AN-1804 LMV225/LMV228 DSBGA Evaluation Board

1 General Description

This board can be used to evaluate the Texas Instruments LMV225 and 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 and LMV228 have an integrated filter for low-ripple average power detection of CDMA signals. Additional filtering can be applied using a single external capacitor.

2 Basic Operation

The LMV225 and 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 P_4 and P_5. The signal applied to connector P_2 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 P_1, while the output voltage is measured through connector P_3.

2.1 Input

The LMV225 has an RF power detection range from −30 dBm to 0 dBm and is designed for direct use in combination with resistive taps. The LMV228 has a detection range from −15 dBm to 15 dBm and are intended for use in combination with a directional coupler. All three detectors have an input impedance of 50Ω. Details about the configuration can be found in the devices' data sheet.

2.2 Output

The output voltage range is typically 0.2V to 2V and can be scaled down to meet ADC input range requirements (both LMV225 and LMV228). Since the LMV225 and LMV228 have a current controlled output, the voltage range can be adjusted by changing the output resistance. To change this a resistor needs to be placed in R_5. The output impedance of the detector (typical 19.8 kΩ) together with the resistor R_5 translates the current into a voltage. The value of resistor R_5 determines the exact scaling. A value of 19.8 kΩ, for example, divides the output voltage range by half. Besides scaling the output voltage, the output ripple can be reduced by lowpass filtering. This can be realized with capacitor C_3. Further details can be found in the applications information section in the devices' data sheet..

3 Schematic

The schematic of the evaluation board is shown in Figure 1.

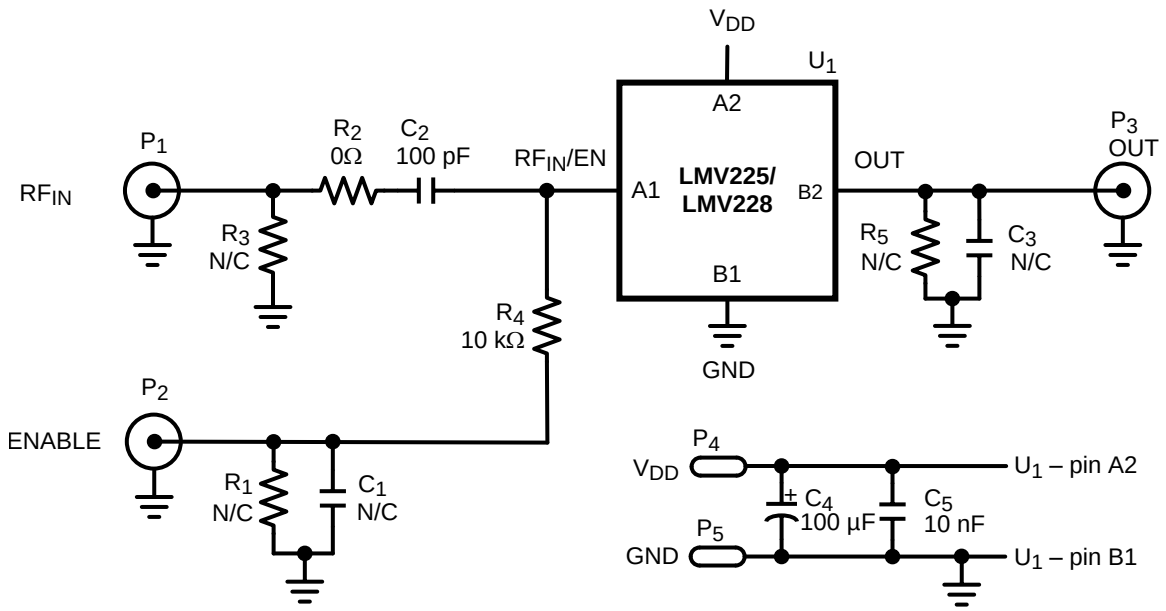


Figure 1. Schematic of the Evaluation Board

4 Bill of Materials

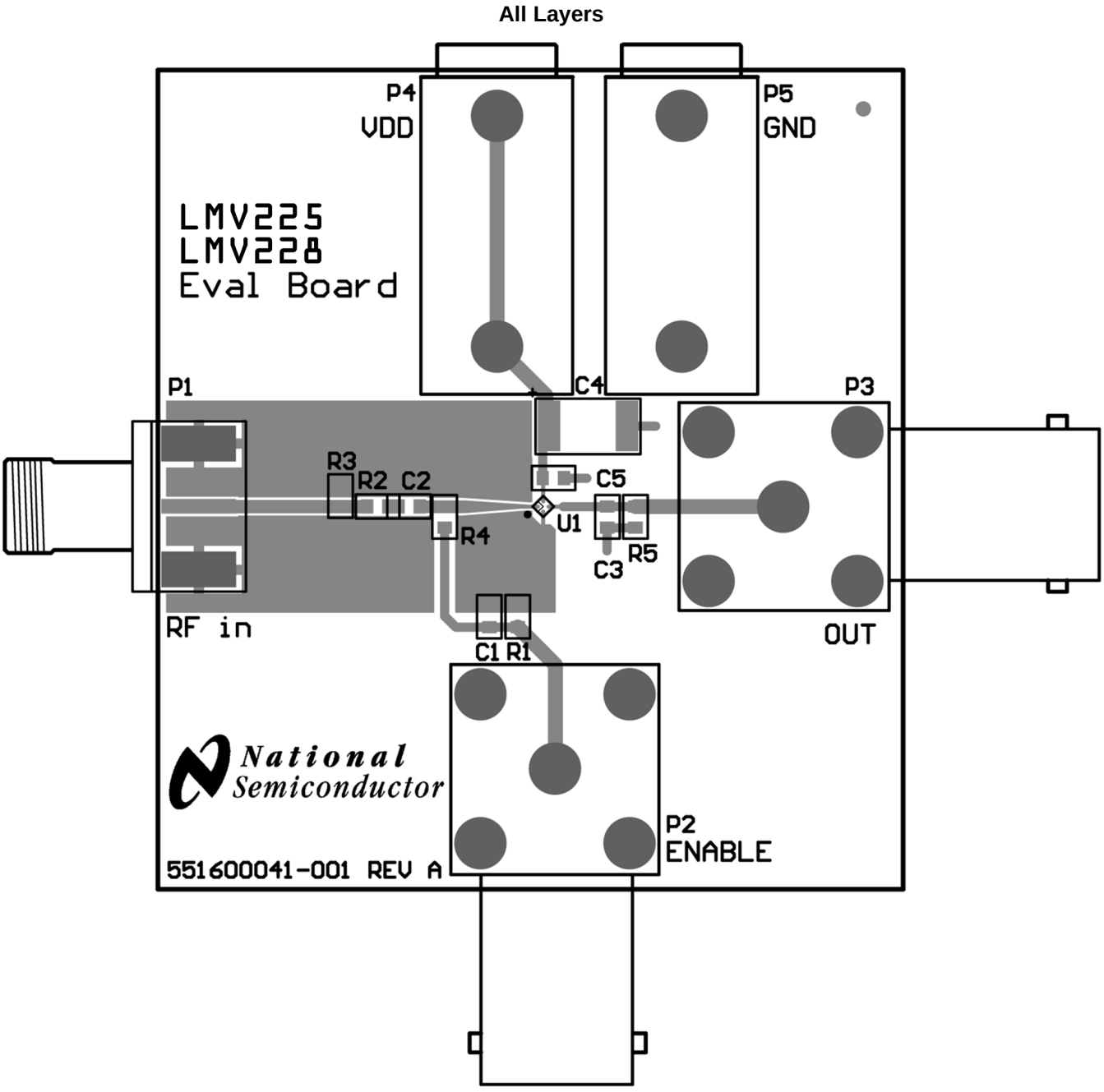
The Bill of Material (BOM) of the evaluation board is listed in Table 1.

Table 1. Bill of Materials of the Evaluation Board

Designator	Description	Comment
C2	0603 Capacitor	100 pF
C4	Case_C Capacitor	100 µF
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	0Ω
R4	0603 Resistor	10 kΩ
R1, R3, R5	0603 Resistor	Not Connected
U1	DSBGA	LMV225 or LMV228

5 Layout

The layout of the evaluation board is shown in Figure 2.



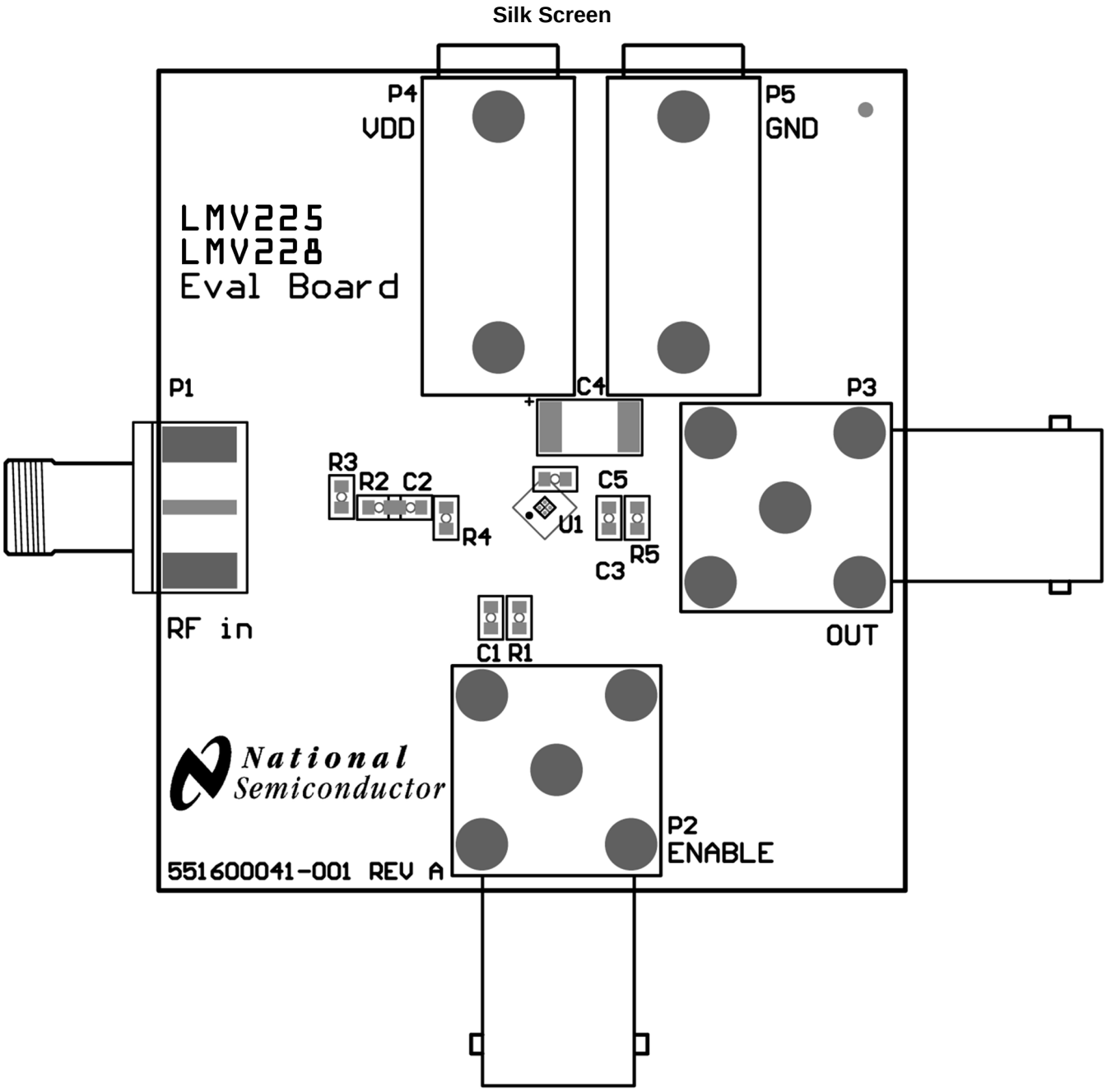


Figure 2. Layout of the Evaluation Board

6 Measurement Procedure

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

In this measurement example a supply voltage of 2.7V is applied by the power supply. To put the LMV225 or LMV228 in active mode, the Enable (P_2) is connected to 2.7V as well. The resulting DC output voltage is measured with a multimeter connected to P_3. A 900 MHz RF signal is applied by the RF generator to connector P_1, where the RF power is swept from −50 dBm to +20 dBm.

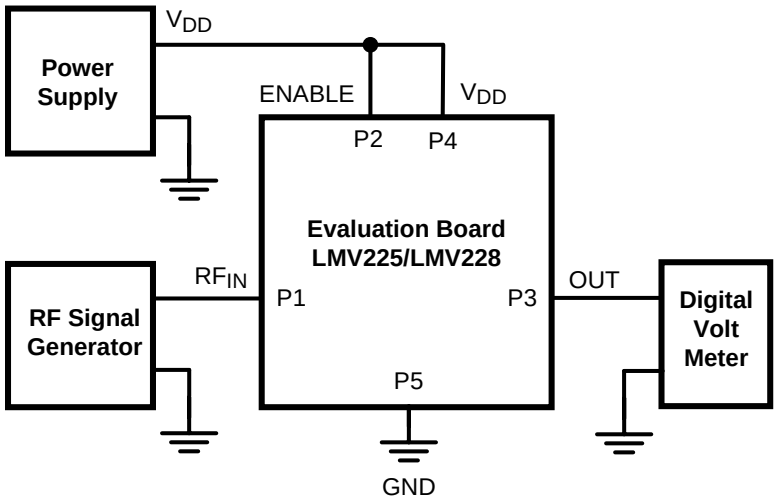


Figure 3. Measurement Setup

7 Measurement Results

Figure 4, and Figure 5 show the measurement results for the LMV225 and 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).

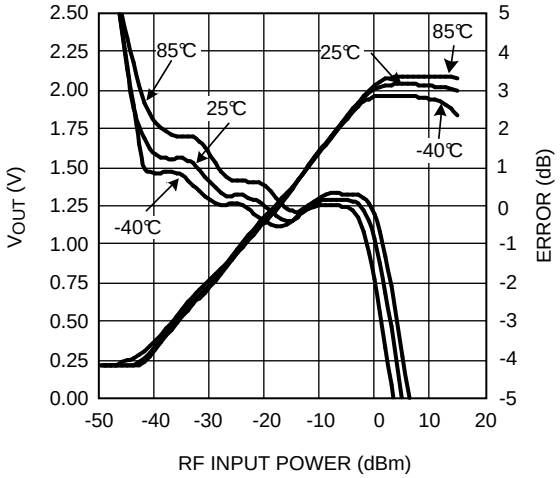


Figure 4. LMV225 Output Voltage and Log Conformance vs. RF Input Power at 900 MHz

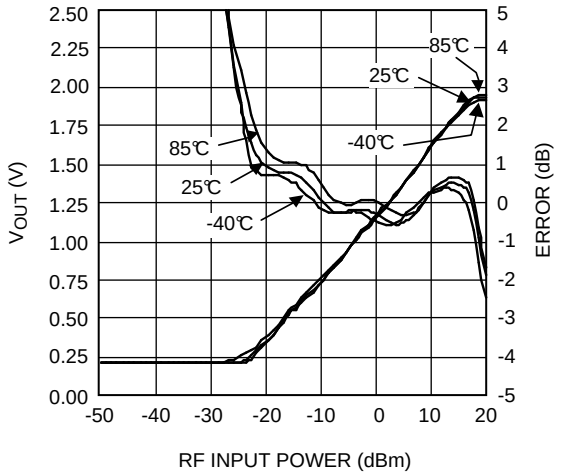


Figure 5. LMV228 Output Voltage and Log Conformance vs. RF Input Power at 900 MHz

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

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Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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Last updated 10/2025