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Product Standards

Part No.	AN26210A
Package Code No.	XLGA012-L-0303

Analogue LSI Business Unit
Semiconductor Company
Matsushita Electric Industrial Co., Ltd.

Established by	Applied by	Checked by	Prepared by
K.Komichi	M.Hiramatsu	M.Ishida	J.Ito

Contents

AN26210A

W-CDMA Dual Band LNA-IC

■ Overview

- AN26210A is LNA-IC for dual band(800MHz/2.1GHz) WCDMA.
- Realizing high performance by using 0.25 μm SiGe Bi-CMOS process(f_T = 50 GHz, f_{max} = 60 GHz).
- Each Bands are selectable and Gain-mode is changeable, controlled by integrated CMOS logic circuit.
- Achieving miniaturization by using small size XLGA package.

■ Features

• Low voltage operation	+2.85 V typ.	
• Low current consumption	4.5 mA typ.	(High-Gain mode)
	0.1 μA typ.	(Low-Gain mode)
• High gain	17.0 dB typ. fRX = 2140 MHz	(High-Gain mode)
	17.0 dB typ. fRX = 880 MHz	(High-Gain mode)
• Low noise figure	1.55 dB typ. fRX = 2140 MHz	(High-Gain mode)
	1.10 dB typ. fRX = 880 MHz	(High-Gain mode)
• Low distortion	2.5 dBm typ. fRX = 2140 MHz	(High-Gain mode)
(IIP3 +10 MHz offset)	2.0 dBm typ. fRX = 880 MHz	(High-Gain mode)

- Small package (XLGA)

■ Applications

- W-CDMA dual-band terminals

■ Package

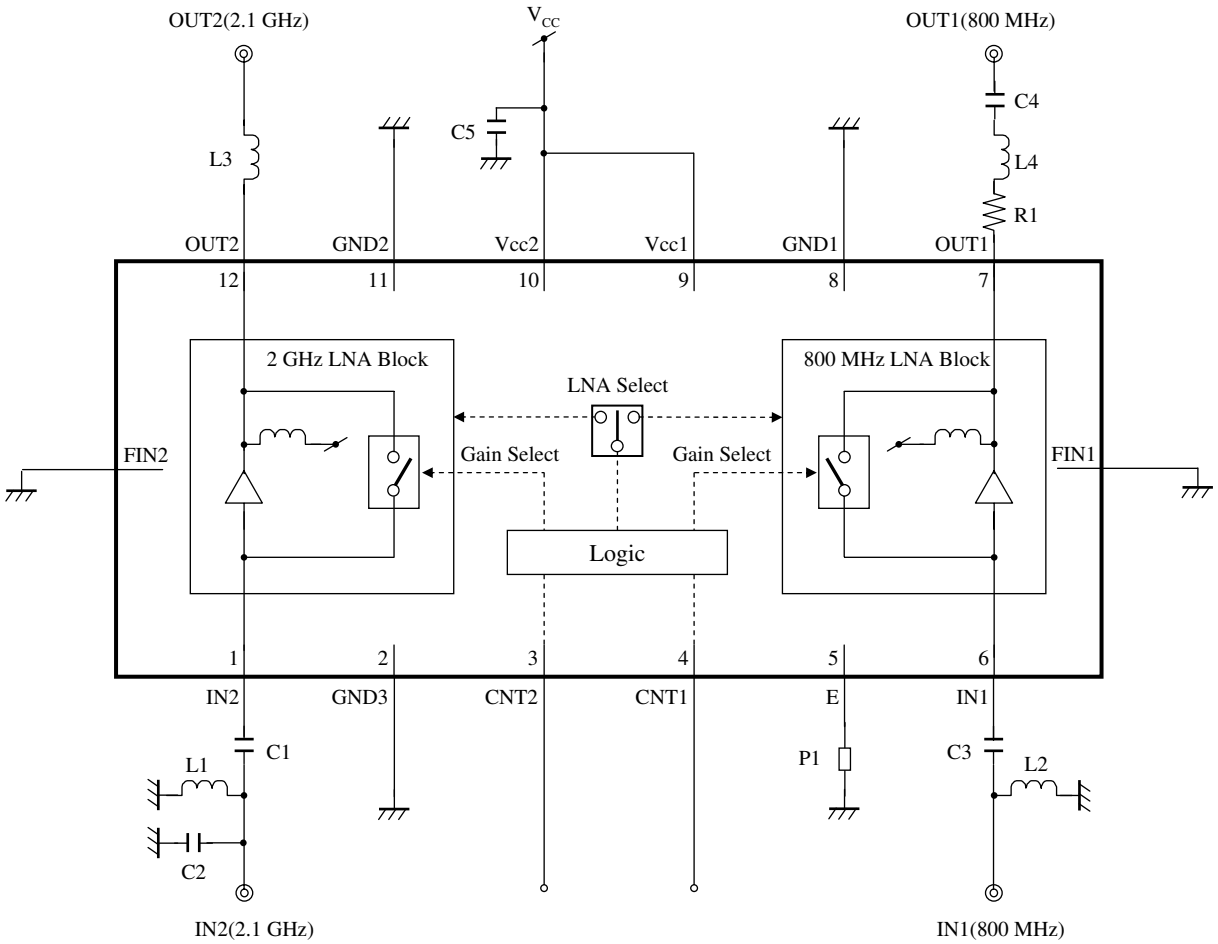
- 12 pin Fine Pitch Land Grid Array Package (LGA Type)

■ Type

- Bi-CMOS IC

■ Application Circuit Example

Note) External components : See page 23



■ Pin Descriptions

Pin No.	Pin name	Type	Description
1	IN2	Input	2.1 GHz RF Input
2	GND3	Ground	GND
3	CNT2	Input	High-Gain / Low-Gain SW
4	CNT1	Input	800 MHz / 2.1 GHz SW
5	E	Output	Emitter
6	IN1	Input	800 MHz RF Input
FIN1	FIN1	Ground	GND
7	OUT1	Output	800 MHz RF Output
8	GND1	Ground	GND
9	Vcc1	Power Supply	V_{CC}
10	Vcc2	Power Supply	V_{CC}
11	GND2	Ground	GND
12	OUT2	Output	2.1 GHz RF Output
FIN2	FIN2	Ground	GND

■ Current and Voltage Range for Pins

Notes) • Do not apply voltage to N.C. pins.

- The values shows voltage to the GND unless otherwise specified. (+) is inlet current and (–) is outlet current in the circuit.
- Voltage applying exceeding below ratings leads to the malfunction and the damage of the device.
- Below ratings are specified regarding malfunction and stress, not for operation guaranty.

Pin No.	Pin name	Rating	Unit	Notes
1	IN2	– 0.3 to (V_{CC})	V	*1
2	GND3	0	V	*3
3	CNT2	– 0.3 to (V_{CC})	V	
4	CNT1	– 0.3 to (V_{CC})	V	
5	E	– 0.3 to (V_{CC} – 1 / 2)	V	*3
6	IN1	– 0.3 to (V_{CC})	V	*1
FIN1	GND	0	V	
7	OUT1	—	V	*2
8	GND	0	V	
9	Vcc	0 to 3.0	V	
10	Vcc	0 to 3.0	V	
11	GND	0	V	
12	OUT2	—	V	*2
FIN2	GND	0	V	

注) *1 : RF signal input pin. Do not apply DC current.
*2 : RF signal output pin. Do not apply DC current.
*3 : Same as GND pin

■ Absolute Maximum Ratings

A No.	Parameter	Symbol	Rating	Unit	Notes
1	Supply voltage	V_{CC}	3.0	V	*1
2	Supply current	I_{CC}	18	mA	—
3	Power dissipation	P_D	37.2	mW	*2
4	Operating ambient temperature	T_{opr}	–20 to +85	°C	*3
5	Storage temperature	T_{stg}	–40 to +125	°C	*3

Notes) *1 : The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.

*2 : The power dissipation shown is the value at T_a = 85°C for the independent (unmounted) IC package.
When using this IC, refer to the P_D-T_a diagram of the package standard page 4 and use under the condition not exceeding the allowable value.

*3 : Except for the power dissipation, operating ambient temperature, and storage temperature, all ratings are for T_a = 25°C.

■ Operating supply voltage range

Parameter	Symbol	Range	Unit	Notes
Supply voltage range	V_{CC}	2.70 to 2.95	V	*

Notes) *: The values under the condition not exceeding the above absolute maximum ratings and the power dissipation

■ Electrical Characteristics at V_{CC} = 2.85 V

Notes) All parameters are specified under T_a = 25°C±2°C unless otherwise specified.

B No.	Parameter	Symbol	Test Circuit	Conditions	Limits			Unit	Notes
					Min	Typ	Max		
DC electrical characteristics									
DC-1	Supply current HG (2.1 GHz)	IccHa	1	V_{CC} current at 2.1 GHz High-Gain mode No input signal	—	4.5	6.0	mA	—
DC-2	Supply current HG (800 MHz)	IccHb	1	V_{CC} current at 800 MHz High-Gain mode No input signal	—	4.5	6.0	mA	—
DC-3	Supply current LG (2.1 GHz)	IccLa	1	V_{CC} current at 2.1 GHz Low-Gain mode No input signal	—	0.1	10	µA	—
DC-4	Supply current LG (800 MHz)	IccLb	1	V_{CC} current at 800MHz Low-Gain mode No input signal	—	0.1	10	µA	—
DC-5	Input voltage (High-Gain mode)	VIH	1	VIH = Vcc× 0.90	2.57	2.85	—	V	—
DC-6	Input voltage (Low-Gain mode)	VIL	1	VIL = Vcc× 0.14	—	0.0	0.4	V	—
DC-7	SW current (High)	IIH	1	Current at SW pin VI H = V_{CC}	—	0.0	10	µA	—
DC-8	SW current (Low)	IIL	1	Current at SW pin VIL = 0 V	—	0.0	10	µA	—

■ Electrical Characteristics (continued) at V_{CC} = 2.85 V

Note) All parameters are specified under T_a = 25°C±2°C, fRXa = 2 140 MHz, PRX = –30 dBm, CW unless otherwise specified.

B No.	Parameter	Symbol	Test Circuit	Conditions	Limits			Unit	Notes
					Min	Typ	Max		
2.1 GHz : LNA AC electrical characteristics									
A-1	Power Gain HG	GHSa	1	High-Gain mode f = 2 150 MHz, PRX = – 30 dBm	15.0	17.0	18.5	dB	—
A-2	Power Gain LG	GLSa	1	Low-Gain mode f = 2 150 MHz, PRX = – 20 dBm	–6.5	–4.5	–1.0	dB	—
A-3	IIP3 +10 MHz offset HG	IIP3H1Sa	1	High-Gain mode f1 = fRXa + 10 MHz f2 = fRXa + 20 MHz Input 2 signals (f1, f2)	–2.0	2.5	—	dBm	—
A-4	IIP3 –10 MHz offset HG	IIP3H2Sa	1	High-Gain mode f1 = fRXa – 10 MHz f2 = fRXa – 20 MHz Input 2 signals (f1,f2)	–2.0	2.0	—	dBm	—
A-5	IIP3 –95 MHz offset HG	IIP3_2040 HSa	1	High-Gain mode f1 = fRXa – 190 MHz PRX1 = – 27 dBm f2 = fRXa – 100 MHz PRX2 = – 33 dBm Input 2 signals (f1, f2)	2.0	5.0	—	dBm	—
A-6	IIP3 –190 MHz offset HG	IIP3_1760 HSa	1	High-Gain mode f1 = fRXa – 190 MHz PRX1 = – 27 dBm f2 = fRXa – 380 MHz PRX2 = – 45 dBm Input 2 signals (f1, f2)	–1.5	1.5	—	dBm	—
A-7	Input P1dB TX undesired signal input HG	IP1dBHSa	1	High-Gain mode f1 = 2170 MHz, PRX1 = –40 dBm f2 = 2170 MHz – 190 MHz Input 2 signals (f1, f2)	–19	–12	—	dBm	—

■ Electrical Characteristics (continued) at V_{CC} = 2.85 V

注) All parameters are specified under T_a = 25°C±2°C, fRXb = 875 MHz, PRX = –30 dBm, CW unless otherwise specified.

B No.	Parameter	Symbol	Test Circuit	Conditions	Limits			Unit	Notes
					Min	Typ	Max		
800 MHz : LNA AC electrical characteristics									
B-1	Power Gain HG	GHSb	2	High-Gain mode f = 885 MHz, RRX = – 30dBm	15.5	17.0	18.5	dB	—
B-2	Power Gain LG	GLSb	2	Low-Gain mode f = 885 MHz, PRX = – 20 dBm	–6.5	–4.2	–1.0	dB	—
B-3	IIP3 +10 MHz offset HG	IIP3H1Sb	2	High-Gain mode f1 = fRXb + 10 MHz f2 = fRXb + 20 MHz Input 2 signals (f1, f2)	–6.5	2.0	—	dBm	—
B-4	IIP3 –10 MHz offset HG	IIP3H2Sb	2	High-Gain mode f1 = fRXb – 10 MHz f2 = fRXb – 20 MHz Input 2 signals (f1, f2)	–8.0	0.0	—	dBm	—
B-5	IIP3 –22.5 MHz offset HG	IIP3_857.5 HSb	2	High-Gain mode f1 = fRXb – 45 MHz PRX1 = – 27 dBm f2 = fRXb – 22.5 MHz PRX2 = – 47 dBm Input 2 signals (f1,f2)	7.5	12.5	—	dBm	—
B-6	IIP3 –45 MHz offset HG	IIP3_790 HSb	2	High-Gain mode f1 = fRXb – 45 MHz PRX1 = – 27 dBm f2 = fRXb – 90 MHz PRX2 = – 50 dBm Input 2 signals (f1, f2)	–5.5	0.0	—	dBm	—
B-7	Input P1dB TX undesired signal input HG	IP1dBHSb	2	High-Gain mode f1 = fRXb, PRX1 = – 40 dBm f2 = fRXb – 45 MHz Input 2 signals (f1, f2)	–19	–14	—	dBm	—

■ Electrical Characteristics (Reference values for design) at V_{CC} = 2.85 V

Note) •All parameters are specified under T_a = 25°C±2°C, fRXa = 2 110 MHz, 2 140 MHz, 2 170 MHz, PRX = –30 dBm, CW

•The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection. If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
2.1 GHz : LNA AC electrical characteristics									
C-1	Power Gain HG	GHa	1	High-Gain mode f = fRXa	15.0	17.0	18.5	dB	—
C-2	Power Gain LG	GLa	1	Low-Gain mode f = fRXa, PRX = – 20 dBm	–6.5	–4.5	–1.0	dB	—
C-3	Noise Figure HG	NFHa	1	High-Gain mode f = fRXa	—	1.55	1.90	dB	*1
C-4	Noise Figure LG	NFLa	1	Low-Gain mode f = fRXa	—	4.5	6.5	dB	—
C-5	IM2 HG	IM2_190 Ha	1	High-Gain mode f1 = fRXa – 190 MHz PRX1 = – 27 dBm f2 = 190 MHz, PRX2 = –75 dBm Input 2 signals (f1, f2)	—	–120	–113	dBm	—
C-6	IM2 HG	IM2_4090 Ha	1	High-Gain mode f1 = fRX – 190 MHz PRX1 = – 27 dBm f2 = 2fRX – 190 MHz PRX2 = – 35 dBm Input 2 signals (f1, f2)	—	–100	– 95	dBm	—
C-7	IIP3 +10 MHz offset HG	IIP3H1a	1	High-Gain mode f1 = fRXa + 10 MHz f2 = fRXa + 20 MHz Input 2 signals (f1, f2)	–2.0	2.5	—	dBm	—
C-8	IIP3 –10 MHz offset HG	IIP3H2a	1	High-Gain mode f1 = fRXa – 10 MHz f2 = fRXa – 20 MHz Input 2 signals (f1, f2)	–2.0	2.0	—	dBm	—
C-9	IIP3 –95 MHz offset HG	IIP3_2040 Ha	1	High-Gain mode f1 = fRXa – 190 MHz PRX1 = – 27 dBm f2 = fRXa – 100 MHz PRX2 = – 33 dBm Input 2 signals (f1, f2)	2.0	5.0	—	dBm	—
C-10	IIP3 –190 MHz offset HG	IIP3_1760 Ha	1	High-Gain mode f1 = fRXa – 190 MHz PRX1 = – 27 dBm f2 = fRXa – 380 MHz PRX2 = – 45 dBm Input 2 signals (f1, f2)	–1.5	1.5	—	dBm	—

Note) *1 : Connector & substrate loss (0.1dB) included

■ Electrical Characteristics (Reference values for design ; continued) at V_{CC} = 2.85 V

Note) • All parameters are specified under T_a = 25°C±2°C, fRXa = 2 110 MHz, 2 140 MHz, 2 170 MHz, PRX = –30 dBm, CW

• The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection. If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
2.1 GHz : LNA AC electrical characteristics									
C-11	IIP3 HG	IIP3_6040 Ha	1	High-Gain mode f1 = fRX – 190 MHz PRX1 = – 27 dBm f2 = 2f1 + fRX, PRX2 = –25 dBm Input 2 signals (f1, f2)	1.5	5.5	—	dBm	—
C-12	Input P1dB TX undesired signal input HG	IP1dB Ha	1	Low-Gain mode f1 = fRX, PRX1 = – 40 dBm f2 = fRX – 190 MHz Input 2 signals (f1, f2)	–19	–12	—	dBm	—
C-13	Reverse Isolation HG	ISOHa	1	High-Gain mode f = fRXa	—	–30	–20	dB	—
C-14	Reverse Isolation LG	ISOLa	1	Low-Gain mode f = fRXa	—	–4.5	–1.0	dB	—
C-15	Input Return Loss HG	S11Ha	1	High-Gain mode f = fRXa	8.5	9.5	—	dB	—
C-16	Input Return Loss LG	S11La	1	Low-Gain mode f = fRXa	8.5	9.5	—	dB	—
C-17	Output Return Loss HG	S22Ha	1	High-Gain mode f = fRXa	8.5	9.5	—	dB	—
C-18	Output Return Loss LG	S22La	1	Low-Gain mode f = fRXa	8.5	9.5	—	dB	—

■ Electrical Characteristics (Reference values for design ; continued) at V_{CC} = 2.85 V

Note) •All characteristics are specified under T_a = 25°C±2°C, fRXb = 875 MHz, 880 MHz, 885 MHz, PRX = –30 dBm, CW

•The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection. If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
800 MHz : LNA AC electrical characteristics									
D-1	Power Gain HG	GHb	2	High-Gain mode f = fRXb	15.5	17.0	18.5	dB	—
D-2	Power Gain LG	GLb	2	Low-Gain mode f = fRXb PRX = – 20 dBm	–6.5	–4.2	–1.0	dB	—
D-3	Noise Figure HG	NFHb	2	High-Gain mode f = fRXb	—	1.10	1.70	dB	*1
D-4	Noise Figure LG	NFLb	2	Low-Gain mode f = fRXb	—	4.2	6.5	dB	—
D-5	IM2 HG	IM2_45 Hb	2	High-Gain mode f1 = fRXb – 45 MHz PRX1 = – 27 dBm f2 = 45 MHz, PRX2 = – 55 dBm Input 2 signals (f1, f2)	—	–94	–89	dBm	—
D-6	IM2 HG	IM2_1715 Hb	2	High-Gain mode f1 = fRX – 45 MHz PRX1 = – 27 dBm f2 = 2fRX – 45 MHz PRX2 = – 50 dBm Input 2 signals (f1, f2)	—	–78	–72	dBm	—
D-7	IIP3 +10 MHz offset HG	IIP3H1b	2	High-Gain mode f1 = fRXb + 10 MHz f2 = fRXb + 20 MHz Input 2 signals (f1, f2)	–6.5	2.0	—	dBm	—
D-8	IIP3 –10 MHz offset HG	IIP3H2b	2	High-Gain mode f1 = fRXb – 10 MHz f2 = fRXb – 20 MHz Input 2 signals (f1, f2)	–8.0	0.0	—	dBm	—
D-9	IIP3 –22.5 MHz offset HG	IIP3_857.5 Hb	2	High-Gain mode f1 = fRXb – 45 MHz PRX1 = – 27 dBm f2 = fRXb – 22.5 MHz PRX2 = – 47 dBm Input 2 signals (f1, f2)	7.5	12.5	—	dBm	—
D-10	IIP3 –45 MHz offset HG	IIP3_790 Hb	2	High-Gain mode f1 = fRXb – 45 MHz PRX1 = – 27 dBm f2 = fRXb – 90 MHz PRX2 = – 50 dBm Input 2 signals (f1, f2)	–5.5	0.0	—	dBm	—

Note) *1 : Connector & substrate loss (0.05dB) included

■ Electrical Characteristics (Reference values for design ; continued) at V_{CC} = 2.85 V

Note) • All characteristics are specified under T_a = 25°C±2°C, fRXb = 875 MHz, 880 MHz, 885 MHz, PRX = -30dBm

• The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection. If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
800 MHz : LNA AC electrical characteristics									
D-11	IIP3 HG	IIP3_2550 Hb	2	High-Gain mode f1 = fRX – 45 MHz PRX1 = – 27 dBm f2 = 2f1 + fRX PRX2 = – 45 dBm Input 2 signals (f1, f2)	–7.0	–2.5	—	dBm	—
D-12	Input P1dB TX undesired signal input HG	IP1dB Hb	2	High-Gain mode f1 = fRXb, PRX1 = – 40 dBm f2 = fRXb – 45 MHz Input 2 signals (f1, f2)	–19	–14	—	dBm	—
D-13	Reverse Isolation HG	ISOHb	2	High-Gain mode f = fRXb	—	–24	–18	dB	—
D-14	Reverse Isolation LG	ISOLb	2	Low-Gain mode f = fRXb	—	–4.2	–1.0	dB	—
D-15	Input Return Loss HG	S11Hb	2	High-Gain mode f = fRXb	8.5	9.5	—	dB	—
D-16	Input Return Loss LG	S11Lb	2	Low-Gain mode f = fRXb	8.5	9.5	—	dB	—
D-17	Output Return Loss HG	S22Hb	2	High-Gain mode f = fRXb	8.5	9.5	—	dB	—
D-18	Output Return Loss LG	S22Lb	2	Low-Gain mode f = fRXb	8.5	9.5	—	dB	—

■ Electrical Characteristics (Reference values for design ; continued) at V_{CC} = 2.7 V to 2.95 V

Note) •All characteristics are specified under T_a = –20°C to 85°C

•The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection. If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
DC electrical characteristics									
DCT-1	Supply current HG(2.1 GHz)	IccHTa	1	V_{CC} current at 2.1 GHz High Gain mode No input signal	—	4.5	6.8	mA	—
DCT-2	Supply current HG(800 MHz)	IccHTb	1	V_{CC} current at 800 MHz High Gain mode No input signal	—	4.5	6.8	mA	—
DCT-3	Supply current LG(2.1 GHz)	IccLTa	1	V_{CC} current at 2.1 GHz Low Gain mode No input signal	—	0.1	10	µA	—
DCT-4	Supply current LG(800 MHz)	IccLTb	1	V_{CC} current at 800 MHz Low Gain mode No input signal	—	0.1	10	µA	—

■ Electrical Characteristics (Reference values for design ; continued) at V_{CC} = 2.7 V to 2.95 V

Note) •All characteristics are specified under T_a = –20°C to 85°C, fRXa = 2 110 MHz, 2 140 MHz, 2 170 MHz, PRX = –30 dBm, CW

•The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection. If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Limits			Unit	Notes
					Min	Typ	Max		
2.1 GHz : LNA AC electrical characteristics									
E-1	Power Gain HG	GHTa	1	High-Gain mode f = fRXa	14.0	17.0	19.0	dB	—
E-2	Power Gain LG	GLTa	1	Low-Gain mode f = fRXa, PRX = – 20 dBm	–7.0	–4.5	– 0.5	dB	—
E-3	Noise Figure HG	NFHTa	1	High-Gain mode f = fRXa	—	1.55	2.25	dB	*1
E-4	Noise Figure LG	NFLTa	1	Low-Gain mode f = fRXa	—	4.5	7.0	dB	—
E-5	IM2 HG	IM2_190 HTa	1	High-Gain mode f1 = fRXa – 190 MHz PRX1 = – 27 dBm f2 = 190 MHz, PRX2 = – 75 dBm Input 2 signals (f1, f2)	—	–120	-110	dBm	—
E-6	IM2 HG	IM2_4090 HTa	1	High-Gain mode f1 = fRXa – 190 MHz PRX1 = – 27 dBm f2 = 2fRXa – 190 MHz PRX2 = – 35 dBm Input 2 signals (f1, f2)	—	–100	– 93	dBm	—
E-7	IIP3 +10 MHz offset HG	IIP3H1Ta	1	High-Gain mode f1 = fRXa + 10 MHz f2 = fRXa + 20 MHz Input 2 signals (f1, f2)	–5	2.5	—	dBm	—
E-8	IIP3 –10 MHz offset HG	IIP3H2Ta	1	High-Gain mode f1 = fRXa – 10 MHz f2 = fRXa – 20 MHz Input 2 signals (f1, f2)	– 5	2.0	—	dBm	—
E-9	IIP3 –95 MHz offset HG	IIP3_2040 HTa	1	High-Gain mode f1 = fRXa – 190 MHz PRX1 = – 27 dBm f2 = fRXa – 100 MHz PRX2 = – 33 dBm Input 2 signals (f1, f2)	– 0.5	5.0	—	dBm	—
E-10	IIP3 –190 MHz offset HG	IIP3_1760 HTa	1	High-Gain mode f1 = fRXa – 190 MHz PRX1 = – 27 dBm f2 = fRXa – 380 MHz PRX2 = – 45 dBm Input 2 signals (f1, f2)	– 3.5	1.5	—	dBm	—

Note) *1 : Connector & substrate loss (0.1dB) included

■ Electrical Characteristics (Reference values for design ; continued) at V_{CC} = 2.7 V to 2.95 V

Note) •All characteristics are specified under T_a = –20°C to 85°C, fRXa = 2 110 MHz, 2 140 MHz, 2 170 MHz, PRX = –30 dBm, CW

• The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection. If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
2.1 GHz : LNA AC electrical characteristics									
E-11	IIP3 HG	IIP3_6040 HTa	1	High-Gain mode f1 = fRXa – 190 MHz PRX1 = – 27 dBm f2 = 2f1 + fRXa PRX2 = – 25 dBm Input 2 signals (f1, f2)	– 0.5	5.5	—	dBm	—
E-12	Input P1dB HG	IP1dB HTa	1	High-Gain mode f1 = fRXa, PRX1 = – 40 dBm f2 = fRXa – 190 MHz Input 2 signals (f1, f2)	– 21	–12	—	dBm	—

■ Electrical Characteristics (Reference values for design : continued) at V_{CC} = 2.7 V to 2.95 V

Note) •All characteristics are specified under T_a = –20°C to 85°C, fRXb = 875 MHz, 880 MHz, 885 MHz, PRX = –30 dBm, CW

•The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection. If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
800 MHz : LNA AC electrical characteristics									
F-1	Power Gain HG	GHTb	2	High-Gain mode f = fRXb	14.5	17.0	19.0	dB	—
F-2	Power Gain LG	GLTb	2	Low-Gain mode f = fRXb, PRX = – 20 dBm	–7.0	–4.2	–0.5	dB	—
F-3	Noise Figure HG	NFHTb	2	High-Gain mode f = fRXb	—	1.10	2.00	dB	*1
F-4	Noise Figure LG	NFLTb	2	Low-Gain mode f = fRXb	—	4.2	7.0	dB	—
F-5	IM2 HG	IM2_45 HTb	2	High-Gain mode f1 = fRXb – 45 MHz PRX1 = – 27 dBm f2 = 45 MHz, PRX2 = – 55 dBm Input 2 signals (f1, f2)	—	–94	-86	dBm	—
F-6	IM2 HG	IM2_1715 HTb	2	High-Gain mode f1 = fRXb – 45 MHz PRX1 = – 27 dBm f2 = 2fRXb – 45 MHz PRX2 = – 50 dBm Input 2 signals (f1, f2)	—	–78	–69	dBm	—
F-7	IIP3 +10 MHz offset HG	IIP3H1Tb	2	High-Gain mode f1 = fRXb + 10 MHz f2 = fRXb + 20 MHz Input 2 signals (f1, f2)	–8.5	2.0	—	dBm	—
F-8	IIP3 –10 MHz offset HG	IIP3H2Tb	2	High-Gain mode f1 = fRXb – 10 MHz f2 = fRXb – 20 MHz Input 2 signals (f1, f2)	–10	0.0	—	dBm	—
F-9	IIP3 –22.5 MHz offset HG	IIP3_857.5 HTb	2	High-Gain mode f1 = fRXb – 45 MHz PRX1 = – 27 dBm f2 = fRXb – 22.5 MHz PRX2 = – 47 dBm Input 2 signals (f1, f2)	4.5	12.5	—	dBm	—
F-10	IIP3 –45 MHz offset HG	IIP3_790 HTb	2	High-Gain mode f1 = fRXb – 45 MHz PRX1 = – 27 dBm f2 = fRXb – 90 MHz PRX2 = – 50 dBm Input 2 signals (f1, f2)	–8.0	0.0	—	dBm	—

Note) *1 : Connector & substrate loss (0.05dB) included

■ Electrical Characteristics (Reference values for design : continued) at V_{CC} = 2.7 V to 2.95 V

Note) •All characteristics are specified under T_a = –20°C to 85°C, fRXb = 875 MHz, 880 MHz, 885 MHz, PRX = –30 dBm, CW

•The characteristics listed below are reference values derived from the design of the IC and are not guaranteed by inspection. If a problem does occur related to these characteristics, we will respond in good faith to user concerns.

B No.	Parameter	Symbol	Test Circuit	Conditions	Reference values			Unit	Notes
					Min	Typ	Max		
800 MHz : LNA AC electrical characteristics									
F-11	IIP3 HG	IIP3_2550 HTb	2	High-Gain mode f1 = fRXb – 45 MHz PRX1 = – 27 dBm f2 = 2f1 + fRXb PRX2 = – 45 dBm Input 2 signals (f1, f2)	–10	–2.5	—	dBm	—
F-12	Input P1dB TX undesired signal input HG	IP1dB HTb	2	High-Gain mode f1 = fRXb, PRX1 = – 40 dBm f2 = fRXb – 45 MHz Input 2 signals (f1, f2)	–21	–14	—	dBm	—

■ Control Pins Mode Table

Note) Control voltage range : See B No. DC-5 / B No. DC-6 at page 8

Pin No.	Descriptions	Voltage		Note
		Low	High	
3	High-Gain/Low-Gain Switching (Gain Control)	Low-Gain	High-Gain	
4	800 MHz/2.1 GHz Switching (LNA Select)	800 MHz	2.1 GHz	

■ Truth Table

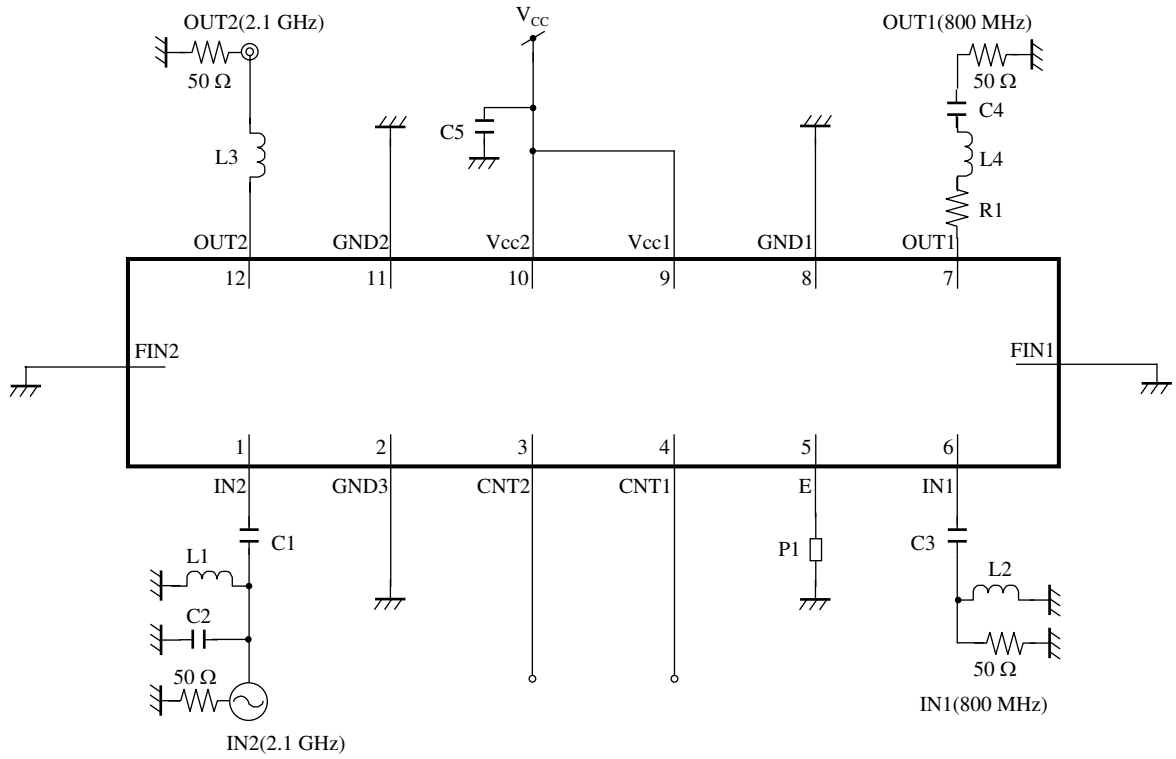
Note) Control voltage range : See B No. DC-5 / B No. DC-6 at page 8

CNT1 (LNA Select) (Pin4)	CNT2 (Gain Control) (Pin3)	LNA2 (2.1 GHz)	LNA1 (800 MHz)	Mode
Low	High	Off	High-Gain	800 MHz High-Gain
Low	Low	Off	Low-Gain	800 MHz Low-Gain
High	High	High-Gain	Off	2.1 GHz High-Gain
High	Low	Low-Gain	Off	2.1 GHz Low-Gain

■ Test Circuit Diagram

Note) External components : See page 23

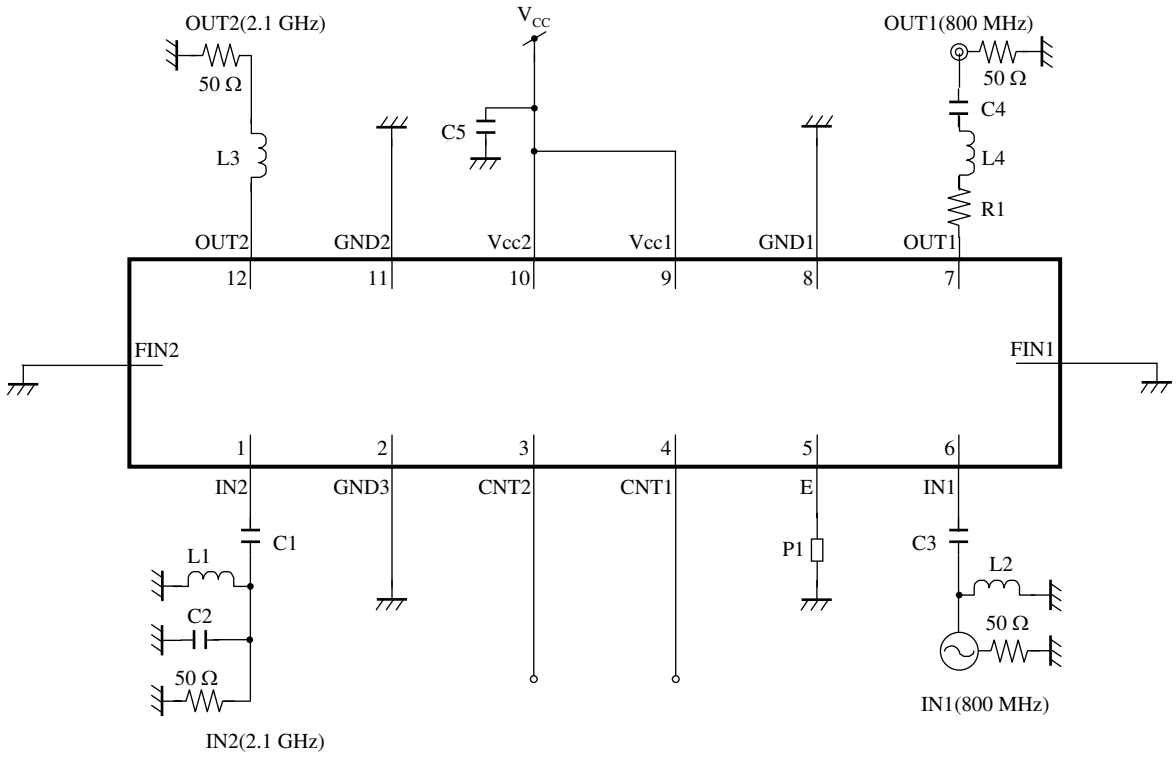
• Test Circuit Diagram 1



■ Test Circuit Diagram (continued)

Note) External components : See page 23

- Test Circuit Diagram 2



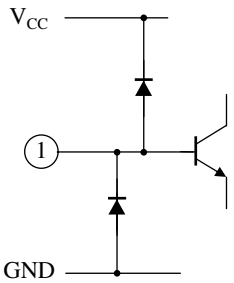
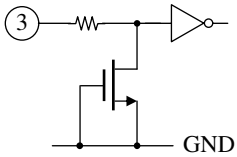
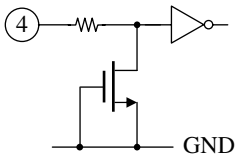
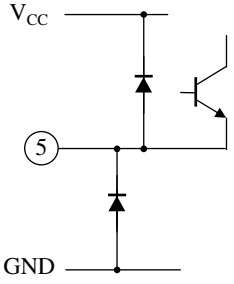
■ Test Circuit Diagram (continued)

• External Components

Components	Size	Value	Part Number	Vendor
L1	1 005	1.5 nH	EKJRF1N5DF2	Panasonic
L2	1 005	10 nH	EKJRF10NJF2	Panasonic
L3	1 005	3.3 nH	EKJRF3N3DF2	Panasonic
L4	1 005	2.7 nH	EKJRF2N7DF2	Panasonic
C1	1 005	0.01 μF	ECJ0EB1A103K	Panasonic
C2	1 005	2.4 pF	ECDG0E2R4B	Panasonic
C3	1 005	0.01 μF	ECJ0EB1A103K	Panasonic
C4	1005	33 pF	ECJ0EC1H330J	Panasonic
C5	1 005	1 pF//10 pF//100 pF //1000 pF	ECJ0EB1H010C, others	Panasonic
R1	1608	12Ω	ERJ3GEYJ120V	Panasonic
P1	Pattern	0.62 nH	Er = 2.7, W = 0.2 mm t = 0.6 mm, L = 0.95 mm	—

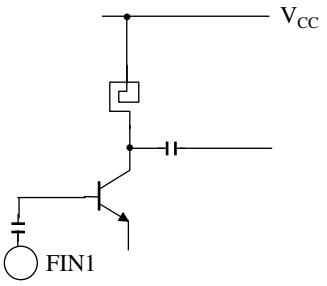
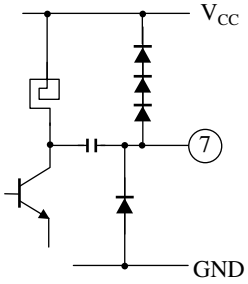
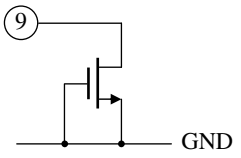
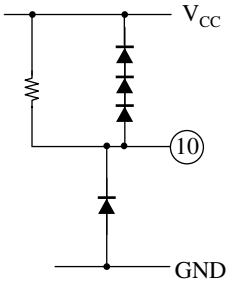
■ Technical Data

• I/O block circuit diagrams and pin function descriptions

Pin No.	Voltage	Internal Circuit	Descriptions
1	0.85 V		2.1 GHz LNA input
2	0.0 V	—	GND
3	—		High-Gain/Low-Gain SW input Less than 0.40 V(V_{CC} × 0.14): Low-Gain mode More than 2.57 V(V_{CC} × 0.90): High-Gain mode
4	—		800 MHz/2.1 GHz SW input Less than 0.40 V(V_{CC} × 0.14): 800 MHz mode More than 2.57 V(V_{CC} × 0.90): 2.1 GHz mode
5	0.0 V		800 MHz LNA emitter
6	0.85 V	Same as 1	800 MHz LNA input

■ Technical Data (continued)

• I/O block circuit diagrams and pin function descriptions (continued)

Pin No.	Voltage	Internal Circuit	Descriptions
FIN1	—		GND
7	—		800 MHz LNA output
8	0.0 V	—	GND
9	2.85 V		Voltage supply
10	2.85 V		Voltage supply