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# Low Noise Amplifier AL411

2021.12

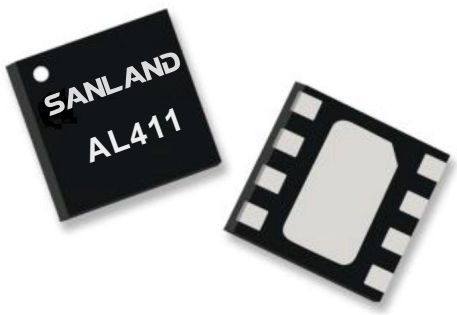
## DESCRIPTION

Sanland's AL411 is a flat gain, high linearity, ultra-low noise amplifier in a micro 2.0 x 2.0 x 0.75mm$^3$ 8-pin DFN package. The LNA provides a gain flatness of 2dB (peak to peak) over a wide bandwidth from 2 to 4.2 GHz.

The 0.25um GaAs enhanced PHEMT technology is used to realize the low noise amplifier with low noise and high-linearity. It is packaged in a green / RoHS-compliant 2x2 mm industry standard package.

The internal active bias circuit provides stable temperature and process change performance. The LNA provides the ability to adjust the power current externally . The power supply voltage is applied to RFOUT/VDD pin through the inductance of RF choke.

## KEY FEATURES




- 0.7-4.2 GHz Operational Bandwidth
- Ultra low noise figure, 0.6dB NF @ 2.6 GHz
- >20 dB gain across 0.7 to 4.2 GHz
- Flat 2 dB gain variation across 2 to 4.2 GHz.
- Bias adjustable for linearity optimization
- 33 dBm OIP3 at 55 mA IDD

RoHS Compliant & Green Package

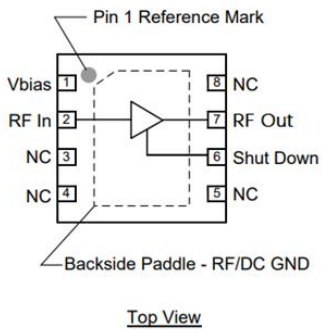
**ESD Class 1A**

Appropriate precautions in handing , packaging and testing devices must be observed !

## Major Applications

- Repeaters / DAS
- Mobile Infrastructure
- LTE / WCDMA / CDMA / GSM
- General Purpose Wireless
- TDD or FDD systems

## Pin Assignment




Top View

## Pin Details

| Pin Number | Name | Description |
|---|---|---|
| 1 | VBIAS | Bias voltage for input gate. External resistor sets current consumption. |
| 2 | RF in | RF input. DC blocking capacitor required. |
| 3,4,5,8 | NC | No connection. May be connected to ground with no change in performance. |
| 6 | Shut Down | |
| 7 | RFOUT/ VDD | RF output. Apply VDD through RF choke inductor. DC blocking capacitor required. |



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## Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|---|---|
| DC Power Supply | +7 | V |
| Quiescent supply current | 90 | mA |
| RF Input Power | 30 | dBm |
| Operating Temperature | -40 to +105 | ℃ |
| Storage Temperature | -65 to +150 | ℃ |
| Operation beyond any one of these limits may cause permanent damage. | | |

**Thermal Data**

| Parameter | Specification | | | Units | Notes |
|---|---|---|---|---|---|
| | Min | Typ. | Max | | |
| Thermal resistance | | 45 | | ˚C/W | |
| Channel temperature @ +85 ˚C reference (package heat slug) | | 101 | | ˚C | VDD = 5 V, IDQ = 55mA, no RF applied , dissipated power=0.275W |
| Test Conditions：VDD = 5 V, TA = +25 ˚C, PIN = –25 dBm , Characteristic Impedance [ZO] = 50 Ω,Unless Otherwise Noted. | | | | | |

## Important Note:

The information provided in this datasheet is deemed to be accurate and reliable only at present time. Sanland Technology Corp. reserves the right to make any changes to the specifications in this datasheet without prior notice.

**Caution: ESD Sensitive**
**Appropriate precaution in handling, packaging**
**And testing devices must be observed.**



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**700 to 4200 MHz Optimized Tuning**

| Parameter | Specification | | | Units | Notes |
|---|---|---|---|---|---|
| | Min | Typ. | Max | | |
| **RF Specifications** | | | | | |
| NF | | 0.6 | | dB | 2.6 GHz, includes Evaluation Board loss |
| S21 | | 24.3 | | dB | 2.6 GHz |
| S11 | | 8.7 | | dB | 2.6 GHz |
| S22 | | 19.8 | | dB | 2.6 GHz |
| S12 | | 35.9 | | dB | 2.6 GHz |
| OIP3 | | 33.7 | | dBm | 2.6 GHz, Δf = 1 MHz, PIN = –25 dBm/tone |
| OP1dB | | 18.1 | | dBm | 2.6 GHz |
| **DC Specifications** | | | | | |
| VDD | | 5 | | V | |
| IDQ | | 55 | | mA | Set with external resistor |
| Test Conditions：VDD = 5 V, TA = +25 °C, PIN = –25 dBm, Characteristic Impedance [ZO] = 50 Ω, Unless Otherwise Noted | | | | | |



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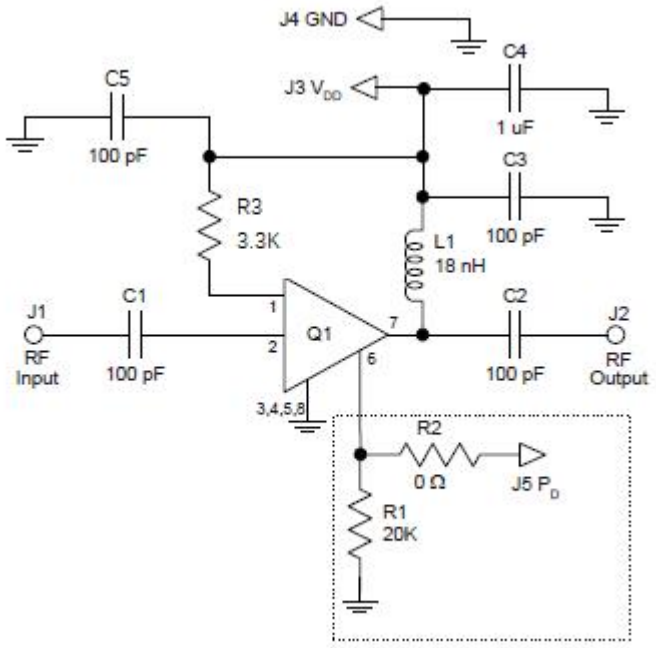


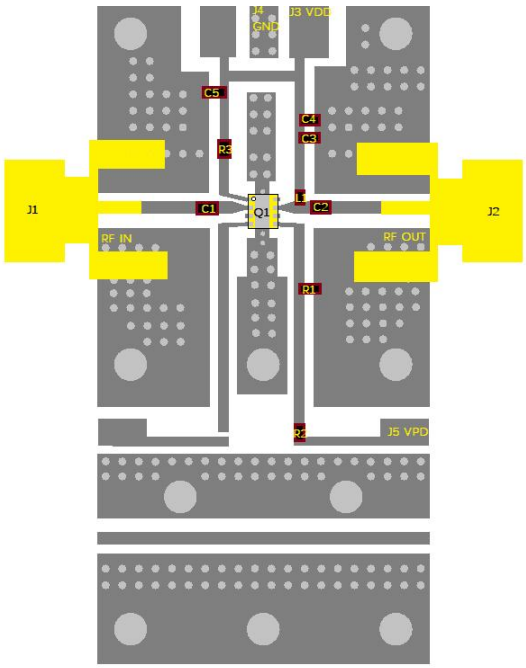


**Notes:**

**For TDD Applications:R1=20K&R2=0K.**

**For FDD Applications:R1=20K 'OR' Pin 5 tied to ground.R2=DNP/Omitted.**

| Component | Description | Value | Size | Manufacturer | Part Number |
|---|---|---|---|---|---|
| Q1 | Ultra Low Noise, Flat Gain LNA | | | SANLAND | AL411 |
| L1 | Inductor | 18nH | 0402 | Coilcraft | 0402CS-18NXJL |
| C1,C2,C3,C5 | Capacitor | 100pF | 0402 | Murata | GRM1555C1H101JA01D |
| R3 | Resistor | 3.3kΩ | 0402 | Kamaya | RC1/4332JB |
| C4 | Capacitor | 1uF | 0402 | Murata | GRM31MR71H105MA88L |



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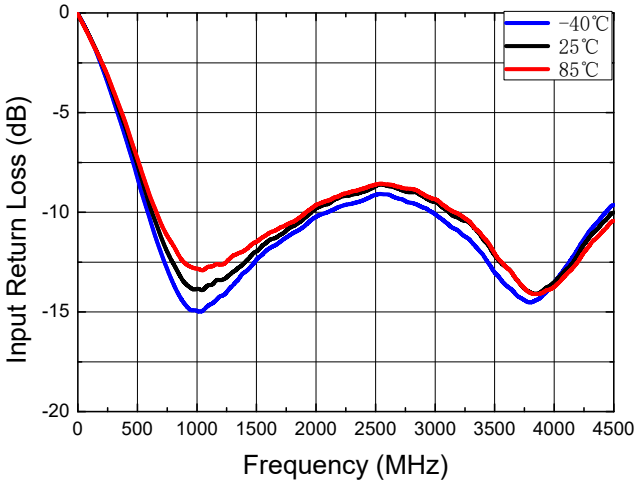
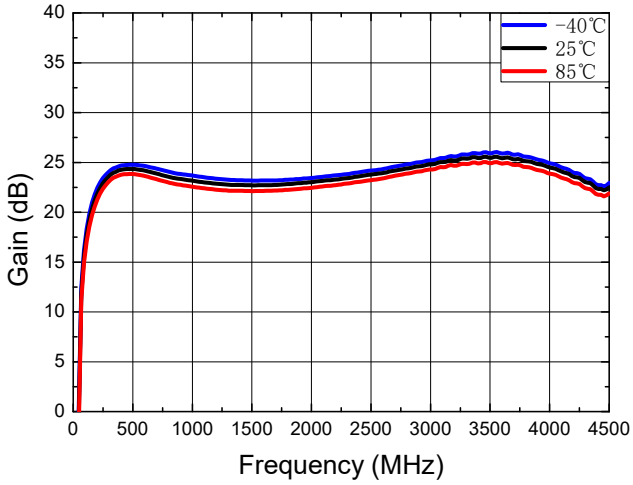
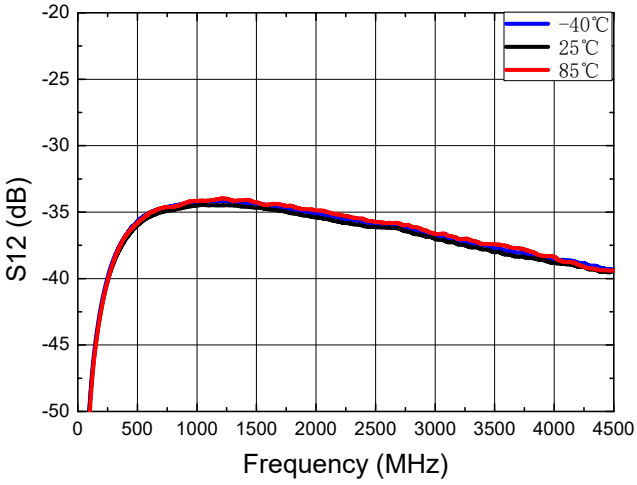
Input Return Loss Vs. Frequency



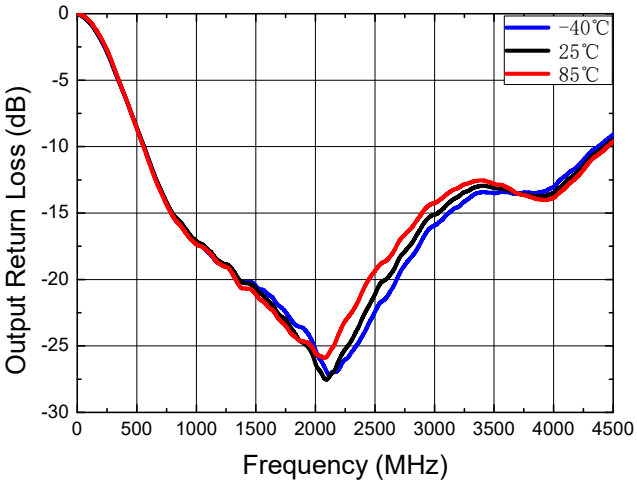

Gain Vs. Frequency




S12 Vs. Frequency




Output Return Loss Vs. Frequency



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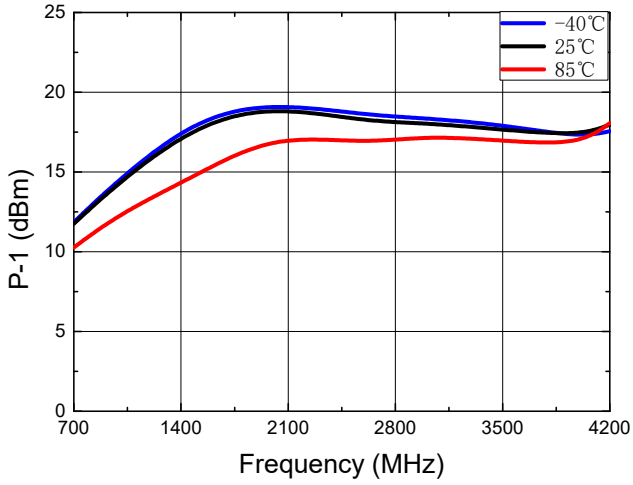
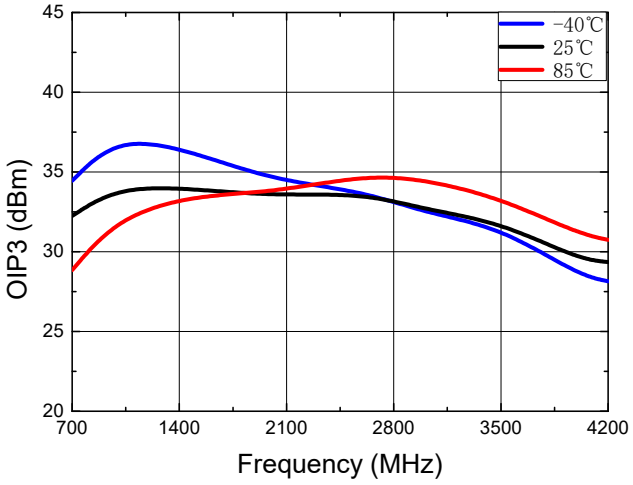
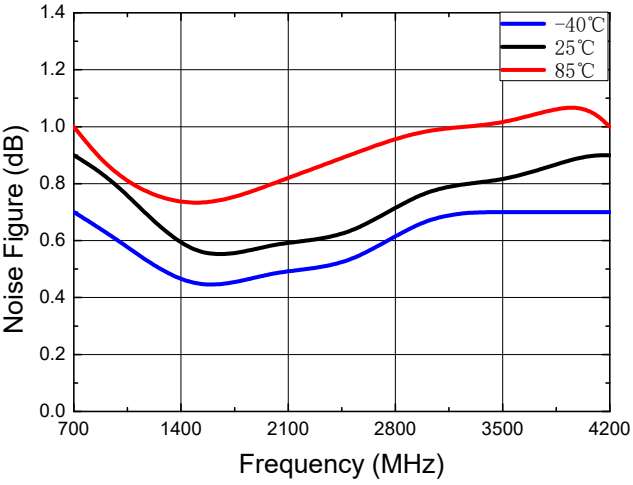
P-1 Vs. Frequency




OIP3 Vs. Frequency




Noise Figure Vs. Frequency



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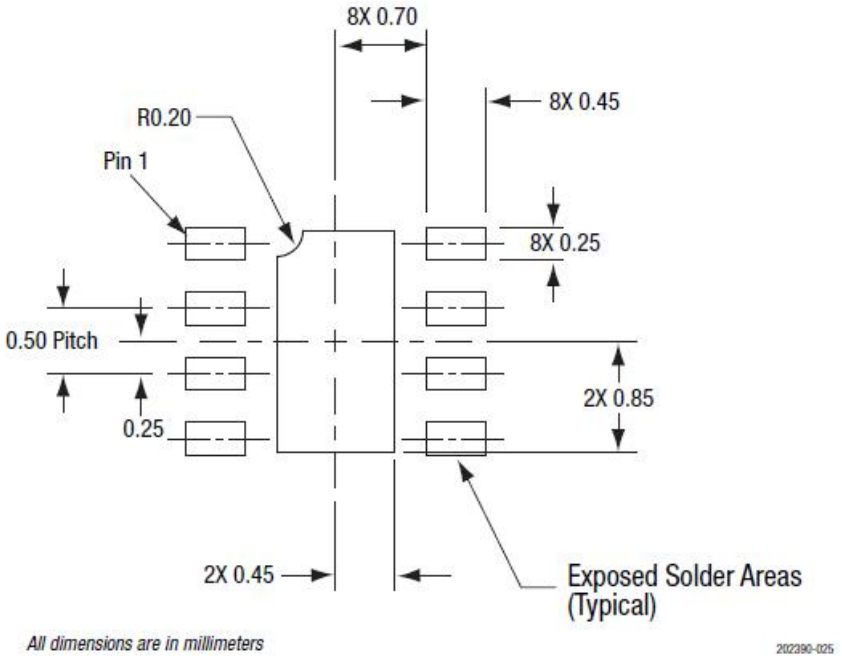


PCB Layout Footprint (Top View)


Typical Part Markings (Top View)



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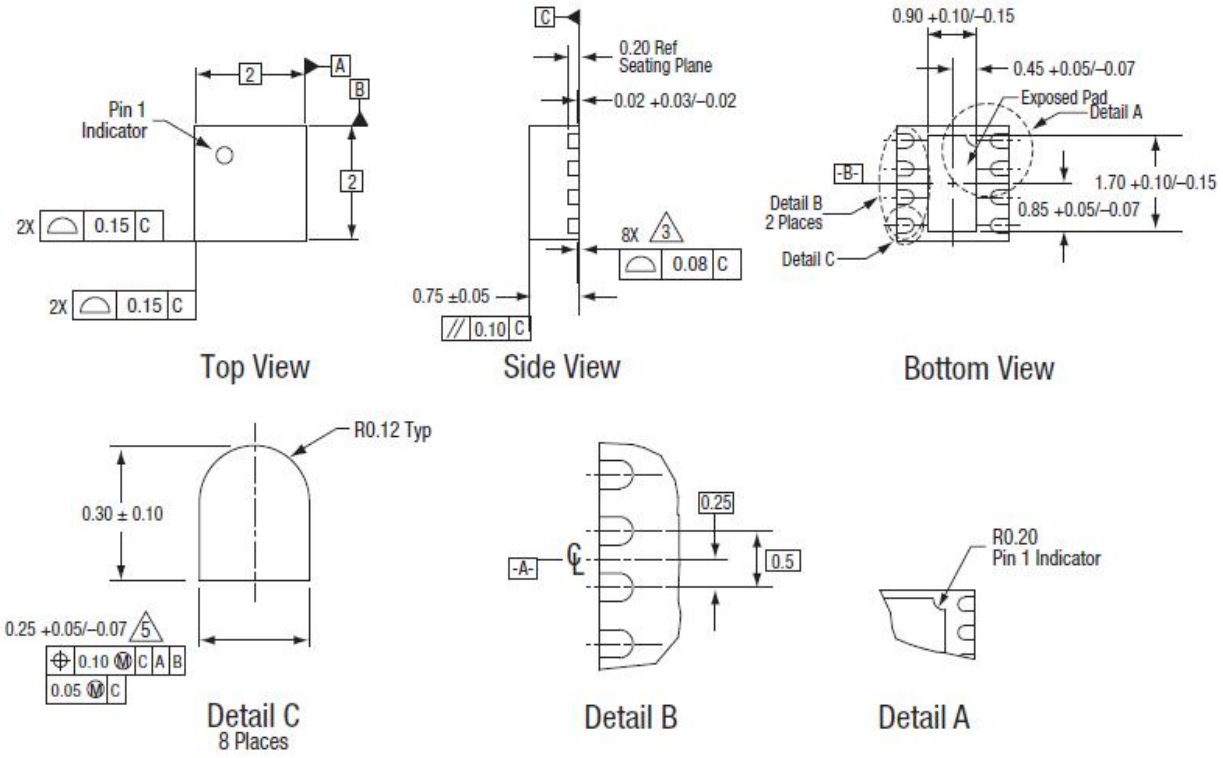


*Notes:*

1. *All measurements are in millimeters.*
2. *Dimensions and tolerances according to ASME Y14.5M-1994.*
3. *Coplanarity applies to the exposed heat sink ground pad as well as the terminals.*
4. *Plating requirement per source control drawing (SCD) 2504.*
5. *Dimension applies to metallized terminal and is measured between 0.15 mm and 0.30 mm from terminal tip.*

202390-027

Package Dimensions



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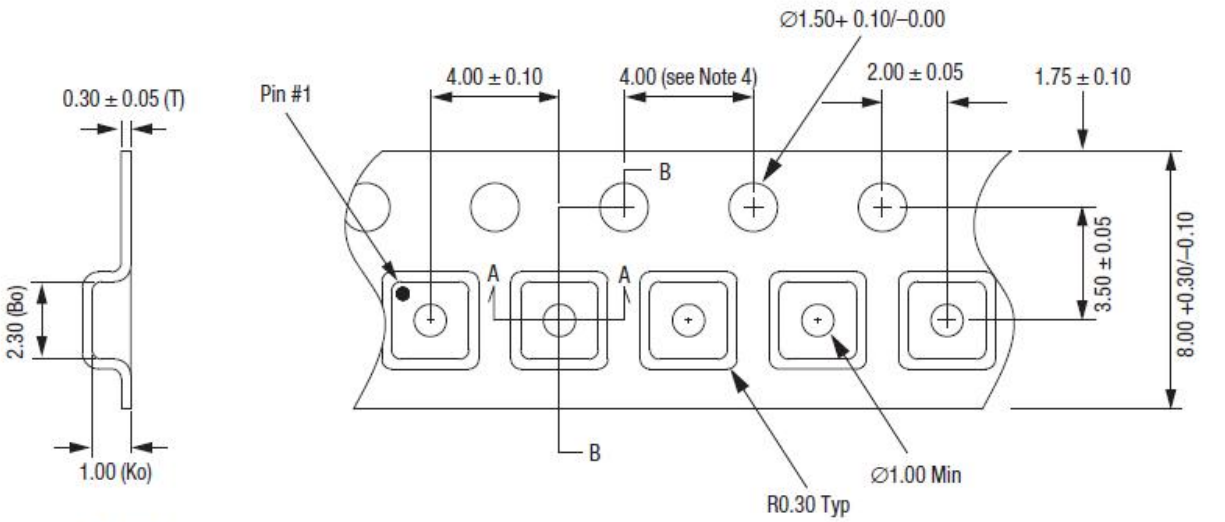


*Notes:*

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 ≤1 x $10^9$ 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.*

Tape and Reel Dimensions



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