TPS60250EVM-185

Contents

1 Introduction

The Texas Instruments TPS60250EVM-185 evaluation module (EVM) helps designers evaluate the operation and performance of the TPS60250 white LED (WLED) driver for applications that are powered with one Li-ion or Li-polymer cell and require two or three separate banks of WLEDs. The TPS60250 contains a $1\times/1.5\times$ chargepump, as well as seven current sinks that are configured into a main display bank of four or five WLEDs and a sub-display bank of two WLEDs. Additionally, the fifth main display WLED can be configured to drive an aux display at up to 80 mA for backlighting a keypad or a weak camera flash.

2   Setup

This chapter describes the jumpers and connectors on the EVM, as well as how to properly connect, set up, and use the TPS60250EVM-185.

2.1   *Input/Output Connector Descriptions*

J1 – VIN

This is the positive input voltage connection to the converter. The EVM operates from any supply voltage between 3 V and 6 V. The leads to the input supply should be twisted and kept as short as possible to minimize EMI transmission and input voltage droop.

J2 – GND

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

J3 – USB to GPIO Connector

This is the connector for the interface box. Connect a ribbon cable of the interface box to this device.

J4 – VLED CATHODE DM5

This is the DM5 connection for using an external aux display WLED bank. Connect the cathode(s) of the external aux display bank to this input.

J5 – VLED ANODE DM5

This is the anode connection for using an external aux display WLED bank. Connect the anode(s) of the external aux display bank to this output.

JP1 – DM1

JP1 is used to connect the cathode of the DM1 LED to the DM1 pin on the TPS60250. Place a shunt on JP1 to connect the WLED to the DM1 input. Remove the shunt to measure the DM1 current or use an external WLED for DM1.

JP2 – DM2

JP2 is used to connect the cathode of the DM2 LED to the DM2 pin on the TPS60250. Place a shunt on JP2 to connect the WLED to the DM2 input. Remove the shunt to measure the DM2 current or use an external WLED for DM2.

JP3 – DM3

JP3 is used to connect the cathode of the DM3 LED to the DM3 pin on the TPS60250. Place a shunt on JP3 to connect the WLED to the DM3 input. Remove the shunt to measure the DM3 current or use an external WLED for DM3.

JP4 – DM4

JP4 is used to connect the cathode of the DM4 LED to the DM4 pin on the TPS60250. Place a shunt on JP4 to connect the WLED to the DM4 input. Remove the shunt to measure the DM4 current or use an external WLED for DM4.

JP5 – DM5

JP5 is used to connect the cathode of the DM5 LED to the DM5 pin on the TPS60250. Place a shunt on JP5 to connect the WLED to the DM5 input. Remove the shunt to measure the DM5 current or use an external WLED for DM5.

JP6 – DS1

JP6 is used to connect the cathode of the DS1 LED to the DS1 pin on the TPS60250. Place a shunt on JP6 to connect the WLED to the DS1 input. Remove the shunt to measure the DS1 current or use an external WLED for DS1.

JP7 – DS2

JP7 is used to connect the cathode of the DS2 LED to the DS3 pin on the TPS60250. Place a shunt on JP7 to connect the WLED to the DS2 input. Remove the shunt to measure the DS2 current or use an external WLED for DS2.

2.2 Equipment Requirements

In order for this EVM to operate properly, the following components must be connected and properly configured.

2.2.1 Personal Computer

A computer with a USB port is required to operate this EVM. The TPS60250 interface software, which is run on the personal computer (PC), communicates with the EVM via the PC USB port. The user sends commands to the EVM and reads the contents of the TPS60250 internal registers through the USB port.

2.2.2 Printed Circuit Board Assembly

The TPS60250EVM-185 PCB contains the TPS60250 IC and its required external components. This board contains several jumpers and connectors that allow the user to customize the board for specific operating conditions.

2.2.3 USB to I^{2}C Adapter

The HPA172 is the link that allows the PC and the EVM to communicate. The adapter connects to the PC with the supplied USB cable on one side and to the EVM though the supplied ribbon cable on the other. When the user writes a command to the EVM, the interface program, which is run from the PC, sends the command to the PC USB port. The adapter receives the USB command and converts the signal to an I^{2}C protocol. It then sends the I^{2}C signal to the TPS60250 board. When the user reads a status register from the EVM, the PC sends a command to read a register on the EVM. When the EVM receives the command, it reports the status of the register via the I^{2}C interface. The adapter receives the information on the I^{2}C interface, converts it to a USB protocol, and sends it to the PC.

2.2.4 Software

Texas Instruments provides software to assist the user in evaluating this EVM. To install the software, insert the enclosed CD into your computer. The software should start automatically. If it does not, go to <Start>, <Run>, and type *D:\setup.exe*, and click <OK> (assuming that D: is your CD drive). Check the TPS60250 product folder on the TI Web site for the latest version of the software.

2.2.5 Power Supplies

The TPS60250 EVM requires one power supply for operation.

2.3 Operation

The following steps must be followed before the EVM can be operated.
1. Install the TPS6025xEVM software.
2. Connect the input voltages to the EVM.
3. Configure all EVM jumpers to the factory settings in Table 1.
4. Connect the ribbon cable between the EVM and the USB-TO-GPIO (HPA172) adapter.
5. Connect the USB cable between the computer and USB-TO-GPIO adapter
6. Run the TPS6025xEVM software.

Table 1. Factory EVM Jumper Settings

Jumper	Shunt Location
JP1	Installed
JP2	Installed
JP3	Installed
JP4	Installed
JP5	Installed
JP6	Installed
JP7	Installed

2.3.1 TPS6025x Software Operation

The software is designed to work with the entire TPS6025x family of devices. A screenshot of the software is shown in Figure 1. The software should automatically detect which device the user is trying to operate and select the correct features accordingly. If the software is started before the EVM is connected, the correct device may not be detected. If this occurs, the different modes are selectable using the Tools pulldown menu. The default mode is TPS60250.

2.3.1.1 Display Enable Settings

This portion of the software allows the user to enable/disable the different banks of LEDs using simple pushbuttons. Open lamp detection may be enabled/disabled using the provided pushbutton. Refer to the TPS60250 data sheet for a description of the open lamp detection. Additionally, the aux display may be grouped with the main display or set for the separate high current (80 mA) aux display. When using the high current setting, it is suggested that separate LEDs are connected the J6 and J6 connectors. The LEDs installed on the EVM are rated for 30-mA dc current and may be damaged at the higher current. Selecting the shutdown option in this pulldown menu disables all of the LEDs and places the IC in a low-power shutdown mode. The internal registers are not changed in this mode.

2.3.1.2 Current Level Settings

This section allows the user to select the LED current for each of the banks of LEDs. The values in the pulldown box change based on the selected value for Ris.

2.3.1.3 General Device Settings

This portion of the software allows the user to select the address of the device used. The EVM comes installed with the primary address device. The Mode Select allows the user to set the mode of the TPS60251 chargepump. Refer to the data sheet for the description of the available modes.

2.3.1.4 Device Register Map

This portion of the software allows the user to change the registers on a bit level. When selecting a bit in the register map, the description of the bit is shown on the bottom bar of the software.
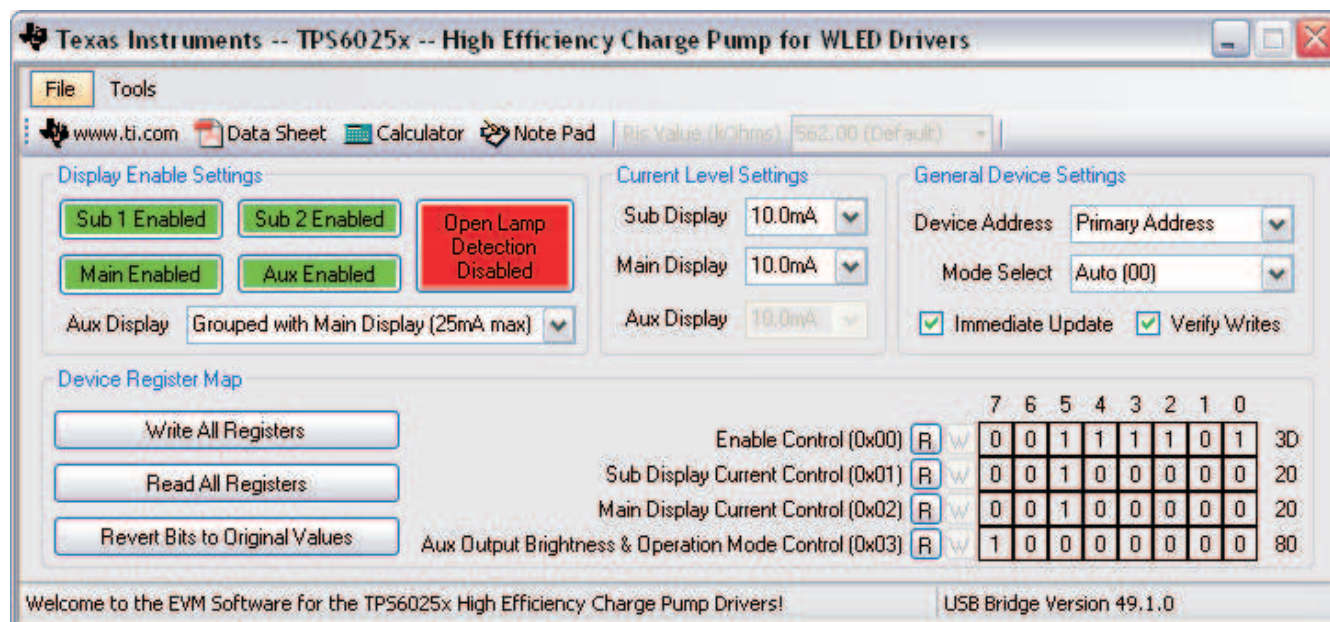

Figure 1. TPS6025x Software Screenshot

3 Board Layout

This chapter provides the TPS60250EVM-185 board layout and illustrations.

3.1 Layout

Board layout is critical for all switch mode power supplies. Figure 2 through Figure 4 show the board layout for the TPS60250EVM-185 PWB.
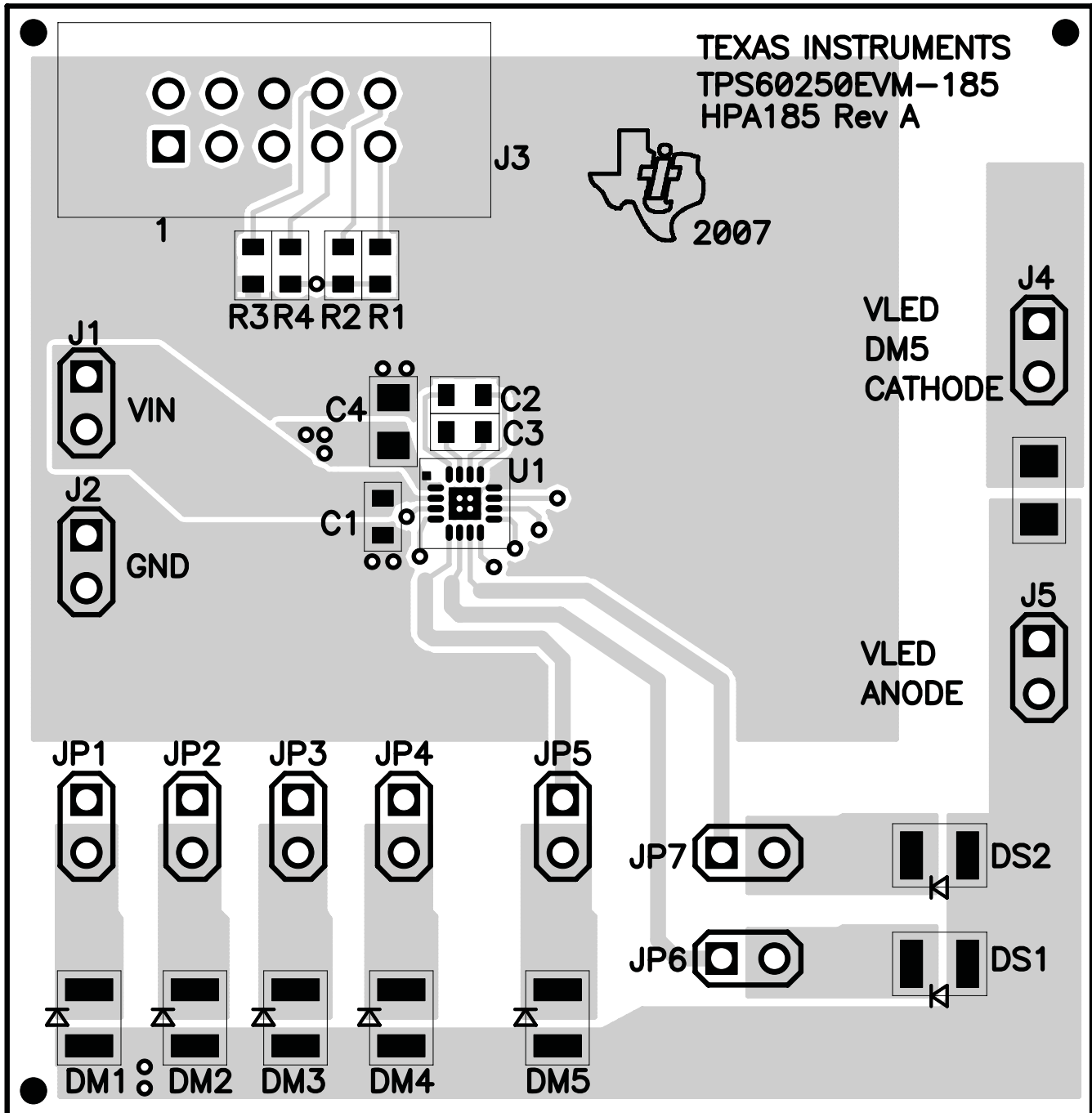
Figure 2. Assembly Layer

Figure 3. Top Layer Routing
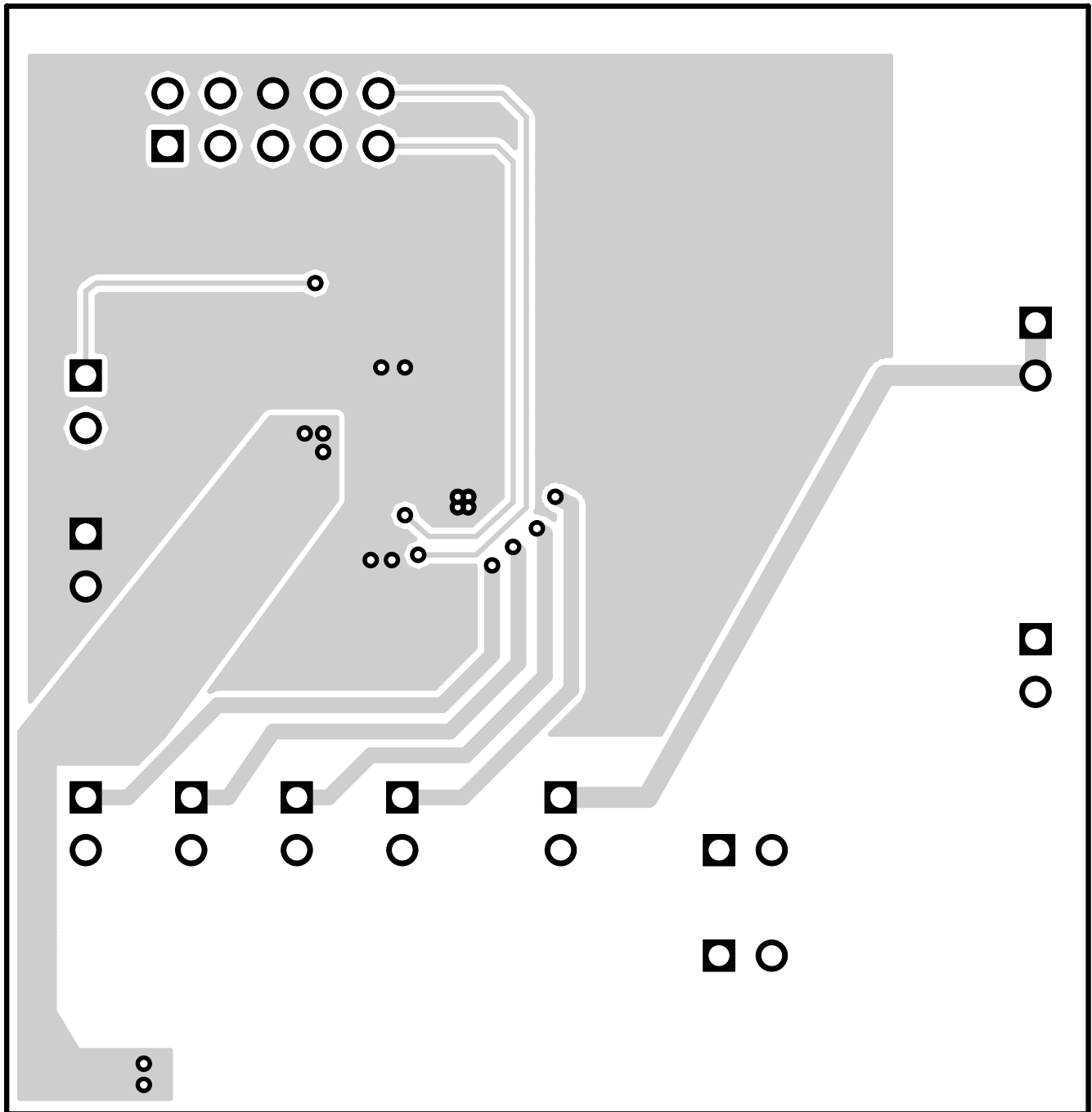
Figure 4. Bottom Layer Routing

4 Schematic and Bill of Materials

This chapter provides the TPS60250EVM-185 schematic and bill of materials.

4.1 *Schematic*
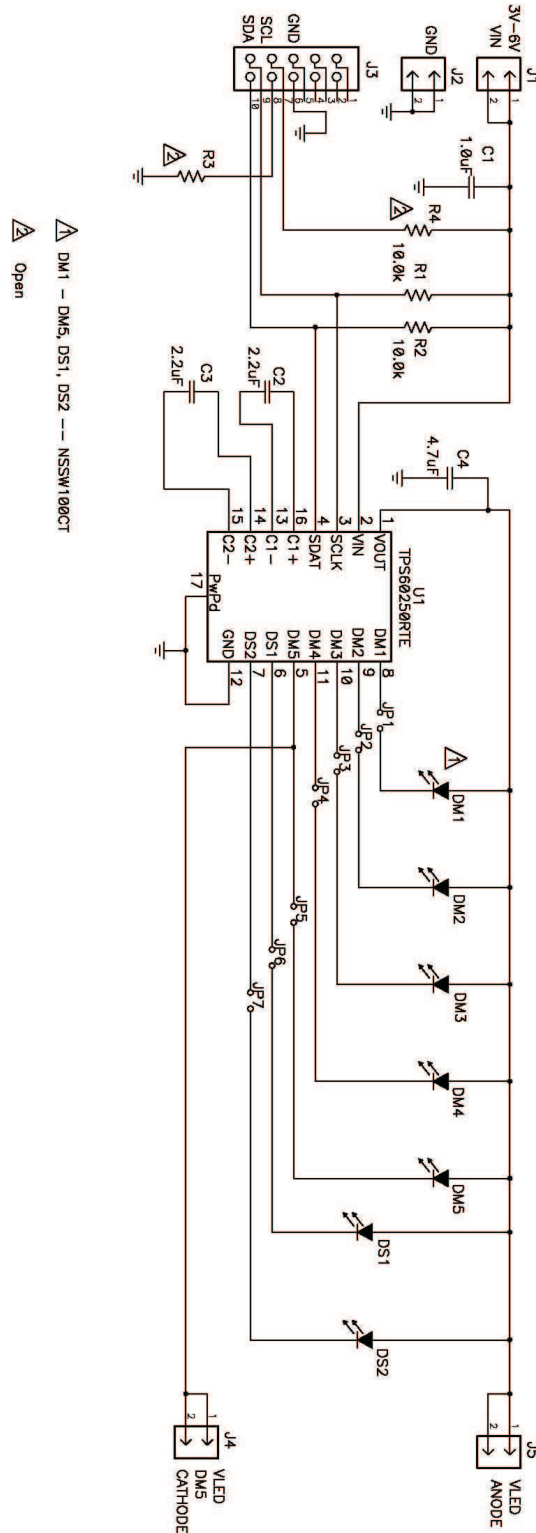
Figure 5. TPS60250EVM-185 Schematic

4.2 Bill of Materials

Table 2. TPS60250EVM-185 Bill of Materials

Count	RefDes	Value	Description	Size	Part Number	MFR
1	C1	1.0uF	Capacitor, Ceramic, 25V, X5R, 10%	0603	GRM188R61E105KA12	muRata
2	C2, C3	2.2uF	Capacitor, Ceramic, 10V, X5R, 10%	0603	GRM188R61A225KE34	muRata
1	C4	4.7uF	Capacitor, Ceramic, 10V, X5R, 10%	0805	GRM21BR61A475KA73	muRata
5	DM1 - DM5		Diode. LED, White	0.079×0.118	NSSW100CT	Nichia
2	DS1, DS2		Diode. LED, White	0.079×0.118	NSSW100CT	Nichia
4	J1 - J5		Header, 2 pin, 100mil spacing, (36-pin strip)	0.100×2	PTC36SAAN	Sullins
1	J3		Connector, Male Straight 2×5 pin, 100mil spacing, 4 Wall	0.338×0.788	2510-6002UB	3M
7	JP1 - JP7		Header, 2-pin, 100mil spacing, (36-pin strip)	0.100×2	PTC36SAAN	Sullins
2	R1, R2	10.0k	Resistor, Chip, 1/16W, 1%	0603	Std	Std
0	R3, R4	Open	Resistor, Chip, 1/16W, 1%	0603		
1	U1		IC, Hi-Efficiency Charge Pump, WLED drivers	QFN-16	TPS60250RTE	TI
1	--		PCB, 2.1 In $\times$ 2.05 In $\times$ 0.062 In		HPA185	Any
7	--		Shunt, 100 mil, Black	0.100	929950-00	3M

Related Documentation From Texas Instruments

TPS60250 data sheet (SLVS769)

EVALUATION BOARD/KIT IMPORTANT NOTICE

FCC Warning

EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 0 V to 6 V and the output voltage range of 80 mV to 6.5 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 100°C. The EVM is designed to operate properly with certain components above 100°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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