AN-1806 LMV232 Evaluation Board

1 General Description

This board, the LMV232TLEVAL, can be used to evaluate the Texas Instruments LMV232 dual-channel mean square power detector. The LMV232 mean square power detector is particularly suited for accurate power measurement of RF modulated signals that exhibit large peak to average ratios, that is, large variations of the signal envelope. Such noise-like signals are encountered in applications such as CDMA and wideband CDMA cellphones.

2 Basic Operation

The LMV232 power detector provides an accurate power measurement for arbitrary input signals, low and high peak-to-average ratios and crest factors. This is because its operation is not based on peak detection, but on direct determination of the mean square value. The single supply, ranging from 2.5V to 3.3V, can be applied through connectors P_5 and P_6 of the evaluation board. The device has two digital interfaces. The signal connected to P_3 (SD) puts the device in an active mode or a shutdown mode. When SD = HIGH, the device is in shutdown, if SD = LOW the device is active. The signal connected to P_4 (BS) selects the active RF input signal. When BS = HIGH, $RF_{IN}1$ is active (P_1). When BS = LOW, $RF_{IN}2$ is active (P_2). The output voltage is measured through connector P_8. Connector P_7 can be used to monitor the voltage on the FB pin of the LMV232 when a 0Ω resistor is placed in R_2. Further details can be found in the Application Notes section of *LMV232 Dual-Channel Integrated Mean Square Power Detector for CDMA & WCDMA* (SNWS017).

The LMV232 conversion gain and bandwidth can be configured by a resistor and a capacitor. Resistor R_1 sets the conversion gain from RF_{IN} to the output voltage. A higher resistor value will result in a higher conversion gain. The maximum dynamic range is achieved when the resistor value is as high as possible, i.e. the output signal just doesn't clip and the voltage stays within the baseband ADC input range. The filter bandwidth is adjusted by capacitor C_4. The capacitor value should be chosen such that the response time of the device is fast enough and modulation on the RF input signal is not visible at the output (ripple suppression). The -3 dB filter bandwidth of the output filter is determined by the time constant R_1*C_4. Generally a capacitor value of 1.5 nF is a good choice.

3 Schematics

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

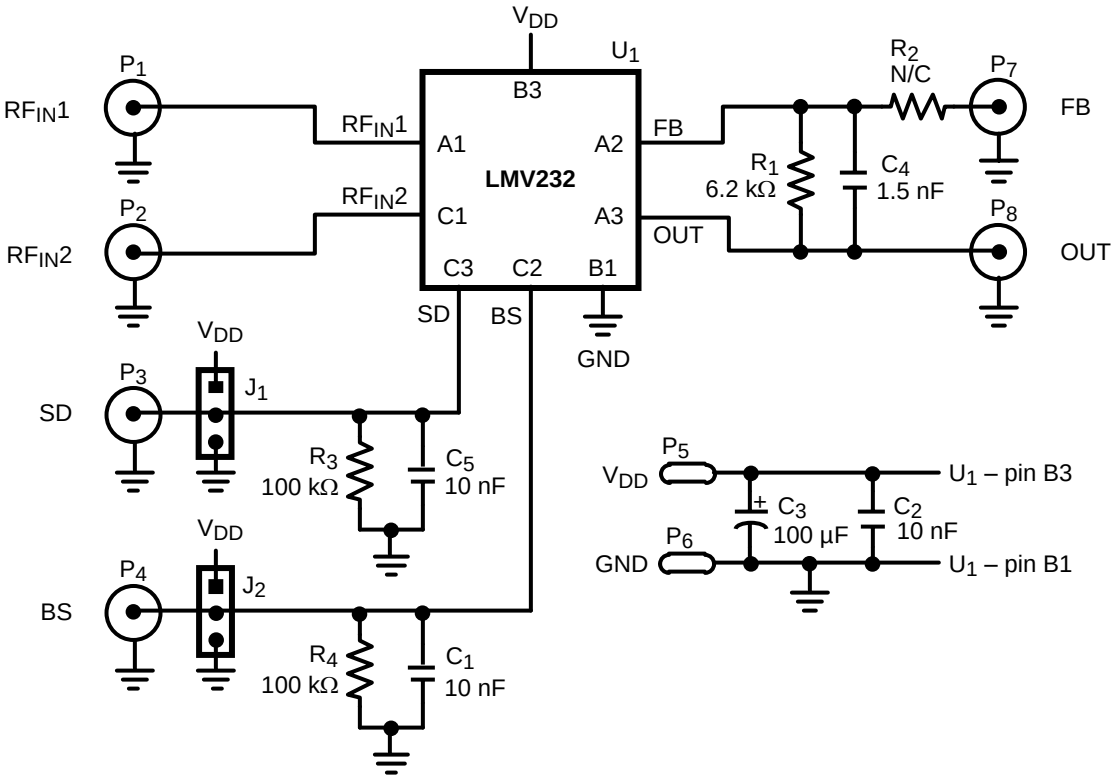


Figure 1. Schematic of the Evaluation Board

4 Bill of Materials

The bill of material (BOM) of the evaluation board is listed in Table 1.

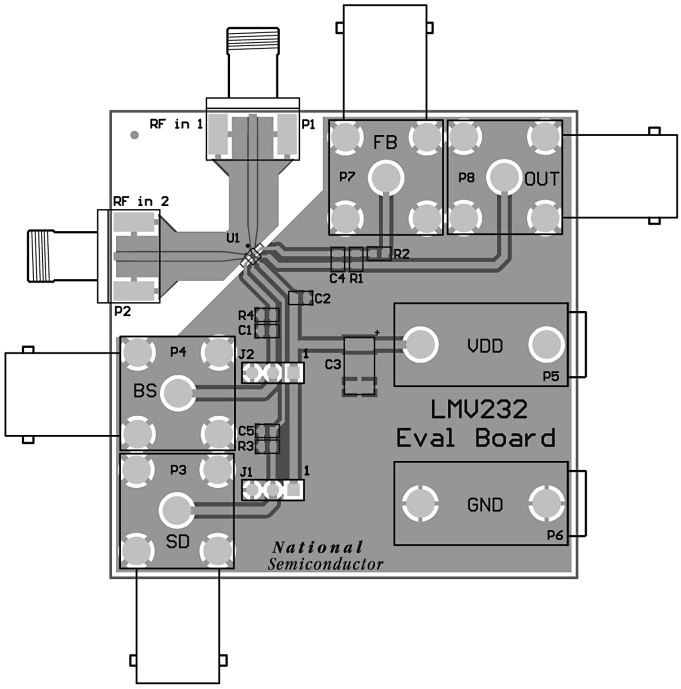
Table 1. Bill of Materials of the Evaluation Board

Designator	Description	Comment
C1, C2, C5	0603 Capacitor	10 nF
C3	Case_C Capacitor	100 µF
C4	0603 Capacitor	1.5 nF
J1, J2	Header 1 × 3	For Jumper
P1, P2	Connector	SMA
P3, P4, P7, P8	Connector	BNC
P5, P6	Connector	Banana
R1	0603 Resistor	6.2 kΩ
R2	0603 Resistor	Not Connected
R3, R4	0603 Resistor	100 kΩ
U1	DSBGA	LMV232

5 Layout

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

All Layers



Silk Screen

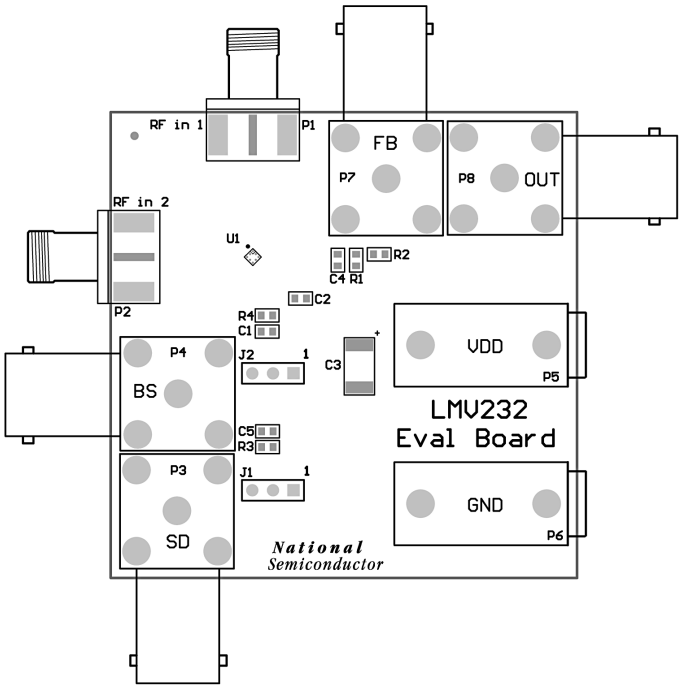


Figure 2. Layout of the Evaluation Board

6 Measurement Procedure

The performance of the LMV232 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. The LMV232 is set in active mode by connecting SD (P_3) to GND, while $RF_{IN}1$ is selected by connecting BS (P_4) to 2.7V. Both $RF_{IN}2$ (P_2) and FB (P_7) can be left unconnected. The resulting DC output voltage is measured with a multimeter connected to OUT (P_8).

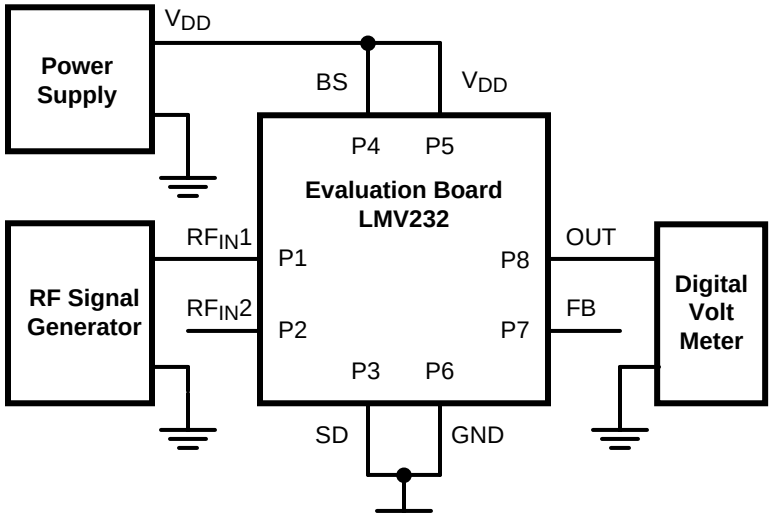


Figure 3. Measurement Setup

7 Measurement Results

Figure 4 and Figure 5 show the measurement results for the LMV232. The power is swept at 900 MHz for different temperatures (Figure 4). The resulting error with respect to an ideal fitted curve is shown in Figure 5.

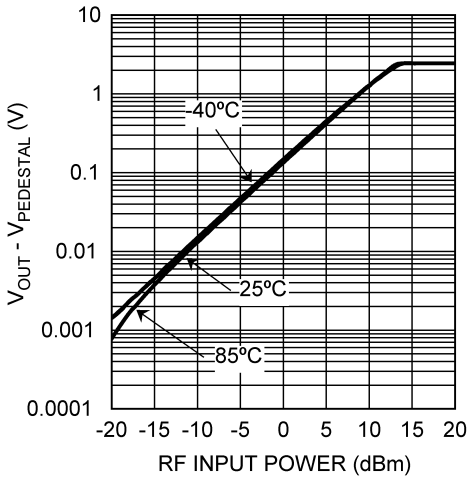


Figure 4. V_{OUT} - $V_{PEDESTAL}$ vs. RF Input Power at 900 MHz

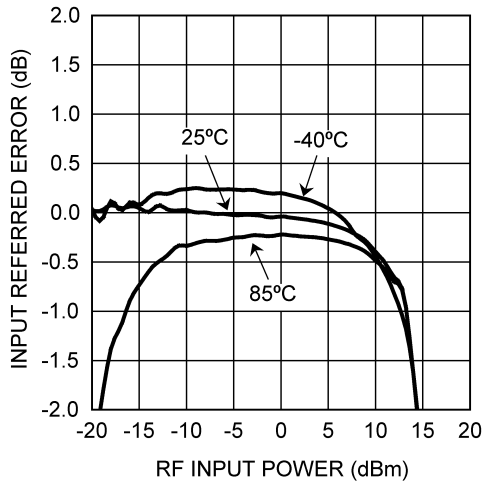


Figure 5. Input Referred Error vs. RF Input Power at 900 MHz

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