TPS65130EVM-839 User's Guide

This user's guide describes the characteristics, operation, and use of the TPS65130 evaluation module (EVM). It includes the EVM specifications, the recommended setup, the schematic diagram, the board layouts, and the bill of materials..

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Trademarks

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1 Introduction

The TPS65130 EVM uses a TPS65130 multichannel output IC to provide both a positive and negative power rail. The goal of the EVM is to make performance evaluation of the TPS65130 easier.

1.1 Modifications

To demonstrate the small size of this power solution, the EVM is designed with components having 0402 footprints where possible, and small inductors. Changing components can improve or degrade EVM performance. For example, using inductors with larger dc resistance reduces efficiency of the solution. Resistors R10 and R11 are for test purposes only. They can be replaced by a 51.1- to 100-Ω resistor and used to measure the loop gain with a loop-gain analyzer. They are not required in a real application.

2 Performance Specification Summary

Table 1 provides a summary of the TPS65130EVM performance specifications. All specifications are given for an ambient temperature of 25°C.

Table 1. Typical Performance Specification Summary

	Condition	Voltage Range (V)			Current Range (mA)		
		MIN	Type	MAX	MIN	TYP	MAX
VIN		2.7	3.3	5.5			2000
VPOS	V_I = 3.3 V	7.76	8	8.24			250
VNEG	V_I = 3.3 V	–5.15	–5	–4.85			200

3 Schematics

Figure 1 illustrates the EVM schematic.

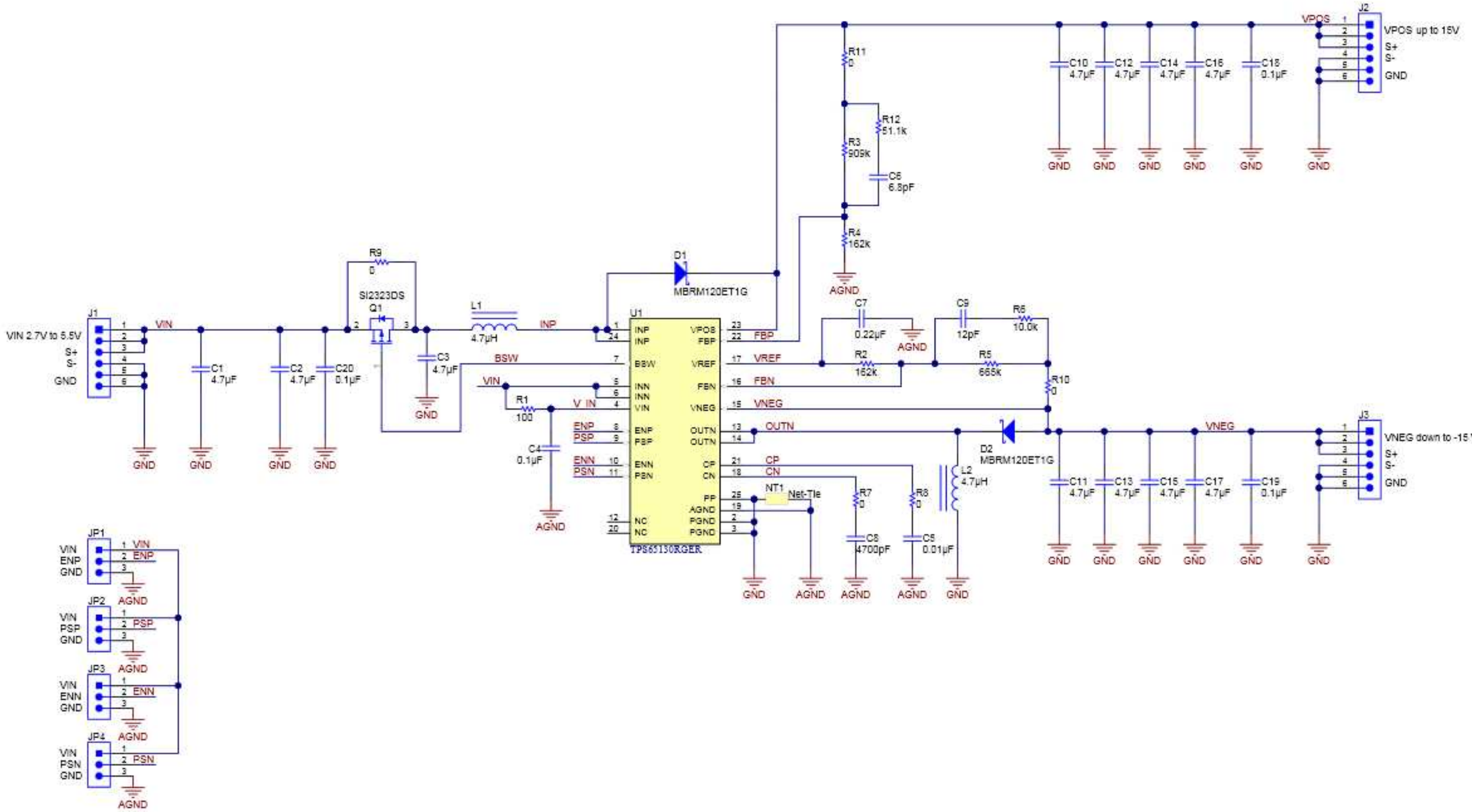

Figure 1. TPS65130EVM-839 Schematic

4 Test Setup

The TPS65130 is designed to operate with a maximum input voltage of 5.5 V. Connect a power supply set between 2.7- and 5.5-V output voltage with a current limit set to at least 3 A. Short pins 1−2 on jumpers JP1 and JP3 to enable both rails.

5 Efficiency Test Results

Figure 2 and Figure 3 show the efficiency results using this EVM:

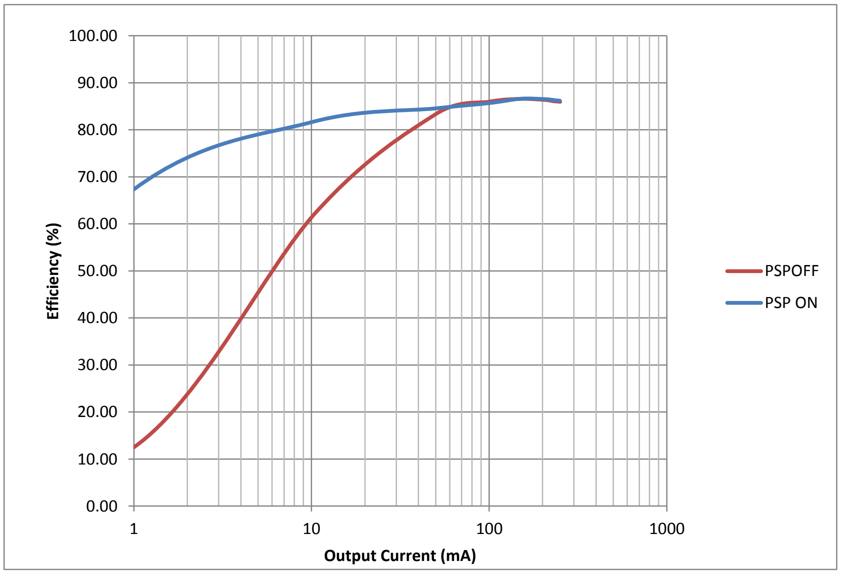

Figure 2. TPS65130 VPOS Efficiency

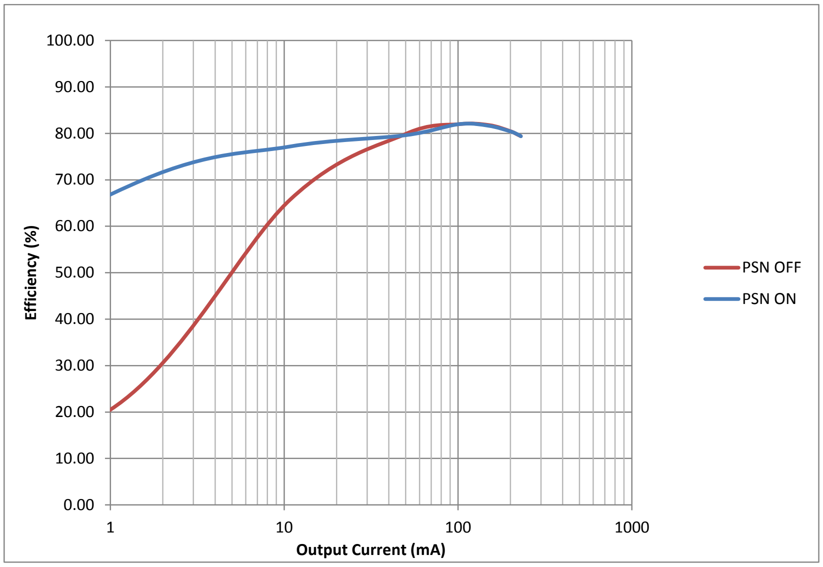

Figure 3. TPS65130 VNEG Efficiency

6 PCB Layout

Figure 4 through Figure 8 show the design of the TPS65130 EVM printed-circuit-board (PCB). The EVM has been designed using a four-layer, 35-µm (1 oz), copper-clad circuit board. All components are on the top side, and all signal traces on the top and bottom layers allow the user to easily view, probe, and evaluate the TPS65130 IC. Moving components to both sides of the PCB offers additional size reduction for space-constrained systems.

The switching nodes with high-frequency noise are isolated from the noise-sensitive feedback circuitry, and careful attention has been given to the routing of high-frequency current loops. See *TPS6513x Positive and Negative Output DC-DC Converter* for more specific layout guidelines.

To ensure that the IC provides its maximum designed output power, it is highly recommended that users follow the EVM board layout when laying out their boards, especially the separate analog and power ground paths and the small footprint, closely-spaced feedback components.

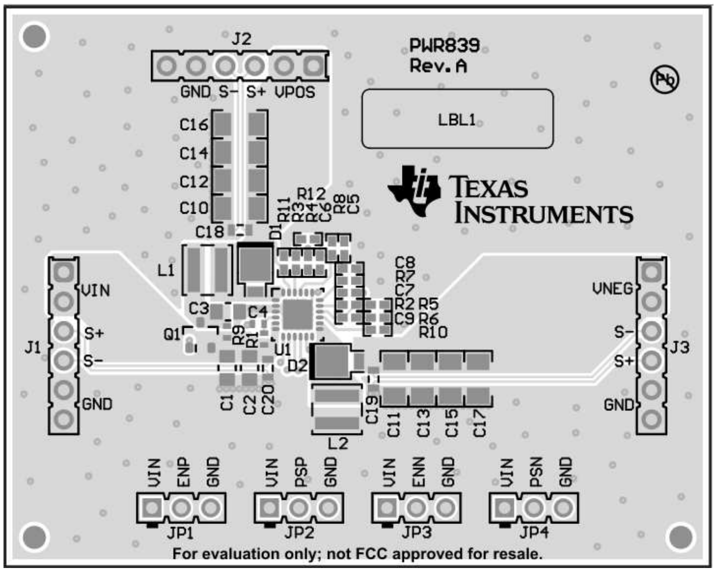

Figure 4. Top Assembly Layer

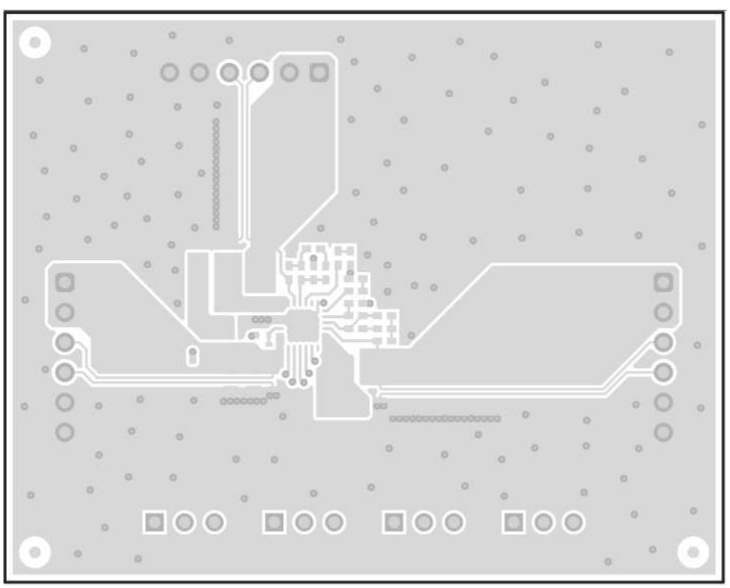

Figure 5. Top Layer

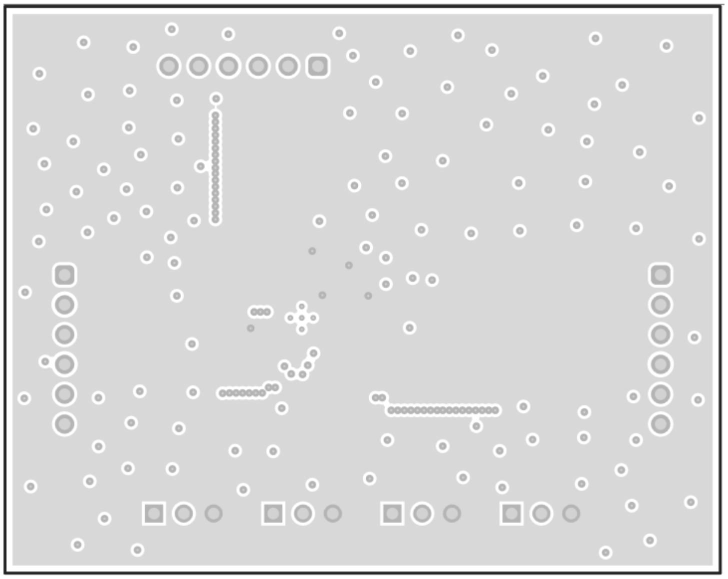

Figure 6. Inner Layer 1

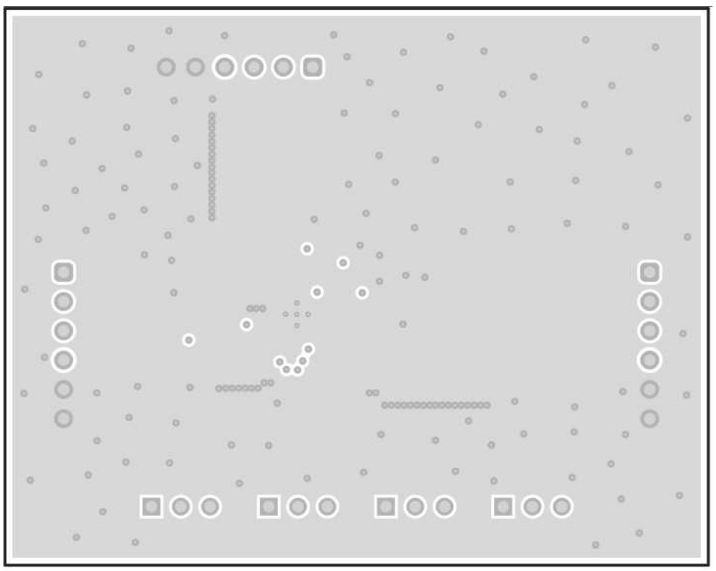

Figure 7. Inner Layer 2

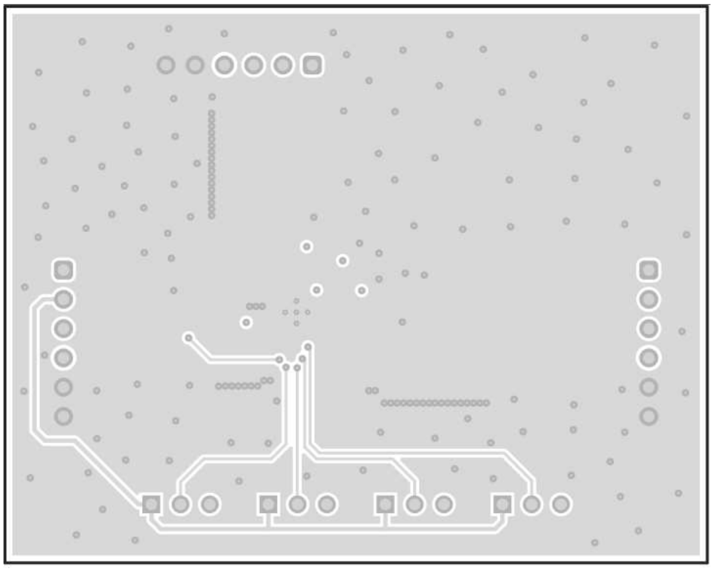

Figure 8. Bottom Layer

7 List of Materials

Table 2 contains the EVM bill of materials.

Table 2. TPS65130EVM-839 Bill of Materials

Count	REFDES	Value	Description	Size	Part Number	MFR
0	C1	Open	Capacitor, Ceramic, 6.3V, X5R, 10%	0805		
8	C10 - C17	4.7uF	Capacitor, Ceramic, 25V, X7R, 10%	1206	C3216X7R1E475K085AB	TDK
2	C2, C3	4.7uF	Capacitor, Ceramic, 10V, X7R, 10%	0805	GRM21BR71A475KA73L	Murata
1	C4	0.1uF	Capacitor, 16V, X7R, 10%	0402	GCM155R71C104KA55D	Murata
1	C5	0.01uF	Capacitor, 16V, X7R, 10%	0402	C1005X7R1C103K050BA	TDK
1	C8	0.0047uF	Capacitor, 50V, X7R, 5%	0402	CGA2B2X7R1H472K050BA	TDK
1	C6	6.8pF	Capacitor, 50V, C0G, 5%	0402	GRM1555C1H6R8CA01D	Murata
1	C7	0.22uF	Capacitor, 10V, X7R, 10%	0402	GRM155R71A224KE01D	Murata
1	C9	12pF	Capacitor, 50V, C0G, 5%	0402	C0402C120J3GACAUTO	Kemet
2	D1, D2		Diode, Schottky, 1A, 20V	457-04	MBRM120ET1G	On Semi
9	J1 - J9		Header, 2 pin, 100mil spacing, (36-pin strip)	0.100 x 2	TSW-102-07-G-S	Samtec
4	JP1 - JP4		Header, 3 pin, 100mil spacing, (36-pin strip)	0.100 x 3	TSW-103-07-G-S	Samtec
2	L1, L2	4.7uH	Inductor, SMT, 0.9A, 90milliohms	0.150 X 0.150	744031004	WE
1	Q1		MOSFET,P-ch, -12 V, 4 A, 51 milliOhm	SOT23	Si2323DS	Vishay
1	R1	100	Resistor, Chip, 1/16W, 1%	0402	Std	Std
2	R2, R4	162k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
1	R3	909k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
1	R5	665k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
1	R6	10k	Resistor, Chip, 1/16W, 1%	0402	Std	Std
4	R7, R8, R10, R11	0	Resistor, Chip, 1/16W, 5%	0402	Std	Std
1	R12	51.1k	Resistor, Chip, 1/16W, 5%	0402	Std	Std
0	R9	Open	Resistor, Chip, 1/16W, 1%	0402		
1	U1		IC, Positive and Negative Output DC-DC Converter	QFN24	TPS65130RGE	TI
4	--		Shunt, 100 mil, Black	0.100	SPC02SYAN	Sullins

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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.

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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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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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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