TPIC74100EVM User's Guide

User's Guide



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TPIC74100EVM User's Guide

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. 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.

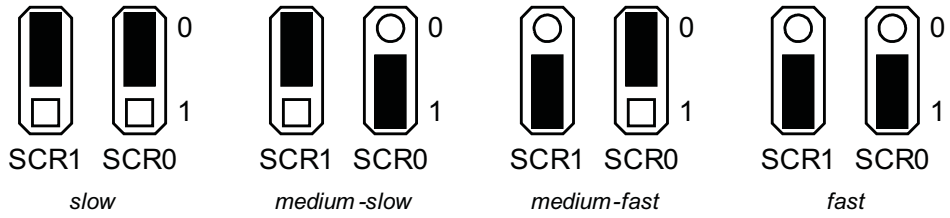


Figure 1. Slew Rate Jumper Settings

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.

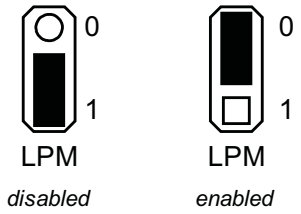


Figure 2. Low Power Mode Jumper Settings

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.

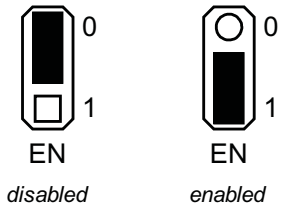


Figure 3. Enable Jumper Settings

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.

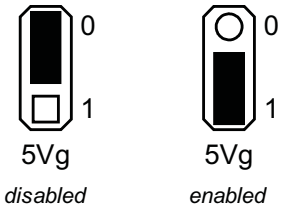


Figure 4. 5Vg Regulated Output Jumper Settings

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.

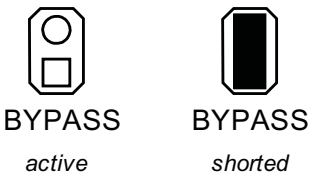


Figure 5. Low Pass Filter Inductor Bypass Jumper Settings

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.

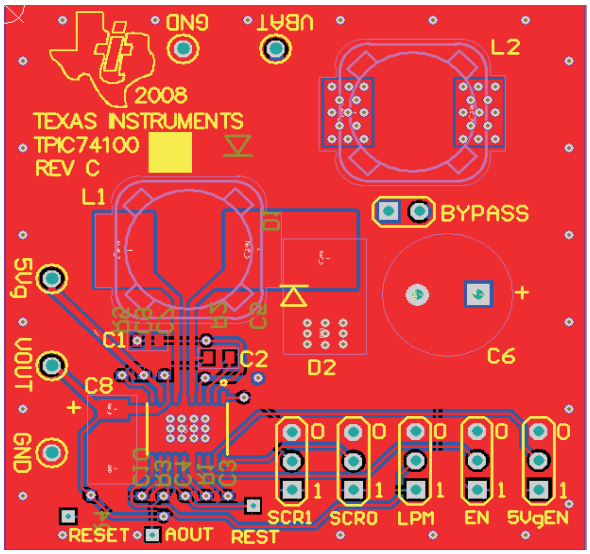


Figure 6. Top Assembly Layer

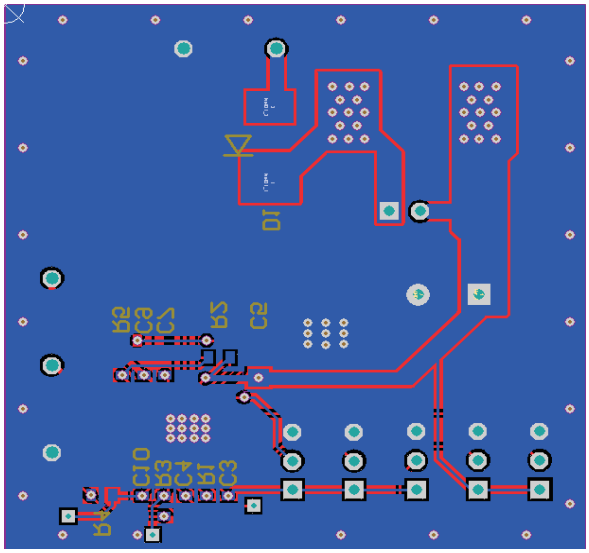


Figure 7. Bottom Assembly Layer

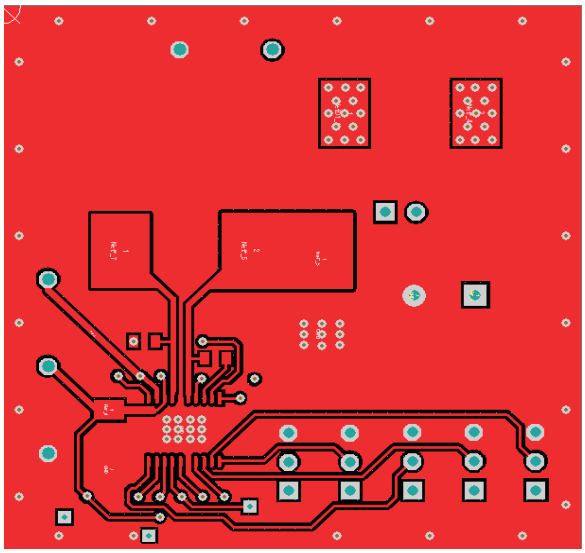


Figure 8. Top Layer Routing

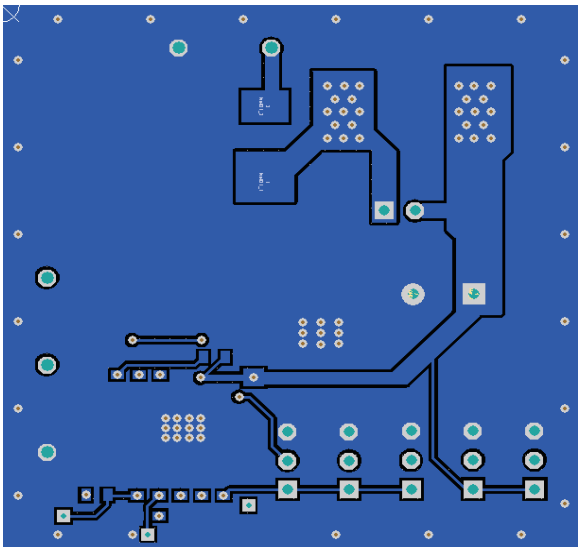


Figure 9. Bottom Layer Routing

4 Schematic

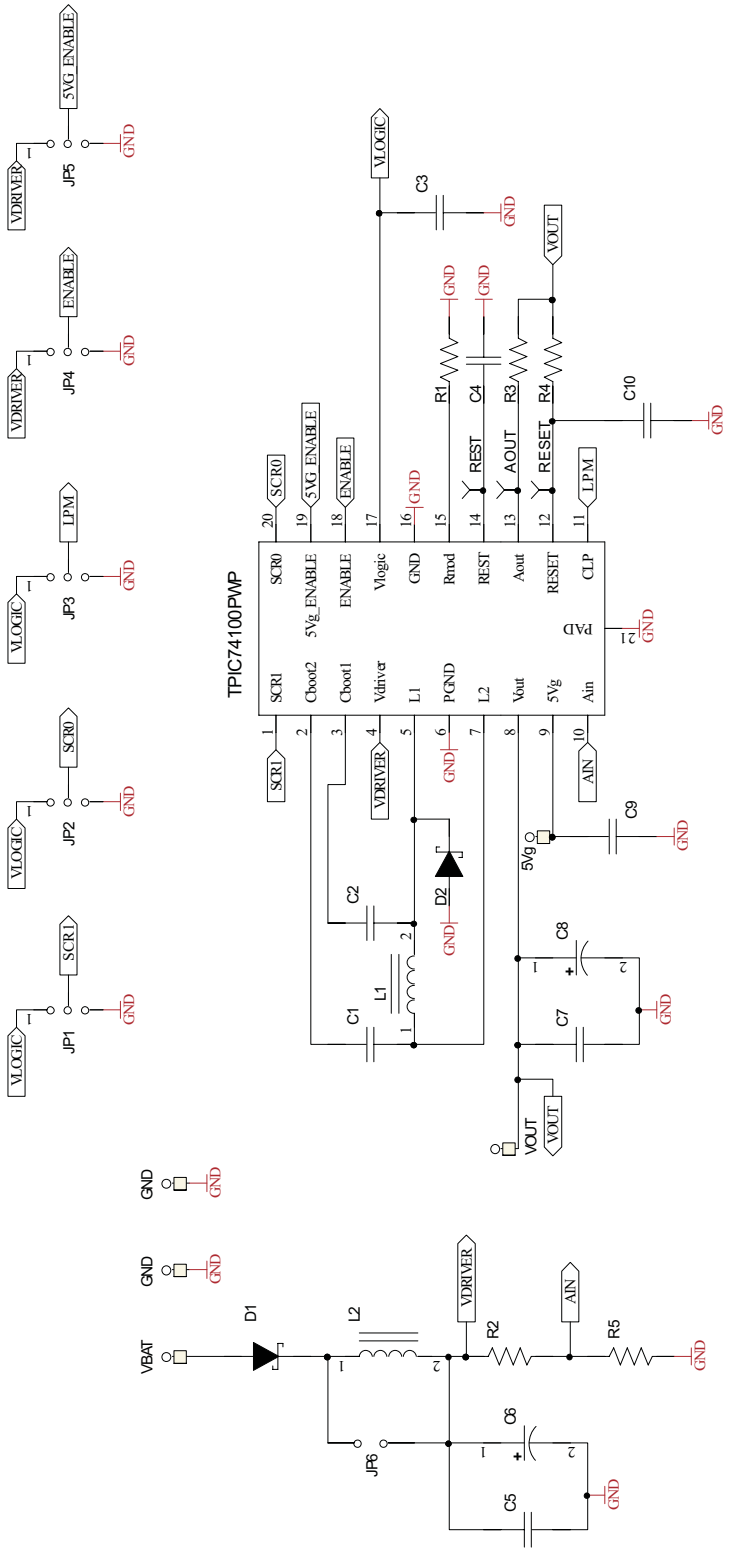


Figure 10. TPIC74100EVM Schematic

Table 2. 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	Rubycon	35ZL470M10X20
1	C8	Capacitor, tantalum, 47uF, 16V, 20%	6032	Sprague	594D476X0016C2T
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
		PCB, 2.3-inch x 2.3-inch x 0.062		Any	TPIC74100, REV C

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of –0.3 V to 48 V and the output voltage range of 0.9 V to 18 V.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 85°C. The EVM is designed to operate properly with certain components above 60°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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