

AGC IF for GSM/PCS

Description

The CXA3174N is a 4-bit digital control variable gain amplifier suitable for the communications.

Features

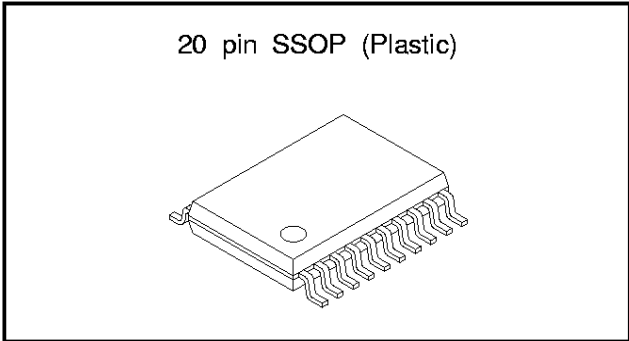
- Gain control amplifier with the wide gain variable range
- Doubler circuit for the LO (local) signal eliminates need for the phase shifter

Functions

- IF signal gain control circuit
- I/Q quadrature demodulator
- Doubler circuit for the LO signal
- Gain control by the 4-bit digital data
- Power saving

Applications

GSM and PCS portable telephones



Absolute Maximum Ratings (Ta = 25 °C)

• Supply voltage	Vcc	14	V
• Operating temperature range	Topr	-35 to +80	°C
• Storage temperature range	Tstg	-65 to +150	°C

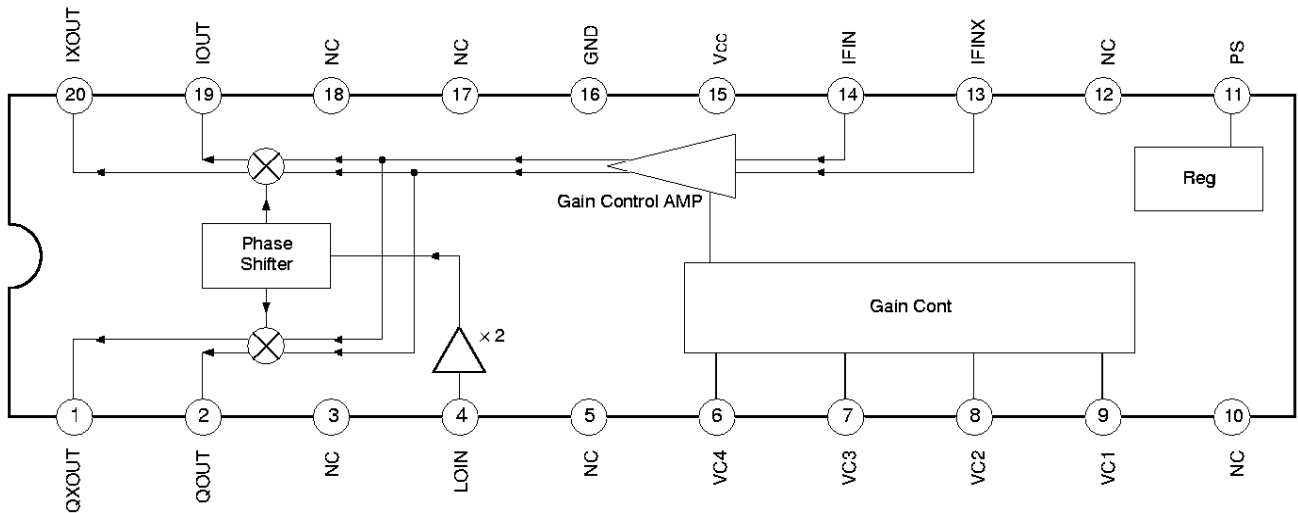
Operating Conditions

Supply voltage	Vcc	2.7 to 3.3	V
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Structure

Bipolar silicon monolithic IC

Block Diagram and Package Outline



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Pin Description

Pin No.	Symbol	Pin voltage	Equivalent circuit	Description
1	QXOUT	1.5 V		Q inverted signal output.
2	QOUT			Q signal output.
19	IOUT			I signal output.
20	IXOUT			I inverted signal output.
3 5 10 12 17 18	NC	—		Not connected.
4	LOIN	1.3 V		Local signal input.
6	VC4	—		AGC control signal input. MSB.
7	VC3			AGC control signal input. 3LSB.
8	VC2			AGC control signal input. 2LSB.
9	VC1			AGC control signal input. LSB.

Pin No.	Symbol	Pin voltage	Equivalent circuit	Description
11	PS	—		Power saving control.
13	IFINX	1.25 V		IF inverted signal input.
14	IFIN			IF signal input.
15	Vcc	—		Power supply.
16	GND	—		Ground.

Electrical Characteristics

V<sub>CC</sub> = 3.0 V, T<sub>a</sub> = 27 °C

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current consumption	I <sub>CC</sub>			10	15	mA
Current consumption for standby	I <sub>CCPS</sub>	PS=0 V		10	100	μA
IF input frequency range	IFINf		5		20	MHz
Maximum gain	G <sub>max</sub>	VC1, 2, 3, 4 = all "Low" *1, *2 Temperature fluctuation : ±2 dB IF input level : -80 dBm (330 Ω conversion)	57	60	63	dB
Minimum gain	G <sub>min</sub>	VC1, 2, 3, 4 = all "High" *1, *2 Temperature fluctuation : ±2 dB IF input level : -20 dBm (330 Ω conversion)	-3	0	-3	dB
Gain variable step	G <sub>step</sub>			4		dB
Gain setting deviation	G <sub>dev</sub>		-3		+3	dB
Gain setting time	G <sub>t</sub>				5	μS
LO input frequency range	LOINf		5		20	MHz
LO input level	LOINv		30	55	80	mV <sub>rms</sub>
I/Q output frequency range	IQf				2000	kHz
I/Q output signal amplitude	IQv	Differential I/Q output amplitude *1, *2 10 kΩ load IF input level : -20 dBm (330 Ω conversion) Gain=0 dB	45	64	91	mV <sub>p-p</sub>
I/Q output maximum amplitude1	IQvmax1	Differential I/Q output amplitude 10 kΩ load Gain=60 dB *2	2.0	2.7		V <sub>p-p</sub>
I/Q output maximum amplitude2	IQvmax2	Differential I/Q output amplitude 10 kΩ load Gain=40 dB *2	2.0	2.4		V <sub>p-p</sub>
I/Q output maximum amplitude3	IQvmax3	Differential I/Q output amplitude 10 kΩ load Gain=20 dB *2	400	480		mV <sub>p-p</sub>
I/Q output maximum amplitude4	IQvmax4	Differential I/Q output amplitude 10 kΩ load Gain=0 dB *2	210	250		mV <sub>p-p</sub>
I/Q output amplitude deviation	IQvdev	Differential I/Q output amplitude *1, *2 10 kΩ load IF input level : -20 dBm (330 Ω conversion) Gain=0 dB	-0.5		0.5	dB

\*1 The IF input level is the value of C4 in the Application Circuit.

\*2 The measured value is for the differential output.

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
I/Q output phase deviation1	IQpdev1	Differential I/Q output *1, *2 10 kΩ load IF input level : -20 dBm (330 Ω conversion) Gain=0 dB LO input level : 30 mVrms	-2.5		2.5	deg
I/Q output phase deviation2	IQpdev2	Differential I/Q output *1, *2 10 kΩ load IF input level : -20 dBm (330 Ω conversion) Gain=0 dB LO input level : 80 mVrms	-2.5		2.5	deg
I/Q output DC voltage	IQvdc		1.4	1.5	1.6	V
I/Q output DC voltage deviation	IQvdcΔ	I-IX, Q-QX Output voltage difference	-30		30	mV
Noise figure1	NF 1	Gain=60 dB			22.5	dB
Noise figure2	NF 2	Gain=20 dB			40	dB
Tertiary intercept point1	IP3 <sub>1</sub>	Gain=60 dB, 330 Ω conversion *1	-49			dBm
Tertiary intercept point2	IP3 <sub>2</sub>	Gain=20 dB, 330 Ω conversion *1	-30			dBm
PS input ON voltage	VpsL		0		0.8	V
Logic input High voltage	VCvH		2.2		V <sub>CC</sub> +0.3	V
Logic input Low voltage	VCvL		0		0.8	V
Logic input resistance	VCr		30			kΩ
LOIN input resistance	LOINr		1.4	2	2.6	kΩ
IFIN input resistance	IFINr	Differential input	1.5	2.2	2.9	kΩ
IFIN input level	IFINv	330 Ω conversion	-90		-10	dBm

### Design Reference

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
LOIN input capacitance	LOINc			2		pF
IFIN input capacitance	IFINc	Differential input		1.2		pF

\*1 The IF input level is the value of C4 in the Application Circuit.

\*2 The measured value is for the differential output.

**Control 1**      Power saving

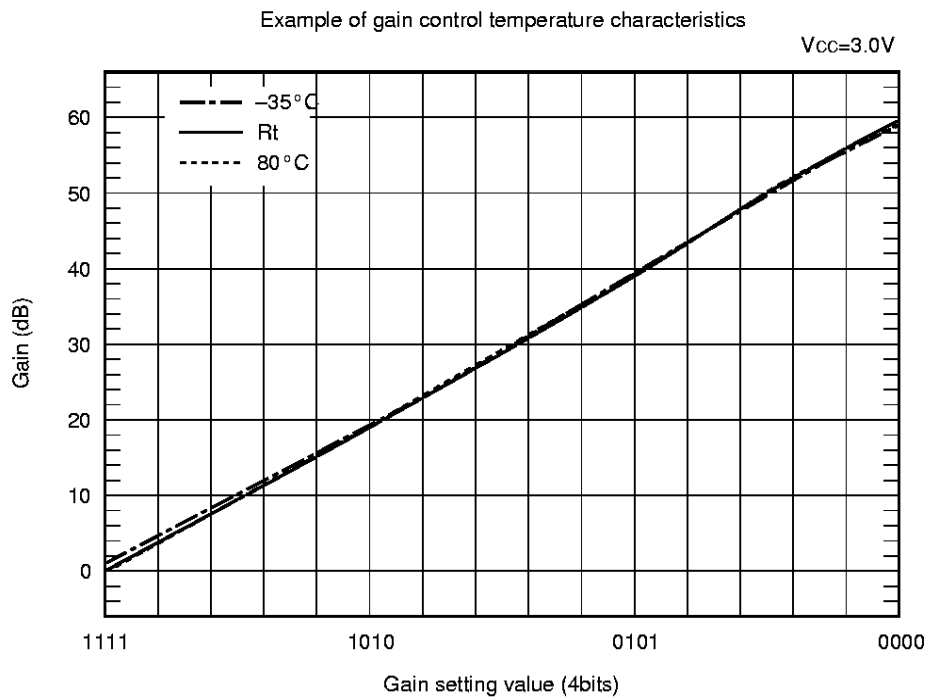
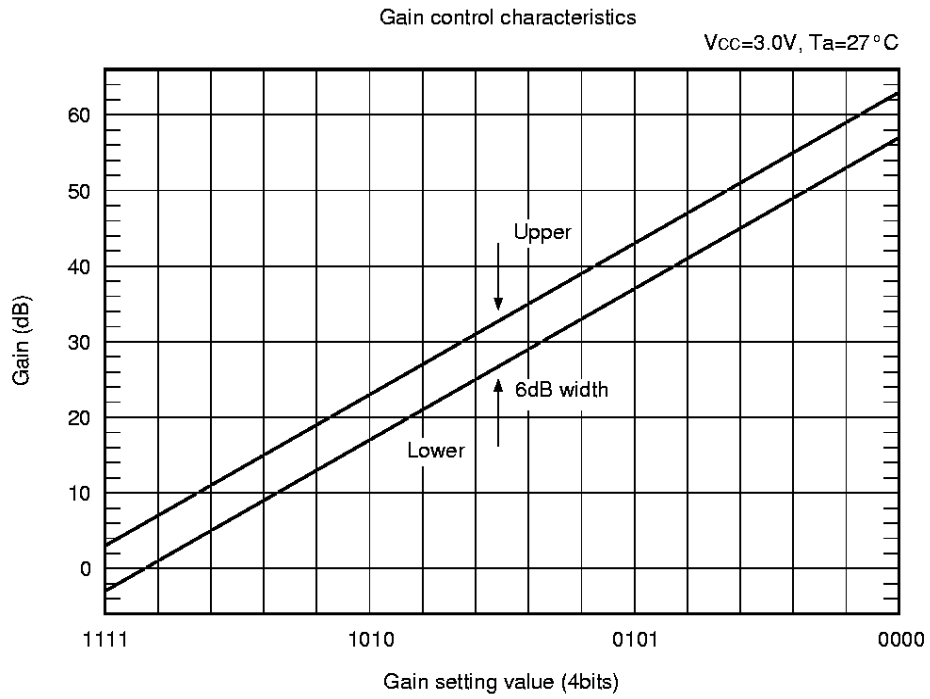
Pin 11 (PS)	Power saving	IC status
H	off	Active
L	on	Sleep

**Control 2**      Gain setting

Pin No.	6	7	8	9	4-bit display	Setting gain (dB)
Symbol	VC4 MSB	VC3 3LSB	VC2 2LSB	VC1 LSB		
MAX	L	L	L	L	"0000"	60
	L	L	L	H	"0001"	56
	L	L	H	L	"0010"	52
	L	L	H	H	"0011"	48
	L	H	L	L	"0100"	44
	L	H	L	H	"0101"	40
	L	H	H	L	"0110"	36
	L	H	H	H	"0111"	32
	H	L	L	L	"1000"	28
	H	L	L	H	"1001"	24
	H	L	H	L	"1010"	20
	H	L	H	H	"1011"	16
	H	H	L	L	"1100"	12
	H	H	L	H	"1101"	8
	H	H	H	L	"1110"	4
MIN	H	H	H	H	"1111"	0

**Note on Operation**

Take care to handle the IC because the electrostatic discharge strength is weak for Pins 6, 7, 8, 9 and 11.



Electrical Characteristics Measurement Circuit

