AN-2264 LMH2121 Evaluation Board

1 General Description

The LMH2121 is an accurate fast responding power detector/RF envelope detector. Its response between an RF input signal and DC output signal is linear. The typical response time of 165 ns making it suitable for an accurate power setting in handsets during a rise-time of RF transmission slots. It can be used in all popular communication standards 2G/3G/4G/WAP.

The LMH2121 has an input range from –28 dBm to +12 dBm. Over this input range the device has an intrinsic high insensitivity on temperature, supply voltage and loading. The bandwidth of the device is from 100 MHz to 3 GHz, covering 2G/3G/4G/WiFi wireless bands.

As a result of the unique internal architecture, the device shows an extremely low part-to-part variation of the detection curve. This is demonstrated by its low intercept and slope variation as well as a very good linear conformance. Consequently the required characterization and calibration efforts are low.

The device is active for EN = High, otherwise it is in a low power consumption shutdown mode. To save power and enable the possibility for 2 detector outputs in parallel, the output (OUT) is high impedance during shutdown.

The LMH2121 is offered in a tiny 4-bump DSBGA package: 0.866mm x 1.07 mm x 0.6 mm.

Figure 1 shows the LMH2121 Evaluation Board.

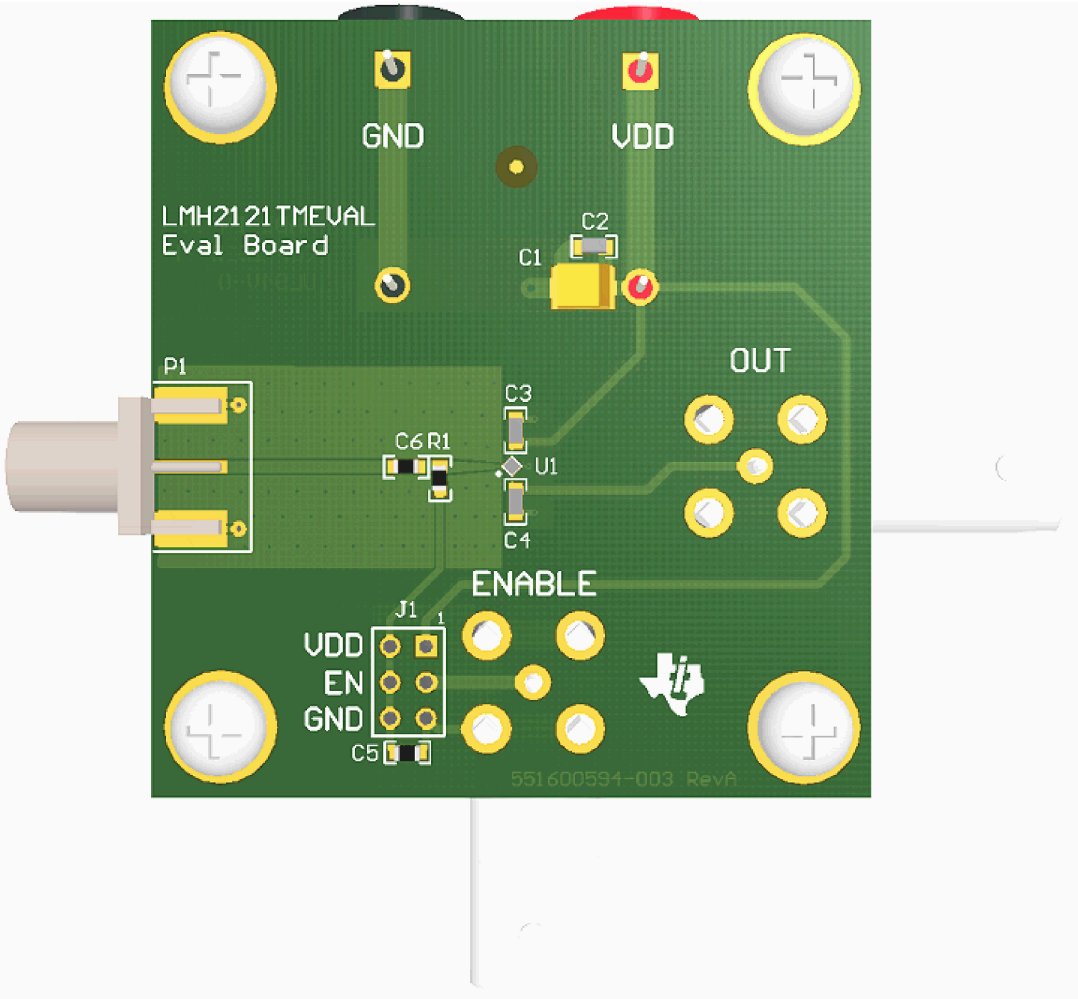

Figure 1. LMH2121 Evaluation Board

2 Basic Operation

The circuit operates with a single supply form 2.6V to 3.3V and has an RF power detection range from −28 dBm to +12 dBm. The board consist of a single LMH2121 along with external components soldered on a printed circuit board (PCB_. External supply voltages and input signals can be applied to the on-board connectors. The supply voltage is applied with connectors P2 (VDD) and P3 (GND). The RF input signal is applied by SMA connector P1. This RF signal is applied through an RF generator and is connected with a 50Ω SMA cable. The detector output can be measured via BNC connector P4.

3 Configuration

The LMH2121 evaluation board can be configured via jumper settings. The device is active when EN = High. This can be accomplished by setting the jumper J1 to VDD or by using external control on P5 by setting the jumper J1 to EN.

An overview of the various jumper positions on the board is given in Figure 2. The settings of the jumper and its function is listed in Table 1.

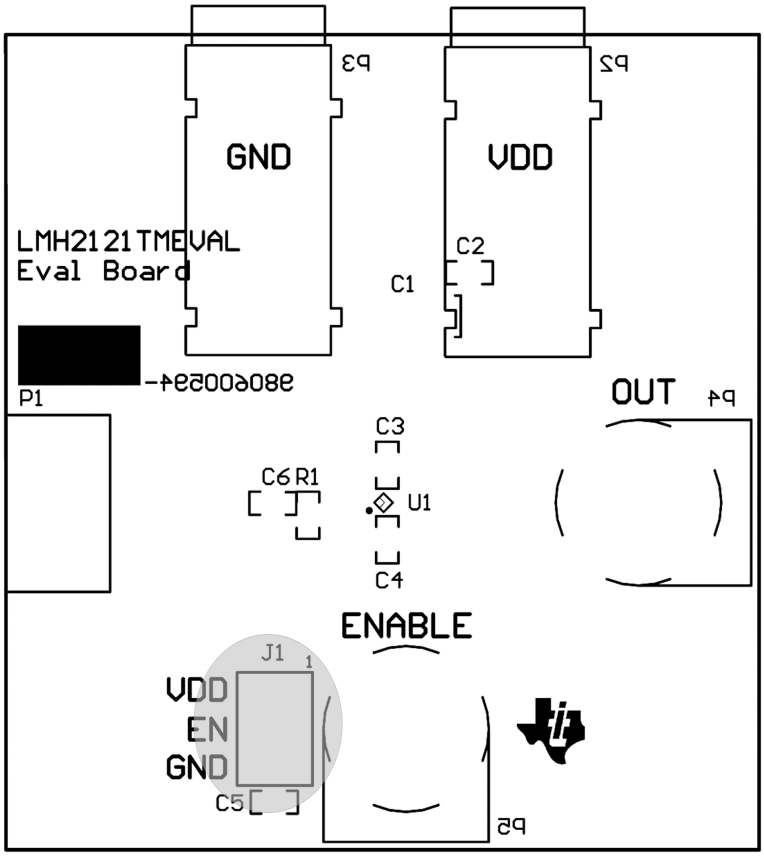

Figure 2. Jumper Positions

Table 1. Jumper and Header Overview [(1)]

Jumper	Function	Jumper Position	Description
J1	Enable	**1–2**	**Active, Connects Enable Pin to VDD**
		3–4	External Control, Connects Enable Pin to Enable P5
		5-6	Shutdown, Connects Enable Pin to GND

(1) Jumper settings refer to the factory default configuration.

4 Measurement Setup

The performance of the LMH2121 can be measured with the setup shown in Figure 3.

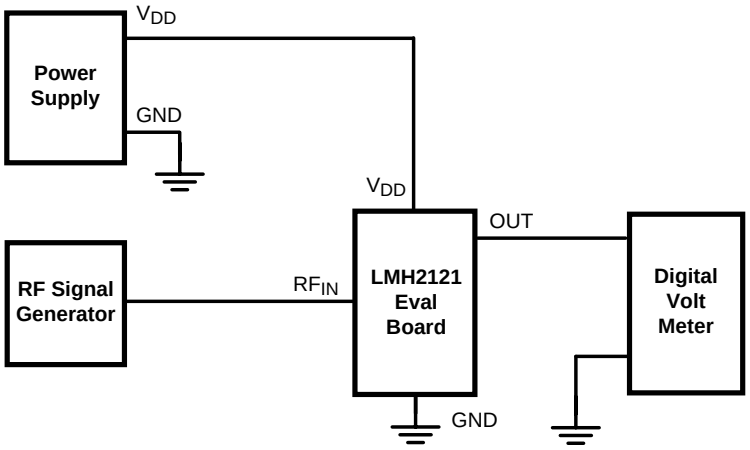

Figure 3. Measurement Setup

An external power supply provides a voltage of 2.7V to 3.3V to the evaluation board. An accurate and stable RF signal generator is used to produce the test signal. Use of low loss cables is recommended to ensure reliable measurement data. The detected output voltage can be measured with a digital voltage meter (DVM).

Figure 5-a depicts the output voltage versus frequency for various power levels on RF_{IN}. The frequency range is from 10 MHz to 10 GHz. Figure 5-b depicts the output voltage versus RF input power for various frequencies.

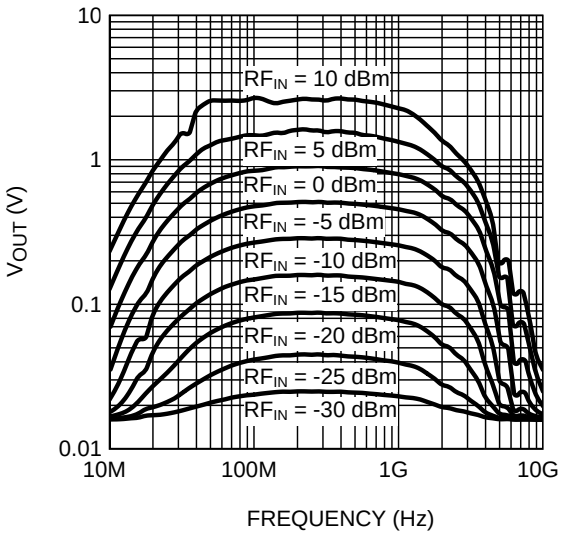

Figure 4. (a) Output Voltage vs. Freqency

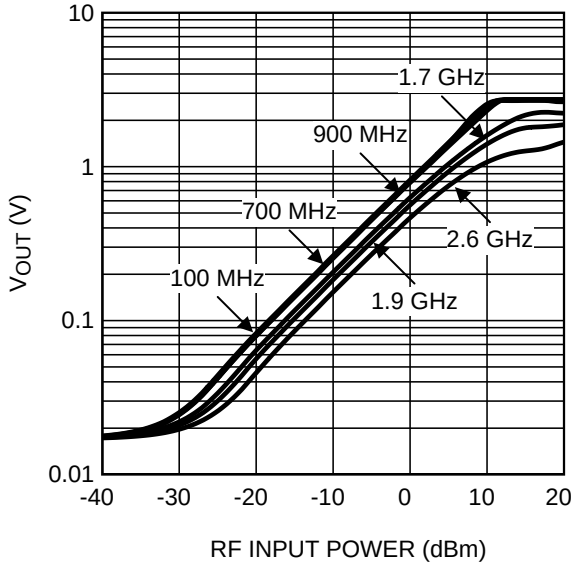

Figure 5. (b) Output Voltage vs. RF Input Power

Figure 6. Output Voltage vs. Freqency and Output Voltage vs. RF Input Power

5 Schematic

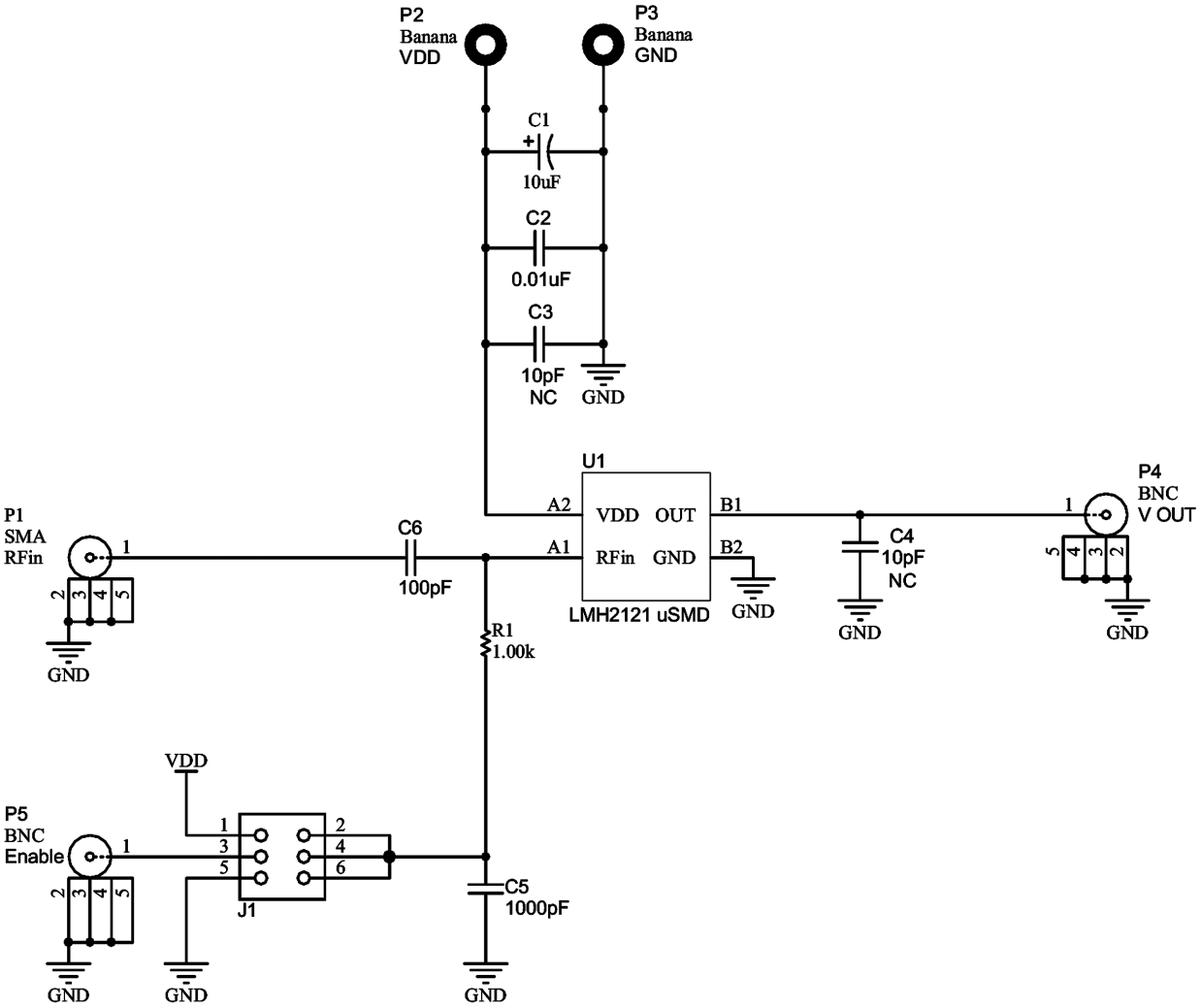

Figure 7. Evaluation Board Schematic

6 Bill of Material

The Bill of Material (BOM) of the evaluation board is given in Table 2.

Table 2. Bill of Material

Designator	Description	Comment
C1	Capacitor	10 µF
C2	0603 Capacitor	10 nF
C3, C4	0603 Capacitor	10 pF
C5	0603 Capacitor	1 nF
C6	0603 Capacitor	100 pF
J1	Header	2x3
P1	Connector	SMA
P2, P3	Connector	Banana
P4, P5	Connector	BNC
R1	0603 Resisitor	1 kΩ
U1	DSBGA	LMH2121

7 Board Layout

As with any other RF device, careful attention must be paid to the board layout. If the board layout isn't properly designed, performance might be less than can be expected for the application. The LMH2121 is designed to be used in RF applications, having a characteristic impedance of 50Ω. To achieve this impedance, the input of the LMH2121 needs to be connected via a 50Ω transmission line. Transmission lines can be created on PCBs using microstrip or (grounded) coplanar waveguide (GCPW) configurations. In order to minimize injection of RF interference into the LMH2121 through the supply lines, the PCB traces for VDD and GND should be minimized for RF signals. This can be done by placing a small decoupling capacitor between the VDD and GND. It should be placed as close as possible to the VDD and GND pins of the LMH2121.

Figure 8 shows the component locations of the LMH2121 evaluation board, and Figure 9 shows the board layout of the LMH2121 evaluation board.

8 LMH2121 Evaluation Board

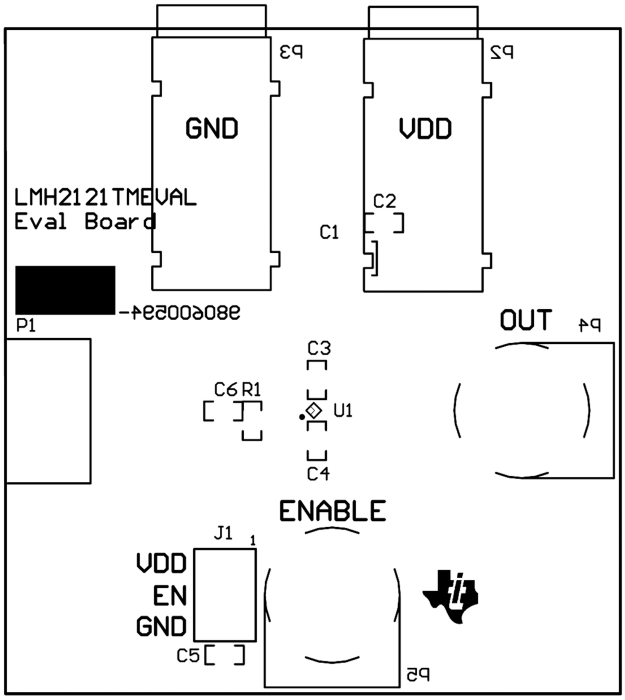

Figure 8. Component Locations of Evaluation Board

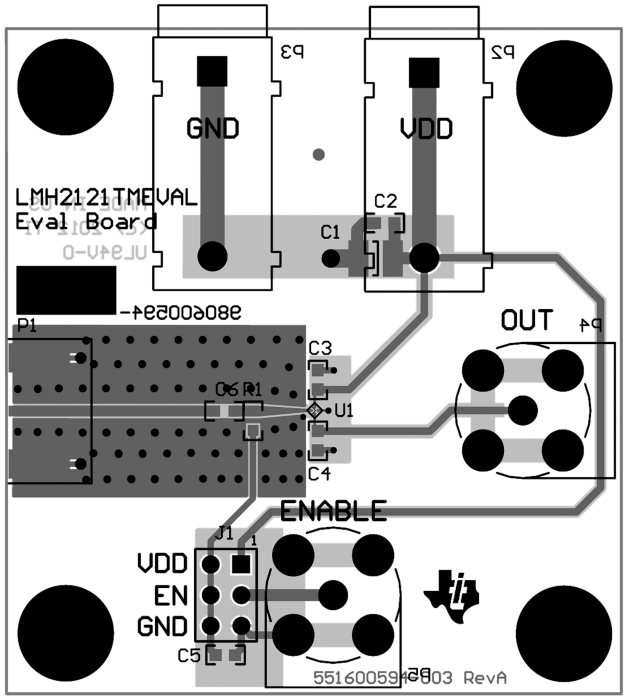

Figure 9. Board Layout of Evaluation Board

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