TPS62510EVM-168

This User's Guide describes the characteristics, operation, and use of the TPS62510EVM-168 Evaluation Module (EVM). The Texas Instruments TPS62510 is a high efficiency step-down converter for operation from a 1.8V to 3.8V input voltage rail capable of supplying up 1.5A. This User's Guide includes setup instructions, a schematic diagram, a bill of materials (BOM), and PCB layout drawings for the evaluation module for the TPS62510.

Contents

1 Introduction 1
2 Setup 1
3 Board Layout 6
4 Schematic and Bill of Materials 8
5 Related Documentation From Texas Instruments 8

List of Figures

1 HPA168 Efficiency 3
2 HPA168 Load Regulation 4
3 Output Voltage 4
4 Output Voltage 5
5 Output Ripple Voltage 5
6 Output Ripple Voltage 6
7 Assembly Layer 6
8 Top Layer Routing 7
9 Bottom Layer Routing 7
10 TPS62510EVM-168 Schematic 8

List of Tables

1 TPS62510EVM-168 Bill of Materials 8

1 Introduction

The Texas Instruments TPS62510EVM-168 evaluation module (EVM) helps designers evaluate the operation and performance of the TPS62510 switching step-down converter. This high efficiency converter is targeted for portable devices where space is critical and is ideally suited for two cell NiMHd or Alkaline applications.

The TPS62510 EVM maximizes output power and efficiency while supplying 1.8V at 1.5A. It is designed to operate with an input voltage between 1.8V–3.8V and has the option to adjust the output voltage by modifying the resistive feedback divider. Refer to the TPS62510 data sheet (SLVS651) for more information.

2 Setup

This chapter describes the jumpers and connectors on the EVM as well as how to properly connect, setup, and use the TPS62510-168.

2.1 Input / Output Connector Descriptions

2.1.1 J1 –VIN

This is the positive input connection to the DC/DC converter. The leads to the input supply should be twisted and kept as short as possible to minimize EMI transmission.

2.1.2 J2 – GND

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

2.1.3 J3 –VOUT

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

The default factory output voltage is set at 1.8V. By adjusting the feedback resistors, the output voltage can be adjusted between 0.6V -- 3.8V. Refer to the data sheet (SLVS651) for further details.

2.1.4 J4 – GND

This is the return connection from the output of the DC/DC converter. Connect this pin to the negative input of the load.

2.1.5 J5 –PG

This header is tied to the Power Good (PG) pin of the IC and is used to indicate when the output voltage reaches a certain threshold. The PG pin is an open-drain output and must be tied to an external voltage (< 4V) through a resistor for proper operation. This pin should be left floating if unused. For the EVM, PG is tied to VOUT through a resistor.

2.1.6 JP1 – MODE/SYNC

This jumper toggles the operating mode of the IC between PFM/PWM mode and Forced PWM mode. Connect the shorting jumper to GND for PFM/PWM operation; connect the shorting jumper to VIN for Forced PWM operation. Also, by removing the jumper the MODE/SYNC pin can also be connected to an external clock if it is desired to sync this EVM to a specific frequency. See the data sheet (SLVS651) for further details. This pin should never be left floating.

2.1.7 JP2 – EN

This jumper enables or disables the linear regulator. Connect the shorting jumper from the center EN pin to VIN to turn the converter ON; connect EN to GND to turn the converter OFF. This pin should never be left floating.

2.1.8 JP3 – OVT

This jumper provides access to the Over Voltage Tracking (OVT) functionality of this IC. By modifying resistors R3 and R4 appropriately, this feature can be demonstrated by removing the shorting jumper and connecting an external voltage source directly to OVT. See the data sheet (SLVS651) for additional details on how to do this. The default setting for the EVM does not demonstrate this feature and appropriately ties OVT to VIN through the shorting jumper in normal operation. This pin should never be left floating.

2.2 Operation

The absolute maximum input voltage for the TPS62510 is 4.0V, and it is imperative that this voltage is not exceeded to ensure the IC is not damaged. The EVM is designed to operate with an input voltage between 1.8V–3.8V and an output voltage adjusted between 0.6V–VIN. JP1 determines the mode for the part and the shorting jumper must be tied either to VIN for Forced PWM mode operation or to GND for PFM/PWM mode operation. JP2 is the enable for the switching converter, and the shorting jumper must be tied to VIN to enable the part or GND to disable the part. The EVM is not initially configured for OVT operation, so the shorting jumper must connect OVT to VIN for proper operation.

2.3 Test Results

The test results for this EVM at T_A = 25°C are shown in Figure 1 and Figure 2.

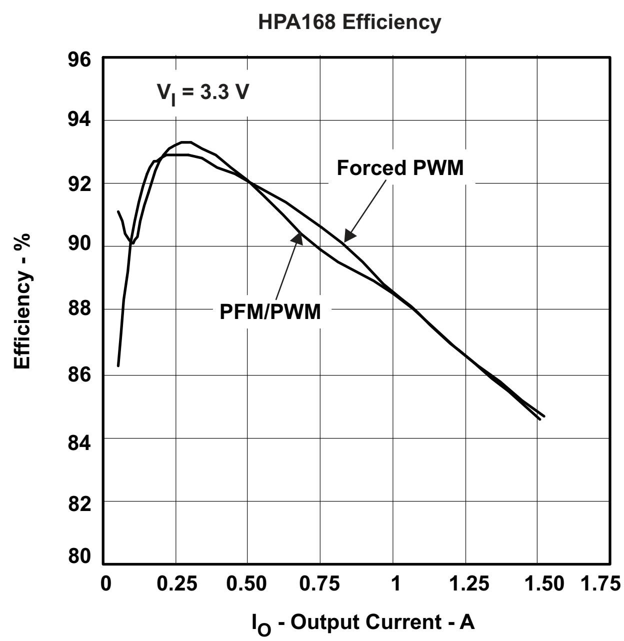

Figure 1. HPA168 Efficiency

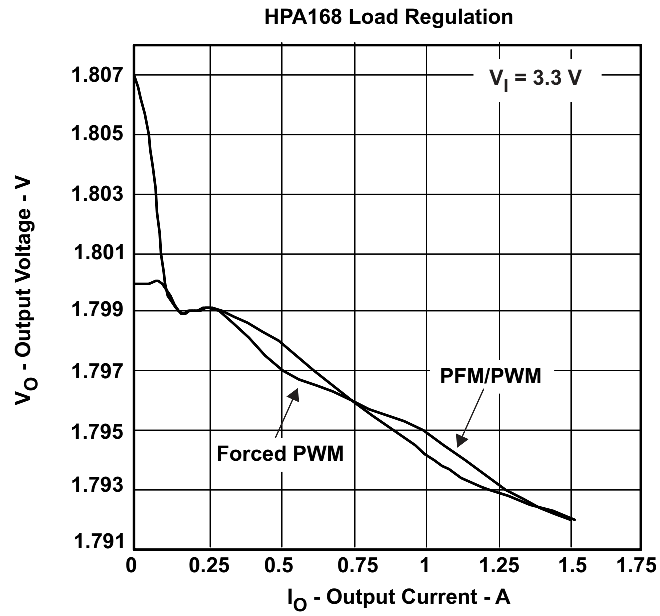

Figure 2. HPA168 Load Regulation

Figure 3 shows the 1.8V output voltage when the load current is pulsed between 1500mA and 150mA. Vin = 3.3Vdc, SYNC = Vin. (Blue = Output Voltage = 50mV/DIV, Green = Output Current = 500mA/DIV, 5µs/DIV)

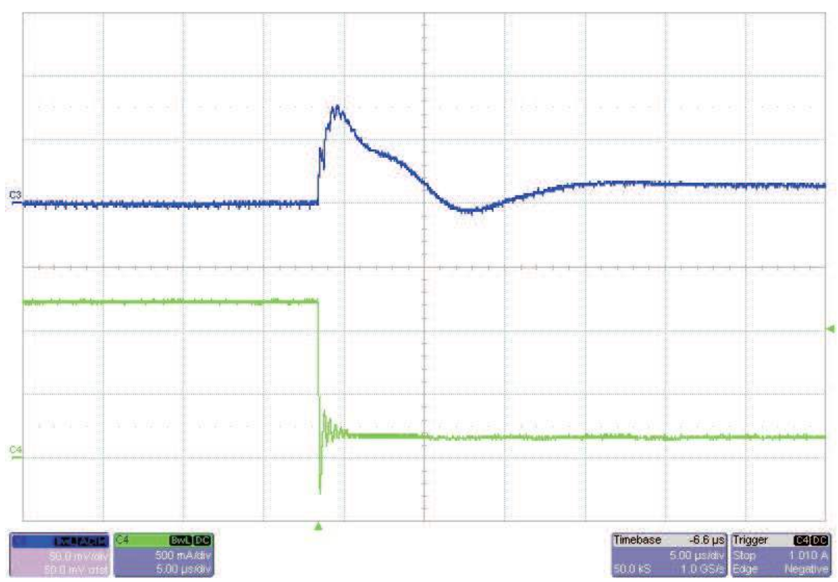

Figure 3. Output Voltage

Figure 4 shows the 1.8V output voltage when the load current is pulsed between 150mA and 1500mA. Vin = 3.3Vdc, SYNC = Vin. (Blue = Output Voltage = 50mV/DIV, Green = Output Current = 500mA/DIV, 5µs/DIV)

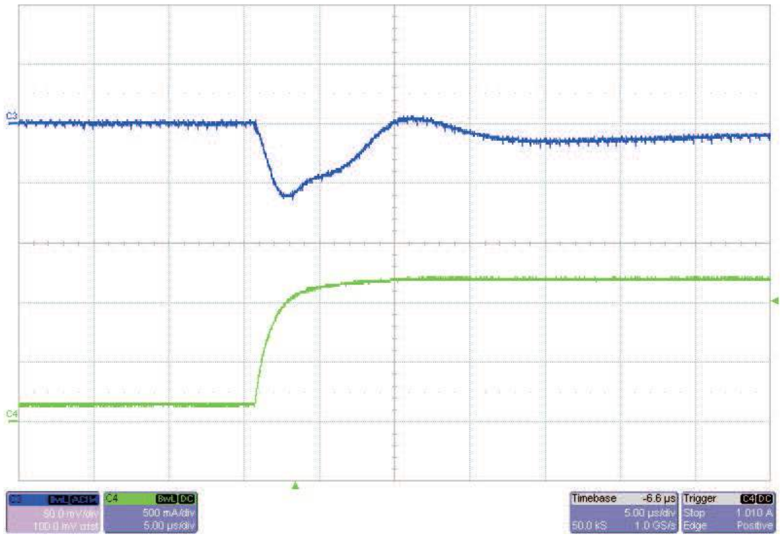

Figure 4. Output Voltage

The 1.8V output ripple voltage in PFM mode is shown in Figure 5. The image was taken with the output loaded to 120mA and the input voltage set to 3.3Vdc. (Yellow = Switchnode = 2V/DIV, Red = Output Ripple Voltage = 10mV/DIV, Green = Inductor Current = 500mA/DIV, 2us/DIV)

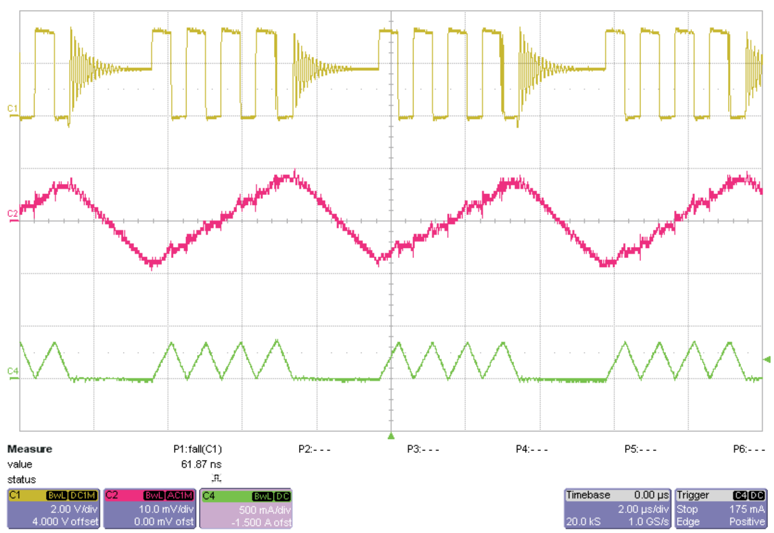

Figure 5. Output Ripple Voltage

The 1.8V output ripple voltage is shown in Figure 6. The image was taken with the output loaded to 1500mA and the input voltage set to 3.3Vdc. (Yellow = Switchnode = 2V/DIV, Blue = Output Ripple Voltage = 10mV/DIV, Green = Inductor Current = 200mA/DIV, 200ns/DIV)

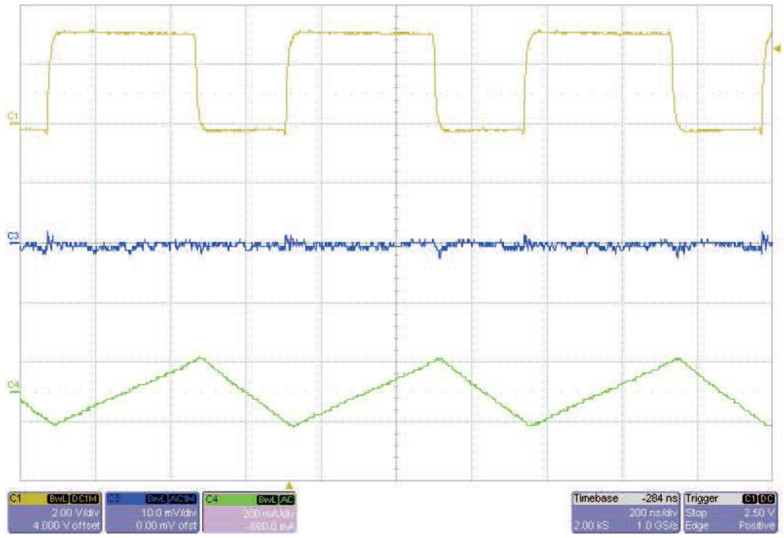

Figure 6. Output Ripple Voltage

3 Board Layout

This chapter provides the TPS62510-168 board layout and illustrations.

3.1 Layout

Figure 7, Figure 8, and Figure 9 show the board layout for the TPS63510-168 PWB.

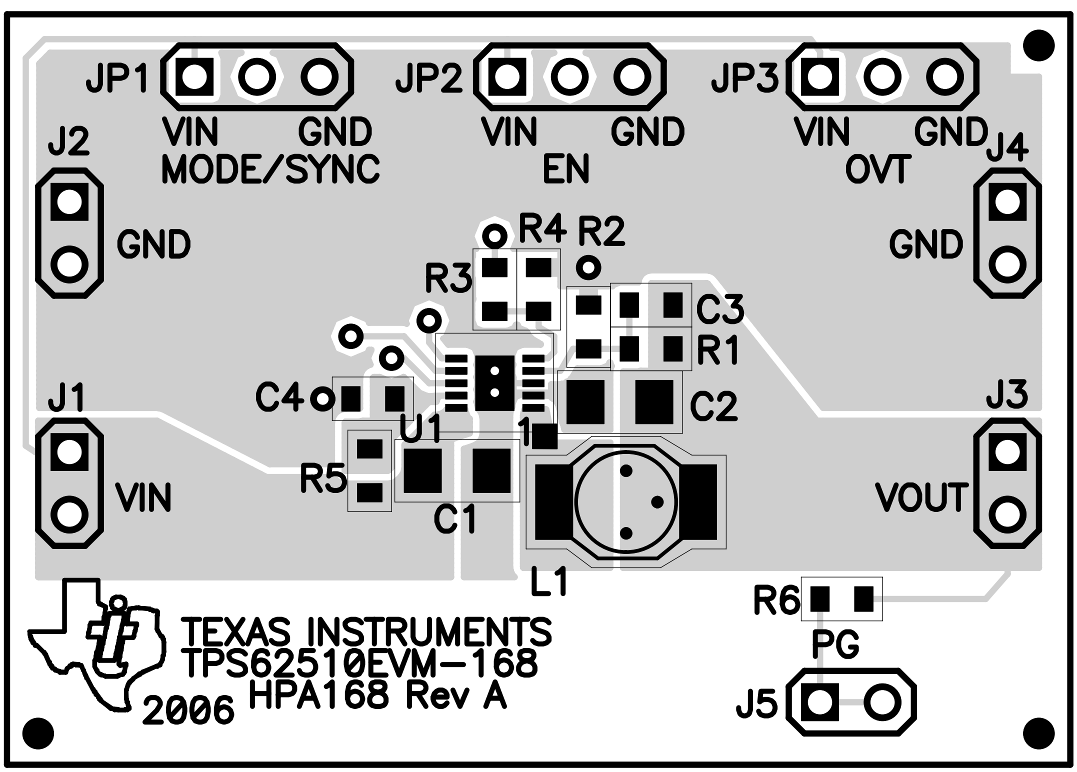

Figure 7. Assembly Layer

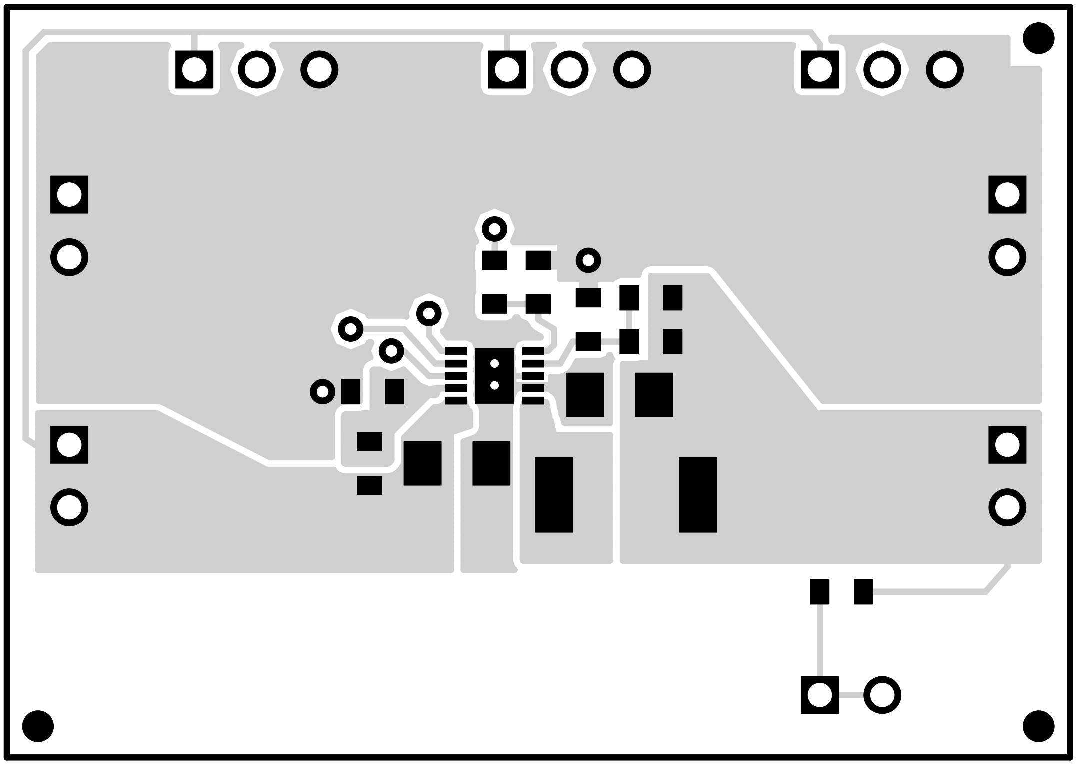

Figure 8. Top Layer Routing

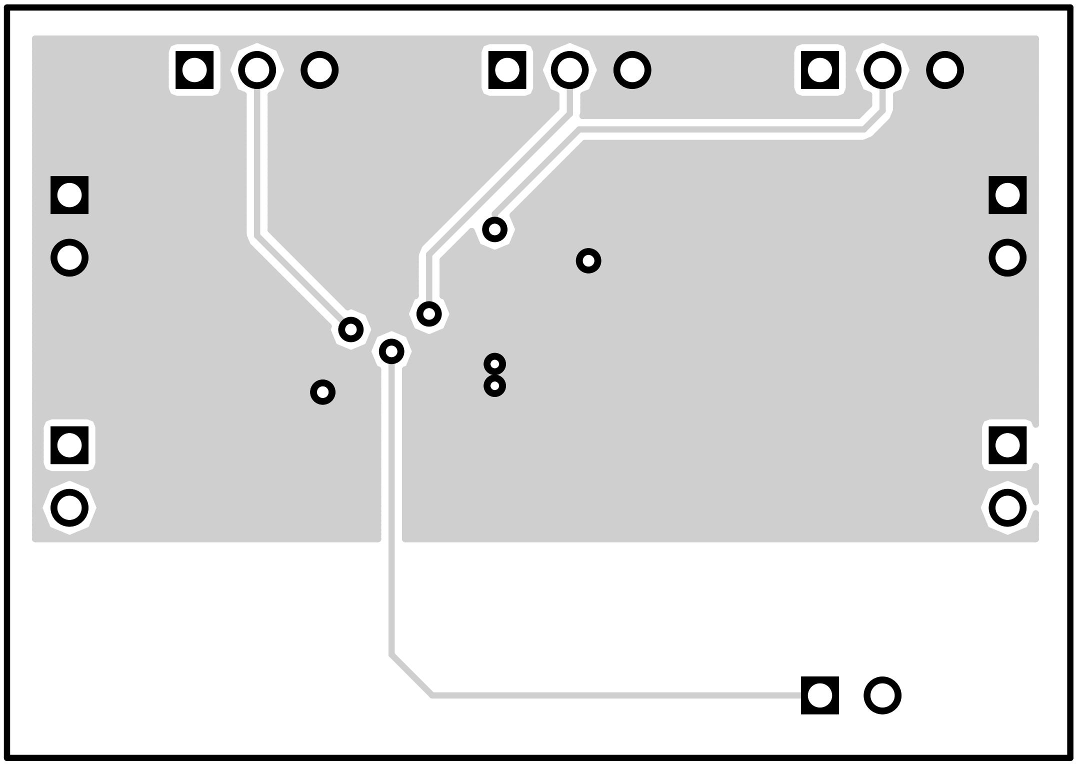

Figure 9. Bottom Layer Routing

4 Schematic and Bill of Materials

This chapter provides the TPS62510EVM-168 schematic and bill of materials.

4.1 Schematic

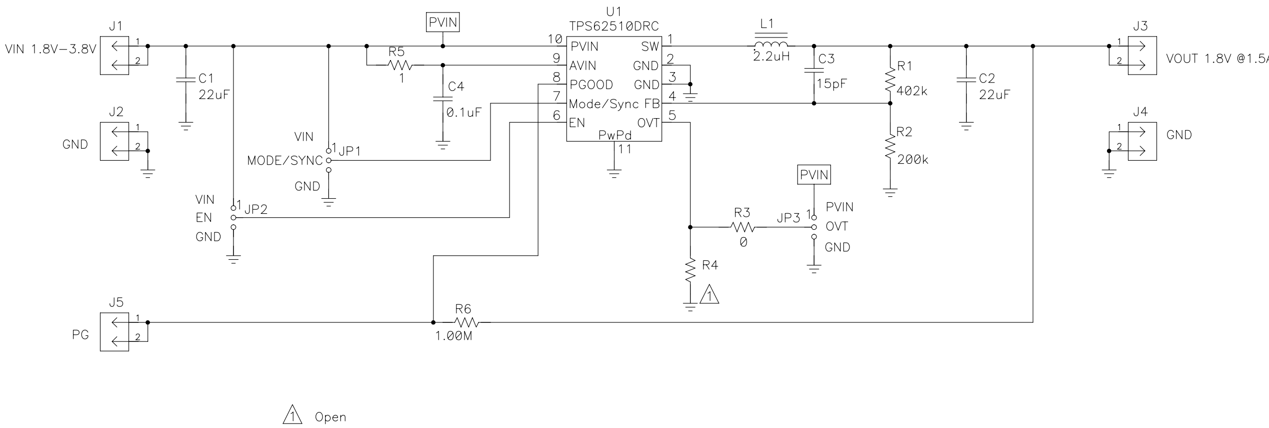

Figure 10. TPS62510EVM-168 Schematic

4.2 Bill of Materials

Table 1. TPS62510EVM-168 Bill of Materials

COUNT	Ref Des	Value	Description	Size	Part Number	MFR
2	C1, C2	22µF	Capacitor, Ceramic, 6.3V, X5R, 15%	1206	C3216X5R0J226K	TDK
1	C3	15pF	Capacitor, Ceramic, 50V, C0G, 5%	0603	C1608C0G1H150JB	TDK
1	C4	0.1µF	Capacitor, Ceramic, 25V, X5R, 10%	0603	C1608X5R1E104KB	TDK
5	J1–J5		Header, 2-pin, 100mil spacing (36-pin strip)	0.100 × 2	PTC36SAAN	Sullins
3	JP1–JP3		Header, 3-pin, 100mil spacing (36-pin strip)	0.100 × 3	PTC36SAAN	Sullins
1	L1	2.2µH	Inductor, SMT, 2.3A, 70mΩ	0.26 × 0.09	DO1608-222MLC	Coilcraft
1	R1	402kΩ	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	R2	200kΩ	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	R3	0Ω	Resistor, Chip, 1/16W, 1%	0603	Std	Std
0	R4	Open	Resistor, Chip, 1/16W, 1%	0603		
1	R5	1Ω	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	R6	1.00M	Resistor, Chip, 1/16W, 1%	0603	Std	Std
1	U1		IC, 1.5A Low Vin high efficiency step-down converter	QFN10	TPS62510DRC	TI
1	–		PCB, 1.7 In x 1.2 In x 0.062 In		HPA168	Any
3	–		Shunt, 100 mil, Black	0.1	929950-00	3M

5 Related Documentation From Texas Instruments

TPS62510 data sheet (SLVS651)

5.1 If You Need Assistance

Contact your local TI sales representative.

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 1.8 V to 3.8 V and the output voltage range of 0.6 V to 3.8 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 50°C. The EVM is designed to operate properly with certain components above 50°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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