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

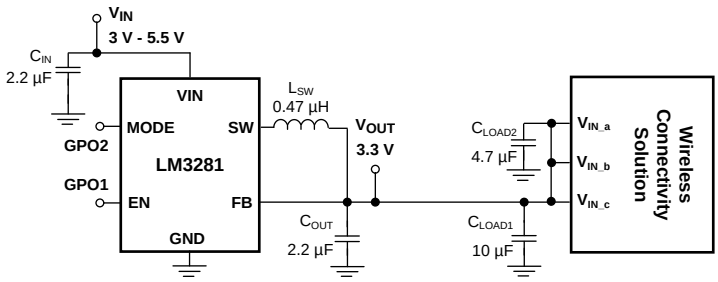
The board will operate under the following conditions:

- V_{IN}: 3 V ≤ V_{IN} ≤ 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.

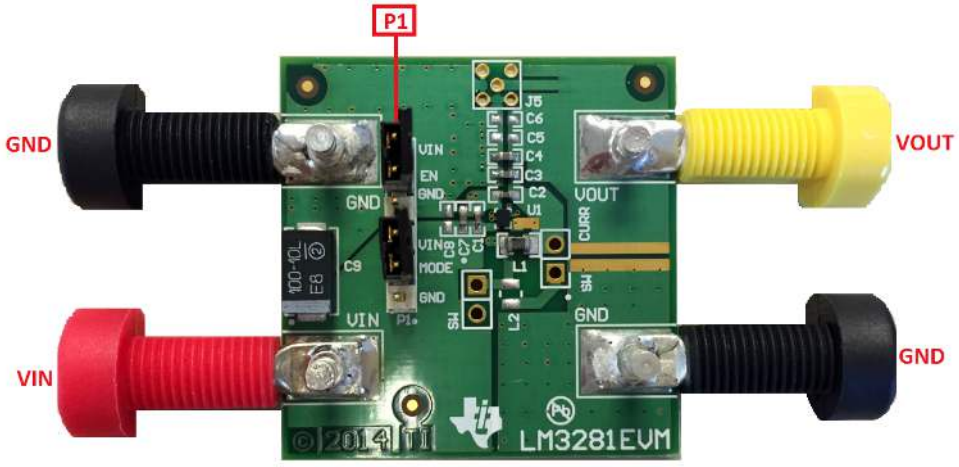


Photo of LM3281 Evaluation Board

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.

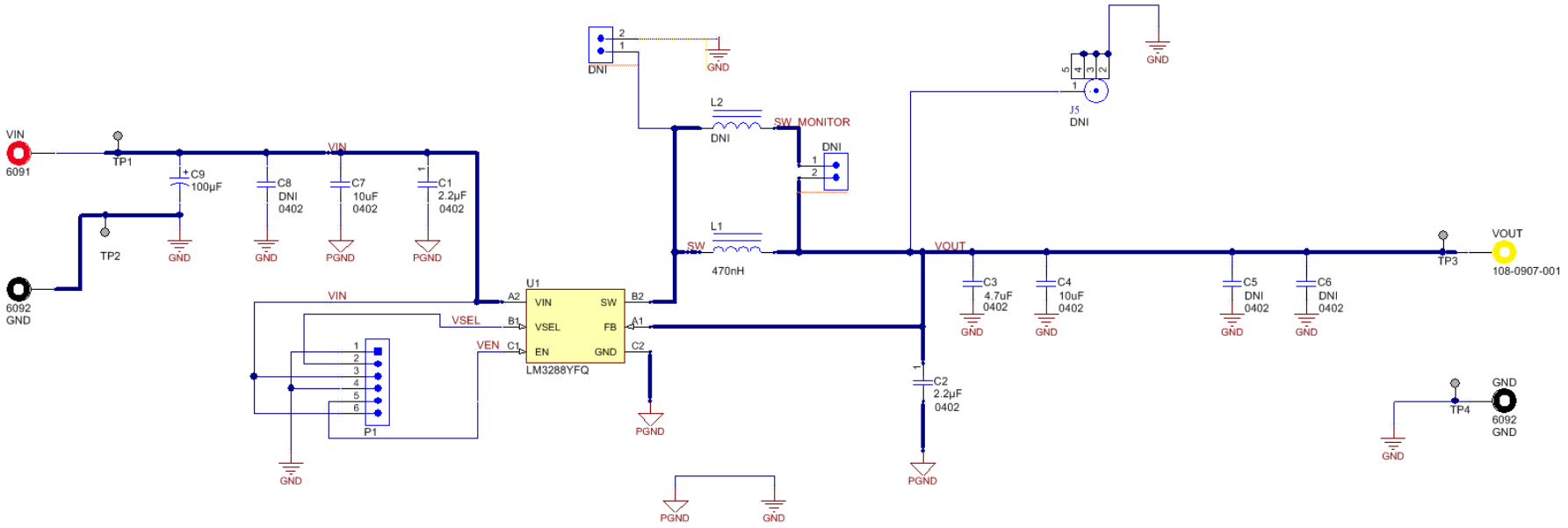
Second half of header P1 (pins 4, 5 and 6) enables or disables the part. When a jumper is placed over pins 4-5, LM3281 is disabled and is in shutdown mode. When a jumper is placed over pins 5-6, the LM3281 is enabled and is in normal mode of operation.

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, ±10%, X5R, 0402	Samsung	CL05A225KQ5NNNC
C3	CAP, CERM, 4.7uF, 10V, ±20%, X5R, 0402	Samsung	CL05A475MP5NRNC
C4,C7	CAP, CERM, 10uF, 10V, ±20%,X5R, 0402	Samsung	CL05A106MP5NUNC
C9	CAP, TA, 100uF, 10V, ±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

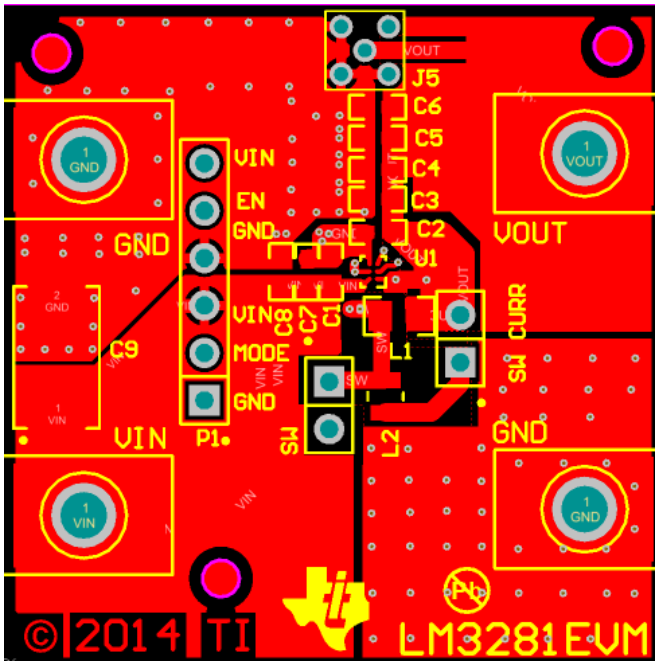


Figure 1. Top Layer

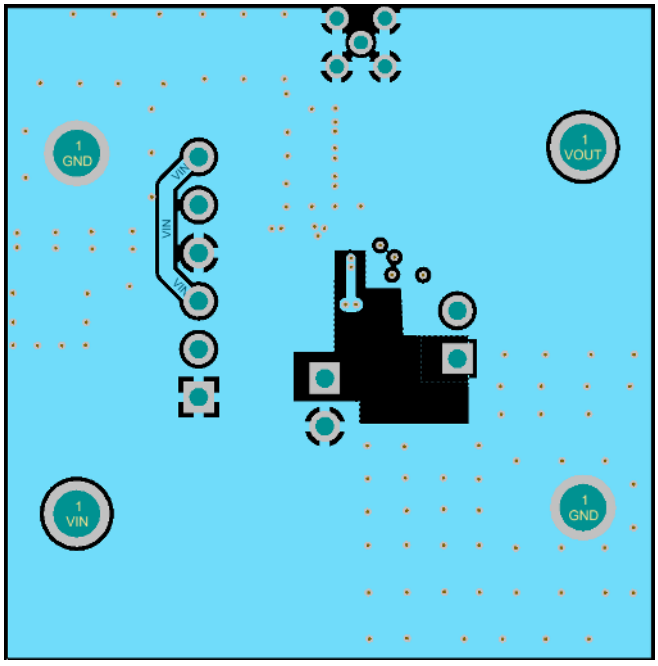


Figure 2. Mid-Layer 1

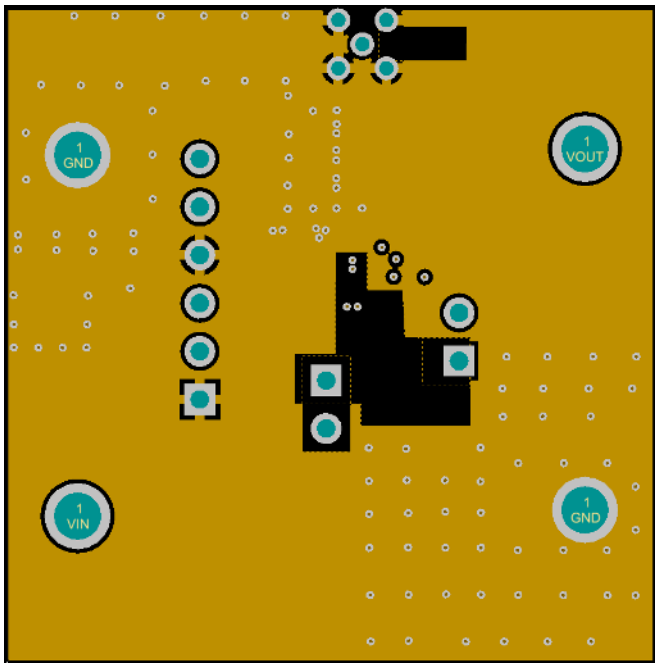


Figure 3. Mid-Layer 2

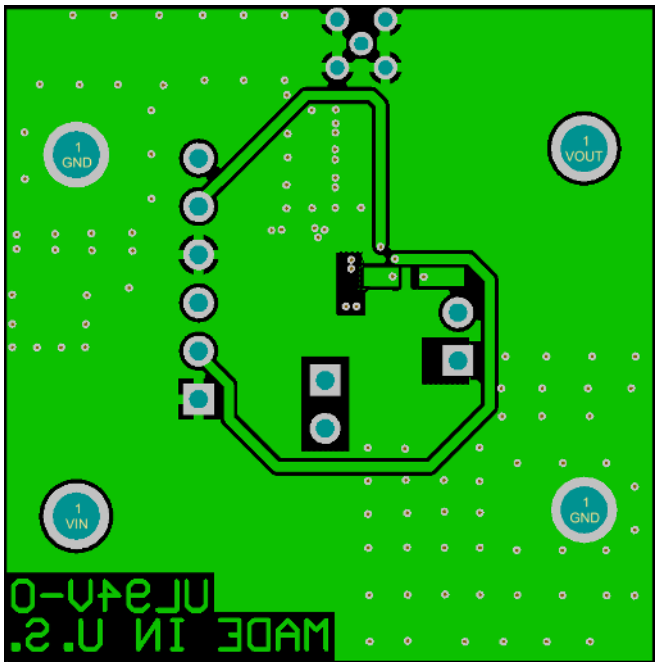


Figure 4. Bottom Layer

9 Pin Configuration and Functions

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

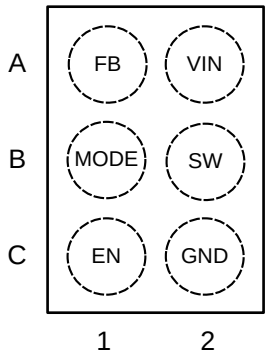


Figure 5. Top View

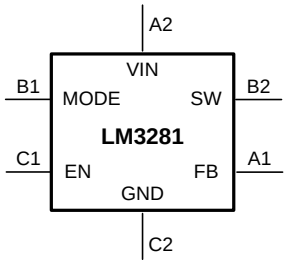


Figure 6. Pin Out

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 CIN 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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      This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

      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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      NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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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.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210*

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Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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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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