TAS5602EVM2 Audio Power Amplifier Evaluation Module

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1 Introduction

1.1 Description

The TAS5602EVM2 evaluation module consists of a single class-D stereo audio power amplifier complete with a small number of external components mounted on a circuit board that can be used to directly drive speakers using a TAS3308 EVM as the input. The input connector for the TAS5602EVM2 is configured to connect directly to the TAS3308 EVM PWM connector. The TAS5602EVM2 can be configured to drive 2 stereo BTL channels up to 20W/ch or 4 SE (single-ended) channels up to 10/ch. It is also possible to configure the EVM to drive speakers in a 2.1 configuration with 2 channels of SE stereo and one channel of BTL subwoofer. The user can also connect to the TAS5602EVM2 input with a ribbon cable from a target system if desired.

This document assumes that the user has obtained a TAS3308 EVM and has set up the PurePath Studio™ software on a test computer with USB interface. The Quick Setup Guide in the TAS3308 EVM User's Guide (TI document SLEU093) describes a method to get the TAS3308 EVM up and running efficiently.

The TAS3308 EVM outputs 6 PWM channels plus a VALID/SYNC signal. The six PWM channels are grouped into three stereo channels named PWM1 L and R, PWM2 L and R, and PWM3 L and R. The TAS5602EVM2 is configured to connect to PWM3, which consists of 4 output lines

1.2 TAS5602EVM2 Specifications

		VALUE	UNIT
V_{CC}	Supply voltage range	10 to 26	V
I_{CC}	Supply current	4	A rms
P_O	Continuous output power per channel: 8 Ω BTL, VCC = 18 V, THD+N = 10%	20	W
R_L	Minimum load impedance,	4	Ω

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2 Operation

2.1 Quick Start Guide for use with TAS3308 Digital Audio Signal Processor

Follow these steps to use the TAS5602EVM2 along with the TAS3308 EVM. Power and speaker connections to the EVM module can be made by inserting stripped wire or using banana plugs for the power supply and output connections. The inputs can be connected directly to the TAS3308 EVM via the 2×20 pin header. Set up the TAS3308 according to the instructions given in the TAS3308EVM User's Guide (SLEU093). Download the TAS5602 configuration file from the TAS5602 product folder. This can be used to optimize the TAS3308 set-up for the TAS5602 power stage.

Some additional adjustments to the Pure Path Studio™ setup for TAS3308 may be necessary to run the TAS5602EVM2.

1. The input selection is performed by selecting the StereoMux and changing the Mux Select Property to StereoCh1 or StereoCh2 depending on the type of signal being used. Select StereoCh1 (TAS3308ADCIn-1) if it is Analog input; select StereoCh2 (TAS3308SAPIn-1) if it is SPDIF format digital input.
2. Build the process flow above and select Build/Generate Code
3. Select Build/Download, and then Run.
4. Press the Mute button on the TAS3308 EVM to turn it to the OFF state. The MUTE indicator LED should turn off. This is necessary since the TAS3308 EVM transitions to the run mode with the MUTE in the ON state.

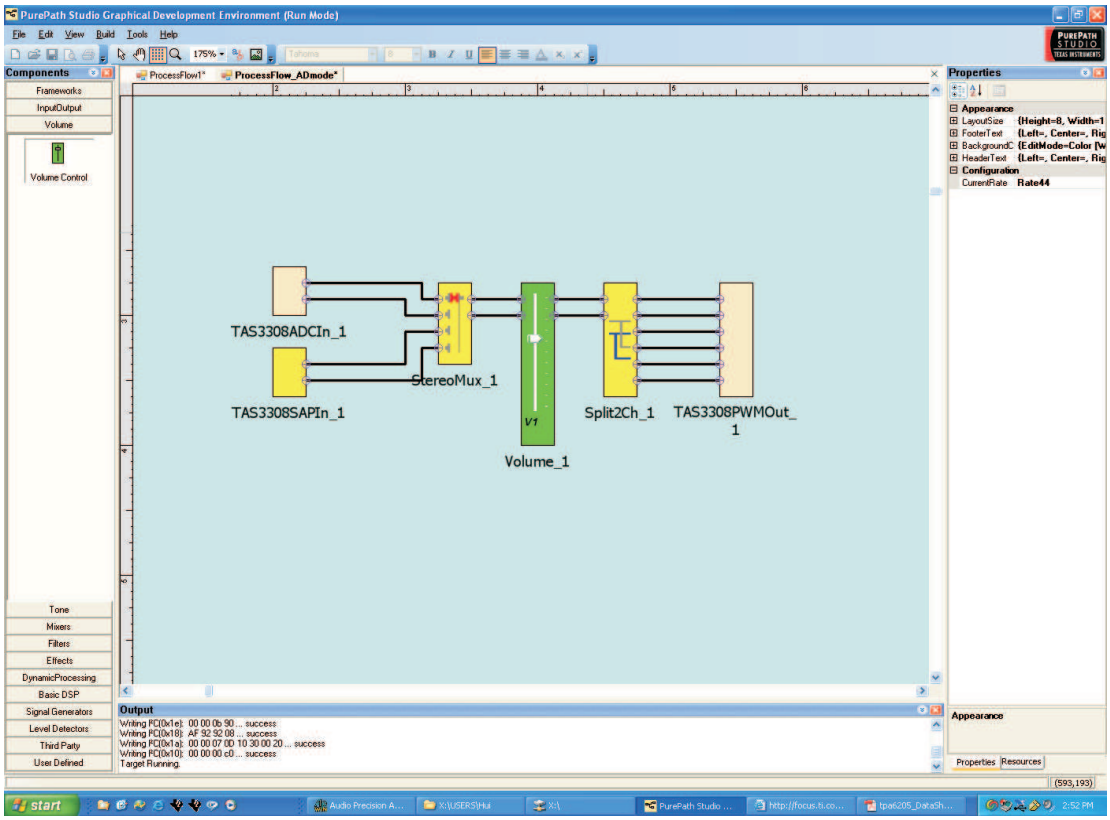

Figure 1. Suggested Process Flow for TAS5602EVM2

2.2 Connect the TAS3308 EVM to TAS5602EVM2

Place the TAS3308 EVM and TAS5602EVM2 at the same height and let the 40 pin connector on each board face each other. Push them together carefully until they make a solid connection

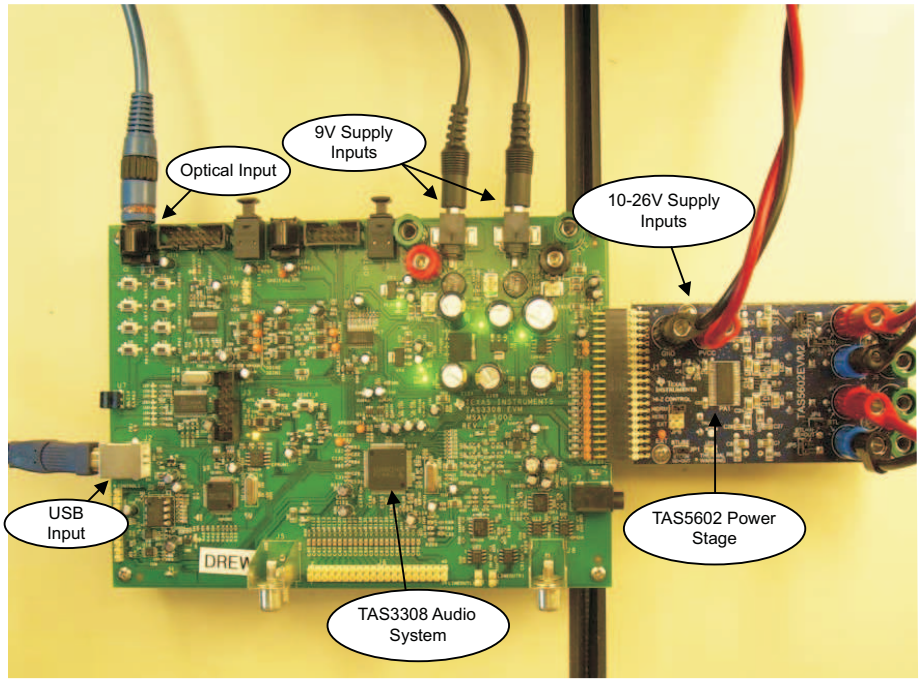

Figure 2. TAS3308EVM/ TAS5602EVM2 External Connections

2.3 Power Supply

1. Three power supplies are required: two 9V, 1.7A power supplies for the TAS3308 EVM and one 10V - 26V, 4A supply for the TAS5602EVM2.
2. Ensure that all external power sources are set to OFF.
3. Connect the two 9V supplies to the TAS33088 EVM. Connect the power supply adjusted from 10V–26V to the module TAS5602 PVCC and GND banana jacks taking care to observe marked polarity.

2.4 Evaluation Module Preparations

Speaker Connections (BTL Configuration)

1. Connect a speaker across OUTA (**J2**) and OUTB (**J4**). Connect another speaker across OUTC (**J6**) and OUTD (**J8**)
2. Install Jumpers 1-5.

Speaker Connections (SE Configuration)

1. Connect a speaker across the following pairs of jacks: OUTA (**J2**) and GND (**J3**), OUTB (**J4**) and GND (**J5**) , OUTC (**J6**) and GND (**J7**), and OUTD (**J8**) and GND (**J9**).
2. Remove Jumpers 1-5.

Control Inputs

1. **HIZ:** This terminal is active LOW. This terminal can be used to (< 1ms) disable the output switching in the event of a power failure. If the HIZ is tied to RESET, the volume ramps up slowly at start-up, but the output switching is stopped at power down. Place JP6 in the NORM position to bypass the function. This position ties HIZ to the 3.3 V supply. Place JP6 in the RESET position to tie HIZ to RESET. Place JP6 in the EXT position if manual test is desired. When JP6 is in the EXT position, the HIZ pin is accessible via the test point "EXT" and the HIZ function can be exercised by grounding this test point to the board ground. The PGND at the power supply ground can be used for this test.
2. **RESET:** This terminal is active LOW. This terminal can be used for pop-free start/stop.
3. **FAULT**: This terminal is active LOW. This terminal is used to indicate short circuit faults. If this pin is low, a short circuit at the output has been detected. FAULT will be reset if the RESET pin is pulled low, or the PVCC supplies are turned off. Thermal fault is not reported on this pin.
4. **THERM_WARN**: This terminal is a TTL compatible push-pull output. Thermal warning flag goes low if the die temperature has reached 125°C. This pin is automatically reset if the temperature drops back below 105°C. The THERMAL WARNING LED lights when this pin goes low.
5. **SE/BTL**: This pin controls the starting up timing based on the output configuration. If SE/BTL is connect to DVDD (SE), the start-up is slow to allow a pop-free start-up in single-ended configurations. If the SE/BTL is connect to GND, the start-up is faster, as desired, for BTL configurations. Use the jumper, JP1, to set this function.

2.5 Power Up

1. Verify correct voltage and input polarity for the ±9V supplies for the TAS3308 EVM and 10V - 26V supply for the TAS5602EVM2. Turn the TAS3308 power supplies ON.
2. Prepare the TAS3308 EVM for audio play by using the Quick Setup Guide in the TAS3308EVM User's Guide (TI document SLEU093). The user may want to turn down the volume on the audio source prior to enabling the audio outputs to the TAS5602 audio amplifier. Connect the audio source to the TAS3308 EVM and use the Pure Path Studio GDE to select the correct Mux to route the audio signal to the PWM3 output.
3. Turn on the power supply for the TAS5602EVM2. LED2 next to the PVCC jack on the TAS5602EVM2 should be lit. Audio power should be reaching the speakers (loads) at this time.
4. Adjust the audio level using the Pure Path Studio GDE to produce the required audio signal.

3 Reference

3.1 TAS5602EVM2 Schematic

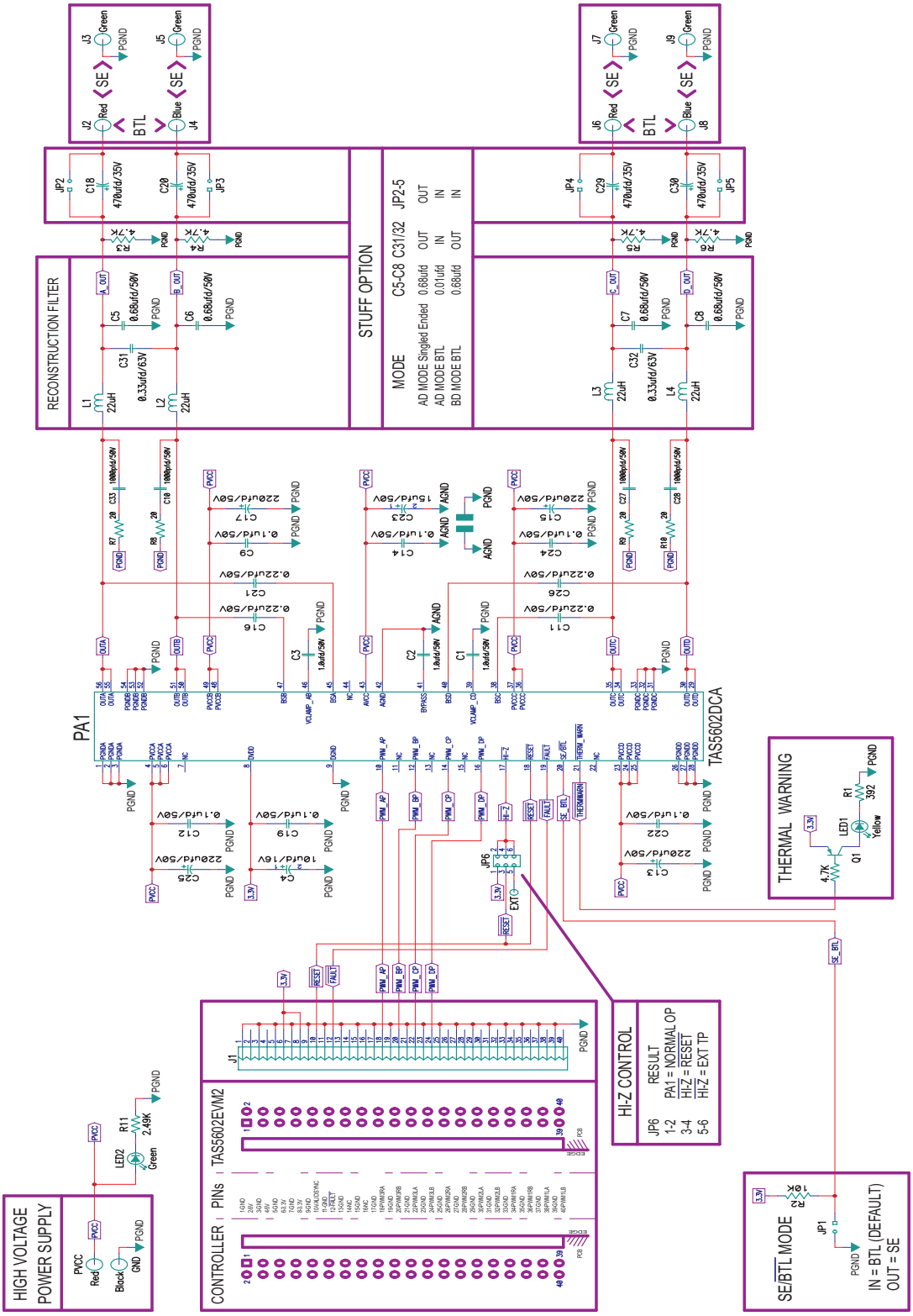

Figure 3. TAS5602EVM2 Schematic

3.2 TAS5602EVM2 PCB Layers

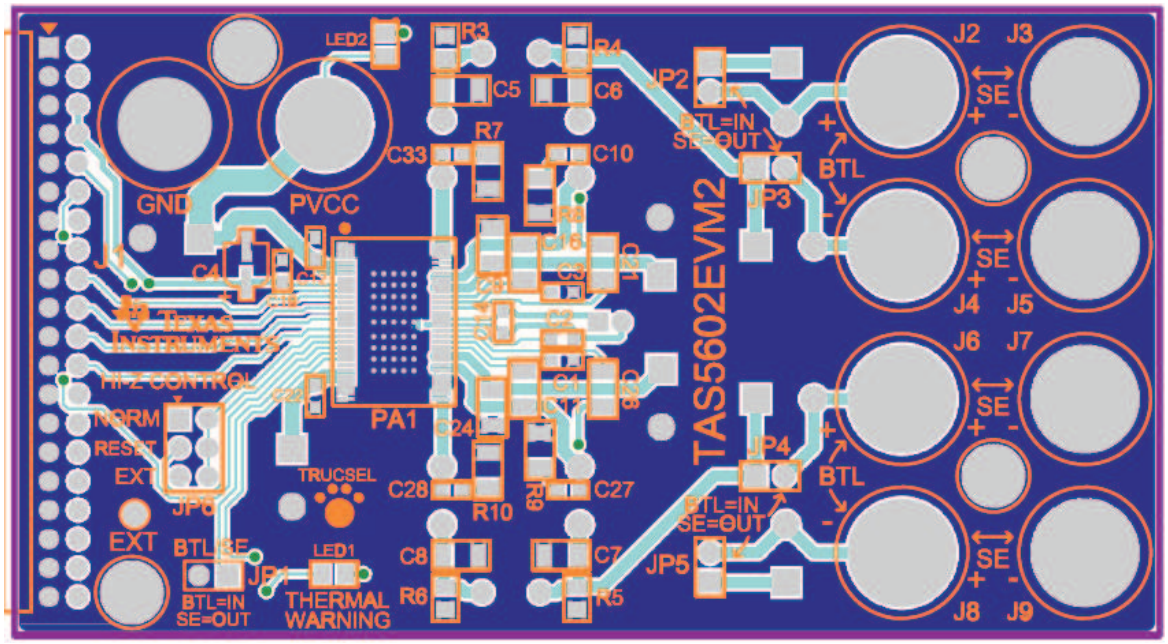

Figure 4. TAS5602EVM2 – Top Side Layout

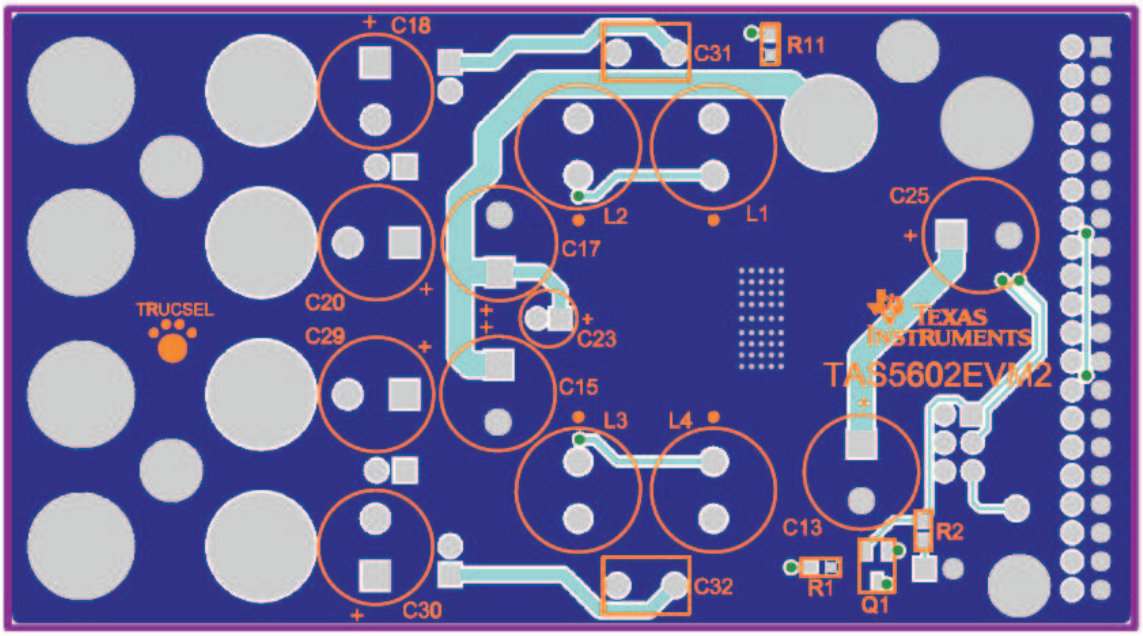

Figure 5. TAS5602EVM2 – Bottom Side Layout

3.3 Bill of Materials

Table 1. Bill of Materials for TAS5602EVM2 – BDBTL

ITEM	DESCRIPTION	REFERENCE DESIGNATORS	QTY	MANUFACTURER	MANUFACTURER PART NUM
1	20W 4 CH POWER AMP, HTSSOP56-DCA	PA1	1	TEXAS INSTRUMENTS	TAS5602DCA
2	Transistor PNP 50V PreBiased/4.7K 100mA SOT23-DBV3	Q1	1	DIODES, INC.	DDTA143TCA-7
3	LED, GREEN 2.0V SMD0805	LED2	1	LUMEX OPTICAL	SML-LXT0805GW-TR
4	LED, YELLOW 2.0V SMD0805	LED1	1	LUMEX OPTICAL	SML-LXT0805YW-TR
5	CAP 1000PFD 50V CERM 0603 X7R	C10, C27, C28, C33	4	PANASONIC	ECU-V1H102KBV
6	CAP 0.1UFD 50V CERM 0603 X7R	C12, C14, C19, C22	4	MURATA	GRM188R71H104KA93D
7	CAP 1.0UFD 50V CERM 0603 X5S	C1, C2, C3	3	TAIYO YUDEN	UMK107C105KA-T
8	CAP 0.1UFD 50V CERM 1206 X7R	C9, C24	2	PANASONIC	ECJ-3VB1H104K
9	CAP 0.22UFD 50V CERM 1206 X7R	C11, C16, C21, C26	4	TDK CORPORATION	C3216X7R1H224K
10	CAP 0.68UFD 50V CERM 1206 X7R ROHS	C5, C6, C7, C8	4	KEMET	C1206C684K5RACTU
12	CAP 10UFD 16V ALUM ELEC SMD VSA	C4	1	PANASONIC	ECE-V1CS100SR
13	CAP 15UFD 50V RAD ALUM ELEC FC	C23	1	PANASONIC	EEU-FC1H150
14	CAP 220UFD 50V RAD ALUM ELEC FC	C13, C15, C17, C25	4	PANASONIC	EEU-FC1H221
15	CAP 470UFD 35V RAD ALUM ELEC HE ROHS	C18, C20, C29, C30	4	NICHICON	UHE1V471MPD
16	RES 392 OHM 1/10W 1% SMD 0603	R1	1	PANASONIC	ERJ-3EKF3920V
17	RES 2.49K OHM 1/16W 1% SMD 0603	R11	1	PANASONIC	ERJ-3EKF2491V
18	RES 10K OHM 1/16W 5% SMD 0603	R2	1	PANASONIC	9C06031A1002JLHFT
19	RES 4.7K OHM 1/8W 1% SMD 0805	R3, R4, R5, R6	4	YAGEO	9C08052A4701FKHFT
20	RES 20 OHM 1/4W 1% SMD 1206	R7, R8, R9, R10	4	YAGEO	9C12063A20R0FKHFT
21	INDUCTOR, SERIES 11RHBP, 22UH	L1, L2, L3, L4	4	TOKO AMERICA	A7503AY-220M
22	HEADER, 2x20 PIN MALE PCB-RA GOLD ROHS	J1, J1	2	SULLINS	PBC20DBAN
23	HEADER, 2 PIN MALE, PCB, STRAIGHT GOLD ROHS	JP1, JP2, JP3, JP4, JP5	5	SULLINS	PBC02SAAN
24	HEADER, 2X3 PIN MALE, PCB STRAIGHT GOLD ROHS	JP6	1	SULLINS	PBC03DAAN
25	PC Testpoint, Orange	EXT	1	KEYSTONE ELECTRONICS	5003
26	BINDING POST, BLUE, TIN PCB ROHS	J4, J8	2	POMONA	3760-6
27	BINDING POST, GREEN, TIN PCB ROHS	J3, J5, J7, J9	4	POMONA	3760-5
28	BINDING POST, RED, TIN PCB ROHS	J2, J6	2	POMONA	3760-2
29	BINDING POST, BLACK, 15A ECONO	GND	1	KEYSTONE ELECTRONICS	7007
30	BINDING POST, RED, 15A ECONO	PVCC	1	KEYSTONE ELECTRONICS	7006
31	SHUNT, BLACK AU FLASH 0.100	JP1, JP2, JP3, JP4, JP5, JP6(1-2)	6	SULLINS	SPC02SYAN
32	Hex Nut, 4-40, Zinc/Steel	HW1, HW2, HW3, HW4	4	BUILDING FASTENERS	HNZ440
33	Standoff 4-40 Threaded M/F 1.50 in. ALUM-HEX	HW1, HW2, HW3, HW4	4	KEYSTONE ELECTRONICS	8409

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It is important to operate this EVM within the input voltage range of 0V to 5V and the output voltage range of 0V to 26V.

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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