LNA IC for VHF and UHF Band (40 MHz to 900 MHz) Applications

FEATURES

- Low voltage operation   +1.8 V to +2.5 V typ.
- Low current consumption

    5.5 mA typ. (High-Gain mode / V_{CC} = 1.8 V)

    1 µA typ. (Low-Gain mode / V_{CC} = 1.8 V)

- High gain

  14.5 dB typ. fRX = 470 MHz (High-Gain mode / V_{CC} = 1.8 V)

- Low noise figure

  1.36 dB typ. fRX = 470 MHz (High-Gain mode / V_{CC} = 1.8 V)

- Low distortion (IIP3 +10 MHz offset)

  −1.5 dBm typ. fRX = 470 MHz (High-Gain mode / V_{CC} = 1.8 V)

- Small package 5 pin Plastic Small Surface Mount Package
 (SMINI Type)

APPLICATIONS

- DTV(VHF／UHF)

DESCRIPTION

AN26072A is LNA-IC for VHF and UHF Band (40 MHz to 900 MHz) Applications.

Realizing high performance by using SiGe Bi-CMOS process (f_T = 90 GHz, f_{max} = 140 GHz).

High/Low Gain-mode is changeable, controlled by integrated CMOS logic circuit.

Achieving miniaturization by using small size package.

SIMPLIFIED APPLICATION

TOP VIEW
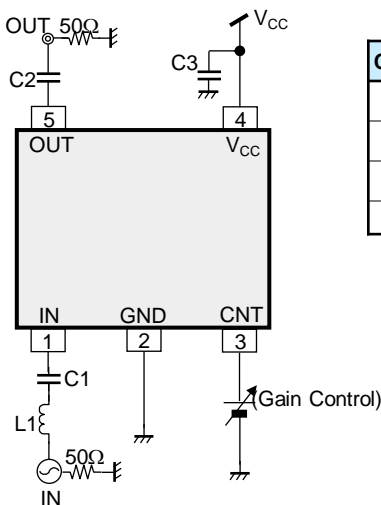
Components	Size	Value	Part Number	Vendor
C1	0603	1 000 pF	GRM033B11C102KD01	Murata
C2	0603	1 000 pF	GRM033B11C102KD01	Murata
C3	0603	0.1 uF	GRM033B30J104KE18	Murata
L1	0603	6.8 nH	LQP03T6N8H04	Murata

Notes) This application circuit is an example. The operation of mass production set is not guaranteed. You should perform enough evaluation and verification on the design of mass production set. You are fully responsible for the incorporation of the above application circuit and information in the design of your equipment.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating	Unit	Note
Supply voltage	V_{CC}	3.6	V	*1
Supply current	I_{CC}	18	mA	—
Operating ambient temperature	T_{opr}	−20 to 70	°C	*2
Operating junction temperature	T_j	−40 to +125	°C	*2
Storage temperature	T_{stg}	−55 to +125	°C	*2
Input Voltage Range	IN (Pin No.1)	—	V	*3
	CNT (Pin No.3)	-0.3 to (V_{CC} + 0.3)	V	*4
	OUT (Pin No.5)	—	V	*5
ESD	HBM (Human Body Model)	2	kV	—
	MM (Machine Model)	100	V	—

Notes). This product may sustain permanent damage if subjected to conditions higher than the above stated absolute maximum rating.
   This rating is the maximum rating and device operating at this range is not guaranteeable as it is higher than our stated recommended operating range.
   When subjected under the absolute maximum rating for a long time, the reliability of the product may be affected.
   *1:The values under the condition not exceeding the above absolute maximum ratings and the power dissipation.
   *2:Except for the power dissipation, operating ambient temperature, and storage temperature, all ratings are for Ta = 25°C.
   *3:RF signal input pin. Do not apply DC current.
   *4:(Vcc + 0.3) V must not be exceeded 3.6 V
   *5:RF signal output pin. Do not apply DC current.

POWER DISSIPATION RATING

PACKAGE	θ_{JA}	PD (Ta=25 °C)	PD (Ta=70 °C)
SSMINI-5DC	833.3°C/W	0.12W	0.06W

Note). For the actual usage, please refer to the PD-Ta characteristics diagram in the package specification, supply voltage, load and ambient temperature conditions to ensure that there is enough margin follow the power and the thermal design does not exceed the allowable value.

CAUTION
Although this has limited built-in ESD protection circuit, but permanent damage may occur on it. Therefore, proper ESD precautions are recommended to avoid electrostatic damage to the MOS gates

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply voltage range	V_{CC}	1.70	2.50	3.00	V	*1

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

ELECRTRICAL CHARACTERISTICS

Vcc = 2.5 V   Ta = 25°C±2°C unless otherwise specified.

Parameter	Symbol	Condition	Limits			Unit	Note
			Min	Typ	Max		
DC electrical characteristics							
Supply current HG	IccHA	Vcc current at High-Gain mode No input signal	—	5.7	7.7	mA	
Supply current LG	IccLA	Vcc current at Low-Gain mode No input signal	—	1	10	μA	
Input voltage (High-Gain mode)	VIHA	—	1.40	2.50	—	V	
Input voltage (Low-Gain mode)	VILA	—	—	0.0	0.55	V	
SW current (High)	IIHA	Current at CNT pin VIHA = Vcc	—	1	10	μA	

Panasonic

ELECRTRICAL CHARACTERISTICS (continued)

Vcc = 1.8 V   Ta = 25°C±2°C unless otherwise specified.

Parameter	Symbol	Condition	Limits			Unit	Note
			Min	Typ	Max		
DC electrical characteristics							
Supply current HG	IccHB	Vcc current at High-Gain mode No input signal	—	5.5	7.5	mA	—
Supply current LG	IccLB	Vcc current at Low-Gain mode No input signal	—	1	10	μA	—
Input voltage (High-Gain mode)	VIHB	—	1.40	2.50	—	V	—
Input voltage (Low-Gain mode)	VILB	—	—	0.0	0.55	V	—

ELECRTRICAL CHARACTERISTICS (continued)

Vcc = 2.5 V   Ta = 25°C±2°C, fRX = 470 MHz, PRX = –30 dBm, CW unless otherwise specified

Parameter	Symbol	Condition	Limits			Unit	Note
			Min	Typ	Max		
LNA AC electrical characteristics							
Power Gain HG	GHSA	High-Gain mode f = fRX	13	15	17	dB	—
Power Gain LG	GLSA	Low-Gain mode f = fRX, PRX = –20 dBm	–1.8	–1.3	—	dB	—
IIP3 +10 MHz offset	IIP31SA	f1 = fRX + 10 MHz f2 = fRX + 20 MHz Input 2 signals (f1, f2)	–7.5	–1.0	—	dBm	—

ELECRTRICAL CHARACTERISTICS (continued)

Vcc = 1.8 V   Ta = 25°C±2°C, fRX = 470 MHz, PRX = –30 dBm, CW unless otherwise specified

Parameter	Symbol	Condition	Limits			Unit	Note
			Min	Typ	Max		
LNA AC electrical characteristics							
Power Gain HG	GHSB	High-Gain mode f = fRX	12.5	14.5	16.5	dB	—
Power Gain LG	GLSB	Low-Gain mode f = fRX, PRX = –20 dBm	–2.0	–1.5	—	dB	—
IIP3 +10 MHz offset	IIP31SB	f1 = fRX + 10 MHz f2 = fRX + 20 MHz Input 2 signals (f1, f2)	–8.0	–1.5	—	dBm	—

APPLICATION INFORMATION
REFERENCE VALUES FOR DESIGN

Notes) Vcc = 2.5 V
Ta = 25°C±2°C, fRXa = 40 MHz, 470 MHz, 900 MHz, PRX = −30 dBm, CW unless otherwise specified.

Parameter	Symbol	Condition	Reference values			Unit	Note
			Min	Typ	Max		
LNA AC electrical characteristics							
Power Gain HG	GHAa	High-Gain mode f = fRXa	12.5	15	17.5	dB	*1
Power Gain LG	GLAa	Low-Gain mode f = fRXa, PRX = −20 dBm	−3.3	−1.3	—	dB	*1
Noise Figure HG	NFHAa	High-Gain mode f = fRXa	—	1.4	2.1	dB	*1,*2
Noise Figure LG	NFLAa	Low-Gain mode f = fRXa	—	1.8	3.8	dB	*1
IIP3 +10 MHz offset HG	IIP3H1Aa	High-Gain mode f1 = fRXa + 10 MHz f2 = fRXa + 20 MHz Input 2 signals (f1, f2)	−10.5	−1	—	dBm	*1
Input P1dB	IP1dBHAa	High-Gain mode f = fRXa	−17.5	−11.5	—	dBm	*1
Reverse Isolation HG	ISOHAa	High-Gain mode f = fRXa	—	−24	−18	dB	*1
Reverse Isolation LG	ISOAa	Low-Gain mode f = fRXa	—	−1.3	−0.4	dB	*1
Input Return Loss HG	S11HAa	High-Gain mode f = fRXa	5	16	—	dB	*1
Input Return Loss LG	S11LAa	Low-Gain mode f = fRXa	7	23.5	—	dB	*1
Output Return Loss HG	S22HAa	High-Gain mode f = fRXa	5	11	—	dB	*1
Output Return Loss LG	S22LAa	Low-Gain mode f = fRXa	8	16	—	dB	*1

Note)   *1 : Checked by design, not production tested.
         *2 : Connector & pattern (evaluation PCB) loss (0.01 dB at fRX = 40 MHz, 0.04 dB at fRX = 470 MHz,
            0.08 dB at fRX = 900 MHz) included.

APPLICATION INFORMATION (continued)
REFERENCE VALUES FOR DESIGN (continued)

Notes) Vcc = 1.8 V
   Ta = 25°C±2°C, fRXa = 40 MHz, 470 MHz, 900 MHz, PRX = –30 dBm, CW unless otherwise specified.

Parameter	Symbol	Condition	Reference values			Unit	Note
			Min	Typ	Max		
LNA AC electrical characteristics							
Power Gain HG	GHBa	High-Gain mode f = fRXa	12	14.5	17	dB	*1
Power Gain LG	GLBa	Low-Gain mode f = fRXa, PRX = –20 dBm	–3.5	–1.5	—	dB	*1
Noise Figure HG	NFHBa	High-Gain mode f = fRXa	—	1.4	2.1	dB	*1,*2
Noise Figure LG	NFLBa	Low-Gain mode f = fRXa	—	2	4	dB	*1
IIP3 +10 MHz offset HG	IIP3H1Ba	High-Gain mode f1 = fRXa + 10 MHz f2 = fRXa + 20 MHz Input 2 signals (f1, f2)	–11	–1.5	—	dBm	*1
Input P1dB	IP1dBHBa	High-Gain mode f = fRXa	–18	–12	—	dBm	*1
Reverse Isolation HG	ISOHBa	High-Gain mode f = fRXa	—	–24	–18	dB	*1
Reverse Isolation LG	ISOLBa	Low-Gain mode f = fRXa	—	–1.5	–0.6	dB	*1
Input Return Loss HG	S11HBa	High-Gain mode f = fRXa	5	14	—	dB	*1
Input Return Loss LG	S11LBa	Low-Gain mode f = fRXa	7	26	—	dB	*1
Output Return Loss HG	S22HBa	High-Gain mode f = fRXa	7	13	—	dB	*1
Output Return Loss LG	S22LBa	Low-Gain mode f = fRXa	8	15	—	dB	*1

Note)   *1 : Checked by design, not production tested.
         *2 : Connector & pattern (evaluation PCB) loss (0.01 dB at fRX = 40 MHz, 0.04 dB at fRX = 470 MHz,
            0.08 dB at fRX = 900 MHz) included.

APPLICATION INFORMATION (continued)
REFERENCE VALUES FOR DESIGN (continued)

Notes) Vcc = 2.5 V
Ta = 25°C±2°C, fRXb = 470 MHz, 620 MHz, 770 MHz, PRX = –30 dBm, CW unless otherwise specified.

Parameter	Symbol	Condition	Reference values			Unit	Note
			Min	Typ	Max		
LNA AC electrical characteristics							
Power Gain HG	GHAb	High-Gain mode f = fRXb	12.8	14.8	17.2	dB	*1
Power Gain LG	GLAb	Low-Gain mode f = fRXb, PRX = –20 dBm	–2.7	–1.5	—	dB	*1
Noise Figure HG	NFHAb	High-Gain mode f = fRXb	—	1.4	1.9	dB	*1,*3
Noise Figure LG	NFLAb	Low-Gain mode f = fRXb	—	2.0	3.2	dB	*1
IIP3 +10 MHz offset HG	IIP3H1Ab	High-Gain mode f1 = fRXb + 10 MHz f2 = fRXb + 20 MHz Input 2 signals (f1, f2)	–8.0	0	—	dBm	*1
Input P1dB	IP1dBHAb	High-Gain mode f = fRXb	–16	–12	—	dBm	*1
Reverse Isolation HG	ISOHAb	High-Gain mode f = fRXb	—	–24	–18	dB	*1
Reverse Isolation LG	ISOAb	Low-Gain mode f = fRXb	—	–1.5	–0.9	dB	*1
Input Return Loss HG	S11HAb	High-Gain mode f = fRXb	8	17	—	dB	*1
Input Return Loss LG	S11LAb	Low-Gain mode f = fRXb	9	16	—	dB	*1
Output Return Loss HG	S22HAb	High-Gain mode f = fRXb	7	12	—	dB	*1
Output Return Loss LG	S22LAb	Low-Gain mode f = fRXb	9	13	—	dB	*1

Note)   *1 : Checked by design, not production tested.
*3 : Connector & pattern (evaluation PCB) loss (0.04 dB at fRX = 470 MHz, 0.05 dB at fRX = 620 MHz, 0.06 dB at fRX = 770 MHz) included.

APPLICATION INFORMATION (continued)
REFERENCE VALUES FOR DESIGN (continued)

Notes) Vcc = 1.8 V
Ta = 25°C±2°C, fRXb = 470 MHz, 620 MHz, 770 MHz, PRX = –30 dBm, CW unless otherwise specified.

Parameter	Symbol	Condition	Reference values			Unit	Note
			Min	Typ	Max		
LNA AC electrical characteristics							
Power Gain HG	GHBb	High-Gain mode f = fRXb	12.3	14.3	16.7	dB	*1
Power Gain LG	GLBb	Low-Gain mode f = fRXb, PRX = –20 dBm	–2.9	–1.7	—	dB	*1
Noise Figure HG	NFHBb	High-Gain mode f = fRXb	—	1.4	1.9	dB	*1,*3
Noise Figure LG	NFLBb	Low-Gain mode f = fRXb	—	2.2	3.4	dB	*1
IIP3 +10 MHz offset HG	IIP3H1Bb	High-Gain mode f1 = fRXb + 10 MHz f2 = fRXb + 20 MHz Input 2 signals (f1, f2)	–8.5	–0.5	—	dBm	*1
Input P1dB	IP1dBHBb	High-Gain mode f = fRXb	–17	–13	—	dBm	*1
Reverse Isolation HG	ISOHBb	High-Gain mode f = fRXb	—	–24	–18	dB	*1
Reverse Isolation LG	ISOLBb	Low-Gain mode f = fRXb	—	–1.7	–1.1	dB	*1
Input Return Loss HG	S11HBb	High-Gain mode f = fRXb	8	16	—	dB	*1
Input Return Loss LG	S11LBb	Low-Gain mode f = fRXb	9.5	17	—	dB	*1
Output Return Loss HG	S22HBb	High-Gain mode f = fRXb	7	13	—	dB	*1
Output Return Loss LG	S22LBb	Low-Gain mode f = fRXb	8	12	—	dB	*1

Note)   *1 : Checked by design, not production tested.
*3 : Connector & pattern (evaluation PCB) loss (0.04 dB at fRX = 470 MHz, 0.05 dB at fRX = 620 MHz, 0.06 dB at fRX = 770 MHz) included.

APPLICATION INFORMATION (continued)
REFERENCE VALUES FOR DESIGN (continued)

Notes) Vcc = 2.5 V
Ta = 25°C±2°C, fRXc = 207.5 MHz, 215 MHz, 222 MHz, PRX = –30 dBm, CW unless otherwise specified.

Parameter	Symbol	Condition	Reference values			Unit	Note
			Min	Typ	Max		
LNA AC electrical characteristics							
Power Gain HG	GHAc	High-Gain mode f = fRXc	12.7	14.5	17.3	dB	*1
Power Gain LG	GLAc	Low-Gain mode f = fRXc, PRX = –20 dBm	–1.5	–1.0	—	dB	*1
Noise Figure HG	NFHAc	High-Gain mode f = fRXc	—	1.2	1.7	dB	*1,*4
Noise Figure LG	NFLAc	Low-Gain mode f = fRXc	—	1.5	3.3	dB	*1
IIP3 +10 MHz offset HG	IIP3H1Ac	High-Gain mode f1 = fRXc + 10 MHz f2 = fRXc + 20 MHz Input 2 signals (f1, f2)	–9.5	–2	—	dBm	*1
Input P1dB	IP1dBHAc	High-Gain mode f = fRXc	–14	–10	—	dBm	*1
Reverse Isolation HG	ISOHAc	High-Gain mode f = fRXc	—	–25	–19	dB	*1
Reverse Isolation LG	ISOAc	Low-Gain mode f = fRXc	—	–1.0	–0.4	dB	*1
Input Return Loss HG	S11HAc	High-Gain mode f = fRXc	7	7.5	—	dB	*1
Input Return Loss LG	S11LAc	Low-Gain mode f = fRXc	20	25	—	dB	*1
Output Return Loss HG	S22HAc	High-Gain mode f = fRXc	7	11	—	dB	*1
Output Return Loss LG	S22LAc	Low-Gain mode f = fRXc	15	20	—	dB	*1

Note)   *1 : Checked by design, not production tested.
*4 : Connector & pattern (evaluation PCB) loss 0.03dB included.

APPLICATION INFORMATION (continued)
REFERENCE VALUES FOR DESIGN (continued)

Notes) Vcc = 1.8 V
Ta = 25°C±2°C, fRXc = 207.5 MHz, 215 MHz, 222 MHz, PRX = –30 dBm, CW unless otherwise specified.

Parameter	Symbol	Condition	Reference values			Unit	Note
			Min	Typ	Max		
LNA AC electrical characteristics							
Power Gain HG	GHBc	High-Gain mode f = fRXc	12.9	14.7	16.8	dB	*1
Power Gain LG	GLBc	Low-Gain mode f = fRXc, PRX = –20 dBm	–1.7	–1.2	—	dB	*1
Noise Figure HG	NFHBc	High-Gain mode f = fRXc	—	1.2	1.6	dB	*1,*4
Noise Figure LG	NFLBc	Low-Gain mode f = fRXc	—	1.7	3.5	dB	*1
IIP3 +10 MHz offset HG	IIP3H1Bc	High-Gain mode f1 = fRXc + 10 MHz f2 = fRXc + 20 MHz Input 2 signals (f1, f2)	–10	–2.5	—	dBm	*1
Input P1dB	IP1dBHBc	High-Gain mode f = fRXc	–16.5	–12.5	—	dBm	*1
Reverse Isolation HG	ISOHBc	High-Gain mode f = fRXc	—	–25	–19	dB	*1
Reverse Isolation LG	ISOLBc	Low-Gain mode f = fRXc	—	–1.2	–0.6	dB	*1
Input Return Loss HG	S11HBc	High-Gain mode f = fRXc	7	8	—	dB	*1
Input Return Loss LG	S11LBc	Low-Gain mode f = fRXc	17	22	—	dB	*1
Output Return Loss HG	S22HBc	High-Gain mode f = fRXc	7	15	—	dB	*1
Output Return Loss LG	S22LBc	Low-Gain mode f = fRXc	13	18	—	dB	*1

Note)   *1 : Checked by design, not production tested.
          *4 : Connector & pattern (evaluation PCB) loss 0.03dB included.

APPLICATION INFORMATION (continued)
REFERENCE VALUES FOR DESIGN (continued)

Notes) Vcc = 2.5 V
Ta = 25°C±2°C, fRXd = 90 MHz, 99 MHz, 108 MHz, PRX = −30 dBm, CW unless otherwise specified.

Parameter	Symbol	Condition	Reference values			Unit	Note
			Min	Typ	Max		
LNA AC electrical characteristics							
Power Gain HG	GHAd	High-Gain mode f = fRXd	12.7	14.5	17.2	dB	*1
Power Gain LG	GLAd	Low-Gain mode f = fRXd, PRX = −20 dBm	−1.4	−0.9	—	dB	*1
Noise Figure HG	NFHAd	High-Gain mode f = fRXd	—	1.2	1.7	dB	*1,*5
Noise Figure LG	NFLAd	Low-Gain mode f = fRXd	—	1.4	3.1	dB	*1
IIP3 +10 MHz offset HG	IIP3H1Ad	High-Gain mode f1 = fRXd + 10 MHz f2 = fRXd + 20 MHz Input 2 signals (f1, f2)	−10.5	−1	—	dBm	*1
Input P1dB	IP1dBHAd	High-Gain mode f = fRXd	−13.5	−9.5	—	dBm	*1
Reverse Isolation HG	ISOHAd	High-Gain mode f = fRXd	—	−25	−19	dB	*1
Reverse Isolation LG	ISOAd	Low-Gain mode f = fRXd	—	−0.9	−0.4	dB	*1
Input Return Loss HG	S11HAd	High-Gain mode f = fRXd	6	6.5	—	dB	*1
Input Return Loss LG	S11LAd	Low-Gain mode f = fRXd	16	21	—	dB	*1
Output Return Loss HG	S22HAd	High-Gain mode f = fRXd	7	11	—	dB	*1
Output Return Loss LG	S22LAd	Low-Gain mode f = fRXd	15	20	—	dB	*1

Note)   *1 : Checked by design, not production tested.
*5 : Connector & pattern (evaluation PCB) loss 0.02dB included.

APPLICATION INFORMATION (continued)
REFERENCE VALUES FOR DESIGN (continued)

Notes) Vcc = 1.8 V
Ta = 25°C±2°C, fRXd = 90 MHz, 99 MHz, 108 MHz, PRX = –30 dBm, CW unless otherwise specified.

Parameter	Symbol	Condition	Reference values			Unit	Note
			Min	Typ	Max		
LNA AC electrical characteristics							
Power Gain HG	GHBd	High-Gain mode f = fRXd	12.9	14.7	16.9	dB	*1
Power Gain LG	GLBd	Low-Gain mode f = fRXd, PRX = –20 dBm	–1.6	–1.1	—	dB	*1
Noise Figure HG	NFHBd	High-Gain mode f = fRXd	—	1.2	1.7	dB	*1,*5
Noise Figure LG	NFLBd	Low-Gain mode f = fRXd	—	1.6	3.3	dB	*1
IIP3 +10 MHz offset HG	IIP3H1Bd	High-Gain mode f1 = fRXd + 10 MHz f2 = fRXd + 20 MHz Input 2 signals (f1, f2)	–11	–1	—	dBm	*1
Input P1dB	IP1dBHBd	High-Gain mode f = fRXd	–16.5	–12.5	—	dBm	*1
Reverse Isolation HG	ISOHBd	High-Gain mode f = fRXd	—	–25	–19	dB	*1
Reverse Isolation LG	ISOLBd	Low-Gain mode f = fRXd	—	–1.1	–0.6	dB	*1
Input Return Loss HG	S11HBd	High-Gain mode f = fRXd	6	7	—	dB	*1
Input Return Loss LG	S11LBd	Low-Gain mode f = fRXd	15	20	—	dB	*1
Output Return Loss HG	S22HBd	High-Gain mode f = fRXd	7	16	—	dB	*1
Output Return Loss LG	S22LBd	Low-Gain mode f = fRXd	14	19	—	dB	*1

Note)   *1 : Checked by design, not production tested.
          *5 : Connector & pattern (evaluation PCB) loss 0.02dB included.

APPLICATION INFORMATION (continued)
REFERENCE VALUES FOR DESIGN (continued)

Notes) Vcc = 1.7 V to 3.0 V
        Ta = −20°C to 70°C

Parameter	Symbol	Condition	Reference values			Unit	Note
			Min	Typ	Max		
DC electrical characteristics							
Supply current HG	IccHT	Vcc current at High-Gain mode No input signal	—	5.7	8.2	mA	*1
Supply current LG	IccLT	Vcc current at Low-Gain mode No input signal	—	1	11	μA	*1
Input voltage (High-Gain mode)	VIHT	—	1.50	2.50	—	V	*1
Input voltage (Low-Gain mode)	VILT	—	—	0.0	0.40	V	*1
SW current (High)	IIHT	Current at CNT pin VIHT = Vcc	—	1	11	μA	*1

Note)   *1 : Checked by design, not production tested.

APPLICATION INFORMATION (continued)
REFERENCE VALUES FOR DESIGN (continued)

Notes) Vcc = 1.7 V to 3.0 V
Ta = –20°C to 70°C, fRXa = 40 MHz, 470 MHz, 900 MHz, PRX = –30 dBm, CW

Parameter	Symbol	Condition	Reference values			Unit	Note
			Min	Typ	Max		
LNA AC electrical characteristics							
Power Gain HG	GHT	High-Gain mode f = fRXa	11.5	15	18.5	dB	*1
Power Gain LG	GLT	Low-Gain mode f = fRXa, PRX = –20 dBm	–3.8	–1.3	—	dB	*1
Noise Figure HG	NFHT	High-Gain mode f = fRXa	—	1.4	2.5	dB	*1,*2
Noise Figure LG	NFLT	Low-Gain mode f = fRXa	—	1.8	4.3	dB	*1
IIP3 +10 MHz offset HG	IIP3H1T	High-Gain mode f1 = fRXa + 10 MHz f2 = fRXa + 20 MHz Input 2 signals (f1, f2)	–13.0	–1.0	—	dBm	*1
Input P1dB HG	IP1dBHT	High-Gain mode f = fRXa	–20	–11.5	—	dBm	*1

Note)   *1 : Checked by design, not production tested.
            *2 : Connector & pattern (evaluation PCB) loss (0.01 dB at fRX = 40 MHz, 0.04 dB at fRX = 470 MHz,
                  0.08 dB at fRX = 900 MHz) included.

PIN CONFIGURATION

Top View

OUT	VCC
5	4
1	2	3
IN	GND	CNT
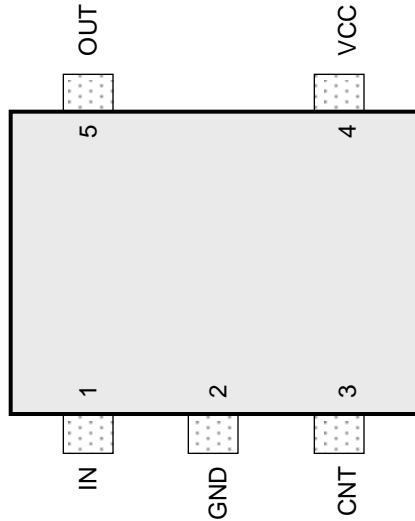
PIN FUNCTIONS

Pin No.	Pin name	Type	Description
1	IN	Input	RF Input
2	GND	Ground	GND
3	CNT	Input	High-Gain / Low-Gain switch L: Low-Gain Mode H: High-Gain Mode
4	VCC	Power Supply	V_{CC}
5	OUT	Output	RF Output

FUNCTIONAL BLOCK DIAGRAM

OUT V_{CC}

5   4

Gain Select

Logic

1   2   3

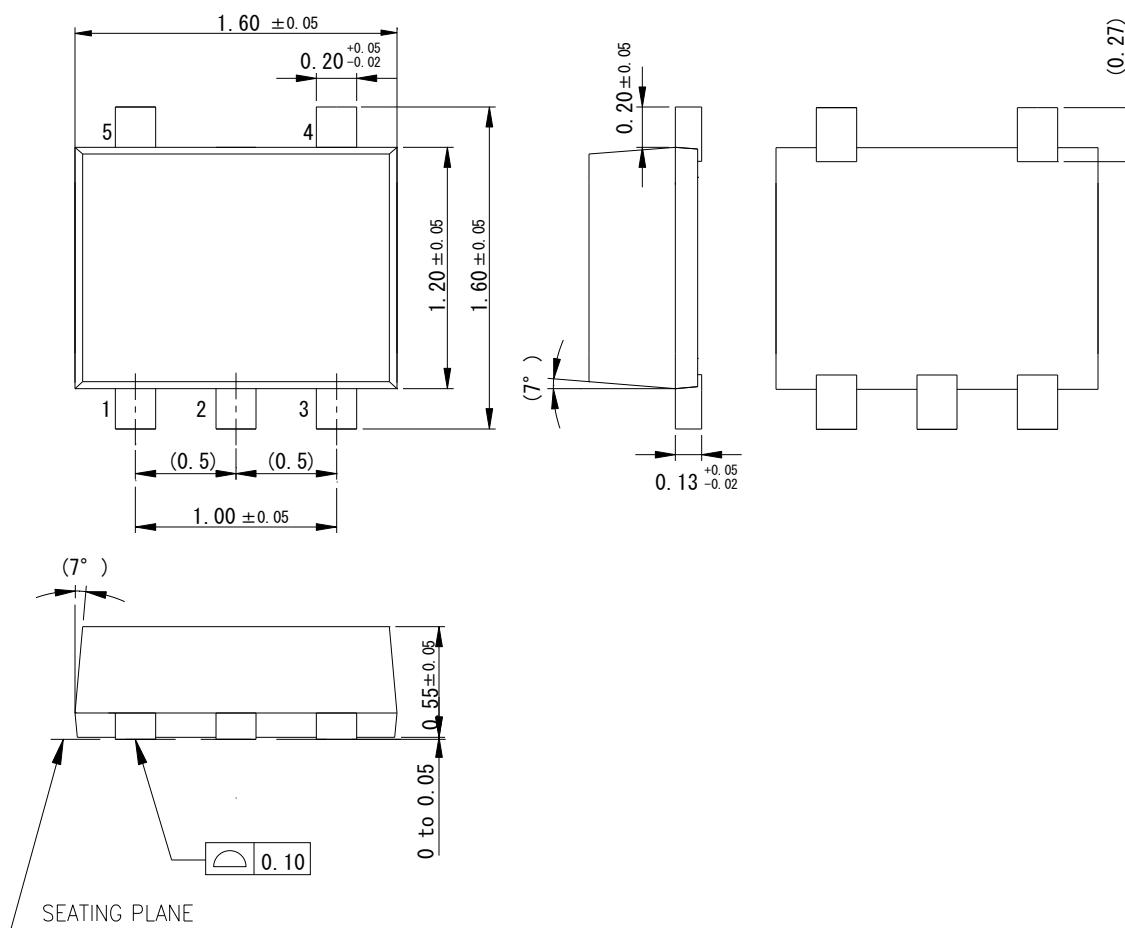IN   GND   CNT   (Gain control)
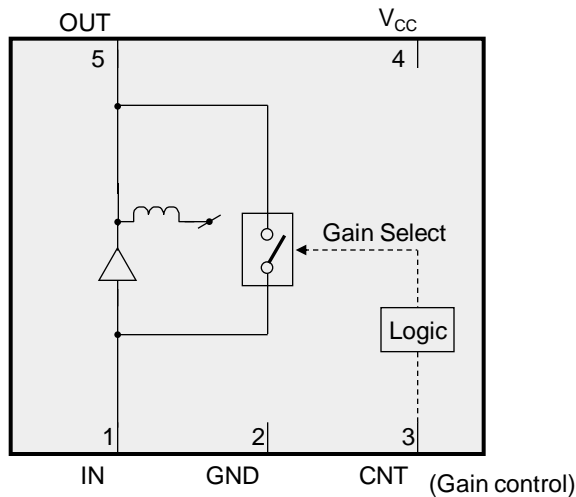
Notes) This circuit and these circuit constants show an example and do not guarantee the design as a mass-production set.
This block diagram is for explaining functions. The part of the block diagram may be omitted, or it may be simplified.

PACKAGE INFORMATION (Reference Data)

Package Code:SSMINI-5DC

Unit:mm

Body Material	:	Br / Sb Free Epoxy Resin
Lead Material	:	Cu Alloy
Lead Finish Method : SnBi Plating		

■ IMPORTANT NOTICE

1. The products and product specifications described in this book 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.

2. When using the LSI for new models, verify the safety including the long-term reliability for each product.

3. When the application system is designed by using this LSI, be sure to confirm notes in this book.
   Be sure to read the notes to descriptions and the usage notes in the book.

4. The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products. No license is granted in and to any intellectual property right or other right owned by Panasonic Corporation or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information de-scribed in this book.

5. This book may be not reprinted or reproduced whether wholly or partially, without the prior written permission of our company.

6. This LSI is intended to be used for general electronic equipment.
   Consult our sales staff in advance for information on the following applications: Special applications in which exceptional quality and reliability are required, or if the failure or malfunction of this LSI may directly jeopardize life or harm the human body.
   Any applications other than the standard applications intended.
   (1) Space appliance (such as artificial satellite, and rocket)
   (2) Traffic control equipment (such as for automobile, airplane, train, and ship)
   (3) Medical equipment for life support
   (4) Submarine transponder
   (5) Control equipment for power plant
   (6) Disaster prevention and security device
   (7) Weapon
   (8) Others : Applications of which reliability equivalent to (1) to (7) is required
   It is to be understood that our company shall not be held responsible for any damage incurred as a result of or in connection with your using the LSI described in this book for any special application, unless our company agrees to your using the LSI in this book for any special application.

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   Our company shall not be held responsible for any damage incurred by you or any third party as a result of or in connection with your using the LSI in automotive application, unless our company agrees to your using the LSI in this book for such application.

8. If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.

9. Please use this product in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Our company shall not be held responsible for any damage incurred as a result of your using the LSI not complying with the applicable laws and regulations.

USAGE NOTES

1. When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. 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.

2. Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.

3. Pay attention to the direction of LSI. When mounting it in the wrong direction onto the PCB (printed-circuit-board), it might smoke or ignite.

4. Pay attention in the PCB (printed-circuit-board) pattern layout in order to prevent damage due to short circuit between pins. In addition, refer to the Pin Description for the pin configuration.

5. Perform a visual inspection on the PCB before applying power, otherwise damage might happen due to problems such as a solder-bridge between the pins of the semiconductor device. Also, perform a full technical verification on the assembly quality, because the same damage possibly can happen due to conductive substances, such as solder ball, that adhere to the LSI during transportation.

6. Take notice in the use of this product that it might break or occasionally smoke when an abnormal state occurs such as output pin-VCC short (Power supply fault), output pin-GND short (Ground fault), or output-to-output-pin short (load short) .

   And, safety measures such as an installation of fuses are recommended because the extent of the above-mentioned damage and smoke emission will depend on the current capability of the power supply.

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