User's Guide

TPIC74100EVM User's Guide

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Trademarks

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1 Introduction

The Texas Instruments TPIC74100EVM evaluation module (EVM) helps designers evaluate the operation and performance of the TPIC74100 Switch Mode Power Supply – Buck Regulator. The EVM contains one DC/DC converter (See Table 1).

Table 1-1. Device and Package Configurations

CONVERTER	IC	PACKAGE
U1	TPIC74100QPWPRQ1	PWP-20

2 Setup

This section describes the jumpers and connectors on the EVM as well and how to properly connect, set up, and use the TPIC74100EVM.

2.1 Input/Output Connector Description

J1 – VBAT is the power input terminal for the converter. The terminal provides power (Vbat).

J2 – GND is the ground terminal for the EVM.

J3 – 5Vg is the power output terminal for the 5Vg regulator output.

J4 – VOUT is the regulated output voltage for the converter.

J5 – GND is a ground terminal for the EVM.

JP1, JP2 – SCR1, SCR0 are jumpers used to set the slew rate of the switching transistor for the L1 terminal switch pin. Jumpers allow the slew rate to be set to four set points.

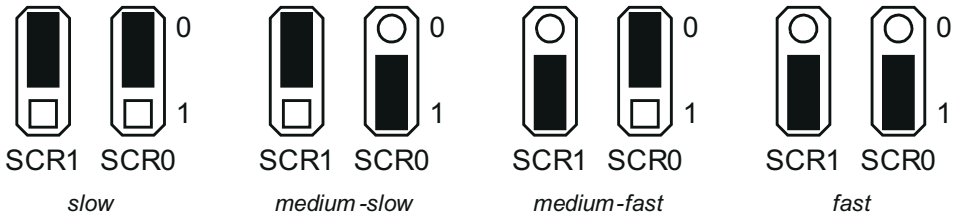

Figure 2-1. Slew Rate Jumper Settings

JP3 – LPM is the jumper used to enable Low Power Mode. The jumper allows LPM to be enabled or disabled. The device will operate in Normal mode when LPM is disabled.

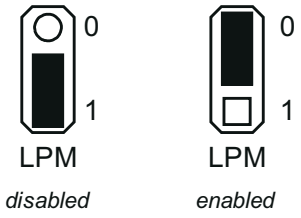

Figure 2-2. Low Power Mode Jumper Settings

JP4 – Enable is the jumper used to enable the converter. The converter is enabled when the Enable is high and disabled when low. The jumper placement allows the converter to be enabled or disabled.

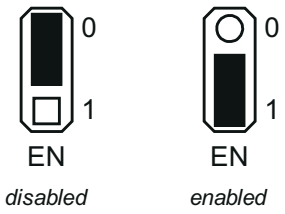

Figure 2-3. Enable Jumper Settings

JP5 – 5VgEN is the jumper used to enable switched 5V regulated output. The output is enabled when the Enable is high and disabled when low. The jumper placement allows the converter to be enabled or disabled.

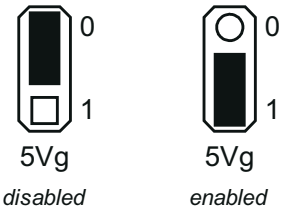

Figure 2-4. 5Vg Regulated Output Jumper Settings

JP6 – Bypass is the jumper used to bypass the low pass filter inductor on the power supply input to the device. This allows the user to remove the filter from the circuit. The jumper placement allows the inductor to be active or shorted.

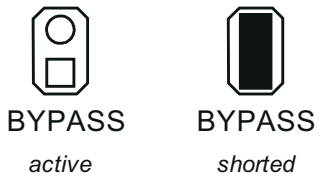

Figure 2-5. Low Pass Filter Inductor Bypass Jumper Settings

2.2 Setup

The input voltage range for the converter is 1.5 volts to 40 volts. The input voltage must be at least 5 V during start up.

2.3 Operation

For proper operation of the TPIC74100, JP1, JP2, JP3, JP4, JP5, and JP6 should be properly configured. The recommended setting, using shorting blocks:

JP1 and JP2 to Fast

JP3 to Enabled

JP4 to Enabled

JP5 to Enabled, if 5Vg is used

JP6 to Shorted

In this configuration, the device powers up when power is applied. JP1, JP2 SCR0, SCR1 select how switch pin slew rate is set: slow, medium-slow, medium-fast, or fast. JP3 LPM selects how Low Power Mode is set: Enabled or Disabled. JP4 EN turns the device on or off. JP5 5Vg turns the regulated 5-V output on or off. JP6 Bypass disables the low-pass filter located on the input supply to the device.

3 Board Layout

Figure 6, Figure 7, Figure 8, and Figure 9 show the board layout for the TPIC74100EVM PWB. The EVM offers resistors, capacitors, and jumpers to program the switch pin slew rate and regulator turn-on Delay. Jumpers are also provided to enable the device and to enable the low-power mode option.

The TPIC74100 offers high efficiency but does dissipate power. The PowerPAD™ package offers an exposed thermal pad to enhance thermal performance. This must be soldered to the copper landing on the PCB for optimal performance. The PCB provides 1-oz copper planes on the top and bottom to dissipate heat.

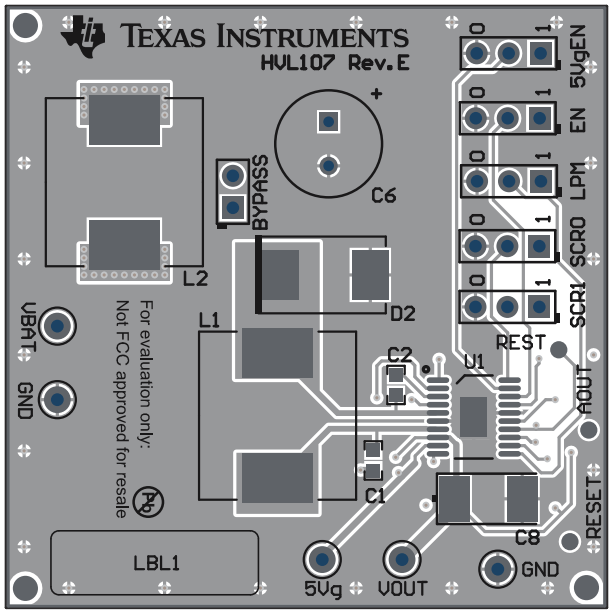

Figure 3-1. Top Assembly Layer

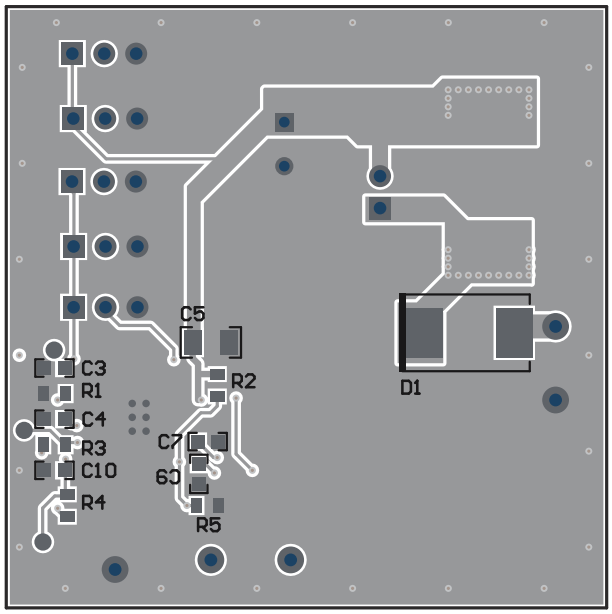

Figure 3-2. Bottom Assembly Layer (viewed from bottom)

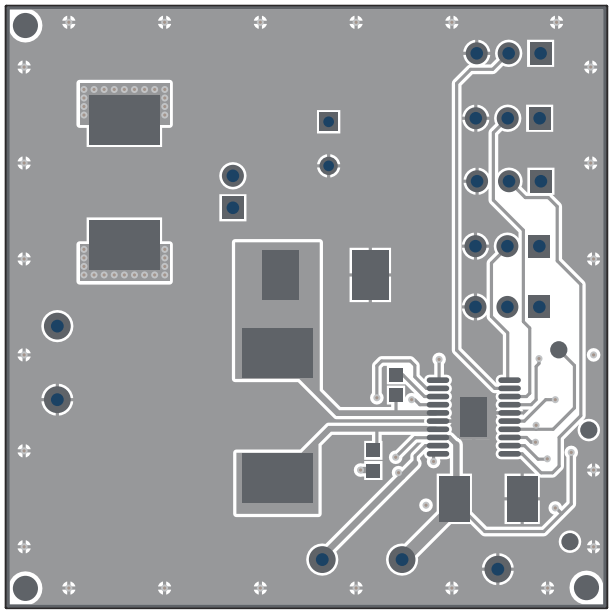

Figure 3-3. Top Layer Routing

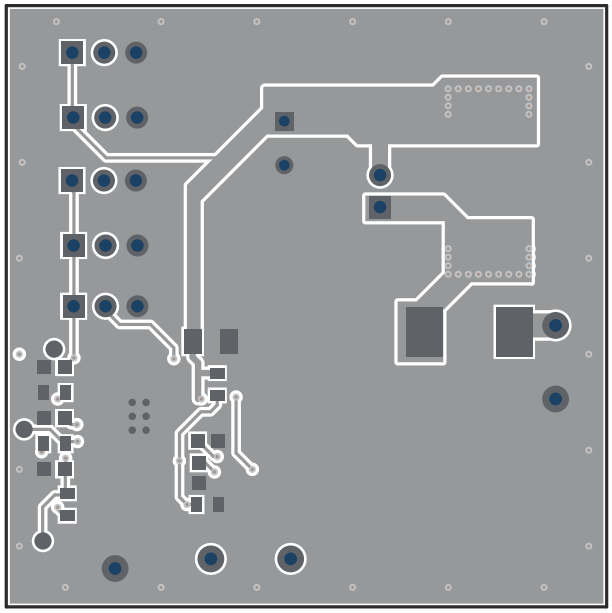

Figure 3-4. Bottom Layer Routing (viewed from bottom)

4 Schematic

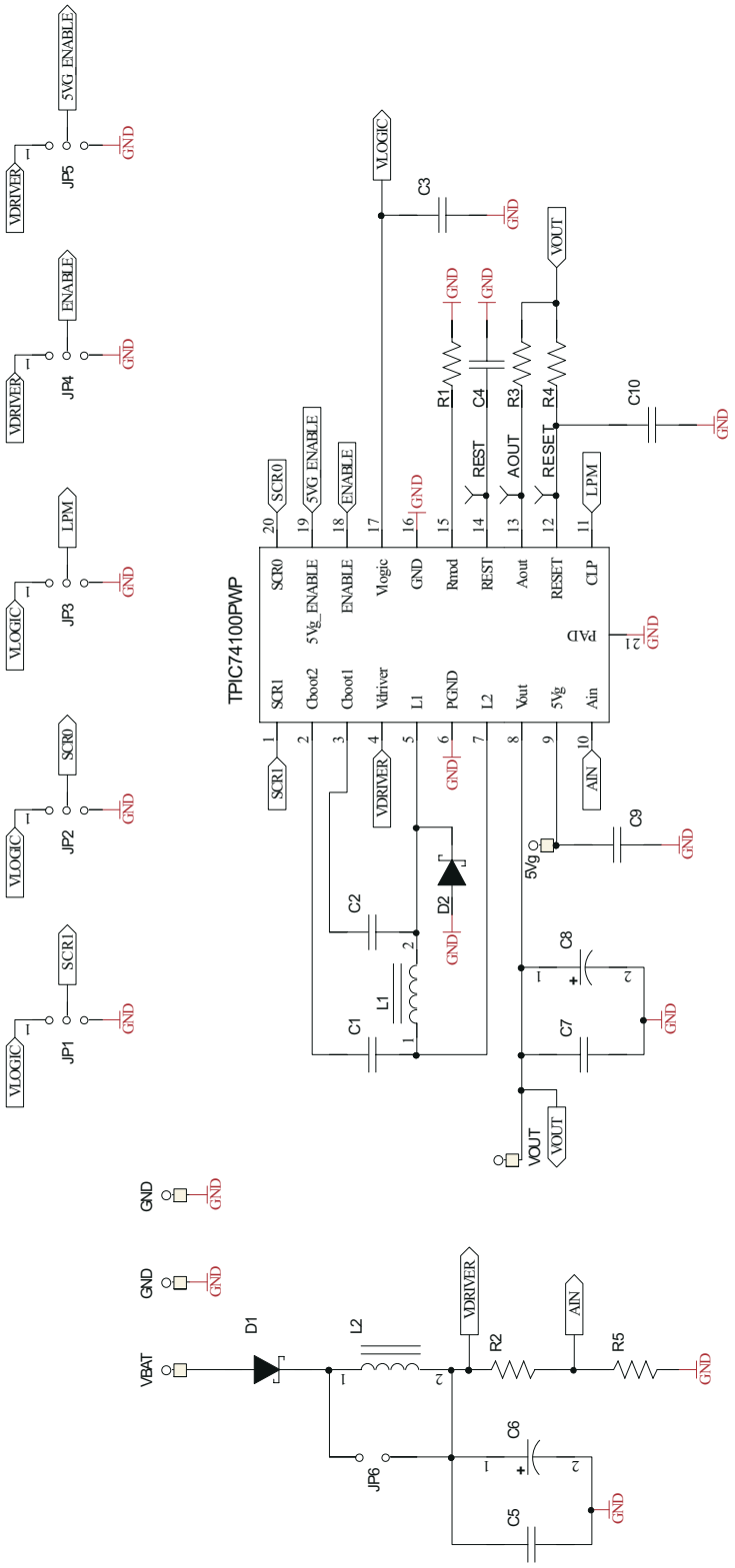

Figure 4-1. TPIC74100EVM Schematic

Table 4-1. TPIC74100EVM Bill of Materials

COUNT	REF DES	DESCRIPTION	SIZE	MFR	PART NO.
2	C1, C2	Capacitor, ceramic, 4.7nF, 50V, 10%	0603	muRata	GRM188R71H472KA01B
1	C3	Capacitor, ceramic, 470nF, 16V, 10%	0603	muRata	GRM188R71C474KA88B
2	C4, C7	Capacitor, ceramic, 100nF, 16V, 10%	0603	muRata	GRM188R71C104KA01J
1	C5	Capacitor, ceramic, 100nF, 50V, 10%	1206	muRata	GCM319R71H104KA37B
1	C6	Capacitor, electrolytic, 470uF, 50V, 10%	10mm	Panasonic	EEU-FC1H471L
1	C8	Capacitor, tantalum, 47uF, 16V, 20%	6032	Kyocera AVX	TPSD476K016T0100V
1	C9	Capacitor, ceramic, 1uF, 16V, 10%	0603	muRata	GRM188R71C105KA12B
1	C10	Capacitor, ceramic, 10nF, 16V, 10%	0603	muRata	GRM188R71C103KA01B
2	D1, D2	Diode, Schottky, 3A, 100V	SMC	IR	30BQ100
5	J1, J2, J3, J4, J5	Test point, 42-mil	0.042	Std	Std
5	JP1, JP2, JP3, JP4, JP5	Header, 3-pin, 100-mil spacing, (36-pin strip)	0.100 x 3	Sullins	PTC36CAAN
1	JP6	Header, 2-pin, 100-mil spacing, (36-pin strip)	0.100 x 2	Sullins	PTC36CAAN
2	L1, L2	Inductor, SMT, 33-uH, 4.34, 54.9-mΩ	12.3mm x 12.3mm	Coilcraft	MSS1260T-333
1	R1	Resistor, chip, 12.1-kΩ, 1/16W, 1%	0603	Std	Std
1	R2	Resistor, chip, 68.1-kΩ, 1/16W, 1%	0603	Std	Std
2	R3, R4	Resistor, chip, 20-kΩ, 1/16W, 1%	0603	Std	Std
1	R5	Resistor, chip, 33.2-kΩ, 1/16W, 1%	0603	Std	Std
1	U1	IC, TPIC74100QPWPRQ1		TI	TPIC74100QPWP

5 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (September 2008) to Revision A (October 2022) **Page**

- Updated the numbering format for tables, figures, and cross-references throughout the document.....2
- Layout figures updated to match physical board Rev. E.....6
- Updated BoM to match components of board Rev. E.....8

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CAUTION

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.

FCC Interference Statement for Class A EVM devices

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.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *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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3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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.

Concerning EVMs Including Detachable Antennas:

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. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

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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http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs 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 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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