TPS622x0EVM-229

This user's guide describes the characteristics, operation, and use of the TPS62240EVM-229 and the TPS62260EVM-229 evaluation modules (EVM). These EVMs demonstrate the Texas Instruments TPS62240 or the TPS62260, 2.25-MHz, synchronous, step-down converters. The TPS62240 supplies 300 mA of output current and the TPS62260 supplies 600 mA. This user's guide includes setup instructions, schematic diagram, bill of materials (BOM), and PCB layout drawings for the evaluation module.

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1 Introduction

The TPS62240EVM-229 and TPS62260EVM-229 evaluation modules (EVM) help designers evaluate the operation and performance of the TPS62240 and TPS62260 converters. These converters are 2.25-MHz, synchronous, step-down converters with 300 mA or 600 mA of output current, respectively.

The TPS622x0EVM-229 has two converter layouts on one board, each electrically isolated from the other. The first converter at the top of the board uses the 2-mm × 2-mm SON package (DRV) with the output voltage set to 1.8V. This converter has been designed with a maximum solution height of 1 mm. The second converter, at the bottom of the board, demonstrates the TSOT-23-6 package (DDC) with the output voltage set to 1.2V. This layout uses a taller inductor with lower losses to achieve higher efficiency than converter 1. Both layouts use the adjustable output voltage version of the converter along with 0603-sized external parts to ease soldering when evaluating different output voltages.

1.1 Related Documentation From Texas Instruments

- *TPS62240, 22.5 MHz 300 mA Step Down Converter in 2x2SON/TSOT23 Package* data sheet (SLVS762)
- *TPS62260, TPS62261, TPS62262 22.5 MHz 600 mA Step Down Converter in 2x2SON/TSOT23 Package* data sheet (SLVS763)

2 Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, set up, and use the TPS622X0EVM-229.

2.1 Input / Output Connector Descriptions

2.1.1 J1 – VIN – Converter 1

This is the positive input supply voltage to converter number one. Twist the leads to the input supply and keep them as short as possible to minimize EMI transmission.

2.1.2 J2 – GND – Converter 1

This is the return connection for the input power supply of the converter.

2.1.3 J3 – VOUT – Converter 1

This is the positive connection from the output of converter number one. Connect this pin to the positive input of the load.

2.1.4 J4 – GND – Converter 1

This is the return connection for the output of converter number one.

2.1.5 JP1 – ENABLE – Converter 1

This jumper enables or disables the converter. Connecting the shorting jumper between pins 1 and 2 (VIN and EN) enables converter 1. Connecting the shorting jumper between pins 2 and 3 (EN and GND) disables converter 1.

2.1.6 JP2 – MODE – Converter 1

This jumper sets the mode of the TPS622x0. Connect the shorting jumper between pins 1 and 2 (VIN and MODE) forces the TPS622x0 into fixed frequency PWM mode. Connecting the shorting jumper between pins 2 and 3 (MODE and GND) enables the Power Save Mode with automatic transition from PFM mode to fixed frequency PWM mode. Never leave this pin floating.

2.1.7 J5 – VIN – Converter 2

This is the positive input supply voltage to converter number 2. Twist the leads to the input supply and keep them as short as possible to minimize EMI transmission.

2.1.8 J6 – GND – Converter 2

This is the return connection for the input power supply of the converter.

2.1.9 J7 – VOUT – Converter 2

This is the positive connection from the output of converter. Connect this pin to the positive input of the load.

2.1.10 J8 – GND – Converter 2

This is the return connection for the output of converter 2.

2.1.11 JP3 – ENABLE – Converter 2

This jumper enables or disables the converter. Connecting the shorting jumper between pins 1 and 2 (VIN and EN) enables converter 2. Connecting the shorting jumper between pin 2 and 3 (EN and GND) disables converter 2. Never leave this pin floating.

3 Operation

Connect the positive input power supply to J1 for converter number one or to J5 for converter number 2. Connect the input power return (ground) to J2 for converter one or J6 for converter two. The TPS622x0EVM-229 has an absolute maximum input voltage of 7 V. The recommended maximum operating voltage is 6 V.

Connect the desired load between J3 and J4 for converter number one or between J7 and J8 for converter number 2. The TPS62240EVM-229 can supply up to 300 mA of output current and the TPS62260EVM-229 can supply up to 600 mA of output current.

Configure jumpers JP1, JP2, and JP3 as required. The functions of JP1, JP2, and JP3 are described in the Set-up section of this manual.

4 Test Results

This section provides typical performance waveforms for the TPS622X0EVM-229 printed-circuit board.

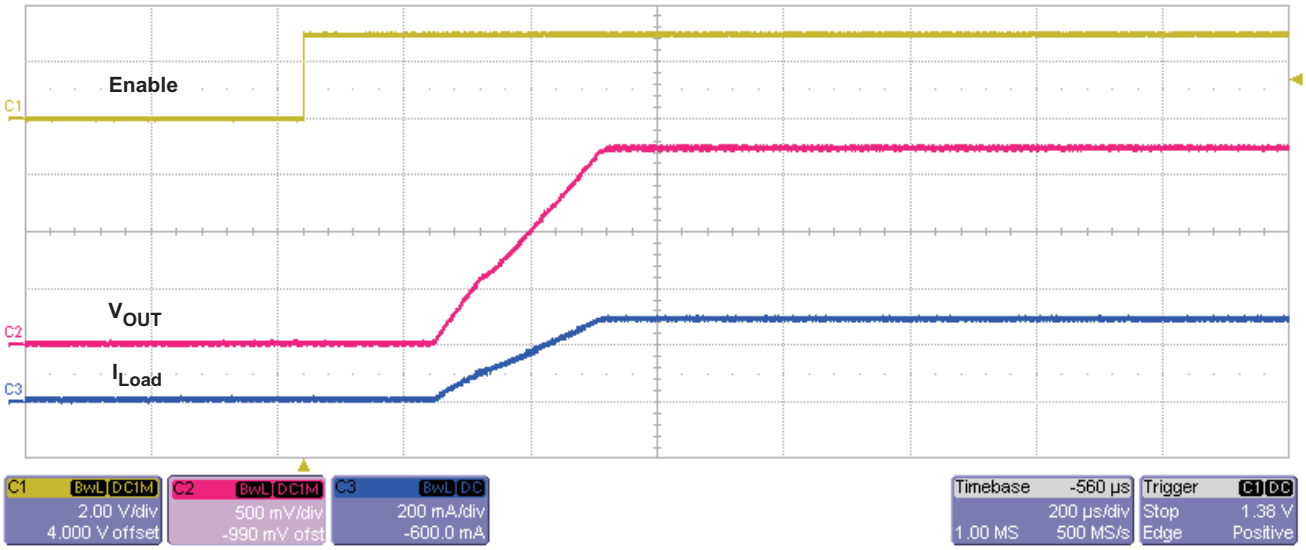

Figure 1. TPS62240 Start-up From Enable, Vin = 3 V, Vout = 1.8 V, ILoad = 300 mA

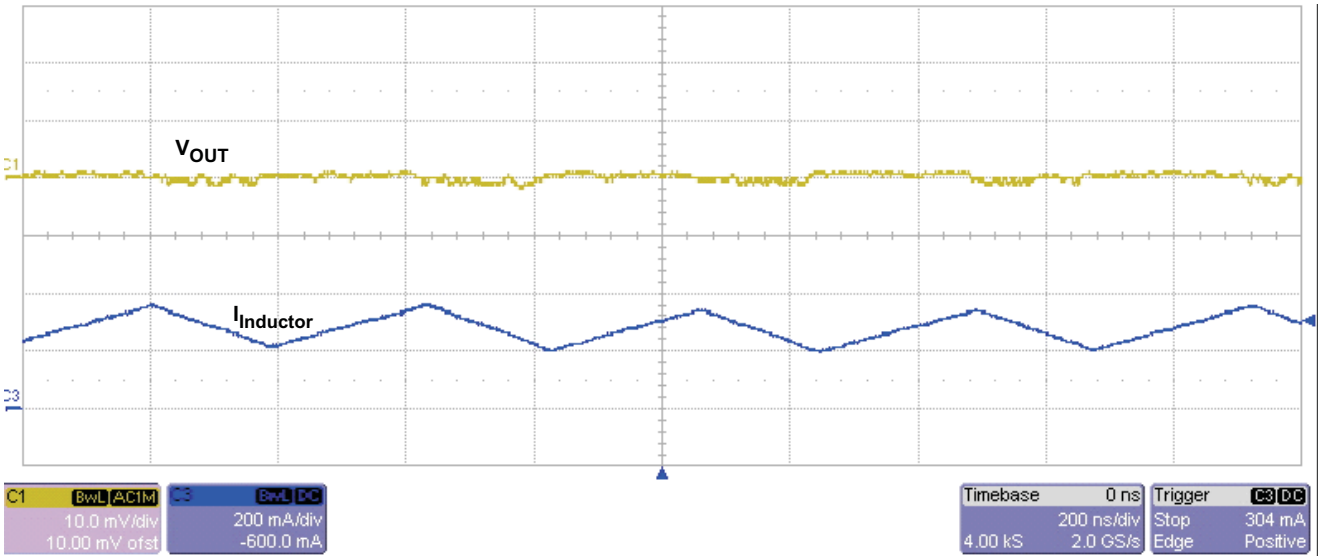

Figure 2. TPS62240 Output Ripple, Vin = 3 V, Vout = 1.8 V, ILoad = 300 mA

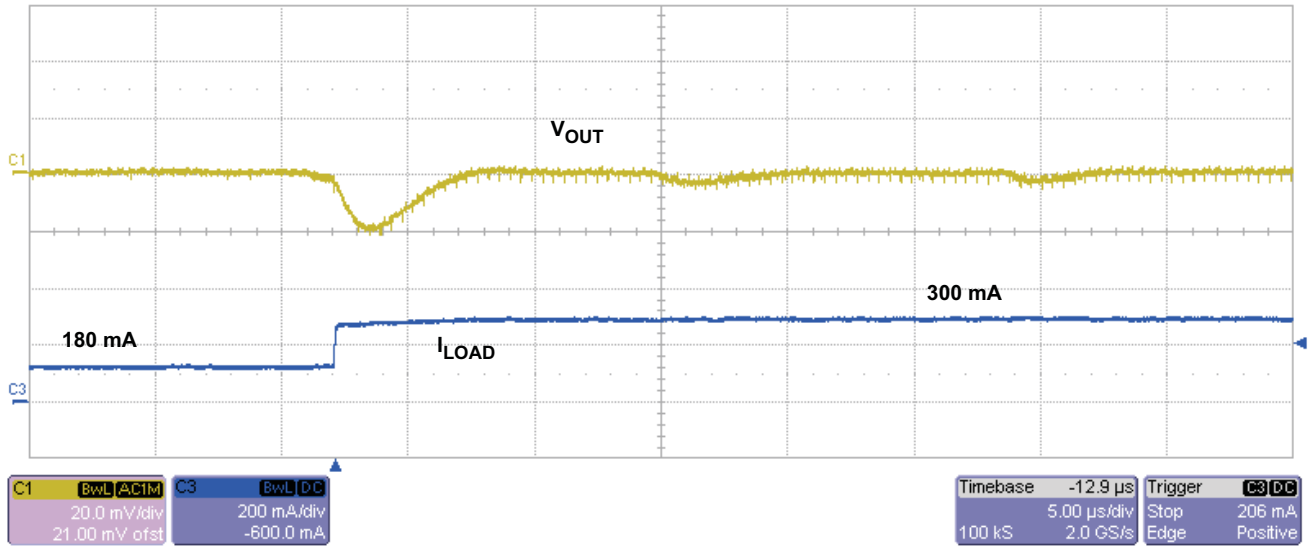

Figure 3. TPS62240 Load Transient, 180-mA to 300-mA Step, Vin = 3 V, Vout = 1.8 V

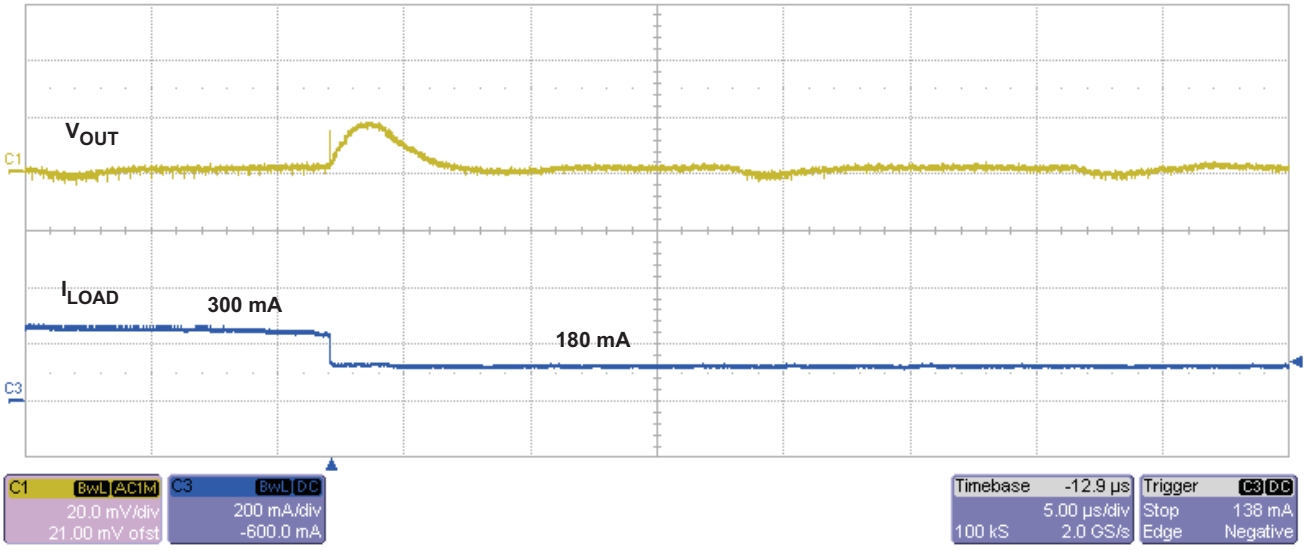

Figure 4. TPS62240 Load Transient, 300-mA to 180-mA Step, Vin = 3 V, Vout = 1.8 V

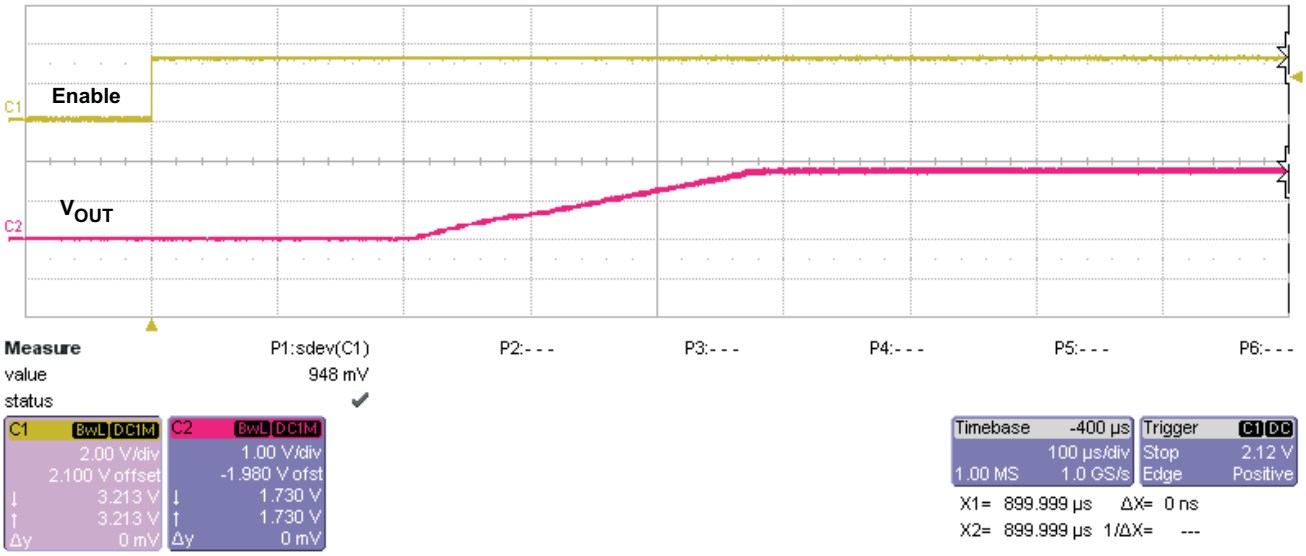

Figure 5. TPS62260 Start-up From Enable, Vin = 3 V, Vout = 1.8 V, ILoad = 600 mA

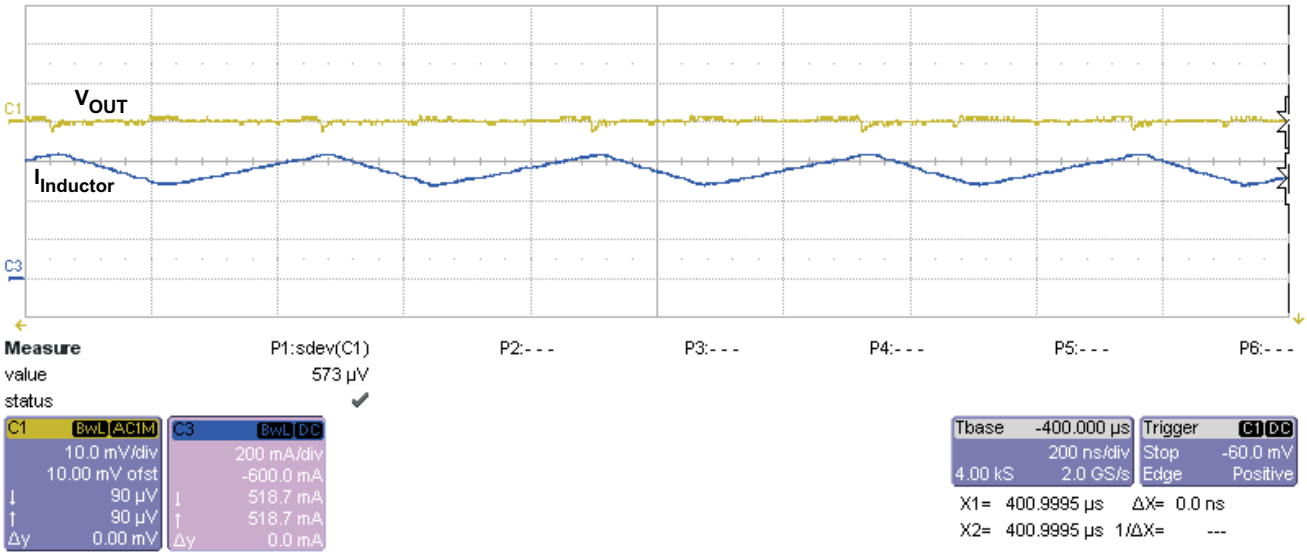

Figure 6. TPS62260 Output Ripple, Vin = 3 V, Vout = 1.8 V, ILoad = 600 mA

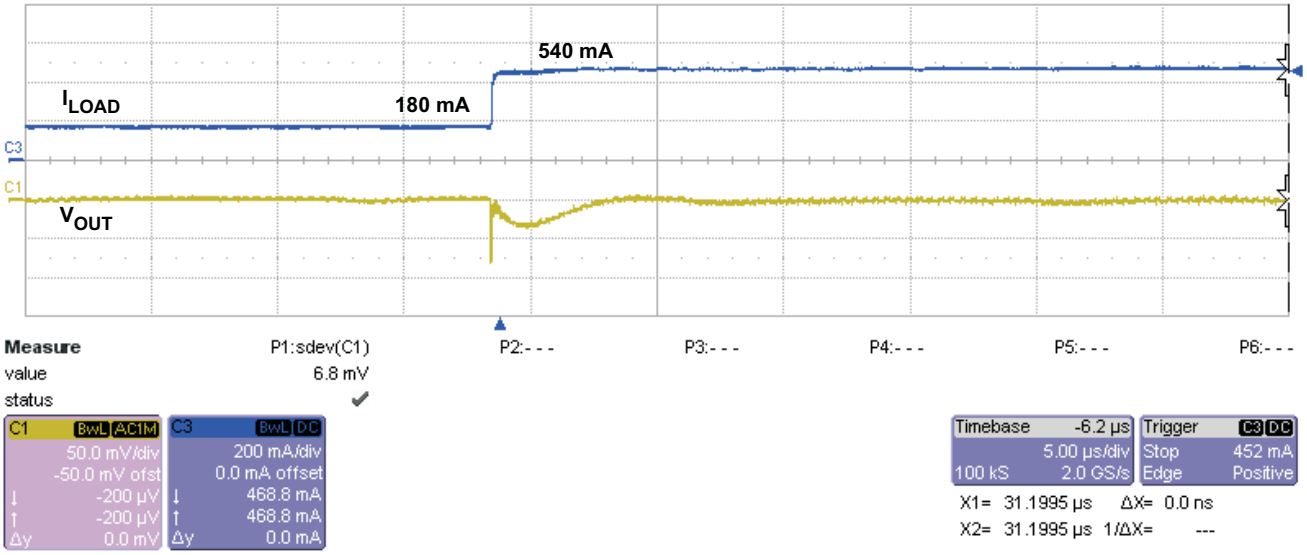

Figure 7. TPS62260 Load Transient, 180-mA to 540-mA Step, Vin = 3 V, Vout = 1.8 V

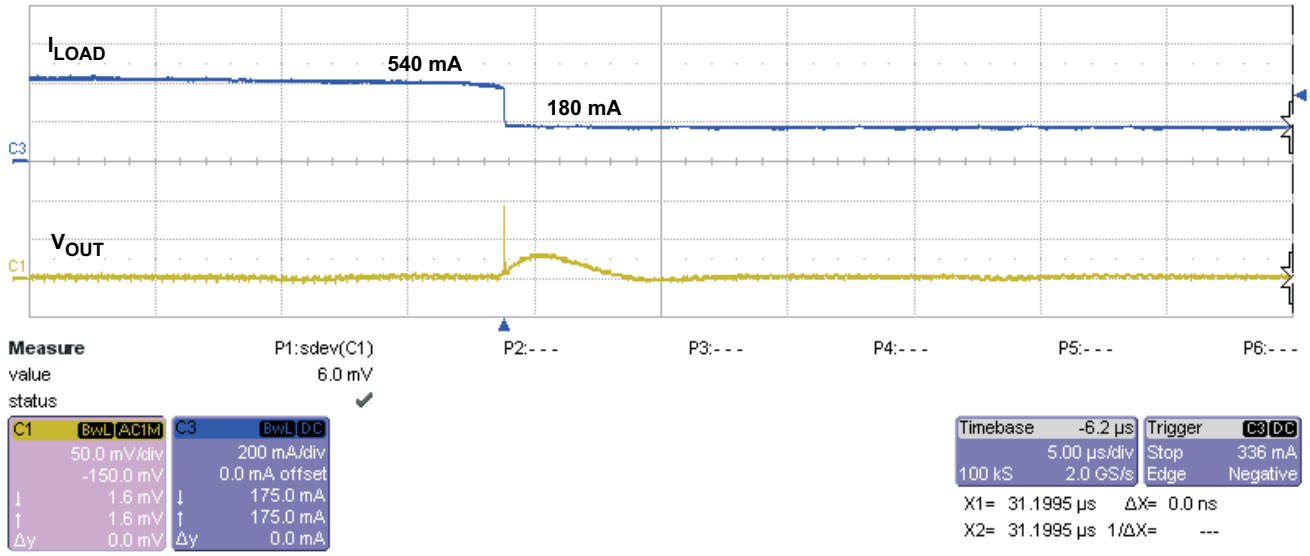

Figure 8. TPS62260 Load Transient, 540-mA to 180-mA Step, Vin = 3 V, Vout = 1.8 V

5 Board Layout, Schematic, and Bill of Materials

This section provides the TPS622X0EVM-229 board layout, schematic, and bill of materials.

5.1 Layout

Board layout is critical for all high-frequency switch mode power supplies. Figure 9 through Figure 11 show the board layout for the TPS622X0EVM-229 PCB. The nodes with high-switching frequencies and currents are kept as short as possible to minimize trace inductance. Careful attention has been given to the routing of high-frequency current loops and a single-point grounding scheme is used. See the data sheet for specific layout guidelines. Figure 12 shows the schematic for the TPS622X0EVM-229, and Table 1 shows the bill of materials.

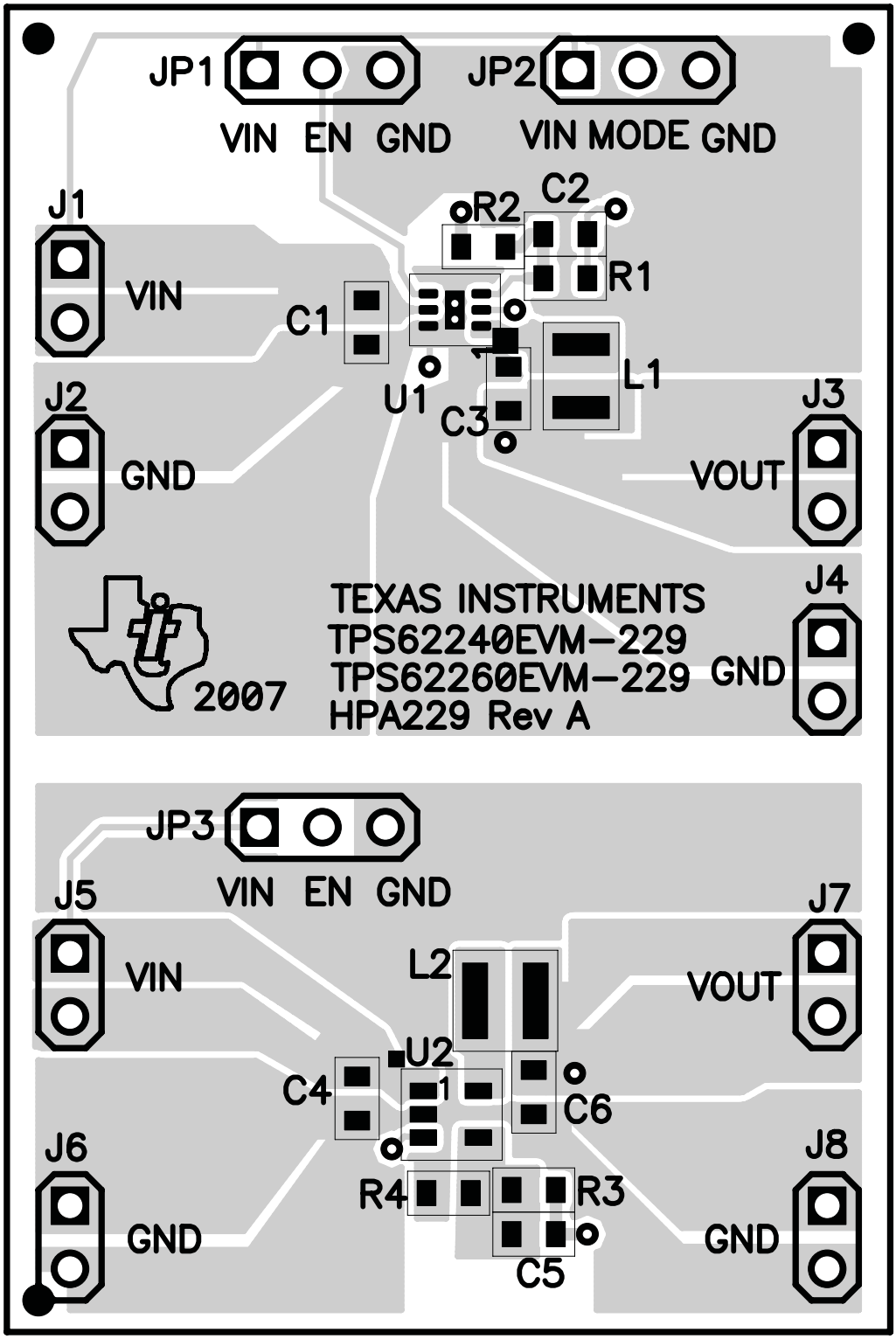

Figure 9. Assembly Layer

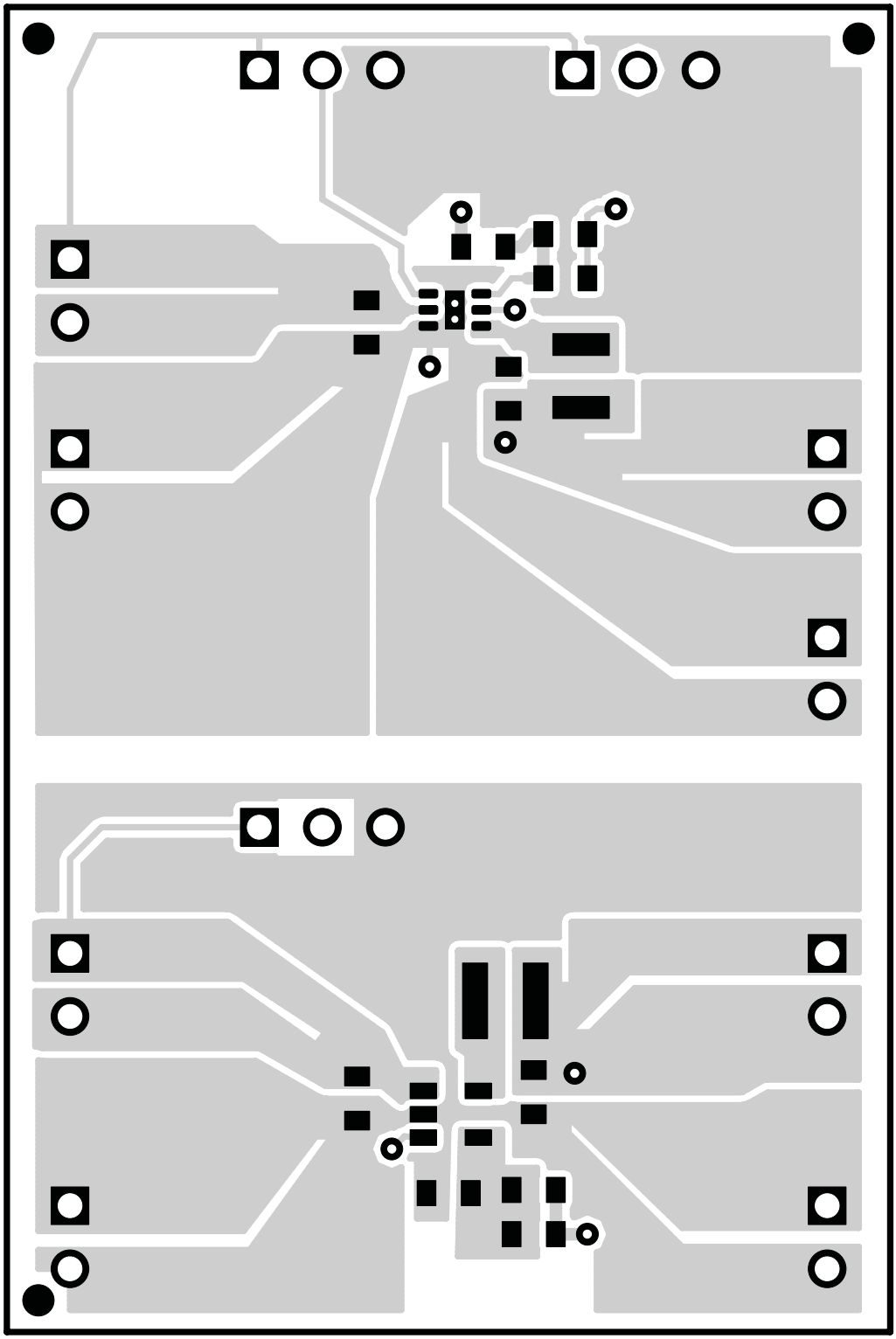

Figure 10. Top Layer Routing

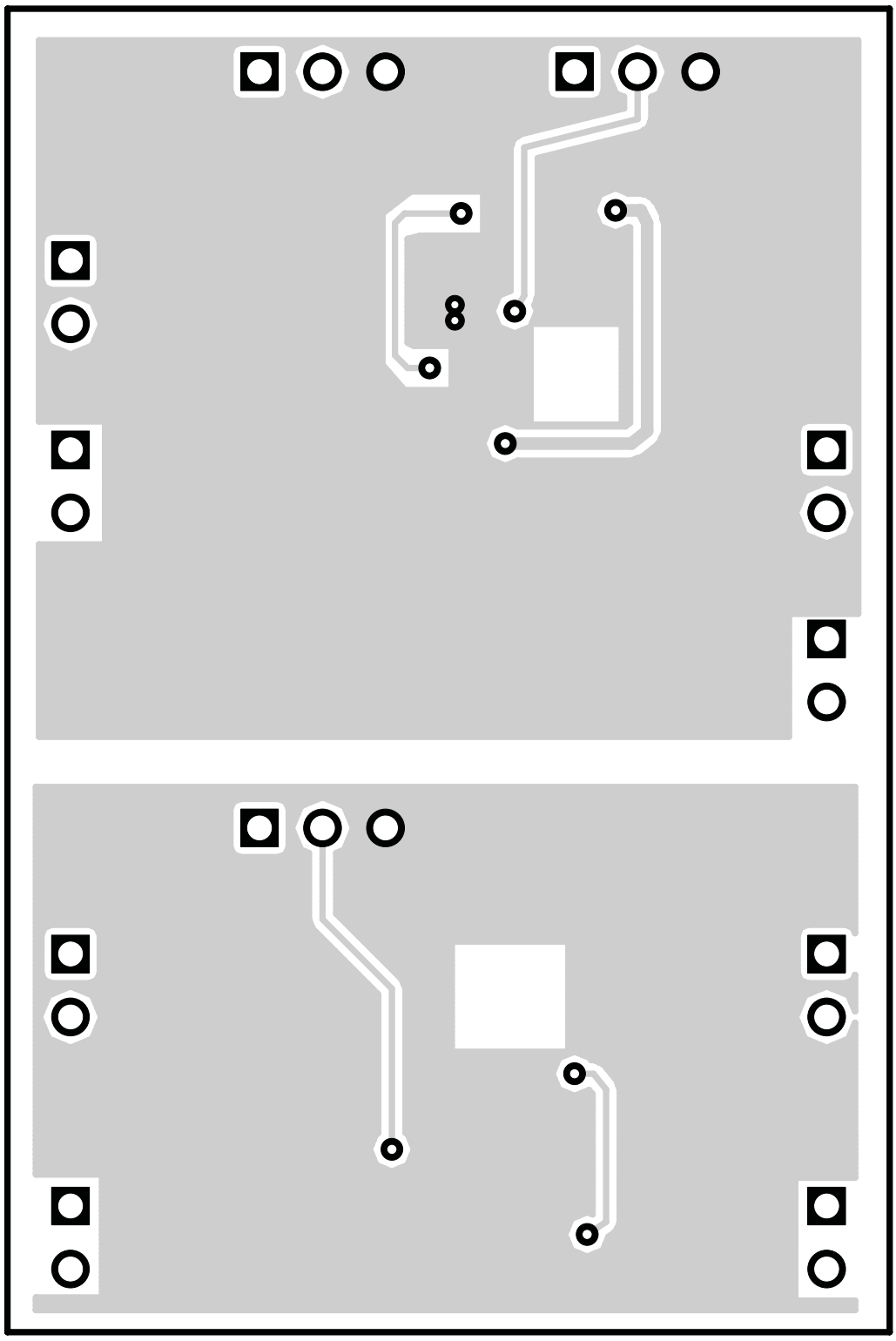

Figure 11. Bottom Layer Routing

5.2 Schematic

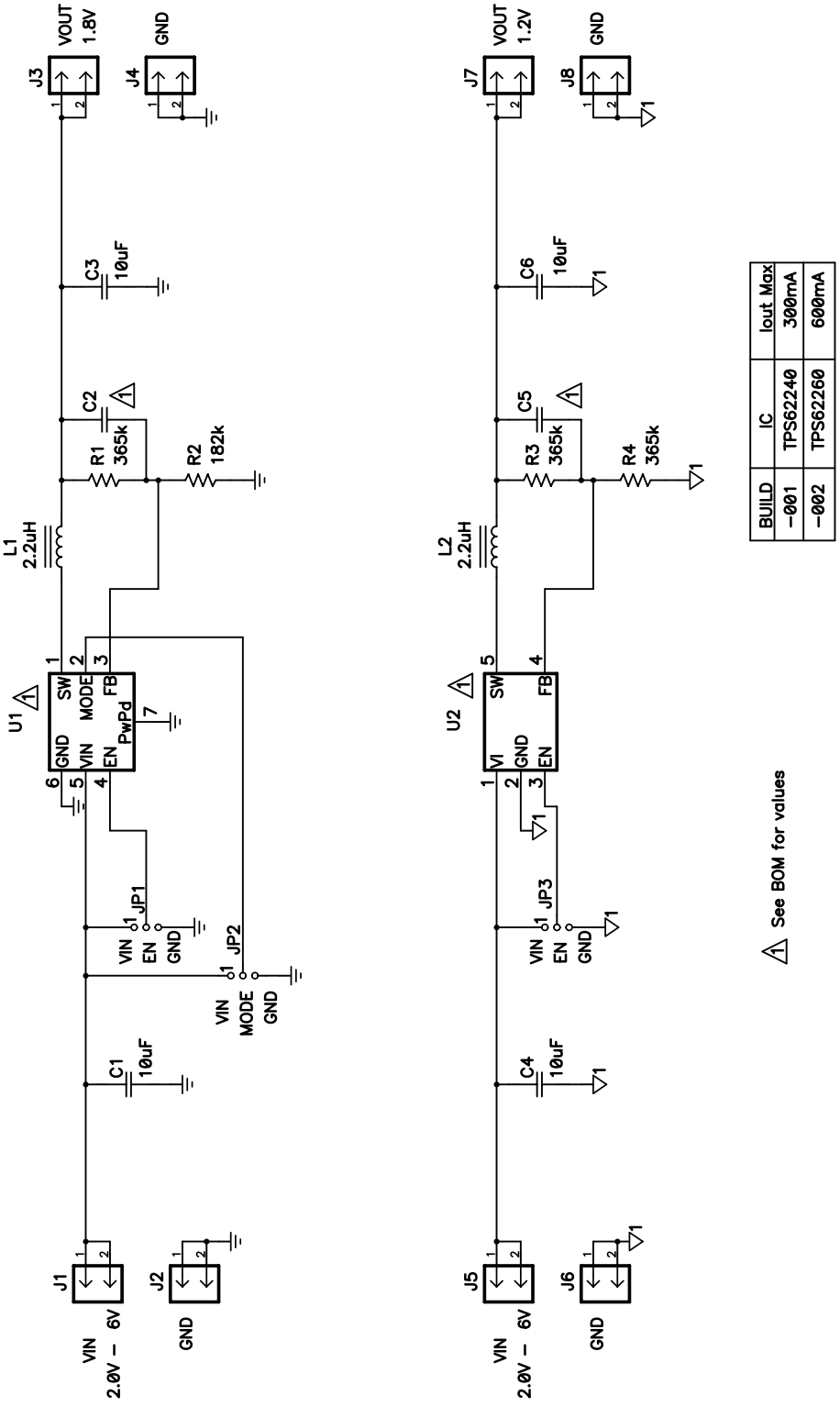

Figure 12. TPS622x0EVM-229 Schematic

5.3 Bill of Materials

Table 1 presents the bill of materials for the TPS622X0EVM-229 evaluation module.

Table 1. TPS622x0EVM-229 Bill of Materials

Count		RefDes	Value	Description	Size	Part Number	Mfr
-001	-002						
4	4	C1, C3, C4, C6	10 µF	Capacitor, Ceramic, 6.3V, X5R, 20%	0603	GRM188R60J106ME47D	Murata
2	0	C2, C5	33 pF	Capacitor, Ceramic, 50V, C0G, 5%	0603	C1608C0G1H330J	TDK
0	2		22 pF	Capacitor, Ceramic, 50V, C0G, 5%	0603	C1608C0G1H220J	TDK
8	8	J1-J8		Header, 2 pin, 100mil spacing (36-pin strip)	1.100x2	PTC36SAAN	Sullins
3	3	JP1-JP3		Header, 3 pin, 100mil spacing (36-pin strip)	1.100x3	PTC36SAAN	Sullins
1	0	L1	2.2 µH	Inductor, SMT Multilayer, 1.3A, 80mΩ	2520 mm	MIPF2520D2R2	FDK Corp.
0	1		2.2 µH	Inductor, SMT Multilayer, 1.2A, 110mΩ	2520 mm	MIPS2520D2R2	FDK Corp.
1	1	L2	2.2 µH	Inductor, SMT, 1.5A, 110mΩ	0.118 x 0.118	LPS3015-222ML	Coilcraft
3	3	R1, R3, R4	365 kΩ	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	1	R2	182 kΩ	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	0	U1		IC, 2.25MHz 300mA Step-down Converter	SON-6 (DRV)	TPS62240DRV	TI
0	1			IC, 2.25MHz 600mA Step-down Converter	SON-6 (DRV)	TPS62260DRV	TI
1	0	U2		IC, 2.25MHz 300mA Step-down Converter	SOT23-5	TPS62240DDC	TI
0	1			IC, 2.25MHz 600mA Step-down Converter	SOT23-5	TPS62260DDC	TI
1	1	-		PCB, 2.1 In x 1.4 In x 0.062 In		HPA229	Any
3	3	-		Shunt, 100mil, Black	0.100	929950-00	

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 2 V to 6 V and the output voltage range of 0.6 V to 6 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 85°C. The EVM is designed to operate properly with certain components above 85°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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