AN6105FHN

Quadrature demodulation IC for CDMA system mobile telephone

■ Overview

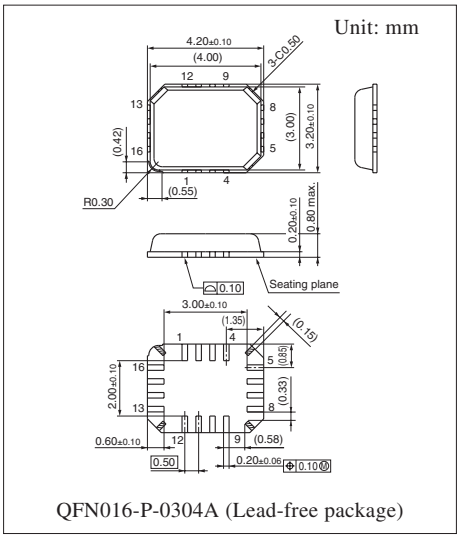
The AN6105FHN is a quadrature demodulation IC for a CDMA system mobile telephone, incorporating a reception IF for IS-95 and GCA plus quadrature demodulator.

■ Features

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

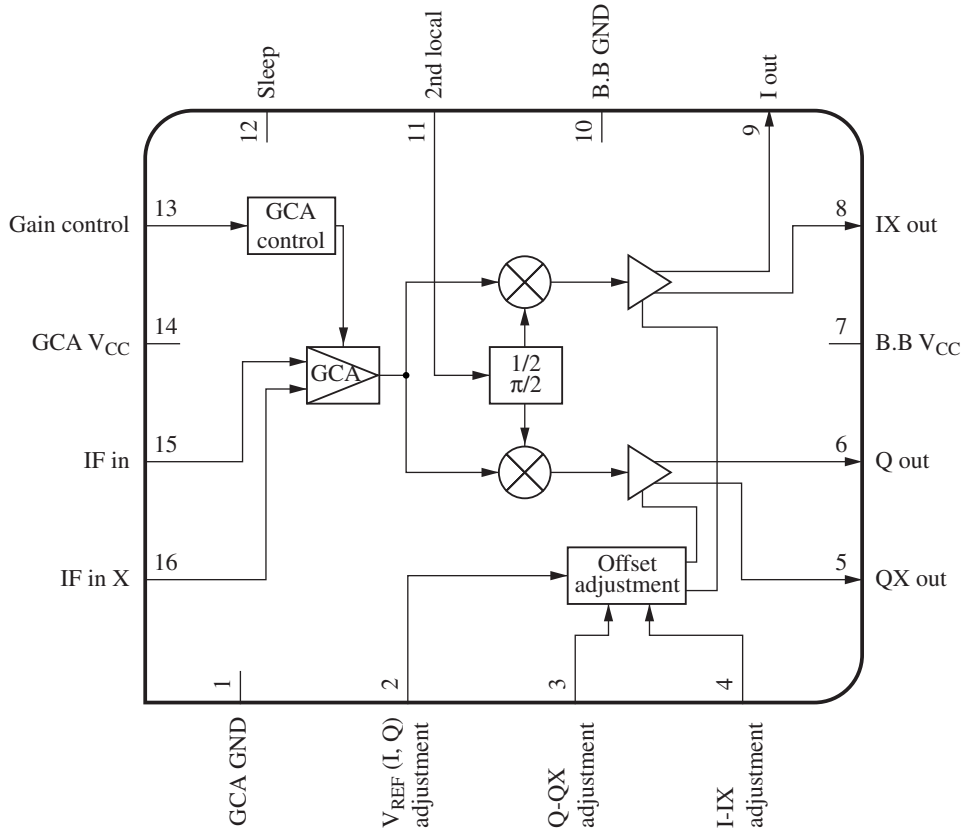
■ Applications

- Cellular telephone (IS-95)



QFN016-P-0304A (Lead-free package)

■ 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	$\overline{Q}$ output	13	Gain adjustment
6	Q output	14	Supply voltage (GCA)
7	Supply voltage (base band)	15	Signal input (+)
8	$\overline{I}$ output	16	Signal input (–)

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	4.2	V
Supply current	I_{CC}	24	mA
Power dissipation *2	P_D	100	mW
Operating ambient temperature *1	T_{opr}	–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.

∗2: P_D is the value at T_a = 85°C without a heatsink. Use this device within the range of allowable power dissipation referring to "■ Technical Data • P_D — T_a curves of QFN016-P-0304".

■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V_{CC}	2.55 to 4.00	V

■ Electrical Characteristics at T_a = 25°C

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} .

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Current consumption	I_{TOT}	V_{IN} , V_{LO}: No input	6	11	15	mA
Current consumption (sleep)	I_{SLP}	V_{IN} , V_{LO}: No input, V_{12} = 0 V	—	0	10	µA
Conversion gain 1	$G_{C(1)}$	Conversion gain between V_{IN} and V_I V_{GC} = 2.5 V, V_{IN} = 5 dBµV	80	85	90	dB
Conversion gain 2	$G_{C(2)}$	Conversion gain between V_{IN} and V_I V_{GC} = 0.1 V, V_{IN} = 85 dBµV	–18	–12	–9	dB
IQ maximum output	V_{IQ}	Output level of V_I , V_{IX} , V_Q and V_{QX} V_{GC} = 2.5 V, V_{IN} = 40 dBµV	1	1.8	—	V[p-p]
Noise figure	NF	V_{GC} = 2.5 V	—	7	8.5	dB

■ Electrical Characteristics at T_a = 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} .

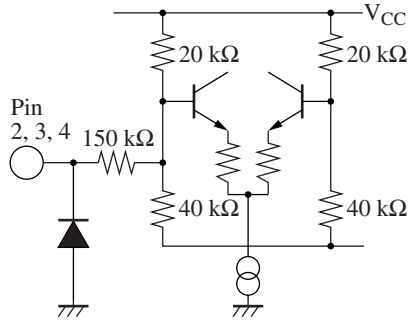
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input IP3	IIP3	Input IP3 value at 60 dB ± 1 dB of conversion gain	65	69	—	dBμV
Gain adjustment sensitivity	β_{GCA}	Gain variation at V_{GC} = 0.5 V to 2.5 V	42	45	48	dB/V
Quadrature demodulation error	IQ_{ERR}	V_{GC} = 1.5 V, V_{IN} = 47 dBμV	—	–25	–20.5	dB
Local signal input level	V_{LO}		–20	–10	–7	dBm
Sleep control (low)	$V_{SLP(1)}$	Voltage to get I_{TOT} of 10 μA and less	—	—	0.2	V
Sleep control (high)	$V_{SLP(2)}$	Voltage for an operating mode	2.3	—	—	V
Gain adjustment voltage	V_{GC}		0.1	—	2.6	V
IQ operating point voltage	V_{IQ}	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	ΔV_{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

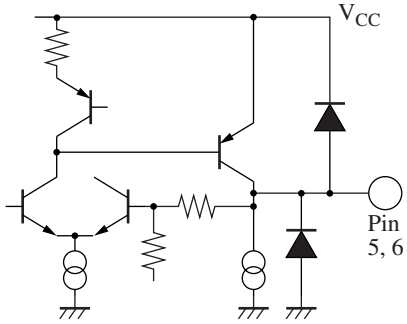
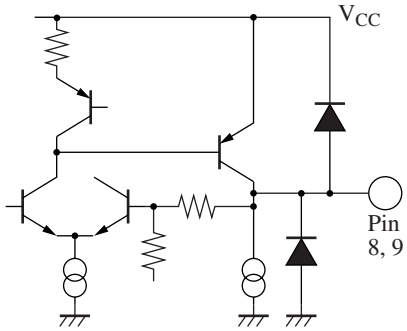
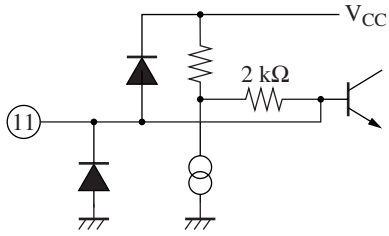
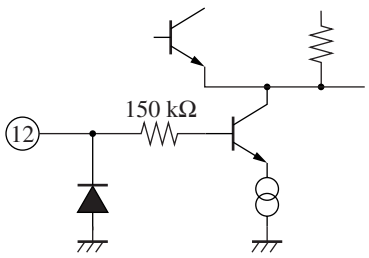
Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
IQ output deviation	ΔV_{IQ}	Level ratio between IQ signals (differential), V_{GC} = 1.5 V, V_{IN} = 47 dBμV	– 0.8	0	0.8	dB
IQ output phase difference	$\Delta\theta_{IQ}$	Phase difference between IQ signals (differential), V_{GC} = 1.5 V, V_{IN} = 47 dBμV	85	90	95	deg

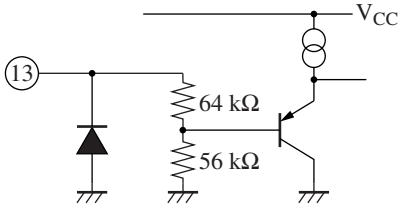
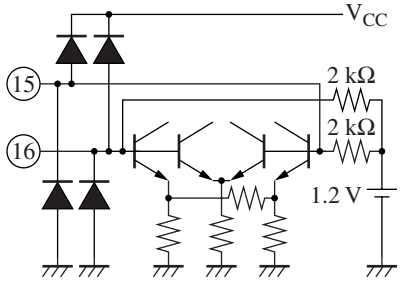
■ Terminal Equivalent Circuits

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

■ Terminal Equivalent Circuits (continued)

Pin No.	Equivalent circuit	Description	DC voltage (V)
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		Pin 8: $\overline{I}$ output: Pin to output the $\overline{I}$ signal.; Pin 9: I output: Pin to output the I signal.	1.5
10	—	GND (base band): Ground pin of base band system.	—
11		Local signal input: Input pin of local signal for IQ demodulation.	2.7
12		Sleep: Operating mode: Connect this pin to supply voltage pin. Sleep mode: Connect to GND.	—

■ Terminal Equivalent Circuits (continued)

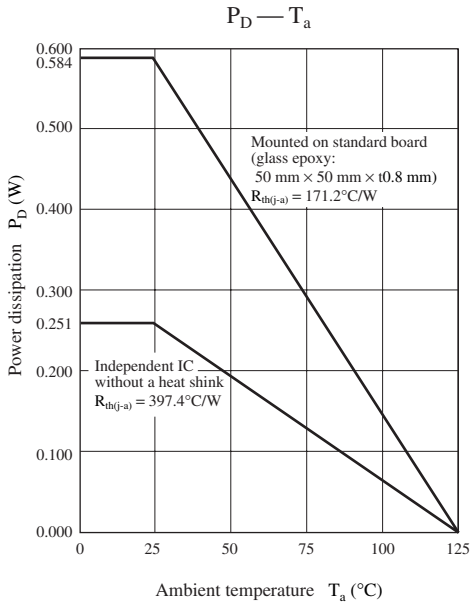
Pin No.	Equivalent circuit	Description	DC voltage (V)
13		Gain adjustment: Adjusts gain. Possible to apply voltage from 0 to a supply voltage.	0
14	—	Supply voltage (GCA): Supply voltage pin of GCA system.	—
15, 16		Pin 15: Signal input (+): Pin to input IF signal. Impedance matching is required.; Pin 16: Signal input (−): AC grounding with a capacitor.	1.2

■ Usage Note

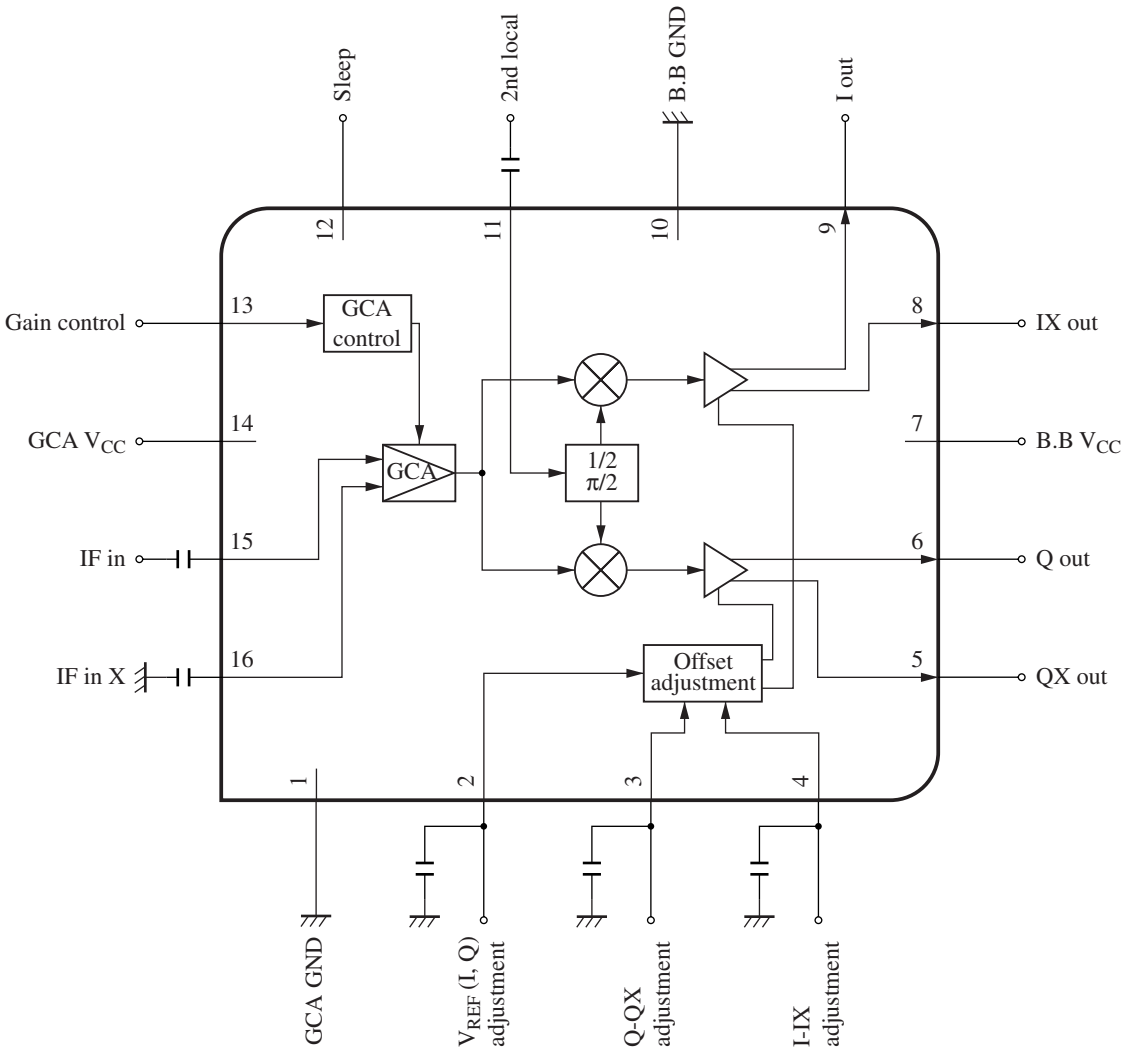
There are two systems of a supply voltage pin for this device. (Pin 7, pin 14)
Apply the same voltage simultaneously to these two pins on use.
(Keep either of them from being off.)

■ Technical Data

• P_D — T_a curves of QFN016-P-0304A



■ Application Circuit Example



Request for your special attention and precautions in using the technical information and semiconductors described in this material

(1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this material and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.

(2) The technical information described in this material is limited to showing representative characteristics and applied circuits examples of the products. It neither warrants non-infringement of intellectual property right or any other rights owned by our company or a third party, nor grants any license.

(3) We are not liable for the infringement of rights owned by a third party arising out of the use of the product or technologies as described in this material.

(4) The products described in this material are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).
Consult our sales staff in advance for information on the following applications:
- Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
- Any applications other than the standard applications intended.

(5) The products and product specifications described in this material are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.

(6) When designing your equipment, comply with the guaranteed values, in particular those of maximum rating, the range of operating power supply voltage, and heat radiation characteristics. Otherwise, we will not be liable for any defect which may arise later in your equipment.
Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.

(7) When using products for which damp-proof packing is required, observe the conditions (including shelf life and amount of time let standing of unsealed items) agreed upon when specification sheets are individually exchanged.