19-1234 Rev 0; 3/98

EVALUATION KIT MANUAL FOLLOWS DATA SHEET

MAXIM

900MHz BPSK Image-Reject Receiver with Transmit Mixer

General Description

The MAX2424/MAX2426 are highly integrated front-end ICs that provide the lowest cost solution for cordless and ISM band radios operating in the 900MHz band. Both devices incorporate a receive image-reject mixer (to reduce filter cost) as well as a versatile transmit mixer. The devices operate from a +2.7V to +4.8V single power supply, allowing direct connection to a 3-cell battery stack.

The receive path incorporates an adjustable-gain LNA and an image-reject downconverter with 35dB image suppression. These features yield excellent combined downconverter noise figure (4dB) and high linearity with an input third-order intercept point (IIP3) of up to +2dBm.

The transmitter consists of a double-balanced mixer and a power amplifier (PA) predriver that produces up to 0dBm (in some applications serving as the final power stage). It can be used in a variety of configurations, including BPSK modulation, direct VCO modulation, and transmitter upconversion. For devices featuring transmit as well as receive image rejection, refer to the MAX2420/MAX2421/MAX2422/MAX2460/MAX2463 data sheet.

The MAX2424/MAX2426 has an on-chip local oscillator (LO), requiring only an external varactor-tuned LC tank for operation. The integrated divide-by-64/65 dual-modulus prescaler can also be set to a direct mode, in which it acts as an LO buffer amplifier. Four separate power-down inputs can be used for system power management, including a 0.5µA shutdown mode.

The MAX2424/MAX2426 come in a 28-pin SSOP package.

Applications

Cordless Phones

Wireless Telemetry

Wireless Networks

Spread-Spectrum Communications

Two-Way Paging

Functional Diagram appears at end of data sheet.

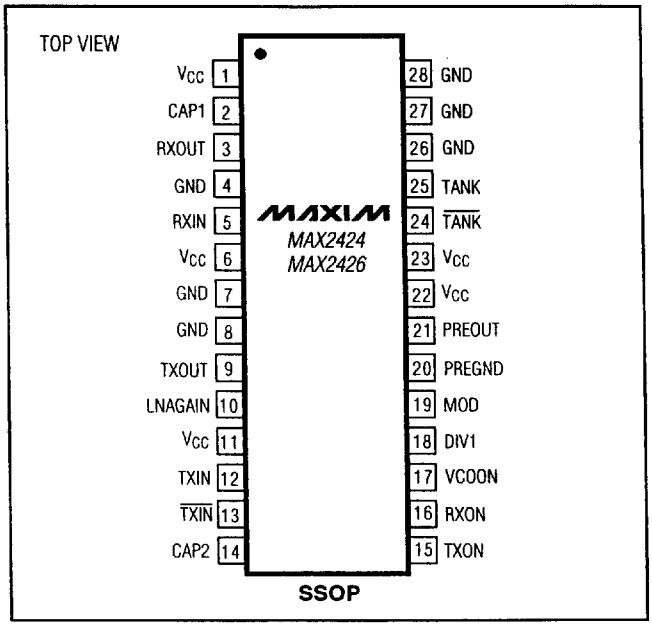
Features

- **Receive Mixer with 35dB Image Rejection**
- **Adjustable-Gain LNA**
- **Up to +2dBm Combined Receiver Input IP3**
- **4dB Combined Receiver Noise Figure**
- **Optimized for Common Receiver IF Frequencies:**
  10>MHz (MAX2424)
  70MHz (MAX2426)
- **PA Predriver Provides up to 0dBm**
- **Low Current Consumption: 23mA Receive**
  20mA Transmit
  9.5mA Oscillator
- **0.5µA Shutdown Mode**
- **Operates from Single +2.7V to +4.8V Supply**

Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE
MAX2424EAI	-40°C to +85°C	28 SSOP
MAX2426EAI	-40°C to +85°C	28 SSOP

Pin Configuration



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ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND .....-0.3V, +5.5V
TXIN, $\overline{TXIN}$ Differential Voltage 2V
Voltage on TXOUT.....-0.3V to (V_{CC} + 1.0V)
Voltage on LNAGAIN, TXON, RXON, DIV1, MOD .....-0.3V to (V_{CC} + 0.3V)
RXIN Input Power .....+10dBm
TANK, $\overline{TANK}$ Input Power.....+2dBm

Continuous Power Dissipation (T_A = +70°C)
SSOP (derate 9.50mW/°C above +70°C) 762mW
Operating Temperature Range .....-40°C to +85°C
Junction Temperature.....+150°C
Storage Temperature Range .....-65°C to +165°C
Lead Temperature (soldering, 10sec) .....+300°C

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC ELECTRICAL CHARACTERISTICS

(V_{CC} = +2.7V to +4.8V, no RF signals applied, LNAGAIN = Unconnected, $V_{\overline{TXIN}}$ = $V_{\overline{TXIN}}$ = 2.3V, V_{VCOON} = 2.4V, RXON = TXON = MOD = DIV1 = 0.45V, PREGND = GND, T_A = -40°C to +85°C. Typicals are at +25°C, V_{CC} = 3.3V, unless otherwise noted.)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Supply-Voltage Range			2.7		4.8	V
Oscillator Supply Current	PREGND = floating			9.5	14	mA
Prescaler Supply Current (÷ 64/65 mode) (Note 1)				4.2	6	mA
Prescaler Supply Current (buffer mode) (Note 2)	DIV1 = 2.4V			5.4	8.5	mA
Receive Supply Current (Note 3)	V_{RXON} = 2.4V, PREGND = floating			23	36	mA
Transmitter Supply Current (Note 4)	V_{RXON} = 0.45V, TXON = 2.4V, PREGND = floating			20	32	mA
Shutdown Supply Current	VCOON = RXON = TXON = MOD = DIV1 = GND	T_A = +25°C		0.5		µA
		T_A = -40°C to +85°C			10	
Digital Input Voltage High	RXON, TXON, DIV1, VCOON, MOD		2.4			V
Digital Input Voltage Low	RXON, TXON, DIV1, VCOON, MOD				0.45	V
Digital Input Current	Voltage on any one digital input = V_{CC} or GND			±1	±10	µA

Note 1: Calculated by measuring the combined oscillator and prescaler supply current and subtracting the oscillator supply current.
Note 2: Calculated by measuring the combined oscillator and LO buffer supply current and subtracting the oscillator supply current.
Note 3: Calculated by measuring the combined receive and oscillator supply current and subtracting the oscillator supply current. With LNAGAIN = GND, the supply current drops by 4.5mA.
Note 4: Calculated by measuring the combined transmit and oscillator supply current and subtracting the oscillator supply current.

AC ELECTRICAL CHARACTERISTICS

(MAX2424/MAX2426 EV kit, V_{CC} = +3.3V, f_{RXIN} = 915MHz, P_{RXIN} = -35dBm, V_{TXIN} = $V_{\overline{TXIN}}$ = 2.3V (DC bias), DC Bias Voltage = 2.6V, V_{TXIN} = 250mVp-p, f_{TXIN} = 1MHz, LNAGAIN = 2V, V_{VCOON} = 2.4V, RXON = TXON = MOD = DIV1 = PREGND = GND, T_A = +25°C, unless otherwise noted.)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
RECEIVER (RXON = 2.4V, f_{LO} = 925.7MHz (MAX2424), f_{LO} = 985MHz (MAX2426))						
Input Frequency Range (Notes 5, 6)			800		1000	MHz
IF Frequency Range (Notes 5, 6)	MAX2424		8.5	10.7	12.5	MHz
	MAX2426		55	70	85	
Image Frequency Rejection			26	35		dB
Conversion Power Gain (Note 7)	LNAGAIN = V_{CC}, T_A = +25°C	MAX2424	20	22	24.5	dB
		MAX2426	19	21	25	
	LNAGAIN = V_{CC}, T_A = -40°C to +85°C (Note 5)	MAX2424	19.5		25	
		MAX2426	18		24	
	LNAGAIN = 1V			12		
	LNAGAIN = GND			-16		
Noise Figure (Notes 5, 7)	LNAGAIN = V_{CC}			4	5	dB
	LNAGAIN = 1V			12		
Input Third-Order Intercept (IIP3) (Notes 5, 8)	LNAGAIN = V_{CC}		-19	-17		dB
	LNAGAIN = 1V			-8		
Input 1dB Compression	LNAGAIN = V_{CC}			-26		dBm
	LNAGAIN = 1V			-16		
LO to RXIN Leakage	Receiver on or off			-60		dBm
Receiver Turn-On Time	(Note 9)			500		ns
TRANSMITTER (TXON = 2.4V, f_{LO} = 915MHz)						
Output Frequency Range (Notes 5, 10)			800		1000	MHz
Baseband 3dB Bandwidth				125		MHz
Output Power	T_A = +25°C		-9	-7	-5	dBm
	T_A = T_{MIN} to T_{MAX} (Note 5)		-9.5		-45	
Output 1dB Compression				0.5		dBm
Output Third-Order Intercept (OIP3) (Note 11)				3.5		dBm
Carrier Suppression				34		dBc
Output Noise Density				140		dBm/Hz
Transimtter Turn-On Time	(Note 12)			220		ns

900MHz BPSK Image-Reject Receiver with Transmit Mixer

AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2424/MAX2426 EV kit, V_{CC} = +3.3V, f_{RXIN} = 915MHz, P_{RXIN} = -35dBm, V_{TXIN} = $V_{\overline{TXIN}}$ = 2.3V (DC bias), DC Bias Voltage = 2.6V, V_{TXIN} = 250mVp-p, f_{TXIN} = 1MHz, LNAGAIN = 2V, V_{VCOON} = 2.4V, RXON = TXON = MOD = DIV1 = PREGND = GND, T_A = +25°C, unless otherwise noted.)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
OSCILLATOR AND PRESCALER						
Oscillator Frequency Range (Note 5)			800		1100	MHz
Oscillator Phase Noise	10kHz offset (Note 13)	MAX2424		82		dBc/Hz
		MAX2426		72		
Oscillator Pulling	Standby to TX or Standby to RX	Standby to TX		30		kHz
		Standby to RX		70		
	RX to TX with P_{RXIN} = -45dBm (RX mode) to P_{RXIN} = 0dBm (TX mode) (Note 15)			250		
Prescaler Output Level	Z_L = 100kΩ ∥ 10pF			500		mVp-p
Oscillator Buffer Output Level	DIV1 = 2.4V, Z_L = 50Ω, T_A = +25°C		-9	-7		dBm
	DIV1 = 2.4V, Z_L = 50Ω, T_A = -40°C to +85°C		-9.5			
Required Modulus Setup Time (Note 5)	÷ 64/65 mode (Note 15)		10			ns
Required Modulus Hold Time (Note 5)	÷ 64/65 mode (Note 15)		0			ns

Note 5: Guaranteed by design and characterization.
Note 6: Image rejection typically falls to 30dBc at the frequency extremes.
Note 7: Refer to the *Typical Operating Characteristics* for a plot showing Receiver Gain vs. LNAGAIN Voltage, Input IP3 vs. LNAGAIN Voltage, and Noise Figure vs. LNAGAIN Voltage.
Note 8: Two tones at P_{RXIN} = -45dBm each, f1 = 915.0MHz and f2 = 915.2MHz.
Note 9: Time delay from RXON = 0.45V to RXON = 2.4V transition to the time the output envelope reaches 90% of its final value.
Note 10: Output power typically falls to -10dBm at the frequency extremes.
Note 11: Two tones at V_{TXIN} = 125mVp-p, f1 = 1.0MHz, and f2 = 1.2MHz.
Note 12: Time delay from TXON = 0.45V to TXON = 2.4V transition to the time the output envelope reaches 90% of its final value.
Note 13: Using tank components shown in Figure 1.
Note 14: This approximates a typical application in which TXOUT is followed by an external PA and a T/R switch with finite isolation.
Note 15: Relative to the rising edge of PREOUT.