CONEXANT™

RF210A and RF210B

Dual-Band, Image-Reject Downconverters For GSM Applications

The RF210A and RF210B devices are available as a dual-band front end for Global System for Mobile Communications (GSM) handset applications. Both of these highly integrated, monolithic devices are optimized for dual-band use in GSM900/DCS1800 or GSM 900/PCS1900 applications. The devices include two Low Noise Amplifiers (LNAs), two image-reject mixers, and two Local Oscillator (LO) buffer amplifiers.

The main advantage of the RF210A and RF210B is their ability to provide 30 dB of image rejection for both the GSM900 and the DCS1800 (or PCS1900) bands without requiring the use of a post-LNA image reject filter. A block diagram of the RF210(A/B) is shown in Figure 1. The device package and pin configuration are shown in Figure 2.

Features

- LNA/image-reject mixer for RF to IF conversion
- 10 dB (RF210A) or 20 dB (RF210B) switchable gain for GSM
- 8 dB (RF210A) or 16 dB (RF210B) switchable gain for DCS/PCS
- 30 dB of image rejection. No post-LNA filtering required
- High isolation LO input buffer
- Differential IF output
- High dynamic range
- Three-cell battery operation (2.7 to 5 V)
- 20-pin Thin Shrink Small Outline Package (TSSOP)

Applications

- Dual-band digital cellular mobile telephony (GSM900/DCS 1800 or GSM900/PCS1900)
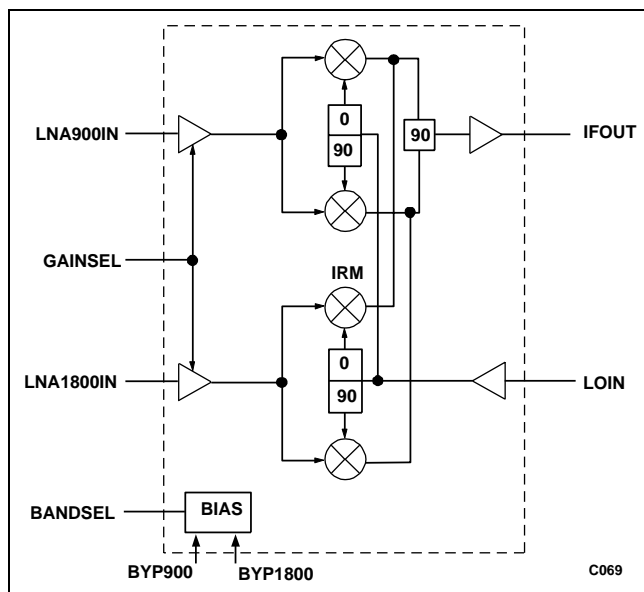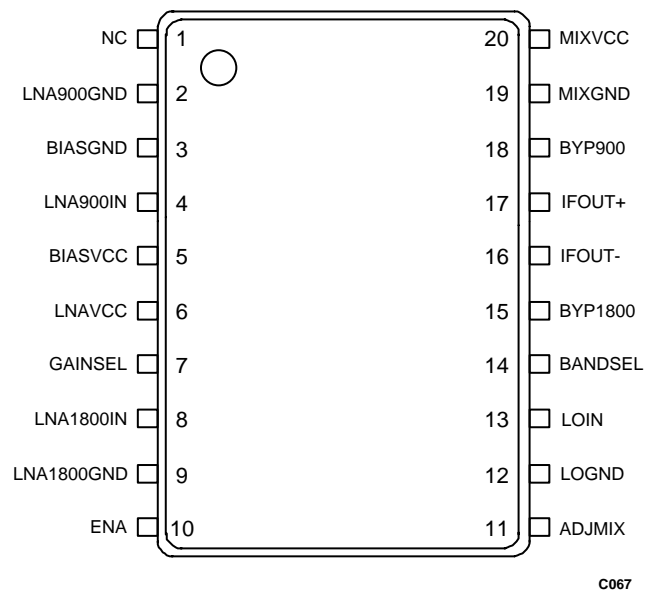

Figure 1. RF210(A/B) Block Diagram

Figure 2. RF210(A/B) Pin Configuration – 20-Pin TSSOP

Technical Description

The RF210(A/B) dual-band, image-reject downconverters implement the front-end functions of a dual-band super-heterodyne receiver. These devices consist of two receive paths, one for GSM900 and the other for DCS1800 (or PCS1900). Each receive path contains an LNA and an image-reject mixer. The IF and LO ports are common to both receive paths. The image-reject mixers can provide 30 dB of image rejection for both the GSM900 and the DCS1800 (or PCS1900) bands without using any post-LNA image reject filters.

The LNA/mixer combination has a switchable gain. The RF210A and RF210B both have 22 dB of gain in the high gain mode. For the RF210A, the gain is reduced by 10 dB (GSM band) and by 8 dB (DCS/PCS band) in the low gain mode. For the RF210B, the gain is reduced by 20 dB (GSM band) and by 16 dB (DCS/PCS band) in the low gain mode. The gain mode is selected using the GAINSEL pin (Pin 7). Low gain mode is selected by driving the GAINSEL signal high; high gain mode is selected by driving the signal low. In addition, small adjustments

of the mixer gain can be accomplished by varying the quiescent current on the ADJMIX pin (Pin 11). This pin can be connected to VCC or ground through resistors. The current will increase if the pin is connected to GND and decrease if connected to VCC. For optimal performance, this pin should be left unconnected.

The band of operation for RF210(A/B) is selected by the BANDSEL signal on Pin 14. It switches the receive path between GSM900 and DCS1800 (or PCS1900) bands.

The device can operate from a three-cell battery pack (2.7 V to 5.0 V). Standby mode current is extremely low at 20 μA, which maximizes handset standby time.

The signal pin assignments and functional pin descriptions are found in Table 1. The absolute maximum ratings of the RF210(A/B) are provided in Table 2, the operating conditions are specified in Table 3, and electrical specifications are provided in Table 4. Figure 3 shows the diagram for a typical application circuit using the RF210(A/B) downconverter. Figure 4 provides the package dimensions for the 20-pin TSSOP device and Figure 5 provides the tape and reel dimensions.

Table 1. RF210(A/B) Signal Description

Pin #	Name	Description	Pin #	Name	Description
1	NC	No connect	11	ADJMIX	Mixer bias adjust pin
2	LNA900GND	900 MHz LNA ground	12	LOGND	LO input ground
3	BIASGND	Bias ground	13	LOIN	LO input
4	LNA900IN	900 MHz LNA input	14	BANDSEL	Band selection pin
5	BIASVCC	Bias supply	15	BYP1800	Bypass capacitor for 1800 MHz band
6	LNAVCC	LNA supply	16	IFOUT−	Mixer output (negative)
7	GAINSEL	LNA gain select	17	IFOUT+	Mixer output (positive)
8	LNA1800IN	1800 MHz LNA input	18	BYP900	Bypass capacitor for 900 MHz band
9	LNA1800GND	1800 MHz LNA ground	19	MIXGND	Mixer ground
10	ENA	Device enable (active high)	20	MIXVCC	Mixer supply

Table 2. Absolute Maximum Ratings

Parameter	Minimum	Maximum	Units
Storage Temperature	−40	+125	°C
LNA Input Power		+5	dBm
Supply Voltage (VCC)	−0.3	+6	V
Input Voltage Range	−0.3	Vcc	V

Table 3. RF210(A/B) Recommended Operating Conditions

Parameter	Min	Typical	Max	Units
Supply Voltage	2.7	3.0	5.0	V
Operating Temperature	−30	+25	+85	°C

Table 4. RF210(A/B) Electrical Specifications (1 of 2)
(T$_A$ = 25 C, V$_{CC}$ = 3.0 V, f_{iF} = 400 MHz, P_{lo} = −10 dBm)

Parameter	Test Condition	Min	Typical	Max	Units
GSM900 Mode, BANDSEL = 0					
Supply current: Enable mode Sleep mode	 ENA = 1 ENA = 0		 38	 10	 mA μA
RF Input frequency		935		960	MHz
IF frequency		350	400	450	MHz
LO frequency		1285		1410	MHz
LO input power			−10		dBm
LO to RF input isolation		30			dB
Input impedance	LNA900IN = 950 MHz		40 − j50		Ω
Gain: High gain (RF210A and RF210B) Low gain (10 dB attenuation, RF210A) Low gain (20 dB attenuation, RF210B) Gain variation vs. Frequency Gain step tracking error	 GAINSEL = 0 GAINSEL = 1 GAINSEL = 1		 22 12 2 0.5	 1 0.5	 dB dB dB dB dB
Noise figure: High gain Low gain (12 dB gain, RF210A) Low gain (2 dB gain, RF210B) High gain (Note 1)	 No blocker, GAINSEL = 0 GAINSEL = 1 GAINSEL = 1 −28 dBm blocker @ 915 MHz, GAINSEL = 0		 3.3 9.0 17 3.9	 3.9 11 19	 dB dB dB dB
Input 1 dB compression point		−25			dBm
Input third order intercept point		−17			dBm
IF shunt resistance/side		400	500	600	Ω
Spurious response: 2(RF) x 2(LO) and 3(RF) x 3(LO) (Note 2):	Interferer input = −75 dBm		−45		dB
Image rejection		35			dB

Conexant
Proprietary Information and Specifications are Subject to Change   October 20, 1999

Table 4. RF210(A/B) Electrical Specifications (2 of 2)
(T_A = 25 C, V_{CC} = 3.0 V, f_{IF} = 400 MHz, P_{lo} = –10 dBm)

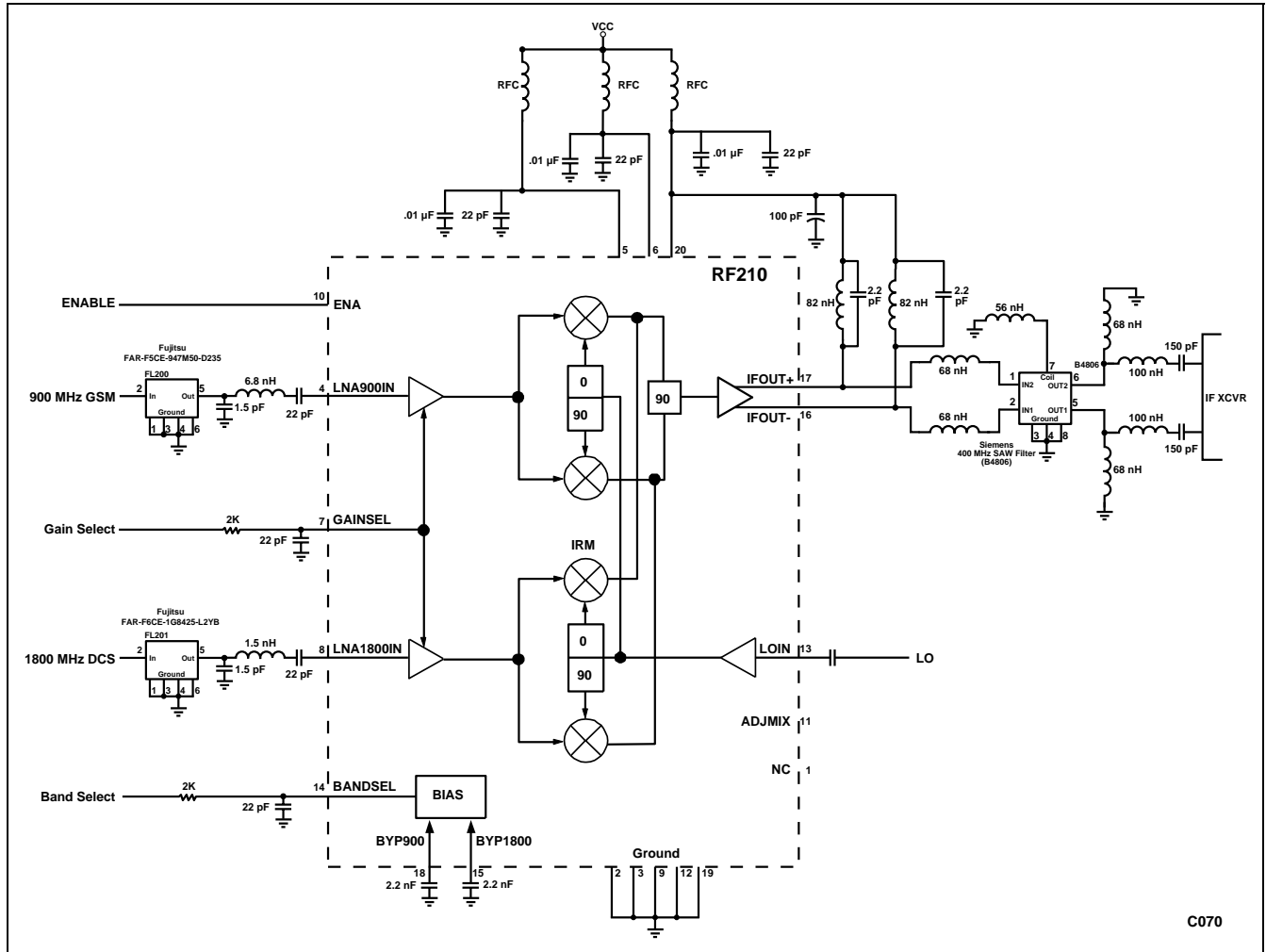| Parameter	Test Condition	Min	Typical	Max	Units
DCS1800/PCS1900 Mode, BANDSEL = 1					

Supply current:
     Enable mode
     Sleep mode
	ENA = 1
	 ENA = 0
			42	
				
				250
					
					mA
					µA

RF input frequency		1805		1990	MHz
IF frequency		350	400	450	MHz
LO frequency		1355		1640	MHz
LO to RF input isolation		30			dB
Input impedance	LNA1800IN = 1900 MHz		40 – j10		Ω

Gain:
     High gain (RF210A and RF210B)
     Low gain (8 dB attenuation, RF210A)
     Low gain (16 dB attenuation, RF210B)
     Gain variation vs. Frequency
     Gain step tracking error
	GAINSEL = 0
	 GAINSEL = 1
	 GAINSEL = 1
			19
			 11
			 3
			 0.5
				
				1
				0.5
					dB
					 dB
					 dB
					 dB
					 dB

Noise figure:
 	
   High gain (19 dB gain, RF210A and RF210B)
 	
   Low gain (11 dB gain, RF210A)
   Low gain (3 dB gain, RF210B)
   High gain (19 dB gain, RF210A and RF210B)
   (Note 3)
	No blocker,
	 GAINSEL = 0
	 GAINSEL = 1
	 GAINSEL = 1
	 –22 dBm blocker,
	 GAINSEL = 0
			
			3.5
			9.0
			15
			
			4.1
				
				4.5
				11
				16
					
					dB
					dB
					dB
					
					dB

Input 1 dB compression point		–24			dBm
Input third order intercept point		–17			dBm
IF shunt resistance/side		400	500	600	Ω
Spurious response (Note 2): 2(RF) x 2(LO) and 3(RF) x 3(LO)	Interferer = –65 dBm		 –53		 dB
Image rejection		35			dB
Control Signals (All Modes)					

Enable (ENA) and gain select (GAINSEL) input voltages:
     V_{IH}
     V_{IL}
		
		1.9
				
				0.8
					
					V
					V

Enable (ENA) and gain select (GAINSEL) input currents:
     I_{IH}
     I_{IL}
		
		–10
			
			20
			–1
				
				100
				0
					
					µA
					µA

Enable time			15		µs
Bandselect switching time			15		µs
Note 1: Assumes 0 dBm @ 915 MHz blocker at the antenna input attenuated by 28 dB.					
Note 2: The rejection is specified with respect to the desired signal gain.					
Note 3: Assumes –12 dBm @ 1785 MHz blocker at the antenna input attenuated by 10 dB.					

Conexant
Proprietary Information and Specifications are Subject to Change

Figure 3. Typical RF210(A/B) Application Circuit

Conexant
Proprietary Information and Specifications are Subject to Change
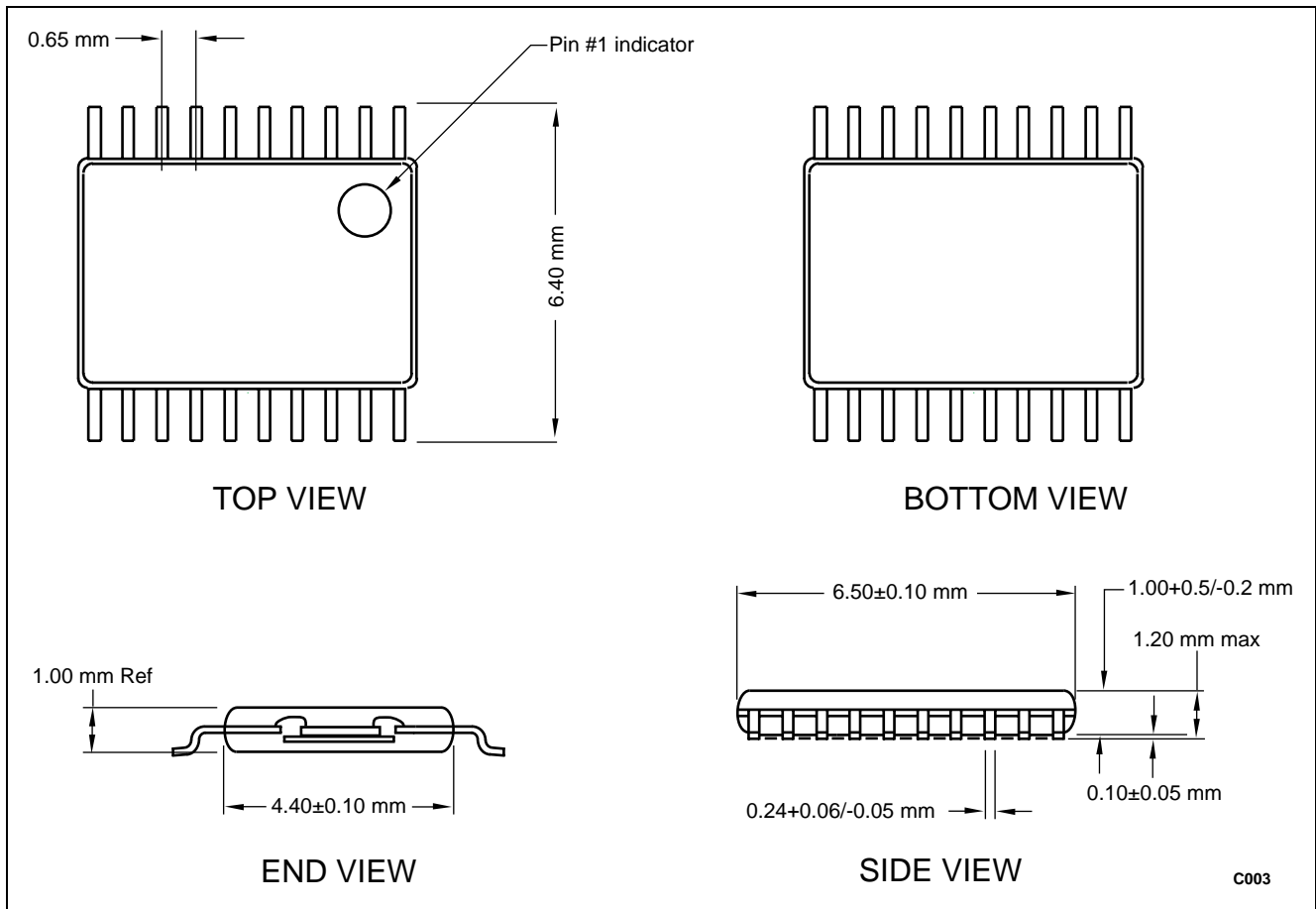
Figure 4. RF210(A/B) Package Dimensions – 20-Pin TSSOP

Notes:
1. Carrier tape material: black conductive polycarbonate
2. Cover tape material: transparent conductive PSA
3. Cover tape size: 9.3 mm width
4. Tolerance: .XX = ±0.10
5. Quantity: 2500 per reel
6. All measurements are in millimeters
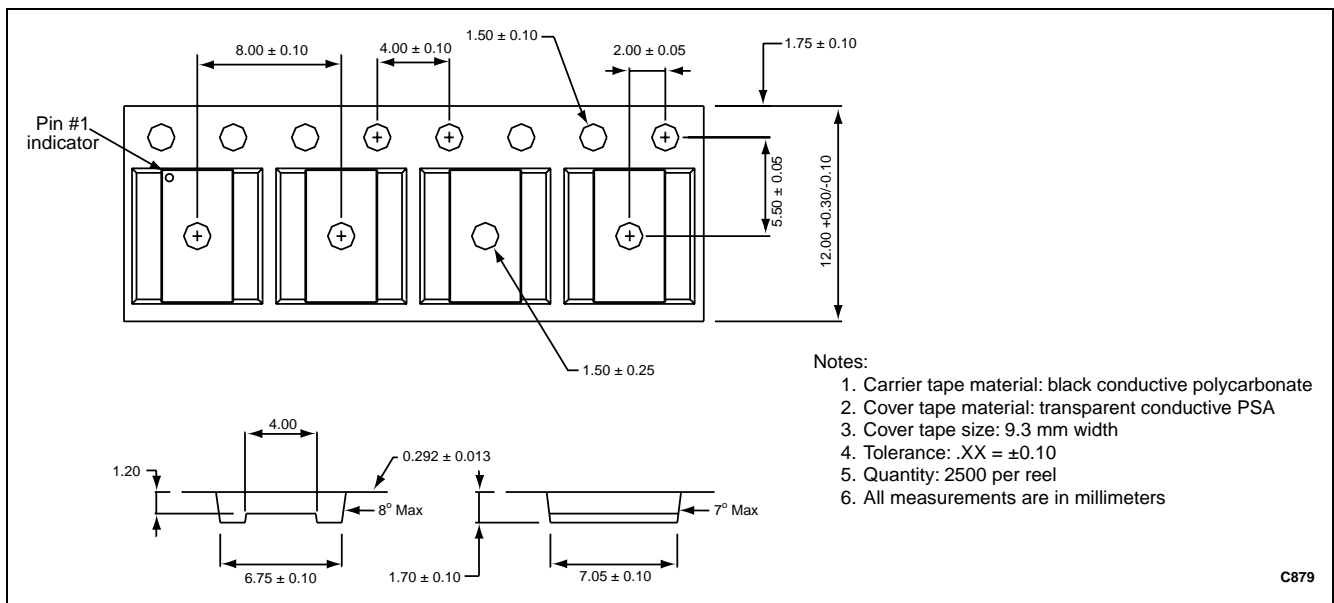
Figure 5. RF210(A/B) Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Product Revision

Dual-Band, Image-Reject Downconverter:
      10 dB switchable gain
      20 dB switchable gain
	RF210A
	RF210B	

Further Information:
literature@conexant.com
1-800-854-8099 (North America)
33-14-906-3980 (International)

Web Site
www.conexant.com

World Headquarters
Conexant Systems, Inc.
4311 Jamboree Road,
P.O. Box C
Newport Beach, CA 92658-8902
Phone: (949) 483-4600
Fax: (949) 483-6375

U.S. Florida/South America
Phone: (727) 799-8406
Fax: (727) 799-8306

U.S. Los Angeles
Phone: (805) 376-0559
Fax: (805) 376-8180

U.S. Mid-Atlantic
Phone: (215) 244-6784
Fax: (215) 244-9292

U.S. North Central
Phone: (630) 773-3454
Fax: (630) 773-3907

U.S. Northeast
Phone: (978) 367-3200
Fax: (978) 256-6868

U.S. Northwest/Pacific West
Phone: (408) 249-9696
Fax: (408) 249-7113

U.S. South Central
Phone: (972) 733-0723
Fax: (972) 407-0639

U.S. Southeast
Phone: (919) 858-9110
Fax: (919) 858-8669

U.S. Southwest
Phone: (949) 483-9119
Fax: (949) 483-9090

APAC Headquarters
Conexant Systems Singapore,
Pte. Ltd.
1 Kim Seng Promenade
Great World City
#09-01 East Tower
Singapore 237994
Phone: (65) 737 7355
Fax: (65) 737 9077

Australia
Phone: (61 2) 9869 4088
Fax: (61 2) 9869 4077

China
Phone: (86 2) 6361 2515
Fax: (86 2) 6361 2516

Hong Kong
Phone: (852) 2 827 0181
Fax: (852) 2 827 6488

India
Phone: (91 11) 692 4780
Fax: (91 11) 692 4712

Korea - Seoul Office
Phone: (82 2) 565 2880
Fax: (82 2) 565 1440

Korea - Taegu Office
Phone: (82 53) 745 2880
Fax: (82 53) 745 1440

Europe Headquarters
Conexant Systems France
Les Taissounieres B1
1681 Route des Dolines
BP 283
06905 Sophia Antipolis Cedex
France
Phone: (33 1) 41 44 36 50
Fax: (33 1) 93 00 33 03

Europe Central
Phone: (49 89) 829 1320
Fax: (49 89) 834 2734

Europe Mediterranean
Phone: (39 02) 9317 9911
Fax   (39 02) 9317 9913

Europe North
Phone: (44 1344) 486 444
Fax: (44 1344) 486 555

Europe South
Phone: (33 1) 41 44 36 50
Fax: (33 1) 41 44 36 90

Middle East Headquarters
Conexant Systems Commercial
(Israel) Ltd.
P.O. Box 12660
Herzlia 46733
Israel
Phone: (972 9) 952 4064
Fax: (972 9) 951 3924

Japan Headquarters
Conexant Systems Japan Co., Ltd.
Shimomoto Building
1-46-3 Hatsudai,
Shibuya-ku
Tokyo, 151-0061
Japan
Phone: (81 3) 5371 1567
Fax: (81 3) 5371 1501

Taiwan Headquarters
Conexant Systems, Taiwan Co.,
Ltd.
Room 2808
International Trade Building
333 Keelung Road, Section 1
Taipei 110
Taiwan, ROC
Phone: (886 2) 2720 0282
Fax: (886 2) 2757 6760

C O N E X A N T™
What's next in communications technologies™