EVM User's Guide: TPSM81033EVM-035

TPSM81033EVM-035 Evaluation Module

Description

The TPSM81033EVM-035 is designed to provide a quick setup to evaluate TPSM81033 device with the output voltage setting to 5V.

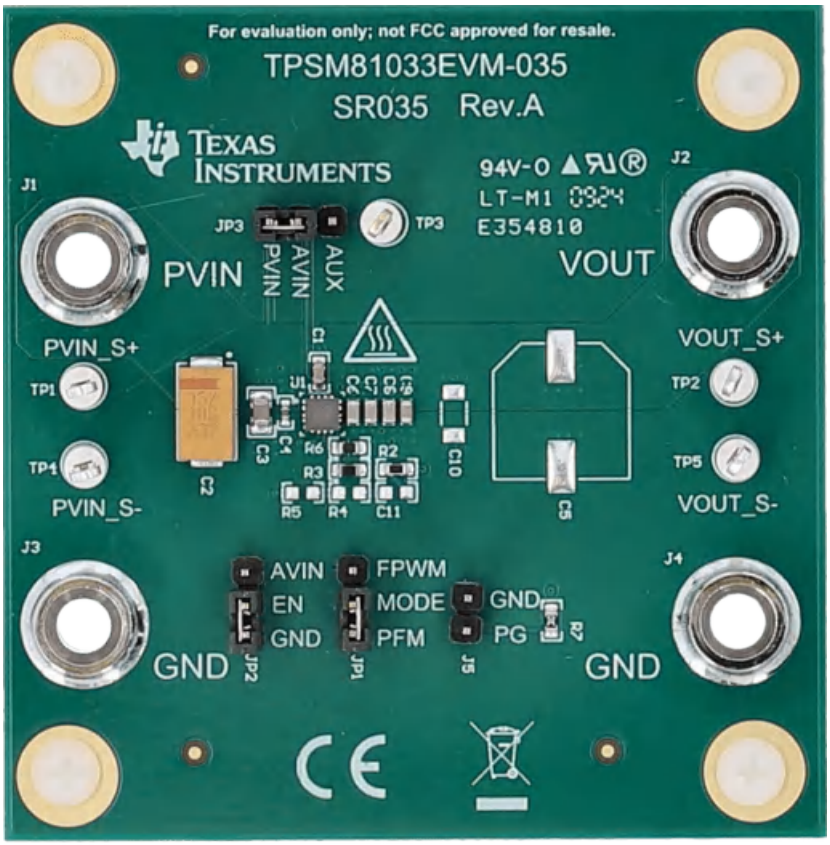
The TPSM81033 is a synchronous boost module. The device provides a power supply design for portable equipment and smart devices powered by various batteries and other power supply. The TPSM81033 has 2A (typical) valley switch current limit over full temperature range.

Features

- Input voltage range: 1.8V to 5.5V
- Output voltage range: 2.2V to 5.5V
- Pin-selectable auto PFM or forced PWM mode at light load
- True disconnection between input and output during shutdown

Applications

- Optical module
- Patient monitor
- Smart meter



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1 Evaluation Module Overview

1.1 Introduction

The TPSM81033 uses adaptive constant on-time valley-current-control topology to regulate the output voltage and operates at 2.4MHz switching frequency.

This user's guide describes the characteristics and operation of the evaluation module TPSM81033EVM-035. This document provides instructions on how to use the evaluation module. Throughout this document, the terms of evaluation board, evaluation module, and EVM are synonymous with the TPSM81033EVM-035. This document also includes a schematic, reference printed circuit board (PCB) layout, and a complete bill of materials (BOM).

CAUTION

Hot surface! Contact can cause burns. Do not touch!

1.2 Kit Contents

Table 1-1 lists the contents of the EVM kit. Contact the Texas Instruments Product Information Center nearest you if any components are missing. TI highly recommends that users check the TI website at https://www.ti.com to verify that the latest versions of the related software is being used.

Table 1-1. Kit Contents

Item	Quantity
TPSM81033EVM	1
TPSM81033QFN-FCMOD	1

1.3 Specification

Table 1-2 provides a summary of the TPSM81033EVM performance characteristics.

Table 1-2. Performance Specification

Tested at 25°C ambient temperature

TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input voltage			3.6		V
Output voltage	TPSM81033EVM, V_{IN} = 3.6V		5.0		V
Output current	V_{IN} =3.6 V		1		A

1.4 Device Information

There are two optional modes at light load by configuring the MODE pin: auto PFM mode and forced PWM to balance the efficiency and noise immunity in light load. The TPSM81033 consumes a 20µA quiescent current from VIN at light load condition. During shutdown, the TPSM81033 is completely disconnected from the input power and only consumes a 0.1µA current to achieve long battery life. The TPSM81033 has 5.75V output overvoltage protection, output short circuit protection, and thermal shutdown protection.

The TPSM81033 offers a very small solution-size with 2.6mm × 2.5mm QFN-FCMOD (8) package and minimum amount of external components.

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2 Hardware

2.1 Setup

This section describes how to properly connect, set up, and use the TPSM81033EVM-035.

2.1.1 Input/Output Connector Descriptions

Reference Designator	Description
J1-VIN	Positive input connection from the input supply for the EVM.
J2-VOUT	Positive connection for the output voltage.
J3-GND	Return connection for the input voltage.
J4-GND	Return connection for the output voltage.
TP1-VIN, TP4-GND	Input voltage sensing for measuring efficiency. PVIN_S+ is for positive input and PVIN_S- is for negative input.
TP2-VOUT, TP5-GND	Output voltage sensing for measuring efficiency. VOUT_S+ is for output positive node and VOUT_S- is for output negative node.
J5-PG	Test point to measure PG pin waveform.
JP1-MODE	MODE pin input jumper.
JP2-EN	EN pin input jumper. Place a jumper across EN and AVIN to turn on the IC. Place a jumper across EN and GND to turn off the IC.
TP3-AUX	Test point to measure AUX pin voltage.

2.1.2 Modification

The EVM is designed to support some modifications by the user. The external component can be changed according to the real application.

2.1.3 Input Capacitor

A 150µF tantalum capacitor C2, is added as the input capacitor in the EVM, The ESR of the tantalum capacitor is 0.1Ω, to damp the ringing of the input voltage when the EVM is powered by a power supply with a long cable. The capacitor is not required for proper operation and can be removed in a real application.

2.1.4 Output Capacitor

4*22µF ceramic capacitors are used in the EVM, the effective capacitor value is approximately 20µF. If the load current is smaller than 1A, then 2*22uF ceramic capacitor (effective capacitor value is approximately 10µF) is also proper.

2.1.5 Feedforward Capacitor

A feed-forward capacitor C11 can help to improve the response performance and the phase margin if the value is properly selected. Refer to this application note to select the feed-forward capacitor if required. *Feedforward Capacitor Makes Boost Converter Fast and Stable*.

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3 Hardware Design Files

3.1 Schematic

Figure 3-1 is the EVM schematic.

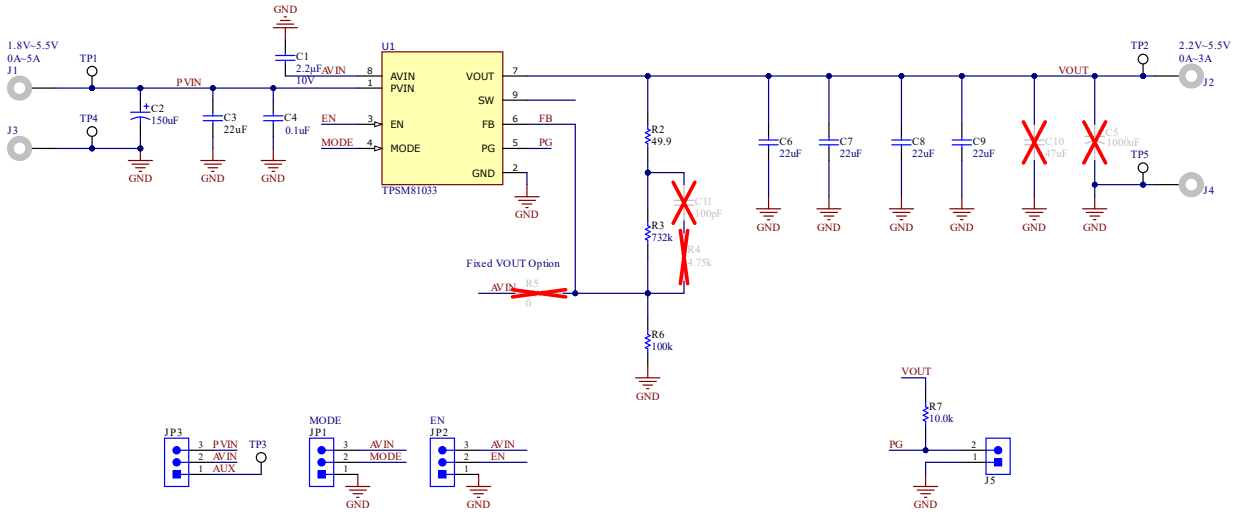

Figure 3-1. Schematic

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3.2 PCB Layout

The PCB of the TPSM81033EVM has four layers. Figure 3-2 and Figure 3-3 show the top side and bottom side of the PCB layout, respectively. Figure 3-4 and Figure 3-5 show the inner layer 1 and inner layer 2, respectively.

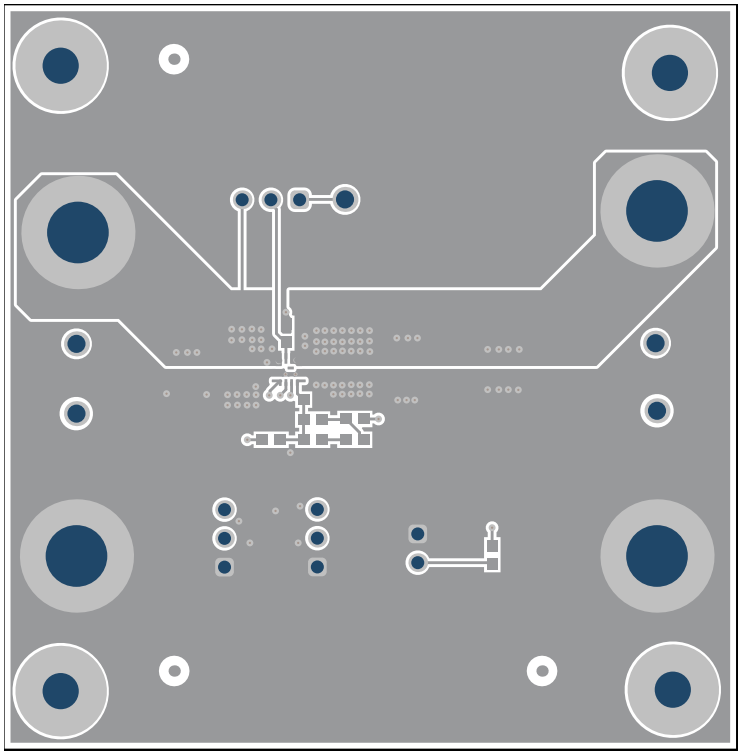

Figure 3-2. Top-Side Layout

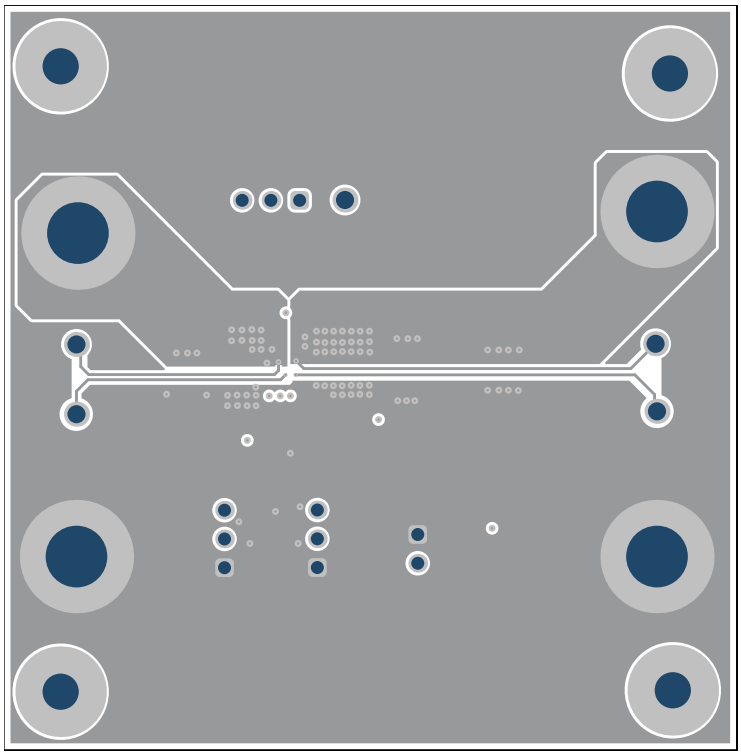

Figure 3-3. Bottom-Side Layout

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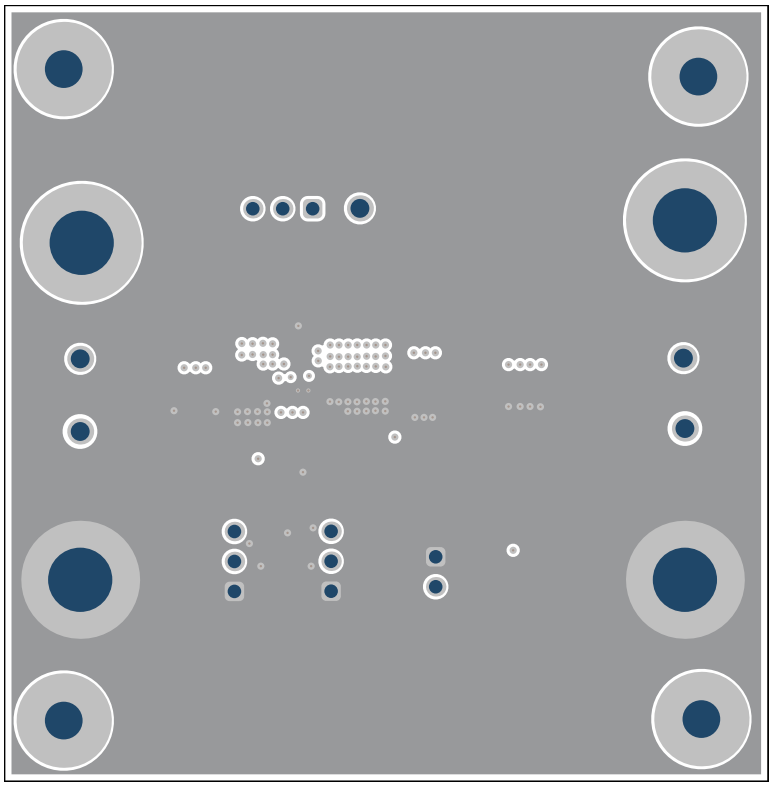

Figure 3-4. Inner Layer 1 Layout

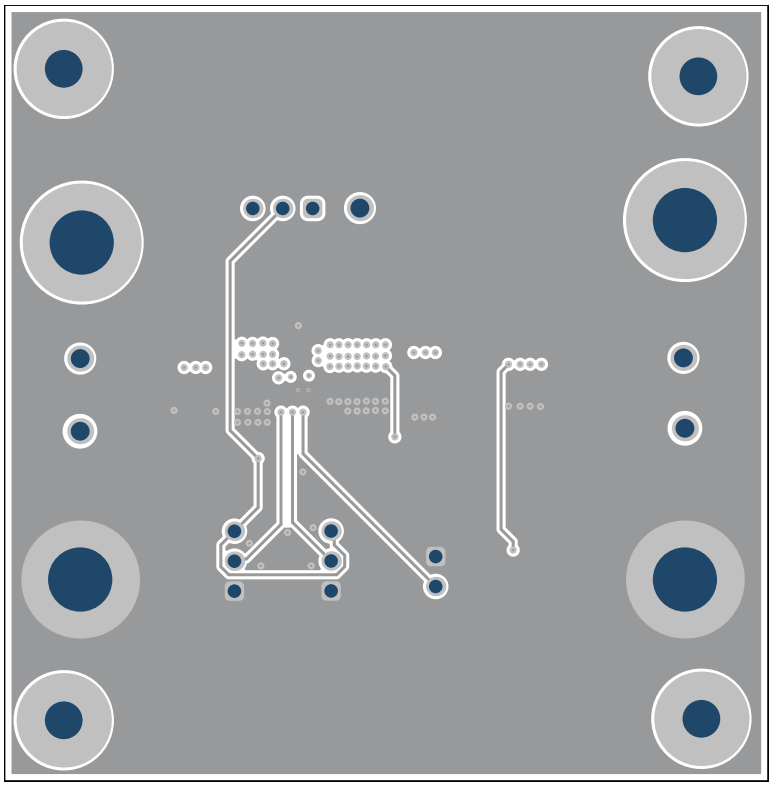

Figure 3-5. Inner Layer 2 Layout

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3.3 Bill of Materials

Table 3-1 displays the EVM bill of materials.

Table 3-1. Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
C1	1	2.2uF	CAP, CERM, 2.2µF, 10V,+/- 10%, X7R, AEC-Q200 Grade 1, 0603	0603	GRM188R71A225KE15J	MuRata
C2	1	150uF	CAP, TA, 150uF, 10V, +/- 10%, 0.1 ohm, SMD	7343-31	T495D157K010ATE100	Kemet
C3	1	22uF	CAP, CERM, 22uF, 25V, +/- 20%, X5R, 0805	0805	GRM21BR61E226ME44L	MuRata
C4	1	0.1uF	CAP, CERM, 0.1uF, 50V, +/- 20%, X7R, 0402	0402	GRM155R71H104ME14D	MuRata
C6, C7, C8, C9	4	22uF	CAP, CERM, 22uF, 10V, +/- 20%, X5R, 0603	0603	GRM188R61A226ME15D	MuRata
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply
H5, H6, H7, H8	4		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C	Keystone
J1, J2, J3, J4	4		Standard Banana Jack, Uninsulated, 6.73mm	Standard Banana Jack, Uninsulated, 6.73mm	575-6	Keystone
J5	1		Header, 2.54mm, 2x1, Gold, TH	Header, 2.54mm, 2x1, TH	61300211121	Wurth Elektronik
JP1, JP2, JP3	3		Header, 2.54mm, 3x1, Gold, TH	Header, 2.54mm, 3x1, TH	61300311121	Wurth Elektronik
R2	1	49.9	RES, 49.9, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060349R9FKEA	Vishay-Dale
R3	1	732k	RES, 732 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW0603732KFKEA	Vishay-Dale
R6	1	100k	RES, 100 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW0603100KFKEA	Vishay-Dale
R7	1	10.0k	RES, 10.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060310K0FKEA	Vishay-Dale
SH-JP1, SH-JP2, SH-JP3	3	1x2	Shunt, 100mil, Flash Gold, Black	Closed Top 100mil Shunt	SPC02SYAN	Sullins Connector Solutions
TP1, TP2, TP3, TP4, TP5	5		Test Point, Multipurpose, White, TH	White Multipurpose Test point	5012	Keystone Electronics
U1	1		5.5V 5.5A 2.4MHz Fully-Integrated Synchronous Boost Module, with Output Discharge Function	QFN-FCMOD2	TPSM81033	Texas Instruments

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Table 3-1. Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
C5	0	1000uF	CAP, AL, 1000uF, 10V, +/- 20%, 0.15 ohm, SMD	SMT Radial G	EEE-FC1A102P	Panasonic
C10	0	47uF	CAP, CERM, 47uF, 10V, +/- 10%, X5R, 1206	1206	GRM31CR61A476KE15L	MuRata
C11	0	100pF	CAP, CERM, 100pF, 50tV, +/- 5%, C0G/NP0, 0603	0603	GRM1885C1H101JA01D	MuRata
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A
R4	0	4.75k	RES, 4.75 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW06034K75FKEA	Vishay-Dale
R5	0	0	RES, 0, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	RMCF0603ZT0R00	Stackpole Electronics Inc

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4 Additional Information

4.1 Trademarks

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5 Revision History

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

Changes from Revision * (May 2024) to Revision A (November 2024)	Page
• Changed status from APL to RTM	1

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