

# SK5295D LNA for Global Navigation Satellite System (GNSS) with High Gain

## GENERAL DESCRIPTION

The SK5295D is a high-gain, low-noise amplifier (LNA) designed for GPS, Galileo, Glonass and Beidou GNSS applications. The LNA achieves 17.64dB gain with 0.91dB noise figure at 1.575GHz, and 16.93dB gain with a noise figure of 0.88dB at 1.176GHz.

The SK5295D sits on a small form factor PCB space. It can operate from a 1.6V to 3.6V single supply and draws only 4.8mA DC current. The shutdown leakage current is only 1uA.

The SK5295D is available in a DFN1.5X1.0-6 package.

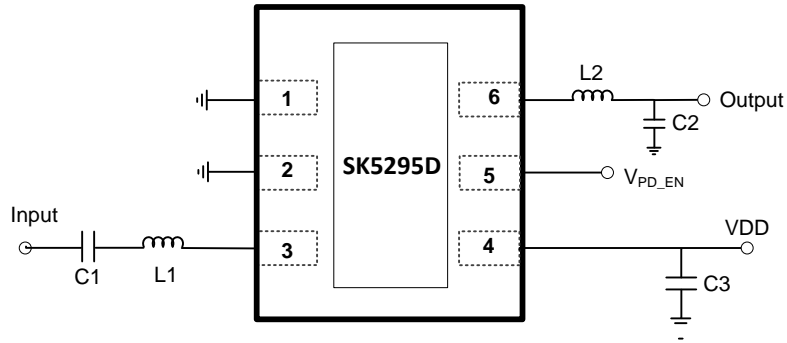
## FEATURES

- Working frequency: 1.1GHz~1.7GHz
- High-power gain and low noise  
0.91dB noise figure with 17.64dB gain at 1.575GHz  
0.88dB noise figure with 16.93dB gain at 1.176GHz
- Integrated 50Ω output matching circuit
- Low-power of 4.8mA operated from a single 1.6V to 3.6V voltage line
- Lead-free and RoHS-compliant package
- High integration with few off-chip BOM and low cost
- Temperature from -40°C~+85°C range

## APPLICATIONS

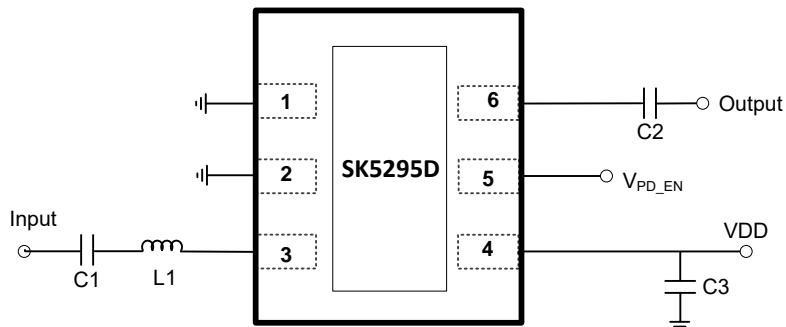
- PNDs (Personal Navigation Devices)
- Location-Enabled MID
- PMPs (Personal Media Players)
- Automobile Navigation Systems
- GNSS tracking systems
- GNSS industrial applications
- Software GPS
- iPad like Mobile PCs

**TYPICAL APPLICATION CIRCUIT**



**Typical application circuit for working frequency:L2/L5**

BOM Descriptions	Symbol	Size	Value	Unit
Chip Capacitor	C1	0402	100	pF
Chip inductor	L1	0402	15	nH
Chip Capacitor	C2	0402	2.0	pF
Chip inductor	L2	0402	6.8	nH
Chip Capacitor	C3	0402	1.0	uF



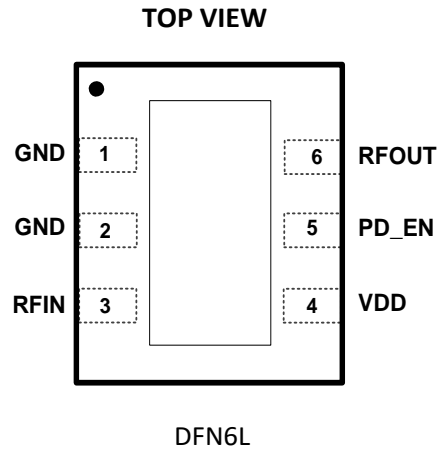
**Typical application circuit for working frequency: L1**

BOM Descriptions	Symbol	Size	Value	Unit
Chip Capacitor	C1	0402	100	pF
Chip inductor	L1	0402	8.2	nH
Chip Capacitor	C2	0402	100	pF
Chip Capacitor	C3	0402	1.0	nH

Note (1): These component values are for reference only and are subject to change with customer specific PCB layout design.

Note (2): If need to applied in Broad band 1.1GHz~1.7GHz simultaneously, please refer to SK5119TS (please contact SUNTEK for the datasheet).

## PIN CONFIGURATION



## PIN DESCRIPTIONS

Pin No.	Name	Description	Connection
6	RFOUT	RF Output	Requires a DC-blocking capacitor.
5	PD_EN	Shut down Input	A logic-low disables the device.
4	VDD	power supply for LNA	Supply Voltage.
3	RFIN	RF Input	Requires a DC-blocking capacitor and external matching components.
2	GND	Ground connection	Main IC GND connection
1	GND	Ground connection	Main IC GND connection

## ORDERING INFORMATION

Part Number	Temperature	Package	Tape and Reel
SK5295D	-40°C ~ +85°C	1.5mm x 1.0 mm x 0.55mm DFN-6L	5000

## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Min	Max	Unit
Supply Voltage	$V_{DD}$	$T_A=+25^{\circ}\text{C}$		4.0	V
Power Down Voltage	$V_{PD\_EN}$	$T_A=+25^{\circ}\text{C}$		4.0	V
LNA Max RF Input Power	$P_{in}$			10	dBm
ESD: HBM, 150pF/1.5KOhm	-		4.0		kV
Storage Temperature	$T_{STG}$		-40	+150	$^{\circ}\text{C}$
Solder Reflow Temperature	$T_{SLDR}$			+260	$^{\circ}\text{C}$

This device should be handled with care within the above stress ratings. This IC has ESD protection circuits within but must be handled and assembled according to the industry practice and at the ESD protected work platforms.

## RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Unit
Ambient Operating Temperature	$T_A$	-40	+25	+85	$^{\circ}\text{C}$
Supply Voltage	$V_{DD}$	1.6	2.7	3.6	V
Power Down Turn-on Voltage	$V_{PDOn}$	1.2	-	$V_{DD}$	V
Power Down Turn-off Voltage	$V_{PDOff}$	0	-	0.4	V

## ELECTRICAL CHARACTERISTICS (for GPS L2/L5)

( $T_A = +25^\circ\text{C}$ ,  $V_{DD} = V_{PD\_EN} = 2.7\text{V}$ ,  $f_{in} = 1176\text{MHz}$ , unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
circuit current	$I_{cc}$	No Signal	4.0	4.8	6.5	mA
Power Gain	$G_p$	Pin=-35dBm	15.5	16.93	19.5	dB
Noise Figure	NF		-	0.88	1.38	dB
Input Return Loss	$RL_{in}$		-	9.5	-	dB
Output Return Loss	$RL_{out}$		-	24.4	-	dB

## STANDARD CHARACTERISTICS FOR REFERENCE

( $T_A = +25^\circ\text{C}$ ,  $V_{DD} = V_{PD\_EN} = 2.7\text{V}$ ,  $f_{in} = 1176\text{MHz}$ , unless otherwise specified)

Parameter	Symbol	Test Conditions	Reference	Unit
Isolation	ISL		34	dB
Input 3rd Order Distortion Intercept Point	$IIP_3$	$f_{in1} = 1176\text{ MHz}$ , $f_{in2} = 1175\text{ MHz}$	-5.5	dBm
Gain 1 dB Compression Input Power	$P_{in(1dB)}$		-15.2	dBm

## ELECTRICAL CHARACTERISTICS (for GPS L1)

( $T_A = +25^\circ\text{C}$ ,  $V_{DD} = V_{PD\_EN} = 2.7\text{V}$ ,  $f_{in} = 1575.42\text{MHz}$ , unless otherwise specified)

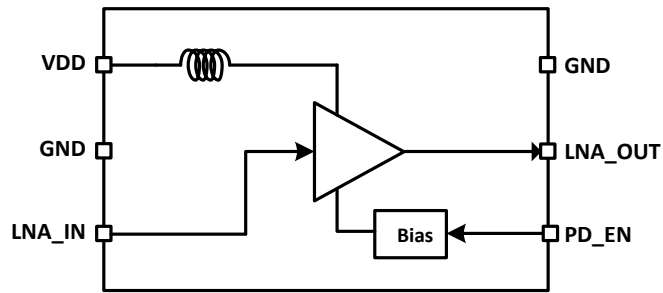
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
circuit current	$I_{cc}$	No Signal	4.0	4.8	6.5	mA
Power Gain	$G_p$	Pin=-35dBm	16.0	17.64	19.5	dB
Noise Figure	NF		-	0.91	1.45	dB
Input Return Loss	$RL_{in}$		-	9.8	-	dB
Output Return Loss	$RL_{out}$		-	12.3	-	dB

## STANDARD CHARACTERISTICS FOR REFERENCE

( $T_A = +25^\circ\text{C}$ ,  $V_{DD} = V_{PD\_EN} = 2.7\text{V}$ ,  $f_{in} = 1575.42\text{MHz}$ , unless otherwise specified)

Parameter	Symbol	Test Conditions	Reference	Unit
Isolation	ISL		33	dB
Input 3rd Order Distortion Intercept Point	$IIP_3$	$f_{in1} = 1575\text{ MHz}$ , $f_{in2} = 1574\text{ MHz}$	-4.5	dBm
Gain 1 dB Compression Input Power	$P_{in(1dB)}$		-15	dBm

## BLOCK DIAGRAM



Block Diagram

## RECOMMENDED REFLOW PROFILE

Profile Feature	Pb-Free Assembly
<b>Preheat &amp; Soak</b>	
Temperature min (T <sub>min</sub> )	150°C
Temperature max (T <sub>max</sub> ) Time (T <sub>min</sub> to T <sub>max</sub> )(t <sub>s</sub> )	200°C 60-120 seconds
Average ramp-up rate (T <sub>max</sub> to T <sub>p</sub> )	3°C /second max.
Liquidous temperature (TL) Time at liquidous (t <sub>L</sub> )	217°C 60-150 seconds
Peak package body temperature (T <sub>p</sub> ) <sup>(1)</sup>	See classification temperatures in next table
Time (t <sub>p</sub> ) <sup>(2)</sup> within 5°C of the specified classification temperature (T <sub>c</sub> )	30 <sup>(2)</sup> seconds
Average ramp-down rate (T <sub>p</sub> to T <sub>max</sub> )	6°C /second max.
Time 25°C to peak temperature	8 minutes max.

### Note:

- (1) Tolerance for peak profile temperature (TP) is defined as a supplier minimum and a user maximum.  
(2) Tolerance for time at peak profile temperature (tp) is defined as a supplier minimum and a user maximum.

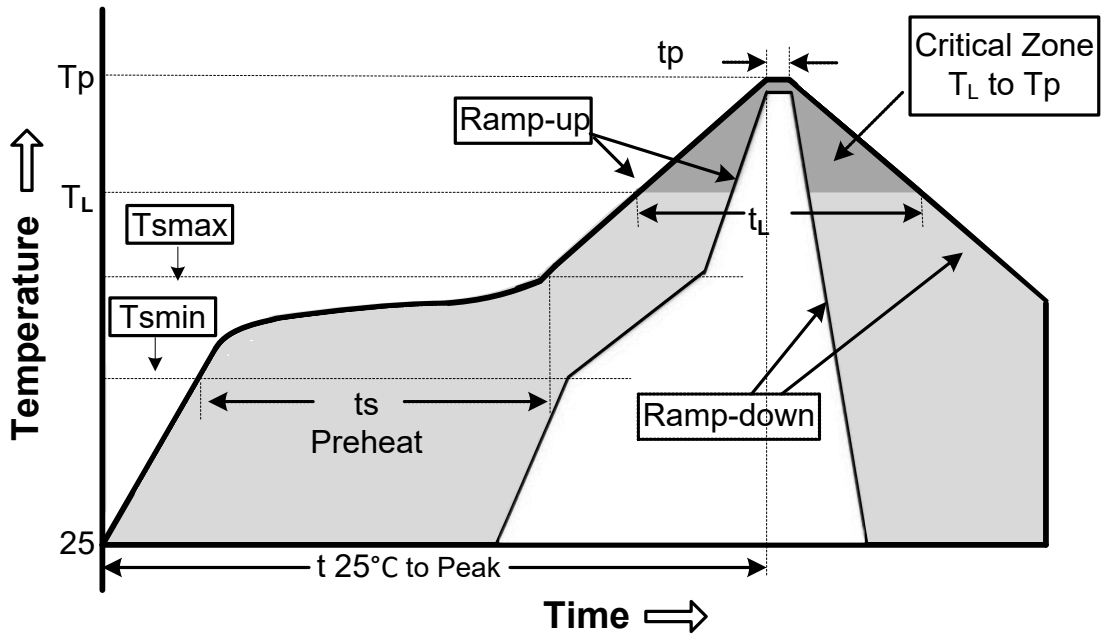
### Remark:

- (1) All temperatures refer to the package body surface temperature. The highest temperature of reflow profile can not exceed 265°C .  
(2) All temperatures refer to the center of the package, measured on the package body surface that is facing up during assembly reflow (e.g., live-bug). If parts are reflowed in other than the normal live-bug assembly reflow orientation (i.e., dead-bug), T<sub>p</sub> shall be within ±2°C of the live-bug T<sub>p</sub> and still meet the T<sub>c</sub> requirements, otherwise, the profile shall be adjusted to achieve the latter. To accurately measure actual peak package body temperatures refer to JEP140 for recommended thermocouple use.  
(3) Reflow profiles in this document are for classification/preconditioning and are not meant to specify board assembly profiles. Actual board assembly profiles should be developed based on specific process needs and board designs and should not exceed the parameters.  
(4) All components in the test load shall meet the classification profile requirements.  
(5) SMD packages classified to a given moisture sensitivity level by using Procedures or Criteria defined within any previous version of J-STD-020, JESD22-A112 (rescinded), IPC-SM-786 (rescinded) do not need to be reclassified to the current revision unless a change in classification level or a higher peak classification temperature is desired.

### Pb-Free Process – Classification Temperatures (T<sub>c</sub>)

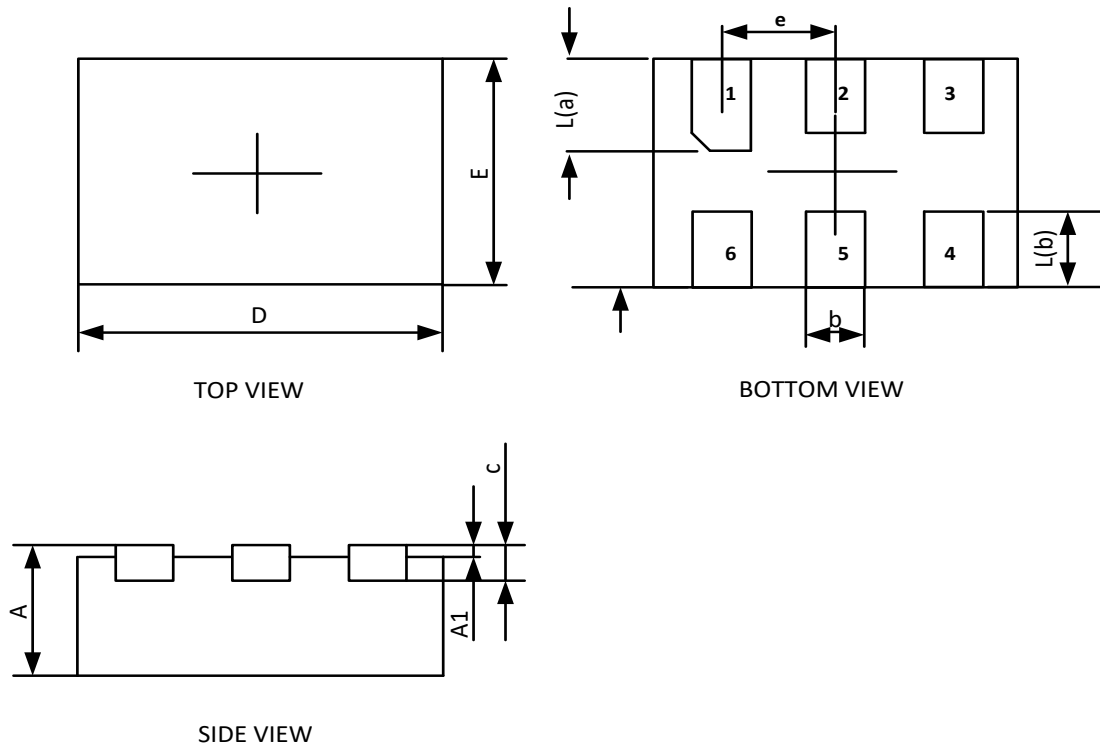
Package Thickness	Volume mm <sup>3</sup> < 350	Volume mm <sup>3</sup> 350 - 2000	Volume mm <sup>3</sup> > 2000
< 1.6 mm	260°C	260°C	260°C
1.6 mm - 2.5 mm	260°C	250°C	245°C
> 2.5 mm	250°C	245°C	245°C

## REFLOW PROFILE



The reflow profile shown above should not be exceeded, since excessive temperatures or transport times during reflow can damage the chip.

**PACKAGE DIMENSIONS: DFN1.5x1.0-6L**



symbol	Dimensions In Millimeters		
	Min.	Nor.	Max.
A	0.500	0.550	0.600
A1	0.000	0.025	0.050
D	1.450	1.500	1.550
E	0.950	1.000	1.050
L(a)	0.350	0.400	0.450
L(b)	0.250	0.350	0.450
c	0.05		
b	0.150	0.200	0.250
e	0.500BSC.		