

LMV225/LMV228 LLP Evaluation Board

National Semiconductor
Application Note 1817
Gerrit de Wagt
March 26, 2008



General Description

This board can be used to evaluate National Semiconductor's LMV225/LMV228 RF detectors. These logarithmic power detectors are intended for use in CDMA and WCDMA applications. They have a 30 dB dynamic range and an RF frequency range from 450 MHz to 2 GHz. The LMV228 is designed to be used in combination with a directional coupler, while the LMV225 detector is especially suited for power measurements via a high-resistive tap as well as directional coupler. The LMV225/LMV228 have an integrated filter for low-ripple average power detection of CDMA signals. Additional filtering can be applied using a single external capacitor.

Basic Operation

The LMV225/LMV228 provide an accurate temperature and supply compensated DC output voltage that relates linearly to the applied RF input power in dBm. The single supply, ranging from 2.7V to 5.5V, can be applied through connectors P₄ and P₅. The signal applied to connector P₂ puts the detector in an active or a shutdown mode. The detector is active for Enable = HI, otherwise it is in a low power consumption shutdown mode. The RF signal is applied through connector P₁, while the output voltage is measured through connector P₃.

Schematic

The schematic of the evaluation board is depicted in *Figure 1*.

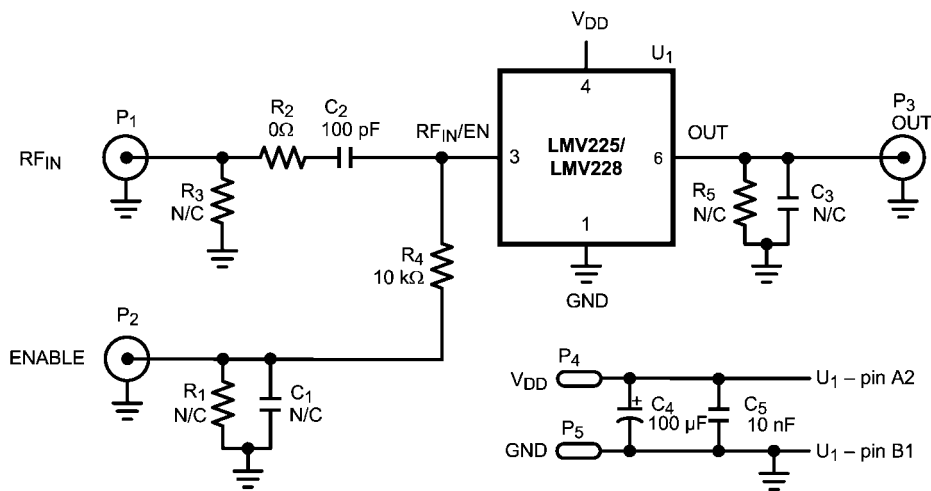


FIGURE 1. Schematic of the Evaluation Board

30057301

Layout

The layout of the evaluation board is depicted in *Figure 2*.

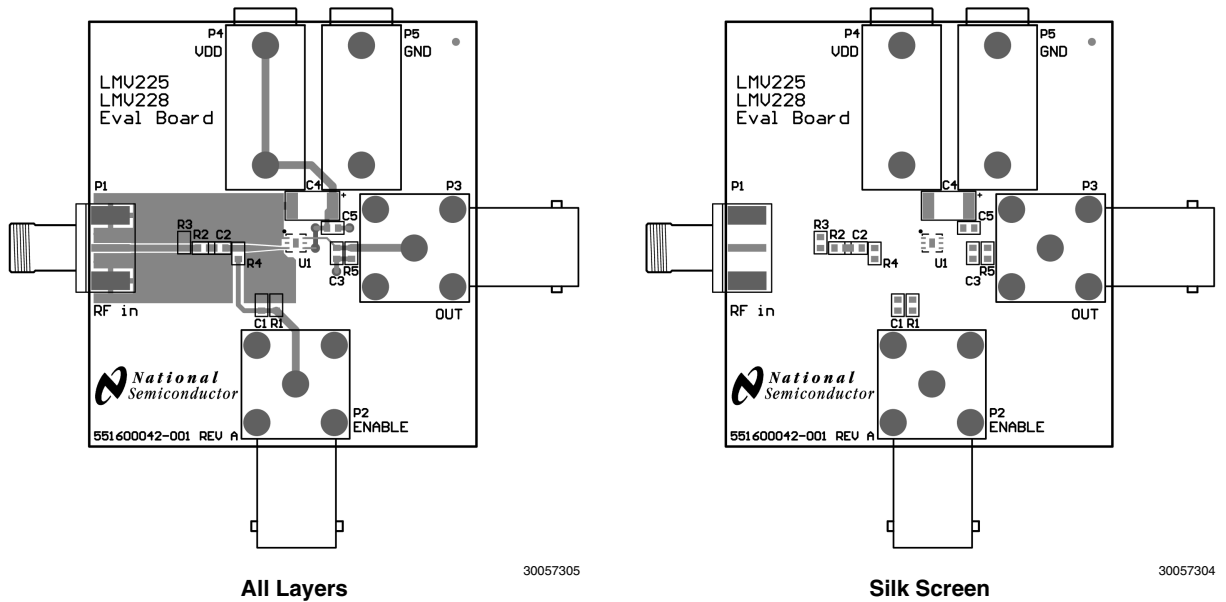


FIGURE 2. Layout of the Evaluation Board

Bill of Materials

The Bill of Material (BOM) of the evaluation board is given in the table below.

Designator	Description	Comment
C2	0603 Capacitor	100 pF
C4	Case_C Capacitor	100 μ F
C5	0603 Capacitor	10 nF
C1, C3	0603 Capacitor	Not Connected
P1	Connector	SMA
P2	Connector	BNC
P3	Connector	BNC
P4	Connector	Banana
P5	Connector	Banana
R2	0603 Resistor	0 Ω
R4	0603 Resistor	10 k Ω
R1, R3, R5	0603 Resistor	Not Connected
U1	LLP	LMV225SD or LMV228SD

Measurement Procedure

The performance of the LMV225/LMV228 can be measured with the setup given in *Figure 3*.

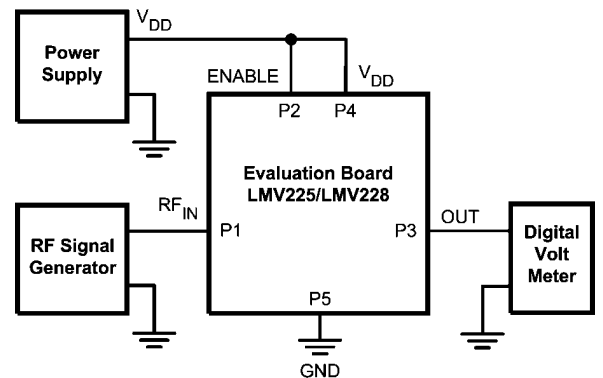


FIGURE 3. Measurement Setup

In this measurement example a supply voltage of 2.7V is applied by the power supply. To put the LMV225/LMV228 in active mode, the Enable (P₂) is connected to 2.7V as well. The resulting DC output voltage is measured with a multimeter connected to P₃. A 900 MHz RF signal is applied by the RF generator to connector P₁, where the RF power is swept from -50 dBm to +20 dBm.

Measurement Results

Figure 4 and *Figure 5* depict the measurement results for the LMV225/LMV228 respectively. For each plot the RF power is swept at 900 MHz for different temperatures. Also the error in dBs with respect to an ideal straight line is plotted (Log conformance).

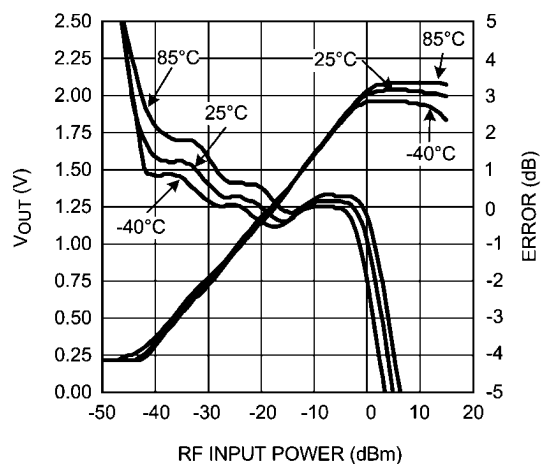


FIGURE 4. LMV225 Output Voltage and Log Conformance vs. RF Input Power at 900 MHz

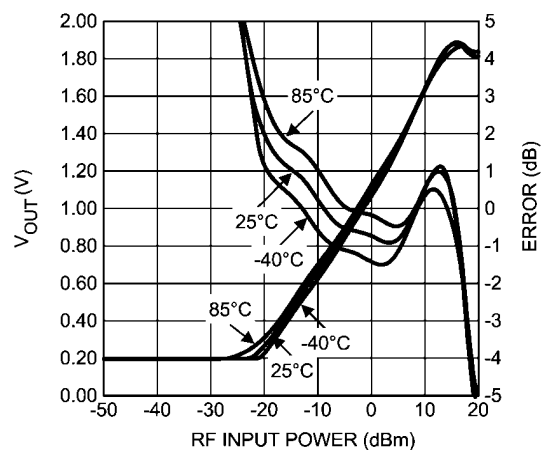


FIGURE 5. LMV228 Output Voltage and Log Conformance vs. RF Input Power at 900 MHz

Notes

For more National Semiconductor product information and proven design tools, visit the following Web sites at:

Products		Design Support	
Amplifiers	www.national.com/amplifiers	WEBENCH	www.national.com/webench
Audio	www.national.com/audio	Analog University	www.national.com/AU
Clock Conditioners	www.national.com/timing	App Notes	www.national.com/appnotes
Data Converters	www.national.com/adc	Distributors	www.national.com/contacts
Displays	www.national.com/displays	Green Compliance	www.national.com/quality/green
Ethernet	www.national.com/ethernet	Packaging	www.national.com/packaging
Interface	www.national.com/interface	Quality and Reliability	www.national.com/quality
LVDS	www.national.com/lvds	Reference Designs	www.national.com/refdesigns
Power Management	www.national.com/power	Feedback	www.national.com/feedback
Switching Regulators	www.national.com/switchers		
LDOs	www.national.com/ldo		
LED Lighting	www.national.com/led		
PowerWise	www.national.com/powerwise		
Serial Digital Interface (SDI)	www.national.com/sdi		
Temperature Sensors	www.national.com/tempsensors		
Wireless (PLL/VCO)	www.national.com/wireless		

THE CONTENTS OF THIS DOCUMENT ARE PROVIDED IN CONNECTION WITH NATIONAL SEMICONDUCTOR CORPORATION ("NATIONAL") PRODUCTS. NATIONAL MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE ACCURACY OR COMPLETENESS OF THE CONTENTS OF THIS PUBLICATION AND RESERVES THE RIGHT TO MAKE CHANGES TO SPECIFICATIONS AND PRODUCT DESCRIPTIONS AT ANY TIME WITHOUT NOTICE. NO LICENSE, WHETHER EXPRESS, IMPLIED, ARISING BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT.

TESTING AND OTHER QUALITY CONTROLS ARE USED TO THE EXTENT NATIONAL DEEMS NECESSARY TO SUPPORT NATIONAL'S PRODUCT WARRANTY. EXCEPT WHERE MANDATED BY GOVERNMENT REQUIREMENTS, TESTING OF ALL PARAMETERS OF EACH PRODUCT IS NOT NECESSARILY PERFORMED. NATIONAL ASSUMES NO LIABILITY FOR APPLICATIONS ASSISTANCE OR BUYER PRODUCT DESIGN. BUYERS ARE RESPONSIBLE FOR THEIR PRODUCTS AND APPLICATIONS USING NATIONAL COMPONENTS. PRIOR TO USING OR DISTRIBUTING ANY PRODUCTS THAT INCLUDE NATIONAL COMPONENTS, BUYERS SHOULD PROVIDE ADEQUATE DESIGN, TESTING AND OPERATING SAFEGUARDS.

EXCEPT AS PROVIDED IN NATIONAL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, NATIONAL ASSUMES NO LIABILITY WHATSOEVER, AND NATIONAL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY RELATING TO THE SALE AND/OR USE OF NATIONAL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS PRIOR WRITTEN APPROVAL OF THE CHIEF EXECUTIVE OFFICER AND GENERAL COUNSEL OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

Life support devices or systems are devices which (a) are intended for surgical implant into the body, or (b) support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in a significant injury to the user. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system or to affect its safety or effectiveness.

National Semiconductor and the National Semiconductor logo are registered trademarks of National Semiconductor Corporation. All other brand or product names may be trademarks or registered trademarks of their respective holders.

Copyright© 2008 National Semiconductor Corporation

For the most current product information visit us at www.national.com



**National Semiconductor
Americas Technical
Support Center**
Email:
new.feedback@nsc.com
Tel: 1-800-272-9959

**National Semiconductor Europe
Technical Support Center**
Email: europe.support@nsc.com
German Tel: +49 (0) 180 5010 771
English Tel: +44 (0) 870 850 4288

**National Semiconductor Asia
Pacific Technical Support Center**
Email: ap.support@nsc.com

**National Semiconductor Japan
Technical Support Center**
Email: jpn.feedback@nsc.com