TPS657051/2EVM-522 Evaluation Module

This user's guide describes the characteristics, operation, and use of the TPS657051/2EVM evaluation module (EVM). The EVM is designed to help the user easily evaluate and test the operation and functionality of the TPS657051/2. This user's guide includes setup instructions for the hardware, a schematic diagram, a bill of materials, and printed-circuit board layout drawings for the evaluation module.

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1 Introduction

The TPS657051/2EVM-522 evaluation module is a fully assembled and tested circuit for evaluating the TPS657051/2 3-channel power management integrated circuit (IC).

1.1 Requirements

In order to operate this evaluation module (EVM), the following components must be connected and properly configured. All components and connectors are supplied in the EVM DC power supply.

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1.2 Power Supply Requirements

A dc power supply capable of delivering 5 V at 1 A is required to operate this EVM

1.3 Applications

- USB camera
- Handheld applications

1.4 Features

- Input voltage rating
- 2 × 200-mA Step-down converter for TPS657051/2
- 2.25-MHz switching frequency
- 1 General-purpose 200-mA LDO

2 TPS657051/2EVM Electrical Performance Specifications

Table 1. TPS657051/2EVM Electrical and Performance Specifications

Parameter		Notes and Conditions		Min	Typ	Max	Unit
INPUT CHARACTERISTICS							
V_{IN}	Input Voltage			3.3		6	V
V_{IN1}	Input Voltage DCDC1			3.3		6	V
V_{IN2}	Input Voltage LDO1			3.3		6	V
V_{UVLO}	UVLO	V_{AC} rising		3.2	3.3	3.45	V
$V_{HYS\ -UVLO}$	UVLO Hysteresis	V_{AC} falling		200		300	mV
OUTPUT CHARACTERISTICS							
V_{DCDC1}	Output Voltage DCDC1	V_{IN} = Nom, I_{OUT} = Nom			3.3		V
V_{DCDC2}	Output Voltage DCDC2	V_{IN} = Nom, I_{OUT} = Nom			1.8		V
V_{LDO1}	Output Voltage LDO1	V_{IN} = Nom, I_{OUT} = Nom	TPS657051		3.0		V
			TPS657052		2.8		
	Output Voltage Accuracy DCDC1, DCDC2	V_{IN} = 3.3 V to 6 V, PFM Mode, Load 0 mA to Iout, max		–1.5 %	–	1.5%	
					1	3	
	Output Voltage Accuracy LDO1	I_{OUT} = 100 mA, Vout = 2.8 V		–2%		+2%	
	Dropout Voltage at LDO	I_O = 200 mA				200	mV
I_{OUT1}	Output Current DCDC1	V_{IN} = Min to Max			400		mA
I_{OUT2}	Output Current DCDC2	V_{IN} = Min to Max			400		mA
I_{OUT1}	Output Current LDO1	V_{IN} = Min to Max			200		mA
SYSTEMS CHARACTERISTICS							
F_{SW}	Switching Frequency			2030	2250	2480	kHz
ηpk	Peak Efficiency	V_{IN} = Nom		–		92%	

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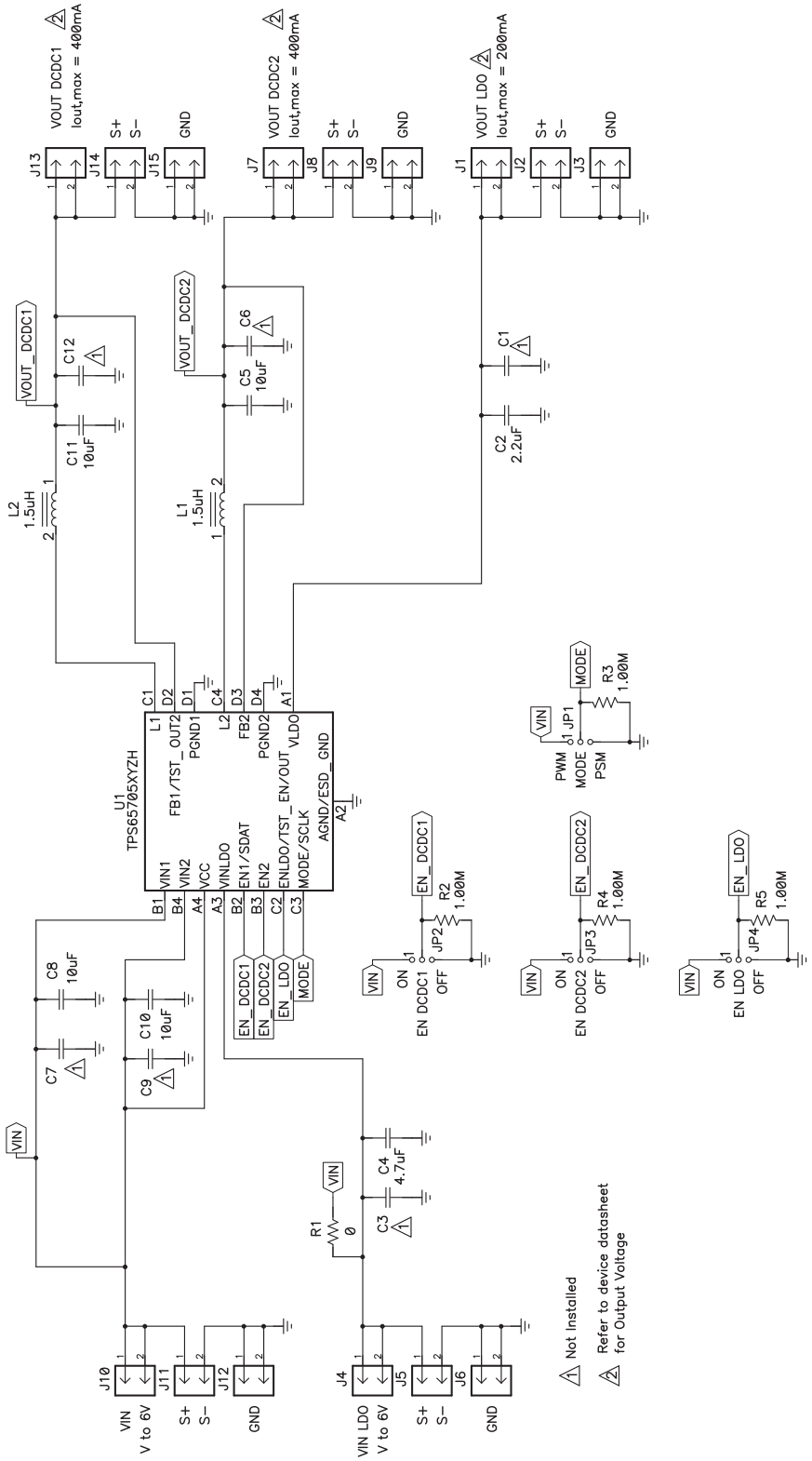
3 TPS657051/2EVM Schematic



For Reference Only, See Table 2 Bill of Materials for Specific Values

Figure 1. TPS657051/2EVM Schematic

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4 Connector and Test Point Descriptions

4.1 Input/Output Connectors

4.1.1 J1 – VLDO

This header is the positive output of the low-dropout (LDO) linear regulator. The default output voltage of the LDO is 3 V (TPS657051) and 2.8 V (TPS657052). The LDO is capable of sourcing up to 200-mA. A load can be connected between J1 and J3 (GND).

This header is the positive connection to the input power supply. The power supply must be connected between J1 and J2 (GND). Twist the leads to the input supply, and keep them as short as possible. The input voltage has to be between 4.35 V and 6 V.

4.1.2 J2 – S+/S–

J2 S+/S– is the sense connection for the output of the LDO. Connect a voltmeter, sense connection of an electronic load, or oscilloscope to this header.

4.1.3 J3 – GND

J3 is the return connection of the LDO. A load can be connected between J3 and J1 (VLDO).

4.1.4 J4 – VINLDO

This header is the input supply for the LDO on the EVM VINLDO and is directly connected to VIN with R1. An external power supply can be connected between J4 (VINLDO) and J6 (GND). Note that the resistors R1 must be removed when supplying the LDO from an external power supply.

4.1.5 J5 – S+/S–

J5 S+/S– is the sense connection for the input power supply of the LDO. Connect a voltmeter, sense connection of a power supply, or oscilloscope to this header.

4.1.6 J6 – GND

J6 is the return connection of the input power supply for the LDO on the EVM. The input of the LDO is directly connected to VIN with R1. Connect an input power supply of the LDO between J4 (VINLDO) and J6.

4.1.7 J7 – VOUT DCDC2

This header is the positive output of VDCDC2 step-down converter. The output voltage of DCDC2 is fixed to 1.8 V from the TPS657051 and TPS657052.

VDCDC2 is capable of sourcing up to 400 mA. A load can be connected between J7 and J9 (GND).

4.1.8 J8 – S+/S–

J8 S+/S– are the sense connection for the output of DCDC2. Connect a voltmeter, sense connection of an electronic load, or oscilloscope to this header.

4.1.9 J9 – GND

J8 is the return connection of VDCDC2 output rail. A load can be connected between J9 and J7 (VDCDC2).

4.1.10 J4 – VIN

This header is the input supply for the dc/dc converters. Connect a power supply between J12 (GND) and J10.

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4.1.11 J11 – S+/S–

J11 S+/S– is the sense connection for the input power supply of the dc/dc converters. Connect a voltmeter, sense connection of a power supply or oscilloscope to this header.

4.1.12 J12 – GND

J12 is the return connection of the input power supply of the dc/dc converters. Connect a power supply between J10 (VIN) and J12.

4.1.13 J13 – VOUT DCDC1

This header is the positive output of VDCDC1 step-down converter. The output voltage of DCDC1 is fixed to 3 V (TPS657051) and 2.8 V (TPS657052).

VDCDC1 is capable of sourcing up to 400 mA. A load can be connected between J15 (GND) and J13.

4.1.14 J14 S+/S–

J14 S+/S- are the sense connection for the output of DCDC1. Connect a voltmeter, sense connection of an electronic load, or oscilloscope to this header.

4.1.15 GND

J8 is the return connection of VDCDC2 output rail. A load can be connected between J13 (VOUT DCDC1) and J15.

4.2 Enable Jumpers and Switches

4.2.1 JP1 MODE

JP1 selects the forced PWM or Power Save Mode (PSM) operation for the DC/DC converters. Placing a shorting bar between MODE and PWM ties the MODE pin of TPS655051/2 to VIN, thereby selecting forced PWM operating mode for the DC/DC converters. Placing a shorting bar between MODE and PFM ties the MODE pin of TPS657051/2 to GND, thereby selecting Power Save Mode operating mode for the DC/DC converter at light-load conditions. If Power Save mode is selected, the DC/DC converters automatically switch to PWM mode at heavier load conditions.

4.2.2 JP2 EN_DCDC1

Placing a shorting bar between EN_DCDC1 and ON ties the enable pin of the DC/DC converter to VIN, thereby enabling the DCDC1. Placing a shorting bar between EN_DCDC1 and OFF ties the enable pin of the DC/DC converter to GND, thereby disabling the DCDC1.

4.2.3 JP2 EN_DCDC1

Placing a shorting bar between EN_DCDC2 and ON ties the enable pin of the DC/DC converter to VIN, thereby enabling the DCDC2. Placing a shorting bar between EN_DCDC2 and OFF ties the enable pin of the DC/DC converter to GND, thereby disabling the DCDC2

4.2.4 JP4 EN_LDO

Placing a shorting bar between EN_LDO and ON ties the enable pin of the LDO to VIN, thereby enabling the LDO. Placing a shorting bar between EN_LDO and OFF ties the enable pin of the LDO to GND, thereby disabling the LDO.

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5 Setup

5.1 Hardware Setup

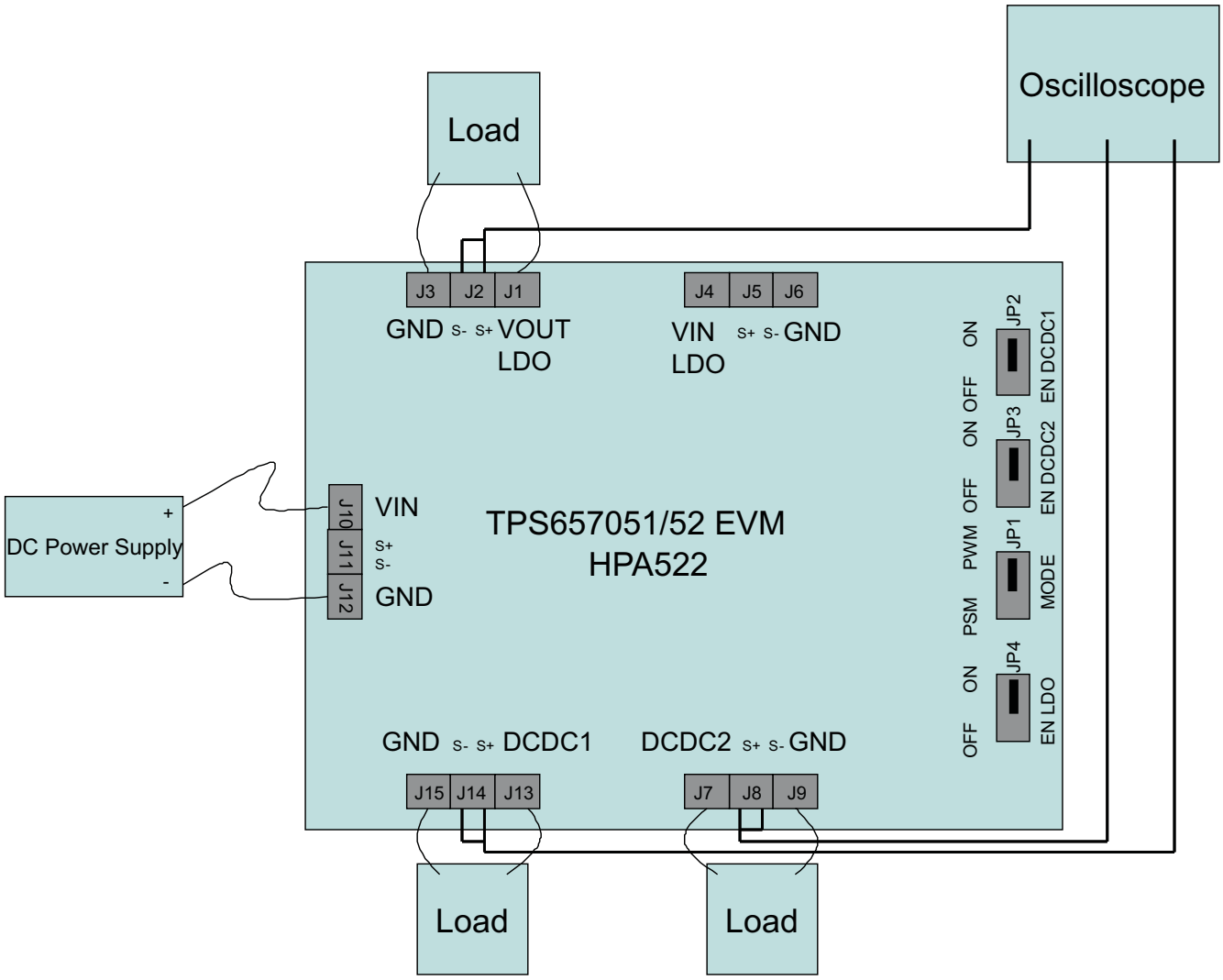

Figure 2. Hardware Board Connection

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6 TPS657051/2EVM Assembly Drawings and Layout

The following illustrations (Figure 3 through Figure 4) show the design of the TPS657051/2EVM printed-circuit board.

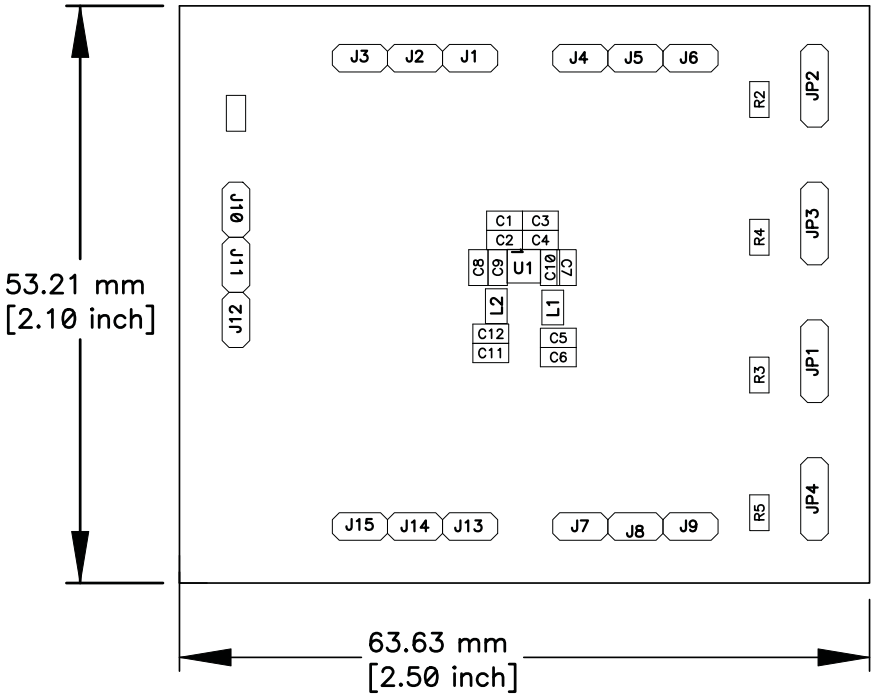

Figure 3. TPS657051/2EVM Component Placement, Viewed From Top

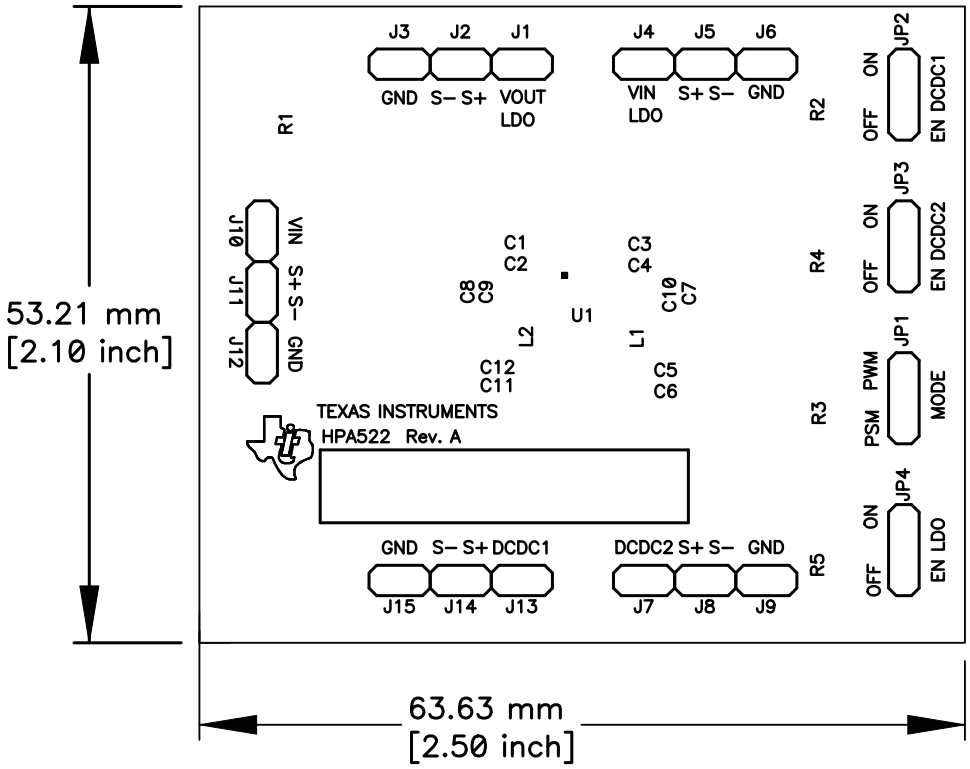

Figure 4. TPS657051/2EVM Silkscreen Top, X-Ray View

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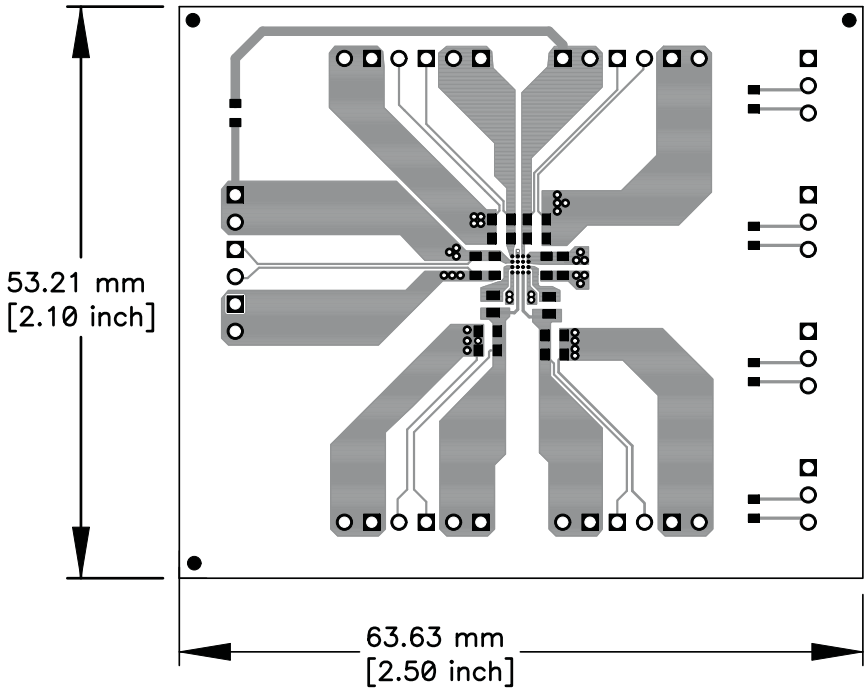

Figure 5. TPS657051/2EVM Top Copper, Viewed From Top

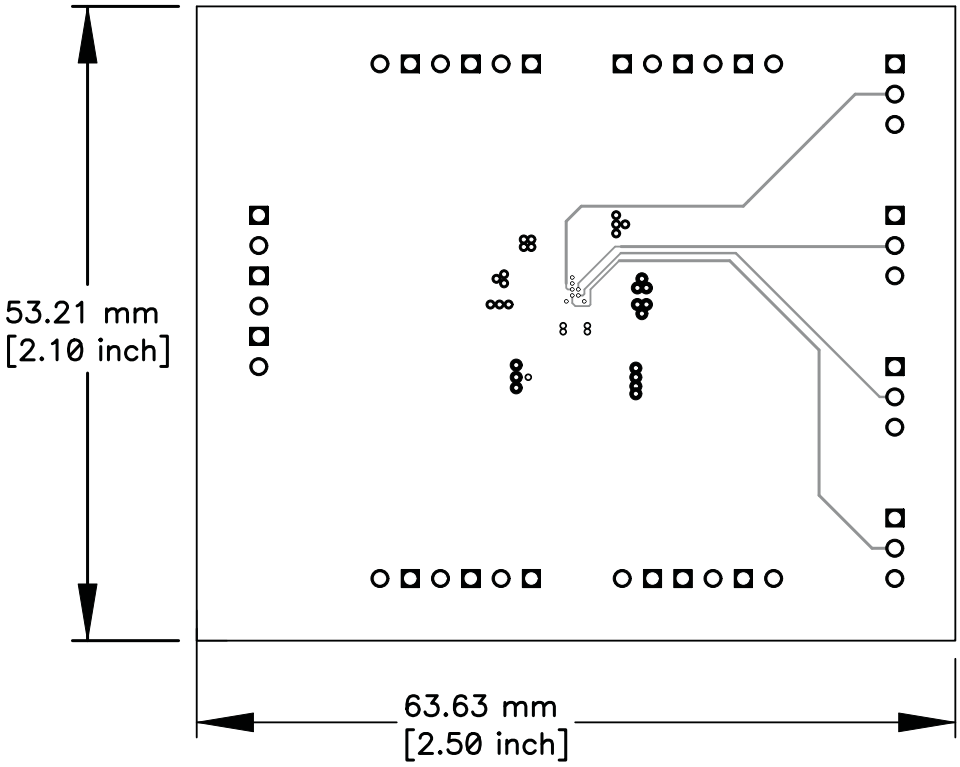

Figure 6. TPS657051/2EVM Internal 1, X-Ray View

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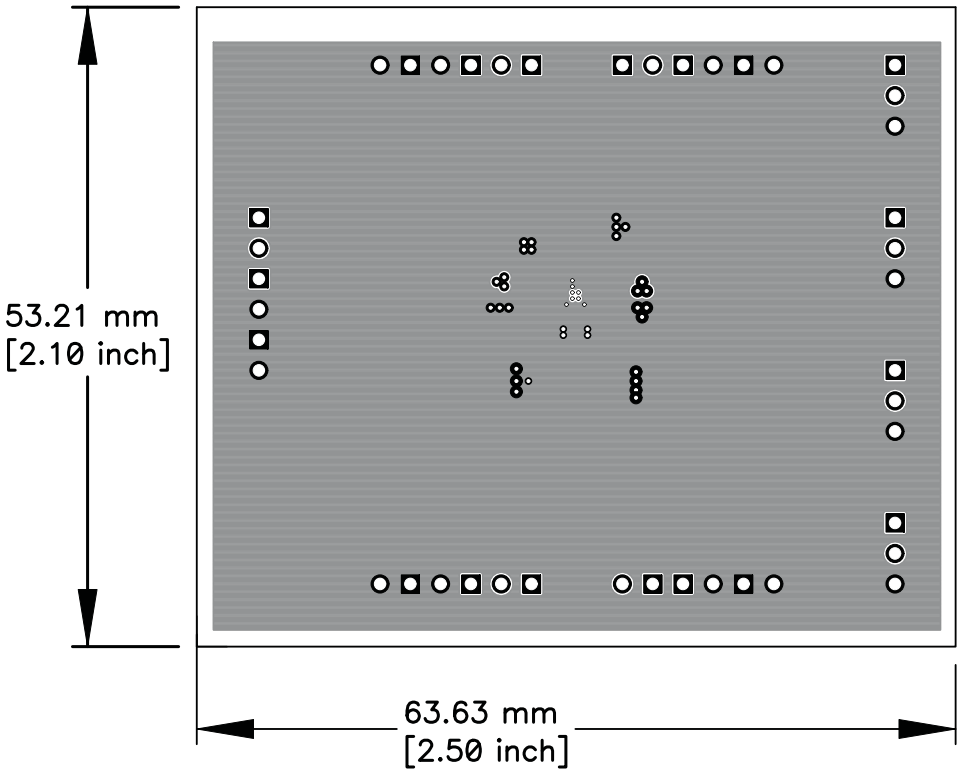

Figure 7. TPS657051/2EVM Internal 2, X-Ray View From Top

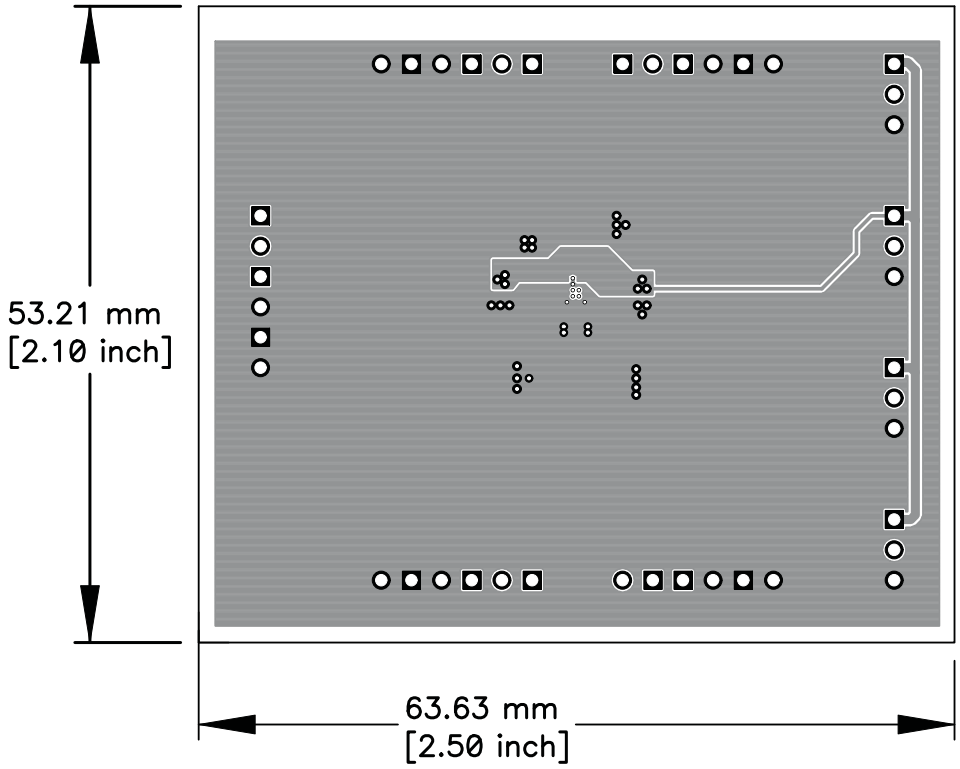

Figure 8. TPS657051/2EVM Bottom Copper View, X-Ray View From Top

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7 Bill of Materials

Table 2. HPA522A Bill of Materials

Count		RefDes	Value	Description	Size	Part Number	MFR
-001	-002						
0	0	C1	open	Capacitor, Ceramic, 6.3V, X5R, 10%	0603	Std	Std
1	1	C2	2.2 µF	Capacitor, Ceramic, 6.3V, X5R, 10%	0603	GRM188R60J225KE19D	Murata
0	0	C3, C6, C7, C9, C12	open	Capacitor, Ceramic, 6.3V, X5R, 20%	0603	Std	Std
1	1	C4	4.7 µF	Capacitor, Ceramic, 6.3V, X5R, 10%	0603	GRM188R60J475KE19D	Murata
4	4	C5, C8, C10, C11	10 µF	Capacitor, Ceramic, 6.3V, X5R, 20%	0603	GRM188R60J106ME47D	Murata
2	2	L1, L2	1.5 µH	Inductor, 700 mA, 300 mΩ	1608	BRC1608T1R5M	Taiyo Yuden
1	1	R1	0	Resistor, Chip, 1/16W, 1%	0603	Std	Std
4	4	R2–R5	1.00M	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	0	U1	TPS657051YZH	IC, Power Management Unit fro Embedded Camera Module	DSBGA-16	TPS657051YZH	TI
0	1	U1	TPS657052YZH	IC, Power Management Unit fro Embedded Camera Module	DSBGA-16	TPS657052YZH	TI
1	1	–		PCB, 2.5 In x 2.1 In x 0.062 In		HPA522	Any

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 3.3 V to 6 V and the output voltage range of 1.2 V to3 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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