TPS6555xEVM-097

This user's guide describes the characteristics, operation, and use of the TPS6555xEVM-097 evaluation module (EVM). This EVM demonstrates the Texas Instruments TPS6555x integrated photo flash charger with IGBT driver. This user's guide 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 TPS6555xEVM-097 evaluation module (EVM) helps designers evaluate the operation and performance of the TPS6555x family of devices. These devices are highly integrated flyback converters used to charge photo-flash capacitors.

The EVM contains one fully functional photo-flash charger capable of charging a photo-flash capacitor to 300 V from a battery with voltage between 1.8 V and 12 V. The EVM also provides a flash lamp and trigger circuit to help the designer evaluate the charging characteristics. Provisions have been made to disable the onboard lamp circuit so that the EVM can be connected to a user-supplied lamp and trigger circuit.

2 Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, set up, and use the TPS6555xEVM-097.

WARNING

The TPS6555xEVM-097 produces high voltage and is designed to charge the bulk flash capacitor to more than 285 volts. This capacitor can maintain this voltage for a long time, even after the input power has been removed from the board. Do not touch any exposed metal on the TPS6555xEVM-097 without first discharging the bulk flash capacitor.

2.1 Input/Output Connector Descriptions

J1 – Vbatt — This is the positive battery voltage input connection to the converter. This voltage should be between 1.8 Vdc and 12 Vdc.

J2 – GND — This is the return connection for the battery voltage to the converter.

J3 – J5 — This is the positive digital supply voltage. This should be a regulated 5-V input.

J4 – GND — This is the return connection for the digital supply voltage.

J5 – REMOTE CONTROL — This connector is used to connect the EVM to a personal computer as an optional method of controlling the EVM. All necessary control inputs and outputs for the converter are present on this connector. The flash and charge signals are inverted before connecting to the TPS6555x IC on the EVM board. The pinout for the connector is shown in Table 1.

J6 – User Lamp Module HV Connections — This connector is used to connect the EVM to a user-supplied lamp and trigger circuit. Pin 2 on this connector is the high-voltage side of the photo-flash capacitor; pin 1 is the trigger signal. See the EVM schematic for more information.

J7 – User Lamp Module HV Return Connections — This connector is used to connect the EVM to a user-supplied lamp and trigger circuit. Both pins of this connector are connected to the negative side of the photo-flash capacitor and provide the return path for the flash currents.

JP1 and JP2 – EVM Lamp Disconnect — These jumpers are used to disconnect the lamp and trigger circuit of the EVM so that a user-supplied lamp and trigger can be evaluated. The lamp and trigger are disconnected when the jumpers of both JP1and JP2 are removed.

JP3 – Ipeak — This jumper is used to externally set the charge current. Pin 2 of this connector is tied directly to the Ipeak pin of the TPS6555x. Five volts and ground are provided on the connector so that a resistor divider can be formed to set the peak charge current anywhere between the TPS6555x minimum and maximum values. Connecting a jumper from pin 2 (Ipeak) to pin 1 (+5V) configures the TPS6555x minimum and maximum values. Connecting a jumper from pin 2 (Ipeak) to pin 3 (GND) configures the TPS6555x to charge the flash capacitor using the minimum peak current.

Table 1. J5 Pinout

Pin No.	Signal	Connection
1	Charge Complete	Output: An active low indicates the flash capacitor is charged.
2	GND	Signal ground
3	Charge	Input: A negative edge initiates the charging of the capacitor.
4	GND	Signal ground
5	Flash	Input: A low signal initiates a lamp flash.
6	GND	Signal ground
7	Ipeak	Input: Used to provide the peak current set-point of the charger
8	GND	Signal ground
9	+5V	The pin is connected to the +5-V plane of the EVM board.
10	GND	Signal ground

2.2 Setup and Operation With Onboard Lamp and Trigger Circuit

The following steps provide information about how to set up and operate the onboard lamp and trigger circuit.

1. Discharge the photo-flash capacitor by shorting C7 with a 15-kΩ resistor for more than 20 seconds. Use a multimeter to measure the voltage on C7, and verify that the voltage is close to zero before continuing or touching any connectors or components.
2. If needed, install jumpers across JP1 and JP2 to connect the onboard lamp and trigger circuit to the control circuitry.
3. Connect the positive lead of a regulated 5-V supply to J3.
4. Connect the negative lead of a regulated 5-V supply to J4.
5. Connect the positive lead of a battery or power supply to J1. This voltage can be between 1.8 V and 12 V.
6. Connect the negative lead of a battery or power supply to J2.
7. Turn on the 5-V supply.
8. Turn on the battery voltage supply.
9. Push and hold the *Charge* button to start charging the flash capacitor.
10. Release the *Charge* button when the green *Charge Complete* LED illuminates.
11. Push the *Flash* switch to flash the lamp.
12. Repeat steps 9 through 11 as desired.

2.3 Setup and Operation With User-Supplied Lamp and Trigger Circuit Operation

The following steps provide information about how to set up and operate the user-supplied lamp and trigger circuit.

1. Discharge the photo-flash capacitor by shorting C7 with a 15-kΩ resistor for more than 20 seconds. Use a multimeter to measure the voltage on C7, and verify that the voltage is close to zero before continuing or touching any connectors or components.
2. Remove jumpers across JP1 and JP2 to disconnect the onboard lamp and trigger circuit from the control circuitry. The TPS6555xEVM should only be used to flash a single flash tube.
3. Connect the high-voltage portion of the user-supplied lamp circuit to pin 2 of J6.
4. Connect the trigger portion of the user-supplied lamp to pin 1 of J6. See the EVM schematic to verify circuit connection.
5. Connect the ground portion of the user lamp circuit to pin 1 of J7.

6. Connect the positive lead of a regulated 5-V supply to J3.
7. Connect the negative lead of a regulated 5-V supply to J4.
8. Connect the positive lead of a battery or power supply to J1. This voltage can be between 1.8 V and 12 V.
9. Connect the negative lead of a battery or power supply to J2.
10. Turn on the 5-V supply.
11. Turn on the battery voltage supply.
12. Push and hold the *Charge* switch to start charging the flash capacitor.
13. Release the *Charge* switch when the green *Charge Complete* LED illuminates.
14. Push *Flash* switch to flash the lamp.
15. Repeat steps 12 through 14 as desired.

3 Board Layout

This section provides the TPS6555xEVM-097 board layout and illustrations.

Board layout is critical for all high-frequency switch mode power supplies. Figure 1, Figure 2, and Figure 3 show the board layout for the TPS6555xEVM-097 PWB. 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 for all high-current and high-voltage traces. See the data sheet for specific layout guidelines.

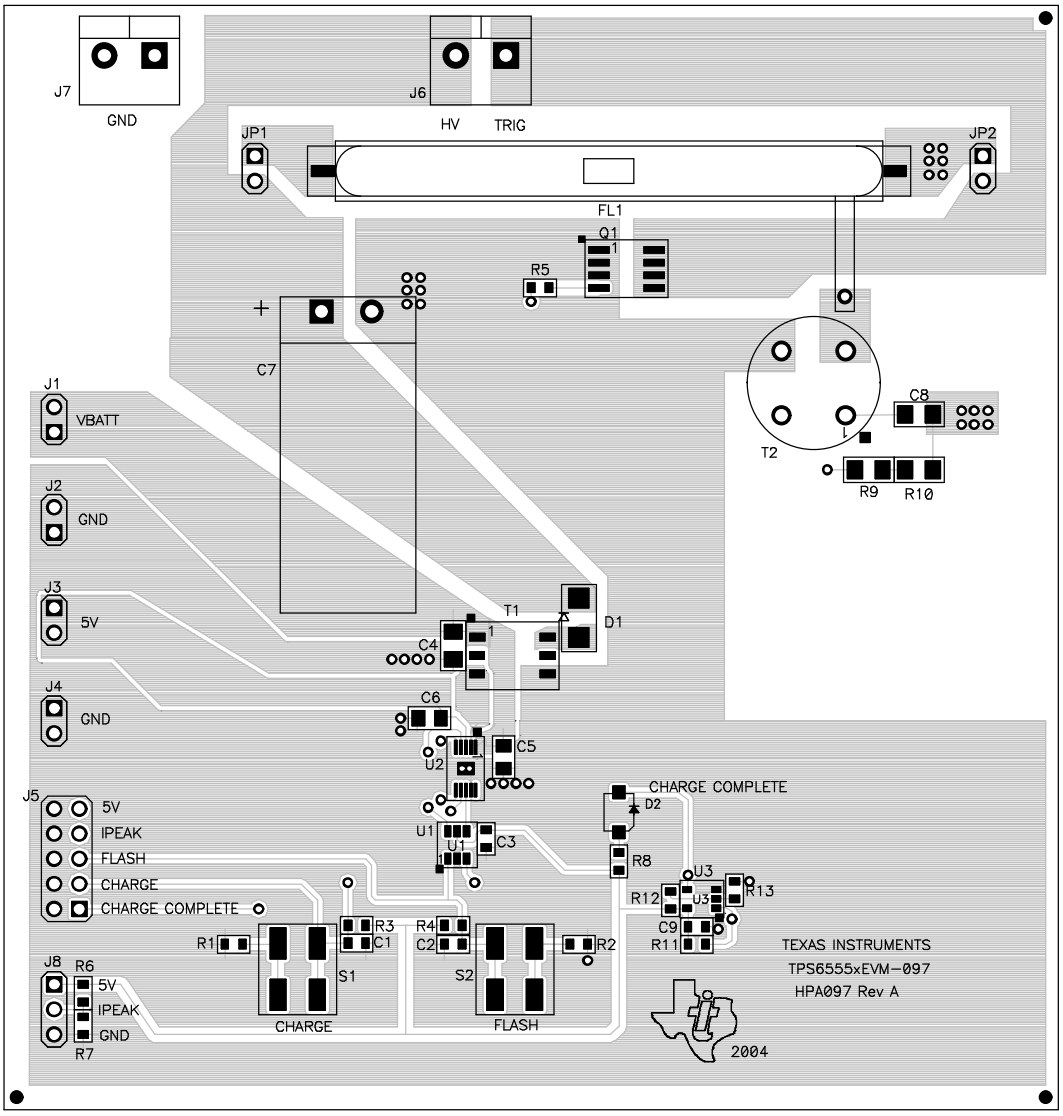

Figure 1. Assembly Layer

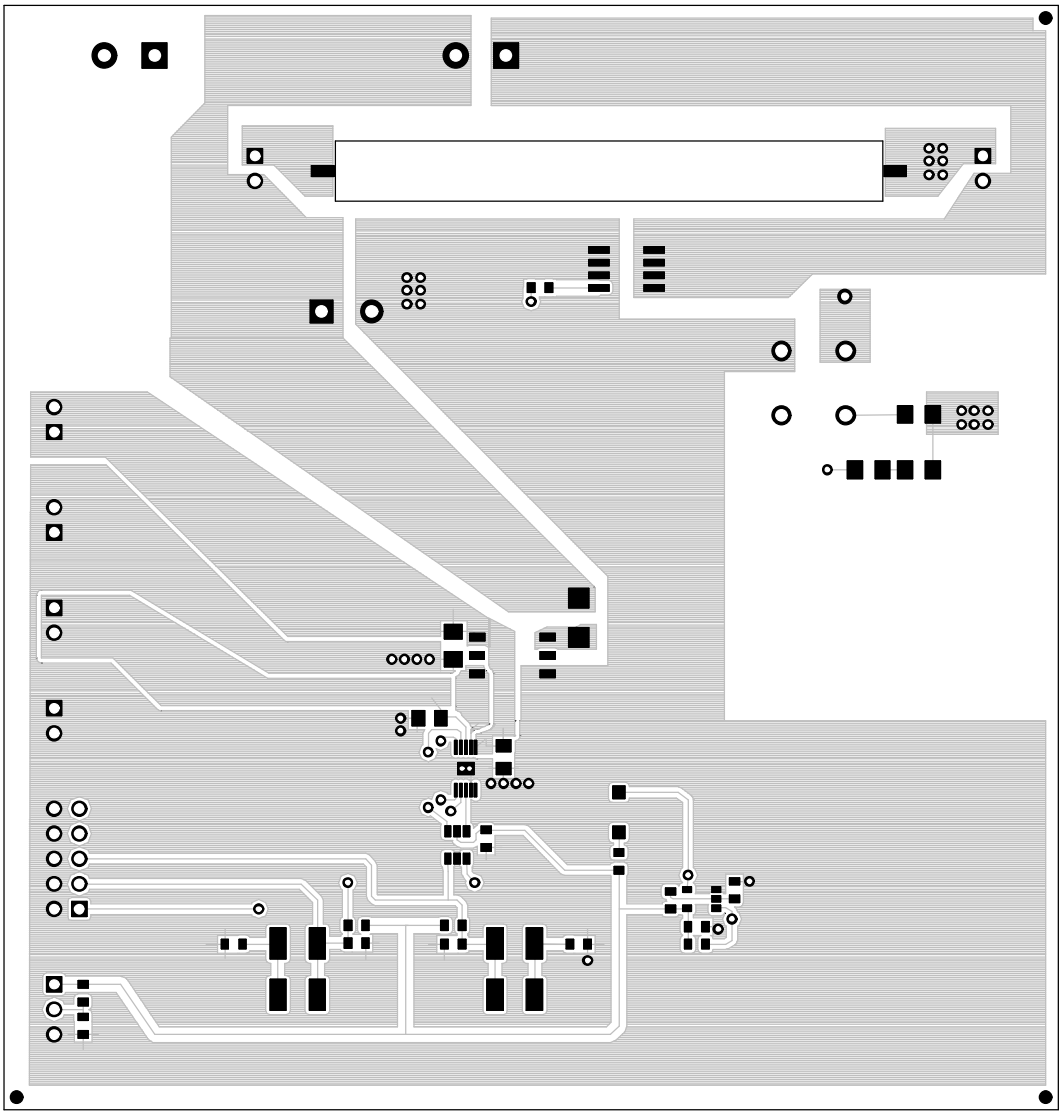

Figure 2. Top Layer Routing

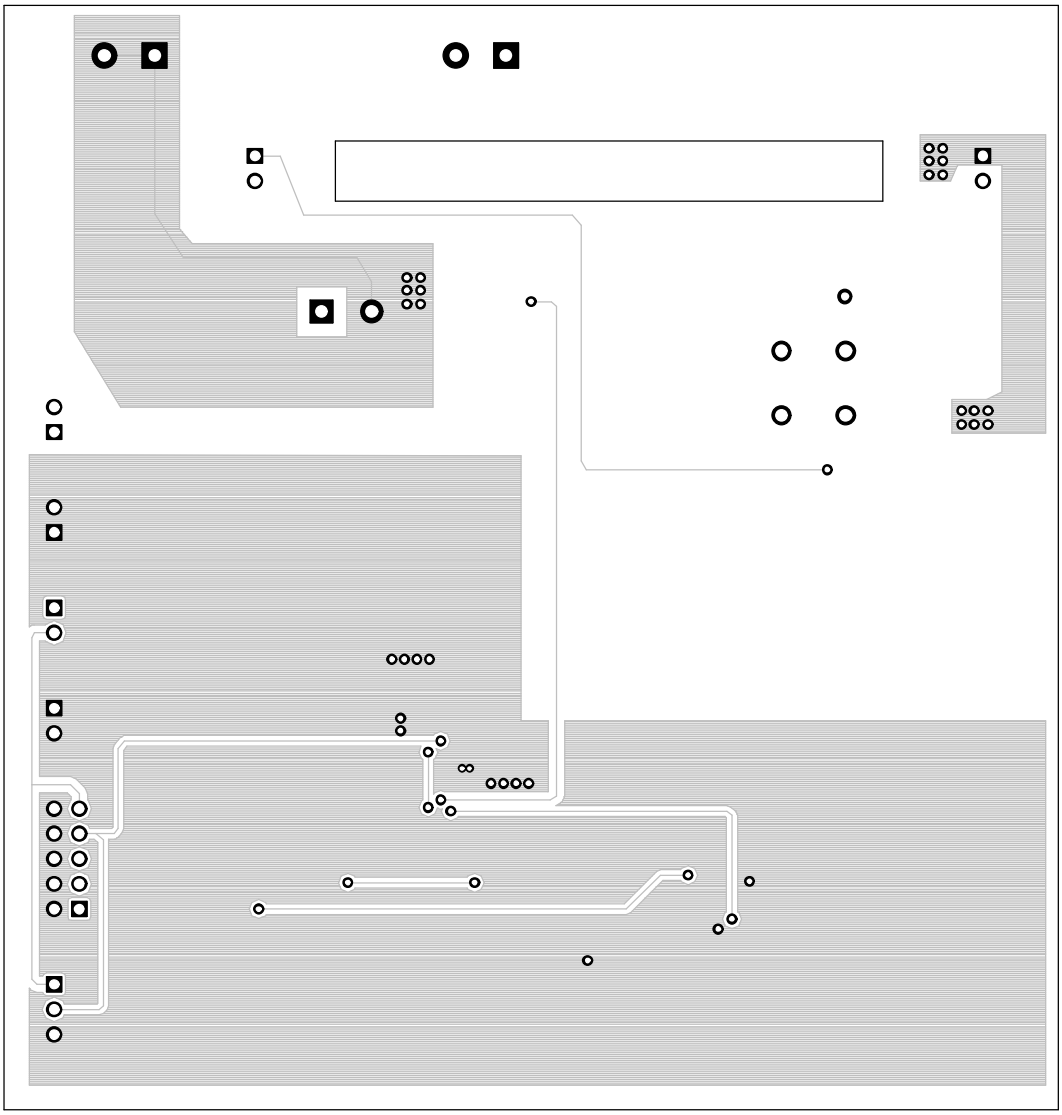

Figure 3. Bottom Layer Routing

4 Schematic and Bill of Materials

This section provides the TPS6555xEVM-097 schematic (see Figure 4) and bill of materials.

4.1 Schematic

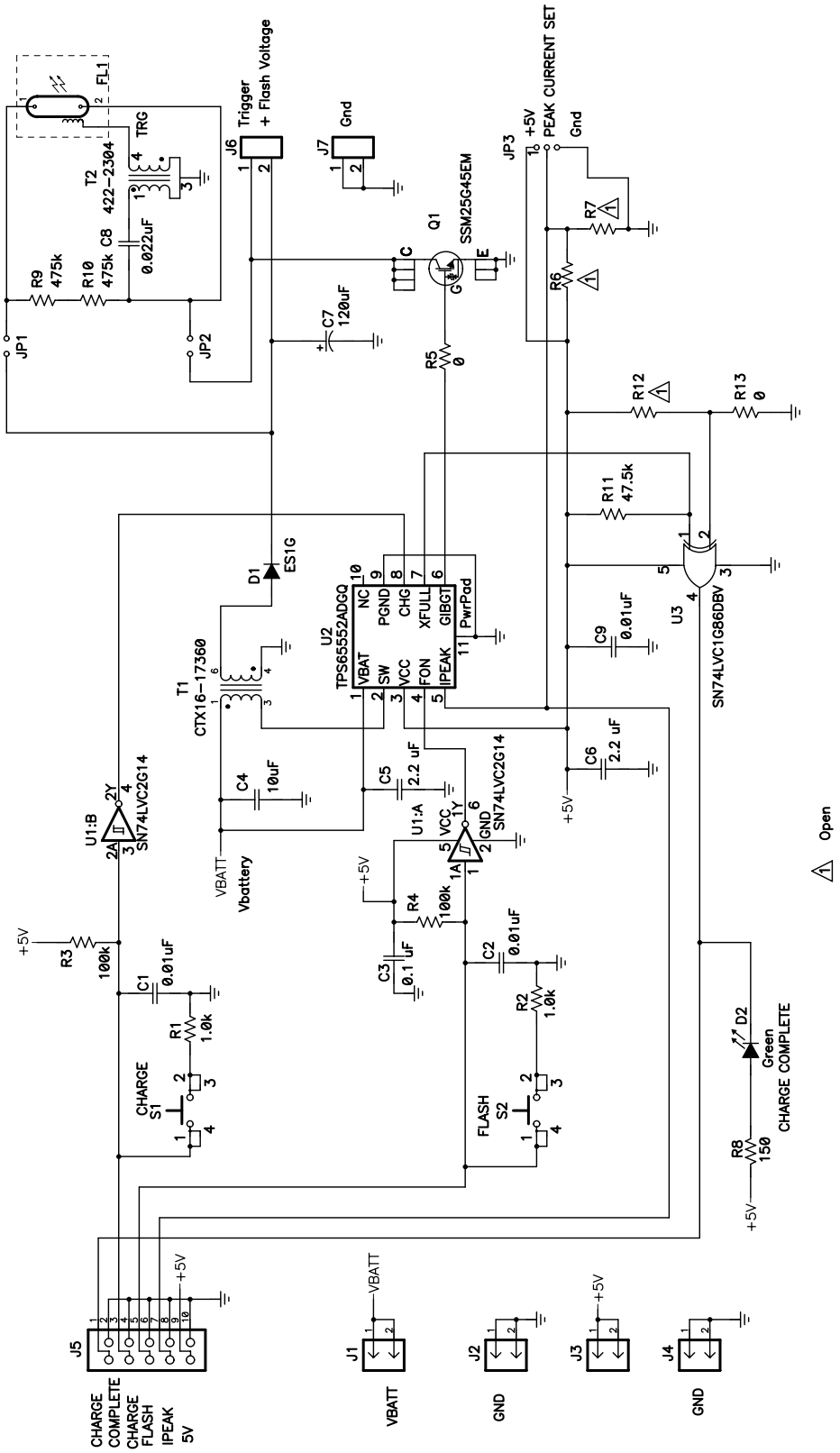

Figure 4. TPS6555xEVM-097 Schematic

4.2 Bill of Materials

Table 4.3. TPS6555xEVM-097 Bill of Materials

COUNT	Ref Des	DESCRIPTION	SIZE	MFR	PART NUMBER
3	C1, C2, C9	Capacitor, Ceramic, 0.01-uF, 50-V, X7R, 10%	0603	TDK	C1608X7R1H103KT
1	C3	Capacitor, Ceramic, 0.1-uF, 50-V, X7R, 10%	0603	TDK	C1608X7R1H104K
1	C4	Capacitor, Ceramic, 10-uF, 16-V, X7R, 10%	1206	TDK	C3216X7R1C106KT
2	C5, C6	Capacitor, Ceramic, 2.2-uF, 16-V, X7R, 10%	0805	TDK	C2012X7R1C225KT
1	C7	Capacitor, Aluminum, 120-uF, 330-VDC, ±20%	13 x 28 mm	Rubycon	330 FW 120A
1	C8	Capacitor, Ceramic, 0.022-uF, 630-V, X7R, 10%	1206	TDK	C3216X7R2J223KT
1	D1	Diode, Rectifier, 1-A, 400-V	SMA	Diodes Inc.	ES1G
1	D2	Diode, LED, Green, Gullwing, GW Type, 20ma, 7.5 mcd typ.	0.120 x 0.087	Panasonic	LN1361CTR
1	FL1	Flash Tube, 400v Max	2.126 x 0.157	Xicon	36FT050
4	J1 - J4	Header, 2-pin, 100mil spacing, (36-pin strip)	0.100 x 2	Sullins	PTC36SAAN
1	J5	Header, 2x5-pin, 100mil spacing (36-pin strip)	0.100 x 5 X 2	Sullins	PTC36SAAN
2	J6, J7	Terminal Block, 2-pin, 15-A, 5.1mm	0.40 x 0.35	OST	ED1609
2	JP1, JP2	Header, 2-pin, 100mil spacing, (36-pin strip)	0.100 x 2	Sullins	PTC36SAAN
1	JP3	Header, 3-pin, 100mil spacing, (36-pin strip)	0.100 x 3	Sullins	PTC36SAAN
1	Q1	Trans, NChan Insulated-Gate Bipolar, 450V, 150A	SO-8	Silicon Standard	SSM25G45EM
1	R1, R2	Resistor, Chip, 1.0k-Ohms, 1/16-W, 1%	0603	Std	Std
1	R11	Resistor, Chip, 47.5k-Ohms, 1/16-W, 1%	0603	Std	Std
2	R3, R4	Resistor, Chip, 100k-Ohms, 1/16-W, 1%	0603	Std	Std
2	R5, R13	Resistor, Chip, 0-Ohms, 1/16-W, 5%	0603	Std	Std
0	R6, R7, R12	Resistor, Chip, xx-Ohms, 1/16-W, 1%	0603		
1	R8	Resistor, Chip, 150-Ohms, 1/16-W, 1%	0603	Std	Std
2	R9, R10	Resistor, Chip, 475k-Ohms, 1/8W, 1%	1206	Std	Std
2	S1, S2	Switch, SPST, PB Momentary, Sealed Washable	0.245 X 0.251	C & K	KT11P2JM
1	T1	Transformer, Flyback, 1:10.2	0.300 x 0.240	Coiltronics	CTX16-17360
1	T2	Transformer, Trigger	0.197 Dia	Xicon	422-2304
1	U1	IC, Dual Schmitt-Trigger Inverter	SOT23-6	TI	SN74LVC2G14DBV
1	U2	IC, Photo Flash Charger and IGBT Driver	DGQ10	TI	TPS65552ADGQ
1	U3	Single 2-Input X-OR Gate	SOT-25	TI	SN74LVC1G86DBV
1	--	PCB, 4.4 In x 4.2 In x 0.062 In		Any	HPA097
3	--	Shunt, 100-mil, Black	0.100	3M	929950-00
4	--	Bumpon, Transparent	0.44" x 0.2"	3M	SJ5303

5 Related Documentation From Texas Instruments

TPS65552A, *Integrated Photo Flash Charger and IGBT Driver* data sheet (SLVS567)

FCC Warnings

This equipment is intended for use in a laboratory test environment only. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment in other environments may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

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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 12 V and the output voltage range of 285 V to 335 V.

The TPS6555xxEVM-097 produces high voltage and is designed to charge the bulk flash capacitor to more than 285 volts. This capacitor can maintain this voltage for a long time, even after the input power has been removed from the board. Do not touch any exposed metal on the TPS6555xxEVM-097 without first discharging the bulk flash capacitor.

Exceeding the specified input rnage may cause unexpected operation and/or irreversibel damage to the EVM. If there are questions concerning the inp0ut 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 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 25°C. The EVM is designed to operate properly with certain components above 25°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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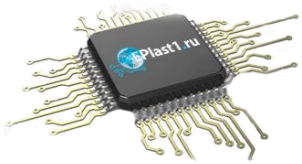

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