

TQL9093 – 3.3-4.2GHz Reference Design

Product Overview

The TQL9093 is a flat-gain, high-linearity, ultra-low noise amplifier in a small 2 x 2 mm surface-mount package. The LNA provides a gain flatness of 2 dB (peak-to-peak) over a wide bandwidth from 1.5 to 4 GHz. At 2.6 GHz, the amplifier typically provides 20 dB gain, +41.5 dBm OIP3 at a 120 mA bias setting, and 0.6 dB noise figure. The LNA can be biased from a single positive supply ranging from 3.3 to 5 volts. The device is housed in a green/RoHS-compliant industry-standard 2x2 mm package.

The TQL9093 is internally matched using a highperformance E-pHEMT process and only requires five external components for operation from a single positive supply: an external RF choke and blocking/bypass capacitors and a bias resistor going to pin 1. This LNA integrates a shut-down biasing capability to allow for operation in TDD applications.

The TQL9093 is optimized for linear performance across the 1.5 to 4 GHz frequency band. It also can operate down to 600 MHz.

Referenced Documents

The reference documents below take precedence over the contents of this application note and should always be consulted for the latest information.

TQL9093 Data Sheet.

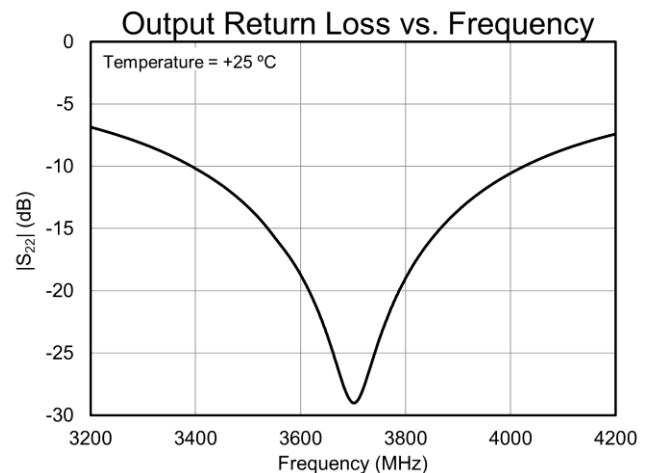
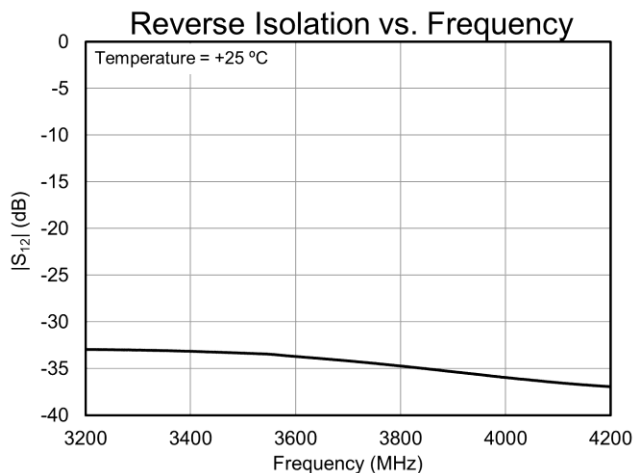
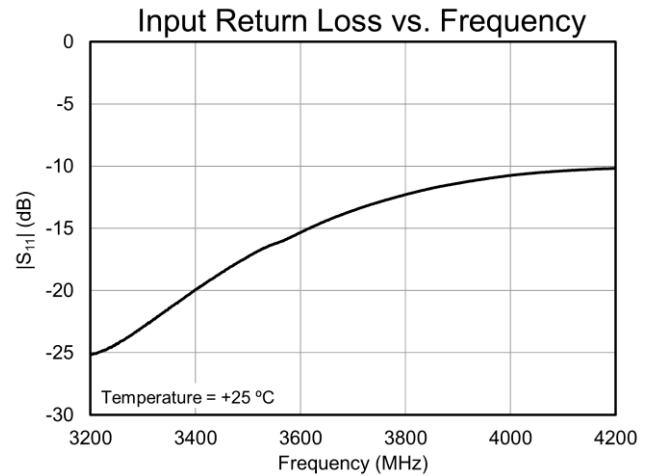
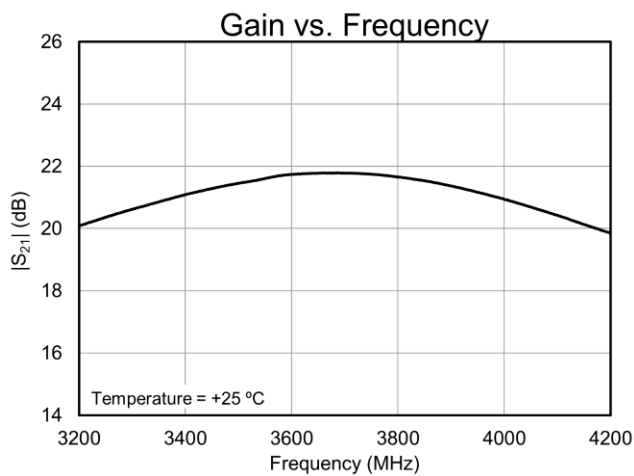
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Application Electrical Performance

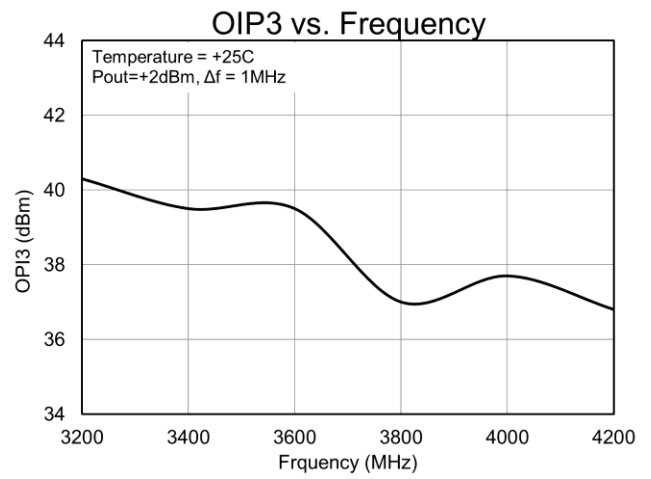
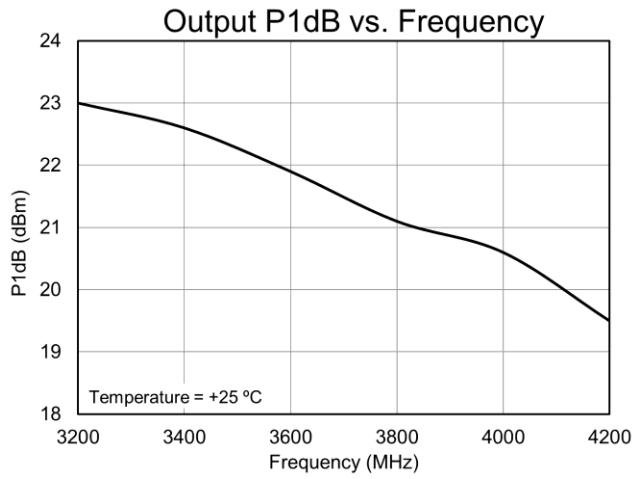
Qorvo Field and Factory Applications Engineers are available to provide technical assistance for determining appropriate matching networks for a particular application.

| Parameter | Conditions | Typical Value | | | Units |
|---------------------------------|----------------------------|---------------|------|------|-------|
| Frequency | | 3200 | 3600 | 4200 | MHz |
| Gain | | 20.1 | 21.7 | 19.9 | dB |
| Input Return Loss | | 25.1 | 15.3 | 10.2 | dB |
| Output Return Loss | | 6.9 | 18.9 | 7.5 | dB |
| Output P1dB | | 23.0 | 21.9 | 19.5 | dBm |
| OIP3 | Pout=+2 dBm/tone, Δf=1 MHz | 40.3 | 39.5 | 36.8 | dBm |
| Device Current, I _{DD} | | 120 | | | mA |

Test conditions unless otherwise noted: VDD = +5 V, IDD = 120 mA (typ.), Temp = +25°C, 50 Ω system.



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Evaluation Board – Bill of Material

| Reference Des. | Value | Description | Manuf. | Part Number |
|----------------|---------------|---------------------------------------|---------|-------------|
| n/a | n/a | Printed Circuit Board | Qorvo | |
| U1 | n/a | AMP, Ultra-Low Noise, Flat Gain LNA | Qorvo | TQL9093 |
| R4 | 3 K Ω | RES, 3 K, 5%, 1/16W, 0402 | Various | |
| R1 | 20 K Ω | RES, 20 K, 5%, 1/16W, 0402 | Various | |
| R2, R3 | 0 Ω | RES, 0 Ω , 5%, 1/16W, 0402 | Various | |
| L1 | 12 nH | IND, 12 nH, 5%, 0603 | Various | |
| L2 | 1.2 nH | IND, 0402, ± 0.1 nH, W/W | Various | |
| C1 | 22 pF | CAP, 0402, ± 0.1 pF, 50V, HI-Q | Various | |
| C4 | 1.0 μ F | CAP, 1.0 μ F, 10%, 10V, X5R, 0402 | Various | |
| C5, C6 | 100 pF | CAP, 100 pF, 5%, 50V, NPO/C9G, 0402 | Various | |
| C2 | 1.4 pF | CAP, 0402, ± 0.1 pF, 50V, HI-Q | Various | |
| C3 | 1000 pF | CAP, 1000 pF, 0402 | Various | |

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Additional Information

For information on ESD, Soldering Profiles, Packaging Standards, Handling and Assembly, please contact Qorvo for general guidelines.

Contact Information

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

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