

PRELIMINARY DATA SHEET

SKY67151-396LF: 0.7-3.8 GHz Ultra Low-Noise Amplifier

Applications

- LTE, GSM, WCDMA, TD-SCDMA infrastructure
- Ultra low-noise, high performance LNAs
- Cellular repeaters
- High temperature applications to +105 °C

Features

- Ultra-low Evaluation Board NF:
 - 0.25 dB @ 0.9 GHz:
 - 0.35 dB @ 1.9 GHz
 - 0.49 dB @ 2.5 GHz
 - 0.70 dB @ 3.6 GHz
- High OIP3 performance: >+35 dBm over 700 to 2700 MHz
- Adjustable supply current from 30 to 100 mA
- Flexible bias voltage: 3 to 5 V
- Temperature and process-stable active bias
- Miniature DFN (8-pin, 2 x 2 mm) package (MSL1 @ 260 °C per JEDEC J-STD-020)



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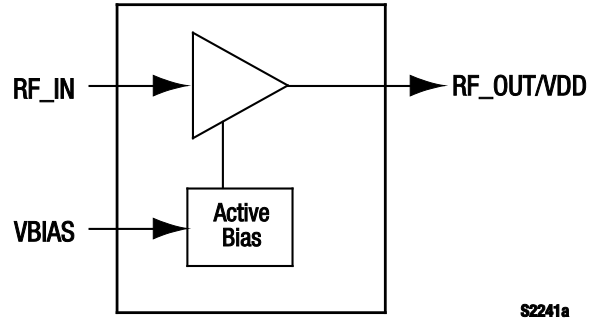


Figure 1. SKY67151-396LF Block Diagram

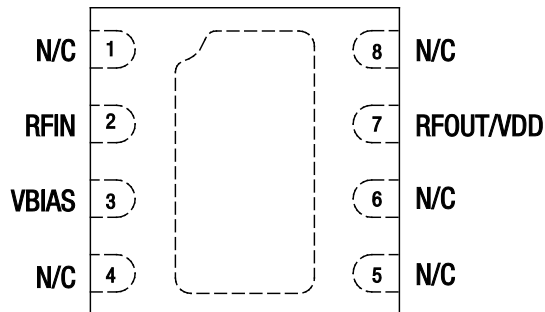
Description

The SKY67151-396LF is GaAs, pHEMT Low-Noise Amplifier (LNA) with an active bias, high linearity, superior gain, and industry-leading Noise Figure (NF) performance from 700 to 3800 MHz. The device features Skyworks advanced, proprietary pHEMT enhancement mode process in a compact 2 x 2 mm, 8-pin Dual Flat No-Lead (DFN) package.

The internal active bias circuitry provides stable performance over temperature and process variation. The device offers the ability to externally adjust supply current. Supply voltage is applied to the RFOUT/VDD pin through an RF choke inductor. Pin 3 (VBIAS) should be connected to RFOUT/VDD through an external resistor to control the supply current. The RFIN and RFOUT/VDD pins should be DC blocked to ensure proper operation.

The SKY67151-396LF operates in the frequency range of 0.7 to 3.8 GHz using a common layout and band-specific tunes.

A functional block diagram is shown in Figure 1. The pin configuration and package are shown in Figure 2. Signal pin assignments and functional pin descriptions are provided in Table 1.



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Figure 2. SKY67151-396LF Pinout – 8-Pin DFN (Top View)

Table 1. SKY67151-396LF Signal Descriptions

Pin #	Name	Description	Pin #	Name	Description
1	N/C	No connection. May be connected to ground with no change in performance.	5	N/C	No connection. May be connected to ground with no change in performance.
2	RFIN	RF input. DC blocking capacitor required.	6	N/C	No connection. May be connected to ground with no change in performance.
3	VBIAS	Bias for 1 st stage amplifier. External resistor sets current consumption.	7	RFOUT/VDD	RF output. Apply VDD through RF choke inductor. DC blocking capacitor required.
4	N/C	No connection. May be connected to ground with no change in performance.	8	N/C	No connection. May be connected to ground with no change in performance.

Table 2. SKY67151-396LF Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Supply voltage	V _{DD}		5.5	V
Quiescent supply current	I _{DQ}		120	mA
RF input power	P _{IN}		+24	dBm
Storage temperature	T _{STG}	-40	+150	°C
Operating temperature	T _A	-40	+105	°C

Notes: Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

CAUTION: Although this device is designed to be as robust as possible, Electrostatic Discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY67151-396LF are provided in Table 2. Electrical specifications are provided in Tables 3 through 7.

Table 3. SKY67151-396LF Electrical Specifications: Thermal Data (Note 1)
(V_{DD} = 5 V, T_A = +25 °C, P_{IN} = -25 dBm, Characteristic Impedance [Z₀] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
Thermal resistance	Θ _{JC}			45		°C/W
Channel temperature @ +85 °C reference (package heat slug)		V _{DD} = 5 V, I _{DQ} = 70 mA, no RF applied, dissipated power = 0.35 W		101		°C

Note 1: Performance is guaranteed only under the conditions listed in this Table.

Table 4. SKY67151-396LF Electrical Specifications: 700 to 1000 MHz Optimized Tuning (Note 1)
(V_{DD} = 5 V, T_A = +25 °C, P_{IN} = -25 dBm, Characteristic Impedance [Z₀] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
RF Specifications						
Noise Figure	NF	@ 900 MHz, includes Evaluation Board loss		0.25		dB
Small signal gain	IS21I	@ 900 MHz		26		dB
Input return loss	IS11I	@ 900 MHz		12		dB
Output return loss	IS22I	@ 900 MHz		20		dB
Reverse isolation	IS12I	@ 900 MHz		37		dB
3 rd Order Input Intercept Point	IIP3	@ 900 MHz, Δf = 1 MHz, P _{IN} = -25 dBm/tone		+10		dBm
3 rd Order Output Intercept Point	OIP3	@ 900 MHz, Δf = 1 MHz, P _{IN} = -25 dBm/tone		+36		dBm
1 dB Input Compression Point	IP1dB	@ 900 MHz		-3		dBm
1 dB Output Compression Point	OP1dB	@ 900 MHz		+22		dBm
DC Specifications						
Supply voltage	V _{DD}			5		V
Quiescent supply current	I _{DQ}	Set with external resistor		80		mA
Bias current	I _{BIAS}			500		μA

Note 1: Performance is guaranteed only under the conditions listed in this Table.

Table 5. SKY67151-396LF Electrical Specifications: 1600 to 2200 MHz Optimized Tuning (Note 1)
(V_{DD} = 5 V, T_A = +25 °C, P_{IN} = -20 dBm, Characteristic Impedance [Z₀] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
RF Specifications						
Noise Figure	NF	@ 1900 MHz, includes Evaluation Board loss		0.35		dB
Small signal gain	IS21I	@ 1900 MHz		20.5		dB
Input return loss	IS11I	@ 1900 MHz		12		dB
Output return loss	IS22I	@ 1900 MHz		20		dB
Reverse isolation	IS12I	@ 1900 MHz		31		dB
3 rd Order Input Intercept Point	IIP3	@ 1900 MHz, Δf = 1 MHz, P _{IN} = -20 dBm/tone		+15.5		dBm
3 rd Order Output Intercept Point	OIP3	@ 1900 MHz, Δf = 1 MHz, P _{IN} = -20 dBm/tone		+36		dBm
1 dB Input Compression Point	IP1dB	@ 1900 MHz		-0.5		dBm
1 dB Output Compression Point	OP1dB	@ 1900 MHz		+19		dBm
DC Specifications						
Supply voltage	V _{DD}			5		V
Quiescent supply current	I _{DQ}	Set with external resistor		70		mA
Bias current	I _{BIAS}			500		μA

Note 1: Performance is guaranteed only under the conditions listed in this Table.

Table 6. SKY67151-396LF Electrical Specifications: 2300 to 2700 MHz Optimized Tuning (Note 1)
(V_{DD} = 5 V, T_A = +25 °C, P_{IN} = -20 dBm, Characteristic Impedance [Z₀] = 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
RF Specifications						
Noise Figure	NF	@ 2500 MHz, includes Evaluation Board loss		0.49		dB
Small signal gain	IS21I	@ 2500 MHz		19		dB
Input return loss	IS11I	@ 2500 MHz		11		dB
Output return loss	IS22I	@ 2500 MHz		20		dB
Reverse isolation	IS12I	@ 2500 MHz		28		dB
3 rd Order Input Intercept Point	IIP3	@ 2500 MHz, Δf = 1 MHz, P _{IN} = -20 dBm/tone		+18		dBm
3 rd Order Output Intercept Point	OIP3	@ 2500 MHz, Δf = 1 MHz, P _{IN} = -20 dBm/tone		+37		dBm
1 dB Input Compression Point	IP1dB	@ 2500 MHz		+1		dBm
1 dB Output Compression Point	OP1dB	@ 2500 MHz		+19		dBm
DC Specifications						
Supply voltage	V _{DD}			5		V
Quiescent supply current	I _{DQ}	Set with external resistor		70		mA
Bias current	I _{BIAS}			500		μA

Note 1: Performance is guaranteed only under the conditions listed in this Table.

Table 7. SKY67151-396LF Electrical Specifications: 3400 to 3800 MHz Optimized Tuning (Note 1)
($V_{DD} = 5\text{ V}$, $T_A = +25\text{ }^\circ\text{C}$, $P_{IN} = -20\text{ dBm}$, Characteristic Impedance [Z_0] = $50\ \Omega$, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min	Typical	Max	Units
RF Specifications						
Noise Figure	NF	@ 3600 MHz, includes Evaluation Board loss		0.70		dB
Small signal gain	IS21I	@ 3600 MHz		16.5		dB
Input return loss	IS11I	@ 3600 MHz		12		dB
Output return loss	IS22I	@ 3600 MHz		20		dB
Reverse isolation	IS12I	@ 3600 MHz		28		dB
3 rd Order Input Intercept Point	IIP3	@ 3600 MHz, $\Delta f = 1\text{ MHz}$, $P_{IN} = -20\text{ dBm/ tone}$		+17.5		dBm
3 rd Order Output Intercept Point	OIP3	@ 3600 MHz, $\Delta f = 1\text{ MHz}$, $P_{IN} = -20\text{ dBm/ tone}$		+34		dBm
1 dB Input Compression Point	IP1dB	@ 3600 MHz		+3.5		dBm
1 dB Output Compression Point	OP1dB	@ 3600 MHz		+19		dBm
DC Specifications						
Supply voltage	V_{DD}			5		V
Quiescent supply current	I_{DQ}	Set with external resistor		70		mA
Bias current	I_{BIAS}			500		μA

Note 1: Performance is guaranteed only under the conditions listed in this Table.

Evaluation Board Description

The SKY67151-396LF Evaluation Board is used to test the performance of the SKY67151-396LF LNA. Three different boards are available for 900, 1900, and 2500 MHz operation.

An assembly drawing for the Evaluation Board is shown in Figure 3. The layer detail is provided in Figure 4. An Evaluation Board schematic diagram is provided in Figure 5. Table 8 provides the Bill of Materials (BOM) list for Evaluation Board components.

Package Dimensions

The PCB layout footprint for the SKY67151-396LF is provided in Figure 6. Typical case markings are shown in Figure 7. Package dimensions for the 8-pin DFN are shown in Figure 8, and tape and reel dimensions are provided in Figure 9.

Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

THE SKY67151-396LF is rated to Moisture Sensitivity Level 1 (MSL1) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to the Skyworks Application Note, *Solder Reflow Information*, document number 200164.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format.

*** TBD ***

Figure 3. SKY67151-396LF Evaluation Board Assembly Diagram

*** TBD ***

Figure 4. Layer Detail Physical Characteristics

*** TBD ***

Figure 5. SKY67151-396LF Evaluation Board Schematic

Table 8. SKY67151-396LF Evaluation Board Bill of Materials

Component	Type	Value	Size	Manufacturer

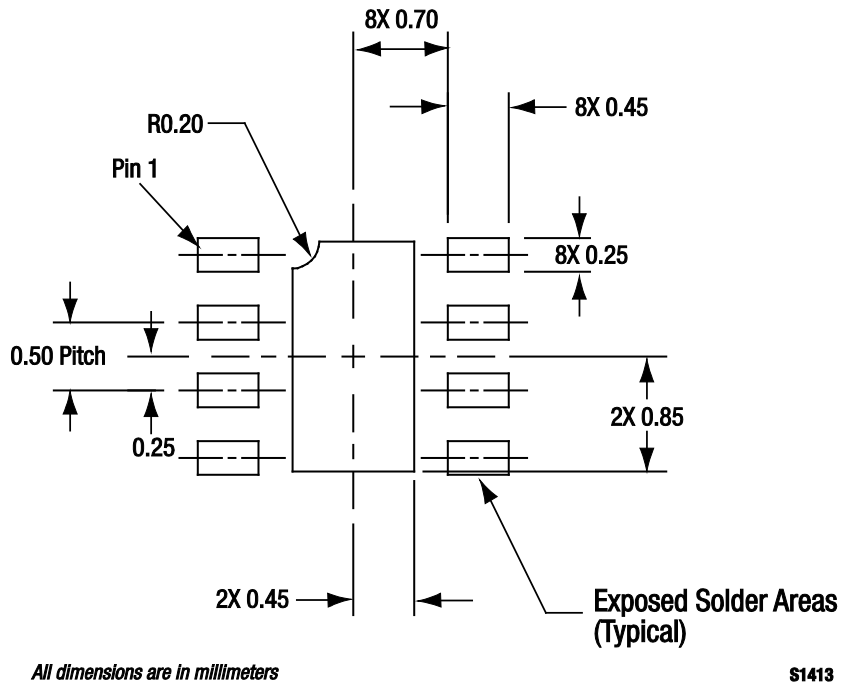
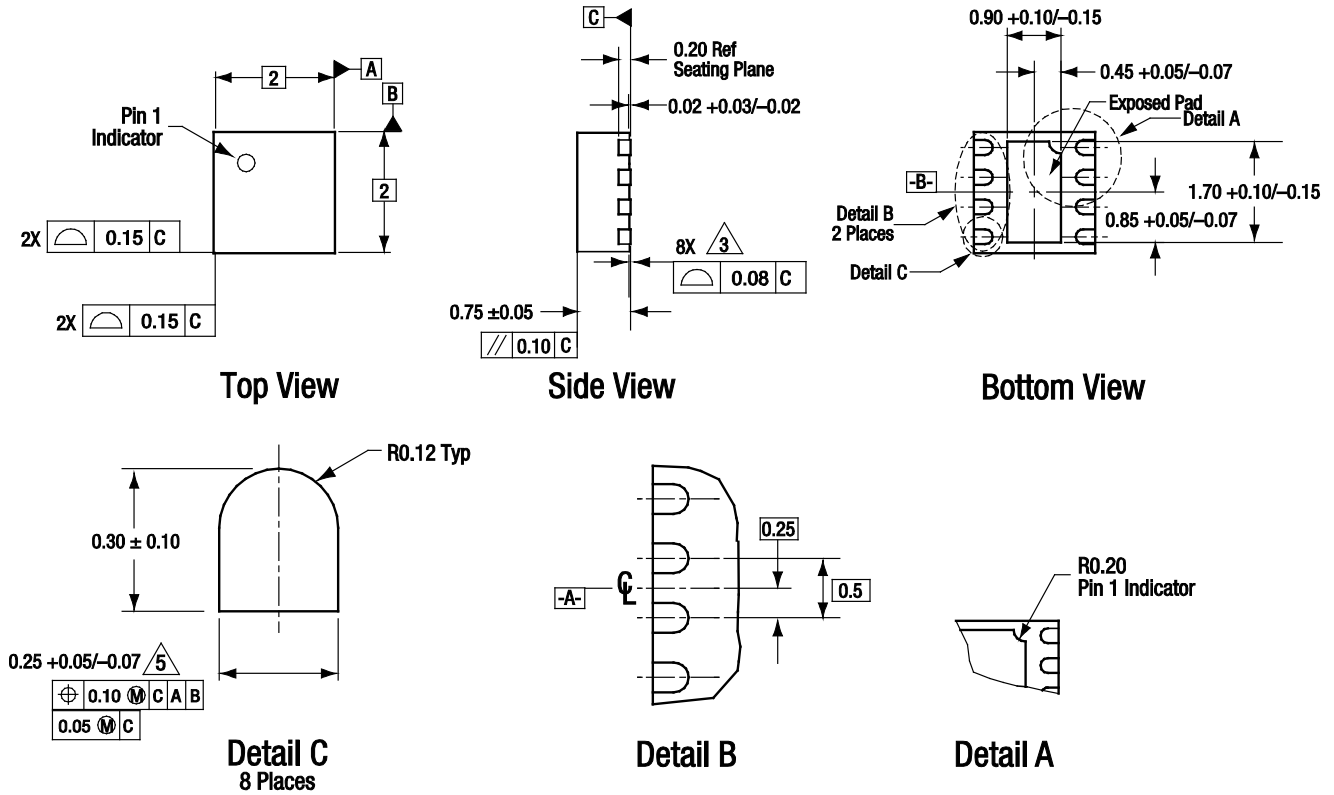


Figure 6. SKY67151-396LF PCB Layout Footprint (Top View)

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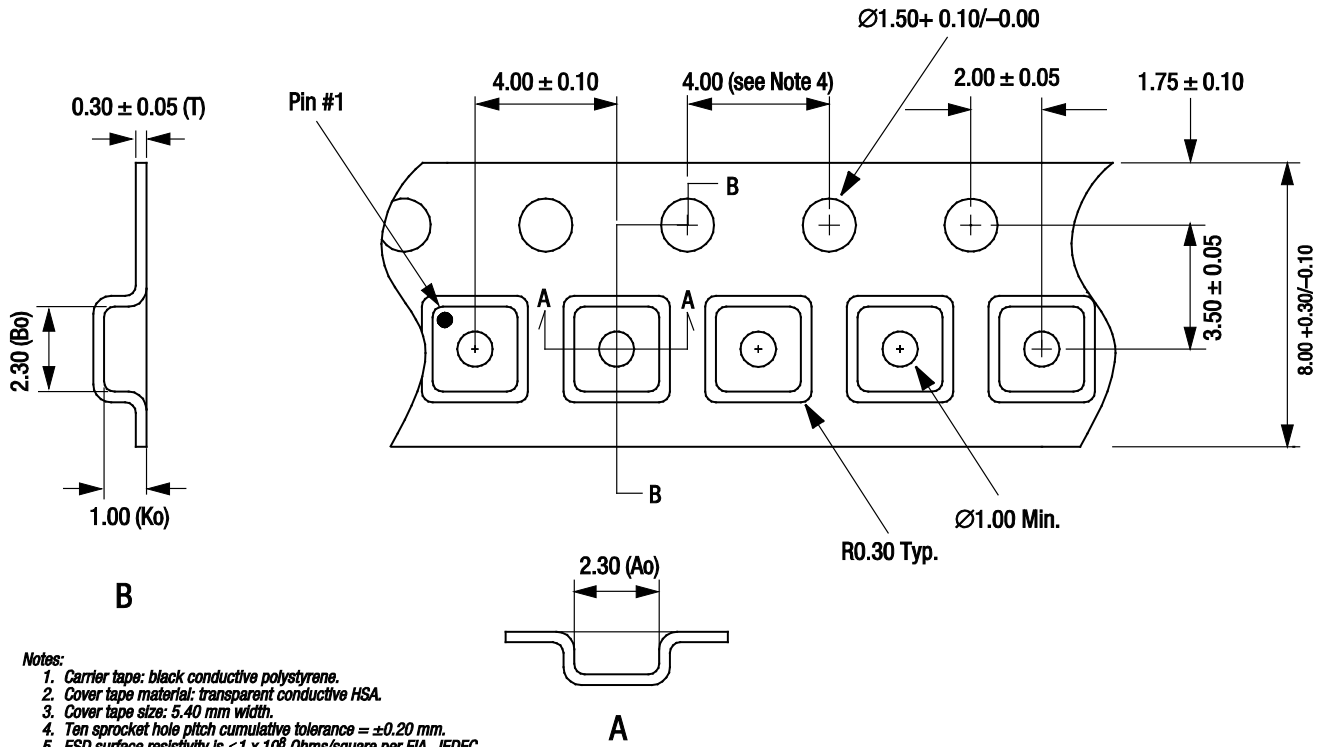
Figure 7. Typical Case Markings (Top View)



All measurements are in millimeters.
 Dimensioning and tolerancing according to ASME Y14.5M-1994.
 Coplanarity applies to the exposed heat sink slug as well as the terminals..
 Plating requirement per source control drawing (SCD) 2504.
 Dimension applies to metallized terminal and is measured between 0.15 mm and 0.30 mm from terminal tip.

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Figure 8. SKY67151-396LF 8-Pin DFN Package Dimensions



- Notes:
1. Carrier tape: black conductive polystyrene.
 2. Cover tape material: transparent conductive HSA.
 3. Cover tape size: 5.40 mm width.
 4. Ten sprocket hole pitch cumulative tolerance = ± 0.20 mm.
 5. ESD surface resistivity is $\leq 1 \times 10^8$ Ohms/square per EIA, JEDEC tape and reel specification.
 6. Ao and Bo measurement point to be 0.30 mm from bottom pocket.
 7. All measurements are in millimeters.

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Figure 9. SKY67151-396LF Tape and Reel Dimensions

Ordering Information

Model Name	Manufacturing Part Number	Evaluation Board Part Number
SKY67151-396LF LNA	SKY67151-396LF	SKY67151-396LF-EVB (900 MHz) SKY67151-396LF-EVB (1900 MHz) SKY67151-396LF-EVB (2500 MHz)

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