

DATA SHEET

SKY67107-306LF: 2.3-2.8 GHz Two-Stage, High Linearity and High Gain Low-Noise Amplifier

Applications

- LTE cellular infrastructure and ISM band systems
- Ultra low-noise, high gain and high linearity systems
- Digital satellite radio

Features

- Ultra-low NF: 0.85 dB @ 2.6 GHz
- High gain: 32 dB @ 2.6 GHz
- Low quiescent current: 125 mA
- Stage 1 and 2 adjustable current
- Wideband performance, useable to 2.8 GHz
- Small, QFN (16-pin, 4 x 4 mm) Pb-free package (MSL1, 260 °C per JEDEC J-STD-020)



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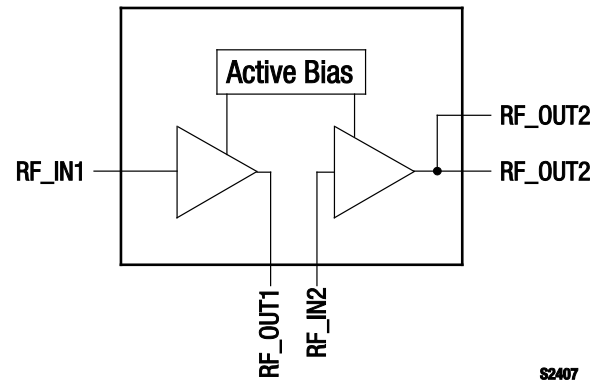


Figure 1. SKY67107-306LF Block Diagram

Description

The SKY67107-306LF is a GaAs pHEMT and HBT two-stage, Low-Noise Amplifier (LNA) with active bias and high linearity performance. The pHEMT front end of the device provides an ultra-low Noise Figure (NF) while the HBT output stage provides high gain, linearity, and efficiency.

The SKY67107-306LF operates in the frequency range of 2.3 to 2.8 GHz. For lower frequency operation, the pin and layout-compatible SKY67105-306LF (Data Sheet document # 201518) should be used.

The SKY67107-306LF is provided in a 4 x 4 mm, 16-pin Quad Flat No-Lead (QFN) package. 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.

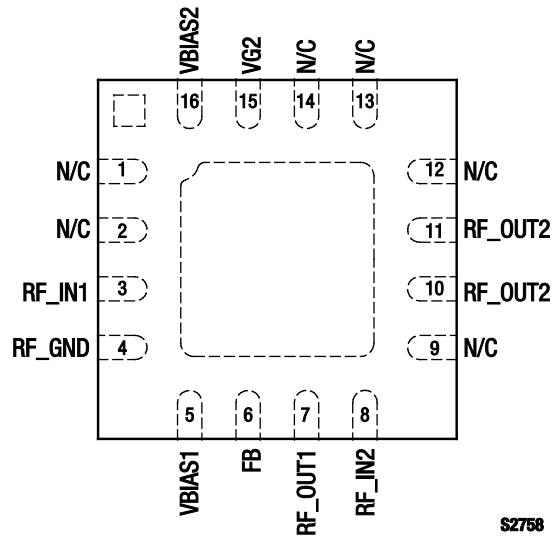


Figure 2. SKY67107-306LF Pinout – 16-Pin QFN (Top View)

Table 1. SKY67107-306LF Signal Descriptions

| Pin # | Name | Description | Pin # | Name | Description |
|-------|---------|---|-------|---------|--|
| 1 | N/C | No connection. May be grounded with no change in performance. | 9 | N/C | No connection. May be grounded with no change in performance. |
| 2 | N/C | No connection. May be grounded with no change in performance. | 10 | RF_OUT2 | RF output of second stage amplifier |
| 3 | RF_IN1 | RF input to first stage amplifier | 11 | RF_OUT2 | RF output of second stage amplifier |
| 4 | RF_GND | RF ground for first stage amplifier | 12 | N/C | No connection. May be grounded with no change in performance. |
| 5 | VBIAS1 | Bias for first stage amplifier. External resistor sets current consumption. | 13 | N/C | No connection. May be grounded with no change in performance. |
| 6 | FB | Feedback pin for first stage amplifier. | 14 | N/C | No connection. May be grounded with no change in performance. |
| 7 | RF_OUT1 | RF output of first stage amplifier | 15 | VG2 | Stage 2 gate bias |
| 8 | RF_IN2 | RF input to second stage amplifier | 16 | VBIAS2 | Bias for second stage amplifier. External resistor sets current consumption. |

Electrical and Mechanical Specifications

The absolute maximum ratings of the SKY67107-306LF are provided in Table 2. Electrical specifications are provided in Table 3.

Typical performance characteristics of the SKY67107-306LF are illustrated in Figures 3 through 13.

Table 2. SKY67107-306LF Absolute Maximum Ratings

| Parameter | Symbol | Minimum | Maximum | Units |
|-----------------------|------------------|---------|---------|-------|
| Supply voltage | V _{DD} | | 5.5 | V |
| RF input power | P _{IN} | | +15 | dBm |
| Operating temperature | T _{OP} | -40 | +85 | °C |
| Storage temperature | T _{STG} | -40 | +125 | °C |
| Junction temperature | T _J | | +150 | °C |
| Thermal resistance | Θ _{JC} | | 85 | °C/W |

Note: 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. The SKY67107-306LF is a Class 1B ESD device.

Table 3. SKY67107-306LF Electrical Specifications (Note 1)

(V_{DD} = +5 V, T_{OP} = +25 °C, P_{IN} = -30 dBm, Optimized for 2600 MHz Operation, Unless Otherwise Noted)

| Parameter | Symbol | Test Condition | Min | Typical | Max | Units |
|--|-----------------|--|-------|---------|------|-------|
| RF Specifications | | | | | | |
| Noise Figure | NF | @ 2600 MHz | | 0.85 | 1.10 | dB |
| Small signal gain | IS21I | @ 2600 MHz | 29 | 32 | | dB |
| Input return loss | IS11I | @ 2600 MHz | | 14 | | dB |
| Output return loss | IS22I | @ 2600 MHz | | 17 | | dB |
| Reverse isolation | IS12I | @ 2600 MHz | | 55 | | dB |
| 3 rd Order Input Intercept Point | IIP3 | @ 2600 MHz, Δf = 1 MHz, P _{IN} = -30 dBm/tone | | +5.5 | | dBm |
| 3 rd Order Output Intercept Point | OIP3 | @ 2600 MHz, Δf = 1 MHz, P _{IN} = -30 dBm/tone | | +37.5 | | dBm |
| 1 dB Input Compression Point | IP1dB | @ 2600 MHz | -14.0 | -12.5 | | dBm |
| 1 dB Output Compression Point | OP1dB | @ 2600 MHz | +17.0 | +18.5 | | dBm |
| DC Specifications | | | | | | |
| Supply voltage | V _{DD} | | | 5.0 | | V |
| Quiescent current | I _{DD} | Set with external resistor | | 125 | | mA |

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

Typical Performance Characteristics

($V_{DD} = +5\text{ V}$, $T_{OP} = +25\text{ }^{\circ}\text{C}$, $P_{IN} = -30\text{ dBm}$, Optimized for 2600 MHz Operation, Unless Otherwise Noted)

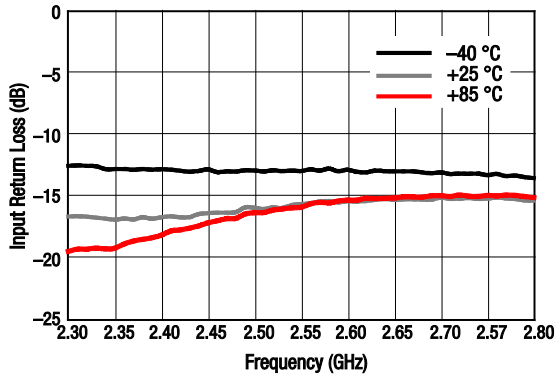


Figure 3. Input Return Loss vs Frequency Over Temperature, Narrow Band

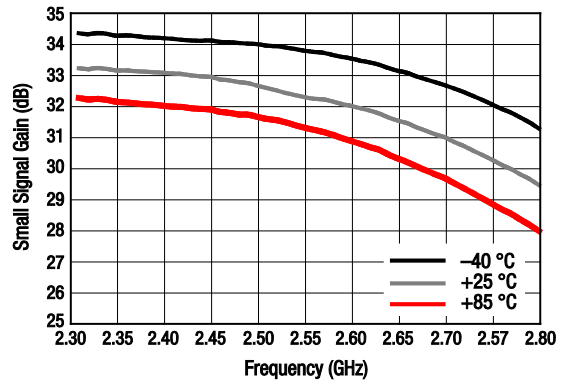


Figure 4. Small Signal Gain vs Frequency Over Temperature, Narrow Band

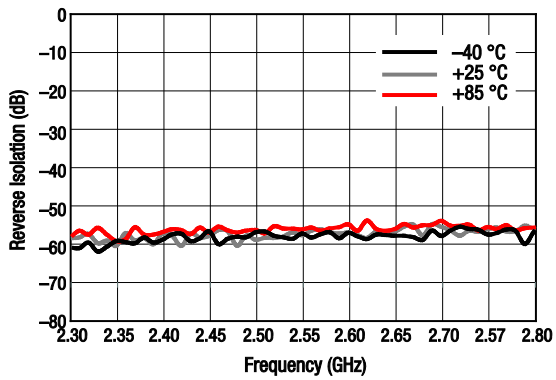


Figure 5. Reverse Isolation vs Frequency Over Temperature, Narrow Band

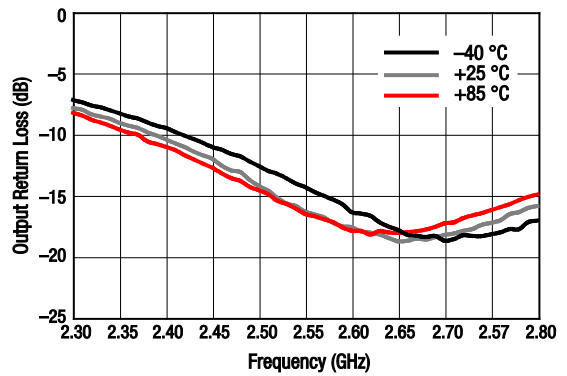


Figure 6. Output Return Loss vs Frequency Over Temperature, Narrow Band

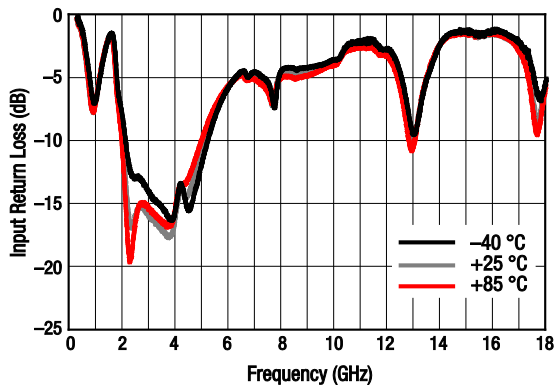


Figure 7. Input Return Loss vs Frequency Over Temperature, Wide Band

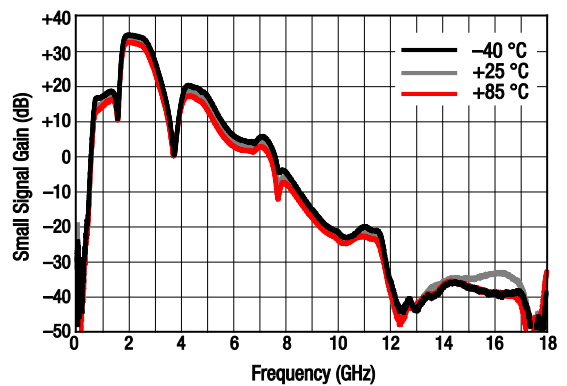


Figure 8. Small Signal Gain vs Frequency Over Temperature, Wide Band

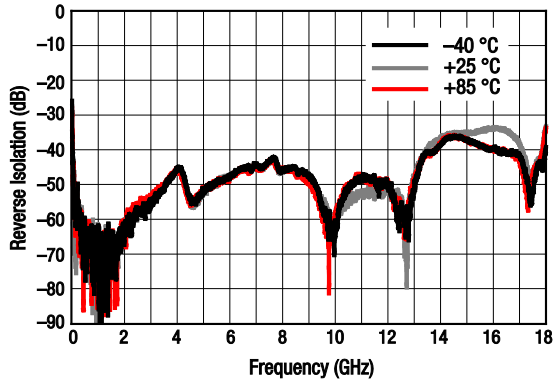


Figure 9. Reverse Isolation vs Frequency Over Temperature, Wide Band

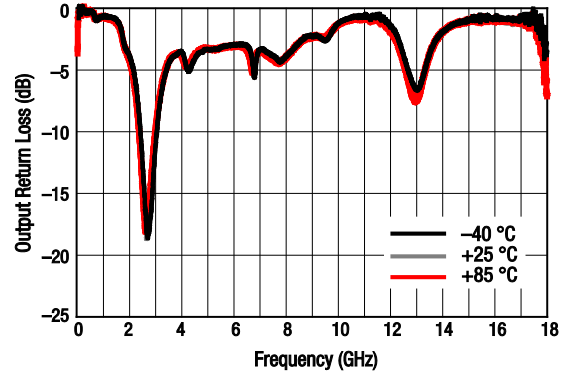


Figure 10. Output Return Loss vs Frequency Over Temperature, Wide Band

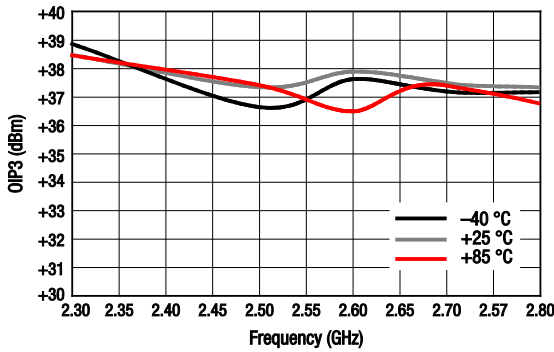


Figure 11. OIP3 vs Frequency Over Temperature

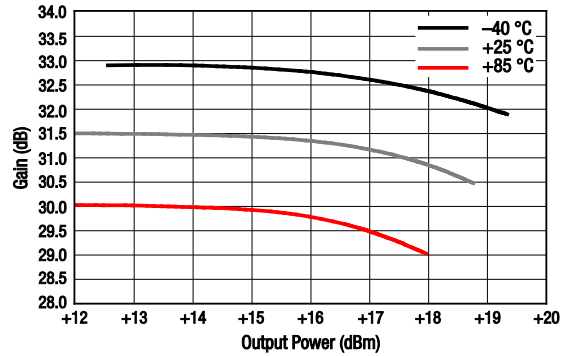


Figure 12. Gain vs Output Power Over Temperature

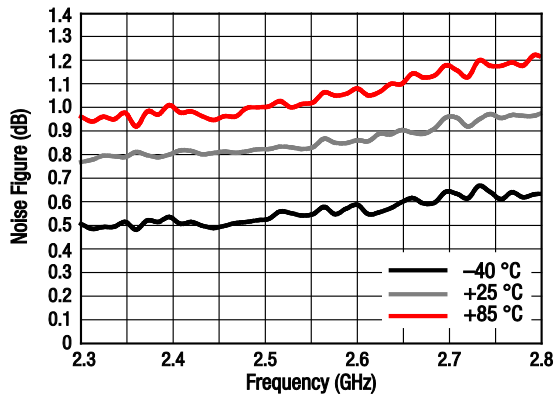


Figure 13. Noise Figure vs Frequency Over Temperature

Evaluation Board Description

The SKY67107-306LF Evaluation Board is used to test the performance of the SKY67107-306LF two-stage LNA. An Evaluation Board schematic diagram is provided in Figure 14 and Table 5 provides the Evaluation Board Bill of Materials.

The Evaluation Board assembly drawing is shown in Figure 15.

Note that the VDD3 pin on the Evaluation Board does not need to be connected and should be left open.

Package Dimensions

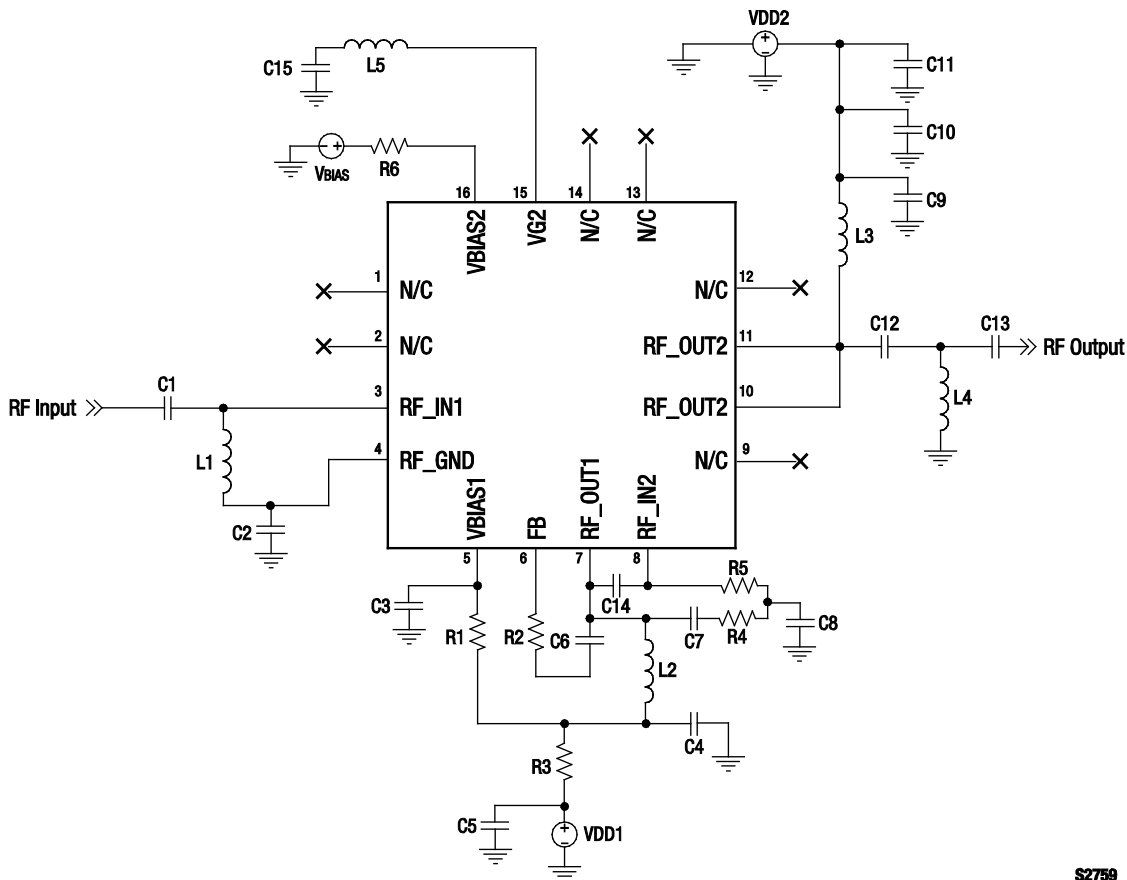
The PCB layout footprint for the SKY67107-306LF is shown in Figure 16. Typical case markings are noted in Figure 17. Package dimensions for the 16-pin QFN are shown in Figure 18, and tape and reel dimensions are provided in Figure 19.

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 SKY67107-306LF 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.

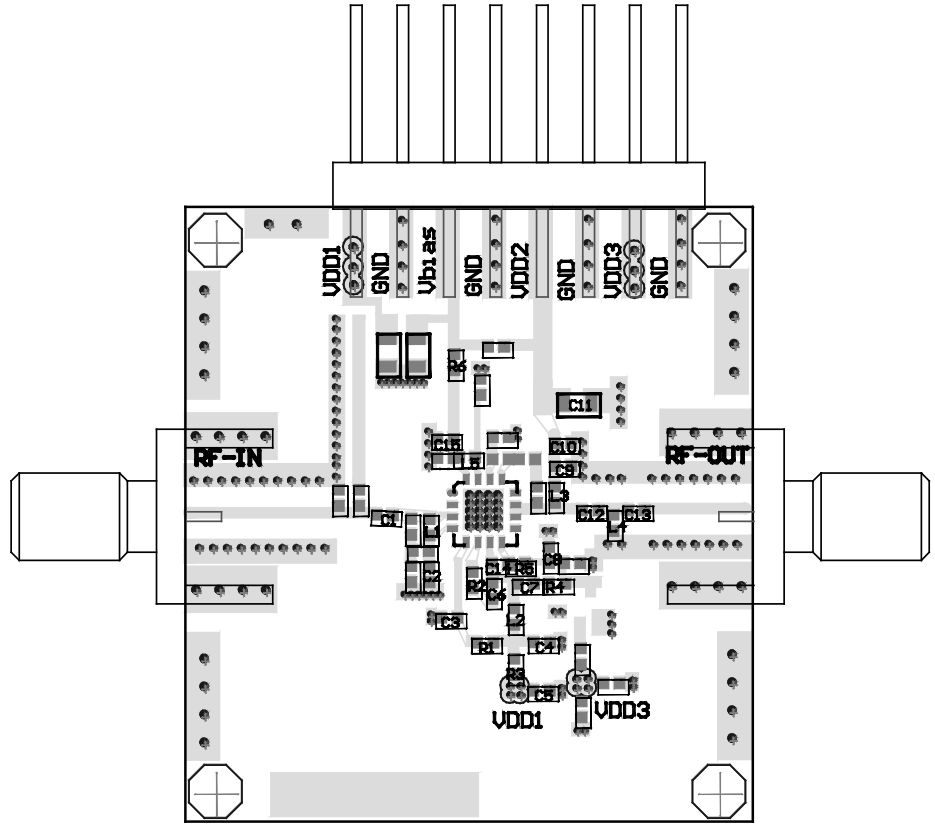


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Figure 14. SKY67107-306LF Evaluation Board Schematic

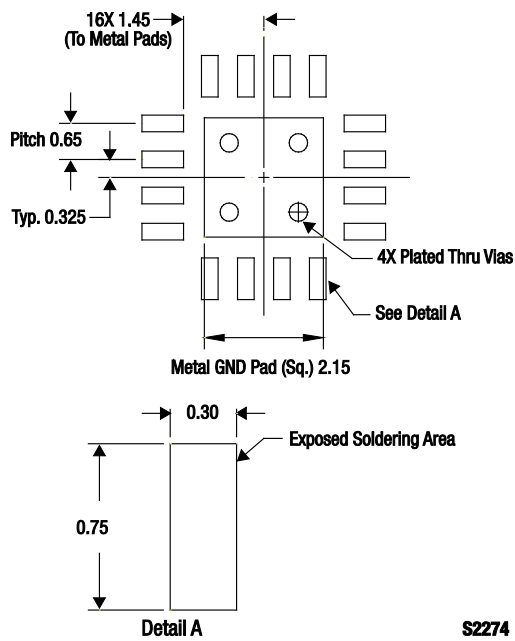
Table 5. SKY67107-306LF Evaluation Board Bill of Materials

| Component | Value | Size | Manufacturer | Manufacturer Part Number |
|--------------|----------------|------|--------------|--------------------------|
| C1 | 10 pF | 0402 | Murata GJM | |
| C2 | 3.6pF | 0402 | Murata GJM | |
| C3 | 0.1 μ F | 0402 | Murata GRM | |
| C4 | 10000 pF | 0402 | Murata GRM | |
| C5 | 1000 pF | 0402 | Murata GRM | |
| C6, C11, C14 | DNP | 0402 | – | |
| C7 | 100 pF | 0402 | Murata GRM | |
| C8 | 1.8 nH | 0402 | TDK MLG | |
| C9 | 1.2 pF | 0402 | Murata GRM | |
| C10 | 1 μ F | 0402 | Murata GRM | |
| C12 | 3.9 pF | 0402 | Murata GRM | |
| C13 | 100 pF | 0402 | Murata GRM | |
| C15 | 6 pF | 0403 | Murata GJM | |
| L1 | 3.3 nH | 0402 | Coilcraft HP | |
| L2 | 2.4 nH | 0402 | TDK MLG | |
| L3 | 33 nH | 0402 | TDK MLG | |
| L4 | 1.8 nH | 0402 | TDK MLG | |
| L5 | 15 nH | 0402 | TDK MLG | |
| R1 | 7.5 k Ω | 0402 | Panasonic 1% | |
| R2 | DNP | 0402 | – | |
| R3, R4 | 0 Ω | 0402 | Panasonic | |
| R5 | 1.8 pF | 0402 | Murata GRM | |
| R6 | 6.2 k Ω | 0402 | Panasonic 1% | |



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Figure 15. SKY67107-306LF Evaluation Board Assembly Diagram



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Figure 16. SKY67107-306LF PCB Layout Footprint

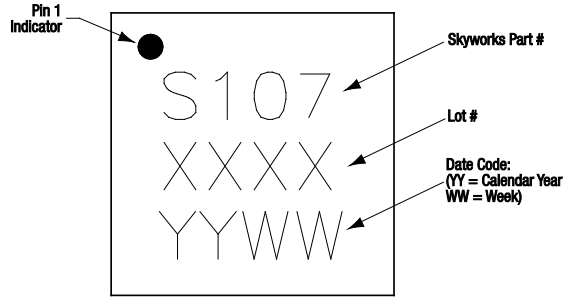
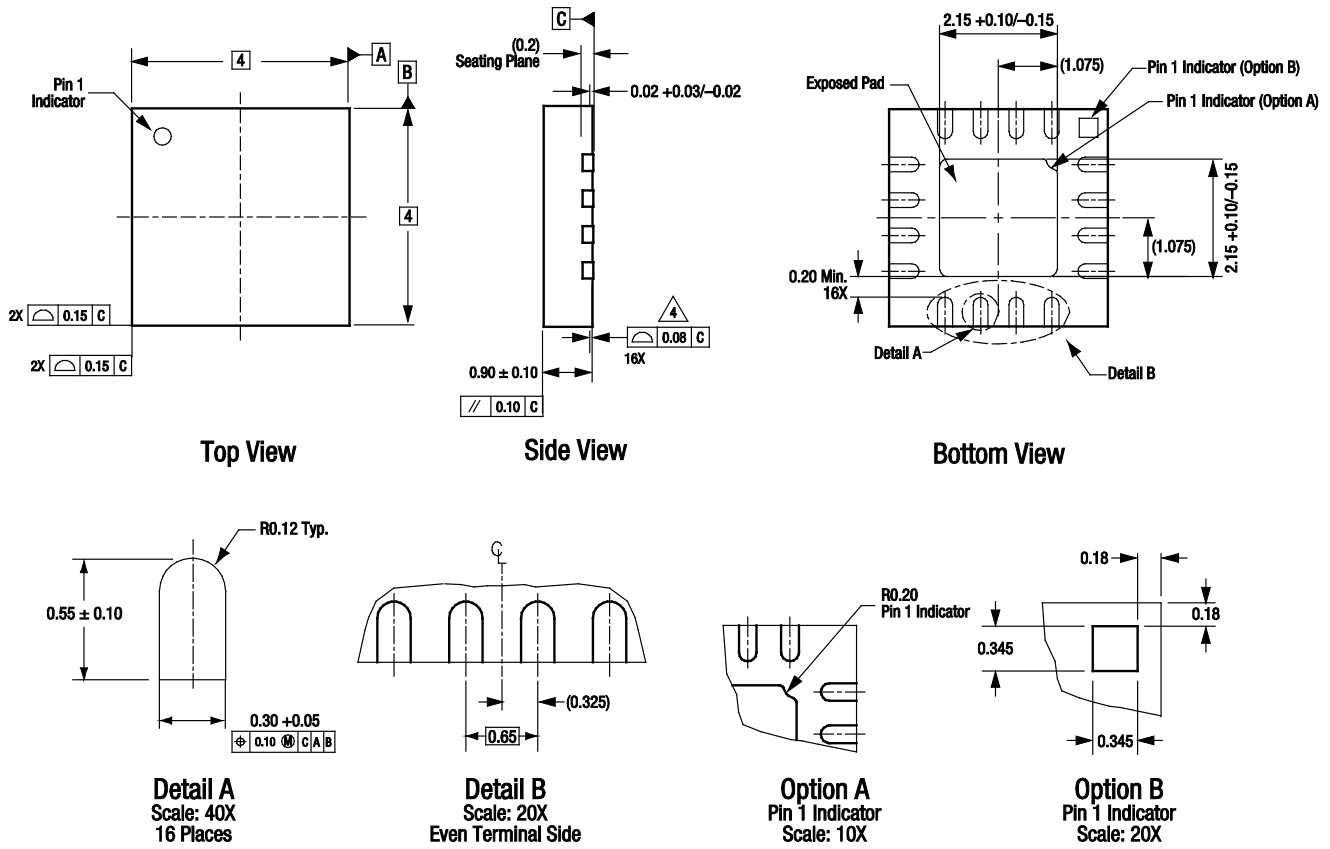


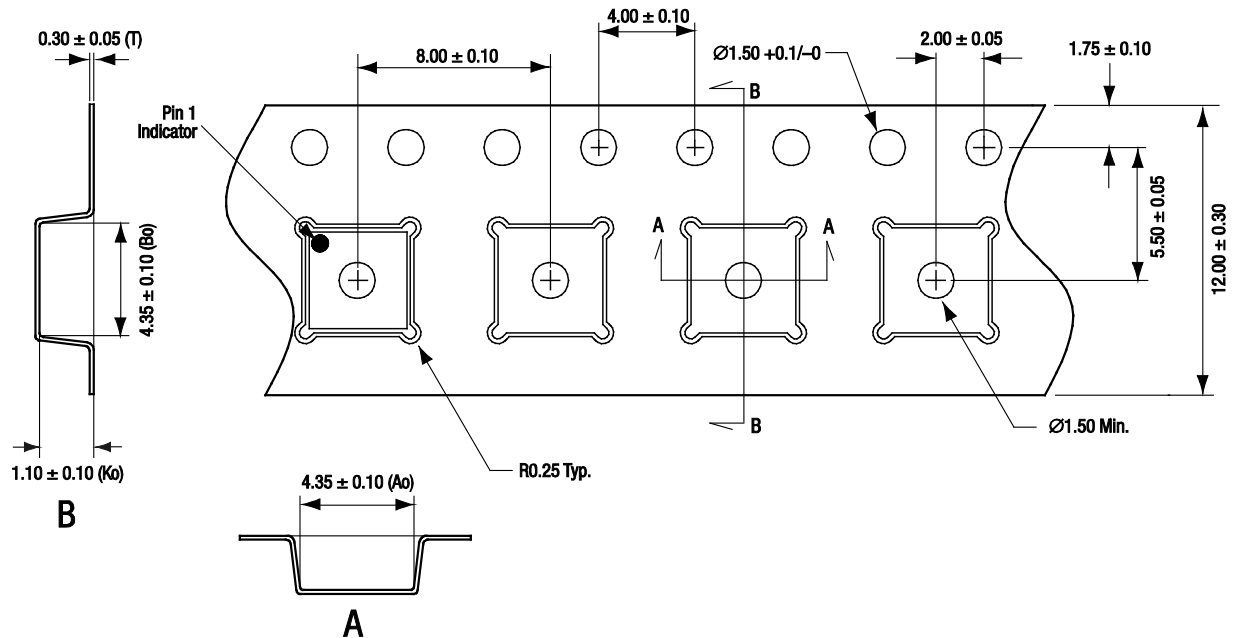
Figure 17. Typical Case Markings



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.
 Package may have option A or option B pin 1 indicator.

S2400

Figure 18. SKY67107-306LF 16-Pin QFN Package Dimensions



- Notes:
1. Carrier tape material: black conductive polystyrene, non-bakeable
 2. Cover tape material: transparent conductive HSA
 3. Cover tape size: 9.2 mm width
 4. ESD surface resistivity is $\geq 1 \times 10^9 \sim \leq 1 \times 10^{10}$ Ohms/square per EIA, JEDEC TNR Specification.
 5. All measurements are in millimeters

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Figure 19. SKY67107-306LF Tape and Reel Dimensions

Ordering Information

| Model Name | Manufacturing Part Number | Evaluation Board Part Number |
|------------------------------|---------------------------|------------------------------|
| SKY67107-306LF Two-Stage LNA | SKY67107-306LF | SKY67107-306LF-EVB |

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