

TQL9093 – 3.5GHz 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.

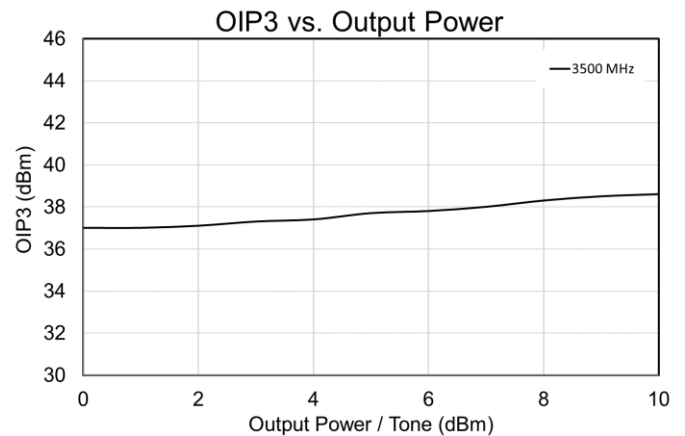
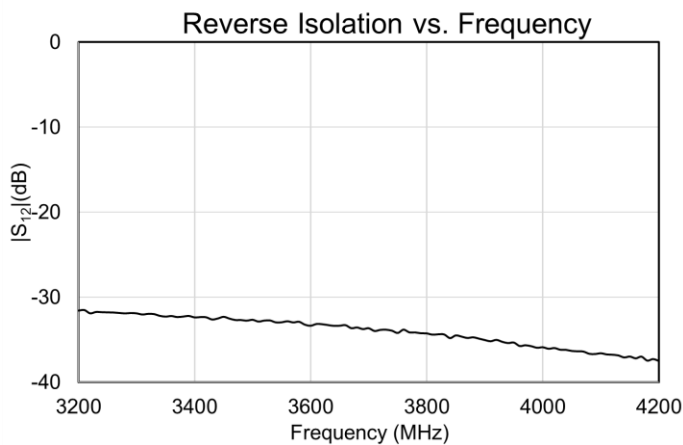
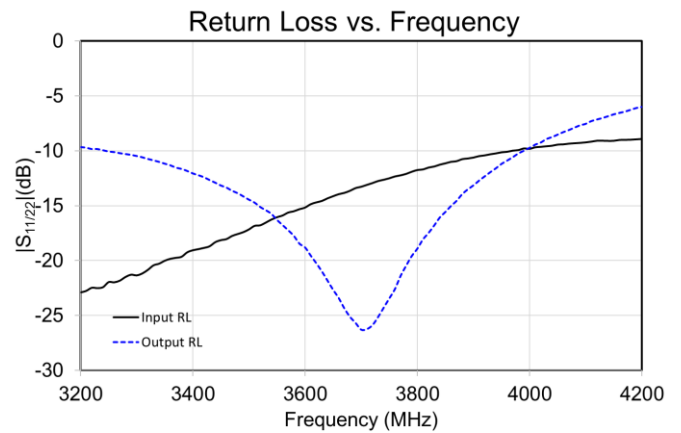
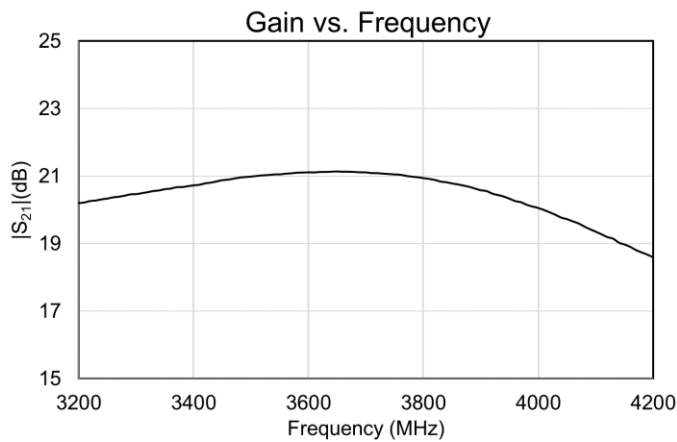
APPLICATION NOTE: TQL9093 – 3.5GHz Reference Design

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		3500	MHz
Gain		21.0	dB
Input Return Loss		17.1	dB
Output Return Loss		14.4	dB
Output P1dB		21.3	dBm
OIP3	Pout=+5 dBm/tone, Δf=1 MHz	37.7	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.



APPLICATION NOTE: TQL9093 – 3.5GHz Reference Design

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	
C4	1.0 μ F	CAP, 1.0 μ F, 10%, 10V, X5R, 0402	Various	
C1, C5, C6	100 pF	CAP, 100 pF, 5%, 50V, NPO/C9G, 0402	Various	
C2	12 pF	CAP, 0402, \pm 0.1pF, 50V, HI-Q	Various	
C3	1000 pF	CAP, 1000 pF, 0402	Various	
C8	0.6 pF	CAP, 0402, \pm 0.1pF, 50V, HI-Q	Various	

APPLICATION NOTE: TQL9093 – 3.5GHz Reference Design

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:

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

Important Notice

The information contained in this Data Sheet and any associated documents (“Data Sheet Information”) is believed to be reliable; however, Qorvo makes no warranties regarding the Data Sheet Information and assumes no responsibility or liability whatsoever for the use of said information. All Data Sheet Information is subject to change without notice. Customers should obtain and verify the latest relevant Data Sheet Information before placing orders for Qorvo® products. Data Sheet Information or the use thereof does not grant, explicitly, implicitly or otherwise any rights or licenses to any third party with respect to patents or any other intellectual property whether with regard to such Data Sheet Information itself or anything described by such information.

DATA SHEET INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Without limiting the generality of the foregoing, Qorvo® products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death. Applications described in the Data Sheet Information are for illustrative purposes only. Customers are responsible for validating that a particular product described in the Data Sheet Information is suitable for use in a particular application.

© 2026 Qorvo US, Inc. All rights reserved. This document is subject to copyright laws in various jurisdictions worldwide and may not be reproduced or distributed, in whole or in part, without the express written consent of Qorvo US, Inc. | QORVO® is a registered trademark of Qorvo US, Inc.