

## **TPS2124 Evaluation Module**

This user's guide describes the characteristics, operation, and use of the TPS2124EVM (EVM). This document contains the EVM schematics, board layout, bill of materials (BOM), and necessary instructions on how to properly operate the EVM.

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## 1 Introduction

The TPS2124 EVM is an evaluation module for TI's TPS2124 two-input, one-output power multiplexer. This device automatically detects, selects, and seamlessly transitions between two power supplies, each operating from 2.7 V to 22 V. The TPS2124 device, WCSP package, can deliver up to 2 A to a downstream load. This user's guide contains the EVM schematics, board layout, list of materials, and necessary instructions on how to properly operate the EVM.

The EVM has test points for convenient access to all critical voltages and pins, and jumpers to configure the different modes of operation. There are also jumpers to configure input and output capacitance, output load resistance, current limit, and the adjustable soft-start time.

### 1.1 Features

The TPS2124 EVM offers many features including:

- Uninterrupted system power with seamless switchover
- Overvoltage protection
- Low  $R_{ON}$  resistance at both inputs: 50 m $\Omega$  typical
- Multiple configurations for different modes of operation

### 1.2 Applications

The TPS2124 power multiplexer can be used in many applications, including:

- Add-on cards (PCIE, RAID, Network)
- ePos
- Video surveillance
- ORing controllers

### 1.3 Description

The TPS2124 EVM power MUX evaluation board enables evaluation of the TPS2124 Power MUX device. The EVM allows operation at different input voltages, although the resistors and jumpers are configured for operation at 3.3 V, 5 V, and 12 V. See the TPS2124 data sheet for more information regarding these settings.

The TPS2124 EVM also allows multiple modes of operation. By configuring the jumpers, the EVM will automatically detect, select, and seamlessly transition between available inputs. The different modes of operation are listed in [Table 1](#).

**Table 1. TPS2124 EVM Comparison Table**

EVM	Modes of Operation:	$V_{OUT}$ Range	$I_{OUT}$ MAX	Package
TPS2124EVM	<ul style="list-style-type: none"> <li>• VCOMP</li> <li>• VREF</li> </ul>	2.7 V–22 V	2 A	WCSP, 1.5 mm x 2.0 mm

## 2 General Configurations

### 2.1 TPS2124 Configurations

This section provides an overview of the TPS2124 evaluation board input and output jumpers. describes the input and output connectors on the EVM. [Table 3](#) describes the different test points and functionality, while [Table 4](#) describes the jumper functionality and configurations.

**Table 2. TPS2124 Input and Output Connector Functionality**

Input	Connector	Label	Description
VIN1	J10	VIN1 + , GND -	Input block header for VIN1
	TP7	VIN1	Input test point for VIN1
	TP5	VIN1_SNS	Input sense connector for VIN1
VIN2	J17	VIN2 + , GND -	Input block header for VIN2
	TP11	VIN2	Input test point for VIN2
	TP10	VIN2_SNS	Input sense connector for VIN2
VOUT	J11	VOUT + , GND -	Output block header for VOUT
	TP8	VOUT	Output test point for VOUT
	TP6	VOUT_SNS	Output sense connector for VOUT
GND	TP12, TP13, TP14, TP15, TP16, TP17, TP18, TP19	GND	Test point for GND

**Table 3. TPS2124 Test Points Description**

Input	Connector	Label	Description
VIN1	TP1	OV1	Overvoltage test point for VIN1
	TP3	PR1	Priority test point for VIN1
VIN2	TP2	OV2	Overvoltage test point for VIN2
	TP9	SEL	Select test point
VOUT	TP4	ST	Status test point

**Table 4. TPS2124 Jumper Description**

Input	Connector	Label	Description
VIN1	J1, J2, J3	PR1 Resistors (3.3 V, 5 V, 12 V)	Sets priority operation based on voltage J1 sets 3.3 V J2 sets 5 V J3 sets 12 V
	J4, J5, J6	OV1 Resistors (3.3 V, 5 V, 12 V)	Sets overvoltage protection for VIN1 channel J4 sets 3.3 V J5, sets 5 V J6 sets 12 V
	JP2	PR1	Priority operation control Position 1-2 sets VCOMP (GND) Position 2-3 sets VREF
VIN2	J7, J8, J9	OV2 Resistors (3.3 V, 5 V, 12 V)	Sets overvoltage protection for VIN2 channel J10 sets 3.3 V J11, sets 5 V J12 sets 12 V
	JP1	SEL	Selects between priority control or GND Position 1-2 disables priority Position 2-3 enables priority

**Table 4. TPS2124 Jumper Description (continued)**

Input	Connector	Label	Description
VOUT	J12	100 $\mu$ F	100- $\mu$ F output capacitor
	J13	100 $\mu$ F	100- $\mu$ F output capacitor
	J14	220 $\mu$ F	220- $\mu$ F output capacitor
	J15	10 $\Omega$	10- $\Omega$ external resistor
	J16	-	Female header for custom output resistance, capacitance
	JP3	ST	Sets adjustable hysteresis Position 1-2 sets ST Position 2-3 disables (GND)
	J18, J19	SS	Soft-start control
	JP4	ILIM	Current Limit Control Position 1-2 sets 2.5 A maximum Position 2-3 sets 1.5 A

### 3 Test Setup and Results

This chapter describes the proper setup for the TPS2124 power MUX EVM. This section explains the different configuration modes present on the EVM, and the required jumper positions to enable each configuration.

#### 3.1 TPS2124EVM Test Equipment

Read the TPS2124 data sheet before using the EVM.

The following test equipment is recommended:

- Storage oscilloscope
- Current probe
- Two adjustable power supplies, 0 V–22 V at 2 A maximum
- A passive or active load

#### 3.2 Setting up the TPS2124EVM

Make sure the TPS2124 evaluation board has default jumper settings as [Table 5](#) shows.

**Table 5. Default Jumper Settings for TPS2124 Evaluation Board**

Input	Connector	Label	Position
	J1	PR1 (3.3 V)	Install
	J4	OV1 (3.3 V)	Install
	J9	J9 (12 V)	Install
	J12, J13	100 $\mu$ F	Install
	J15	10 $\Omega$	Install
	J18	SS (10 nF)	Install
	JP1	SEL	Jump pins 1 and 2
	JP2	PR1	Jump pins 2 and 3
	JP3	ST	Jump pins 2 and 3
	JP4	ILIM	Jump pins 2 and 3

The default jumper configuration sets the Internal Voltage Reference (VREF) configuration. Since the voltage on the priority pin is set for 3.3-V operation and SEL is grounded, the priority is given to VIN1. Therefore, VIN1 can be set to 3.3 V, and the device will prioritize VIN1 even if VIN2 is at a higher voltage. See the data sheet for more information regarding the configuration settings.

#### 4 Board Layout

Figure 1 show the test equipment setup for the TPS2124.

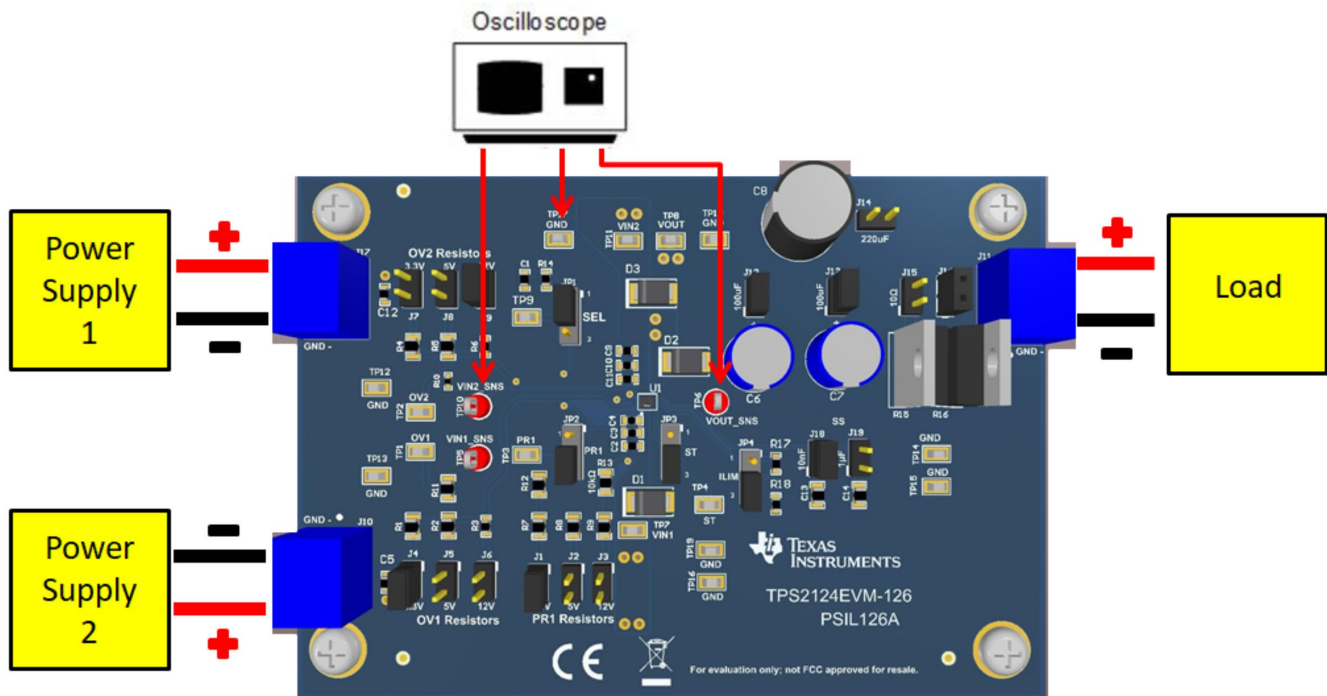


Figure 1. TPS2124 Setup With Test Equipment

## 5 Schematic

Figure 2 illustrates the TPS2124 schematic.

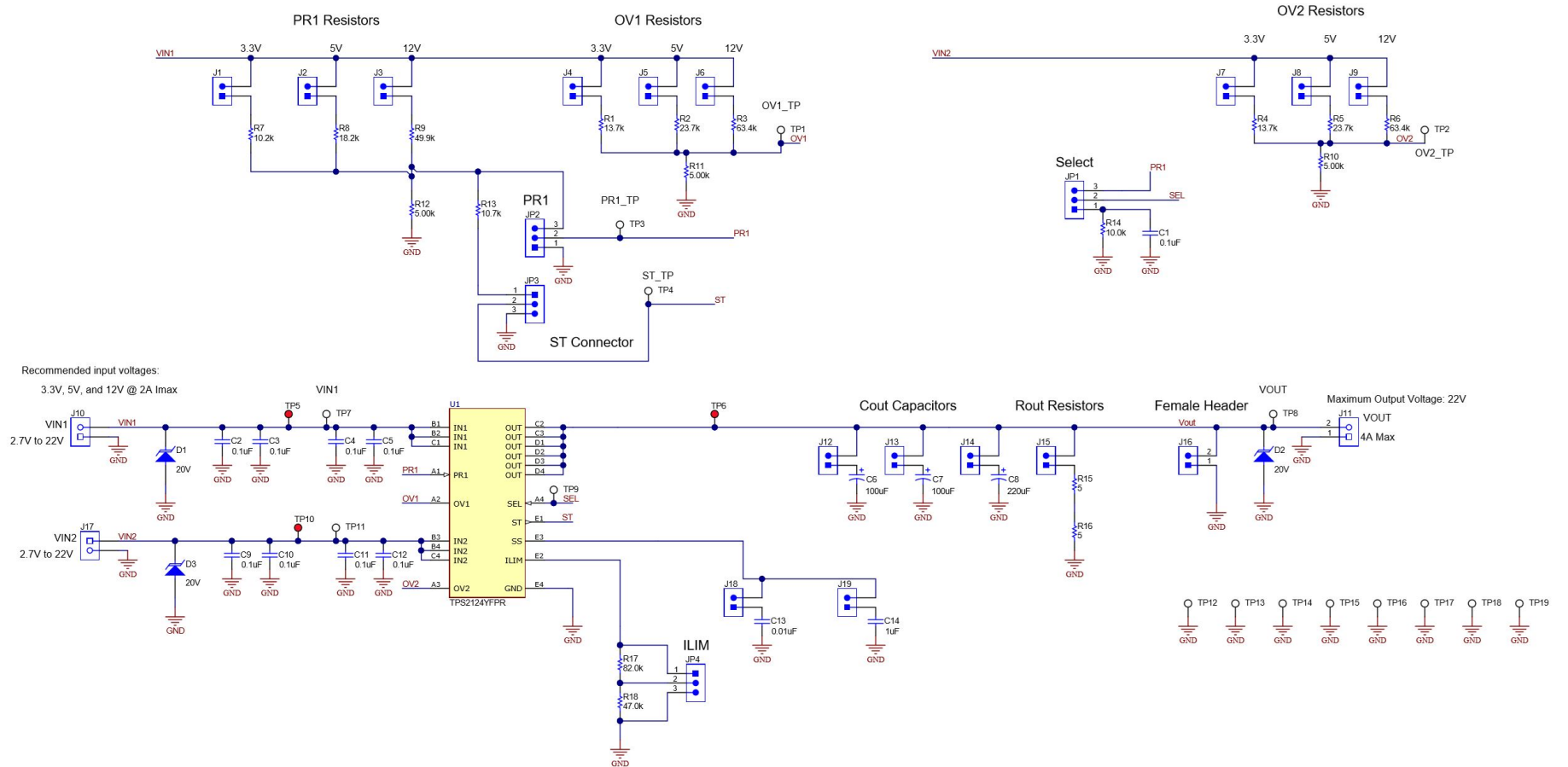


Figure 2. TPS2124 Schematic

## 6 Bill of Materials

Table 6 lists the TPS2124EVM-126 BOM.

**Table 6. TPS2124EVM-126 Bill of Materials<sup>(1)</sup>**

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
!PCB1	1		Printed Circuit Board		PSIL126	Any		
C1, C2, C3, C4, C5, C9, C10, C11, C12	9	0.1uF	CAP, CERM, 0.1 uF, 25 V, +/- 10%, X7R, 0603	0603	06033C104KAT2A	AVX		
C6, C7	2	100uF	CAP, AL, 100 uF, 50 V, +/- 20%, 0.17 ohm, TH	8.0x10.5mm	UHE1H101MPD	Nichicon		
C8	1	220uF	CAP, AL, 220 uF, 35 V, +/- 20%, TH	D10xL12.5mm	UHE1V221MPD6	Nichicon		
C13	1	0.01uF	CAP, CERM, 0.01 uF, 50 V, +/- 10%, X7R, 0805	0805	885012207092	Wurth Elektronik		
C14	1	1uF	CAP, CERM, 1 uF, 50 V, +/- 10%, X7R, 0805	0805	C0805C105K5RACTU	Kemet		
D1, D2, D3	3	20V	Diode, TVS, Uni, 20 V, 32.4 Vc, SMB	SMB	SMBJ20A-13-F	Diodes Inc.		
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, J5, J6, J7, J8, J9, J12, J13, J14, J15, J18, J19	15		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		
J10, J11, J17	3		Terminal Block, 2x1, 5.08mm, TH	2x1 Terminal Block	OSTTA024163	On-Shore Technology		
J16	1		Receptacle, 2x1, 2.54mm, Tin, TH	Receptacle, 2x1, 2.54mm, TH	SSW-102-01-T-S	Samtec		
JP1, JP2, JP3, JP4	4		Header, 100mil, 3x1, TH	Header, 3x1, 100mil, TH	800-10-003-10-001000	Mill-Max		
R1, R4	2	13.7k	RES, 13.7 k, 1%, 0.125 W, 0805	0805	ERJ-6ENF1372V	Panasonic		

<sup>(1)</sup> Unless otherwise noted in the *Alternate Part Number* or *Alternate Manufacturer* columns, all parts may be substituted with equivalents.



**Table 6. TPS2124EVM-126 Bill of Materials<sup>(1)</sup> (continued)**

Designator	Quantity	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
R2, R5	2	23.7k	RES, 23.7 k, 0.1%, 0.125 W, 0805	0805	RT0805BRD0723K7L	Yageo America		
R3, R6	2	63.4k	RES, 63.4 k, 0.1%, 0.1 W, 0603	0603	RT0603BRD0763K4L	Yageo America		
R7	1	10.2k	RES, 10.2 k, 0.5%, 0.1 W, 0805	0805	RR1220P-1022-D-M	Susumu Co Ltd		
R8	1	18.2k	RES, 18.2 k, 0.1%, 0.125 W, 0805	0805	RT0805BRD0718K2L	Yageo America		
R9	1	49.9k	RES, 49.9 k, 0.5%, 0.1 W, 0805	0805	RR1220P-4992-D-M	Susumu Co Ltd		
R10	1	5.00k	RES, 5.00 k, 0.1%, 0.05 W, 0402	0402	PNM0402E5001BST1	Vishay-Dale		
R11, R12	2	5.00k	RES, 5.00 k, 0.1%, 0.2 W, 0805	0805	PNM0805E5001BST5	Vishay Thin Film		
R13	1	10.7k	RES, 10.7 k, 1%, 0.125 W, AEC-Q200 Grade 0, 0805	0805	CRCW080510K7FKEA	Vishay-Dale		
R14	1	10.0k	RES, 10.0 k, 0.5%, 0.1 W, 0603	0603	RT0603DRE0710KL	Yageo America		
R15, R16	2	5	RES, 5, 1%, 50 W, TO-220-2	TO-220-2	PF2205-5RF1	RIDEON		
R17	1	82k	RES, 82.0 k, 0.1%, 0.1 W, 0603	0603	RG1608P-823-B-T5	Susumu Co Ltd		
R18	1	47k	RES, 47.0 k, 0.5%, 0.15 W, AEC-Q200 Grade 0, 0603	0603	MCT0603MD4702DP500	Vishay		
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8, SH-J9, SH-J10	10	1x2	Shunt, 100mil, Flash Gold, Black	Closed Top 100mil Shunt	SPC02SYAN	Sullins Connector Solutions		
TP1, TP2, TP3, TP4, TP7, TP8, TP9, TP11, TP12, TP13, TP14, TP15, TP16, TP17, TP18, TP19	16		Test Point, Miniature, SMT	Testpoint_Keystone_Miniature	5015	Keystone		
TP5, TP6, TP10	3		Test Point, Multipurpose, Red, TH	Red Multipurpose Testpoint	5010	Keystone		
U1	1		TPS2124YFPR, YFP0020AAAA (DSBGA-20)	YFP0020AAAA	TPS2124YFPR	Texas Instruments	TPS2124YFPT	Texas Instruments
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A		

**Revision History**

<b>DATE</b>	<b>REVISION</b>	<b>NOTES</b>
May 2020	*	Initial release

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