

SK51345

1.1-1.65GHz Broad Band GNSS Low Noise Amplifier

GENERAL DESCRIPTION

The SK51345 is a high-gain, broad band, low-noise amplifier (LNA) designed for GPS, Galileo, Glonass and Beidou GNSS applications.

The SK51345 uses GaAs process. It achieves 17dB gain at 1.575GHz with a noise figure of 0.50dB, and 19dB gain at 1.207GHz with a noise figure of 0.50dB.

The SK51345 sits on a small form factor PCB space. It can operate in a 3V single supply and draws 15mA DC current.

The SK51345 is available in a 4-pin SOT343 package.

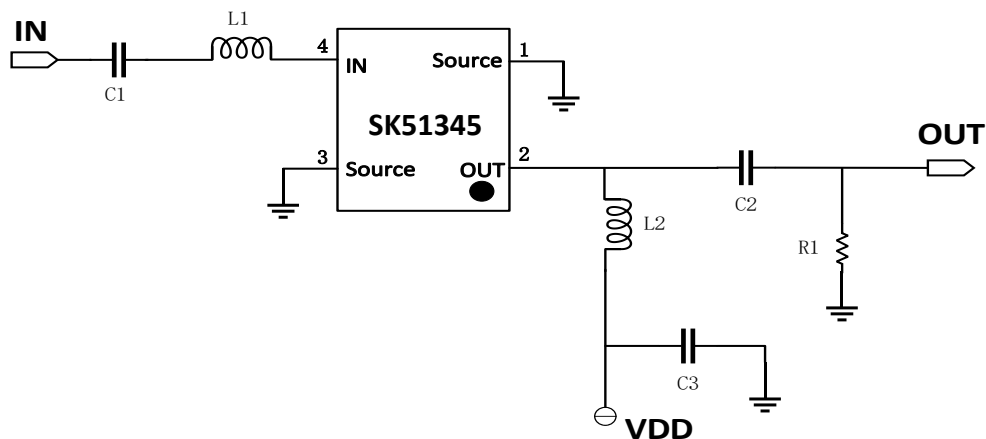
FEATURES

- Operating frequency: 1.1GHz ~ 1.65GHz
- High power gain:
 - 19dB @1.207GHz
 - 17dB @1.575GHz
- Ultra low noise figure:
 - 0.50dB @1.207GHz
 - 0.50dB @1.575GHz
- 15mA low-power operates from a single 3V voltage
- Lead-free and RoHS-compliant
- High integration with few off-chip BOM and low cost
- Ambient operating temperature: -40 °C ~ 105 °C

APPLICATIONS

- Location-enabled MID
- PMPs (personal media players)
- Automobile navigation systems
- GNSS tracking systems
- GNSS industrial applications

TYPICAL APPLICATION CIRCUIT

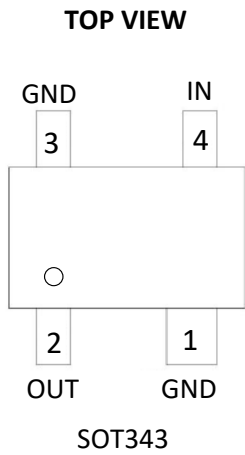


BOM Descriptions	Symbol	Size	Value	Unit
Chip Capacitor	C1	0402	100	pF
Chip Capacitor	C2	0402	3.9	pF
Chip Capacitor	C3	0402	1000	pF
Chip Inductor	L1	0402	5.1	nH
Chip Inductor	L2	0402	3.9	nH
Chip Resistor	R1	0402	150	Ω

Note (1): Working frequency: 1.1~1.65GHz

Note (2): These component values are for reference only and are subject to change with customer specific PCB layout design.

PIN CONFIGURATION



PIN DESCRIPTION

Pin No.	Name	Pin Description
1/3	GND	Ground connection
2	OUT	RF Output/power supply for LNA
4	IN	RF Input

ORDERING INFORMATION

Part Number	Temperature	Package	Tape and Reel
SK51345	-40°C ~ 105°C	SOT343	3000

ABSOLUTE MAXIMUM RATINGS ⁽¹⁾

Parameter	Symbol	Test Conditions	Min	Max	Unit
Supply Voltage	V_{DD}	$T_A = +25^{\circ}\text{C}$		7.0	V
LNA Max RF Input Power	P_{in}			20	dBm
ESD: HBM, 150pF/1.5KOhm ⁽²⁾	-		1.6		kV
Storage Temperature	T_{STG}		-55	+150	$^{\circ}\text{C}$
Solder Reflow Temperature	T_{SLDR}			+260	$^{\circ}\text{C}$

Note (1): This device should be handled with care within the above stress ratings.

Note (2): Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling this device.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Unit
Ambient Operating Temperature	T_A	-40	+25	+105	$^{\circ}\text{C}$
Supply Voltage	V_{DD}	2.7	3.0	5.0	V

ELECTRICAL CHARACTERISTICS

($T_A = +25^{\circ}\text{C}$, $V_{DD} = 3\text{V}$, $f_{in} = 1207\text{MHz}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
circuit current	I_{CC}	No Signal	10	15	19	mA
Power Gain	G_p	$P_{in} = -35\text{dBm}$	17	19	21	dB
Noise Figure	NF		-	0.5	-	dB
Input Return Loss	RL_{in}		-	10	-	dB
Output Return Loss	RL_{out}		-	20	-	dB

($T_A = +25^{\circ}\text{C}$, $V_{DD} = 3\text{V}$, $f_{in} = 1575\text{MHz}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
circuit current	I_{CC}	No Signal	10	15	19	mA
Power Gain	G_p	$P_{in} = -35\text{dBm}$	15.5	17.0	19.0	dB
Noise Figure	NF		-	0.45	-	dB
Input Return Loss	RL_{in}		10	15	-	dB
Output Return Loss	RL_{out}		10	16	-	dB

STANDARD CHARACTERISTICS FOR REFERENCE

($T_A = +25^{\circ}\text{C}$, $V_{DD} = 3\text{V}$, $f_{in} = 1207\text{MHz}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Reference	Unit
Isolation	ISL		39	dB
Output 3rd Order Distortion Intercept Point	OIP_3	$P_{out}=0\text{dBm}/\text{tone}$, $\Delta f=1\text{MHz}$	21	dBm
Gain 1 dB Compression Output Power	$P_{out(1dB)}$		13.8	dBm

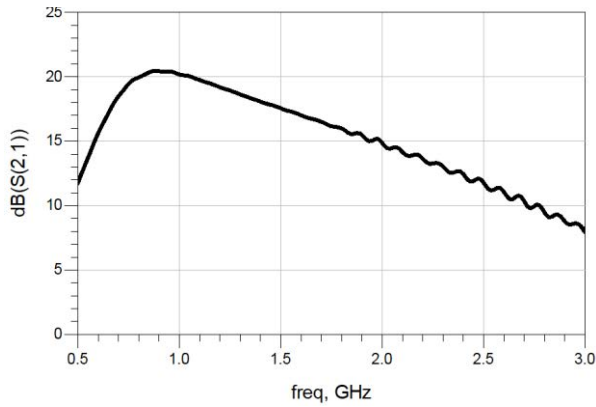
($T_A = +25^{\circ}\text{C}$, $V_{DD} = 3\text{V}$, $f_{in} = 1575\text{MHz}$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Reference	Unit
Isolation	ISL		38	dB
Output 3rd Order Distortion Intercept Point	OIP_3	$P_{out}=0\text{dBm}/\text{tone}$, $\Delta f=1\text{MHz}$	21	dBm
Gain 1 dB Compression Output Power	$P_{out(1dB)}$		14.7	dBm

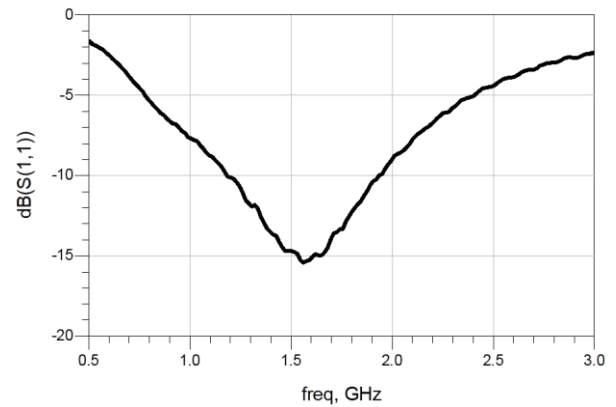
TYPICAL PERFORMANCE

($T_A = +25^\circ\text{C}$, $V_{DD} = 3\text{V}$, $I_{DD} = 15\text{mA}$, unless otherwise specified)

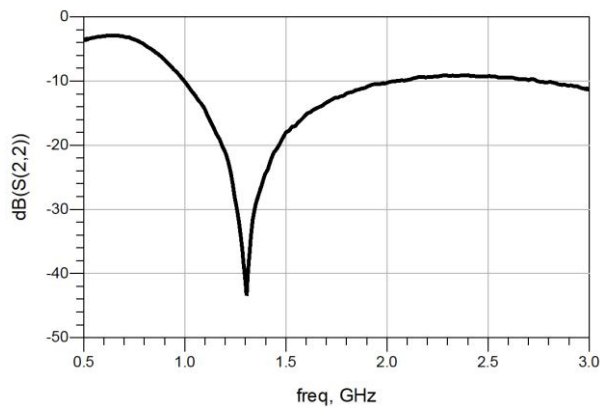
S21 vs. Frequency



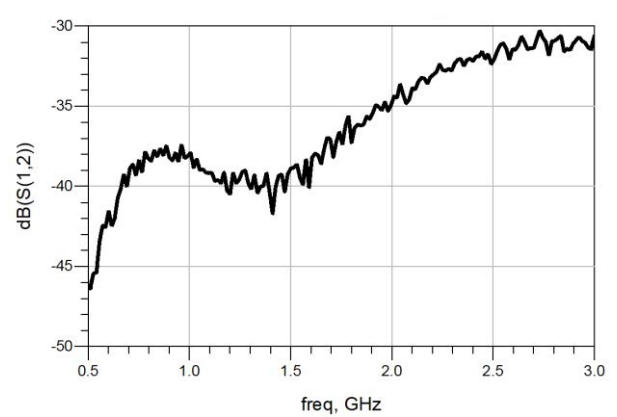
S11 vs. Frequency



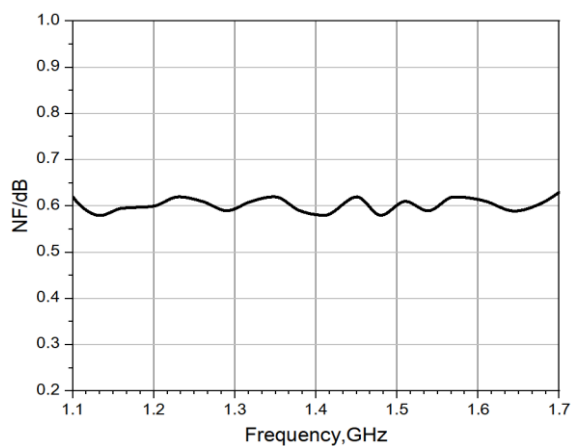
S22 vs. Frequency



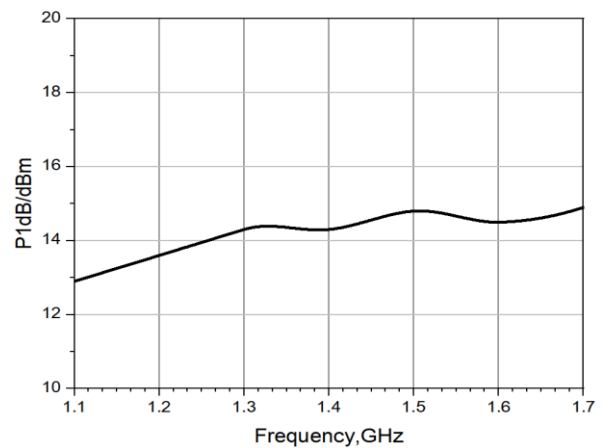
S12 vs. Frequency



NF vs. Frequency



P1dB vs. Frequency



RECOMMENDED REFLOW PROFILE

Profile Feature	Pb-Free Assembly
Preheat & Soak	
Temperature min (T _{smin})	150°C
Temperature max (T _{smax}) Time	200°C
(T _{smin} to T _{smax})(ts)	60-120 seconds
Average ramp-up rate (T _{smax} to T _p)	3°C /second max.
Liquidous temperature	217°C
(TL) Time at liquidous (tL)	60-150 seconds
Peak package body temperature (T _p) ⁽¹⁾	See classification temperatures in next table
Time (t _p) ⁽²⁾ within 5°C of the specified classification temperature (T _c)	30 ⁽²⁾ seconds
Average ramp-down rate (T _p to T _{smax})	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.

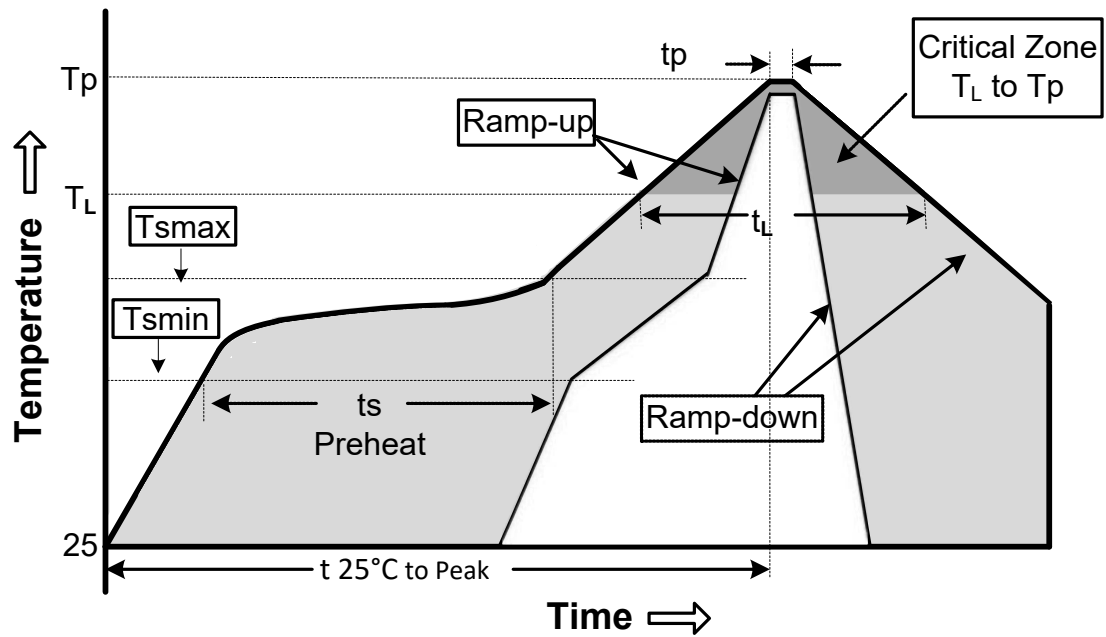
Remark:

- (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_p shall be within ±2°C of the live-bug T_p and still meet the T_c 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.

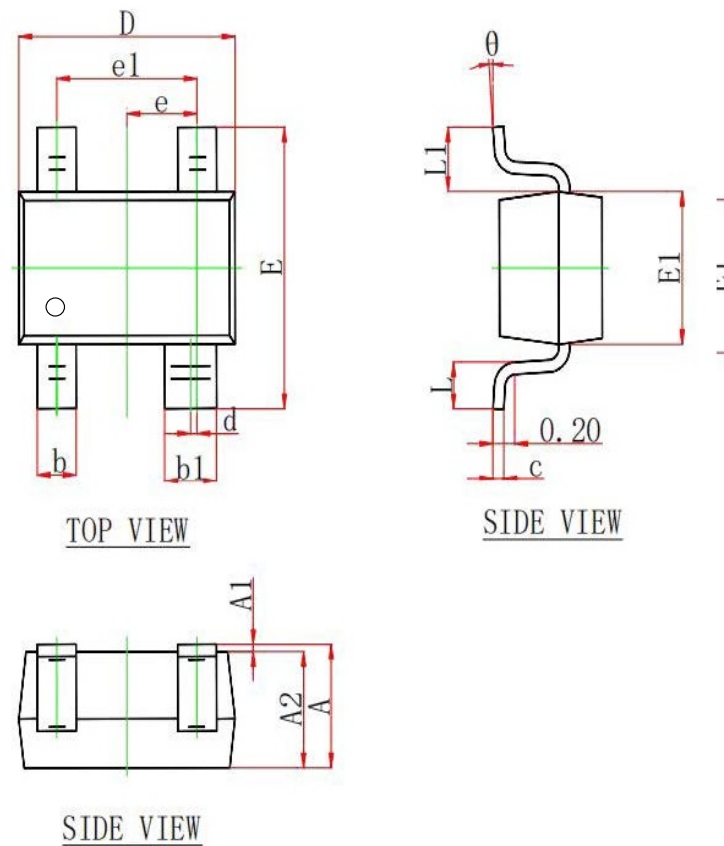
Pb-Free Process – Classification Temperatures (T_c)

Package Thickness	Volume mm ³ < 350	Volume mm ³ 350 - 2000	Volume mm ³ > 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: SOT343


Symbol	Dimensions In Millimeters	
	Min.	Max.
A	0.900	1.100
A1	0.000	0.100
A2	0.800	1.000
b	0.250	0.400
b1	0.350	0.500
c	0.080	0.150
d	0.050 TYP.	
D	2.000	2.200
E	2.000	2.450
E1	1.150	1.350
e	0.650 TYP.	
E1	1.200	1.400
L	0.260	0.460
L1	0.525 REF.	
θ	0°	8°