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TPS211xEVM
Power Multiplexer Evaluation Module

User's Guide

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range between 2.8 V and 5.5 V and the output voltage range of 2.8 V and 5.5 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 60°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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Read This First

About This Manual

This user's guide describes the TPS211x evaluation module (EVM). This guide contains the EVM schematic, bill of materials, assembly drawing, and top and bottom board layouts.

How to Use This Manual

This document contains the following chapters:

❑ Chapter 1- Introduction

❑ Chapter 2- EVM Setup

❑ Chapter 3- Schematic and Bill of Materials

❑ Chapter 4- Board Layout

The information in a caution or a warning is provided for your protection. Please read each caution and warning carefully.

Related Documentation From Texas Instruments

TPS2110/1 Autoswitching Power Mux- data sheet (SLVS443)

TPS2112/3 Autoswitching Power Mux- data sheet (SLVS446)

TPS2114/5 Autoswitching Power Mux- data sheet (SLVS447)

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Electrostatic Sensitive Devices

> **This EVM contains components that can potentially be damaged by electrostatic discharge. Always transport and store the EVM in its supplied ESD bag when not in use. Handle using an antistatic wristband. Operate on an antistatic work surface. For more information on proper handling, refer to SSYA008.**

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Introduction

The TPS211x EVM is an evaluation module for the Texas Instruments TPS211x family of two-input, one-output power multiplexers. These multiplexers enable seamless transition between two power supplies, each operating at 2.8 V–5.5 V and delivering up to 1 A. EVM configurations are available for the TPS2110 through TPS2115. Refer to Table 3-1, the schematic, and the bill of materials in this user's guide to distinguish between these configurations.

The EVM has test points for convenient access to all critical node voltages, potentiometers for adjusting the current limit and the auto-switching voltage sense thresholds, headers for selecting the manual/auto-switching operating modes, and headers for selecting the output hold-up capacitance.

Chapter 2

EVM Setup

This chapter describes the proper setup of the TPS211xEVM for use in device evaluations.

2.1 Setting Up the EVM

The user is encouraged to read the applicable TPS211x data sheet before using the EVM.

The following test equipment is recommended:

❑ Storage oscilloscope

❑ Current probe

❑ Two adjustable power supplies, 0V – 6 V @ 2-A

❑ Volt-Ohm meter

❑ A passive or active load

Figure 2-1 shows the EVM test set up.

Figure 2-1. Basic EVM Setup
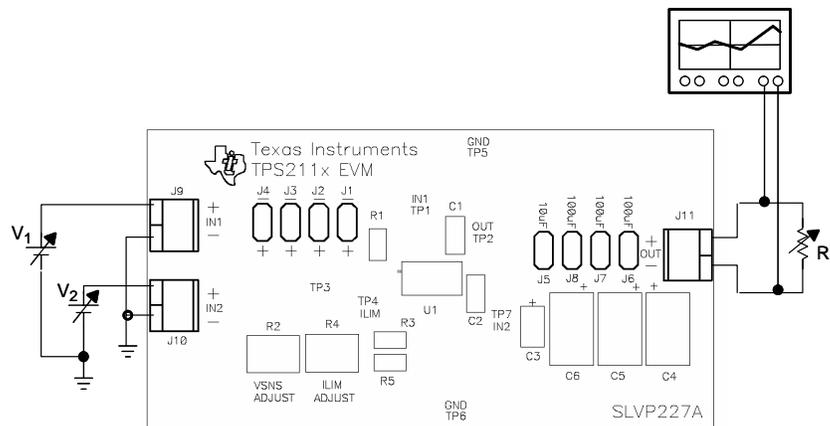
2.2 Current-Limit Adjustment

Potentiometer R4 controls the resistance R_{ILIM} that sets the TPS211x current limit threshold. Adjusting R4 clockwise increases the current limit threshold by decreasing R_{ILIM}. The current limit threshold is $250/R_{ILIM}$ for the TPS2110, TPS2112, and TPS2114 and $500/R_{ILIM}$ for the TPS2111, TPS2113, and TPS2115.

To measure the resistance R_{ILIM}, connect an ohmmeter between test points TP4 and GND. The measurement should be made with the IN1 and IN2 supplies off. To ensure accurate in-circuit resistance measurements, the ohmmeter must apply no more than 0.5 V across the resistor.

2.3 Manual Switching Mode (TPS2110/1/4/5 Only)

Potentiometer R2 and header J4 have no effect upon the operation of the manual switching mode.

Some products like digital cameras and palm computers that receive power from an internal battery or from a docking station can take advantage of the manual-switching feature. The TPS2110/1/4/5 digital control input, D1, can directly sense the presence of the docking station and connect the load to the appropriate power source.

2.3.1 Configuring the TPS2110/1 for Manual Switching

To place the device into manual switching mode, short header J1. The logic level on the D1 pin now determines which input is selected. On the EVM, header J2 controls the D1 pin. If J2 is left open, then D1 is internally pulled high and IN1 is selected. If J2 is shorted, then D1 is pulled low and IN2 is selected.

2.3.2 Configuring the TPS2114/5 for Manual Switching

To place the device into manual switching mode, short header J2. The logic level on the D1 pin determines which input is selected. On the EVM, header J3 controls the D1 pin. If J3 is left open, then D1 is internally pulled high and IN1 is selected. If J3 is shorted, then D1 is pulled low and IN2 is selected.

2.4 Automatic Switching Modes

All EVMs support Mode 1 automatic switching. Mode 2 automatic switching is supported by the TPS2110–TPS2113 EVMs only.

2.4.1 Mode 1 Automatic Switching

OUT connects to the higher of IN1 and IN1 in Mode 1 automatic switching. Refer to Table 2-1 to configure the EVM for Mode 1 automatic switching.

Table 2-1. EVM Shorting Jumper Placement for Mode 1 Automatic Switching

EVM	Device	Header			
		J1	J2	J3	J4
SLVP227-001	TPS2110		X		
SLVP227-002	TPS2111		X		
SLVP227-003	TPS2112		X		
SLVP227-004	TPS2113		X		
SLVP227-005	TPS2114			X	
SLVP227-006	TPS2115			X	

A manufacturer can provide a secondary battery pack option to extend the product run time with Mode 1 automatic switching. The TPS211x cycles between the primary and secondary batteries until both batteries are drained.

2.4.2 Mode 2 Automatic Switching (TPS2110/1/2/3 Only)

In Mode 2 automatic switching, OUT connects to IN1 if the voltage at IN1 is sufficiently high, otherwise OUT connects to the higher of IN1 and IN2. The threshold at which IN1 is selected corresponds to approximately 0.8 V at test point TP3. The corresponding value of the IN1 voltage depends upon the setting of potentiometer R2. Adjusting R2 clockwise increases the IN1 selection threshold voltage.

Refer to Table 2-2 to configure the EVM for Mode 2 automatic switching.

Table 2-2. EVM Shorting Jumper Placement for Mode 2 Automatic Switching

EVM	Device	Header			
		J1	J2	J3	J4
SLVP227-001	TPS2110		X		X
SLVP227-002	TPS2111		X		X
SLVP227-003	TPS2112		X		X
SLVP227-004	TPS2113		X		X

A manufacturer can provide a secondary battery pack option to extend the product run time with Mode 2 automatic switching. The TPS2110–TPS2113 drains the primary battery at IN1 and automatically switches to the secondary battery at IN2.

2.5 Output Voltage Holdup

Headers J5–J8 select the output holdup capacitance.

The output voltage drops out for 60 μs (max) whenever the TPS211x switches between the IN1 and IN2 supplies. Some capacitance at the TPS211x output is necessary to prevent the output voltage from dropping too much during the supply switchover. Excessive voltage drop can cause a system to reset or lose data.

2.6 Switch Status (TPS2112/3/4/5 Only)

The switch status output can be monitored at the positive terminal of header J1. A switch status output equal to logic 1 corresponds to an IN2 switch that is on.

Schematic and Bill of Materials

The TPS211xEVM schematic and bill of materials are provided in this chapter.

3.1 EVM Configurations

Table 3-1. Available EVM Configurations

EVM Designator	Device	Current-Limit Adjustment Range	Switch Status Output	Switching Modes	
				Automatic	Manual
SLVP227-001	TPS2110	0.31 A–0.75 A	No	Yes	Yes
SLVP227-002	TPS2111	0.63 A–1.25 A	No	Yes	Yes
SLVP227-003	TPS2112	0.31 A–0.75 A	Yes	Yes	No
SLVP227-004	TPS2113	0.63 A–1.25 A	Yes	Yes	No
SLVP227-005	TPS2114	0.31 A–0.75 A	Yes	Yes	Yes
SLVP227-006	TPS2115	0.63 A–1.25 A	Yes	Yes	Yes

3.2 Schematic

Figure 3-1. TPS211xEVM Schematic
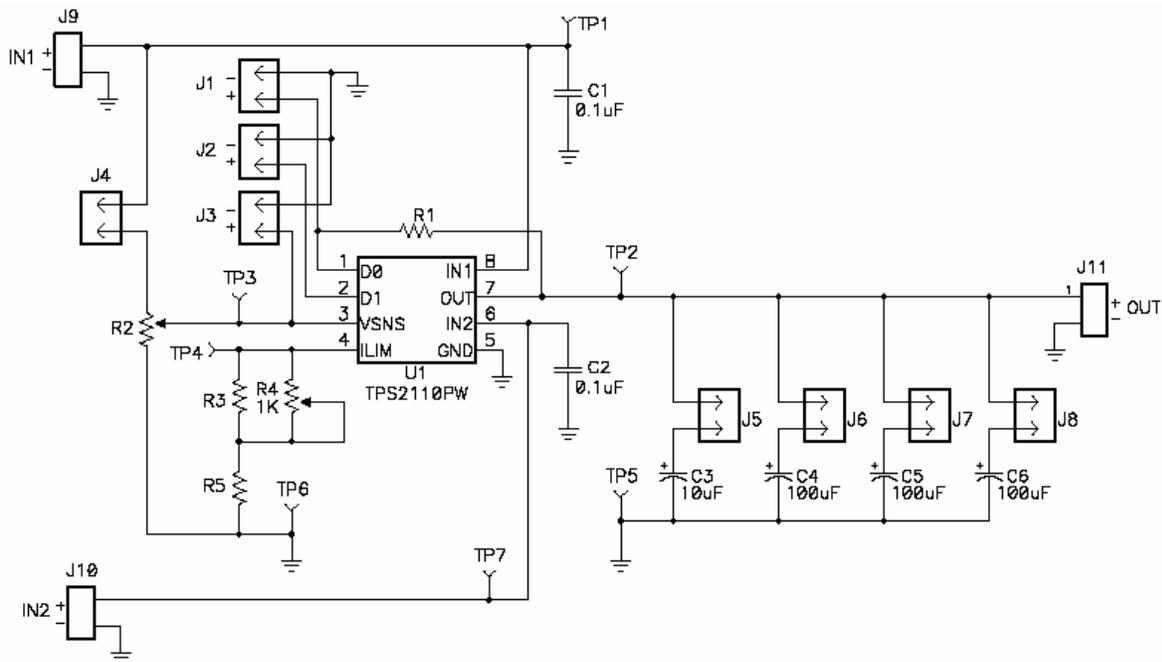
U1	R1	R2	R3	R5	Current-Limit
TPS2110	—	10KΩ	887	332	0.31 A–0.75 A
TPS2111	—	10KΩ	681	392	0.63 A–1.25 A
TPS2112	10KΩ	10KΩ	887	332	0.31 A–0.75 A
TPS2113	10KΩ	10KΩ	681	392	0.63 A–1.25 A
TPS2114	10KΩ	—	887	332	0.31 A–0.75 A
TPS2115	10KΩ	—	681	392	0.63 A–1.25 A

3.3 Bill of Materials

Table 3-2. SLVP227 Bill of Materials

Ref Des	Quantity						Description	MFG	MFG PART #	Size
	-001	-002	-003	-004	-005	-006				
U1	1	0	0	0	0	0	IC, Power mux	Texas Instruments	TPS2110PW	PW-8
	0	1	0	0	0	0	IC, Power mux	Texas Instruments	TPS2111PW	PW-8
	0	0	1	0	0	0	IC, Power mux	Texas Instruments	TPS2112PW	PW-8
	0	0	0	1	0	0	IC, Power mux	Texas Instruments	TPS2113PW	PW-8
	0	0	0	0	1	0	IC, Power mux	Texas Instruments	TPS2114PW	PW-8
	0	0	0	0	0	1	IC, Power mux	Texas Instruments	TPS2115PW	PW-8
R3	1	0	1	0	1	0	Resistor, 887 Ω, 1%, 0.1 W	Panasonic	ERJ-6ENF8870	805
	0	1	0	1	0	1	Resistor, 681 Ω,, 1%, 0.1 W	Panasonic	ERJ-6ENF6810	805
R5	0	1	0	1	0	1	Resistor, 392 Ω,, 1%, 0.1 W	Panasonic	ERJ-6ENF3920	805
	1	0	1	0	1	0	Resistor, 332 Ω,, 1%, 0.1 W	Panasonic	ERJ-6ENF3320	805
R1	0	0	1	1	1	1	Resistor, 10 KΩ,, 1%, 0.1 W	Panasonic	ERJ-6ENF1002	805
R4	1	1	1	1	1	1	Resistor, Pot, 1 KΩ,, 10%, 0.25 W, 12-turn	Bourns	3266W-1-102	N/A
R2	1	1	1	1	0	0	Resistor, Pot, 10 KΩ,, 10%, 0.25 W, 12-turn	Bourns	3266W-1-103	N/A
C1, C2	2	2	2	2	2	2	Capacitor, 0.1 μF, 10%, 50 V, X7R	Philips	12062R104K9B20D	1206
C3	1	1	1	1	1	1	Capacitor, tantalum, 10 μF, 20%, 10 V	Vishay	293D106X0010B2T	B
C4-C6	3	3	3	3	3	3	Capacitor, tantalum, 100 μF, 20%, 10 V	Vishay	293D107X0010D2T	D
J1-J8	8	8	8	8	8	8	Header, 2 pin, 0.1" center	Molex	22-03-2021	N/A
TP1-TP4, TP7	5	5	5	5	5	5	Test-point, white	Keystone	5012	N/A
TP5, TP6	2	2	2	2	2	2	Test-point, surface mount, square	Keystone	5016	N/A
J9-J1 1	3	3	3	3	3	3	Terminal block, 125 VAC, 6A, 2 x 3,5mm	On-Shore Tech.	ED555/2DS	N/A

Table 3-2. SLVP227 Bill of Materials (Continued)

Ref Des	Quantity						Description	MFG	MFG PART #	Size
	-001	-002	-003	-004	-005	-006				
REF	1	1	1	1	1	1	PCB, SLVP227A	American PCB		N/A
REF	4	4	4	4	4	4	Bumper, rubber, PSA, black	SPC Technology	SPC2568	N/A
REF	5	5	5	5	5	5	Shorting jumper, 10 μ-inch gold	3M	929955-06	N/A

Chapter 4

Board Layout

This chapter describes the TPS211xEVM board layout and presents some component placement considerations.

4.1   Layout Considerations

The IN1, IN2, and OUT pins of the TPS211x can carry up to 1 A, so traces to these pins should be of suitable length and width to minimize the voltage drop to the load. Locate the 0.1 µF bypass capacitors close to the IN1, IN2, and GND pins of the TPS211x.

*Figure 4-1. Component Placement*
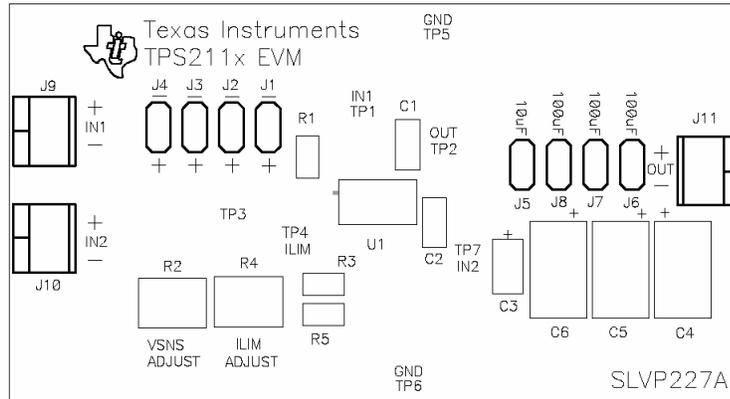
Figure 4-2. Top-Side Layout
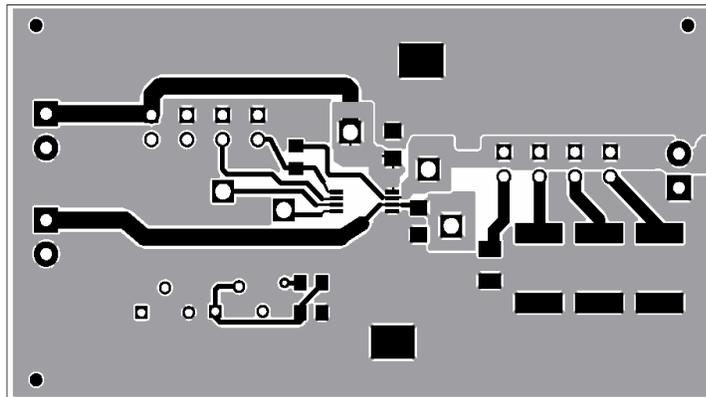
Figure 4-3. Bottom-Side Layout