

Using the LM3281 Evaluation Board

User's Guide



Literature Number: SNVU457
November 2014

LM3281 Evaluation Board

1 Introduction

The LM3281 evaluation board is a working demonstration of high efficiency low-noise miniature DC-DC converter optimized for powering noise sensitive wireless connectivity chipsets and RF Front End Modules (FEMs) from a single Lithium-Ion cell. The LM3281 is ideal for “always on” applications with very low unloaded quiescent current of 16 μA (typ). The LM3281 steps down an input voltage from 3 V to 5.5 V to a fixed output voltage of 3.3 V. Five different modes of operation are used to optimize efficiency and minimize battery drain. In Pulse Width Modulation (PWM) mode, the device operates at a fixed frequency of 6 MHz which minimizes RF interference when driving medium-to-heavy loads. At light load, the device automatically enters into ECO mode with reduced quiescent current. In low-battery condition, a bypass mode circumvents the PWM DC-DC converter and connects the battery directly to the load with a very low drop out across LM3281. At light loads the device can also be forced into PWM mode resulting in very low output voltage ripple. Shutdown mode turns the device off and reduces battery consumption to 0.1 μA (typ.).

For more details and electrical characteristics of the converter operation, please refer to the LM3281 device data sheet ([SNVSA38](#)). Please see Layout section of the data sheet for guidelines on key considerations when implementing LM3281 in a system solution.

2 Operating Conditions

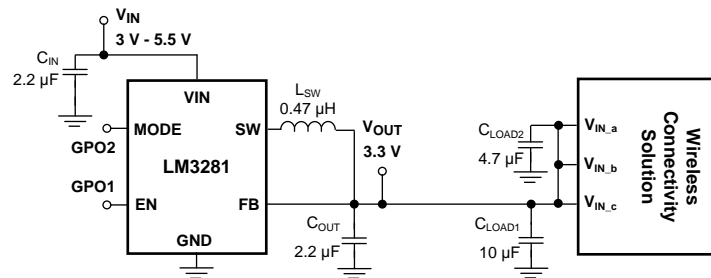
The board will operate under the following conditions:

- V_{IN} : 3 V \leq V_{IN} \leq 5.5 V
- V_{OUT}
 - In regulation: 3.3 V
 - In bypass: V_{IN} – (voltage drop across PFET_{RDSON} + DCR of L_{SW} in parallel with BPFET_{RDSON})
- I_{OUT} : up to 1200 mA
- Operating ambient temperature range: –30°C to 85°C

3 Package

The LM3281 is available in an 6-bump lead-free DSBGA package.

4 Typical Application Circuit



5 Evaluation Board

Photo of LM3281 Evaluation Board shows the LM3281EVM with major connectors and jumpers identified.

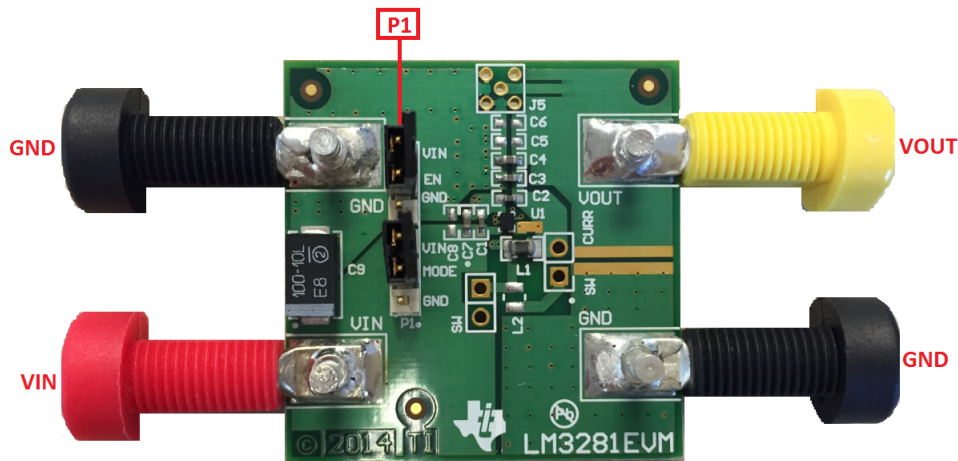


Photo of LM3281 Evaluation Board

5.1 Connections and Jumper Positions

1. Connect input power supply to the RED (VIN) and BLACK (GND) banana jacks.
2. Connect the load to the YELLOW (VOUT) and BLACK (GND) banana jacks.

There is a 6x1 header labeled P1 on the board that should be thought of as two separate 3x1 headers.

First half of header P1 (pins 1, 2 and 3) control whether LM3281 operates in automatic ECO/PWM mode or in forced PWM mode. When a jumper is placed over pins 1-2, forced PWM mode is enabled. When a jumper is placed on pins 2-3, automatic ECO/PWM mode is active. Please refer to LM3281 data sheet ([SNVSA38](#)) for further details of these operating modes.

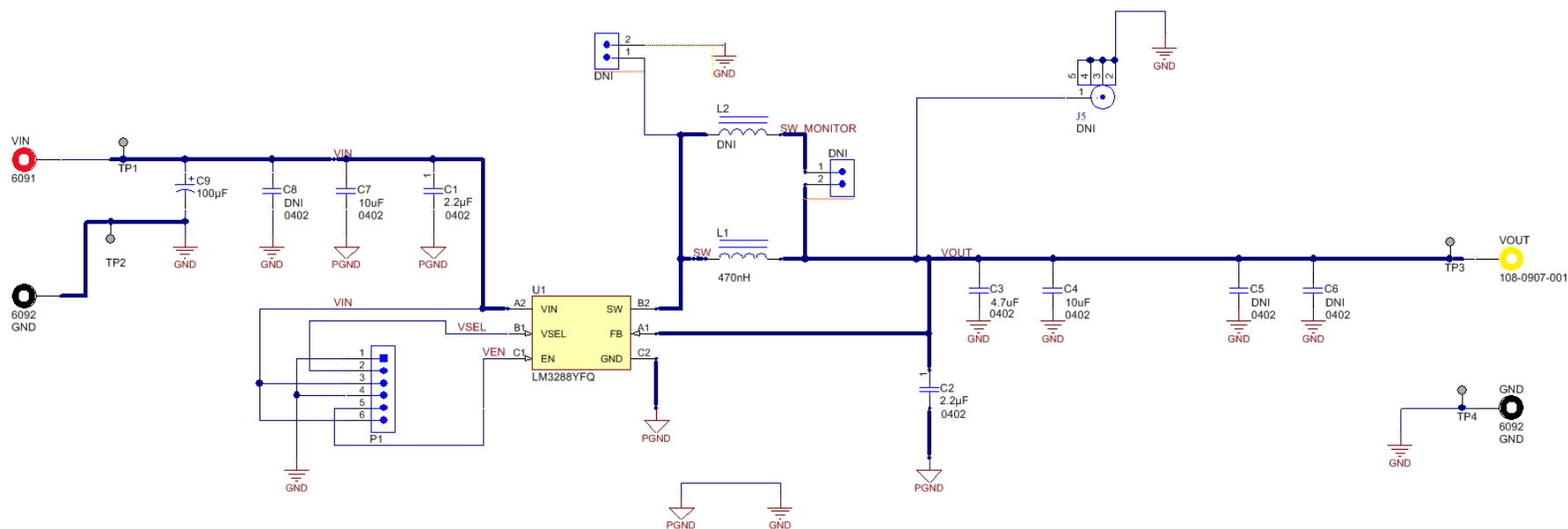
Second half of header P1 (pins 4, 5 and 6) enables or disables the part. When a jumper is placed over pins 4-5, LM3281 is disabled and is in shutdown mode. When a jumper is placed over pins 5-6, the LM3281 is enabled and is in normal mode of operation.

6 Bill of Materials for LM3281 Evaluation Board

Table 1. LM3281EVM BOM

| DESIGNATOR | DESCRIPTION | MANUFACTURER | PART NUMBER |
|--------------------|--|-----------------------|-------------------|
| C1, C2 | CAP, CERM, 2.2uF, 6.3V, $\pm 10\%$, X5R, 0402 | Samsung | CL05A225KQ5NNNC |
| C3 | CAP, CERM, 4.7uF, 10V, $\pm 20\%$, X5R, 0402 | Samsung | CL05A475MP5NRNC |
| C4,C7 | CAP, CERM, 10uF, 10V, $\pm 20\%$, X5R, 0402 | Samsung | CL05A106MP5NUNC |
| C9 | CAP, TA, 100uF, 10V, $\pm 20\%$, 0.6 Ω , SMD | Vishay-Sprague | 293D107X0010D2TE3 |
| GND, J2 | Standard Banana Jack, Insulated, Black | Keystone | 6092 |
| L1 | Inductor, Shielded, Ferrite, 470nH, 2.05A, 0.09 Ω , SMD | Murata | LQM21PNR47MGH |
| P1 | Header, TH, 100mil, 6x1, Gold plated, 230 mil above insulator | Samtec | TSW-106-07-G-S |
| TP1, TP2, TP3, TP4 | Terminal, Turret, TH, Double | Keystone | 1502-2 |
| U1 | LM3281 | Texas Instruments | LM3281YFQ |
| VIN | Standard Banana Jack, Insulated, Red | Keystone | 6091 |
| VOUT | BANANA JACK, 15A, Insulated, Nylon, Yellow | Emerson Network Power | 108-0907-001 |

7 LM3281EVM Schematic



LM3281EVM Schematic

8 LM3281EVM PCB Layout and Layers

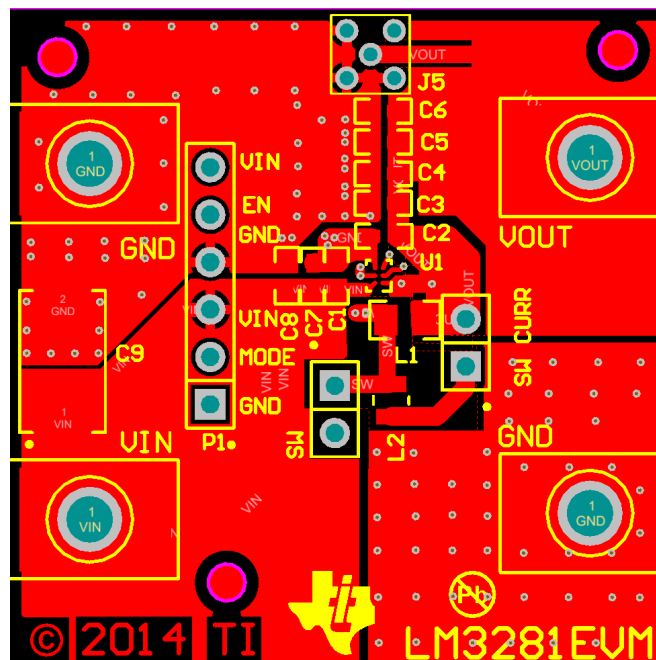


Figure 1. Top Layer

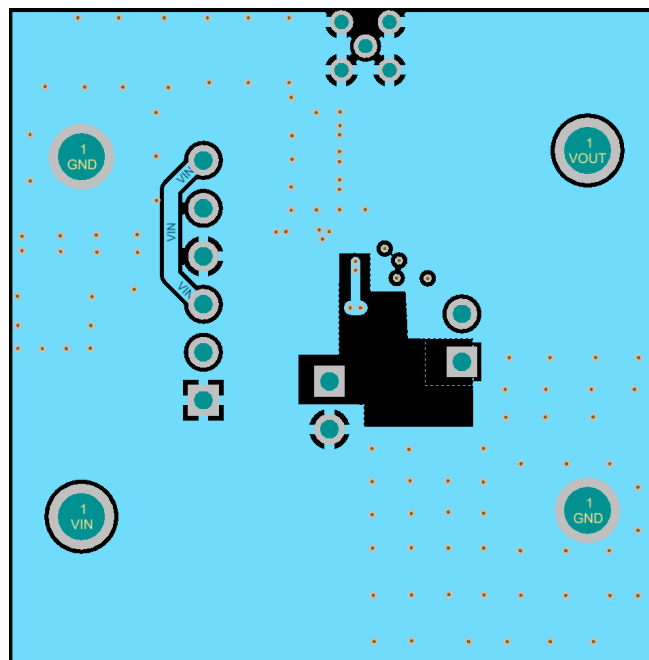


Figure 2. Mid-Layer 1

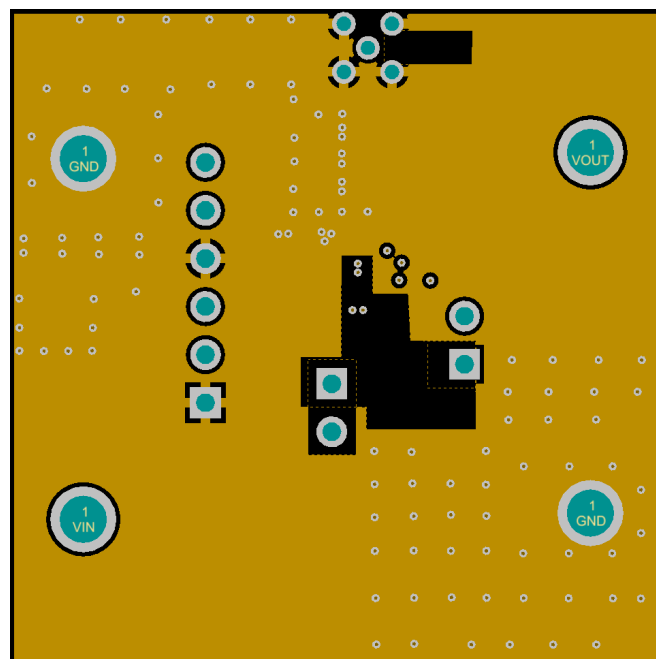


Figure 3. Mid-Layer 2

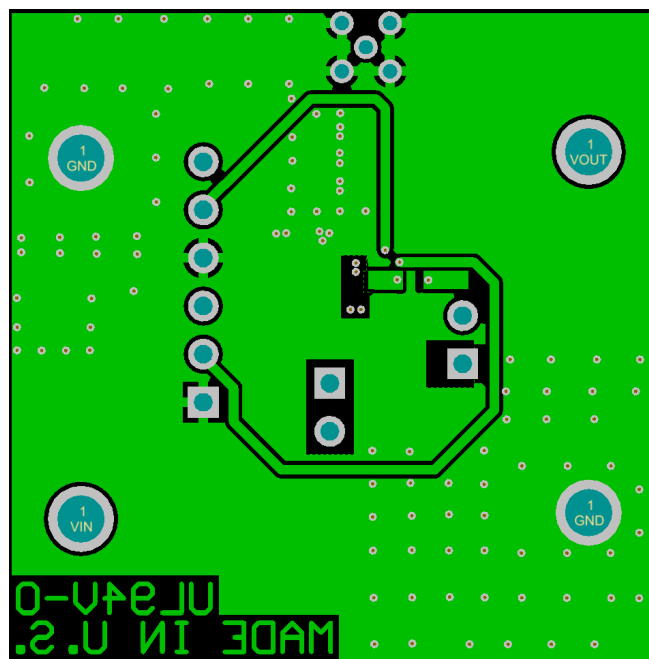


Figure 4. Bottom Layer

9 Pin Configuration and Functions

Figure 5 and Figure 6 show pin-out of LM3281, and Pin Functions provides a description of each pin.

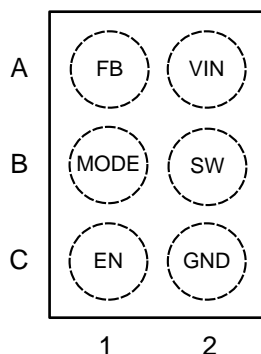


Figure 5. Top View

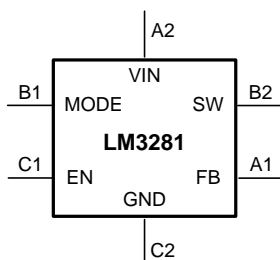


Figure 6. Pin Out

Pin Functions

| PIN | | TYPE | DESCRIPTION |
|-----|------|--------|---|
| NO. | NAME | | |
| A1 | FB | Power | Connect to the output at the output filter capacitor C_{OUT} by lowest inductance path with a trace rated for 2 A. |
| A2 | VIN | Power | Connect to input filter capacitor C_{IN} by lowest inductance path, then connect to supply voltage with a trace rated for 2 A. |
| B1 | MODE | Logic | Selects automatic ECO/PWM mode or forced PWM mode. When MODE is HIGH the LM3281 automatically transitions between PWM and ECO operation. When MODE is LOW the LM3281 operates in PWM mode only. Do not leave MODE pin floating. |
| B2 | SW | Power | Connect to inductor LSW with a trace rated for 2 A. |
| C1 | EN | Logic | Set this digital input logic high for normal operation. For shutdown, set to logic low. Do not leave EN pin floating. |
| C2 | GND | Ground | Connect to input filter capacitor C_{IN} by lowest inductance path, then to system ground by a very low inductance path. |

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Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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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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Concernant les EVMs avec appareils radio:

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Concernant les EVMs avec antennes détachables

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2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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