# AN6105FHN

# Quadrature demodulation IC for CDMA system mobile telephone

### ■ Overview

The AN6105FHN is a quadrature demodulation IC for a CDMA system mobile telephone, incorporating a reception IF for IS-95 and GCA plus quadrature demodulator.

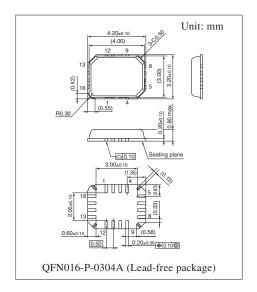
#### ■ Features

Current consumption: 11 mA typ.
Gain control range: +85 dB to -5 dB
High linearity control characteristic: ±3 dB

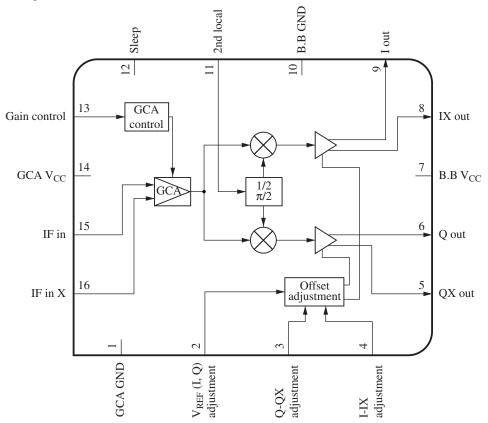
• Temperature dependency: ±3 dB

### Applications

• Cellular telephone (IS-95)



### ■ Block Diagram



### ■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	GND (GCA)	9	I output
2	I, Q output operating point adjustment	10	GND (base band)
3	Q operating point offset adjustment	11	Local signal input
4	I operating point offset adjustment	12	Sleep
5	Q output	13	Gain adjustment
6	Q output	14	Supply voltage (GCA)
7	Supply voltage (base band)	15	Signal input (+)
8	$\overline{f I}$ output	16	Signal input (–)

### Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V <sub>CC</sub>	4.2	V
Supply current	$I_{CC}$	24	mA
Power dissipation *2	$P_{\mathrm{D}}$	100	mW
Operating ambient temperature *1	T <sub>opr</sub>	-30 to +85	°C
Storage temperature *1	$T_{stg}$	-55 to +125	°C

Note) \*1: Except for the operating ambient temperature and storage temperature, all ratings are for  $T_a = 25$ °C.

### ■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V <sub>CC</sub>	2.55 to 4.00	V

### ■ Electrical Characteristics at $T_a = 25$ °C

 $\label{eq:continuous} Unless otherwise specified, V_{CC}=2.8~V,~V_{SLP}=2.8~V,~V_{GC}=2.5~V,~V_{LO}=-10~dBm;~f=223.7~MHz,~V_{IN};~f=112.35~MHz,~V_{I}~,~V_{IX}~,~V_{Q}~,~V_{QX};~f=500~kHz,~a~measurement~in~high~impedance~be~made~for~V_{I}~,~V_{IX}~,~V_{Q}~and~V_{QX}~.$ 

/ 1 / 1A / Q / QA		<u> </u>		1/1 / Q	. Q2	
Parameter	Symbol	Conditions	Min	Тур	Max	Unit
Current consumption	I <sub>TOT</sub>	$V_{\mathrm{IN}}$ , $V_{\mathrm{LO}}$ : No input	6	11	15	mA
Current consumption (sleep)	I <sub>SLP</sub>	$V_{IN}$ , $V_{LO}$ : No input, $V_{12} = 0 \text{ V}$	_	0	10	μΑ
Conversion gain 1	G <sub>C(1)</sub>	Conversion gain between $V_{IN}$ and $V_{I}$ $V_{GC} = 2.5 \ V, \ V_{IN} = 5 \ dB\mu V$	80	85	90	dB
Conversion gain 2	G <sub>C(2)</sub>	Conversion gain between $V_{IN}$ and $V_{I}$ $V_{GC} = 0.1 \ V, \ V_{IN} = 85 \ dB\mu V$	-18	-12	-9	dB
IQ maximum output	V <sub>IQ</sub>	Output level of $V_I$ , $V_{IX}$ , $V_Q$ and $V_{QX}$ $V_{GC} = 2.5 \ V, \ V_{IN} = 40 \ dB\mu V$	1	1.8	_	V[p-p]
Noise figure	NF	$V_{GC} = 2.5 \text{ V}$	_	7	8.5	dB

<sup>\*2:</sup>  $P_D$  is the value at  $T_a = 85^{\circ}\text{C}$  without a heatsink. Use this device within the range of allowable power dissipation referring to "Technical Data".

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### ■ Electrical Characteristics at T<sub>a</sub> = 25°C (continued)

Unless otherwise specified,  $V_{CC}$  = 2.8 V,  $V_{SLP}$  = 2.8 V,  $V_{GC}$  = 2.5 V,  $V_{LO}$  = -10 dBm: f = 223.7 MHz,  $V_{IN}$ : f = 112.35 MHz,  $V_I$ ,  $V_{IX}$ ,  $V_Q$ ,  $V_{QX}$ : f = 500 kHz, a measurement for high impedance be made for  $V_I$ ,  $V_{IX}$ ,  $V_Q$  and  $V_{QX}$ .

Parameter	Symbol	Conditions	Min	Тур	Max	Unit
Input IP3	IIP3	Input IP3 value at 60 dB ± 1 dB of conversion gain	65	69	_	dBμV
Gain adjustment sensitivity	$\beta_{GCA}$	Gain variation at $V_{GC} = 0.5 \text{ V}$ to 2.5 V	42	45	48	dB/V
Quadrature demodulation error	IQ <sub>ERR</sub>	$V_{GC} = 1.5 \text{ V}, V_{IN} = 47 \text{ dB}\mu\text{V}$	_	-25	-20.5	dB
Local signal input level	V <sub>LO</sub>		-20	-10	-7	dBm
Sleep control (low)	V <sub>SLP(1)</sub>	Voltage to get $I_{TOT}$ of 10 $\mu A$ and less	_	_	0.2	V
Sleep control (high)	V <sub>SLP(2)</sub>	Voltage for an operating mode	2.3	_	_	V
Gain adjustment voltage	V <sub>GC</sub>		0.1	_	2.6	V
IQ operating point voltage	V <sub>IQ</sub>	DC operating point voltage at no adjustment for IQ output (pin 5, pin 6, pin 8 and pin 9)	1.2	1.5	1.7	V
IQ operating point deviation	$\Delta V_{IQ}$	DC operating point voltage difference between $V_{I^{-}}V_{IX}$ and $V_{Q^{-}}V_{QX}$ (at no adjustment)	-250	0	250	mV

#### • Design reference data

Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

Parameter	Symbol	Conditions	Min	Тур	Max	Unit
IQ output deviation	$\Delta V_{IQ}$	Level ratio between IQ signals (differential),	- 0.8	0	0.8	dB
IQ output phase difference	$\Delta  heta_{ m IQ}$	$V_{GC}$ = 1.5 V, $V_{IN}$ = 47 dB $\mu$ V Phase difference between IQ signals (differential), $V_{GC}$ = 1.5 V, $V_{IN}$ = 47 dB $\mu$ V	85	90	95	deg

### ■ Terminal Equivalent Circuits

Pin No.	Equivalent circuit	Description	DC voltage (V)
1		GND (GCA): Ground pin of GCA system.	_
2, 3, 4	$\begin{array}{c c} & & & & & & & & & & & & & & & & & & &$	Pin 2: I, Q output operating point adjustment: Pin to adjust an operating point voltage of IQ output (pin 5, pin 6, pin 8 and pin 9).; Pin3: Q operating point offset adjustment: Pin to adjust an offset voltage between Q, Q output (pin 5, pin 6).; Pin 4: I operating point offset adjustment: Pin to adjust an offset voltage between I, I output (pin 8, pin 9).	1.9

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## ■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description	DC voltage (V)
5, 6	V <sub>CC</sub> Pin 5, 6	Pin 5: $\overline{Q}$ output: Pin to output the $\overline{Q}$ signal.; Pin 6: Q output: Pin to output the Q signal.	1.5
7	_	Supply voltage (base band): Supply voltage pin of base band system.	2.8
8, 9	V <sub>CC</sub> Pin 8, 9	Pin 8: Ī output:  Pin to output the Ī signal.;  Pin 9: I output:  Pin to output the I signal.	1.5
10	_	GND (base band): Ground pin of base band system.	_
11	$V_{CC}$ $2 k\Omega$ $M$	Local signal input: Input pin of local signal for IQ demodulation.	2.7
12	150 kΩ	Sleep: Operating mode: Connect this pin to supply voltage pin. Sleep mode: Connect to GND.	_

### ■ Terminal Equivalent Circuits (continued)

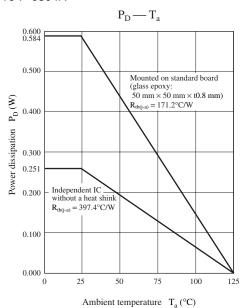
Pin No.	Equivalent circuit	Description	DC voltage (V)
13	V <sub>CC</sub> 8  64 kΩ  56 kΩ  777	Gain adjustment: Adjusts gain. Possible to apply voltage from 0 to a supply voltage.	0
14	_	Supply voltage (GCA): Supply voltage pin of GCA system.	_
15, 16	$V_{CC}$ $\begin{array}{c} 2 k\Omega \\ 2 k\Omega \\ 2 k\Omega \\ \end{array}$ $\begin{array}{c} 1.2 \text{ V} \\ \end{array}$	Pin 15: Signal input (+): Pin to input IF signal. Impedance matching is required.; Pin 16: Signal input (–): AC grounding with a capacitor.	1.2

### ■ Usage Note

There are two systems of a supply voltage pin for this device. (Pin 7, pin 14) Apply the same voltage simultaneously to these two pins on use. (Keep either of them from being off.)

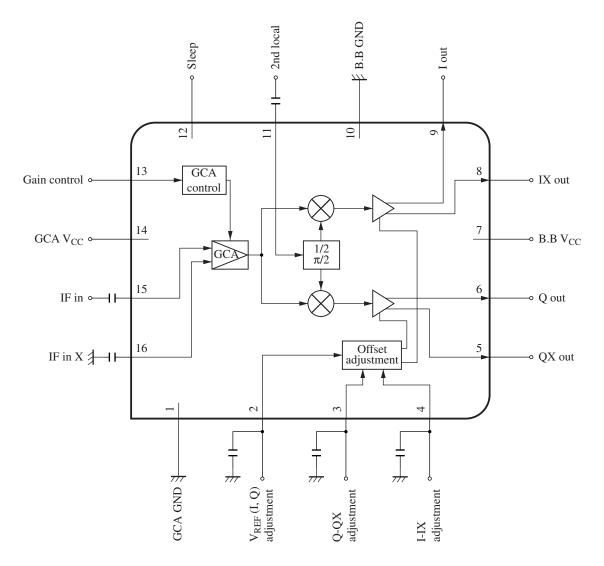
### ■ Technical Data

• P<sub>D</sub> — T<sub>a</sub> curves of QFN016-P-0304A



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## ■ Application Circuit Example



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