

### Applications

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

### Product Features

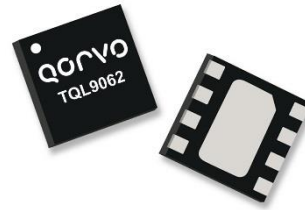
- 0.5-6.0 GHz Operational Bandwidth
- 16.3 dB Gain at 3.5 GHz
- 43.6 dBm OIP3 at 3.5 GHz
- 1.8V TTL logic compatible for shut-down control
- Unconditionally stable
- Integrated on-chip matching, 50 ohm in/out
- Integrated active bias

### General Description

The TQL9062 is a cascadable high-linearity gain block amplifier in a small 2 x 2 mm surface-mount package. At 3.5 GHz, the amplifier typically provides 16.3 dB gain, +43.6 dBm OIP3 at a 120 mA bias setting, and 1.4 dB noise figure. The LNA can be biased from a single positive supply ranging from 3.3 to 5 volts.

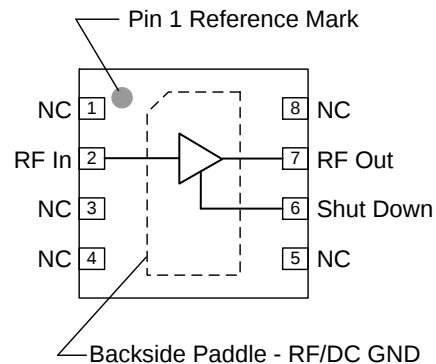
The TQL9062 has good noise figure and high linearity performance allowing the device to be used in both receiver and transmitter chains for high performance systems. The gain block is internally matched using a high performance E-pHEMT process and only requires four external components for operation from a single positive supply: an external RF choke and blocking/bypass capacitors. This low noise amplifier contains an internal active bias circuit to maintain high performance over temperature and integrates a shut-down capability to allow for operation in TDD applications.

The TQL9062 covers the 500-6000 MHz frequency band and is targeted for wireless infrastructure or other applications requiring high linearity and/or low noise figure.



8 pin 2x2 mm DFN Package

### Functional Block Diagram



### Pin Configuration

| Pin No.         | Label             |
|-----------------|-------------------|
| 1, 3, 4, 5, 8   | No Connect or GND |
| 2               | RF In             |
| 6               | Shut Down         |
| 7               | RF Out            |
| Backside Paddle | RF/DC GND         |

### Ordering Information

| Part No.    | Description                  |
|-------------|------------------------------|
| TQL9062     | High Linearity Gain Block    |
| TQL9062-PCB | 0.5-6.0 GHz Evaluation Board |

Standard T/R size = 2500 pieces on a 7" reel

## Absolute Maximum Ratings

| Parameter                                       | Rating       |
|-------------------------------------------------|--------------|
| Storage Temperature                             | -65 to 150°C |
| Supply Voltage ( $V_{DD}$ )                     | +7 V         |
| RF Input Power, CW, 50Ω, $T=25^{\circ}\text{C}$ | +33 dBm      |
| RF Input Power, WCDMA, 10dB PAR                 | +27 dBm      |
| RF Input Power, CW, OFF State                   | +33 dBm      |

Operation of this device outside the parameter ranges given above may cause permanent damage.

## Recommended Operating Conditions

| Parameter                    | Min | Typ | Max  | Units |
|------------------------------|-----|-----|------|-------|
| Supply Voltage ( $V_{DD}$ )  | 3.3 | 5.0 | 5.25 | V     |
| $T_{CASE}$                   | -40 |     | +105 | °C    |
| $T_j$ for $>10^6$ hours MTTF |     |     | +190 | °C    |

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

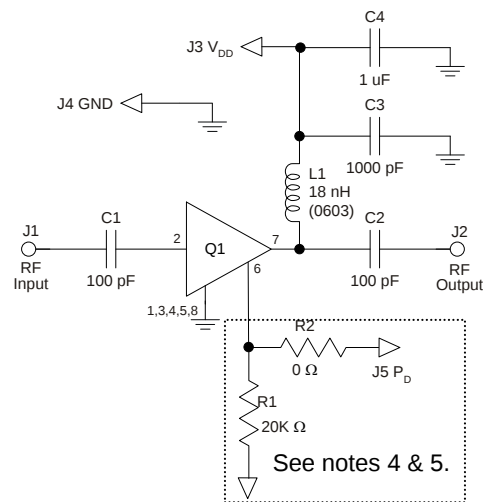
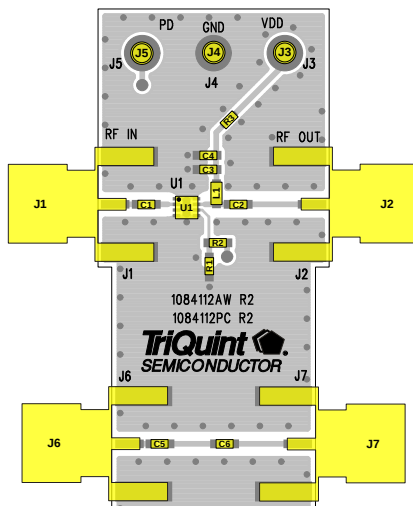
## Electrical Specifications

Test conditions unless otherwise noted:  $V_{DD}=+5\text{V}$ ,  $\text{Temp}=+25^{\circ}\text{C}$ , 50 Ω system.

| Parameter                         | Conditions                                              | Min  | Typ   | Max      | Units |
|-----------------------------------|---------------------------------------------------------|------|-------|----------|-------|
| Operational Frequency Range       |                                                         | 500  |       | 6000     | MHz   |
| Test Frequency                    |                                                         |      | 3500  |          | MHz   |
| Gain                              |                                                         |      | 16.3  |          | dB    |
| Input Return Loss                 |                                                         |      | 13    |          | dB    |
| Output Return Loss                |                                                         |      | 18    |          | dB    |
| Noise Figure <sup>(1)</sup>       |                                                         |      | 1.4   |          | dB    |
| Output P1dB                       |                                                         |      | +21.3 |          | dBm   |
| Output IP3                        | $P_{out}=+7\text{ dBm/ tone}$ , $\Delta f=1\text{ MHz}$ |      | +43.6 |          | dBm   |
| Power Shutdown Control (pin 6)    | On state                                                | 0    |       | 0.63     | V     |
|                                   | Off state (Power down)                                  | 1.17 |       | $V_{DD}$ | V     |
| Current, $I_{DD}$                 | On state                                                |      | 122   |          | mA    |
|                                   | Off state (Power down)                                  |      | 3     |          | mA    |
| Shutdown pin current, $I_{SD}$    | $V_{PD} \geq 1.17\text{ V}$                             |      | 200   |          | μA    |
| Switching Speed                   | LNA ON to OFF                                           |      | 520   |          | ns    |
|                                   | LNA OFF to ON                                           |      | 450   |          | ns    |
| Thermal Resistance, $\theta_{jc}$ | channel to case                                         |      | 48    |          | °C/W  |

Note: 1) Noise figure data has input trace loss de-embedded.

## TQL9062-PCB Evaluation Board



### Notes:

1. See Evaluation Board PCB Information section for material and stack-up.
2. R3 (0  $\Omega$  jumper) is not shown on the schematic and may be replaced with copper trace in the target application layout.
3. All components are of 0402 size unless stated on the schematic.
4. For TDD Applications: R1 = 20K & R2 = 0 $\Omega$
5. For FDD Applications: R1 = 20K 'OR' Pin 6 tied to ground. R2 = DNP/Omitted
6. A through line is included on the evaluation board to de-embed the board losses.
7. R4 sets the current draw. Can be changed for the desired bias point. See table below.

## Bill of Material – TQL9062-PCB

| Reference Des. | Value      | Description                     | Manuf.  | Part Number |
|----------------|------------|---------------------------------|---------|-------------|
| N/A            | N/A        | Printed Circuit Board           | Qorvo   |             |
| U1             | n/a        | Ultra Low Noise, Flat Gain LNA  | Qorvo   | TQL9062     |
| R1             | 20K        | Resistor, chip, 0402, 5%, 1/16W | various |             |
| R2, 3          | 0 $\Omega$ | Resistor, Chip, 0402, 5%, 1/16W | various |             |
| L1             | 18 nH      | Inductor, 0603, coil            | various |             |
| C3             | 1000 pF    | Cap, chip, 0402                 | various |             |
| C4             | 1.0 uF     | Cap., Chip, 0402                | various |             |
| C1, C2, C5, C6 | 100 pF     | Cap., Chip, 0402                | various |             |

### Typical Performance – TQL9062-PCB

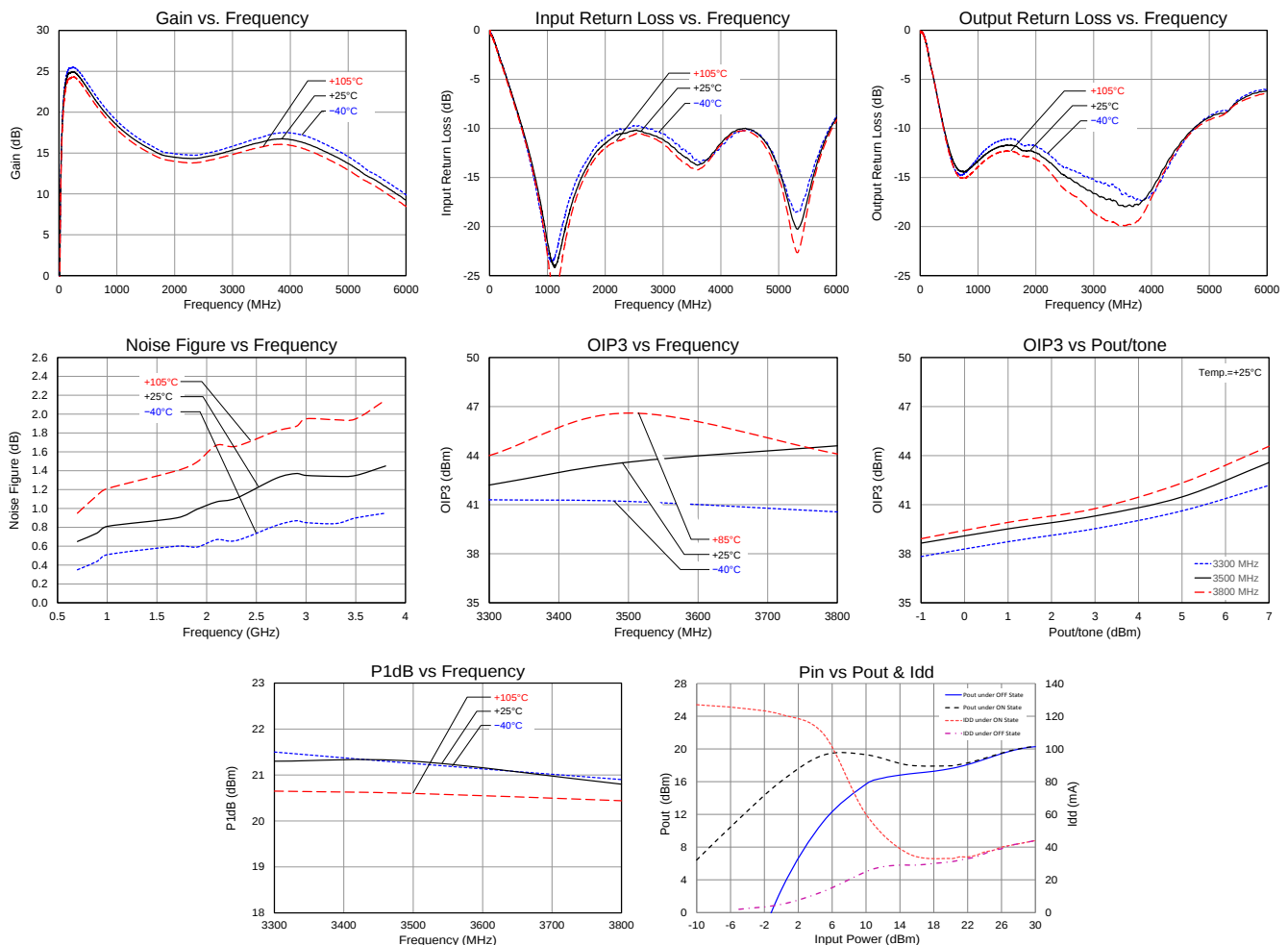
Test conditions unless otherwise noted:  $V_{DD}=+5\text{ V}$ ,  $I_{DD}=122\text{ mA}$  (typ.), Temp= $+25^{\circ}\text{C}$

| Parameter                   | Conditions                                             | Typical Values |       |       | Units |
|-----------------------------|--------------------------------------------------------|----------------|-------|-------|-------|
| Frequency                   |                                                        | 3300           | 3500  | 3800  | MHz   |
| Gain                        |                                                        | 15.3           | 16.3  | 16.7  | dB    |
| Input Return Loss           |                                                        | 12.5           | 13.5  | 13    | dB    |
| Output Return Loss          |                                                        | 17             | 18    | 17    | dB    |
| Output P1dB                 |                                                        | +21.3          | +21.3 | +20.8 | dBm   |
| OIP3                        | $P_{out}=+5\text{ dBm/tone}$ , $\Delta f=1\text{ MHz}$ | +42.2          | +43.6 | +44.6 | dBm   |
| Noise figure <sup>(1)</sup> |                                                        | 1.3            | 1.4   | 1.5   | dB    |

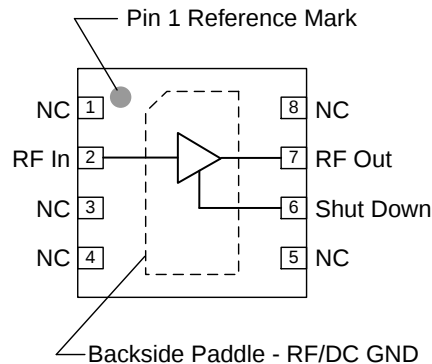
Note: 1) Noise figure data has input trace loss de-embedded.

### Performance Plots – TQL9062-PCB

Test conditions unless otherwise noted:  $V_{DD}=+5\text{ V}$ ,  $I_{DD}=122\text{ mA}$ , Temp= $+25^{\circ}\text{C}$ . Noise figure data has input trace loss de-embedded.



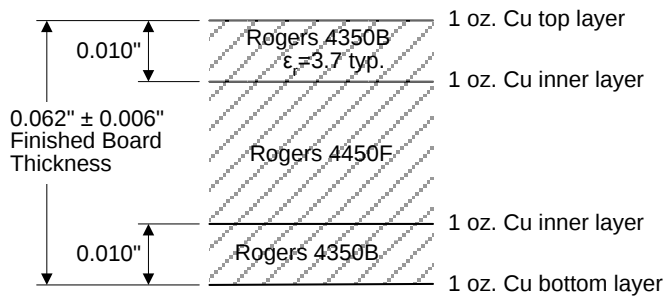
## Pin Configuration and Description



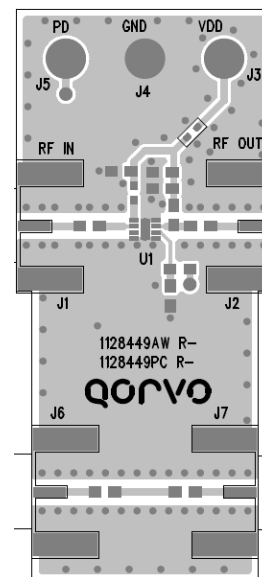
| Pin No.         | Label           | Description                                                                                                                                                            |
|-----------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1, 3, 4, 5, 8   | NC              | No electrical connection. Provide grounded land pads for PCB mounting integrity.                                                                                       |
| 2               | RF In           | RF Input pin. A DC Block is required.                                                                                                                                  |
| 6               | Shut Down       | A high voltage(>1.17V) turns off the device. If the pin is pulled to ground or driven with a voltage less than 0.63V, then the device will operate under LNA ON state. |
| 7               | RF Out / DCBias | RF Output pin. DC bias will also need to be injected through an RF bias choke/inductor for operation.                                                                  |
| Backside Paddle | RF/DC GND       | RF/DC ground. Use recommended via pattern to minimize inductance and thermal resistance; see PCB Mounting Pattern for suggested footprint.                             |

## Evaluation Board PCB Information

### Qorvo PCB 1128449 Material and Stack-up



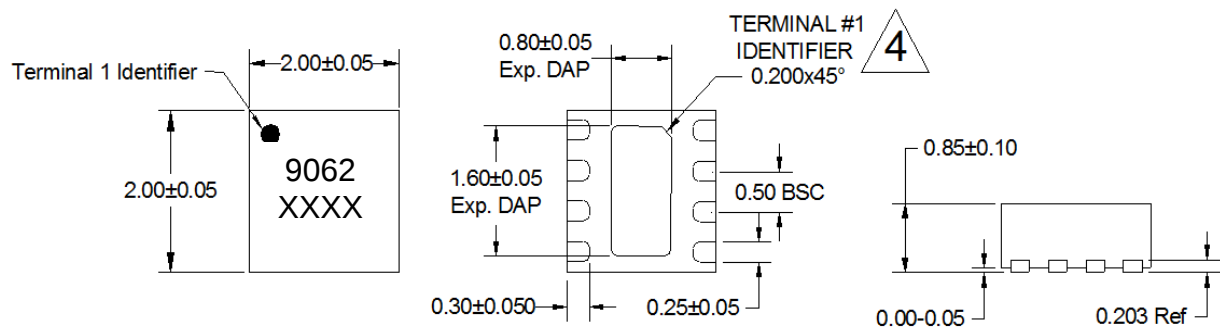
50 ohm line dimensions: width = 0.020", spacing = 0.032"



## Mechanical Information

### Package Marking and Dimensions

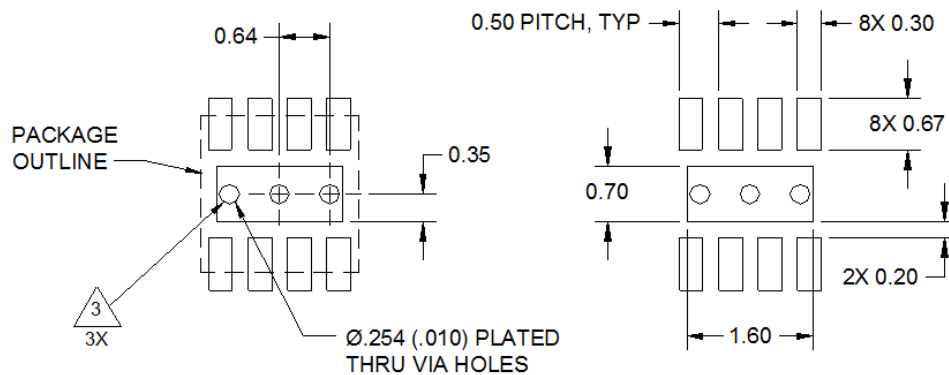
Marking: Part number – 9062  
Lot code – XXXX



#### Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Except where noted, this part outline conforms to JEDEC standard MO-220, Issue E (Variation VGGC) for thermally enhanced plastic very thin fine pitch quad flat no lead package (QFN).
3. Dimension and tolerance formats conform to ASME Y14.4M-1994.
4. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

### PCB Mounting Pattern



#### Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Vias are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation. We recommend a  $0.35$  mm ( $\#80/.0135$ ") diameter bit for drilling via holes and a final plated thru diameter of  $0.25$  mm ( $0.10$ ").
4. Ensure good package backside paddle solder attach for reliable operation and best electrical performance.

## Product Compliance Information

### ESD Sensitivity Ratings



Caution! ESD-Sensitive Device

ESD Rating: Class 1C  
Value:  $\geq 1000V$  to  $< 2000V$   
Test: Human Body Model (HBM)  
Standard: JEDEC Standard JESD22-A114

ESD Rating: Class C3  
Value:  $\geq 1000V$   
Test: Charged Device Model (CDM)  
Standard: JEDEC Standard JESD22-C101

### MSL Rating

MSL Rating: Level 1  
Test:  $260^{\circ}C$  convection reflow  
Standard: JEDEC Standard IPC/JEDEC J-STD-020

### Solderability

Compatible with both lead-free ( $260^{\circ}C$  max. reflow temperature) and tin/lead ( $245^{\circ}C$  max. reflow temperature) soldering processes.

Contact plating: NiPdAu

### RoHS Compliance

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ( $C_{15}H_{12}Br_4O_2$ ) Free
- PFOS Free
- SVHC Free

## Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

Web: [www.triquint.com](http://www.triquint.com) Tel: 877-800-8584  
Email: [customer.support@qorvo.com](mailto:customer.support@qorvo.com)

For information about the merger of RFMD and TriQuint as Qorvo:

Web: [www.qorvo.com](http://www.qorvo.com)

For technical questions and application information:

Email: [sjcapapplications.engineering@qorvo.com](mailto:sjcapapplications.engineering@qorvo.com)

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- Подбор аналогов;
- Консультации по применению компонента;
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- Защита от снятия компонента с производства.



#### Как с нами связаться

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