuit*; see the *Typical Operating Characteristics* for performance vs. inductor values	f_{IF} = 450MHz, L1 = L2 = 120nH		25		dB
			f_{IF} = 350MHz, L1 = L2 = 270nH		25		
			f_{IF} = 300MHz, L1 = L2 = 390nH		25		
RF-to-IF Isolation		P_{LO} = +3dBm (Note 7)		27	30		dB
LO Leakage at RF Port		P_{LO} = +3dBm			-28.6	-22.8	dBm
2LO Leakage at RF Port		P_{LO} = +3dBm			-29.7		dBm
LO Leakage at IF Port		P_{LO} = +3dBm (Note 7)			-28.4		dBm

3.3V SUPPLY AC ELECTRICAL CHARACTERISTICS—f_{RF} = 2300MHz TO 2900MHz, HIGH-SIDE LO INJECTION

(*Typical Application Circuit* with tuning elements outlined in **Table 1**, RF and LO ports are driven from 50Ω sources. Typical values are for T_C = +25°C, V_{CC} = 3.3V, P_{LO} = 0dBm, f_{RF} = 2600MHz, f_{LO} = 2900MHz, f_{IF} = 300MHz, unless otherwise noted.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Small-Signal Conversion Gain	G_C				8.3		dB
Gain Variation vs. Frequency	ΔG_C	f_{RF} = 2300MHz to 2900MHz, any 100MHz band			0.15		dB
Conversion Gain Temperature Coefficient	TC_{CG}	T_C = -40°C to +85°C			-0.012		dB/°C
Single Sideband Noise Figure	NF_{SSB}	No blockers present			9.6		dB
Noise Figure Temperature Coefficient	TC_{NF}	Single sideband, no blockers present, T_C = -40°C to +85°C			0.018		dB/°C
Input 1dB Compression Point	IP_{1dB}	(Note 9)			7.75		dBm
Third-Order Input Intercept Point	IIP3	f_{RF1} = 2600MHz, f_{RF2} = 2601MHz, P_{RF1} = P_{RF2} = -5dBm			19.7		dBm
IIP3 Variation with T_C		f_{RF1} = 2600MHz, f_{RF2} = 2601MHz, P_{RF1} = P_{RF2} = -5dBm, T_C = -40°C to +85°C			±0.5		dB
2LO-2RF Spur Rejection	2 x 2	f_{SPUR} = f_{LO} - 150MHz	P_{RF} = -10dBm		64		dBc
			P_{RF} = -5dBm		59		
3LO-3RF Spur Rejection	3 x 3	f_{SPUR} = f_{LO} - 100MHz	P_{RF} = -10dBm		74		dBc
			P_{RF} = -5dBm		64		
RF Input Return Loss	RL_{RF}	LO on and IF terminated into a matched impedance			17.5		dB
LO Input Return Loss	RL_{LO}	RF and IF terminated into a matched impedance			19.5		dB
IF Output Impedance	Z_{IF}	Nominal differential impedance at the IC's IF outputs			200		Ω
IF Output Return Loss	RL_{IF}	RF terminated into 50Ω, LO driven by 50Ω source, IF transformed to 50Ω using external components shown in the *Typical Application Circuit*; see the *Typical Operating Characteristics* for performance vs. inductor values	f_{IF} = 450MHz, L1 = L2 = 120nH		25		dB
			f_{IF} = 350MHz, L1 = L2 = 270nH		25		
			f_{IF} = 300MHz, L1 = L2 = 390nH		25		
RF-to-IF Isolation		f_{RF} = 2300MHz to 2900MHz, P_{LO} = +3dBm			38		dB
LO Leakage at RF Port		f_{LO} = 2600MHz to 3200MHz, P_{LO} = +3dBm			-30		dBm
2LO Leakage at RF Port		f_{LO} = 2600MHz to 3200MHz, P_{LO} = +3dBm			-31		dBm
LO Leakage at IF Port		f_{LO} = 2600MHz to 3200MHz, P_{LO} = +3dBm			-34		dBm

SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

5.0V SUPPLY AC ELECTRICAL CHARACTERISTICS—f_{RF} = 2300MHz TO 2900MHz, LOW-SIDE LO INJECTION

(*Typical Application Circuit* with tuning elements outlined in **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_{IF} = 300MHz, f_{LO} = 2000MHz to 2600MHz, $f_{RF} > f_{LO}$, T_C = -40°C to +85°C. Typical values are for T_C = +25°C, V_{CC} = 5.0V, P_{LO} = 0dBm, f_{RF} = 2600MHz, f_{LO} = 2300MHz, f_{IF} = 300MHz, all parameters are guaranteed by design and characterization, unless otherwise noted.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Small-Signal Conversion Gain	G_C	f_{RF} = 2300MHz to 2900MHz, T_C = +25°C (Note 7)		8.2	8.9	9.5	dB
Gain Variation vs. Frequency	ΔG_C	f_{RF} = 2300MHz to 2900MHz, any 100MHz band			0.1		dB
Conversion Gain Temperature Coefficient	TC_{CG}	T_C = -40°C to +85°C			-0.012		dB/°C
Single Sideband Noise Figure	NF_{SSB}	No blockers present			9.5	12.5	dB
		f_{RF} = 2600MHz, f_{IF} = 300MHz, P_{LO} = 0dBm, V_{CC} = +5.0V, T_C = +25°C, no blockers present			9.5	10.5	
Noise Figure Temperature Coefficient	TC_{NF}	Single sideband, no blockers present, T_C = -40°C to +85°C			0.018		dB/°C
Input 1dB Compression Point	IP_{1dB}	T_C = +25°C (Note 9)		9.5	10.7		dBm
Third-Order Input Intercept Point	IIP3	f_{RF1} - f_{RF2} = 1MHz, P_{RF1} = P_{RF2} = -5dBm, T_C = +25°C (Note 7)		22	24.05		dBm
IIP3 Variation with T_C		f_{RF} = 2300MHz to 2900MHz, P_{RF1} = P_{RF2} = -5dBm, T_C = -40°C to +85°C			±0.5		dB
2RF-2LO Spur Rejection	2 x 2	$f_{SPUR} = f_{LO} + 150MHz$	P_{RF} = -10dBm	63	68		dBc
			P_{RF} = -5dBm	58	63		
3RF-3LO Spur Rejection	3 x 3	$f_{SPUR} = f_{LO} + 100MHz$	P_{RF} = -10dBm	79	84		dBc
			P_{RF} = -5dBm	69	74		
RF Input Return Loss	RL_{RF}	LO on and IF terminated into a matched impedance			19		dB
LO Input Return Loss	RL_{LO}	RF and IF terminated into a matched impedance			18		dB
IF Output Impedance	Z_{IF}	Nominal differential impedance at the IC's IF outputs			200		Ω
IF Output Return Loss	RL_{IF}	RF terminated into 50Ω, LO driven by 50Ω source, IF transformed to 50Ω using external components shown in the *Typical Application Circuit*; see the *Typical Operating Characteristics* for performance vs. inductor values	f_{IF} = 450MHz, L1 = L2 = 120nH		25		dB
			f_{IF} = 350MHz, L1 = L2 = 270nH		25		
			f_{IF} = 300MHz, L1 = L2 = 390nH		25		
RF-to-IF Isolation		f_{RF} = 2600MHz, P_{LO} = +3dBm		29	36		dB
LO Leakage at RF Port		f_{LO} = 1800MHz to 2900MHz, P_{LO} = +3dBm			-28	-20	dBm
2LO Leakage at RF Port		f_{LO} = 1800MHz to 2900MHz, P_{LO} = +3dBm			-29	-19	dBm
LO Leakage at IF Port		f_{LO} = 1800MHz to 2900MHz, P_{LO} = +3dBm			-24		dBm

5.0V SUPPLY AC ELECTRICAL CHARACTERISTICS—f_{RF} = 3100MHz TO 3900MHz, LOW-SIDE LO INJECTION

(*Typical Application Circuit* with tuning elements outlined in **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} = 3100MHz to 3900MHz, f_{IF} = 300MHz, f_{LO} = 2800MHz to 3600MHz, $f_{RF} > f_{LO}$, T_C = -40°C to +85°C. Typical values are for T_C = +25°C, V_{CC} = 5.0V, P_{LO} = 0dBm, f_{RF} = 3500MHz, f_{LO} = 3200MHz, f_{IF} = 300MHz. All parameters are guaranteed by design and characterization, unless otherwise noted.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Small-Signal Conversion Gain	G_C	T_C = +25°C (Note 7)		7.5	8.0	8.5	dB
Gain Variation vs. Frequency	ΔG_C	f_{RF} = 3450MHz to 3750MHz, any 100MHz band			0.15		dB
		f_{RF} = 3450MHz to 3750MHz, any 200MHz band			0.3		
Conversion Gain Temperature Coefficient	TC_{CG}	T_C = -40°C to +85°C			-0.012		dB/°C
Single Sideband Noise Figure	NF_{SSB}	No blockers present			10.5	13.5	dB
		f_{RF} = 3500MHz, f_{IF} = 300MHz, P_{LO} = 0dBm, V_{CC} = +5.0V, T_C = +25°C, no blockers present			10.5	11.6	
Noise Figure Temperature Coefficient	TC_{NF}	f_{RF} = 3100MHz to 3900MHz, single sideband, no blockers present, T_C = -40°C to +85°C			0.018		dB/°C
Noise Figure Under Blocking	NF_B	+8dBm blocker tone applied to RF port, f_{RF} = 3500MHz, f_{LO} = 3200MHz, $f_{BLOCKER}$ = 3750MHz, P_{LO} = 0dBm, V_{CC} = +5.0V, T_C = +25°C (Note 8)			18.7	21	dB
Input 1dB Compression Point	IP_{1dB}	f_{RF} = 3500MHz (Note 9)		10	12		dBm
Third-Order Input Intercept Point	IIP3	f_{RF1} - f_{RF2} = 1MHz, P_{RF1} = P_{RF2} = -5dBm (Note 7)		23	25		dBm
IIP3 Variation with T_C		f_{RF} = 3100MHz to 3900MHz, f_{IF} = 300MHz, f_{RF1} - f_{RF2} = 1MHz, P_{RF1} = P_{RF2} = -5dBm, T_C = -40°C to +85°C			±0.3		dB
2RF-2LO Spur Rejection	2 x 2	f_{SPUR} = f_{LO} + 150MHz	P_{RF} = -10dBm	60	69		dBc
			P_{RF} = -5dBm	55	64		
3RF-3LO Spur Rejection	3 x 3	f_{SPUR} = f_{LO} + 100MHz	P_{RF} = -10dBm	78	86		dBc
			P_{RF} = -5dBm	68	76		
RF Input Return Loss	RL_{RF}	LO on and IF terminated into a matched impedance			20		dB
LO Input Return Loss	RL_{LO}	RF and IF terminated into a matched impedance			16.5		dB
IF Output Impedance	Z_{IF}	Nominal differential impedance at the IC's IF outputs			200		Ω

SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

5.0V SUPPLY AC ELECTRICAL CHARACTERISTICS—f_{RF} = 3100MHz TO 3900MHz, LOW-SIDE LO INJECTION (continued)

(*Typical Application Circuit* with tuning elements outlined in **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} = 3100MHz to 3900MHz, f_{IF} = 300MHz, f_{LO} = 2800MHz to 3600MHz, $f_{RF} > f_{LO}$, T_C = -40°C to +85°C. Typical values are for T_C = +25°C, V_{CC} = 5.0V, P_{LO} = 0dBm, f_{RF} = 3500MHz, f_{LO} = 3200MHz, f_{IF} = 300MHz. All parameters are guaranteed by design and characterization, unless otherwise noted.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
IF Output Return Loss	RL_{IF}	RF terminated into 50Ω, LO driven by 50Ω source, IF transformed to 50Ω using external components shown in the *Typical Application Circuit*; see the *Typical Operating Characteristic*s for performance vs. inductor values	f_{IF} = 450MHz, L1 = L2 = 120nH		25		dB
			f_{IF} = 350MHz, L1 = L2 = 270nH		25		
			f_{IF} = 300MHz, L1 = L2 = 390nH		25		
RF-to-IF Isolation		f_{RF} = 2600MHz P_{LO} = +3dBm (Note 7)		23	27		dB
LO Leakage at RF Port		f_{LO} = 2800MHz to 3600MHz P_{LO} = +3dBm			-31	-20	dBm
2LO Leakage at RF Port		P_{LO} = +3dBm			-27		dBm
LO Leakage at IF Port		P_{LO} = +3dBm (Note 7)			-29.5	-20	dBm

+5.0V SUPPLY AC ELECTRICAL CHARACTERISTICS—f_{RF} = 3100MHz TO 3900MHz, HIGH-SIDE LO INJECTION

(*Typical Application Circuit* with tuning elements outlined in **Table 1**, V_{CC} = 4.75V to 5.25V, RF and LO ports are driven from 50Ω sources, Typical values are for T_C = +25°C, V_{CC} = 5.0V, P_{LO} = 0dBm, f_{RF} = 3500MHz, f_{LO} = 3800MHz, f_{IF} = 300MHz. Parameters are guaranteed by design and not production tested.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Small-Signal Conversion Gain	G_C				7.6		dB
Gain Variation vs. Frequency	ΔG_C	f_{RF} = 3450MHz to 3750MHz, any 100MHz band			0.15		dB
		f_{RF} = 3450MHz to 3750MHz, any 200MHz band			0.3		
Conversion Gain Temperature Coefficient	TC_{CG}	T_C = -40°C to +85°C			-0.012		dB/°C
Single Sideband Noise Figure	NF_{SSB}	No blockers present			10.9		dB
Noise Figure Temperature Coefficient	TC_{NF}	Single sideband, no blockers present, T_C = -40°C to +85°C			0.018		dB/°C
Input 1dB Compression Point	IP_{1dB}	(Note 9)			12.4		dBm
Third-Order Input Intercept Point	IIP3	f_{RF1} = 3500MHz, f_{RF2} = 3501MHz, P_{RF1} = P_{RF2} = -5dBm			24.7		dBm
IIP3 Variation with T_C		f_{RF1} = 3500MHz, f_{RF2} = 3501MHz, P_{RF1} = P_{RF2} = -5dBm, T_C = -40°C to +85°C			±0.5		dB
2LO-2RF Spur Rejection	2 x 2	f_{SPUR} = f_{LO} - 150MHz	P_{RF} = -10dBm		69		dBc
			P_{RF} = -5dBm		64		

+5.0V SUPPLY AC ELECTRICAL CHARACTERISTICS—f_{RF} = 3100MHz TO 3900MHz, HIGH-SIDE LO INJECTION (continued)

(*Typical Application Circuit* with tuning elements outlined in **Table 1**, V_{CC} = 4.75V to 5.25V, RF and LO ports are driven from 50Ω sources, Typical values are for T_C = +25°C, V_{CC} = 5.0V, P_{LO} = 0dBm, f_{RF} = 3500MHz, f_{LO} = 3800MHz, f_{IF} = 300MHz. Parameters are guaranteed by design and not production tested.) (Note 6)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
3LO-3RF Spur Rejection	3 x 3	$f_{SPUR} = f_{LO}$ - 100MHz	P_{RF} = -10dBm		90		dBc
			P_{RF} = -5dBm		80		
RF Input Return Loss	RL_{RF}	LO on and IF terminated into a matched impedance			22		dB
LO Input Return Loss	RL_{LO}	RF and IF terminated into a matched impedance			16.3		dB
IF Output Impedance	Z_{IF}	Nominal differential impedance at the IC's IF outputs			200		Ω
IF Output Return Loss	RL_{IF}	RF terminated into 50Ω, LO driven by 50Ω source, IF transformed to 50Ω using external components shown in the *Typical Application Circuit*; see the *Typical Operating Characteristics* for performance vs. inductor values	f_{IF} = 450MHz, L1 = L2 = 120nH		25		dB
			f_{IF} = 350MHz, L1 = L2 = 270nH		25		
			f_{IF} = 300MHz, L1 = L2 = 390nH		25		
RF-to-IF Isolation		f_{RF} = 3100MHz to 3700MHz, P_{LO} = +3dBm			26.6		dB
LO Leakage at RF Port		f_{LO} = 3400MHz to 4000MHz, P_{LO} = +3dBm			-38		dBm
2LO Leakage at RF Port		f_{LO} = 3400MHz to 4000MHz, P_{LO} = +3dBm			-13.5		dBm
LO Leakage at IF Port		f_{LO} = 3400MHz to 4000MHz, P_{LO} = +3dBm			-27		dBm

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} = 300MHz due to the 4:1 impedance transformer. Output measurements were taken at IF outputs of the *Typical Application Circuit*.

Note 7: 100% production tested for functional performance.

Note 8: Measured with external LO source noise filtered so that 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*.

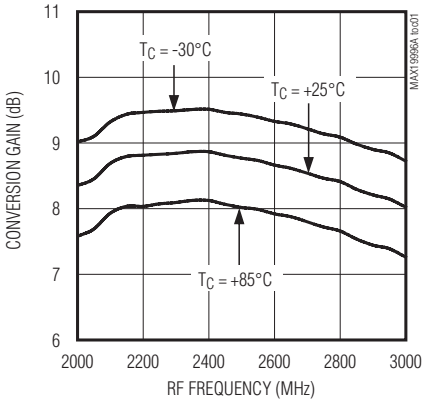
Note 9: Maximum reliable continuous input power applied to the RF port of this device is +12dBm from a 50Ω source.

SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

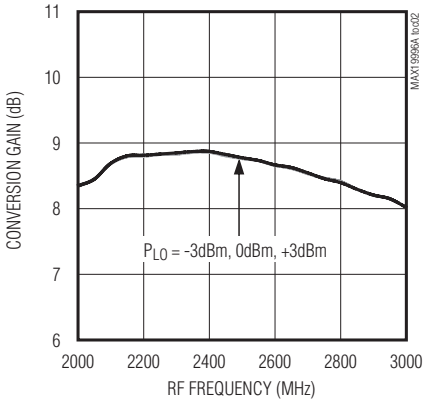
Typical Operating Characteristics

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 5.0V, f_{RF} = 2000MHz to 3000MHz, LO is high-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

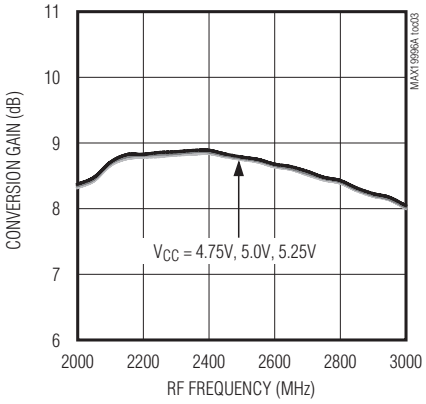
CONVERSION GAIN vs. RF FREQUENCY



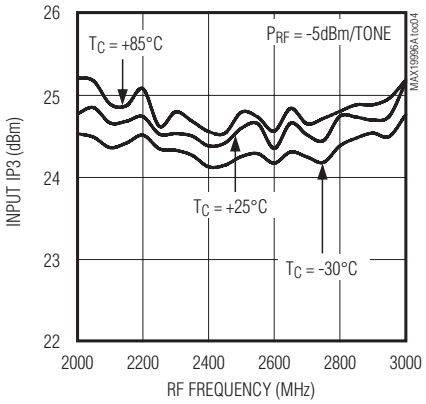
CONVERSION GAIN vs. RF FREQUENCY



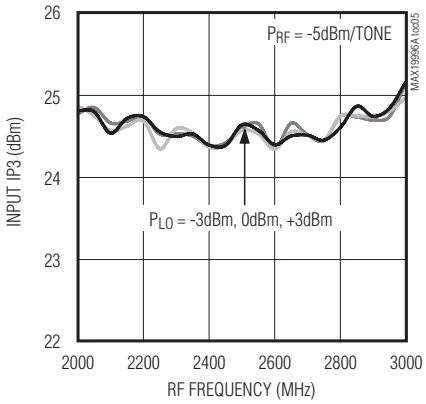
CONVERSION GAIN vs. RF FREQUENCY



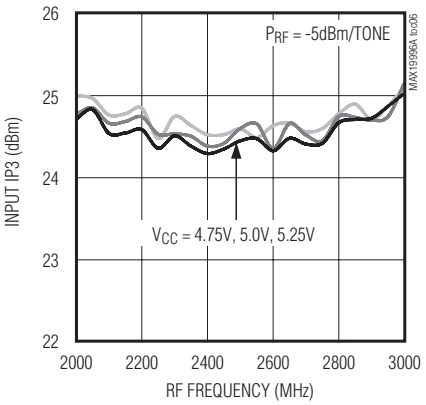
INPUT IP3 vs. RF FREQUENCY



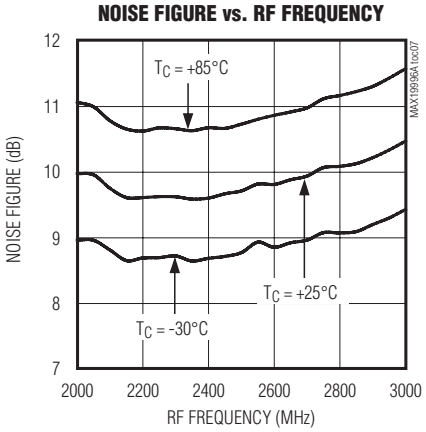
INPUT IP3 vs. RF FREQUENCY



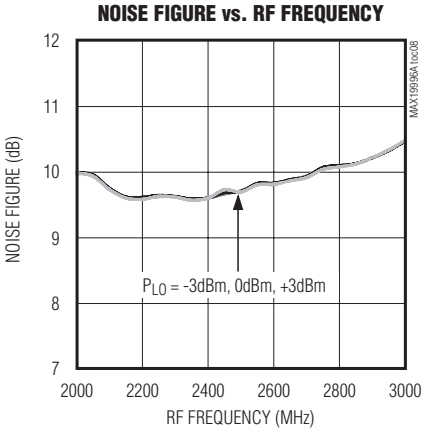
INPUT IP3 vs. RF FREQUENCY



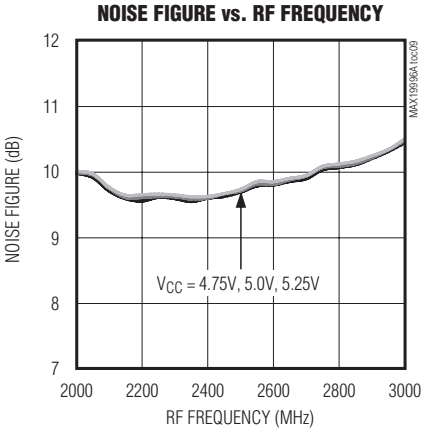
NOISE FIGURE vs. RF FREQUENCY



NOISE FIGURE vs. RF FREQUENCY



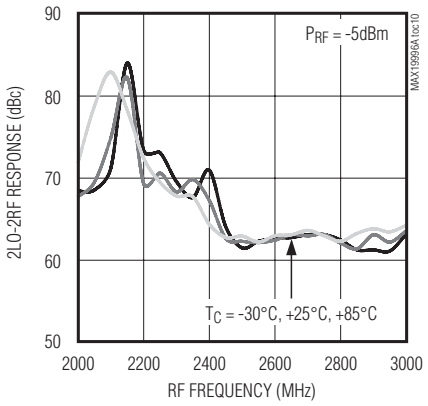
NOISE FIGURE vs. RF FREQUENCY



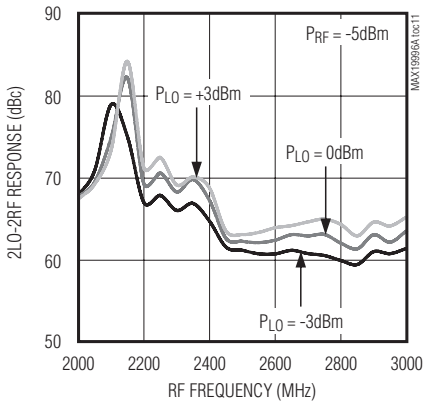
Typical Operating Characteristics (continued)

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 5.0V, f_{RF} = 2000MHz to 3000MHz, LO is high-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

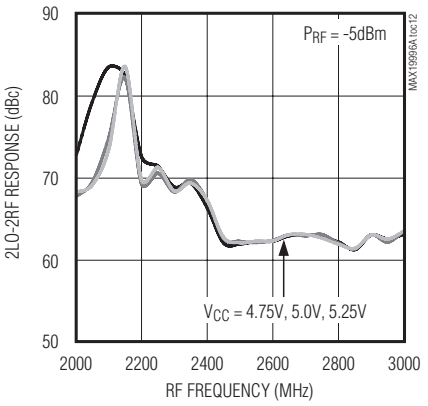
2LO-2RF RESPONSE vs. RF FREQUENCY



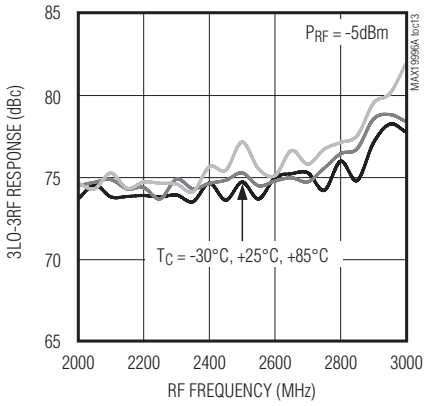
2LO-2RF RESPONSE vs. RF FREQUENCY



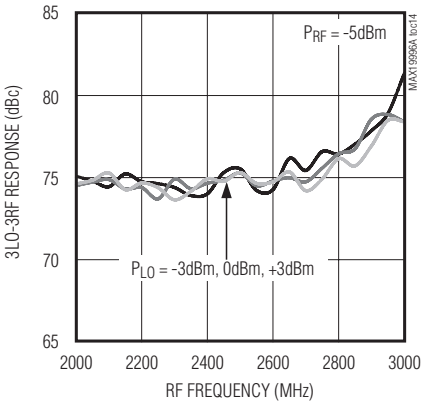
2LO-2RF RESPONSE vs. RF FREQUENCY



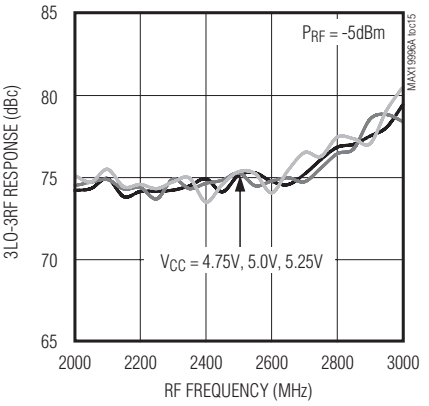
3LO-3RF RESPONSE vs. RF FREQUENCY



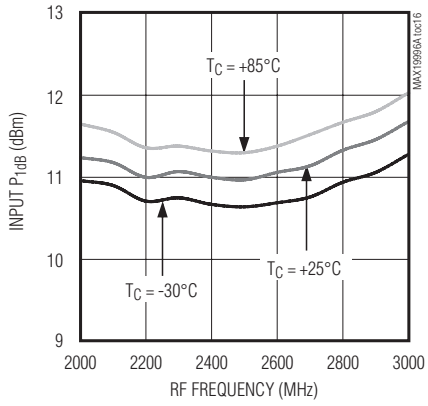
3LO-3RF RESPONSE vs. RF FREQUENCY



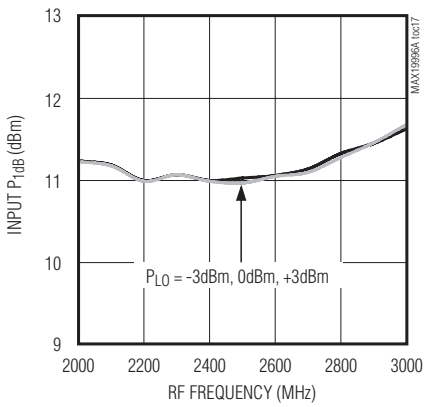
3LO-3RF RESPONSE vs. RF FREQUENCY



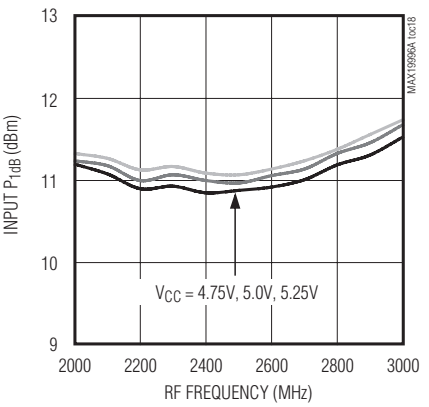
INPUT P_{1dB} vs. RF FREQUENCY



INPUT P_{1dB} vs. RF FREQUENCY



INPUT P_{1dB} vs. RF FREQUENCY

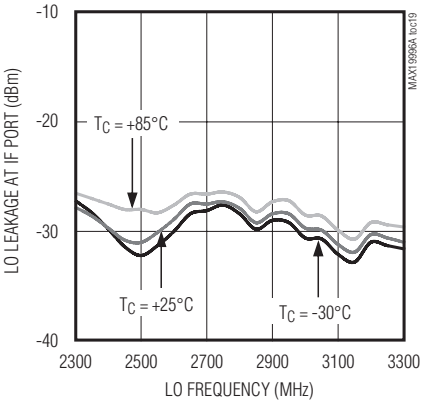


SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

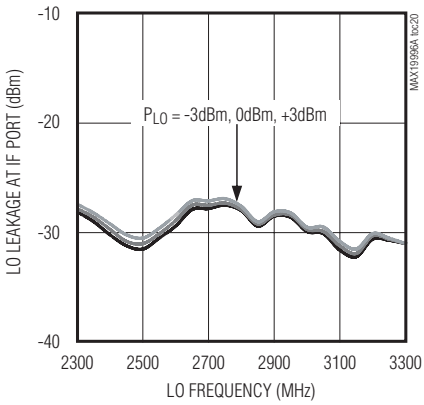
Typical Operating Characteristics (continued)

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 5.0V, f_{RF} = 2000MHz to 3000MHz, LO is high-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

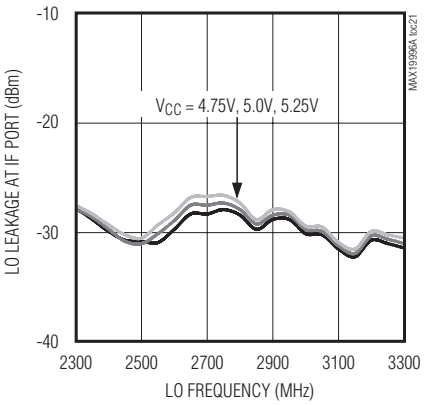
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



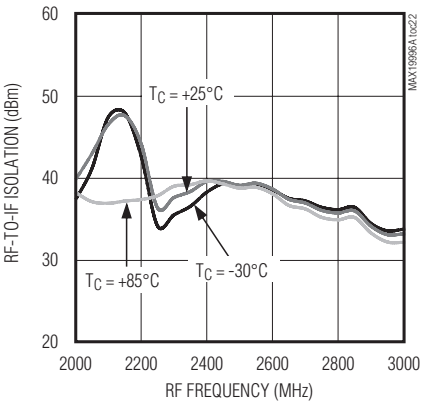
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



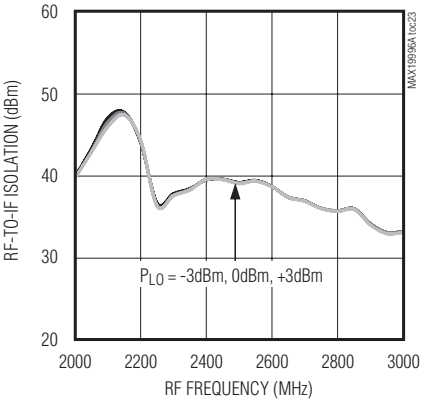
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



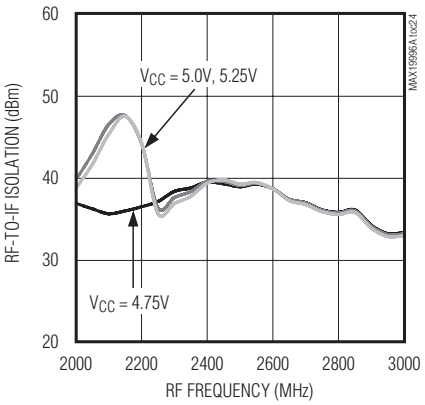
RF-TO-IF ISOLATION vs. RF FREQUENCY



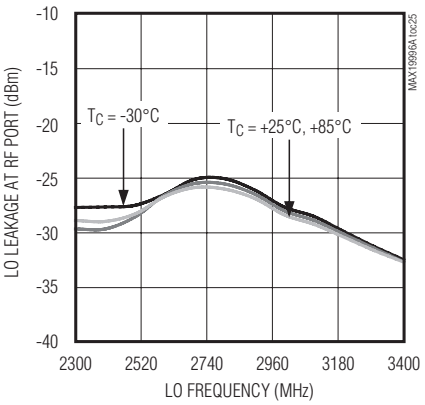
RF-TO-IF ISOLATION vs. RF FREQUENCY



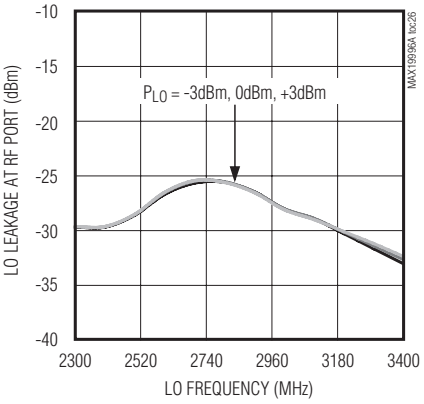
RF-TO-IF ISOLATION vs. RF FREQUENCY



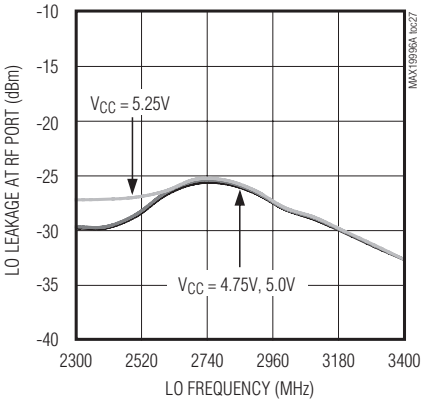
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



LO LEAKAGE AT RF PORT vs. LO FREQUENCY



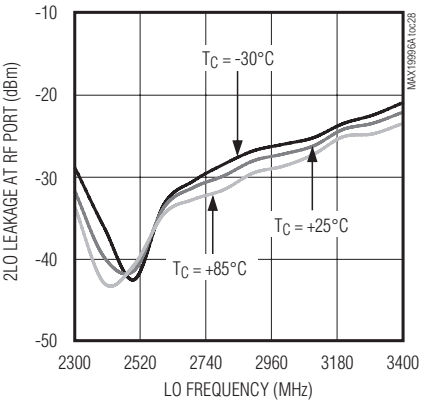
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



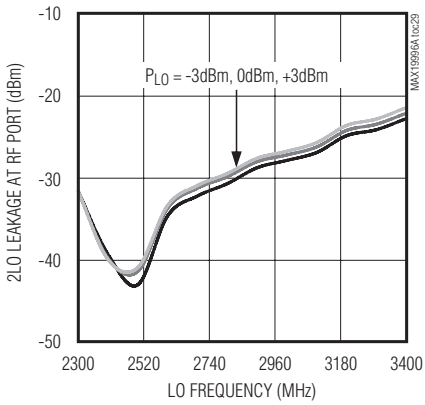
Typical Operating Characteristics (continued)

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 5.0V, f_{RF} = 2000MHz to 3000MHz, LO is high-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

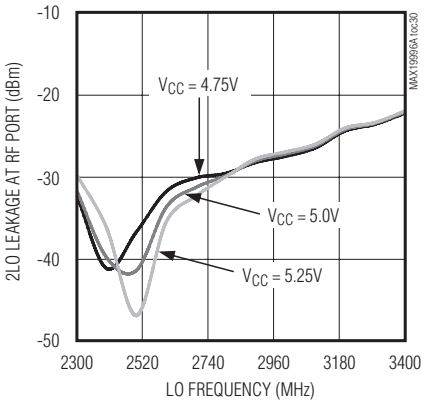
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



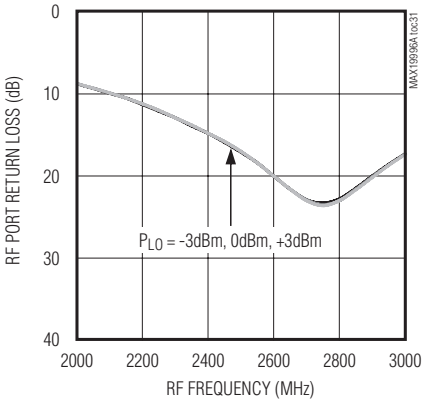
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



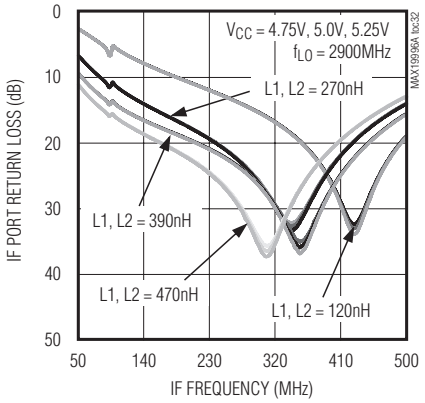
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



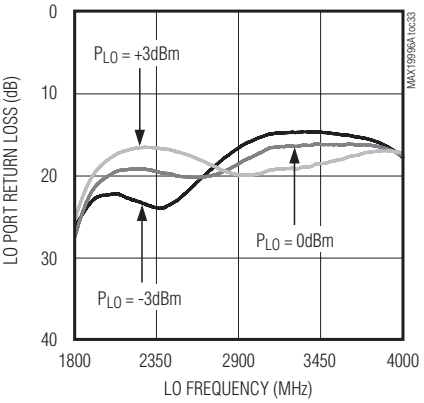
RF PORT RETURN LOSS vs. RF FREQUENCY



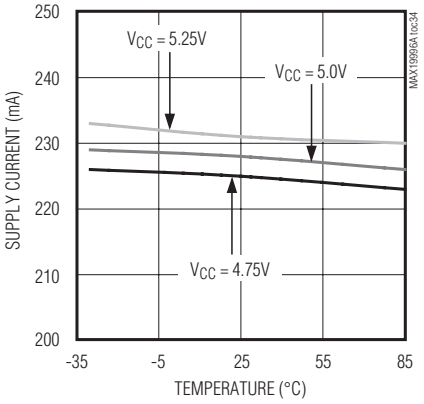
IF PORT RETURN LOSS vs. IF FREQUENCY



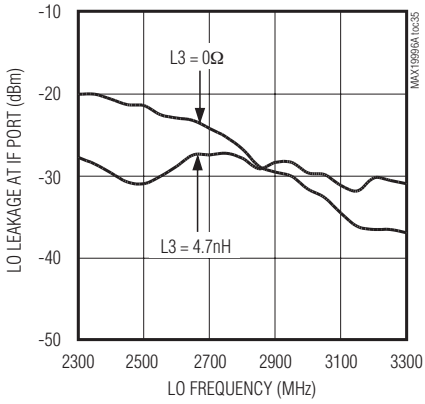
LO PORT RETURN LOSS vs. LO FREQUENCY



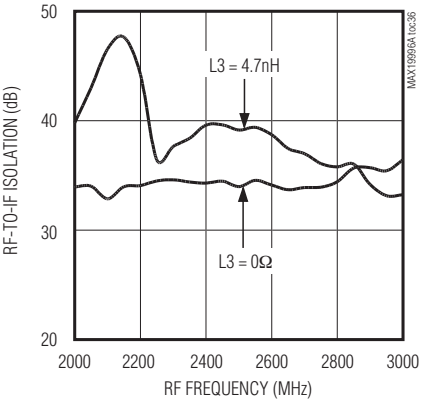
SUPPLY CURRENT vs. TEMPERATURE (T_C)



LO LEAKAGE AT IF PORT vs. LO FREQUENCY



RF-TO-IF ISOLATION vs. RF FREQUENCY

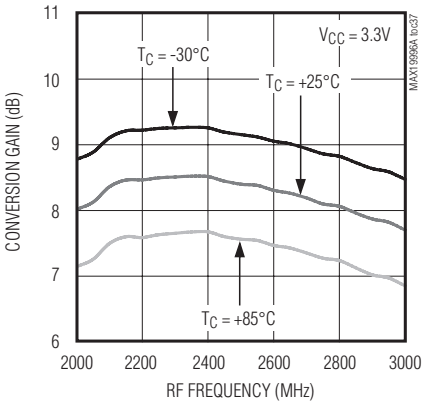


SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

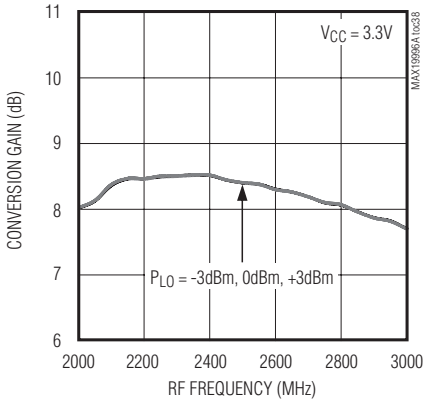
Typical Operating Characteristics

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 3.3V, f_{RF} = 2000MHz to 3000MHz, LO is high-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

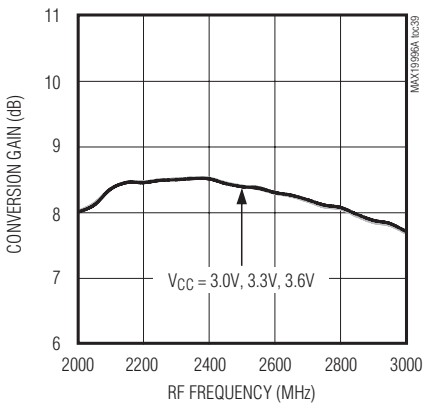
CONVERSION GAIN vs. RF FREQUENCY



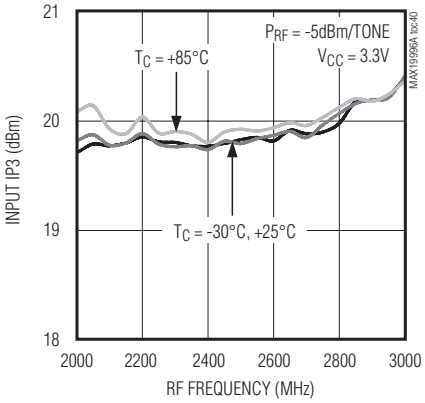
CONVERSION GAIN vs. RF FREQUENCY



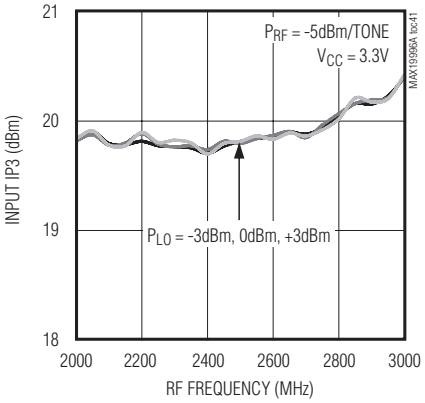
CONVERSION GAIN vs. RF FREQUENCY



INPUT IP3 vs. RF FREQUENCY



INPUT IP3 vs. RF FREQUENCY



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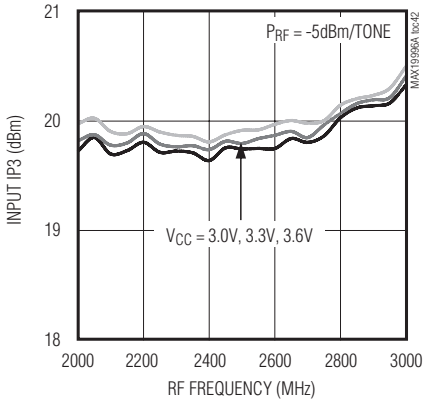
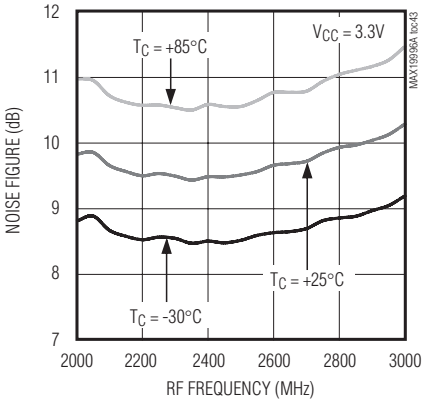
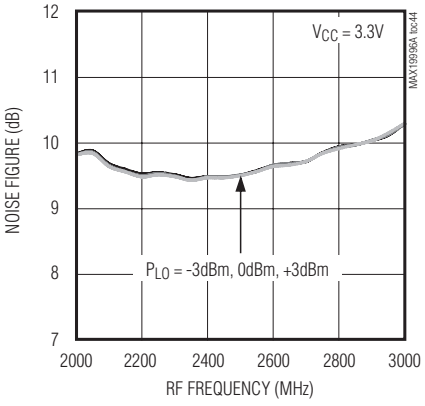


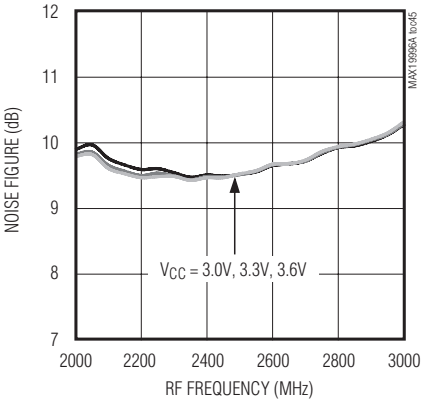
NOISE FIGURE vs. RF FREQUENCY



NOISE FIGURE vs. RF FREQUENCY



NOISE FIGURE vs. RF FREQUENCY

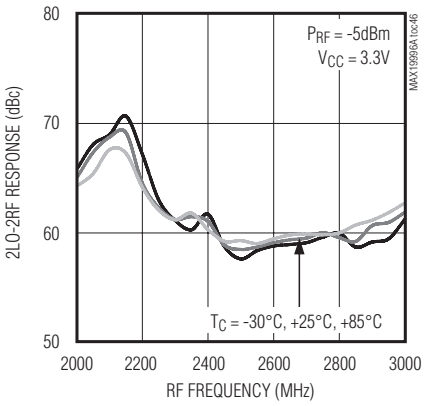


SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

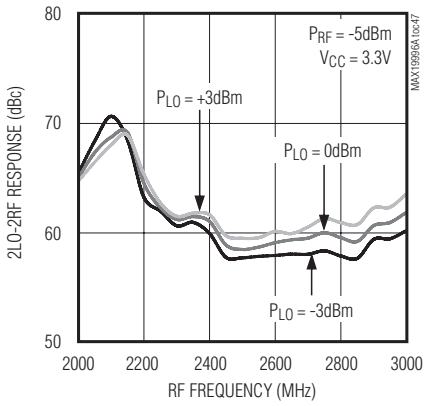
Typical Operating Characteristics (continued)

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 3.3V, f_{RF} = 2000MHz to 3000MHz, LO is high-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

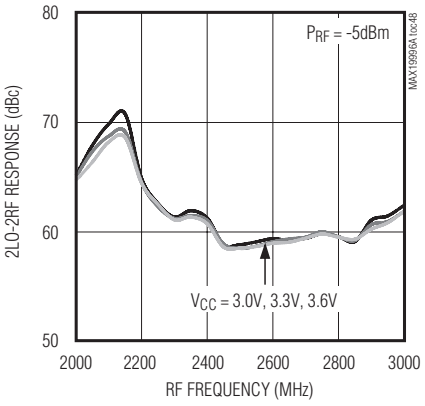
2LO-2RF RESPONSE vs. RF FREQUENCY



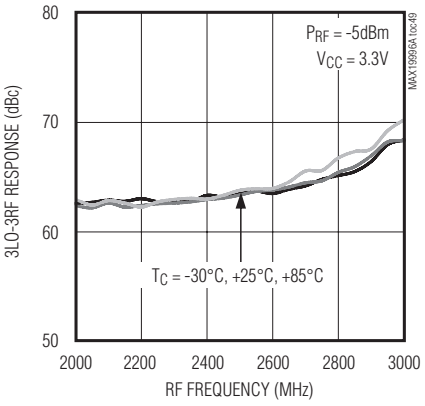
2LO-2RF RESPONSE vs. RF FREQUENCY



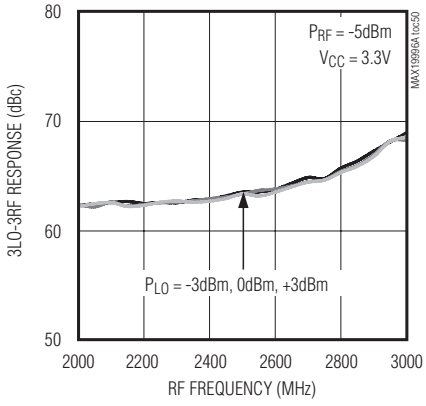
2LO-2RF RESPONSE vs. RF FREQUENCY



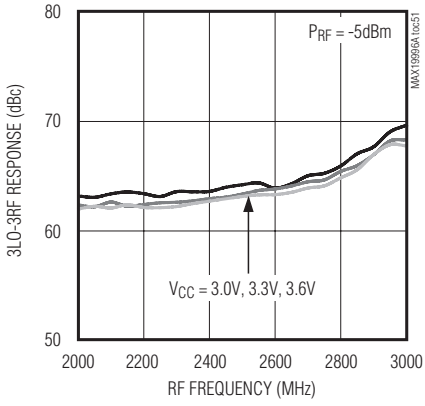
3LO-3RF RESPONSE vs. RF FREQUENCY



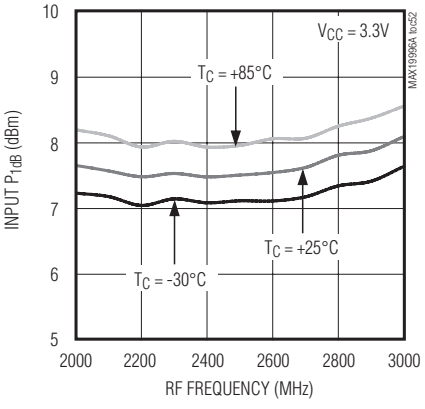
3LO-3RF RESPONSE vs. RF FREQUENCY



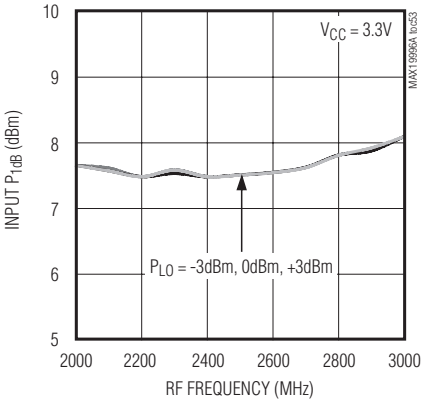
3LO-3RF RESPONSE vs. RF FREQUENCY



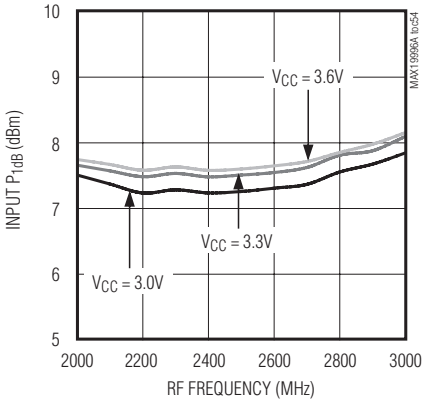
INPUT P_{1dB} vs. RF FREQUENCY



INPUT P_{1dB} vs. RF FREQUENCY



INPUT P_{1dB} vs. RF FREQUENCY

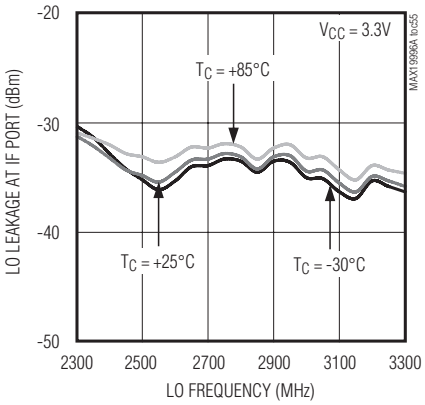


SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

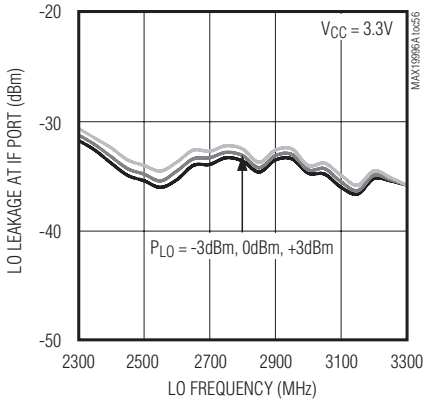
Typical Operating Characteristics (continued)

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 3.3V, f_{RF} = 2000MHz to 3000MHz, LO is high-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

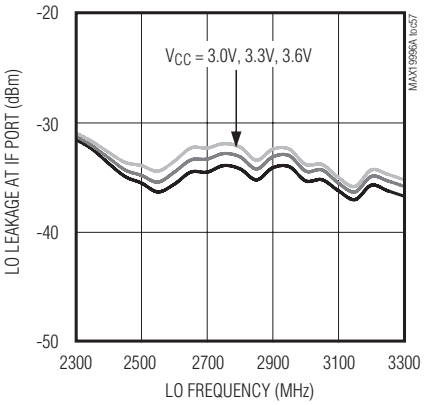
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



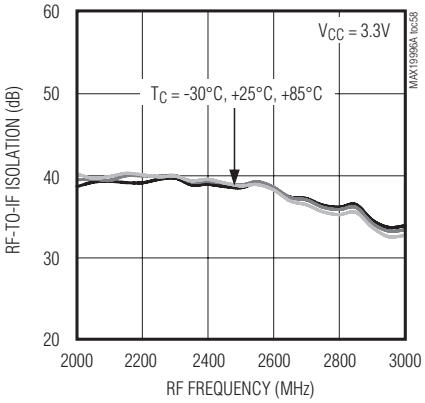
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



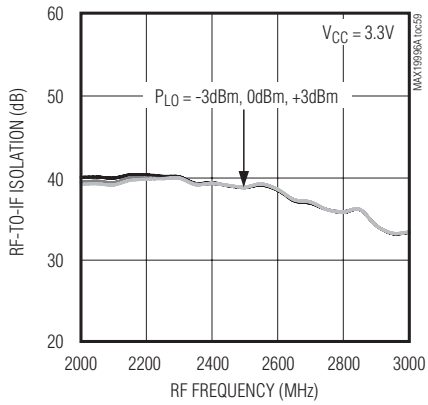
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



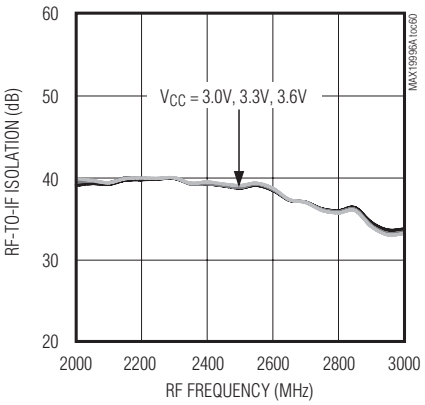
RF-TO-IF ISOLATION vs. RF FREQUENCY



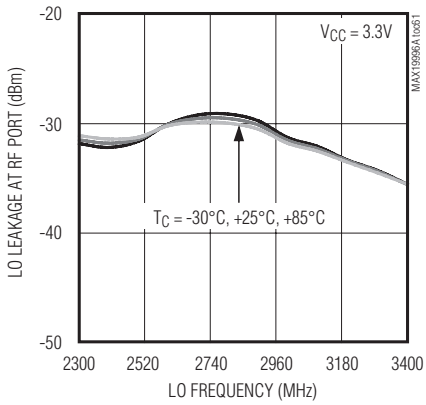
RF-TO-IF ISOLATION vs. RF FREQUENCY



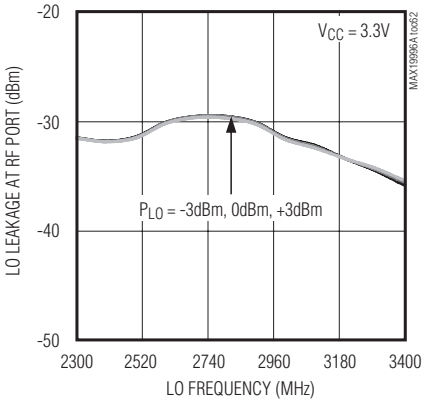
RF-TO-IF ISOLATION vs. RF FREQUENCY



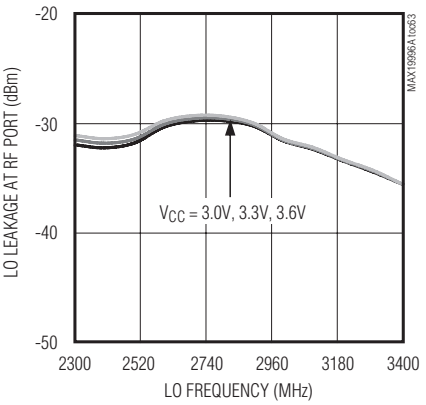
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



LO LEAKAGE AT RF PORT vs. LO FREQUENCY



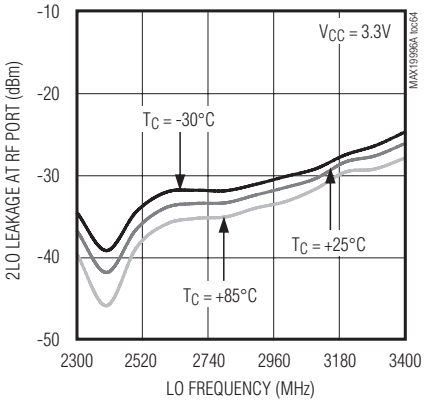
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



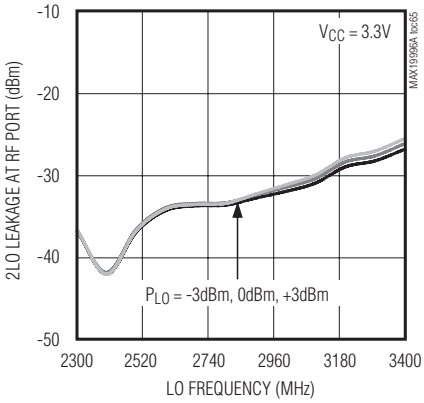
Typical Operating Characteristics (continued)

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 3.3V, f_{RF} = 2000MHz to 3000MHz, LO is high-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

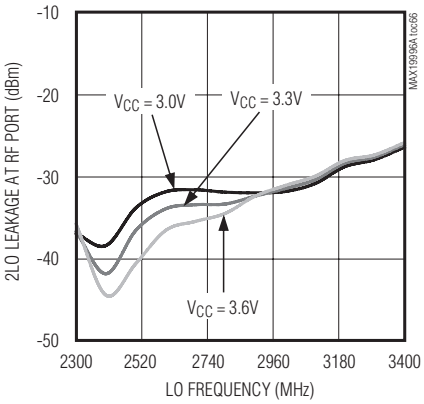
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



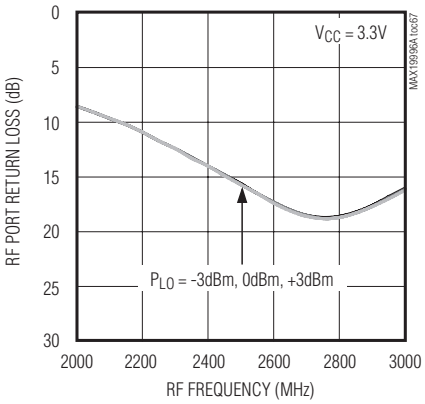
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



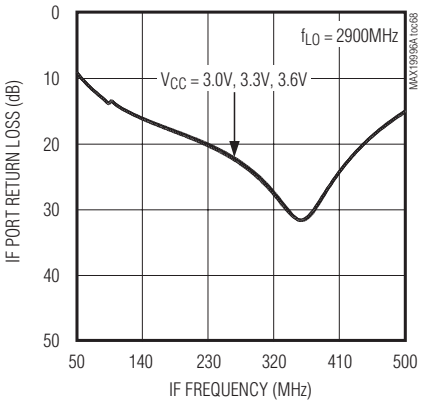
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



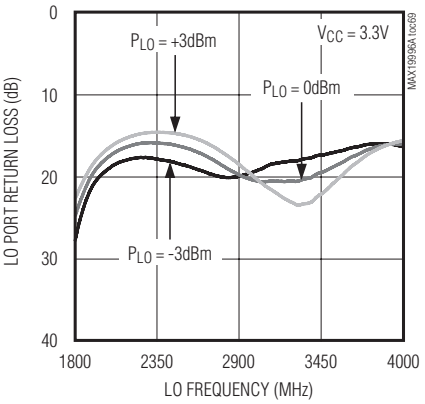
RF PORT RETURN LOSS vs. RF FREQUENCY



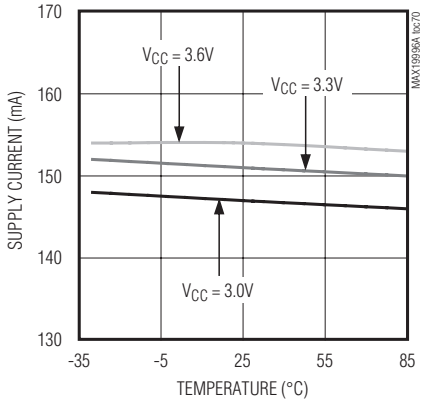
IF PORT RETURN LOSS vs. IF FREQUENCY



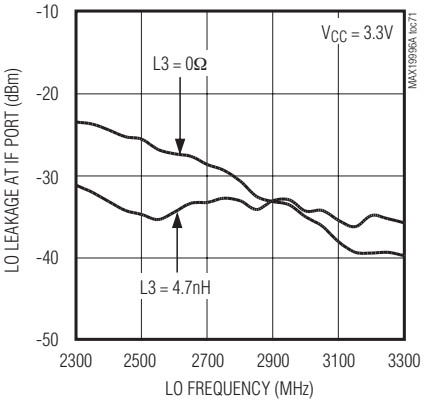
LO PORT RETURN LOSS vs. LO FREQUENCY



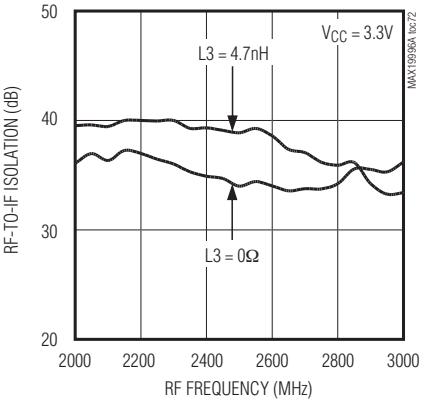
SUPPLY CURRENT vs. TEMPERATURE (T_C)



LO LEAKAGE AT IF PORT vs. LO FREQUENCY



RF-TO-IF ISOLATION vs. RF FREQUENCY

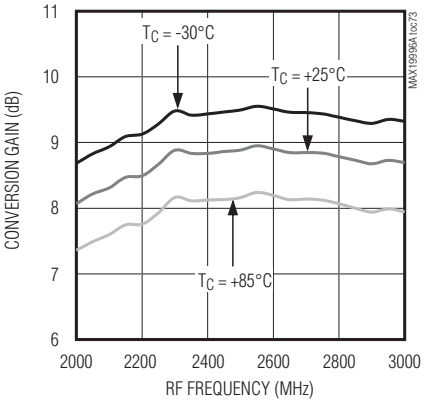


SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

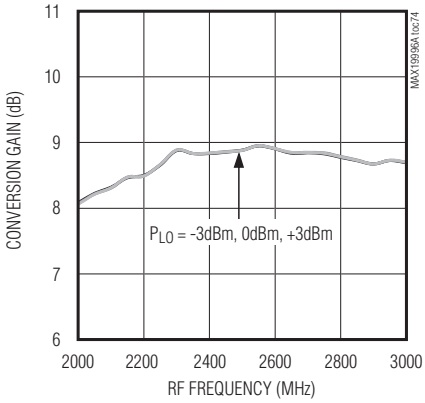
Typical Operating Characteristics

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 5.0V, f_{RF} = 2000MHz to 3000MHz, LO is low-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

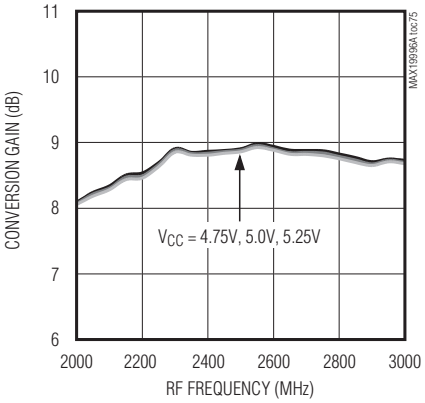
CONVERSION GAIN vs. RF FREQUENCY



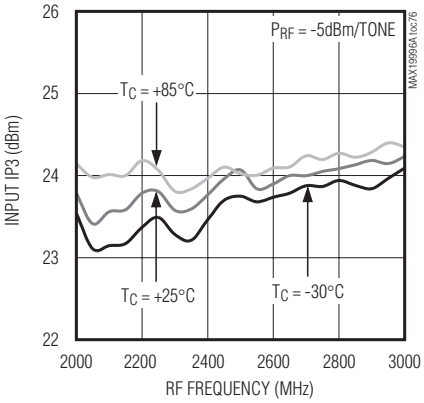
CONVERSION GAIN vs. RF FREQUENCY



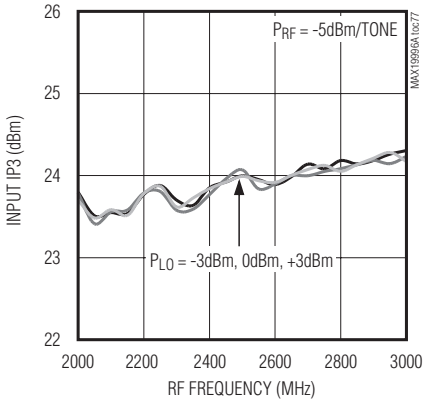
CONVERSION GAIN vs. RF FREQUENCY



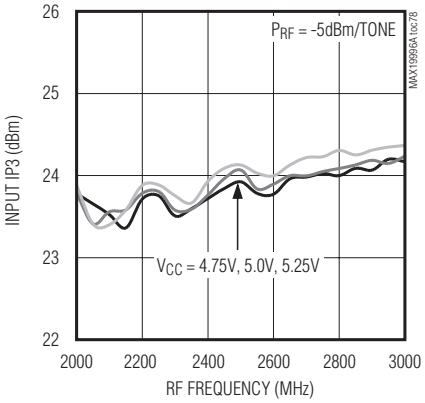
INPUT IP3 vs. RF FREQUENCY



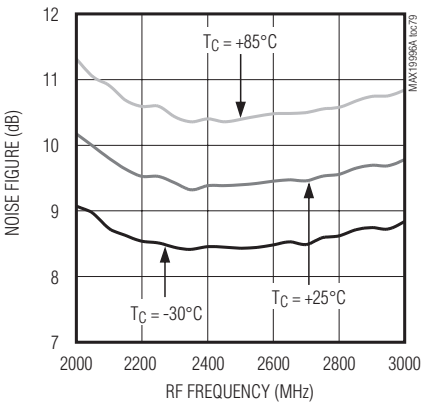
INPUT IP3 vs. RF FREQUENCY



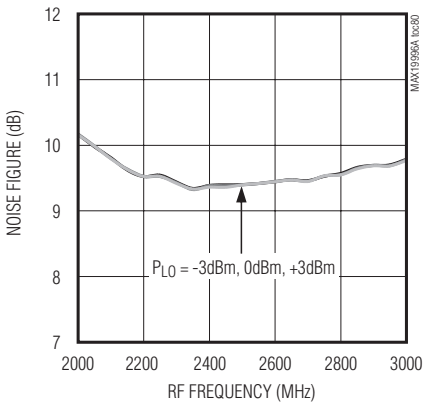
INPUT IP3 vs. RF FREQUENCY



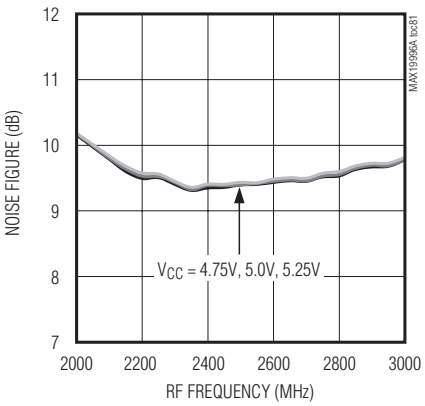
NOISE FIGURE vs. RF FREQUENCY



NOISE FIGURE vs. RF FREQUENCY



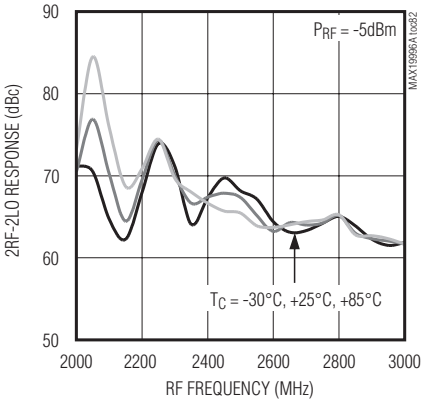
NOISE FIGURE vs. RF FREQUENCY



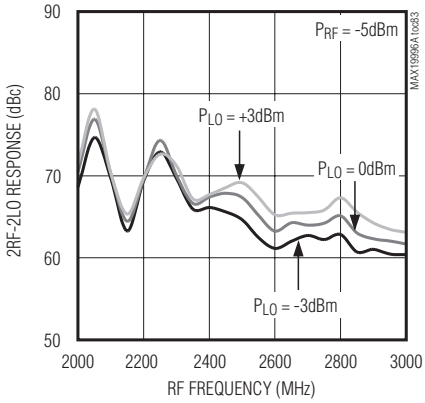
Typical Operating Characteristics (continued)

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 5.0V, f_{RF} = 2000MHz to 3000MHz, LO is low-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

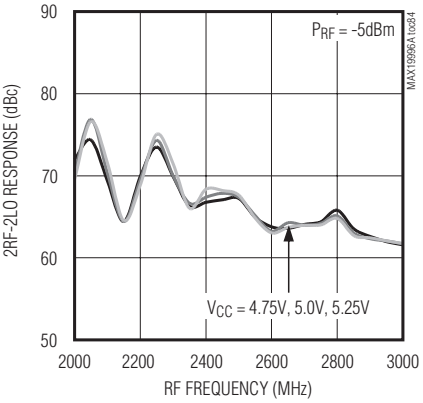
2RF-2LO RESPONSE vs. RF FREQUENCY



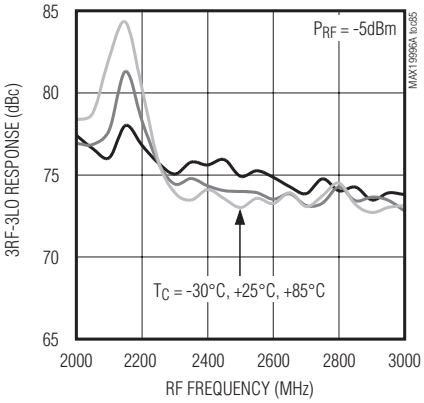
2RF-2LO RESPONSE vs. RF FREQUENCY



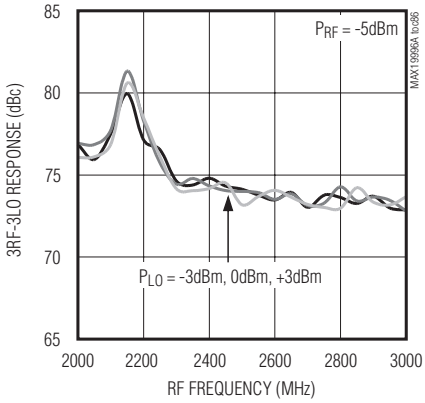
2RF-2LO RESPONSE vs. RF FREQUENCY



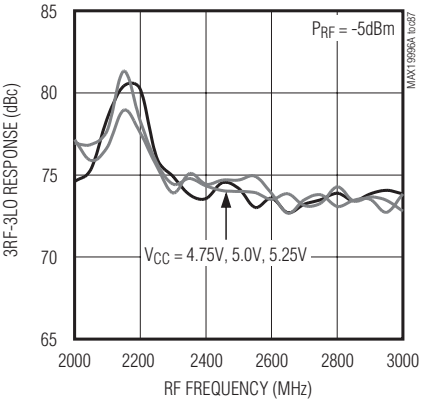
3RF-3LO RESPONSE vs. RF FREQUENCY



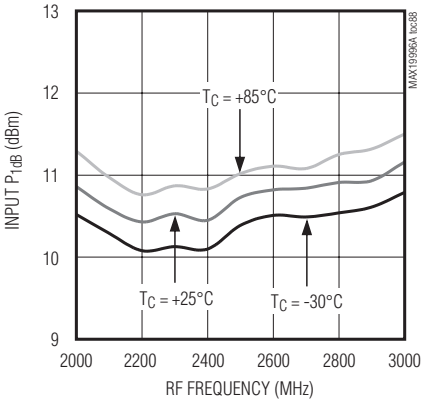
3RF-3LO RESPONSE vs. RF FREQUENCY



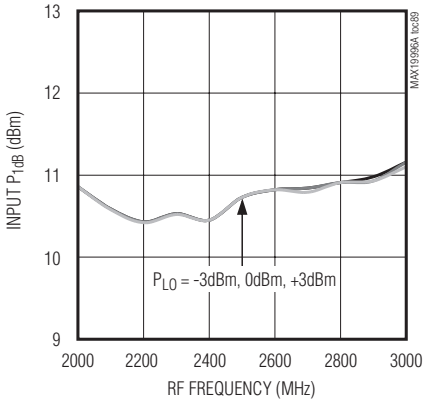
3RF-3LO RESPONSE vs. RF FREQUENCY



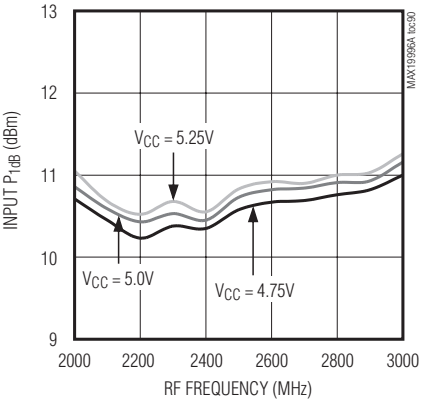
INPUT P_{1dB} vs. RF FREQUENCY



INPUT P_{1dB} vs. RF FREQUENCY



INPUT P_{1dB} vs. RF FREQUENCY



SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

Typical Operating Characteristics (continued)

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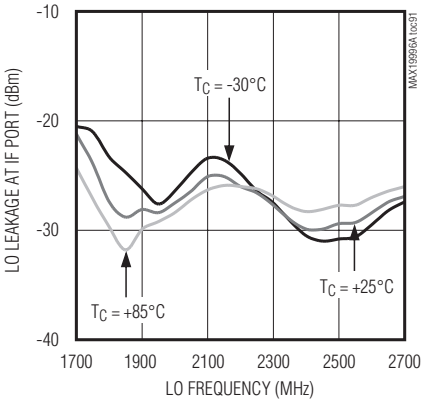
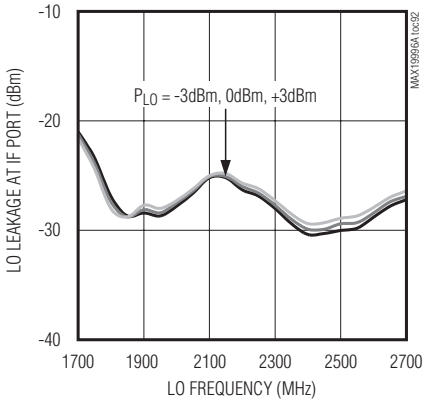
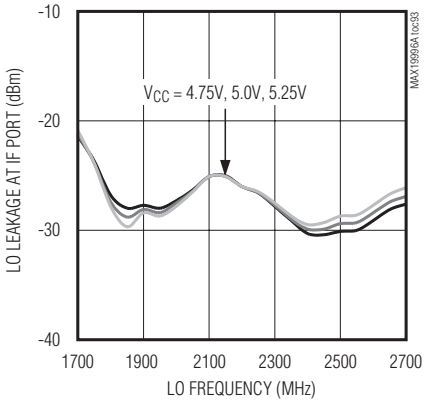


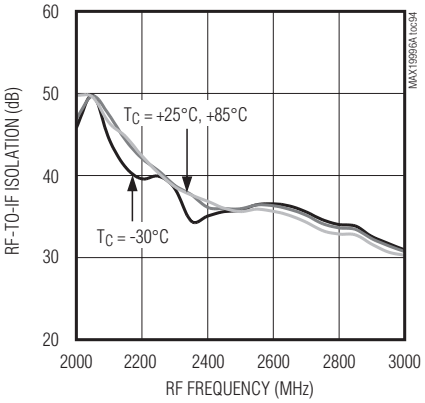
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



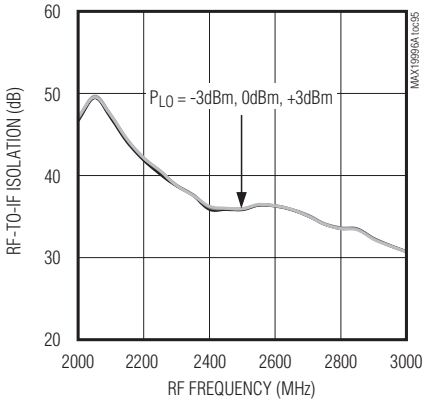
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



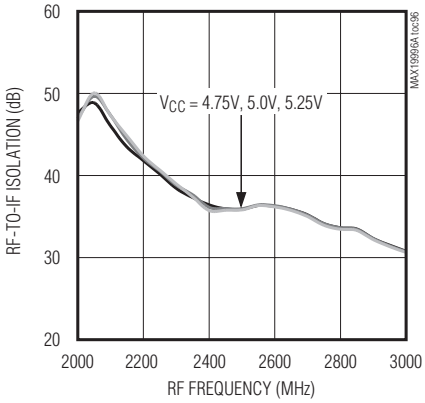
RF-TO-IF ISOLATION vs. RF FREQUENCY



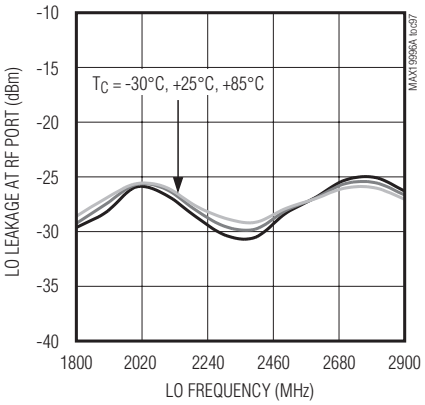
RF-TO-IF ISOLATION vs. RF FREQUENCY



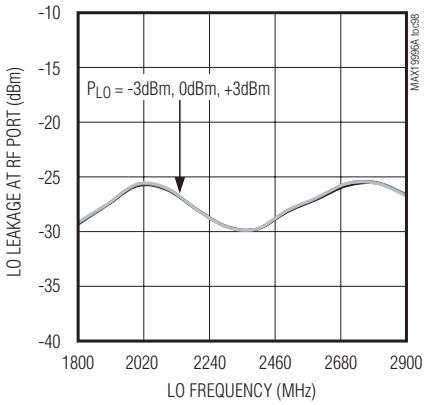
RF-TO-IF ISOLATION vs. RF FREQUENCY



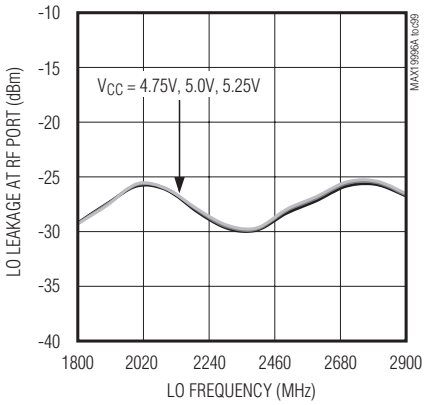
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



LO LEAKAGE AT RF PORT vs. LO FREQUENCY



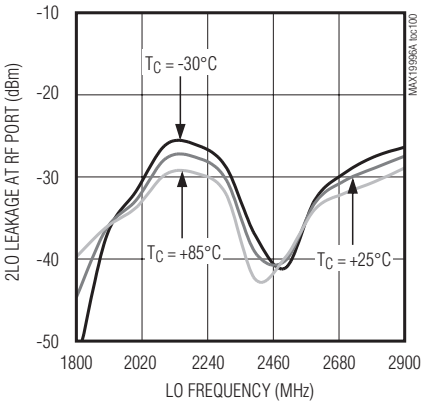
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



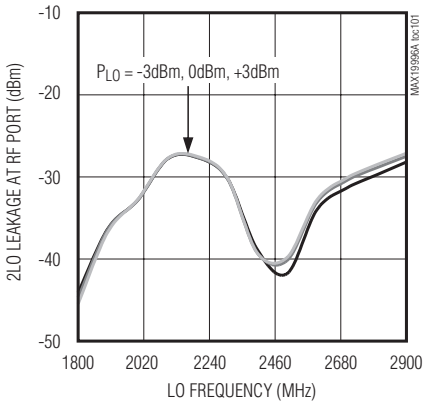
Typical Operating Characteristics (continued)

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 5.0V, f_{RF} = 2000MHz to 3000MHz, LO is low-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

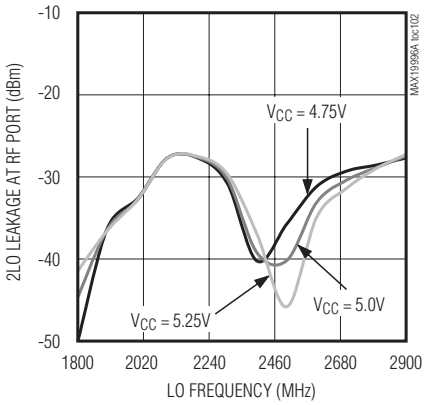
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



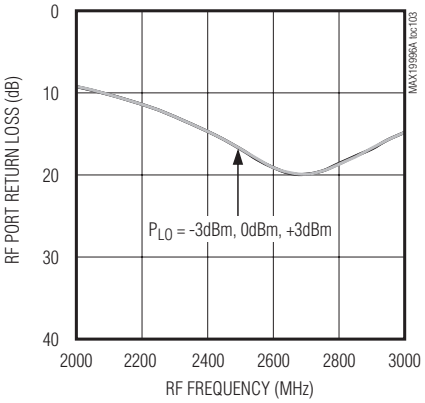
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



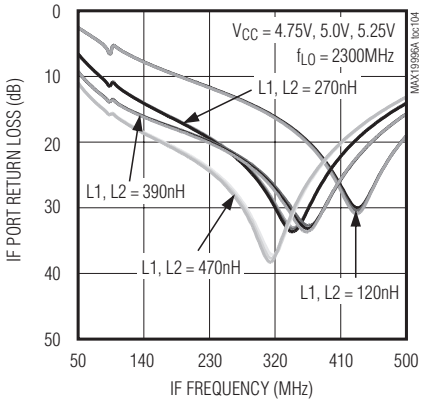
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



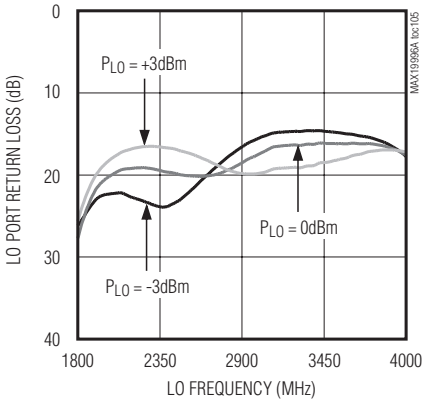
RF PORT RETURN LOSS vs. RF FREQUENCY



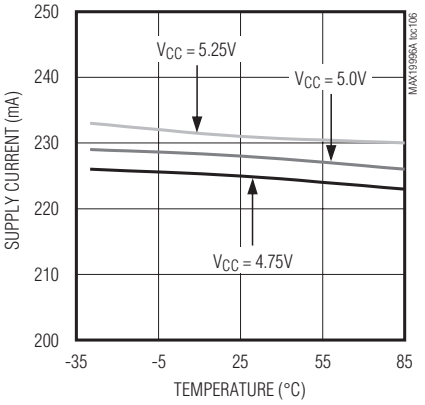
IF PORT RETURN LOSS vs. IF FREQUENCY



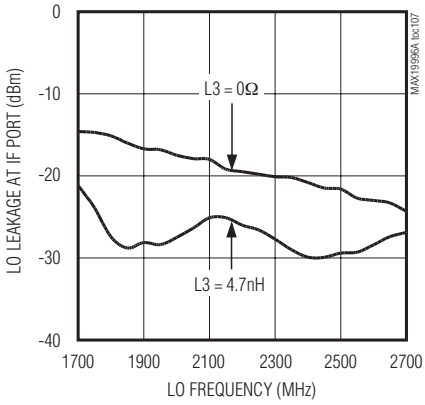
LO PORT RETURN LOSS vs. LO FREQUENCY



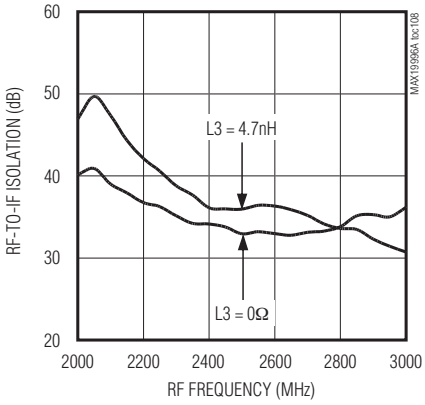
SUPPLY CURRENT vs. TEMPERATURE (T_C)



LO LEAKAGE AT IF PORT vs. LO FREQUENCY



RF-TO-IF ISOLATION vs. RF FREQUENCY

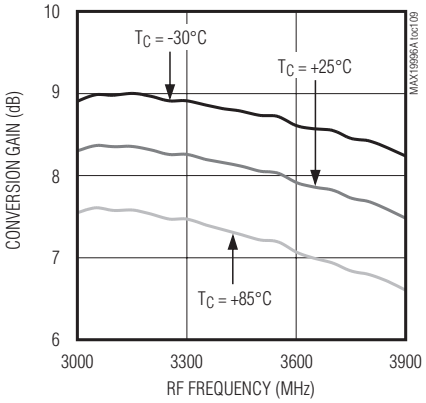


SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

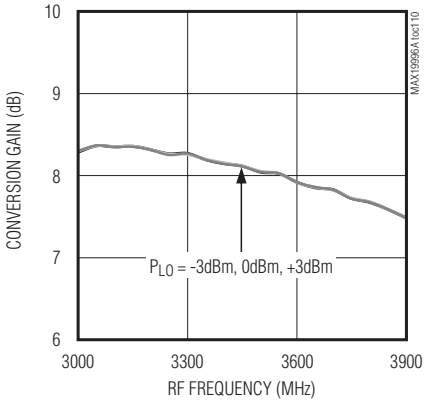
Typical Operating Characteristics

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 5.0V, f_{RF} = 3000MHz to 3900MHz, LO is low-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

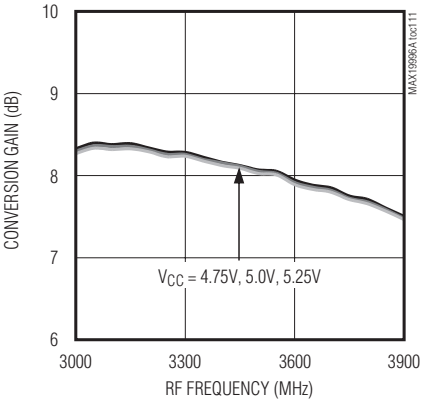
CONVERSION GAIN vs. RF FREQUENCY



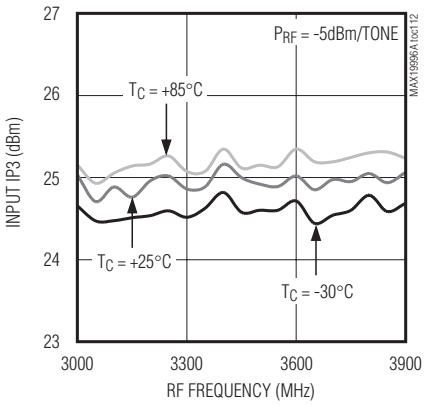
CONVERSION GAIN vs. RF FREQUENCY



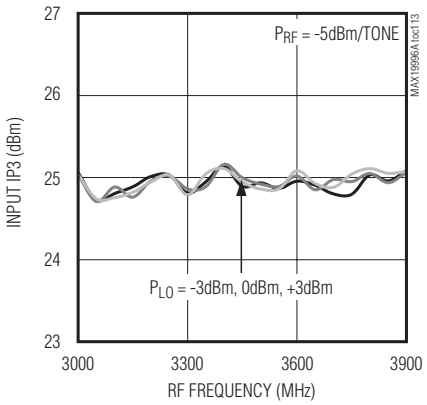
CONVERSION GAIN vs. RF FREQUENCY



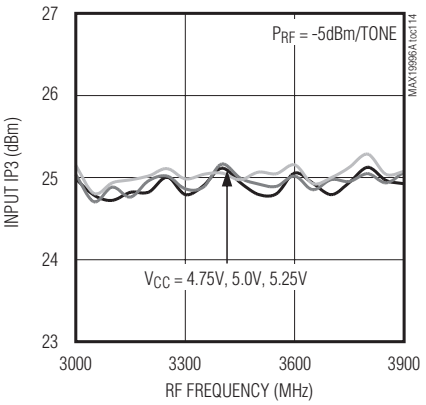
INPUT IP3 vs. RF FREQUENCY



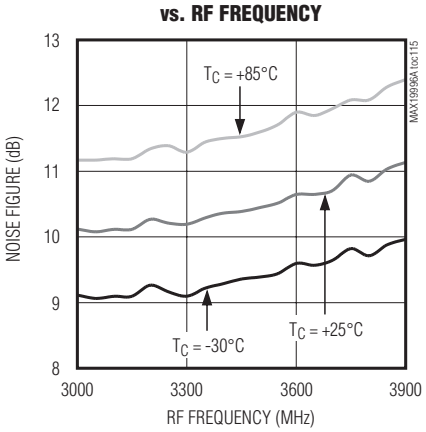
INPUT IP3 vs. RF FREQUENCY



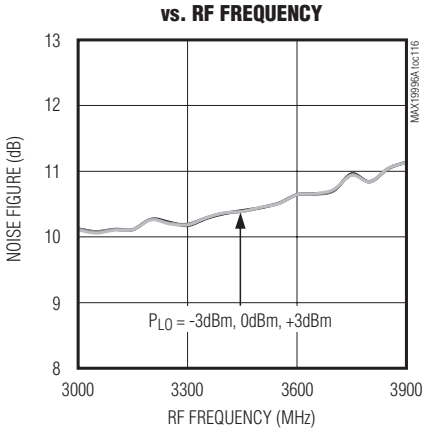
INPUT IP3 vs. RF FREQUENCY



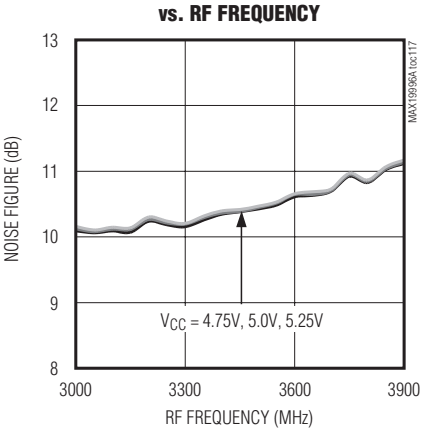
NOISE FIGURE vs. RF FREQUENCY



NOISE FIGURE vs. RF FREQUENCY



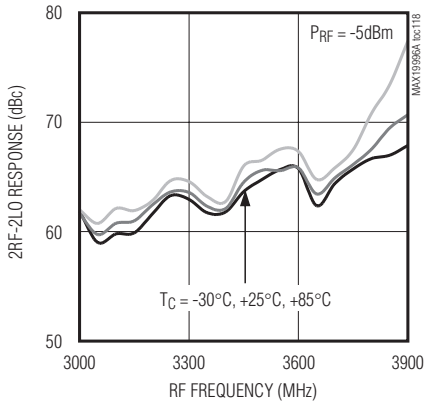
NOISE FIGURE vs. RF FREQUENCY



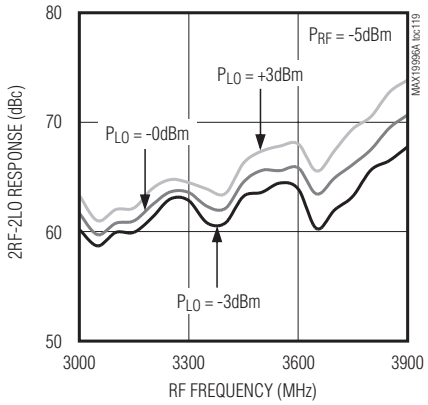
Typical Operating Characteristics (continued)

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 5.0V, f_{RF} = 3000MHz to 3900MHz, LO is low-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

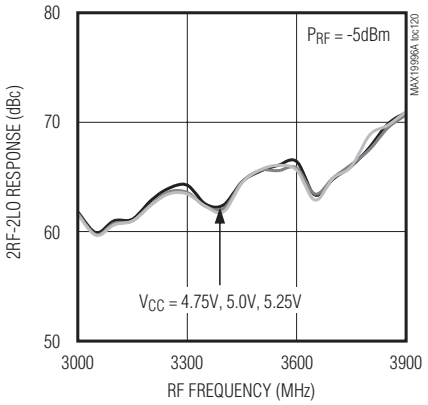
2RF-2LO RESPONSE vs. RF FREQUENCY



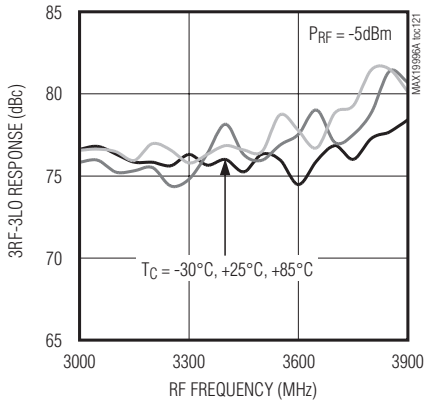
2RF-2LO RESPONSE vs. RF FREQUENCY



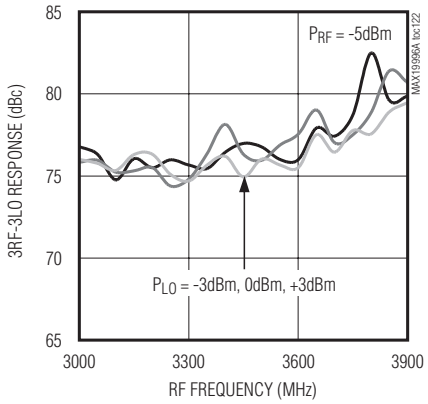
2RF-2LO RESPONSE vs. RF FREQUENCY



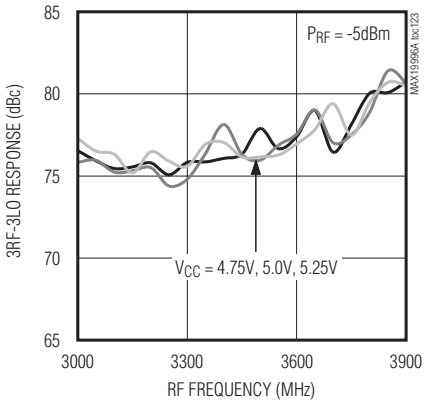
3RF-3LO RESPONSE vs. RF FREQUENCY



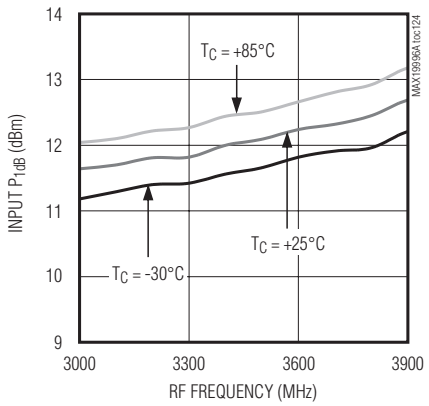
3RF-3LO RESPONSE vs. RF FREQUENCY



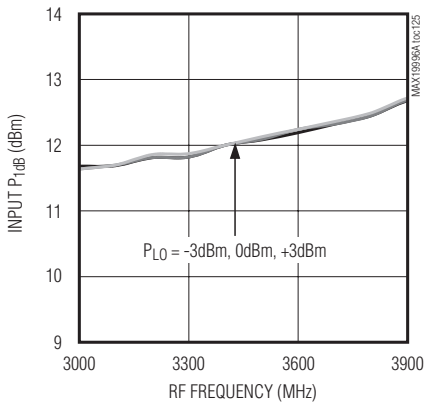
3RF-3LO RESPONSE vs. RF FREQUENCY



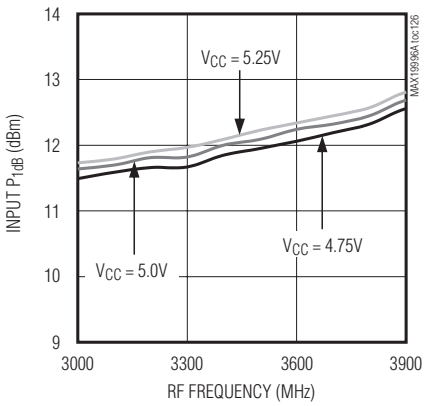
INPUT P_{1dB} vs. RF FREQUENCY



INPUT P_{1dB} vs. RF FREQUENCY



INPUT P_{1dB} vs. RF FREQUENCY

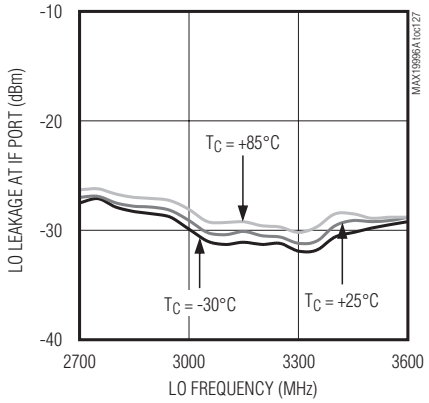


SiGe, High-Linearity, 2000MHz to 3900MHz Downconversion Mixer with LO Buffer

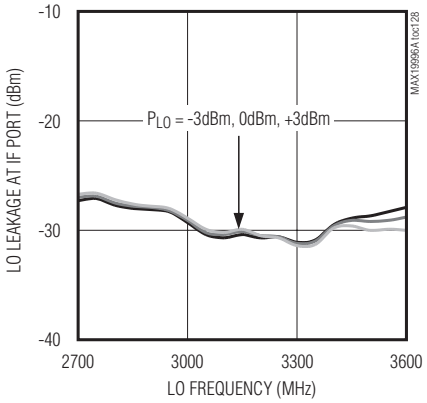
Typical Operating Characteristics (continued)

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 5.0V, f_{RF} = 3000MHz to 3900MHz, LO is low-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

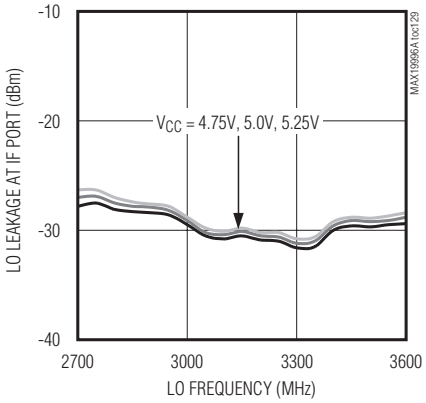
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



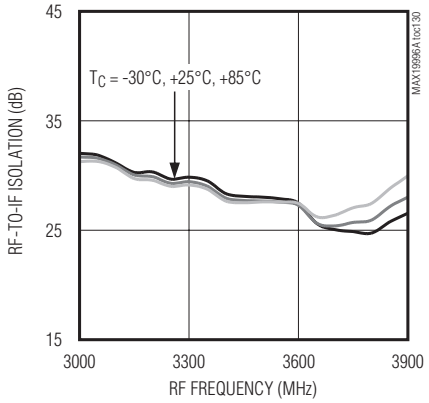
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



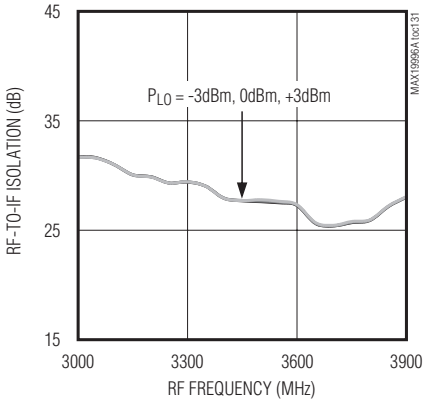
LO LEAKAGE AT IF PORT vs. LO FREQUENCY



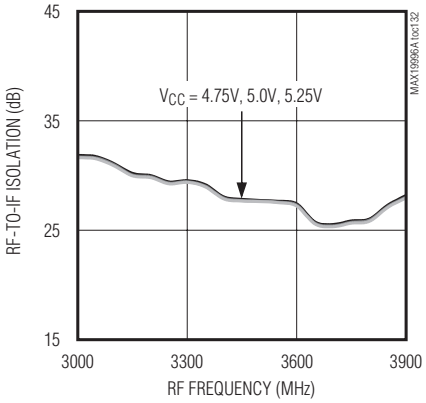
RF-TO-IF ISOLATION vs. RF FREQUENCY



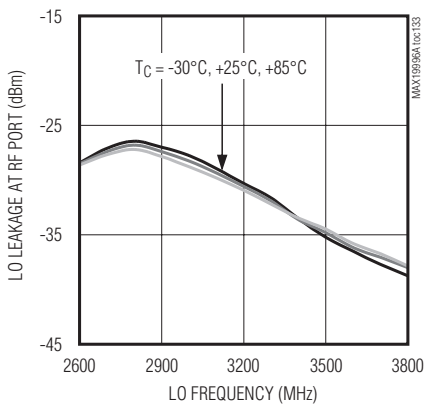
RF-TO-IF ISOLATION vs. RF FREQUENCY



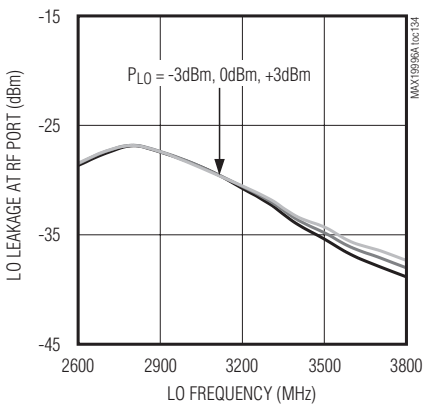
RF-TO-IF ISOLATION vs. RF FREQUENCY



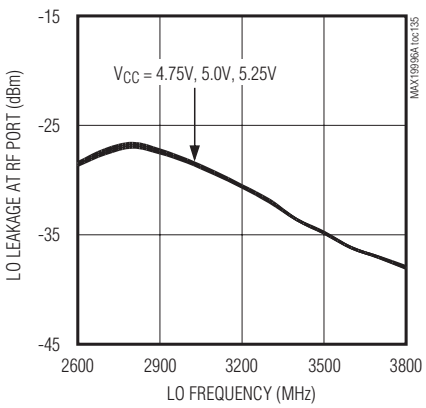
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



LO LEAKAGE AT RF PORT vs. LO FREQUENCY



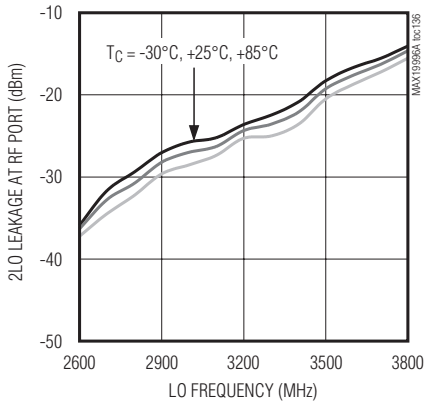
LO LEAKAGE AT RF PORT vs. LO FREQUENCY



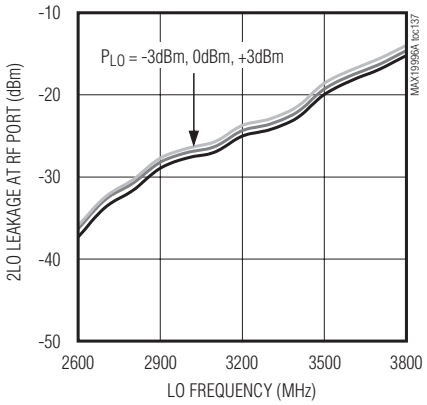
Typical Operating Characteristics (continued)

(*Typical Application Circuit* with tuning elements outlined in **Table 1, V_{CC} = 5.0V, f_{RF} = 3000MHz to 3900MHz, LO is low-side injected** for a 300MHz IF, P_{RF} = -5dBm, P_{LO} = 0dBm, T_C = +25°C, unless otherwise noted.)

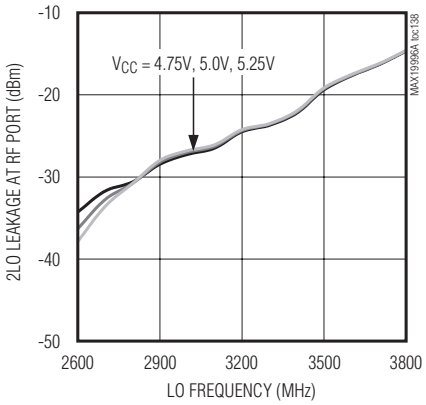
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



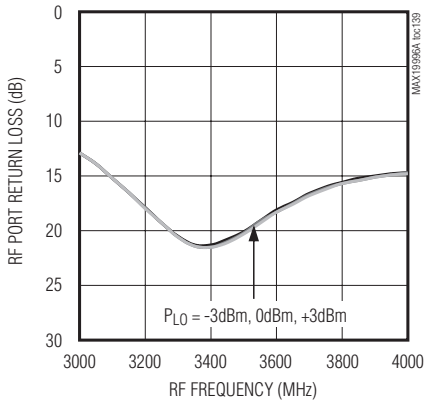
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



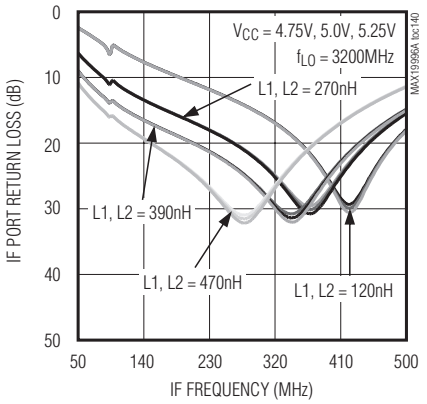
2LO LEAKAGE AT RF PORT vs. LO FREQUENCY



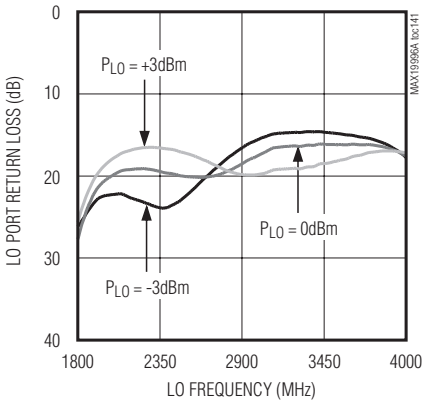
RF PORT RETURN LOSS vs. RF FREQUENCY



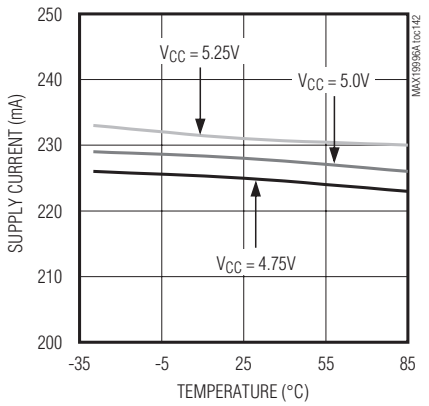
IF PORT RETURN LOSS vs. IF FREQUENCY



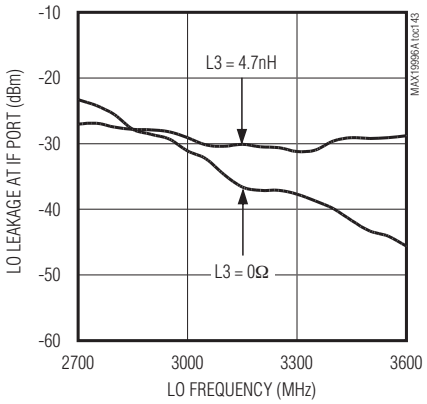
LO PORT RETURN LOSS vs. LO FREQUENCY



SUPPLY CURRENT vs. TEMPERATURE (T_C)



LO LEAKAGE AT IF PORT vs. LO FREQUENCY



RF-TO-IF ISOLATION vs. RF FREQUENCY