Preliminary Data Sheet
July 1995

AT&T Microelectronics

W2005
1 GHz to Baseband FM and DQPSK Cellular Receiver

Features

- 800 MHz to 1 GHz RF-IF mixer
- Proven double conversion architecture:
  — First IF capability: 10 MHz to over 200 MHz
  — Second IF capability: 0.2 MHz to 2.0 MHz
- Dual second intermediate frequency (IF) amplifiers and demodulators:
  — Analog FM limiting amplifier and FM quadrature detector
  — Digital DQPSK linear AGC amplifiers with dual mixer I & Q quadrature demodulator
- Accurate on-board local oscillator phase splitter for digital quadrature demodulator
- Four enable/powerdown modes, selectable from two digital control pins, allow operation with minimum supply current
- Low supply current
- Analog RSSI available
- Analog AGC for digital-mode IF amplifiers
- Over 130 dB combined gain

Applications

- IS54 (North American dual-mode) Cellular Radio Portable and Mobile Terminals
- Cellular radio base stations
- Digital satellite communications
- Multisymbol signaling receivers

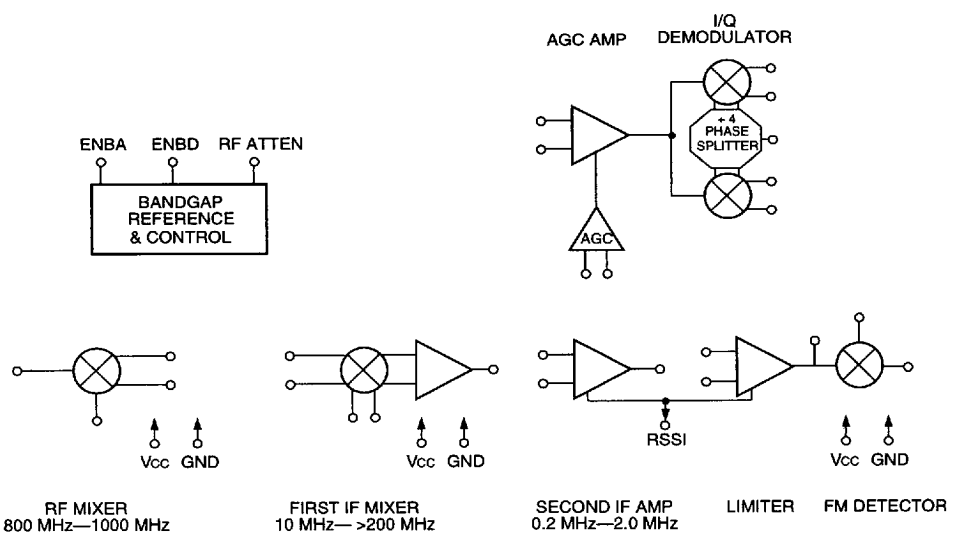

Figure 1. General Block Diagram

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Description

The W2005 FM and DQPSK Cellular Receiver is a monolithic integrated circuit that provides most of the receive-path functions required to meet the IS54 standard. The W2005 converts FM or digitally modulated RF carriers at 800 MHz to 1 GHz and provides required IF gain and separate baseband detectors for the two modulation modes. The W2005 is suited for application in mobile and hand-held cellular telephones designed to the IS54 (North American), Japanese, and other digital personal-communications standards.

The W2005 is organized into four subfunctions (see Figure 2): RF mixer/attenuator, first IF mixer/amplifier, analog section, and digital section (note that the electrical specification tables correspond to each subfunction). Each section has a buffered output to allow for external filtering, which also provides flexibility in system-architecture selection. The RF mixer/attenuator section accepts an RF signal from an external LNA and filter. The RF mixer provides either 9 dB single-ended output gain or 18 dB attenuation, and the mixer provides conversion to the first IF. A differential pair of open-collector outputs is provided for off-chip filtering between the RF mixer/attenuator and first IF mixer/amplifier input. The first IF mixer/amplifier in this section provides 26 dB of fixed gain with an input matching network (power gain = 17 dB). The first IF mixer provides further conversion down to the 0.2 MHz to 2.0 MHz range, which allows the use of inexpensive ceramic filters at two points in the signal path. After the first IF mixer, there is a 40 dB amplifier that may be used for both digital and analog signals or with analog signals only. In the second IF sections, the signal path may be split between two parallel amplifier/demodulator sections with separate outputs. Analog signals are handled by a 60 dB limiting amplifier and an FM quadrature detector. Digital signals are amplified by a 85 dB AGC amplifier and demodulated in double-balanced mixers, which are fed with 90° phase-separated local-oscillator (LO) signals generated by an accurate internal phase shifter.

A pair of logic inputs allows the device four modes of operation: a powerdown mode consumes less than 100 µA of supply current; one of two partially enabled modes allows analog or digital operation only; or a fully enabled mode allows the use of analog RSSI while in digital receive mode.

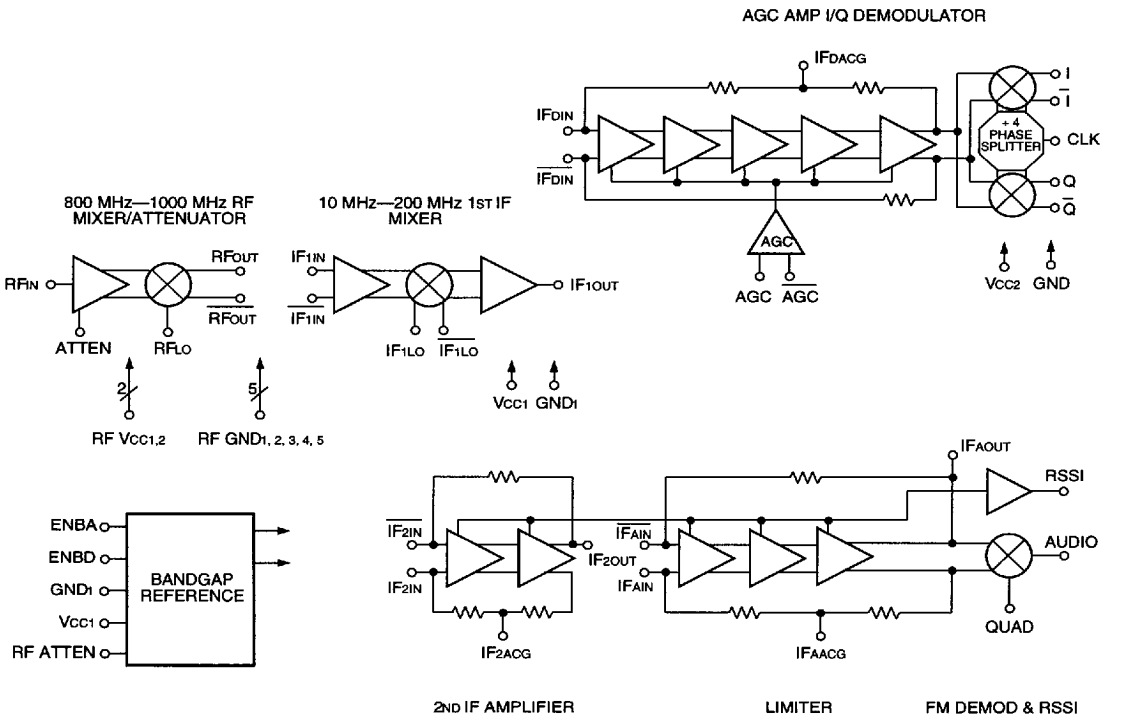


Figure 2. Detailed Block Diagram

Pin Information

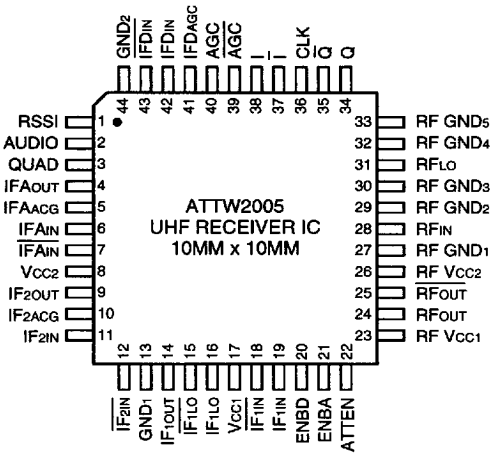


Figure 3. Pin Diagram

Table 1. Pin Descriptions

Pin	Symbol	Name/Description
1	RSSI	**Received Signal Strength Indicator.** Provides logarithmic (dB-linear) dc output voltage.
2	AUDIO	**Audio Output.** From FM detector; capacitively couple to load.
3	QUAD	**Quad Input.** Input to FM detector from filter which is parallel resonant near second IF center frequency and has a Q factor approximately equal to ten.
4	IFAOUT	**Analog Output.** Output of analog section limiting amplifiers; couple to quad coil and pin 3 (QUAD) with 10 pF capacitor.
5	IFAACG	**Analog Signal Ground.** Signal ground for analog section limiting amplifier; connect to ground with 0.1 µF capacitor.
6, 7	IFAIN $\overline{\text{IFAIN}}$	**Analog Mode Limiter Input.** Differential inputs to analog IF limiting amplifier; to be directly coupled to dielectric sources such as ceramic filters (capacitively couple to ground or sources with a dc level on the output).
8	VCC2	**Second IF Power Supply.** Positive power supply connection for both analog and digital second IF amplifiers and demodulators.
9	IF2OUT	**Second IF Output.** Output of 40 dB second IF amplifier; to be directly coupled to dielectric loads such as ceramic filters (capacitively couple to loads with a dc level on the input).
10	IF2ACG	**Second IF Signal Ground.** Signal ground for 40 dB second IF amplifier; connect to ground with 0.1 µF capacitor.
11, 12	IF2IN, $\overline{\text{IF2IN}}$	**Second IF Inputs.** Differential inputs to 40 dB second IF amplifier; to be directly coupled to dielectric sources such as ceramic filters (capacitively couple to ground or sources with a dc level on the output).
13	GND1	**First IF Mixer Ground.** Power supply (dc) ground for first IF mixer section.
14	IF1OUT	**First IF Mixer Output.** Output of first IF mixer/amplifier section; to be directly coupled to dielectric loads such as ceramic filters (capacitively couple to loads with a dc level on the input).

Pin Information (continued)

Table 1. Pin Descriptions (continued)

Pin	Symbol	Name/Description
15, 16	$\overline{IF_{1LO}}$, IF_{1LO}	**First IF Mixer LO Inputs.** Differential inputs to first IF mixer local oscillator; to be capacitively coupled to ground or source.
17	V_{CC1}	**First IF Mixer Power Supply.** Positive power supply connection for first IF mixer/amplifier section.
18, 19	$\overline{IF_{1IN}}$, IF_{1IN}	**First IF Mixer Inputs.** Differential inputs to first IF mixer/amplifier section; to be ac coupled to ground or source.
20	ENBD	**Enable Digital Mode.** Positive logic enable connection for digital mode operation (see Table 2).
21	ENBA	**Enable Analog Mode.** Positive logic enable connection for analog mode operation (see Table 2).
22	ATTEN	**RF Attenuation.** Positive logic enable connection for RF attenuator (see Table 2).
23, 26	RFV_{CC1}, RFV_{CC2}	**RF Power Supply.** Positive power supply connections for RF mixer/amplifier section.
24, 25	RF_{OUT}, $\overline{RF_{OUT}}$	**RF Outputs.** Differential outputs of RF mixer/amplifier; collector leads to be capacitively coupled to load; inductively or directly coupled to Vcc.
27, 29, 30, 32, 33	$RFGND_1$, $RFGND_2$, $RFGND_3$, $RFGND_4$, $RFGND_5$	**RF Ground.** Negative power supply connection for RF mixer/amplifier section.
28	RF_{IN}	**RF Input.** RF mixer/amplifier input; to be capacitively coupled.
31	RF_{LO}	**RF LO Input.** RF mixer local-oscillator input; to be capacitively coupled.
34, 35	Q, $\overline{Q}$	**Q Outputs.** Differential outputs from Q mixer of quadrature demodulator; to be capacitively coupled to load.
36	CLK	**Clock Input.** Local oscillator (clock) input to quadrature demodulator phase shifter; to be capacitively coupled. Input frequency must be four times second IF center frequency.
37, 38	$\overline{I}$, I	**I Outputs.** Differential outputs from I mixer of quadrature demodulator; to be capacitively coupled to load.
39	$\overline{AGC}$	**Automatic Gain Control—Reference.** Negative half of differential AGC control input; to be connected to differential dc source or dc reference voltage between 2.1 Vdc and 2.9 Vdc.
40	AGC	**Automatic Gain Control.** Positive half of differential AGC control input; to be connected to differential dc source or dc control voltage varied up to 0.7 Vdc above or below voltage at $\overline{AGC}$.
41	IFD_{ACG}	**Digital Signal Ground.** Signal ground for digital section linear AGC amplifier; connect to ground with 0.1 µF capacitor.
42, 43	IFDIN $\overline{IFDIN}$	**Digital Second IF Inputs.** Differential inputs to digital section AGC amplifier; to be directly coupled to dielectric sources such as ceramic filters (capacitively couple to ground or sources with a dc level on the output).
44	GND2	**Second IF Ground.** Power supply ground for both analog and digital second-IF amplifier and demodulator sections.

Pin Information (continued)

Table 2. Digital Control Pin Truth Table

Control Pin			Mode/Function
ENBA	ENBD	ATTEN	
LOW	LOW	—	**Powerdown.** All receive circuits powered down; supply current < 100 µA.
LOW	HIGH	—	**Digital Receive.** All circuits active except 60 dB limiting second IF amp, RSSI, and FM quadrature detector.
HIGH	LOW	—	**Analog/FM Receive.** All circuits active except AGC amplifiers and I and Q quadrature demodulators.
HIGH	HIGH	—	**All Active.** All receive circuits functional, e.g., digital mode I and Q demodulator used with analog RSSI.
—	—	HIGH	**RF Mixer Low Gain.** –18 dB.
—	—	LOW	**RF Mixer High Gain.** 9 dB (single-ended output).

Absolute Maximum Ratings

Stresses in excess of the Absolute Maximum Ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to Absolute Maximum Ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Ambient Operating Temperature	T_A	–35	100	°C
Storage Temperature	T_{stg}	–65	150	°C
Lead Soldering Temperature/Time	T_L	—	300/10	°C/s
Positive Supply Voltage	V_{CC}	—	6.0	Vdc
Power Dissipation	P_D	—	650	mW
ac Peak-to-Peak Input Voltage	—	—	Vcc	Vp-p
Enable Input Voltage	V_{ENB}	—	Vcc	V

Handling Precautions

Electrostatic Discharge Caution

This device may be damaged by electrostatic discharge (ESD) over 200 V (over 50 V for RF output pins). Protective measures should be taken during handling.

Operating Ranges

The W2005 provides substantial useful functionality over a wide range of operating conditions. Performance over these ranges may vary for one or more of the parameters specified in the Electrical Specifications Table.

Parameter	Min	Max	Units
Supply Voltage	4.0	5.5	Vdc
RF Mixer/Attenuator Section:			
RF Frequency Range	<400	≥1800	MHz
LO Frequency Range	<400	≥1800	MHz
LO Input Power Range	–10	6	dBm/50 Ω
First IF Mixer/Amplifier Section:			
Input Frequency Range	10	1000	MHz
LO Input Level Range	–10	6	dBm/50 Ω
LO Frequency	10	1000	MHz
Digital Second IF Amplifier, AGC, Quadrature Demodulator Section:			
Second IF Frequency	0.1	4	MHz
Quadrature Demodulator LO (CLK) Frequency	0.4	16	MHz
CLK Input Level	–10	6	dBm/50 Ω
Analog Second IF Amplifier Frequency	0.1	4	MHz
Ambient Operating Temperature Range	–35	85	°C

Electrical Specifications

Table 3. dc and Logic Parameters

The following conditions apply to all specifications, unless otherwise listed: T_A = +25 °C, V_{CC} = 4.75 V to 5.25 V, V(LO) = –6 dBm to +3 dBm/50 Ω, RF = 800 MHz to 1000 MHz, IF1 = 10 MHz to 200 MHz, IF2 = 0.2 MHz to 2 MHz.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Current:	I_{CC}				
Fully Enabled		—	21	27	mA
Analog-only Mode		—	19	—	mA
Digital-only Mode		—	18	—	mA
Sleep Mode		—	0.5	100	µA
Enable Input:					
Logic-high Voltage	V_{IHMIN}	3.1	—	—	Vdc
Logic-low Voltage	V_{ILMAX}	—	—	0.7	Vdc
Logic-low Current	I_{ILMAX}	—	—	10	µA
Logic-high Current	I_{IHMAX}	—	—	250	µA
Attenuator Input-high Current	—	—	110	300	µA
Enable Time (external capacitor dependent)	—	—	30	—	µs

Table 4. RF Mixer/Attenuator Section

Parameter	Min	Typ	Max	Unit
Current Consumption	—	12	—	mA
Power Gain (single-ended output):				
High Mode	—	9	—	dB
Low Mode (some LO level dependence)	—	–18	—	dB
Noise Figure (differential output)	—	11.5	—	dB

Electrical Specfications (continued)

Table 4. RF Mixer/Attenuator Section (continued)

Parameter	Min	Typ	Max	Unit
RF Input Impedance @ 881 MHz	—	45 – j15	—	Ω
RF LO Input Impedance	—	400 II 2	—	Ω II pF
Output Impedance	—	3600 II 4	—	Ω II pF
IP3 (referred to input)	0	5.5	—	dBm
LO VSWR Variation (after nominal match to 1.0)	—	1.4	—	—
LO Suppression at Input	—	20	—	dB

Table 5. First IF Mixer/Amplifier Section

IF deviation ≤ 0.5 MHz.

Parameter	Min	Typ	Max	Unit
Voltage Gain (with input matching network from 200 Ω source)	—	26	—	dB
Power Gain	—	17	—	dB
Gain Flatness within IF Deviation	—	±0.2	—	dB
Noise Figure at IF Input (double sideband)	—	10	—	dB
1 dB Compression Point at 50 Ω Matching Network Input	—	–30	—	dBm/50 Ω
IP3 at 50 Ω Matching Network Input	—	–20	—	dBm/50 Ω
IF Input Impedance	—	5 II 2	—	kΩ II pF
LO Input Impedance	—	4 II 2	—	kΩ II pF
IF Output Impedance	—	1.5	—	kΩ
LO Suppression at IF Input (relative to LO input level)	—	40	—	dB

Table 6. Analog Second IF Amplifier, Limiter, RSSI, FM Detector Section

R_L = 10 kΩ; filter Z_{IN} = Z_{OUT} = 1.5 kΩ; 18 dB attenuation between 40 dB amplifier output and 60 dB limiting amplifier input; 1 kHz FM at 8 kHz deviation; IF filter bandwidth = 28 kHz.

Parameter	Min	Typ	Max	Unit
IF Gain (net)	—	100	—	dB
RSSI Range of Input Signal	—	90	—	dB
RSSI Output Voltage Range	1.3	—	2.3	Vdc
RSSI Linearity	—	±1.5	—	dB
RSSI Transfer Function	—	7	—	mV/dB
IF Input Impedance (both stages)	—	1.5	—	kΩ
Output Impedance (40 dB amplifier)	—	1500	—	Ω
Output Impedance (60 dB limiter)	—	150	—	Ω
FM Detector Input Impedance (Quad., pin 3)	—	40	—	kΩ
Audio Output Impedance	—	300	—	Ω
Audio Output Amplitude (Q (Quad.) ≥ 10)	100	—	—	mVrms
Audio SINAD for RF Signal –50 dBm, (Q (Quad.) = 10, C-message weighting)	35	—	—	dB

Electrical Specifications (continued)

Table 6. Analog Second IF Amplifier, Limiter, RSSI, FM Detector Section (continued)

R_L = 10 kΩ; filter Z_{IN} = Z_{OUT} = 1.5 kΩ; 18 dB attenuation between 40 dB amplifier output and 60 dB limiting amplifier input; 1 kHz FM at 8 kHz deviation; IF filter bandwidth = 28 kHz.

Parameter	Min	Typ	Max	Unit
Noise Figure (from 40 dB amplifier input to FM detector audio output)	—	10	—	dB
IP3 of 40 dB Amplifier Section (at the output)	—	2	—	dBm

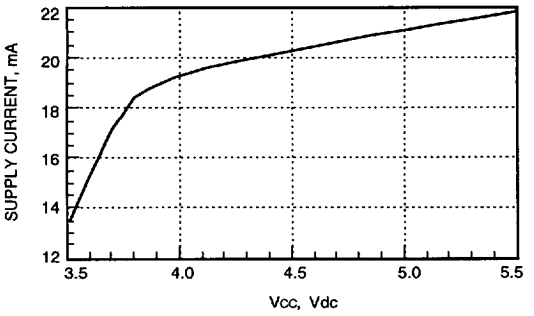
Table 7. Digital Second IF Amplifier, AGC, Quadrature Demodulator Section

R_L = 10 kΩ; V_{CLK} = –3 dBm/50 Ω ± 3 dB; IF deviation ≤ 0.5 MHz; differential I or Q output; $V_{\overline{AGC}}$ = 2.5 Vdc.

Parameter	Min	Typ	Max	Unit
IF Input Impedance	—	1.5	—	kΩ
CLK Input Impedance @ 1.8 MHz	—	20 ll 4	—	kΩ ll pF
IF Amplifiers Gain (differential output): Maximum (30 kHz channel) Minimum	 — —	 80 10	 — —	 dB dB
Demodulator Gain	—	0	—	dB
Baseband Bandwidth (–3 dB)	—	130	—	kHz
AGC Input Impedance: AGC or $\overline{AGC}$	—	500	—	kΩ
AGC Input Common-mode Range	2.1	—	2.9	Vdc
AGC Control Voltage Range	—	±0.6	—	Vdc
AGC Transfer Function	—	14	—	mV/dB
I and Q Phase Accuracy	–2	0.2	2	°
I and Q Amplitude Mismatch	–0.2	±0.05	0.2	dB
I and Q Maximum Output Swing (differential)	0.5	—	—	Vp-p
I and Q Common-mode Voltage (as a function of Vcc)	—	0.97Vcc – 1.2	—	Vdc
IP3 at Output (I or Q, differential, equivalent voltage)	—	10	—	dBm/50 Ω
1 dB Compression Point (I or Q, differential, at output)	—	–2	—	dBm/50 Ω
Noise Figure @ IF Input, Referred to Half-channel Baseband Bandwidth	—	15	—	dB

Characteristic Curves

Unless otherwise noted, the following measurement conditions apply: standard evaluation board used; Vcc = 5.0 Vdc; room temperature; RF = 883.16 MHz + baseband; RFLO = 966.32 MHz at –4 dBm/50 Ω; IFLO = 82.705 MHz at –3 dBm/50 Ω; CLK = 1.82 MHz at –3 dBm/50 Ω; baseband digital mode = 1 kHz tone; baseband analog mode = 1 kHz tone, 8 kHz deviation.



Note: Both analog and digital modes enabled; no signal input.

Figure 4. Supply Current vs. Supply Voltage

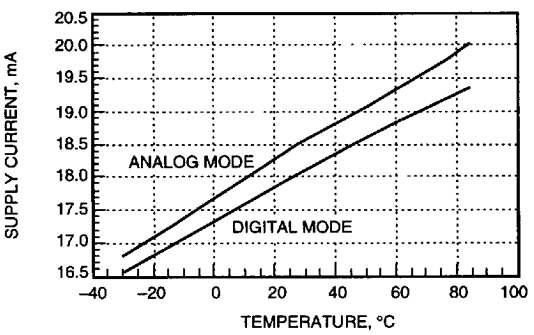


Figure 5. Supply Current vs. Temperature

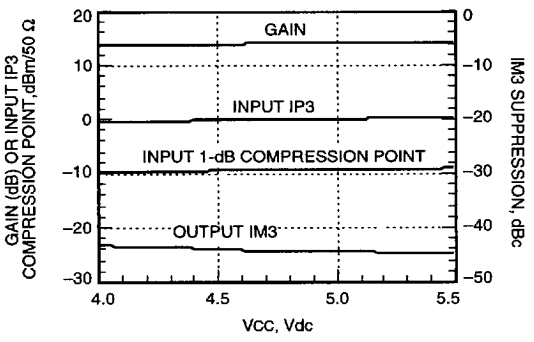


Figure 6. First IF Mixer Gain, IP3, Compression Point and IM3 vs. Vcc

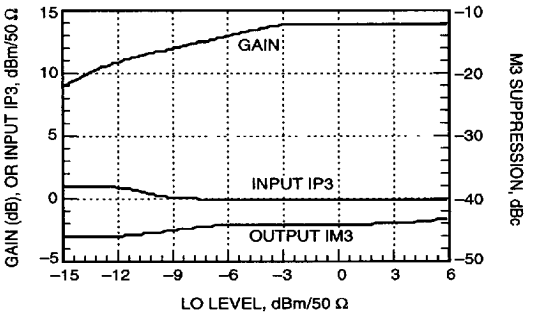


Figure 7. First IF Mixer Gain, IP3, and IM3 vs. LO Level

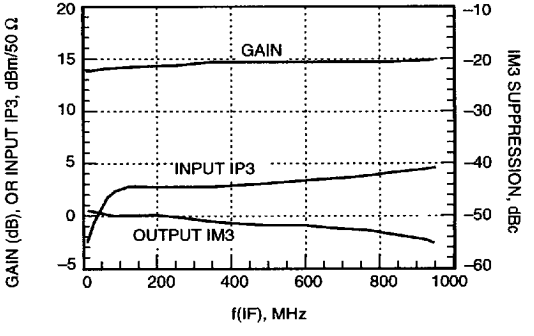


Figure 8. First IF Mixer Gain, IP3, and IM3 vs. f(IF)

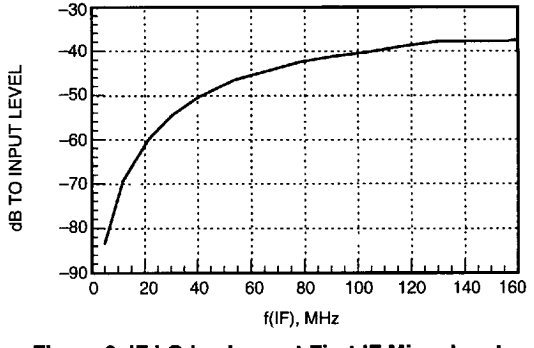


Figure 9. IF LO Leakage at First IF Mixer Input

Characteristic Curves (continued)

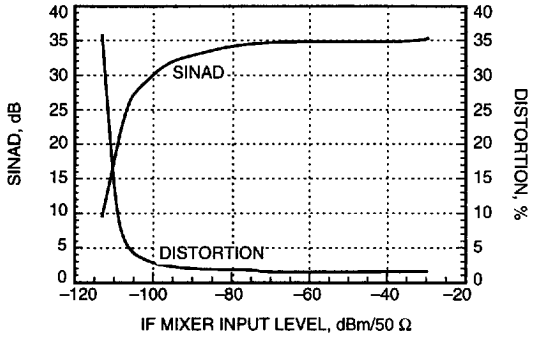


Figure 10. Audio Sinad and Distortion vs. IF Mixer Matching Network Input Level

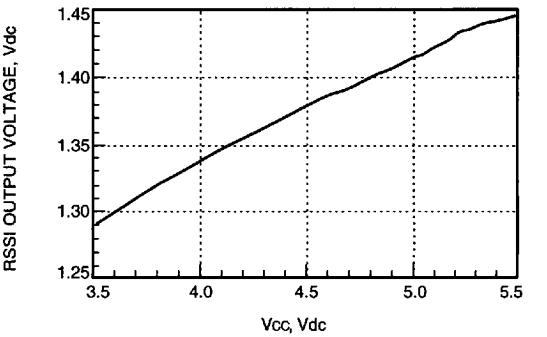


Figure 13. RSSI Output Voltage vs. Supply Voltage

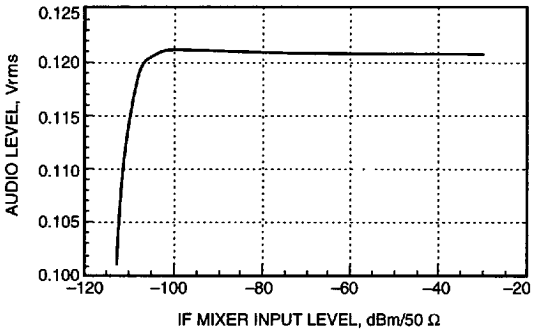


Figure 11. Audio Output Level vs. IF Mixer Matching Network Input Level

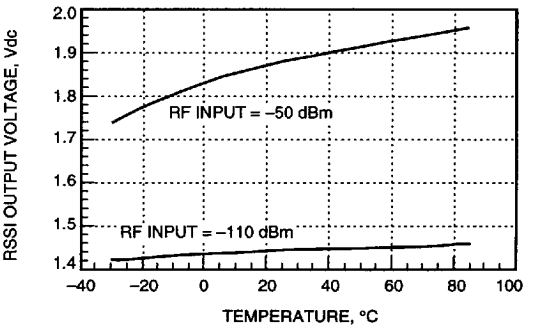


Figure 14. RSSI Output Voltage vs. Temperature

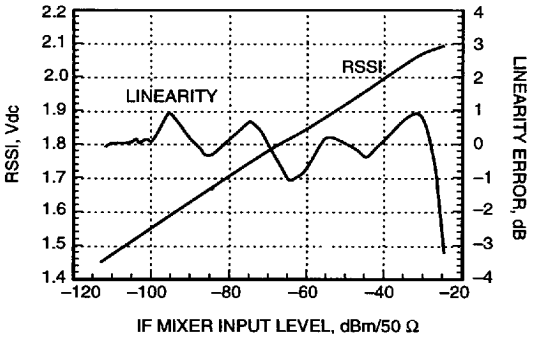


Figure 12. RSSI Output and Linearity vs. Level @ IF Mixer Matching Network Input

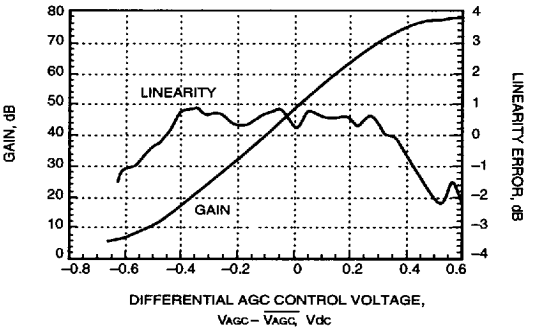
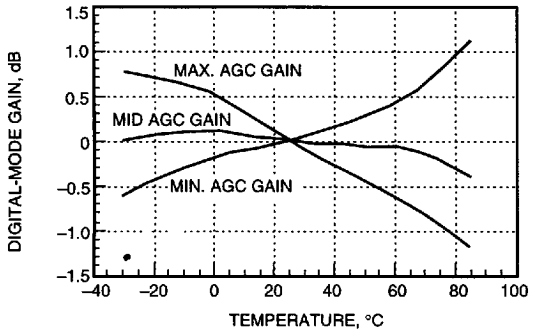


Figure 15. AGC Gain and Linearity vs. Differential Control Voltage

Characteristic Curves (continued)



Note: Gain normalized to 25 °C; attenuator off.

Figure 16. Normalized Digital-Mode Gain vs. Temperature

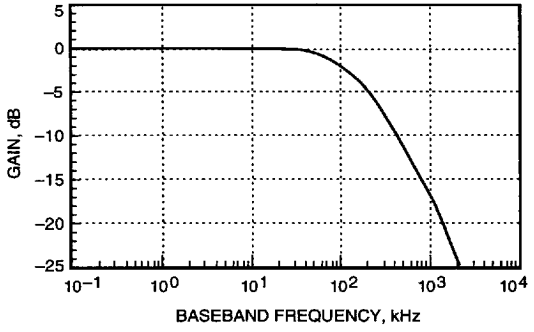
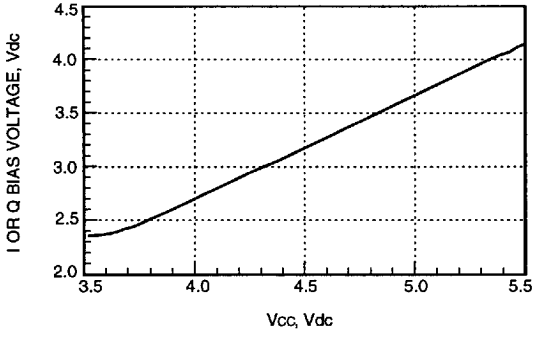


Figure 17. I/Q Gain-Bandwidth Normalized to 1 kHz



Note: Both analog and digital modes enabled; no signal input.

Figure 18. I/Q Output Bias Voltage vs. Vcc

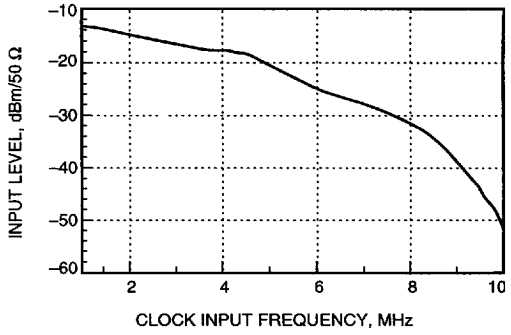


Figure 19. Minimum CLK Level vs. CLK Frequency

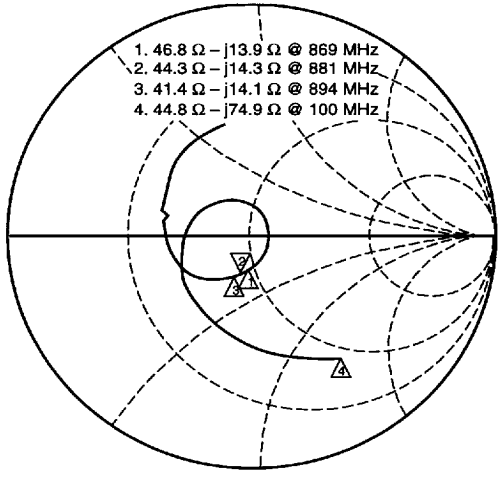


Figure 20. RF Input Impedance (100 MHz—1200 MHz)

Characteristic Curves (continued)

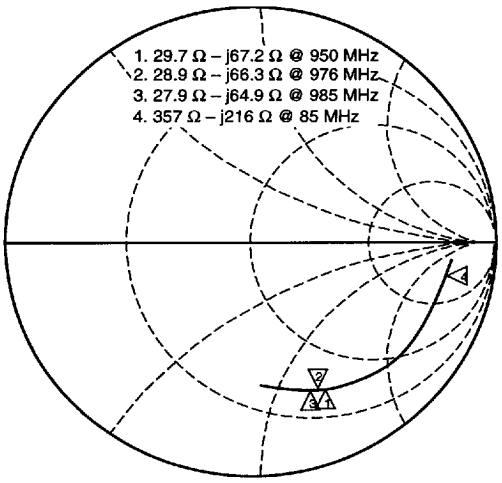


Figure 21. RF LO Input Impedance (50 MHz—1 GHz)

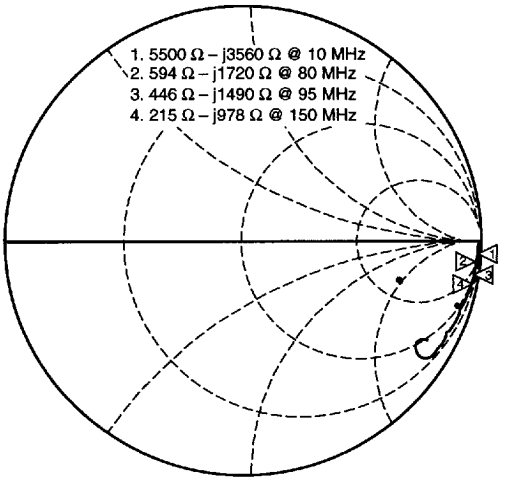


Figure 23. First IF Mixer Input Impedance (1 MHz—1 GHz)

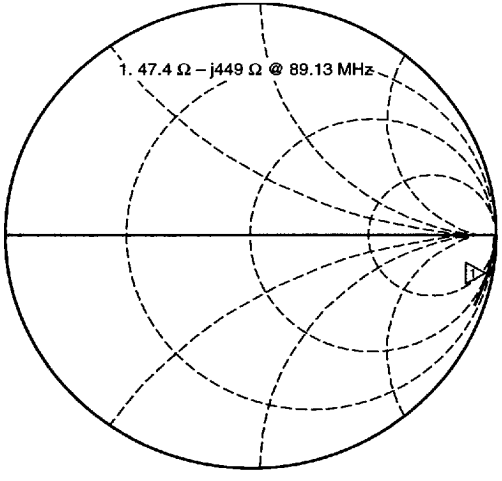


Figure 22. RF Mixer Output Impedance (50 MHz—1.2 GHz)

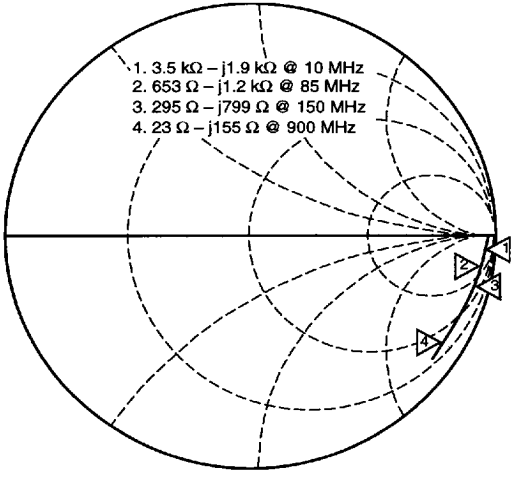


Figure 24. First IF Mixer LO Input Impedance (10 MHz—1 GHz)

Level Charts

Table 8. W2005 Dual-Mode Receiver IC Level Chart—Analog Mode

Matching and proper terminations are assumed. RF mixer assumed to use differential output (LC, no transformer).

					W2005		W2005		W2005		W2005	
Signal Path	**ANT**	**D.F.**	**LNA**	**RFF**	**RFM**	**SAW**	**IFM**	**CF1**	**40dB**	**CF2**	**LIM**	**Unit**
Minimum Analog Mode Signal Sensitivity (IS55 requirement –116 dBm)												
Wanted signal level	–117.00	–121.0	–106.8	–111.3	–101.3	–96.3	–74.3	–80.3	–34.3	–52.3	13.7	dBm
Gain each	—	–4.0	14.2	–4.5	10.0	–5.0	17.0	–6.0	46.0	–18.0	66.0	dB
Noise each	—	4.0	2.0	4.5	13.0	5.0	10.0	6.0	10.0	18.0	10.0	dB
System noise at ANT	—	4.0	6.0	6.2	9.7	9.7	10.0	10.0	10.1	10.1	10.1	dB
IP3 each	—	40.0	–8.0	10.0	3.0	10.0	–20.0	10.0	NA	NA	NA	dBm
System IP3 at ANT	—	40.0	–4.0	–5.5	–7.3	–9.6	–30.7	–31.0	NA	NA	NA	dBm
Input sensitivity (12 dB SINAD)	—	–122.1	–120.1	–119.9	–116.4	–116.4	–116.0	–116.0	–116.0	–116.0	–116.0	dBm
Typical Component Performance (compare to worst case, see above)												
Wanted signal level	–117.00	–120.0	–107.0	–110.0	–97.5	–91.0	–68.2	–72.7	–26.7	–44.7	21.3	dBm
Gain each	—	–3.0	13.0	–3.0	12.5	–3.5	18.0	–4.5	46.0	–18.0	66.0	dB
Noise each	—	3.0	1.5	3.0	11.0	3.5	8.0	4.5	10.0	18.0	10.0	dB
System noise at ANT	—	3.0	4.5	4.7	7.2	7.2	7.3	7.3	7.3	7.3	7.3	dB
IP3 each	—	40.0	–7.0	10.0	5.5	10.0	–20.0	20.0	NA	NA	NA	dBm
System IP3 at ANT	—	40.0	–4.0	–5.5	–6.9	–11.4	–36.0	–36.0	NA	NA	NA	dBm
Input sensitivity (12 dB SINAD)	—	–123.1	–121.6	–121.4	–118.9	–118.9	–118.8	–118.8	–118.7	–118.7	–118.7	dBm

Level Charts (continued)

Table 8. W2005 Dual-Mode Receiver IC Level Chart—Analog Mode (continued)

Matching and proper terminations are assumed. RF mixer assumed to use differential output (LC, no transformer).

					W2005		W2005		W2005		W2005	
Signal Path	**ANT**	**D.F.**	**LNA**	**RFF**	**RFM**	**SAW**	**IFM**	**CF1**	**40dB**	**CF2**	**LIM**	**Unit**
Analog Blocking Signal (IS55 requirement > 60 dB)												
Wanted signal gain	—	–3.50	11.00	–3.00	11.00	–5.00	22.00	–6.00	52.00	–18.00	66.00	dB
Minimum wanted	–113.00	–116.50	–105.50	–108.50	–97.50	–102.50	–80.50	–86.50	–34.50	–52.50	13.50	dBm
Blocking signal gain	—	–3.50	11.00	–3.00	11.00	–32.00	22.00	–35.00	52.00	–48.00	66.00	dB
±60 kHz blocking	–48.00	–51.50	–40.50	–43.50	–32.50	–64.50	–42.50	–77.50	–25.50	–73.50	–7.50	dBm

Notes:
ANT = base of antenna.

D.F. = duplex filter (e.g., Murata, Motorola, Toko).

LNA = low-noise preamplifier (e.g., Motorola, Phillips, NEC).

RFF = RF filter (e.g., Toko, Motorola, Murata, Fujitsu, Hitachi).

RFM = RF mixer (W2005).

SAW = IF channel filter (e.g., Toko, Sawtek, Murata, RF Monolithics).

IFM = first IF mixer (W2005).

CF1 = ceramic channel filter (e.g., Murata).

40dB = 40 dB analog IF amplifier (W2005).

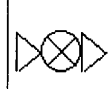
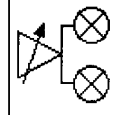
CF2 = L/C or other second IF filter.

LIM = 60 dB limiting analog IF amplifier & FM detector (W2005).

Level Charts (continued)

Table 9. AT&T W2005 Dual-Mode Receiver IC Level Chart—Digital Mode

Matching and proper terminations are assumed.
RF mixer assumed to use differential output (LC, no transformer).

					W2005 		W2005 		W2005 	
Signal Path	**ANT**	**D.F.**	**LNA**	**RFF**	**RFM**	**SAW**	**IFM**	**CF1**	**AGC**	**Unit**
Minimum Digital Signal Path (IS55 requirement 3% BER @ –110 dBm):										
Gain per stage	—	–3.50	11.00	–3.00	11.00	–5.00	22.00	–6.00	80.00	dB
Wanted signal level, dBm/50 Ω	–111.00	–114.50	–103.50	–106.50	–95.50	–100.50	–78.50	–84.50	–4.50	dBm
Very Large Digital Signal:										
Gain per stage	—	–3.50	11.00	–3.00	–18.00	–5.00	22.00	–6.00	23.00	dB
Wanted signal level, dBm/50 Ω	–25.00	–28.50	–17.50	–20.50	–38.5	–43.50	–21.50	–27.50	–4.50	dBm

Notes:
ANT = base of antenna.

D.F. = duplexer filter (e.g., Murata, Motorola, Toko).

LNA = low-noise preamplifier (e.g., Motorola, Phillips, NEC).

RFF = RF filter (e.g., Toko, Motorola, Murata, Fujitsu, Hitachi).

RFM = RF mixer (W2005).

SAW = IF channel filter (e.g., Toko, Sawtek, Murata, RF Monolithics).

IFM = first IF mixer (W2005).

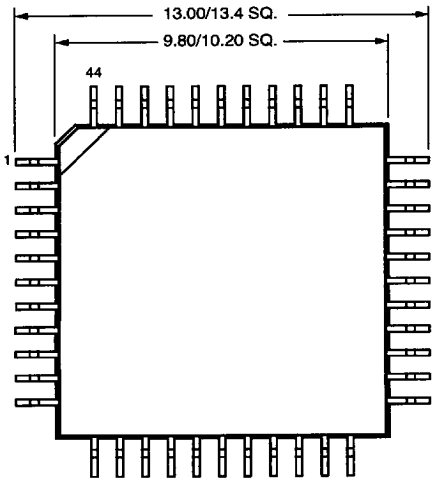
CF = ceramic channel filter (e.g., Murata).

AGC = 12 dB to 87 dB AGC amplifier and quadrature demodulator (W2005).

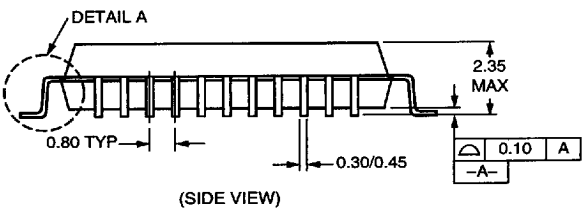
Outline Diagram

44-Pin MQFP

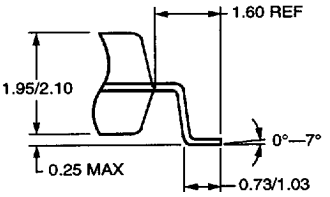
Dimensions are in millimeters.



(TOP VIEW)



(SIDE VIEW)



DETAIL A

Ordering Information

Device Code	Description	Package	Comcode
W2005BBE-DB*	1 GHz to Baseband FM and DQPSK Cellular Receiver	44MQFP	107364218
W2005BBE-DT†	1 GHz to Baseband FM and DQPSK Cellular Receiver	44MQFP	107364226
EVB2005A	Evaluation Board	—	106891377

* Minimum order quantity of 96 pieces in trays.
† Minimum order quantity of 500 pieces on tape and reel.