

GENERAL DESCRIPTION

The SGM13001C is a low noise amplifier (LNA) for GLONASS, Galileo, Beidou and GPS applications. The device delivers 19.1dB gain at an extremely low noise figure of 0.83dB. It also features high gain and excellent linearity performance that operates from 1550MHz to 1615MHz.

The device requires 6.4mA from a single 1.6V to 3.1V supply, dropping to below 1µA in power down mode.

No external DC blocking capacitors are required on the RF paths as long as no external DC voltage is applied, which can save PCB area and cost.

The SGM13001C is available in a Green UTDFN-1.5×1.0-6AL package.

APPLICATIONS

- Car Navigation
- Personal Navigation Equipment
- Mobile Phone with GPS
- RF Front End Modules
- Digital Video Camera, Digital Camera

FEATURES

- **High Gain: 19.1dB at 1575.42MHz**
- **Low Noise Figure: 0.83dB at 1575.42MHz**
- **Low Operation Current: 6.4mA**
- **Current Less than 1µA in Power Down Mode**
- **Operating Frequency Range: 1550MHz to 1615MHz**
- **Single Supply Voltage Range: 1.6V to 3.1V**
- **Low Cost BOM**
- **Lead-Free and RoHS Compliant**
- **Available in a Green UTDFN-1.5×1.0-6AL Package**

BLOCK DIAGRAM

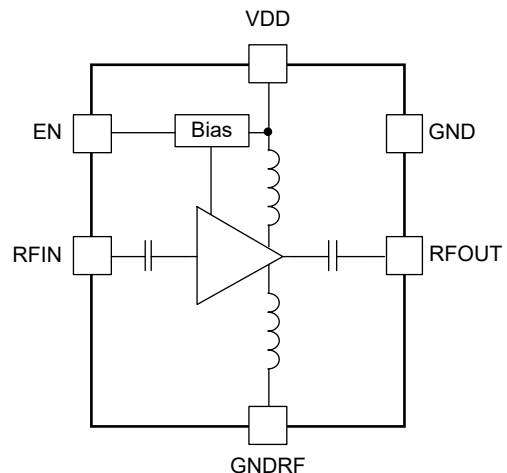


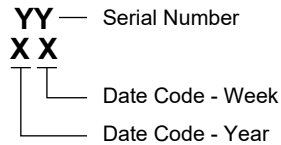
Figure 1. SGM13001C Block Diagram

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM13001C	UTDFN-1.5×1.0-6AL	-40°C to +85°C	SGM13001CYUGF6G/TR	6R XX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XX = Date Code.



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

- Supply Voltage, V_{DD} -0.3V to 3.6V
- EN to GND..... -0.3V to 3.6V
- RFIN, RFOUT to GND -0.3V to 0.3V
- RF Input Power, P_{IN} 10dBm
- Junction Temperature.....+150°C
- Storage Temperature Range -55°C to +150°C
- Lead Temperature (Soldering, 10s).....+260°C
- ESD Susceptibility
- HBM.....4000V
- CDM 500V

RECOMMENDED OPERATING CONDITIONS

- Operating Temperature Range -40°C to +85°C
- Supply Voltage Range, V_{DD} 1.6V to 3.1V
- Operating Frequency Range, f_0 1550MHz to 1615MHz
- Control Voltage High, V_{CTL_H} 1.35V to V_{DD}
- Control Voltage Low, V_{CTL_L} 0V to 0.45V

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

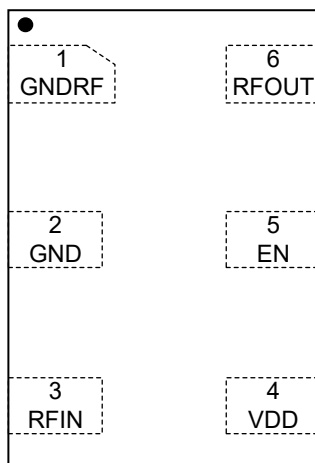
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

PIN CONFIGURATION

(TOP VIEW)



UTDFN-1.5×1.0-6AL

PIN DESCRIPTION

PIN	NAME	FUNCTION
1	GNDRF	RF Ground.
2	GND	Analog Ground.
3	RFIN	LNA Input from Antenna.
4	VDD	Power Supply.
5	EN	Active High Enable Input for the Device. Pull high enable, pull low into power down mode.
6	RFOUT	LNA Output.

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{DD} = 1.6V to 3.1V, f = 1550MHz to 1615MHz, typical values are at V_{DD} = 2.8V, f = 1575.42MHz, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
DC Characteristics						
Supply Voltage	V _{DD}		1.6		3.1	V
Supply Current	I _{VDD}	EN = High		6.4	10.2	mA
	I _{SD}	EN = Low	0	0.2	2.3	µA
Control Voltage	V _{CTL_H}	High	1.35	1.8	V _{DD}	V
	V _{CTL_L}	Low	0	0	0.45	
Turn-On Time	t _{ON}	Time from EN on to 90% of the gain		0.5		µs
Turn-Off Time	t _{OFF}	Time from EN off to 10% of the gain		0.1		µs
RF Characteristics						
RF Frequency Range	f ₀	None		1575.42		MHz
Power Gain	S21		17.1	19.1		dB
Noise Figure	NF			0.83		dB
Input Return Loss	S11			-4		dB
Output Return Loss	S22			-11		dB
Reverse Isolation	S12			-27		dB
Stability	Kf	Frequency range from 500MHz to 5GHz	1			
Input Power 1dB Compression Point	P _{1dB}			-12		dBm
Input In-Band IP3	IIP3_inb	f ₁ = 1574.5MHz, f ₂ = 1575.5MHz, -30dBm		-2		dBm
Input Out-Band IP3	IIP3_outb	f ₁ = 1712.7MHz, -30dBm, f ₂ = 1850MHz, -30dBm, IP3 = (2 × P1 + P2 + Gain 1575MHz - IM3)/2		0		dBm

(T_A = +25°C, V_{DD} = 1.6V to 3.1V, f = 1550MHz to 1615MHz, typical values are at V_{DD} = 1.8V, f = 1575.42MHz, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
DC Characteristics						
Supply Voltage	V _{DD}		1.6		3.1	V
Supply Current	I _{VDD}	EN = High		6.3	10.2	mA
	I _{SD}	EN = Low	0	0.1	1.5	µA
Control Voltage	V _{CTL_H}	High	1.35	1.8	V _{DD}	V
	V _{CTL_L}	Low	0	0	0.45	
Turn-On Time	t _{ON}	Time from EN on to 90% of the gain		0.5		µs
Turn-Off Time	t _{OFF}	Time from EN off to 10% of the gain		0.1		µs
RF Characteristics						
RF Frequency Range	f ₀	None		1575.42		MHz
Power Gain	S21		16.6	18.6	20.6	dB
Noise Figure	NF			0.84		dB
Input Return Loss	S11			-4		dB
Output Return Loss	S22			-11		dB
Reverse Isolation	S12			-27		dB
Stability	Kf	Frequency range from 500MHz to 5GHz	1			
Input Power 1dB Compression Point	P _{1dB}			-17		dBm
Input In-Band IP3	IIP3_inb	f ₁ = 1574.5MHz, f ₂ = 1575.5MHz, -30dBm		-3		dBm
Input Out-Band IP3	IIP3_outb	f ₁ = 1712.7MHz, -30dBm, f ₂ = 1850MHz, -30dBm, IP3 = (2 × P1 + P2 + Gain 1575MHz - IM3)/2		-2		dBm

TYPICAL APPLICATION CIRCUIT

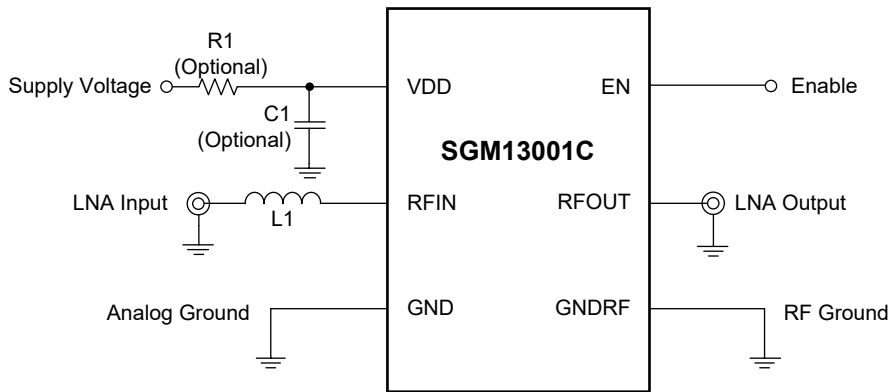


Figure 2. SGM13001C Typical Application Circuit

Table 1. SGM13001C Function Table

Component	Vendor	Type	Part Number & Value
L1	Murata	Wired inductor, high Q	LQW15AN9N1, 9.1nH

EVALUATION BOARD LAYOUT

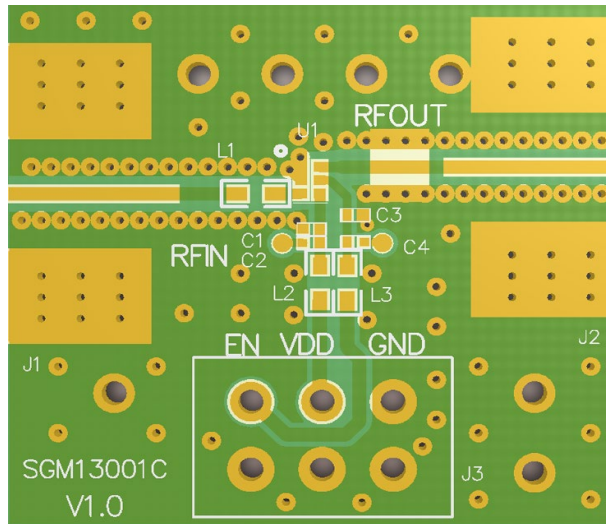


Figure 3. SGM13001C Evaluation Board Layout

REVISION HISTORY

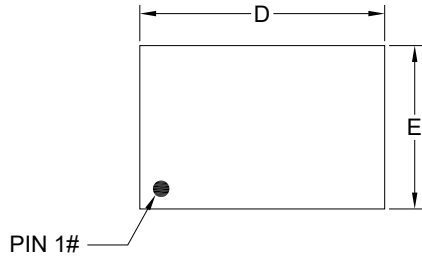
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (MARCH 2022) to REV.A	Page
Changed from product preview to production data.....	All

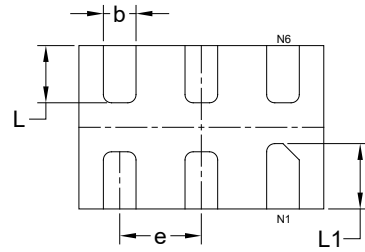
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

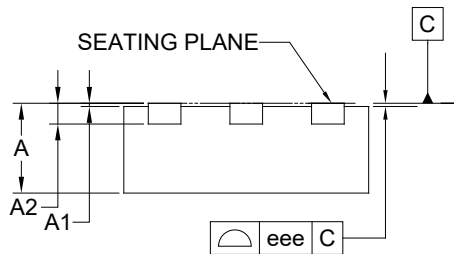
UTDFN-1.5×1.0-6AL



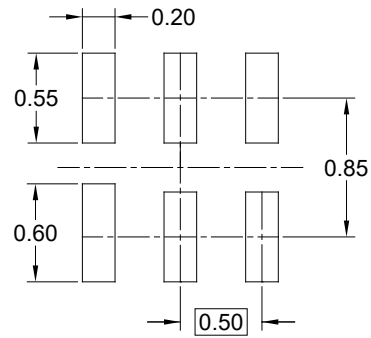
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.500	-	0.600
A1	0.000	-	0.050
A2	0.127 REF		
b	0.150	-	0.250
D	1.400	-	1.600
E	0.900	-	1.100
e	0.500 BSC		
L	0.250	-	0.450
L1	0.300	-	0.500
eee	0.050		

NOTE: This drawing is subject to change without notice.

PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
UTDFN-1.5×1.0-6AL	7"	9.5	1.12	1.72	0.7	4.0	4.0	2.0	8.0	Q1

DD00001

PACKAGE INFORMATION

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7" (Option)	368	227	224	8
7"	442	410	224	18

DD0002