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# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### General Description

The MAX2550 is a complete single-chip RF-to-bits and bits-to-RF radio transceiver. This device is in compliance with the 3GPP TS25.104 femtocell standard for Band I, V, and VIII. It is equipped with multiple receive inputs and transmit outputs for low band, high band, and macro-cell monitoring (Table 1).

This fully integrated transceiver facilitates compact radio designs for dongle and standalone femtocell products by minimizing external component count. Maxim's MAX-PHY serial interface is used to drastically reduce IC pin count, while worldwide field-proven architecture accelerates time to product deployment.

The device features unparalleled receive blocker performance and the industry's lowest noise figure for higher data rates and range. Low-power operational modes are available to minimize power consumption. The transmitter is designed to deliver EVM far exceeding the standard requirement at 0dBm.

The MAX2550–MAX2553 is a family of pin-compatible transceivers that cover all major WCDMA and cdma2000® bands. All parts are controlled by a 4-wire interface.

The MAX2550 is packaged in a compact 7mm x 7mm TQFN and specified over the -40°C to +85°C extended temperature range. A complete radio reference design is available to facilitate custom designs.

### Applications

WCDMA Band I, V, and VIII Femtocells

**Ordering Information** and **Simplified Block Diagram** appear at end of data sheet.

For related parts and recommended products to use with this part, refer to [www.maxim-ic.com/MAX2550.related](http://www.maxim-ic.com/MAX2550.related).

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### Benefits and Features

- ◆ Single-Chip Femtocell Radio Transceiver
- ◆ WCDMA/HSPA+ Band I, V, and VIII Operation
- ◆ TS25.104 Standard Compliant
- ◆ Multiple LNA Inputs for WCDMA, PCS, and GSM Macrocell Monitoring
- ◆ High Level of Integration
  - ◇ On-Chip Fractional-N Frequency Synthesizers for LO Generation
  - ◇ No Tx SAW Filters Required
  - ◇ Integrated PA Drivers for Lower-Cost Power Amplifier Designs
  - ◇ 12-Bit AFC DAC to Control TCXO
  - ◇ On-Chip Temperature Sensor
  - ◇ Three General-Purpose Outputs
  - ◇ Reference Clock with Selectable CMOS and Low Swing Output
  - ◇ PLL Lock-Detect Output Through GPO3
- ◆ Optimized Receiver Performance
  - ◇ Exceptional Receive Sensitivity
  - ◇ High Dynamic Range Sigma-Delta ADCs Allow Simple AGC Implementation with Switched Gain States
- ◆ Optimized Transmitter Performance
  - ◇ Factory Calibrated for Gain, Carrier Leakage, and Sideband Suppression
  - ◇ 10-Bit Gain Control Resolution for Better Power Accuracy
  - ◇ 60dB Gain Control Range
- ◆ Loopback Operating Mode from Tx Baseband Input to Rx Baseband Output
- ◆ MAX-PHY Serial Digital Interface
- ◆ SPI Read/Write Functionality
- ◆ Operation Controlled by 4-Wire Serial Interface
- ◆ Low-Cost, 7mm x 7mm TQFN Package

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at [www.maximintegrated.com](http://www.maximintegrated.com).

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### ABSOLUTE MAXIMUM RATINGS

$V_{CC\_}$ to GND_ .....	-0.3V to +3.9V	Junction Temperature .....	+150°C
RXIN_, MIXIN_, LNAOUT_ to GND_.....	-0.3V to +1.2V	Operating Temperature Range .....	-40°C to +85°C
All Pins except $V_{CC\_}$ to GND_ .....	-0.3V to ( $V_{CC\_} + 0.3V$ )	Storage Temperature Range.....	-65°C to +150°C
AC Input Signals .....	1.0V Peak	Lead Temperature (soldering, 10s) .....	+300°C
Digital Input Current.....	±10mA	Soldering Temperature (reflow) .....	+260°C
Maximum VSWR Without Damage.....	8:1		
Continuous Power Dissipation ( $T_A = +70^\circ\text{C}$ )			
TQFN Multilayer Board			
(derate 40mW/°C above +70°C).....	3.2W		

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.

### PACKAGE THERMAL CHARACTERISTICS (Note 1)

TQFN

Junction-to-Ambient Thermal Resistance ( $\theta_{JA}$ ) .....	25°C/W	Junction-to-Case Thermal Resistance ( $\theta_{JC}$ ) .....	1°C/W
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**Note 1:** 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](http://www.maxim-ic.com/thermal-tutorial).

### DC ELECTRICAL CHARACTERISTICS

( $V_{CC\_} = 3.0V$  to  $3.6V$ ,  $T_A = -40$  to  $+85^\circ\text{C}$ ,  $50\Omega$  system,  $f_{REFIN} = 19.2\text{MHz}$ , typical values are at  $V_{CC\_} = 3.3V$ ,  $T_A = +25^\circ\text{C}$ , unless otherwise noted. Register settings as defined in tables following the specification tables.) (Note 2)

SPEC NO.	PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
DC1a	Supply Voltage	$V_{CC\_}$		3.0	3.3	3.6	V
DC19a	Operating Supply Current WCDMA	$I_{CC\_}$	Full-duplex high band		298	390	mA
DC19b			Full-duplex low band		300	390	
DC20			RXIN2 monitor		78	105	
DC21			RXIN4 monitor		78	105	
DC22			RXIN5 monitor		72	95	
DC23			Tx only		236	315	
DC24			Idle Rx		43		
DC25			Idle Tx		40		
DC3	Operating Supply Current AFC-Only Mode	$I_{CC\_}$	AFC DAC and SPI only		175	1000	μA
DC5	Operating Supply Current Reference Buffer Mode	$I_{CC\_}$	REFOUT = $500\Omega \parallel 22\text{pF}$ , all else = off		5.3	7.5	mA
DC6	Operating Supply Current Sleep Mode	$I_{CC\_}$	All functions off		14	1000	μA
DC11	Digital Input Logic-High			1.3			V
DC12	Digital Input Logic-Low					0.4	V
DC13	Input Current for Digital Control Pins					10	μA
DC16	GPO Sink Current		$V_{OUT} = 0.35V$ , DOUT_DRV = 01	1.0	1.8		mA
DC17	GPO Source Current		$V_{OUT} = V_{CC\_} - 0.3V$ , DOUT_DRV = 01	1.0	1.9		mA

# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC\_} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC\_} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Band I Duplexer Specifications

(Duplexer between antenna and duplexer loss: 0.3dB (applies to all Rx modes).)

### Antenna—Uplink Port (Applies to Uplink WCDMA Rx Mode on RXIN1)

BAND (MHz)	Uplink 1920 to 1980	1 to 1870	1870 to 1920	1980 to 2020	2020 to 2200	2300 to 2500	2500 to 4500	4500 to 12750
ATTENUATION (dB)	Attenuation	Minimum Attenuation						
	2	32	12	12	37	27	12	7
<b>Rx SAW FILTER RESPONSE</b>								
BAND (MHz)	Out of band							
ATTENUATION (dB)	Required minimum attenuation relative to in-band							
	25							

### Band I Uplink WCDMA Rx Mode on RXIN1 (Full Duplex)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb1fu-0	Frequency Band	WCDMA FDD Band I uplink (lowest to highest channel center frequency)	1922.4		1977.6	MHz
Wb1fu-1	Sensitivity 3GPP TS25.104 Section 7.2.1	Tx on at -27dBm, LNA gain mid gain, PGA gain register set to 9, assumed SNDR > -17.5dB at sensitivity, using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104, tested by measurement of SNDR at output on CW input signal at -90dBm, SNDR at MAX-PHY filter output established with FFT, LNA linearity set to high		-116	-107	dBm
Wb1fu-1a	Sensitivity with LNA in High-Gain Mode	Tx on at -27dBm, LNA gain high, PGA gain register set to 6, assumed SNDR > -17.5dB at sensitivity, using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104, tested by measurement of SNDR at output on CW input signal at -90dBm, SNDR at MAX-PHY filter output established with FFT, LNA linearity set to high		-119	-107	dBm
Wb1fu-3	High-Level EVM WCDMA	$P_{\text{IN}} = -20\text{dBm}$ , LNA gain low, PGA gain register set to 1		4.5		%

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## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC-} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC-} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Band I Uplink WCDMA Rx Mode on RXIN1 (Full Duplex) (continued)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb1fu-4	Sensitivity with Adjacent Channel Interference 3GPPP TS25.104 Section 7.4.1	Tx on -27dBm, LNA gain high, PGA gain register set to 3, assumed SNDR > -17.5dB at sensitivity, inferring signals at front-end input -28dBm, at 5MHz offset and -5MHz offset and modulated as in 3GPP. Using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104. Production tested by measurement if SNDR at output on CW input signal at -90dBm. SNDR at MAX-PHY filter output established with FFT.		-109	-101	dBm
Wb1fu-5	Sensitivity with In-Band Blocking Interference 3GPPP TS25.104 Section 7.5.1	Tx on -27dBm, LNA gain high, PGA gain register set to 6, assumed SNDR > -17.5dB at sensitivity, inferring signals at front-end input -30dBm, at 10MHz offset and -5MHz offset and modulated as in 3GPP. Using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104. Production tested by measurement if SNDR at output on CW input signal at -90dBm test only worst case in production. SNDR at MAX-PHY filter output established with FFT.		-117	-101	dBm
Wb1fu-6	Sensitivity with Out-of-Band Blocking Interference 3GPP TS25.104 Section 7.5.1	Front-end assumed response as above, Tx on at -27dBm, LNA high gain, PGA gain register set to 6, assumed SNDR > -17.5dB at sensitivity, interfering signal at front-end input -15dBm CW, 1MHz to 1900MHz and 2000MHz to 12750MHz using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104, tested by measurement of SNDR at output on CW input signal at -90dBm, SNDR at MAX-PHY filter output established with FFT (Note 3)		-112	-101	dBm

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## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC\_} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC\_} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Band I Uplink WCDMA Rx Mode on RXIN1 (Full Duplex) (continued)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb1fu-8	Sensitivity with Intermodulation Interference 3GPP TS25.104 Section 7.6.1	Tx on at -27dBm; LNA gain high; PGA gain register set to 6; assumed SNDR > -17.5dB at sensitivity; interfering signals at front-end input -38dBm, at 10MHz offset (CW) and 20MHz offset (modulated) as in 3GPP; using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104; tested by measurement of SNDR at output on CW input signal at -90dBm; SNDR at MAX-PHY filter output established with FFT (Note 3)		-118	-101	dBm
Wb1fu-10	Spurious Emissions Out-of-Band 3GPP TS25.104 Section 7.7.1	30MHz to 1GHz, measured in 100kHz BW		-100	-60	dBm
		1GHz to 12.75GHz, measured in 1MHz BW, with the exception of frequencies between 12.5MHz below the first carrier frequency and 12.5MHz above the last carrier frequency used by the BS (Note 3)		-75	-50	
Wb1fu-11	Spurious Emissions in Receive Bands 3GPP TS25.104 Section 7.9.2	Front-end assumed response as above, 1920MHz to 1980MHz (Note 3)		-95	-80	dBm
Wb1fu-12	Conversion Gain High LNA Gain	LNA high gain; PGA gain register set to 6; tested on CW input signal at -90dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	21	30	36	dB
Wb1fu-13	Conversion Gain Mid LNA Gain	LNA mid gain; PGA gain register set to 9; tested on CW input signal at -90dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	21	30	36	dB
Wb1fu-14	Conversion Gain Low LNA Gain	LNA gain low; PGA gain register set to 1; tested on CW input signal at -20dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	-13	-7	-3.5	dB

# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC-} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC-} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Antenna—Downlink Port (Applies to Downlink WCDMA Rx Mode on RXIN5)

BAND (MHz)	Downlink 2110 to 2170	1 to 2025	2025 to 2050	2050 to 2095	2185 to 2230	2230 to 2255	2255 to 12750
ATTENUATION (dB)	Attenuation	Minimum Attenuation					
	2	15	10	0	0	10	15

### Band I Downlink WCDMA Rx Mode on RXIN5 (Monitor)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb1fd-0	Frequency Band		2112.4		2167.6	MHz
Wb1fd-1	Sensitivity 3GPP TS25.101 Section 7.3.1	LNA gain high, PGA gain register set to 11, assumed SNDR > -7dB at sensitivity, using UL reference measurement channel, (12.2kbps) as specified in C.3.1 3GPP 25.101, tested by measurement of SNDR at output on CW input signal at -90dBm, SNDR at MAX-PHY filter output established with FFT, LNA linearity set to high		-110		dBm
Wb1fd-4	Sensitivity with Adjacent Channel Interference 3GPP TS25.101 Section 7.5.1	LNA gain high; PGA gain register set to 11; assumed SNDR > -7dB at sensitivity; interfering signals at front-end input -52dBm, at 5MHz offset and -5MHz offset and modulated as in 3GPP; using UL reference measurement channel (12.2kbps) as specified in C.3.1 3GPP 25.101; production tested by measurement of SNDR at output on CW input signal at -90dBm; SNDR at MAX-PHY filter output established with FFT		-110		dBm
Wb1fd-4a	Sensitivity with Adjacent Channel Interference 3GPP TS25.101 Section 7.5.1 CASE 2	LNA gain medium, PGA gain register set to 6; tested SNDR at output; interfering signals at front-end input -25dBm, at 5MHz offset and -5MHz offset and modulated as in 3GPP; using UL reference measurement channel (12.2kbps) as specified in C.3.1 3GPP 25.101; production tested by measurement of SNDR at output on CW input signal at -69dBm; SNDR at MAX-PHY filter output established with FFT		-94		dBm

# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC\_} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC\_} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Band I Downlink WCDMA Rx Mode on RXIN5 (Monitor) (continued)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb1fd-8	Sensitivity with Intermodulation Interference 3GPP TS25.101 Section 7.8.1	LNA gain high, PGA gain register set to 11; assumed SNDR > -7dB at sensitivity; interfering signals at front-end input -46dBm, at 10MHz offset (CW) and 20MHz offset (modulated ) as in 3GPP; using UL reference measurement channel (12.2kbps) as specified in C.3.1 3GPP 25.101; production tested by measurement of SNDR at output on CW input signal at -90dBm; SNDR at MAX-PHY filter output established with FFT		-110		dBm
Wb1fd-10	Spurious Emissions Out-of-Band 3GPP TS25.101 Section 7.9.1	30MHz to 12750MHz in 100kHz bandwidth (Note 3)		-80	-60	dBm
Wb1fd-11	Spurious Emissions in Receive Bands 3GPP TS25.101 section 7.9.2	Front-end assumed response as above, 1920MHz to 1980MHz and 2110MHz to 2170MHz (Note 3)		-95	-80	dBm
Wb1fd-12	Conversion Gain High LNA Gain	LNA gain high; PGA gain register set to 11; tested on CW input signal at -90dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	33	44	49	dB
Wb1fd-13	Conversion Gain Low LNA Gain	LNA gain low; PGA gain register set to 0; tested on CW input signal at -20dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	-22	-13	-7.5	dB



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## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC\_} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC\_} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### DCS Band Rx Mode on RXIN2

#### Assumed External Front-End Filtering Characteristics Between Antenna and LNA

BAND (MHz)	In-Band 1805 to 1880	Out of Band (a) 0.1 to 1705	Out of Band (b) 1705 to 1785	Out of Band (c) 1920 to 1980	Out of Band (d) 1980 to 4000
ATTENUATION (dB)	Attenuation	Minimum Attenuation			
	3.5	27.5	15.5	15.5	27.5

### DCS Band Rx Mode on RXIN2

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
dcs-0	RF Frequency	At pin RXIN2, 200KHz channel raster, lowest to highest channel center frequency	1805.2		1879.8	MHz
dcs-1	Sensitivity 3GPP TS100.910 Section 6.2	LNA gain high, PGA gain register set to 12; assumed SNDR > 7dB at sensitivity; using static E-TCH/F as specified in 3GPP TS 100.910; production tested by measurement of SNDR at output on CW input signal at -102dBm; SNDR at MAX-PHY filter output established with FFT		-108		dBm
dcs-2	Conversion Gain High LNA Gain	LNA gain high, PGA gain register set to 12; production tested on CW input signal at -102dBm; calculated by subtracting the FE input signal in dBm from the output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	40	46		dB

### EGSM/WCDMA Band Rx Mode on RXIN4

#### External Front-End Filtering Characteristics EGSM

BAND (MHz)	In-Band 925 to 960	905 to 915	Out of Band (a) 0.1 to 905	Out of Band (b) N/A	Out of Band (c) N/A	Out of Band (d) 980 to 12750
ATTENUATION (dB)	Attenuation	Minimum Attenuation				
	3.5	19.5	24.5	N/A	N/A	24.5

#### Assumed External Front-End Filtering Characteristics Between Antenna and LNA: (WCDMA on RXIN4)

BAND (MHz)	Downlink 869 to 894	1 to 804	824 to 849	914 to 3000	3000 to 6000
ATTENUATION (dB)	Attenuation	Minimum Attenuation			
	3	37	51	35	20

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## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC\_} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC\_} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### EGSM/WCDMA Band Rx Mode on RXIN4

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
G900 -0	RF Frequency	At pin RXIN4, 200KHz channel raster, EGSM lowest to highest channel center frequency	925.2		959.8	MHz
G900-1	Sensitivity 3GPP TS100.910 Section 6.2	LNA gain high, PGA gain register set to 12; assumed SNDR > 7dB at sensitivity; using static E-TCH/F as specified in 3GPP TS 100.910; production tested by measurement of SNDR at output on CW input signal at -102dBm; SNDR at MAX-PHY filter output established with FFT		-110		dBm
G900-2	Conversion Gain High LNA Gain	LNA gain high, PGA gain register set to 12; production tested on CW input signal at -102dBm; calculated by subtracting the FE input signal in dBm from the output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	43	50		dB

### Band V Duplexer Specifications

#### Antenna—Uplink Port (Applies to Uplink WCDMA Rx Mode on RXIN3)

BAND (MHz)	Uplink 824 to 849	1 to 804	869 to 894	894 to 2500	2500 to 3000	3000 to 6000
ATTENUATION (dB)	Attenuation			Minimum Attenuation		
	2	32	43	32	22	15
<b>Rx SAW FILTER RESPONSE</b>						
BAND (MHz)	Out-of-Band					
ATTENUATION (dB)	Required minimum attenuation relative to in-band					
	25					

# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC-} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC-} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Band V Uplink WCDMA Rx Mode on RXIN3 (Full Duplex)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb5fu-0	Frequency Band	WCDMA FDD Band V uplink (lowest to highest channel center frequency)	821.4		846.6	MHz
Wb5fu-1	Sensitivity 3GPP TS25.104 Section 7.2.1	Tx on at -27dBm, LNA gain mid gain, PGA gain register set to 9, assumed SNDR > -17.5dB at sensitivity, using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104, tested by measurement of SNDR at output on CW input signal at -90dBm, SNDR at MAX-PHY filter output established with FFT, LNA linearity set to high		-116	-107	dBm
Wb5fu-2	Sensitivity with LNA in High-Gain Mode	Tx on at -27dBm, LNA gain high, PGA gain register set to 6, assumed SNDR > -17.5dB at sensitivity, using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104, tested by measurement of SNDR at output on CW input signal at -90dBm, SNDR at MAX-PHY filter output established with FFT, LNA linearity set to high		-119	-107	dBm
Wb5fu-3	High-Level EVM WCDMA	$P_{\text{IN}} = -20$ dBm, LNA gain low, PGA gain register set to 1		4.0		%
Wb5fu-4	Sensitivity with Adjacent Channel Interference 3GPP TS25.104 Section 7.4.1	Tx on at -27dBm; LNA gain high; PGA gain register set to 3; assumed SNDR > -17.5dB at sensitivity; interfering signals at front-end input -28dBm, at 5MHz offset and -5MHz offset and modulated as in 3GPP; using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104; tested by measurement of SNDR at output on CW input signal at -90dBm; SNDR at MAX-PHY filter output established with FFT		-108		dBm
Wb5fu-5	Sensitivity with In-Band Blocking Interference 3GPP TS25.104 Section 7.5.1	Tx on at -27dBm; LNA gain high; PGA gain register set to 6; assumed SNDR > -17.5dB at sensitivity; interfering signal at front-end input -30dBm at min, 10MHz offset modulated as in 3GPP; using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104; tested by measurement of SNDR at output on CW input signal at -90dBm; (test only worst case in production); SNDR at MAX-PHY filter output established with FFT (Note 3)		-117	-101	dBm

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## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC-} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC-} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Band V Uplink WCDMA Rx Mode on RXIN3 (Full Duplex) (continued)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb5fu-6	Sensitivity with Out-of-Band Blocking Interference 3GPP TS25.104 Section 7.5.1	Front-end assumed response as above; Tx on at -27dBm; LNA gain high; PGA gain register set to 6; assumed SNDR > -17.5dB at sensitivity; interfering signal at Front-end input -15dBm CW; 1MHz to 804MHz and 869MHz to 12750MHz with 1 MHz steps; no exceptions allowed; (test only worst case in production); using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104; tested by measurement of SNDR at output on CW input signal at -90dBm; SNDR at MAX-PHY filter output established with FFT		-111		dBm
Wb5fu-7	Sensitivity with Intermodulation Interference 3GPP TS25.104 Section 7.6.1	Tx on at -27dBm; LNA gain high; PGA gain register set to 6; assumed SNDR > -17.5dB at sensitivity; interfering signals at front-end input -38dBm, at 10MHz offset (CW) and 20MHz offset (modulated) as in 3GPP; using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104; tested by measurement of SNDR at output on CW input signal at -90dBm; SNDR at MAX-PHY filter output established with FFT (Note 3)		-117	-101	dBm
Wb5fu-8	Spurious Emissions Out-of-Band 3GPP TS25.104 Section 7.7.1	30MHz to 1GHz, measured in 100kHz BW		-100	-60	dBm
		1GHz to 12.75GHz, measured in 1MHz BW, with the exception of frequencies between 12.5MHz below the first carrier frequency and 12.5MHz above the last carrier frequency used by the BS (Note 3)		-86	-50	
Wb5fu-10	Conversion Gain High LNA Gain	LNA high gain; PGA gain register set to 6; tested on CW input signal at -90dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	22	29.5	35	dB
Wb5fu-11	Conversion Gain Mid LNA Gain	LNA mid gain; PGA gain register set to 9; tested on CW input signal at -90dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	22	29	35	dB

# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC\_} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC\_} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Band V Uplink WCDMA Rx Mode on RXIN3 (Full Duplex) (continued)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb5fu-12	Conversion Gain Low LNA Gain	LNA gain low; PGA gain register set to 1; tested on CW input signal at -20dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	-17.5	-10.5	-6	dB

### Antenna—Downlink Port (Applies to Downlink WCDMA Rx Mode on RXIN4)

BAND (MHz)	Downlink 869 to 894	1 to 804	824 to 849	914 to 3000	3000 to 6000
ATTENUATION (dB)	Attenuation	Minimum Attenuation			
	3	37	51	35	20

### Band V Downlink WCDMA Rx Mode on RXIN4 (Monitor)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb5fd-0	Frequency Band		867.4		891.6	MHz
Wb5fd-1	Sensitivity 3GPP TS25.101 Section 7.3.1	LNA gain high, PGA gain register set to 11, assumed SNDR > -7dB at sensitivity, using UL reference measurement channel (12.2kbps) as specified in C.3.1 3GPP 25.101, tested by measurement of SNDR at output on CW input signal at -90dBm, SNDR at MAX-PHY filter output established with FFT, LNA linearity set to high		-111.5	-104.7	dBm
Wb5fd-4	Sensitivity with Adjacent Channel Interference 3GPP TS25.101 Section 7.5.1	LNA gain high; PGA gain register set to 11; assumed SNDR > -7dB at sensitivity; interfering signals at front-end input -52dBm, at 5MHz offset and -5MHz offset and modulated as in 3GPP; using UL reference measurement channel (12.2kbps) as specified in C.3.1 3GPP 25.101; tested by measurement of SNDR at output on CW input signal at -90dBm; SNDR at MAX-PHY filter output established with FFT		-111	-101	dBm
Wb5fd-9	Spurious Emissions Out-of-Band 3GPP TS25.101 Section 7.9.1 (Note 3)	30MHz to 1000MHz, 100kHz bandwidth		-100	-60	dBm
		1000MHz to 12750MHz, 1MHz bandwidth		-98	-50	

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## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC\_} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC\_} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Band V Downlink WCDMA Rx Mode on RXIN4 (Monitor) (continued)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb5fd-10	Spurious Emissions in Receive Bands 3GPP TS25.101 Section 7.9.2	Front-end assumed response as above, 824MHz to 849MHz and 869MHz to 894MHz (Note 3)		-95	-80	dBm
Wb5fd-11	Conversion Gain High LNA Gain	LNA gain high; PGA gain register set to 11; tested on CW input signal at -90dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	40	45	48.5	dB
Wb5fd-12	Conversion Gain Low LNA Gain	LNA gain low; PGA gain register set to 0; tested on CW input signal at -20dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	-18	-14	-10	dB

### Band VIII Duplexer Specifications

#### Antenna—Uplink Port (Applies to Uplink WCDMA Rx Mode on RXIN3)

BAND (MHz)	Uplink 880 to 915	1 to 870	925 to 960	960 to 2500	2500 to 3000	3000 to 6000
ATTENUATION (dB)	Attenuation			Minimum Attenuation		
	2	32	43	32	22	15
<b>Rx SAW FILTER RESPONSE</b>						
BAND (MHz)	Out-of-band					
ATTENUATION (dB)	Required minimum attenuation relative to in-band					
	25					

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## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC-} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC-} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Band VIII Uplink WCDMA Rx Mode on RXIN3 (Full Duplex)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb8fu-0	Frequency Band	WCDMA FDD Band V uplink (lowest to highest channel center frequency)	882.4		912.6	MHz
Wb8fu-1	Sensitivity 3GPP TS25.104 Section 7.2.1	Tx on at -27dBm, LNA gain mid gain, PGA gain register set to 9, assumed SNDR > -17.5dB at sensitivity, using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104, tested by measurement of SNDR at output on CW input signal at -90dBm, SNDR at MAX-PHY filter output established with FFT, LNA linearity set to high (Note 3)		-116	-107	dBm
Wb8fu-2	Sensitivity with LNA in High-Gain Mode	Tx on at -27dBm, LNA gain high, PGA gain register set to 6, assumed SNDR > -17.5dB at sensitivity, using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104, tested by measurement of SNDR at output on CW input signal at -90dBm, SNDR at MAX-PHY filter output established with FFT, LNA linearity set to high		-120	-107	dBm
Wb8fu-3	High-Level EVM WCDMA	$P_{\text{IN}} = -20\text{dBm}$ , LNA gain low, PGA gain register set to 1		4.0		%
Wb8fu-4	Sensitivity with Adjacent Channel Interference 3GPP TS25.104 Section 7.4.1	Tx on at -27dBm; LNA gain high; PGA gain register set to 3; assumed SNDR > -17.5dB at sensitivity; interfering signals at front-end input -28dBm, at 5MHz offset and -5MHz offset and modulated as in 3GPP; using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104; tested by measurement of SNDR at output on CW input signal at -90dBm; SNDR at MAX-PHY filter output established with FFT (Note 3)		-107	-101	dBm
Wb8fu-5	Sensitivity with In-Band Blocking Interference 3GPP TS25.104 Section 7.5.1	Tx on at -27dBm; LNA gain high; PGA gain register set to 6; assumed SNDR > -17.5dB at sensitivity; interfering signal at front-end input -30dBm at min, 10MHz offset modulated as in 3GPP; using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104; tested by measurement of SNDR at output on CW input signal at -90dBm; (test only worst case in production); SNDR at MAX-PHY filter output established with FFT (Note 3)		-118	-101	dBm

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## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC\_} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC\_} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Band VIII Uplink WCDMA Rx Mode on RXIN3 (Full Duplex) (continued)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb8fu-6	Sensitivity with Out-of-Band Blocking Interference 3GPP TS25.104 Section 7.5.1	Front-end assumed response as above; Tx on at -27dBm; LNA gain high; PGA gain register set to 6; assumed SNDR > -17.5dB at sensitivity; interfering signal at front-end input -15dBm CW; 1MHz to 804MHz and 869MHz to 12750MHz with 1 MHz steps; no exceptions allowed; (test only worst case in production); using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104; tested by measurement of SNDR at output on CW input signal at -90dBm; SNDR at MAX-PHY filter output established with FFT (Note 3)		-113	-101	dBm
Wb8fu-7	Sensitivity with Intermodulation Interference 3GPP TS25.104 Section 7.6.1	Tx on at -27dBm; LNA gain high; PGA gain register set to 6; assumed SNDR > -17.5dB at sensitivity; interfering signals at front-end input -38dBm, at 10MHz offset (CW) and 20MHz offset (modulated) as in 3GPP; using UL reference measurement channel (12.2kbps) as specified in A.2 3GPP 25.104; tested by measurement of SNDR at output on CW input signal at -90dBm; SNDR at MAX-PHY filter output established with FFT (Note 3)		-118	-101	dBm
Wb8fu-8	Spurious Emissions Out-of-Band 3GPP TS25.104 Section 7.7.1	30MHz to 1GHz, measured in 100kHz BW		-100	-60	dBm
		1GHz to 12.75GHz, measured in 1MHz BW, with the exception of frequencies between 12.5MHz below the first carrier frequency and 12.5MHz above the last carrier frequency used by the BS (Note 3)		-78	-50	
Wb8fu-10	Conversion Gain High LNA Gain	LNA high gain; PGA gain register set to 6; tested on CW input signal at -90dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	23	30	35	dB
Wb8fu-11	Conversion Gain Mid LNA Gain	LNA mid gain; PGA gain register set to 9; tested on CW input signal at -90dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	22	29.5	35	dB



# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC-} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC-} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Band VIII Uplink WCDMA Rx Mode on RXIN3 (Full Duplex) (continued)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb8fu-12	Conversion Gain Low LNA Gain	LNA gain low; PGA gain register set to 1; tested on CW input signal at -20dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	-16	-9	-5	dB

### Antenna—Downlink Port (Applies to Downlink WCDMA Rx Mode on RXIN4)

BAND (MHz)	Downlink 925 to 960	1 to 804	880 to 915	914 to 3000	3000 to 6000
ATTENUATION (dB)	Attenuation	Minimum Attenuation			
	3	37	51	35	20

### Band VIII Downlink WCDMA Rx Mode on RXIN4 (Monitor)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb8fd-0	Frequency Band		927.4		957.6	MHz
Wb8fd-1	Sensitivity 3GPP TS25.101 Section 7.3.1	LNA gain high, PGA gain register set to 11, assumed SNDR > -7dB at sensitivity, using UL reference measurement channel (12.2kbps) as specified in C.3.1 3GPP 25.101, tested by measurement of SNDR at output on CW input signal at -90dBm, SNDR at MAX-PHY filter output established with FFT, LNA linearity set to high, specified data is for a manual built fCLGA using 2.7pF filter caps		-111.5	-104.7	dBm
Wb8fd-4	Sensitivity with Adjacent Channel Interference 3GPP TS25.101 Section 7.5.1	LNA gain high; PGA gain register set to 11; assumed SNDR > -7dB at sensitivity; interfering signals at front-end input -52dBm, at 5MHz offset and -5MHz offset and modulated as in 3GPP; using UL reference measurement channel (12.2kbps) as specified in C.3.1 3GPP 25.101; tested by measurement of SNDR at output on CW input signal at -90dBm; SNDR at MAX-PHY filter output established with FFT		-111	-101	dBm

# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC-} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred. Typical values are at  $V_{CC-} = 3.3\text{V}$ ,  $T_A = +25^{\circ}\text{C}$  and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

### Band VIII Downlink WCDMA Rx Mode on RXIN4 (Monitor) (continued)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Wb8fd-9	Spurious Emissions Out-of-Band 3GPP TS25.101 Section 7.9.1 (Note 3)	30MHz to 1000MHz, 100kHz bandwidth		-100	-60	dBm
		1000MHz to 12750MHz, 1MHz bandwidth		-90	-50	
Wb8fd-10	Spurious Emissions in Receive Bands 3GPP TS25.101 Section 7.9.2	Front-end assumed response as above, 925MHz to 960MHz and 880MHz to 915MHz (Note 3)		-100	-80	dBm
Wb8fd-11	Conversion Gain High LNA Gain	LNA gain high; PGA gain register set to 11; tested on CW input signal at -90dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	40	44.5	49	dB
Wb8fd-12	Conversion Gain Low LNA Gain	LNA gain low; PGA gain register set to 0; tested on CW input signal at -20dBm; calculated by subtracting the FE input signal in dBm from the ADC output signal in dBFS at digital filter outputs, includes digital gain to the 16-bit output	-17.5	-12	-8.5	dB

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## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### Tx MODE AC ELECTRICAL CHARACTERISTICS

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , WCDMA downlink TM1 16 channels with -14dBfs peak level into sigma-delta modulator inside baseband chip (see the *Baseband Input Level* section), registers set as described in Tables 20–51,  $V_{CC\_} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , typical values are at  $T_A = +25^{\circ}\text{C}$ ,  $V_{CC\_} = 3.3\text{V}$ , and mid-band, unless otherwise noted. Tx specifications are referred to the input pin of the chip.) (Note 2)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
W1	RF Frequency Range	Center of the WCDMA signal, Band I output (TXOUTH)	2112.4		2167.6	MHz
W1a		Band V and VIII output (TXOUTL)	Band V	867.4	891.6	MHz
W1b			Band VIII	927.4	957.6	
W2	Linear Output Power	TX_GAIN = 1023	0			dBm
W3	Adjacent Channel Power Ratio	Offset frequency = $\pm 5\text{MHz}$ in $3.84\text{MHz}$ BW, $P_{\text{OUT}} = 0\text{dBm}$		-55		dBc
W4	Alternate Channel Power Ratio	Offset frequency = $\pm 10\text{MHz}$ in $3.84\text{MHz}$ BW, $P_{\text{OUT}} = 0\text{dBm}$		-70		dBc
W5	Rx Band Noise Power, $P_{\text{OUT}} \leq 0\text{dBm}$ (Note 3)	Noise measured at -80MHz offset in $3.84\text{MHz}$ BW, then convert to per Hz, Band I output		-149	-142	dBm/Hz
W5a		Noise measured at -45MHz offset in $3.84\text{MHz}$ BW, then convert to per Hz, Band V and VIII output		-145	-140	dBm/Hz
W6	EVM	$P_{\text{OUT}} = 0\text{dBm}$		4		%
W6a	RCDE	TM6, 8 channels at $0\text{dBm}$		-28		dB
W7	Minimum Output Power	TX_GAIN = 0		-61	-45	dBm
W8	Output Power Deviation from $T_A = +25^{\circ}\text{C}$ to $-40^{\circ}\text{C}$ (Note 3)	TX_GAIN = 1023, high band	-1.5	+0.4	+2	dB
		Low band	-0.5	+1.5	+3.5	
W9	Output Power Deviation from $T_A = +25^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ (Note 3)	TX_GAIN = 1023, high band	-3	-0.8	0	dB
		Low band	-3.5	-1.6	0	
W10	Power Control Step Size Accuracy	Five calibration points over the power control range to create four linear regions, any linearly interpolated 1dB TX_GAIN step over the specified power range (W2 and W7) produces 1dB output power step within this error range.		$\pm 0.25$		dB
W11	Power Control Step Size Accuracy	Five calibration points over the power control range to create four linear regions, any linearly interpolated 10dB TX_GAIN step over the specified power range (W2 and W7) produces 10dB output power step within this error range.		$\pm 0.75$		dB

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## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS: General

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC\_} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred, typical values are at  $T_A = +25^{\circ}\text{C}$ ,  $V_{CC\_} = 3.3\text{V}$ , unless otherwise noted.) (Note 2)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>REFERENCE FREQUENCY INPUT</b>						
R1	Input Level	Test condition	125		600	mV <sub>P-P</sub>
R2	Input Frequency	Reference divider set to divide-by-2 for frequencies higher than 26MHz	13	19.2	40	MHz
<b>REFERENCE FREQUENCY OUTPUT</b>						
RO1a	REFOUT Output Level, AC	500 $\Omega$    22pF load, REFOUT_LV_CMOS_SEL = 1	110	320	500	mV <sub>P-P</sub>
RO1b	REFOUT Output Level, DC			0.8		V
RO2	REFOUT Output Amplitude	500 $\Omega$    22pF load, REFOUT_LV_CMOS_SEL = 0	2.25	2.7		V <sub>P-P</sub>
RO4	REFOUT Output Frequency	Matches REFIN frequency (FREF)	13	19.2	40	MHz
<b>Rx DIGITAL LOW-VOLTAGE DIFFERENTIAL SIGNALING OUTPUT INTERFACE</b>						
LV0	Output Bit Rate on Each I and Q	Test condition		153.6		Mbps
LV1	Output Common Mode			1.2		V
LV3	Output Differential Swing on Load (Note 3)	120 $\Omega$ differential output load (Note 3)	100	140	220	mV <sub>PEAK</sub>
LV4	Differential Output Resistance			670		$\Omega$
<b>Tx BASEBAND INTERFACE</b>						
Bb1	Input Bit Rate, on Each I and Q	Test condition		153.6		Mbps
Bb8	Common Mode Input Voltage			1.25		V
Bb9	Differential Input Swing		112	140	500	mV <sub>P-P</sub>
Bb10	Differential Input Resistance (Note 3)	Bit TXINDACZI = 1	55	100	140	$\Omega$
Bb11		Bit TXINDACZI = 0	140	220	340	
<b>Rx RF PLL</b>						
RS1	Valid RF Main Division Ratio Range		62		147	
RS3	Valid Main Fractional Divider Programming Value	20-bit resolution	00000		FFFFF	hex
RS5	Charge-Pump Current Gain	Using 800 $\mu\text{A}$ setting	0.5	0.82	1.0	mA
RS6a	VCO Tuning Gain	RXVCO, high band	38	127	216	MHz/V
RS6b		RXVCO, low band	21	65	111	
RS9	PLL Settling Time	50kHz loop bandwidth		200		$\mu\text{s}$

# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### AC ELECTRICAL CHARACTERISTICS: General (continued)

(MAX2550 EV kit,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ , registers set as described in Tables 20–51,  $V_{CC\_} = 3.0\text{V}$  to  $3.6\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred, typical values are at  $T_A = +25^{\circ}\text{C}$ ,  $V_{CC\_} = 3.3\text{V}$ , unless otherwise noted.) (Note 2)

SPEC NO.	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>Tx RF PLL</b>						
TS2	Valid RF Main Division Ratio Range		66		153	
TS3	Valid Reference Division Ratios	Division ratios are 1 or 2	1		2	
TS4	Valid Main Fractional Divider Programming Value	20-bit resolution	00000		FFFFF	hex
TS5	Charge-Pump Current CP	800 $\mu\text{A}$	0.5	0.82	1.0	mA
TS9	PLL Settling Time	50kHz loop bandwidth		200		$\mu\text{s}$
DAC1	Resolution	Monotonicity is production tested		12		Bits
<b>AFC DAC</b>						
DAC3	Output-Voltage High	Load > 200k $\Omega$ to GND, AFCDAC = all 1	2.55	2.68		V
DAC4	Output-Voltage Low	Load > 200k $\Omega$ to $V_{CC\_}$ , AFCDAC = all 0		0.37	0.45	V
DAC5	Output Noise	Any code within 0.5V to 2.5V output level, 100Hz to 20kHz		6		$\mu\text{V}/\text{rtHz}$
DAC6	Settling Time	Step from 0.6V to 2V, settling to $\pm 10\text{mV}$				$\mu\text{s}$
<b>DIGITAL TEMPERATURE SENSOR</b>						
T1	Output Code vs. Temperature	$T_A = -40^{\circ}\text{C}$		5		%code
T2		$T_A = +25^{\circ}\text{C}$		17		
T3		$T_A = +85^{\circ}\text{C}$		27		
T5	Code Slope	$T_A = -20^{\circ}\text{C}$ to $+70^{\circ}\text{C}$		5		
<b>ISOLATION</b>						
M1	RXIN_ Pin-to-Pin Isolation	Between any RXIN_ pins, with one of the two ports disabled		30		dB
M2	TXOUT_ to RXIN_ Isolation	Between any TXOUT and RXIN_, with both ports on		60		dB

**Note 2:** Production tested at  $T_A = +25^{\circ}\text{C}$ . Cold and hot are guaranteed by design and characterization.

**Note 3:** Guaranteed by design and characterization.

# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### General Comments

#### MAX-PHY

MAX-PHY is Maxim's solution for the digital interface system between the radio IC and the baseband/DSP. It is a multimode, software programmable, digital signal post-processing engine that processes the data out of the radio IC and produces the digital filtered outputs for use in the DSP. It enables multimode operation of the radio through software control. Maxim offers an evaluation kit for the MAX2550 along with an FPGA-based MAX-PHY evaluation platform. The FPGA includes the recommended digital channel-selection filters. The Verilog code for these filters is also available for integration into the DSP. Contact Maxim for further information.

### Additional Information

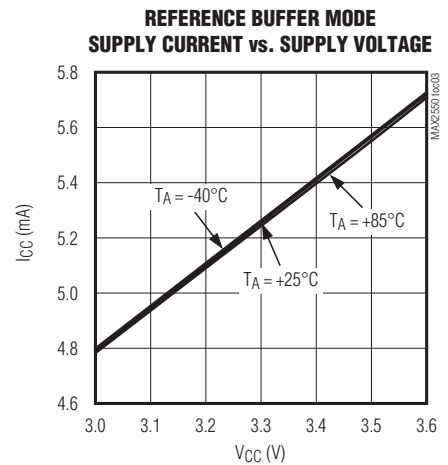
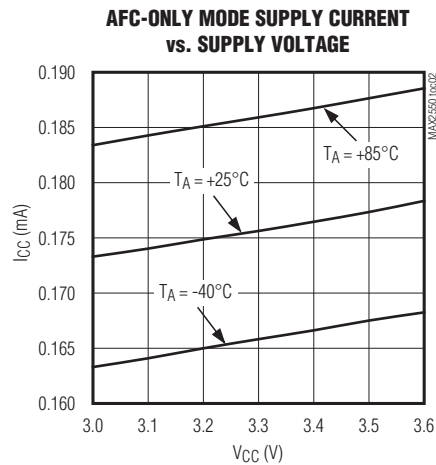
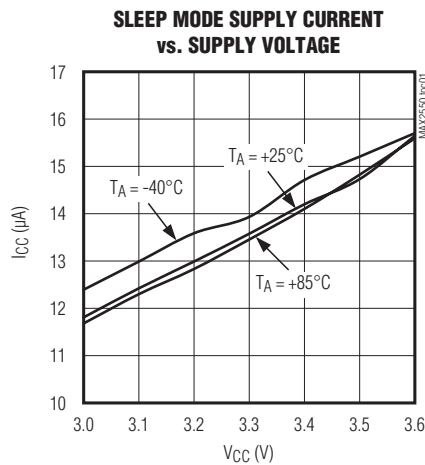
The specifications in the following pages calculate sensitivity with a specified front-end loss from a measured signal-to-noise and distortion ratio (SNDR) and an assumed minimum output SNDR<sub>SENS</sub> needed for demodulation at sensitivity. The sensitivity values can be related to noise figure by the formula:

$$\text{Noise Figure of MAX2550 (dB)} = \text{Sensitivity (dBm)} - \text{Front-End Loss (dB)} - \text{SNDR}_{\text{SENS}} \text{ (dB)} + 174 \text{ dBm/Hz} - 10 \times \text{LOG}(\text{bandwidth in Hz})$$

Low-noise amplifier (LNA) and programmable-gain amplifier (PGA) gain are set according to the Conditions column in the *Electrical Characteristics* table. The output SNDR is measured using MAX-PHY and the bandwidth of the measurement is defined by the digital filters in MAX-PHY. DC at the output is excluded from the SNDR measurement. SNDR is calculated using an FFT of the output bytes with a typical FFT length of 2<sup>14</sup> output samples.

### Typical Operating Characteristics

(MAX2550 EV kit and MAX-PHY FPGA evaluation platform, T<sub>A</sub> = +25°C, unless otherwise noted. Registers set as described in Tables 20 and 21, V<sub>CC</sub> = 3.3V, f<sub>REFIN</sub> = 19.2MHz, all sensitivity levels and blocker levels are antenna referred.)

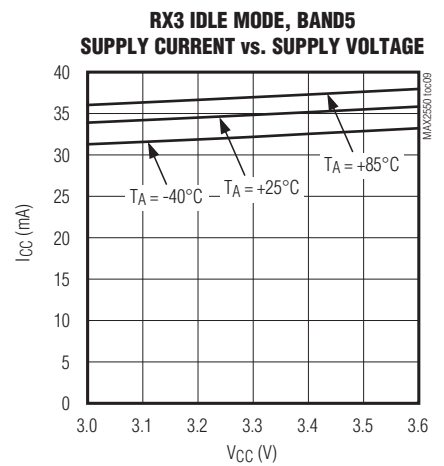
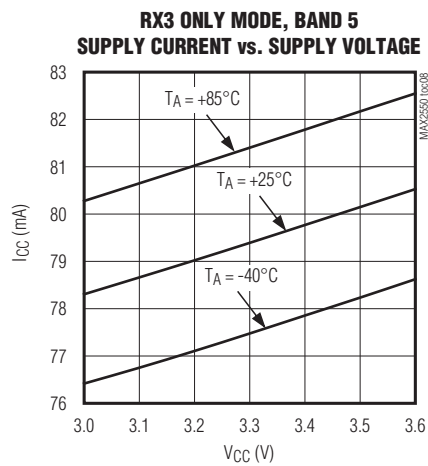
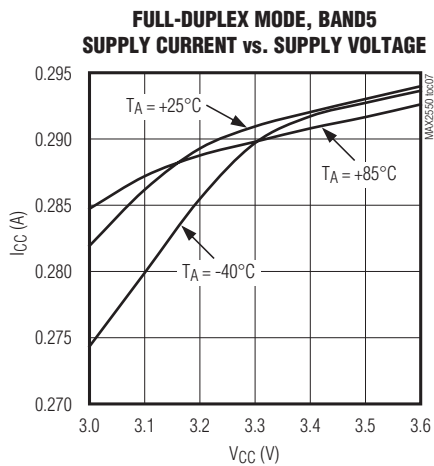
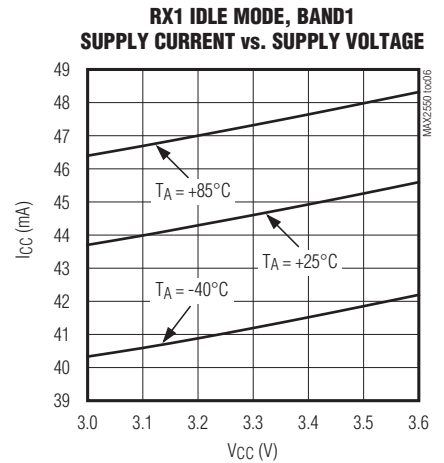
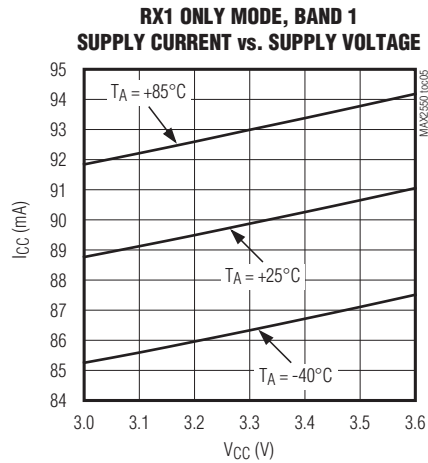
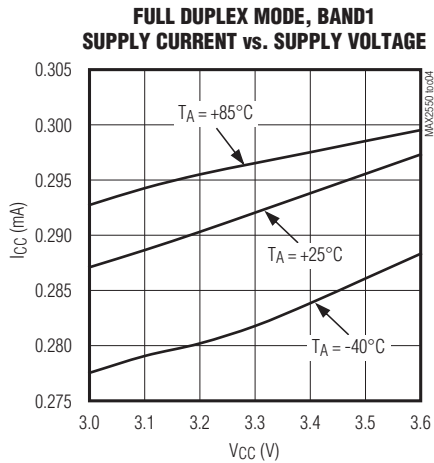


# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### Typical Operating Characteristics (continued)

(MAX2550 EV kit and MAX-PHY FPGA evaluation platform,  $T_A = +25^\circ\text{C}$ , unless otherwise noted. Registers set as described in Tables 20 and 21,  $V_{CC\_} = 3.3\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred.)

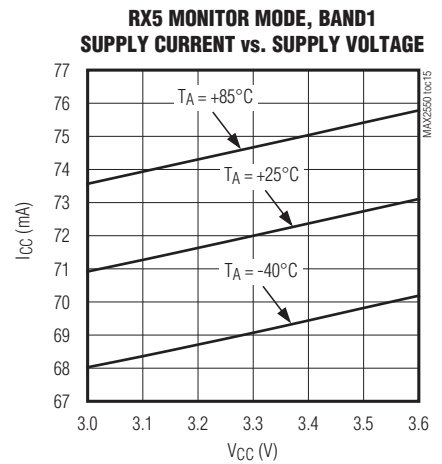
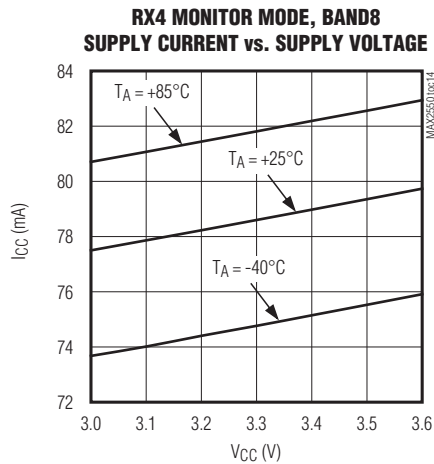
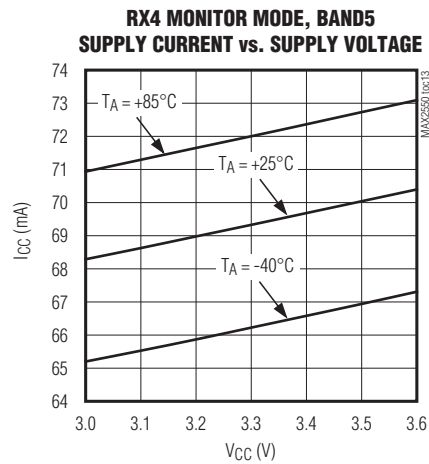
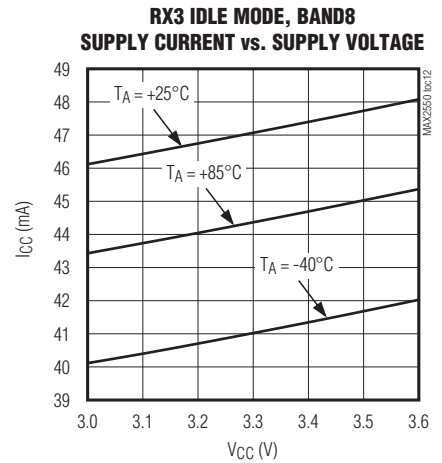
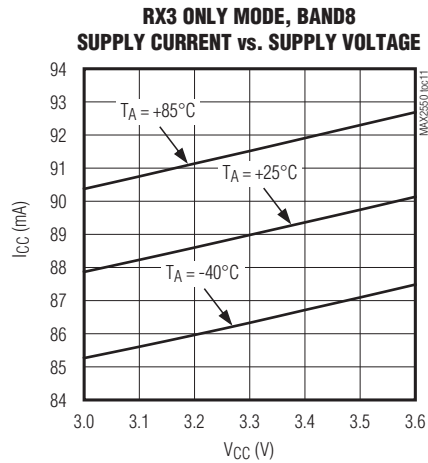
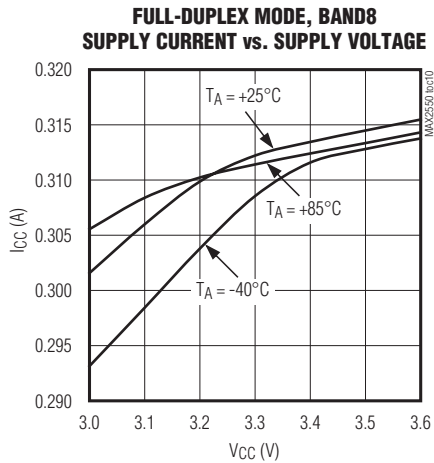


# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### Typical Operating Characteristics (continued)

(MAX2550 EV kit and MAX-PHY FPGA evaluation platform,  $T_A = +25^\circ\text{C}$ , unless otherwise noted. Registers set as described in Tables 20 and 21,  $V_{CC\_} = 3.3\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred.)





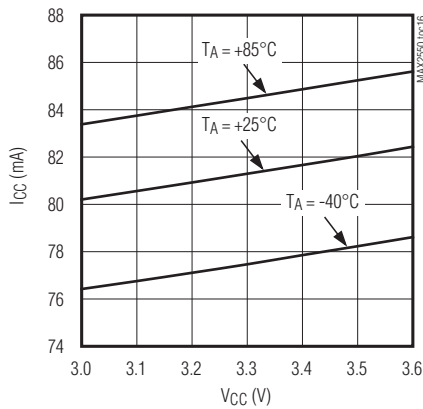
# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

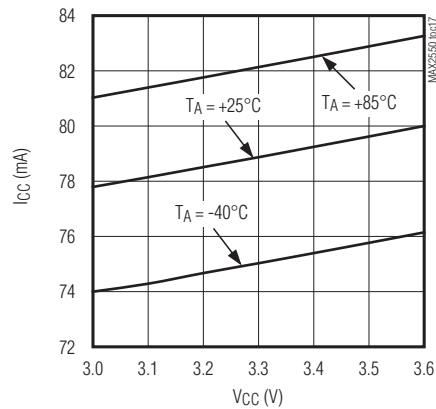
### Typical Operating Characteristics (continued)

(MAX2550 EV kit and MAX-PHY FPGA evaluation platform,  $T_A = +25^\circ\text{C}$ , unless otherwise noted. Registers set as described in Tables 20 and 21,  $V_{CC\_} = 3.3\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred.)

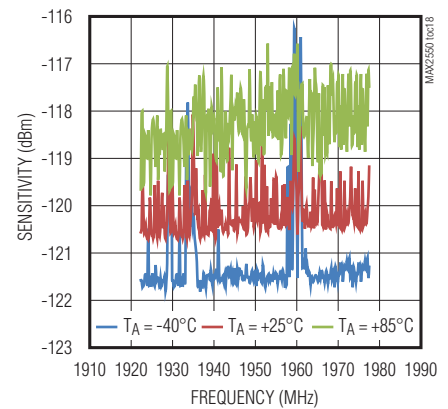
**RX2 MONITOR MODE, DCS  
SUPPLY CURRENT vs. SUPPLY VOLTAGE**



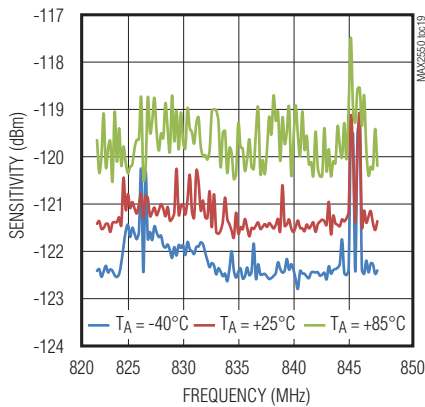
**RX4 MONITOR MODE, GSM  
SUPPLY CURRENT vs. SUPPLY VOLTAGE**



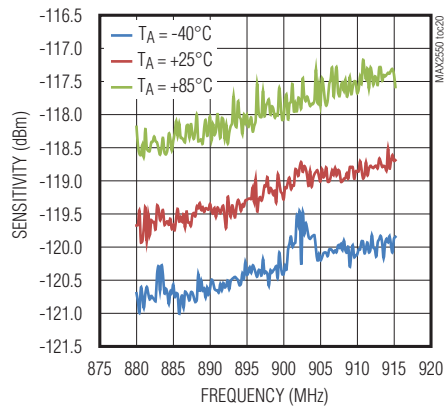
**BAND1 UPLINK Rx  
SENSITIVITY vs. FREQUENCY**



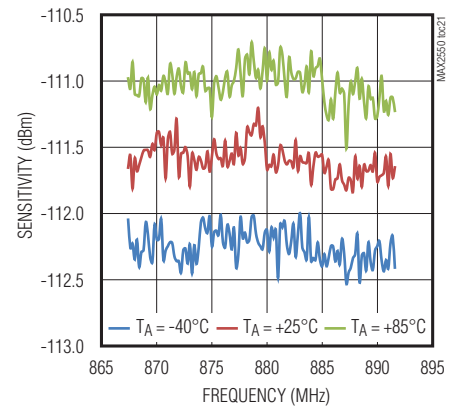
**BAND5 UPLINK Rx  
SENSITIVITY vs. FREQUENCY**



**BAND8 UPLINK Rx  
SENSITIVITY vs. FREQUENCY**



**BAND5 DOWNLINK Rx  
SENSITIVITY vs. FREQUENCY**



# MAX2550

## Band I, V, and VIII WCDMA Femtocell Transceiver with GSM Monitoring

### Typical Operating Characteristics (continued)

(MAX2550 EV kit and MAX-PHY FPGA evaluation platform,  $T_A = +25^\circ\text{C}$ , unless otherwise noted. Registers set as described in Tables 20 and 21,  $V_{CC\_} = 3.3\text{V}$ ,  $f_{\text{REFIN}} = 19.2\text{MHz}$ , all sensitivity levels and blocker levels are antenna referred.)

