

Product Description

ATEK169P3 is a wideband low noise amplifier covering LF to 8 GHz frequency range. Amplifier can be used up to 12 GHz. Amplifier operational low frequency range can be extended to lower frequencies by increasing external component values.

ATEK169P3 provides flat gain and low noise over wideband with single supply voltage. This allows users to easily realize wideband receiver frontends.

Amplifier housed in compact 3x3 mm low cost SMD package, input and output matched to 50 ohms internally. Evaluation Board, bare die, custom package, and module options are available upon request.

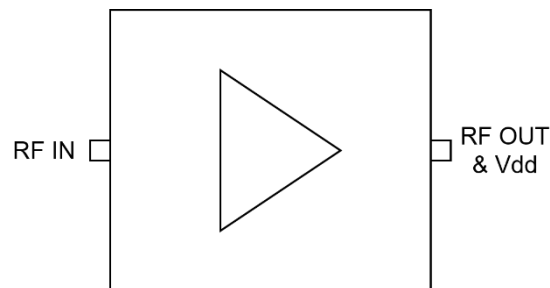
Product Features

- Frequency Range: LF - 8 GHz
- Gain: 17 dB
- Noise Figure: 1.3 dB
- P1dB: 20.5 dBm
- Single Supply
- Positive Supply
- 3x3 mm compact size

Applications

- Wideband Receivers
- Telecommunication
- Test and Measurement
- SATCOM
- SDR

Functional Block Diagram



Electrical Specifications

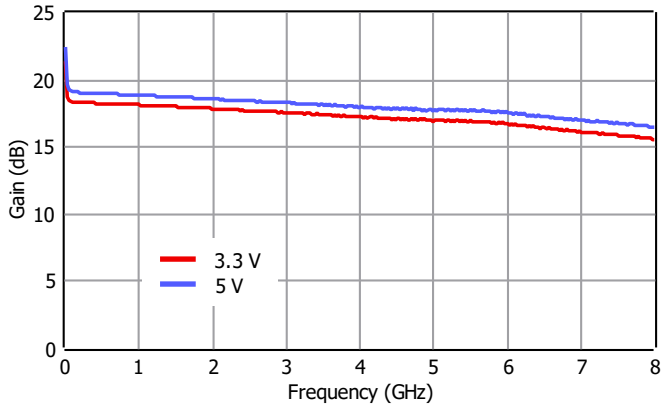
Conditions unless otherwise specified: $V_{DD} = 5\text{ V}$, $I_{DQ} = 75\text{ mA}$, Typical, $T = 25\text{ C}$, CW.

| Parameter | | Min | Typ | Max | Units |
|-----------------------------|---------|-----|---------|-----|-------|
| Operational Frequency Range | | LF | | 8 | GHz |
| Gain | 0.1 GHz | | 18 | | dB |
| | 1 GHz | | 18 | | |
| | 2 GHz | | 17.5 | | |
| | 4 GHz | | 17 | | |
| | 8 GHz | | 15.5 | | |
| Noise Figure | 0.1 GHz | | 1.4 | | dB |
| | 1 GHz | | 0.9 | | |
| | 2 GHz | | 1.05 | | |
| | 4 GHz | | 1.25 | | |
| | 8 GHz | | 1.4 | | |
| Isolation | 0.1 GHz | | 23 | | dB |
| | 1 GHz | | 22.6 | | |
| | 2 GHz | | 22.4 | | |
| | 4 GHz | | 22 | | |
| | 8 GHz | | 22 | | |
| Input Return Loss | | | -17 | | dB |
| Output Return Loss | | | -13 | | dB |
| Output IP3 | | | 31 | | dBm |
| Output P1dB | | | 20.5 | | dBm |
| Psat | | | 21 | | dBm |
| DC Supply Voltage (Vdd) | | | 3.3 5 | | V |
| DC Supply Current | | | 40 75 | | mA |
| Operating Temperature | | -40 | | 85 | °C |

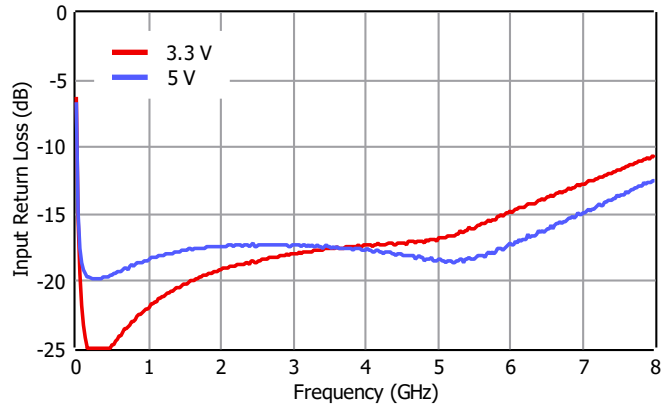
Typical Performance Plots

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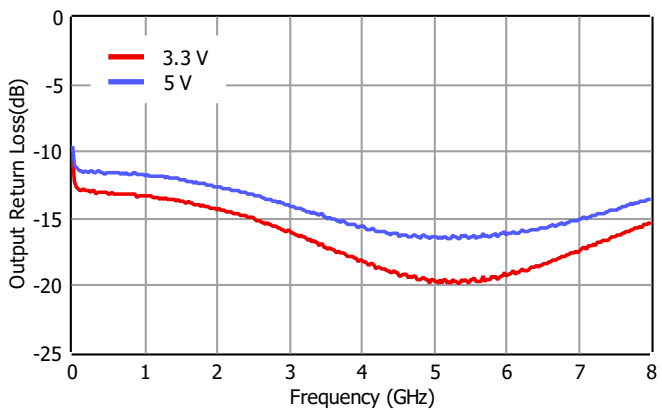
Gain



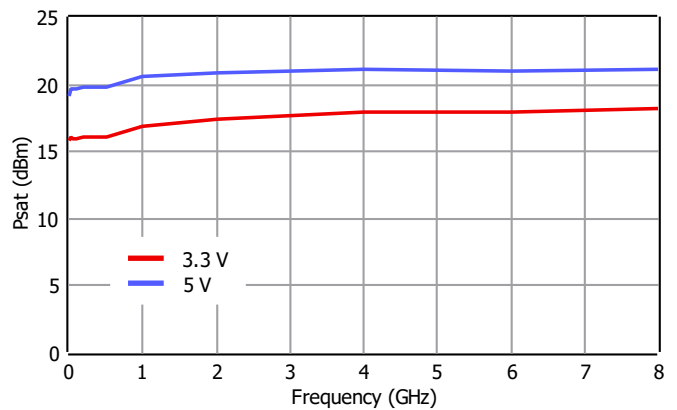
Input Return Loss



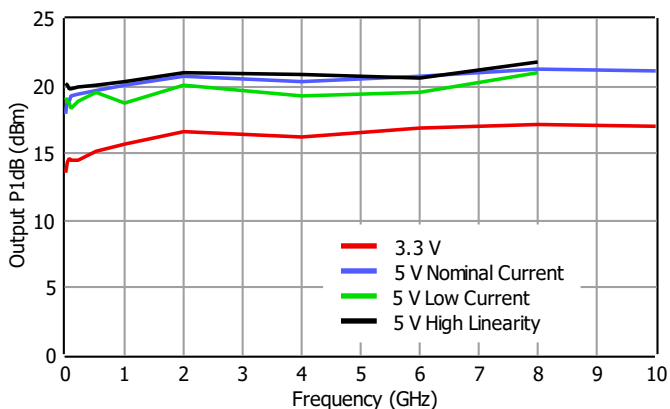
Output Return Loss



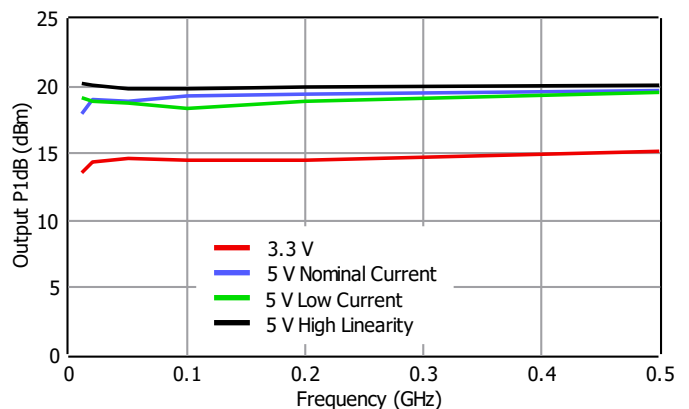
Psat



P1dB



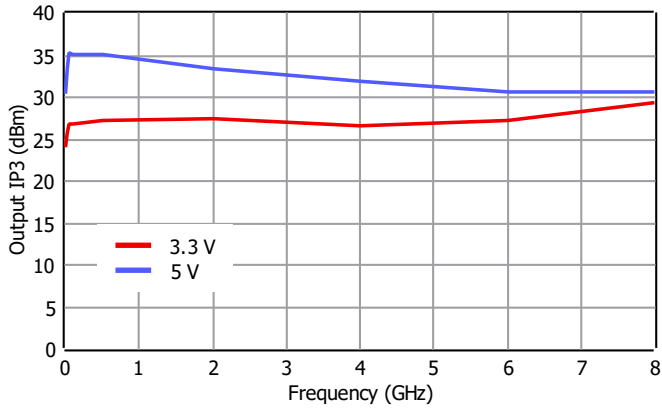
P1dB at Low Frequency



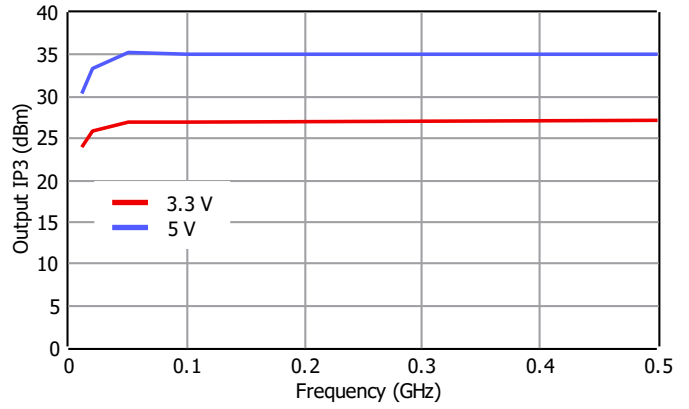
Typical Performance Plots

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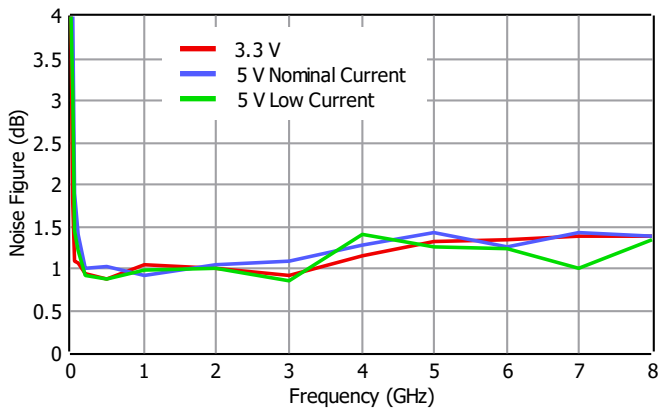
IP3



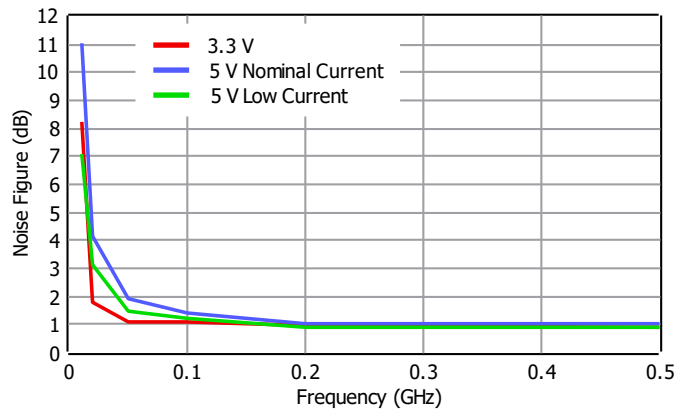
IP3 at Low Frequency



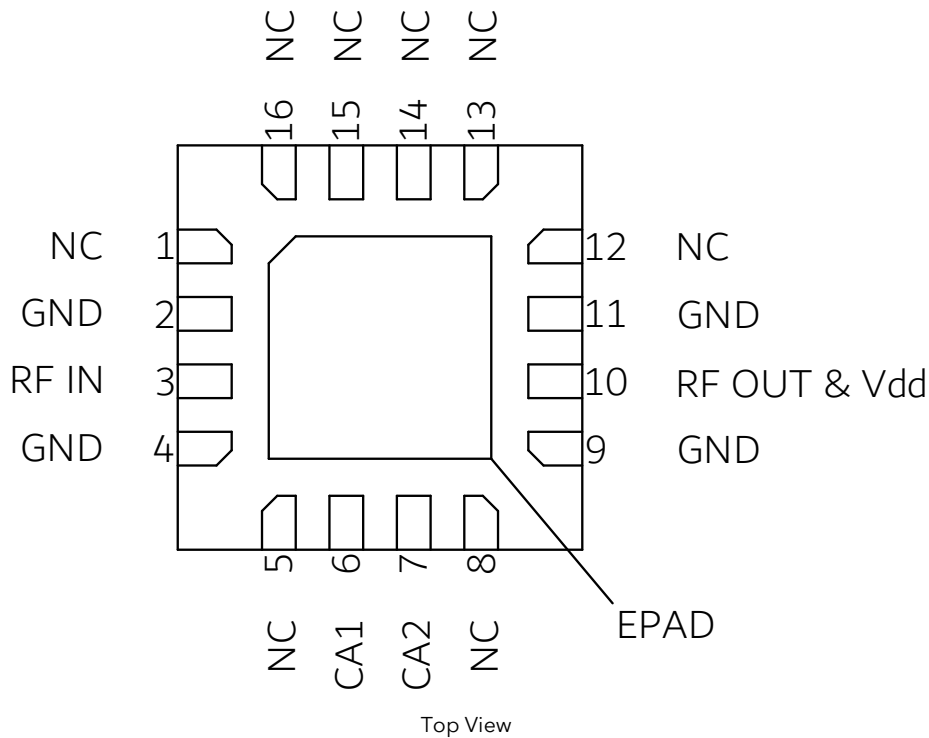
Noise Figure



Noise Figure at Low Frequency



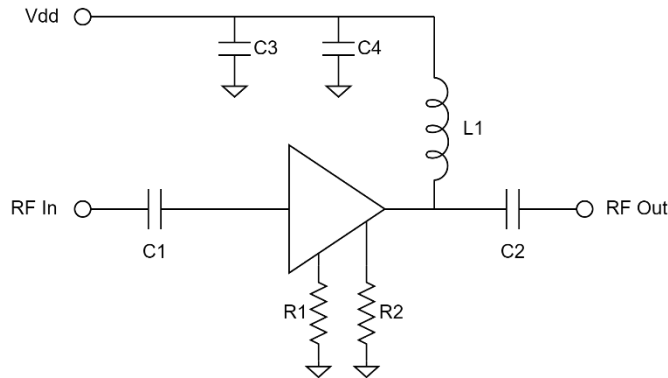
Pin Description



| Pin Number | Pin Name | Description |
|----------------|--------------|--|
| 3 | RF IN | RF input pin. Wideband external DC block capacitor is required. |
| 10 | RF OUT & Vdd | RF output pin. Wideband external DC block capacitor is required. |
| 6 | CA1 | Current consumption adjustment pin. See Application Section for details. |
| 7 | CA2 | Current consumption adjustment pin. See Application Section for details. |
| 1, 5, 8, 12-16 | NC | These pins are not internally connected. Can be grounded on the PCB. |
| 2, 4, 9, 11 | GND | Ground. |
| 17 | EPAD | Exposed Pad on the bottom of the package should be connected to ground with multiple number of vias to reduce the inductance to the GND. |

Applications Information

Signal entering from RF IN goes to RF OUT with an amplification. Typical application schematic to operate the amplifier is given below.



C1 and C2 are DC block capacitors. It is recommended to use wideband low loss DC block capacitors to achieve the best performance. Using low profile capacitors is also possible, which will result in additional loss.

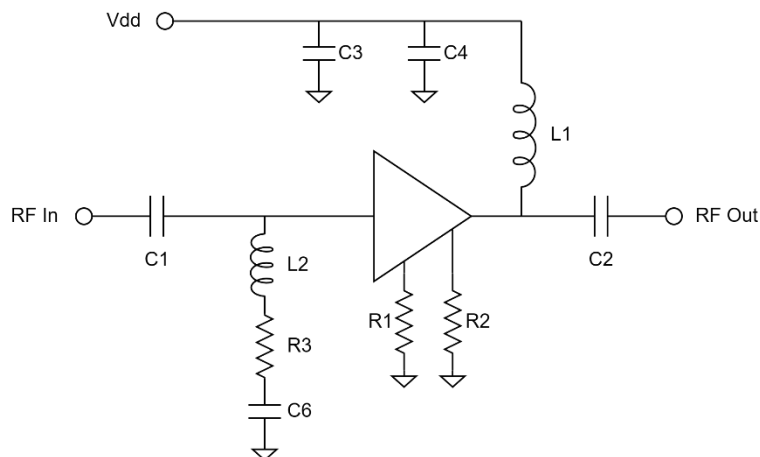
L1 is used as RF choke inductor. It is recommended to use wideband RF choke to achieve wideband performance. To extend the low frequency cutoff of the amplifier from 10 MHz to lower frequencies, high value C3, C4 and L1 external components can be used. This will improve low frequency performance at the expense of flat wideband response, and high frequency response.

The amplifier has 3 modes of operation. Leaving CA1 and CA2 pins floating, connecting a resistor or connecting to ground sets the configuration state. By changing the configuration, amplifier can provide higher P1dB at the expense of current consumption.

Configuration details for these pins are shown in the table below.

| Configuration | CA1 State (R1) | CA2 State (R2) | Voltage (V) | Typical Current (mA) |
|-----------------|----------------|----------------|-------------|----------------------|
| Low Current | 50R | Short to GND | 5 | 53 |
| Nominal Current | Open/floating | Short to GND | 5 | 75 |
| High Linearity | Open/floating | 10R | 5 | 94 |

To improve the stability below 30MHz, the suggested application schematic is given below.



Adding L2, R3 and C6 will improve the stability factor under 30MHz.

Small signal plots are gathered with probe PCB measurements with external Bias Tee and external DC Block, to generate data shown in this document. The calibration performed with external Bias Tee and external DC Block capacitor.

Large signal and noise figure data are generated with connectorized evaluation PCB measurements which have SMD Bias Tee and DC Block capacitors. Then the PCB trace and connector transition losses are de-embedded, to generate plots shown in this document.

The NC pins of the Amplifier are connected to the GND on the PCBs used to generate the plots shown in this document. Vdd values shown on the datasheet correspond to the Vdd pins shown on the application schematic, not the output pin of the amplifier.

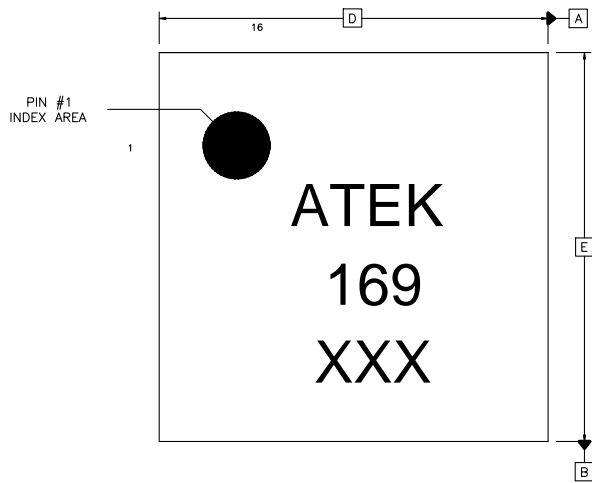
Vdd value can be increased to get higher P1dB performance.

Absolute Maximum Ratings

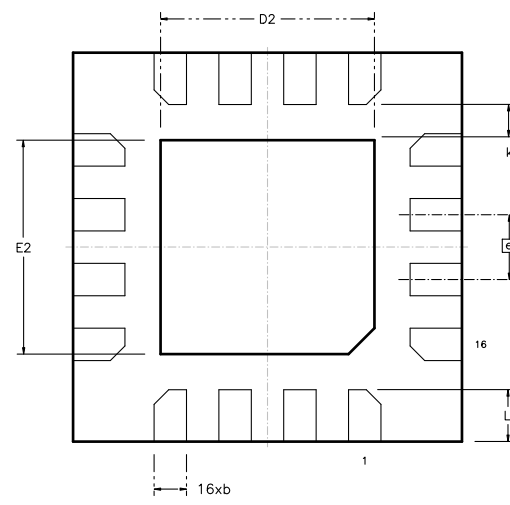
| Parameter | Value/Range |
|----------------------|---------------|
| Supply Voltage (Vdd) | TBD |
| RF Input Power | TBD |
| Storage Temperature | -55 to +125°C |

Operation of this device outside the parameter ranges given above may cause damage. These conditions should not be applied simultaneously.

Mechanical and Marking Information



Top View



Bottom View



Side View

NOTES:
1) ALL DIMENSIONS IN MM

| SYMBOL | MIN | MAX | SYMBOL | MIN | MAX |
|--------|------|------|--------|------|------|
| A, V | 0.80 | 1.00 | E2 | 1.55 | 1.75 |
| b | 0.18 | 0.30 | e | 0.50 | BSC |
| D | 3.00 | BSC | k | 0.20 | - |
| D2 | 1.55 | 1.75 | L | 0.35 | 0.45 |
| E | 3.00 | BSC | | | |

Handling Precautions



Caution!
ESD-Sensitive Device
Handle Accordingly

Contact Information

For the latest specifications, additional product information, support, and sales.

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Revisions

| Revision No | Revision Date | Revision Reason | Section / Page No |
|-------------|---------------|--------------------------|-------------------|
| 1.0 | 07.08.2024 | Initial Release | |
| 1.1 | 14.08.2024 | Format And Content Fixed | |
| 1.2 | 30.01.2025 | Large Signal Plots Added | |