TPS2505EVM

This user's guide describes the characteristics, operation, and use of the TPS2505EVM Evaluation Module. It includes setup instructions, a schematic diagram, a bill of materials (BOM), and PCB layout drawings for the evaluation module.

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1 Introduction

The Texas Instruments TPS2505 is an integrated 5.1 V Boost, Dual-Switch, and 3.3V LDO PM IC for USB Hubs. The IC has 3 features as summarized below:

1. Boost Regulator: Generates a 5.1 V/1 A DC output, from a 1.8 V (2.2 V for startup) to 5.25 V input supply.
2. Dual-Switch USB Port Support: HSPORT1 (500 mA), and HSPORT2 (100 mA) with separate and programmable current limiting and fault reporting.
3. LDO regulator: 3.3 V, 200 mA with 3.1 V reset output. Powered from Boost regulator.

Table 1 gives Key Features and Specifications of TPS2505.

Table 1. TPS2505 Key Features and Specifications

Feature	Min	Nom	Max	Note
BOOST REGULATOR				
Efficiency		90%		
Supply input voltage	1.8 V		5.25 V	2.2 V bat min required for Boost startup
Continuous on current (HSPORT1)		500 mA		
Continuous on current (HSPORT2)		100 mA		
Primary + secondary port on current		600 mA		
Boost peak current			1 A	
Output Regulated voltage	4.95 V	5.1 V	5.25 V	
HIGH SIDE SWITCHES				
Continuous current (per output)			500 mA	At 5.1 V continuous, max Boost output drive is 1A
Current limiting (per output)			1.5 A	Independent and externally programmable via ILIM1/2 pins
Fault reporting				Each output to trip and indicate fault condition if load > ILIM. Active low fault flag outputs, FAULT1b, FAULT2b.
LOW DROP-OUT REGULATOR				
Supply input voltage	4.95 V	5.1 V	5.25 V	Boost output
Output regulated voltage	3.2 V	3.3 V	3.4 V	
Output current at 3.3 V			200 mA	
LDO RESET				
Timing		175 ms		Active low signal, goes high 150-200 ms after 3.3 V supply is valid
Timing threshold			3.1 V	While 3.3 V supply is < 3.1 V, output is low

2 Setup

This section describes the connectors and jumpers on the EVM as well as how to properly connect, setup, and use the TPS2505EVM.

2.1 J1 – VIN

Connector for the EVM input power supply. Input voltage range is from 1.8V (2.2 V at startup) to 5.25 V. The leads to the connector should be twisted and kept as short as possible. TP1 is the test point for the connector.

2.2 J2 – BOOST_OUT

Connector for the BOOST regulator output (5.1 V/1 A). TP8 is the test point for the connector.

2.3 J3 – HSPORT1

Connector for the HSPORT1 output (0.5 A). TP7 is the test point for the connector.

2.4 J4 – HSPORT2

Connector for the HSPORT2 output (0.1 A). TP6 is the test point for the connector.

2.5 J5 – LDO_OUT

Connector for the LDO output (3.3 V/200 mA). TP9 is the test point for the connector.

2.6 JPS1 – DIS_HSPORT1

This jumper disables the switch of HS_PORT1 high-side switch. When the jumper is ON, it pulls down the pin of EN_HSPORT1 to disable the switch. When the jumper is OFF, the pin of EN_HSPORT1 is pulled up by resistor R1 to VIN which enables the switch.

2.7 JPS2 – DIS_BOOST

This jumper disables the BOOST regulator. When the jumper is ON, it pulls down the pin of EN_ BOOST to disable the BOOST regulator. When the jumper is OFF, the pin of EN_ BOOST is pulled up by resistor R2 to VIN which enables the BOOST.

2.8 JPS3 – DIS_LDO

This jumper disables the LDO regulator. When the jumper is ON, it pulls down the pin of EN_LDO to disable the LDO regulator. When the jumper is OFF, the pin of EN_ LDO is pulled up by resistor R3 to VIN which enables the LDO.

2.9 JPS4 – DIS_HSPORT2

This jumper disables the switch of HS_PORT2 high-side switch. When the jumper is ON, it pulls down the pin of EN_HSPORT2 to disable the switch. When the jumper is OFF, the pin of EN_HSPORT2 is pulled up by resistor R4 to VIN which enables the switch.

2.10 JPS5 – R_ILIM1

This jumper is used to set the current-limit threshold of USB switch by allowing connection or bypassing resistor R10 from ILIM1 to GND. Set the nominal current-limit threshold using Equation 1:

$$IOS(nom)\ [A] = 26000 / RILIM\ [\Omega] \quad (1)$$

2.11 JPS6 – R_ILIM2

This jumper is used to set different current-limit threshold of USB switch by allowing connection or bypassing resistor R9 from ILIM2 to GND. Set the nominal current-limit threshold using Equation 2:

$$IOS(nom)\ [A] = 26000 / RILIM\ [\Omega] \quad (2)$$

2.12 JPS7 – LDO_IN_SELECT

This jumper is used to select LDO input power supply source. Connecting pins 1 and 2 selects BOOST_OUT, connecting pins 2 and 3 selects VIN as LDO input source. TP2 is the test point for LDO_IN.

TP3 – LDO_OUT test point.
TP4 – FAULT1B test point.
TP5 – FAULT2B test point.
TP10 – BOOST switch node test point.
TP11, TP12, TP13, and TP14 – Power GND (PGND) test points.
TP15 – ILIM1 test point.
TP16 – ILIM2 test point.

2.13 L2 – 2.2 µH DNI Inductor

DNI (Do Not Install) part for optional use according to application needs.

2.14 C2 – 100 µF DNI Capacitor

DNI (Do Not Install) part for optional use according to application needs.

3 Schematic, Silk Screen, and Bill of Materials

3.1 TPS2505EVM Schematic

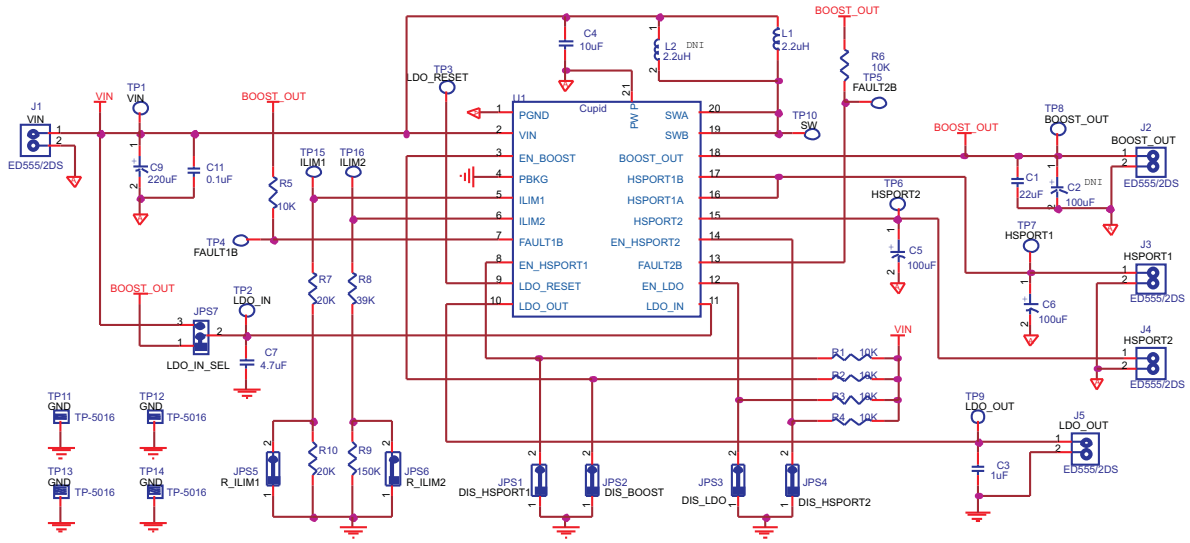

Figure 1. TPS2505 EVM Schematic.

3.2 PCB Silkscreen

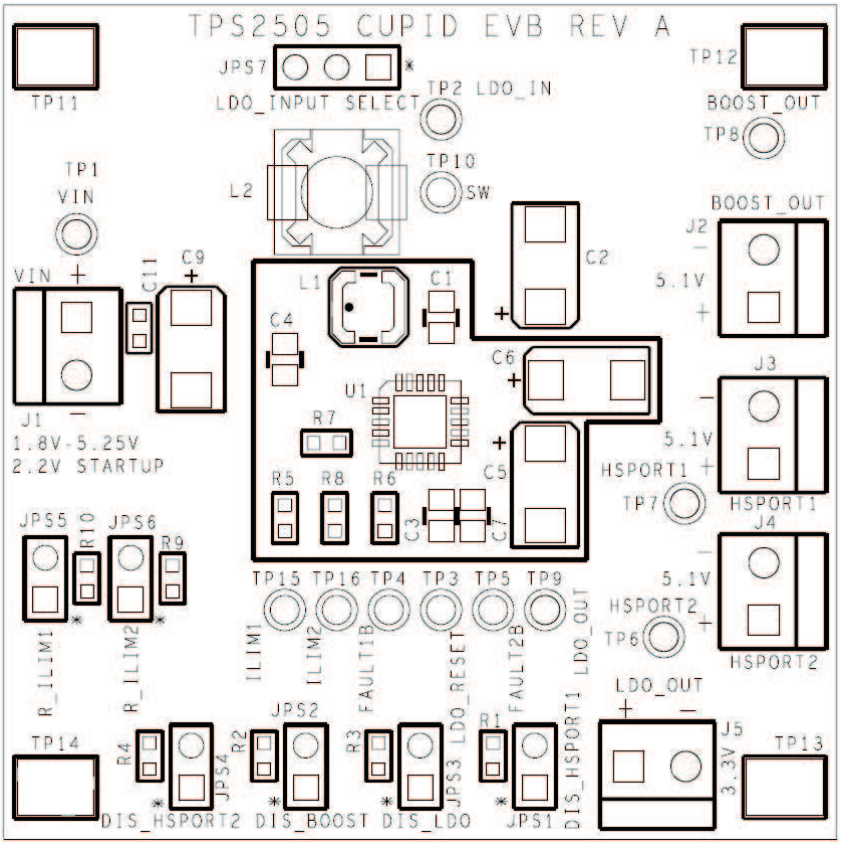

Figure 2. TPS2505 EVM PCB Silkscreen.

3.3 Bill of Materials

Table 2. TPS2505EVM Bill of Materials

QTY	Part Reference	Value	Part Number	PCB Footprint
1	C1	22 µF	C2012X5R0J226M	0805
4	C2, C5, C6, C9	100 µF	T495C227K006ZTE100	6032
1	C3	1 µF	Generic	0805
1	C4	10 µF	C2012X5R0J106M	0805
1	C7	4.7 µF	C2012X5R0J475M	0805
1	C11	0.1 µF	Generic	0603
4	J1, J2, J3, J4, J5	ED555/2DS	ED555/2DS	ED555_2DS
7	JPS1, JPS2, JPS3, JPS4, JPS5, JPS6, JPS7	Jumper_1x2_100	Generic	H2
1	L1	2.2 µH	LPS4018-222ML	LPS4018-222ML
1	L2	2.2 µH	DR73-2R2-R	DR73-2R2-R
6	R1, R2, R3, R4, R5, R6	10 KΩ	Generic	0603
2	R7, R10	20 KΩ	Generic	0603
1	R8	39 KΩ	Generic	0603
1	R9	150 KΩ	Generic	0603
12	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP15, TP16	Test loop (Black)	5001	MINIATURE_TH_TP
4	TP11, TP12, TP13, TP14	TP-5016	5016	TP_5016

Table 2. TPS2505EVM Bill of Materials (continued)

QTY	Part Reference	Value	Part Number	PCB Footprint
1	U1	TPS2502	TPS2502	20_RGW

4 Board Layout

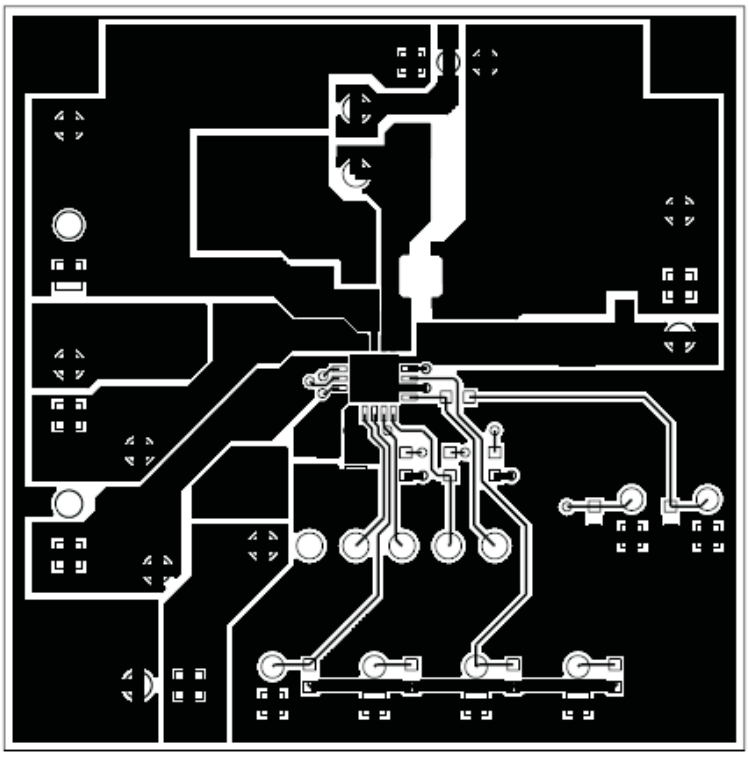

Figure 3. TPS2505 EVM PCB Top Layer Layout

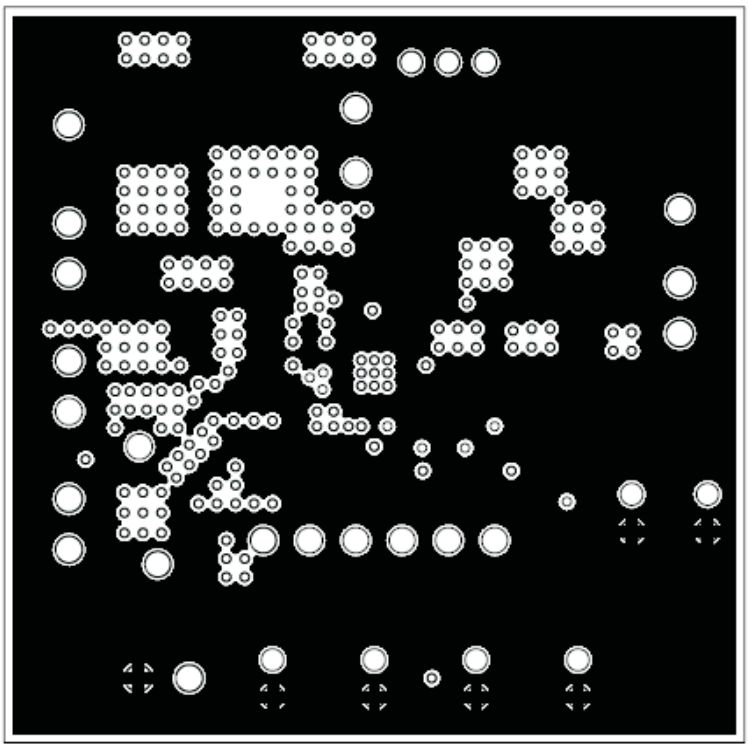

Figure 4. TPS2505 EVM PCB Second Layer Layout

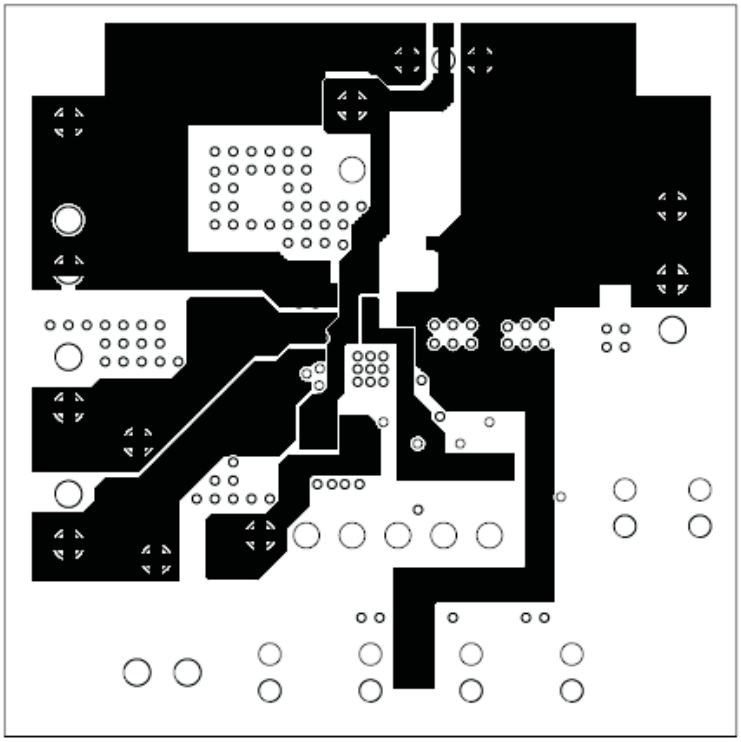

Figure 5. TPS2505 EVM PCB Third Layer Layout

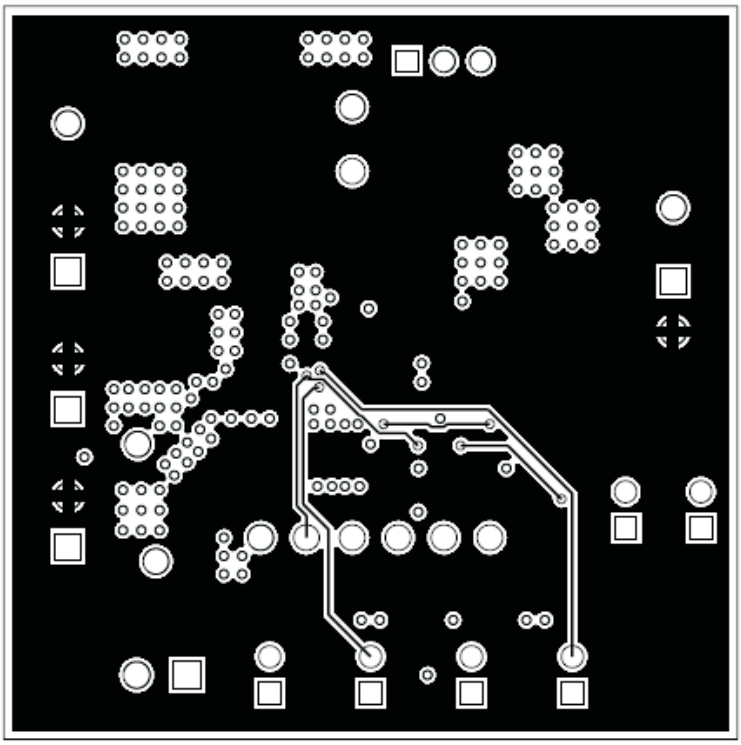

Figure 6. TPS2505 EVM PCB Bottom Layer Layout

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 3.1 V to 6.5 V and the output voltage range of xxx V to xxx 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 125°C. The EVM is designed to operate properly with certain components above 125°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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