

# TAS5102EVM and TAS5103EVM for the TAS5102 and TAS5103 Digital Amplifier Power Output Stages

## User's Guide



Literature Number: SLLU106  
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# **TAS5102EVM and TAS5103EVM for the TAS5102 and TAS5103 Digital Amplifier Power Output Stages**

This user's guide describes the operation of the TAS5102 and TAS5103 evaluation modules (EVM) from Texas Instruments.

## **1 Related Documentation from Texas Instruments**

**Table 1** contains a list of data sheets that have detailed descriptions of the integrated circuits used in the design of the HPL-MC012 Modulator/Controller Module which accompanies the TAS5102EVM and TAS5103EVM as well as the link to the TAS5102/3 data sheet. These documents can be obtained from the Texas Instruments Web site at <http://www.ti.com>.

**Table 1. Related Documentation From Texas Instruments**

Part Number	Literature Number
TAS5086	<a href="#">SLES131</a>
TAS5102/3	<a href="#">SLLS801</a>
TUSB3210	<a href="#">SLLS466</a>
UA78M12CKTPR	<a href="#">SLVS059</a>
TPS40200D	<a href="#">SLUS659</a>
TPS3825-33DBVT	<a href="#">SLVS165</a>

### **1.1 Additional Documentation**

- Personal Computer (PC) Configuration Tool for TAS5086 (TAS5086 GUI version 4.0 or later). This software comes on the compact disk in the EVM package.

## **2 Overview**

The TAS5102EVM and TAS5103EVM packages are composed of two separate modules, the HPL-MC012 Modulator/Controller Module and the TAS5102EVM or TAS5103EVM Amplifier Module. They are designed so that the user can separate the two modules and connect the TAS5102EVM or TAS5103EVM Amplifier Module into a target system via a ribbon cable. Keep this ribbon cable as short as possible to avoid degradation in the PWM signals.

The TAS5102 and TAS5103 customer evaluation amplifier modules each demonstrate two audio integrated circuits — the TAS5086 and the TAS5102 or TAS5103 from Texas Instruments (TI).

The TAS5086DBT is a high-performance, 32-bit (24-bit input), multichannel PurePath Digital™ pulse width modulator (PWM) based on Equibit™ technology with fully symmetrical AD modulation scheme. It accepts an input sample rate from 32 kHz to 192 kHz. The device also has digital audio processing (DAP) that provides bass management, advanced performance, and a high level of system integration.

The TAS5102 is a compact, high-power, digital amplifier power stage designed to drive an 8-Ω loudspeaker up to 20 W/channel at 10% THD+N. It contains integrated gate-drive, four matched and electrically isolated enhancement-mode N-channel power DMOS transistors, and protection/fault-reporting circuitry. The DAD package has a PowerPAD™ package on the top side for heat transfer through a heat sink. The heat sink in this design is for evaluation purposes only.

PurePath Digital, Equibit, PowerPAD are trademarks of Texas Instruments.  
 Windows is a trademark of Microsoft Corporation.

The TAS5103 is a compact, high-power, digital amplifier power stage designed to drive an 8- $\Omega$  loudspeaker up to 15 W/channel at 10% THD+N. It contains integrated gate-drive, four matched and electrically isolated enhancement-mode N-channel power DMOS transistors, and protection/fault-reporting circuitry. The DAP package has a PowerPAD™ package on the bottom side for heat transfer through the printed-circuit board.

Either of these EVMs plus the HPLMC-012 form a complete two-channel, digital audio amplifier system which includes digital input (S/PDIF), control interface (via USB) to PC and DAP (digital audio processor) features like digital volume control, bass management, and input and output multiplexers.

This EVM is designed to illustrate a low-cost approach to an amplifier design using this device. Improved performance, at increased cost, can be achieved with a high-performance configuration.

## 2.1 TAS5102EVM and TAS5103EVM Features

- Modular approach comprised of TAS5102EVM or TAS5103EVM amplifier modules and HPL-MC012 modulator/controller module
- Two-channel evaluation module.
- Self-contained protection system (short-circuit and thermal).
- Standard I<sup>2</sup>S and I<sup>2</sup>C control via SPDIF and USB
- Double-sided, plated-through printed-circuit board (PCB) layout
- Single power supply operation

## 2.2 PCB Key Map

Physical structure for the TAS5102/3EVM is illustrated in Figure 1.

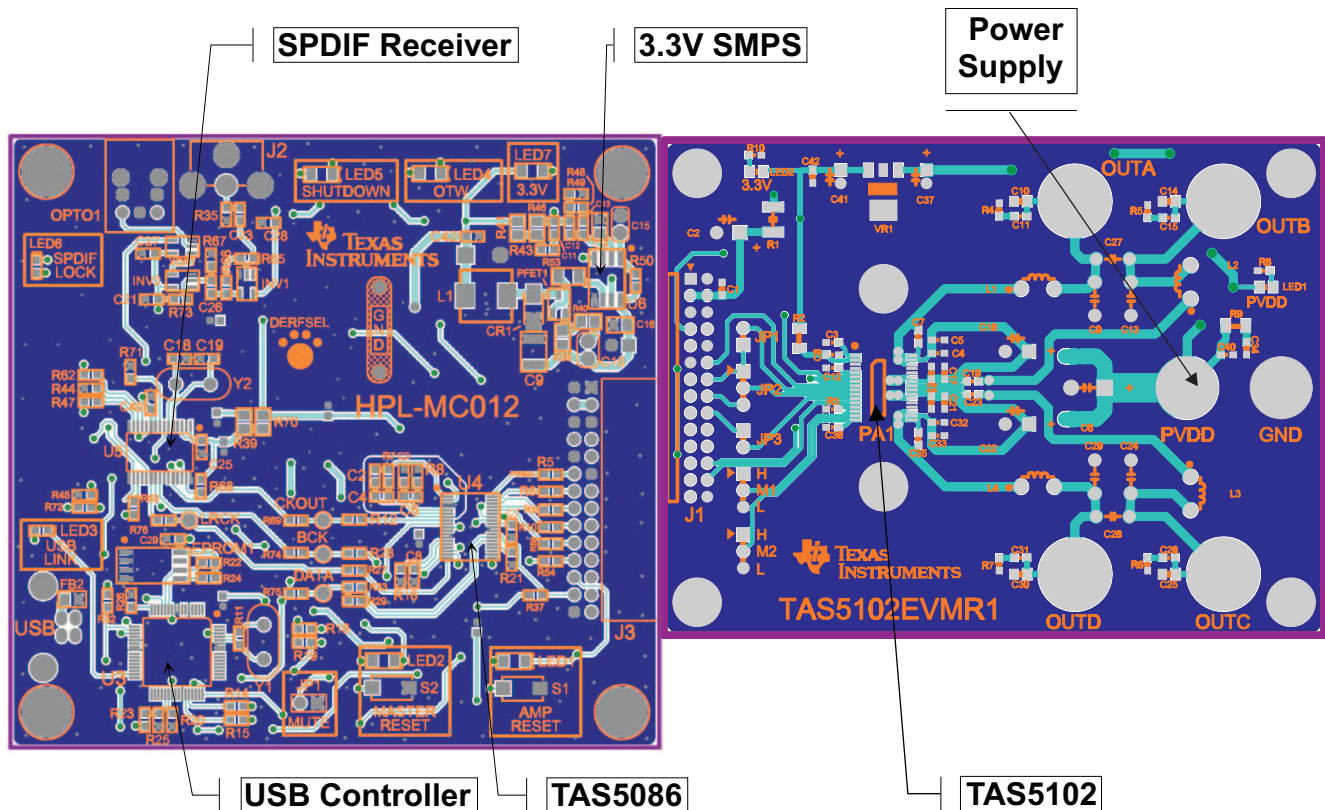


Figure 1. Physical Structure for TAS5102/3EVM

### 3 Quick-Setup Guide

This section describes the TAS5102/3EVM board in regards to power supplies and system interfaces. It provides information regarding handling and unpacking, absolute operating conditions, and a description of the factory default switch and jumper configuration.

The section also provides a step-by-step guide to configuring the TAS5102/3EVM for device evaluation.

#### 3.1 Electrostatic Discharge Warning

Many components on the TAS5102/3EVM are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

#### CAUTION

Failure to observe ESD handling procedures can result in damage to EVM components.

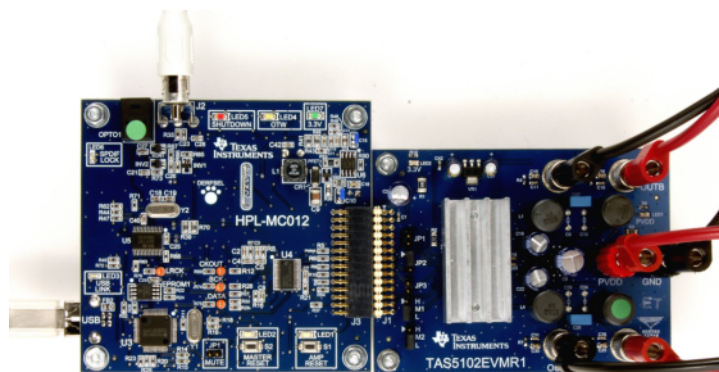
#### 3.2 Unpacking the EVM

On opening the TAS5086-TAS5102EVM or TAS51033EVM package, ensure that the following items are included:

- 1 pc. TAS5102/3 EVM Power Stage Board
- 1 pc. HPL-MC012 Modulator/Input Board
- Because this system has standard connectors, no cables are supplied
- 1 pc. TAS5102/3EVM CD-ROM.

If any of these items are missing, contact the Texas Instruments Product Information Center nearest you to inquire about a replacement.

Connect the Modulator/Input board to the Power Stage board with the docking connectors on each board. Use care because this connector is not keyed.



**Figure 2. Modulator and Power Stage Board Connection Example**

#### 3.3 Power Supply Setup

To power up the EVM, one power supply is needed for system power, logic and gate-drive, and for output stage supply. The power supply is connected to the EVM with banana cables or stripped insulated wire.

**Table 2. Recommended Supply Voltage**

Description	Voltage Limitations	Current Requirement	Connector
Output stage power supply	8 V – 23 V	5 A	Red/black

### CAUTION

Applying voltages above the limitations given in [Table 2](#) can cause permanent damage to your hardware.

### 3.4 GUI Software Installation

The TAS5086 GUI provides easy control of all registers in TAS5086. To install the GUI, run the setup file from the TAS5102/3 CD-ROM.

After installation, turn on the power supply, and connect the USB cable to the Modulator/Controller board.

Start the GUI program from The Windows™ menu. (Program Files/Texas Instruments Inc) The start-up of the GUI takes few seconds.


**Figure 3. TAS5086 GUI Window**

From the files menu, load the configuration file:

TAS5102 EVM Configuration.cfg

The file is located on the TAS5102/3EVM CD-ROM. This file contains all settings for a default setup of the EVM.

For easy access of the file, it is recommended to copy the files into directory where the GUI is installed. Default is C:\Program Files\Texas Instruments Inc\TAS5086\.

For more advanced use of the GUI and the features of the TAS5086 modulator, see the GUI User's Guide and the TAS5086 data sheet ([SLES131](#)). The GUI User's Guide can be accessed by clicking on Help in the toolbar and then selecting *User's Guide* in the drop-down menu.



### 3.5 Operational Sequence and Indicators

- After connecting the power supply and turning it on, the power supply current must be ~50 mA. The amplifier reset LED must be on.
  - The PVDD and 3.3-V LEDs must be on. If not, check the connections to the power supply.
- Connect the SPDIF cable, either optical or coaxial, to an SPDIF source.
- Connect the USB cable and the USB LED (blue LED must be on).
  - The EVM must enumerate without the installation of a USB driver; it is a Windows™ audio class device.
- Start the GUI. (It must not give an indication of COMMUNICATION ERROR).
  - C:\Program Files\Texas Instruments Inc\TAS5086 GUI
- Load the configuration file.
  - (File, Load, Config File, TAS5102 EVM Configuration.cfg)
  - The AMP RESET LED must go off.
  - The power supply current must be ~100 mA.
  - This indicates that the amplifier is switching and ready for audio input.
  - The SPDIF indicator must be on (blue LED), when locked to a valid source of SPDIF.
- If the preceding conditions are met, the EVM system is ready to accept audio data.
  - Note: The default gain setting of the TAS5086 GUI is 0 dB. If you are connecting directly from a music source (CD player) for input and speakers for output, you may want to use the volume control function of GUI to reduce the gain before the program material is started.

## 4 System Interfaces

This section describes the TAS5102/3 EVM board in regards to power supplies and system interfaces.

### 4.1 Power Supply (PSU) Interface (PVDD and GND)

The TAS5102/3 EVM module must be powered from a well-regulated external power supply. Good audio performance requires a stabilized power supply with low ripple voltage and low output impedance.

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**Note:** The length of power supply cable must be minimized. Increasing the length of the PSU cable is equal to increasing the distortion for the amplifier at high output levels and low frequencies.

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Maximum output stage supply voltage depends of the speaker load resistance. For the recommended maximum supply voltage, see the TAS5102/3 data sheet ([SLLS801](#)).

**Table 3. Recommended Supply Voltages**

Description	Voltage Limitations (8-Ω Load)	Current Recommendations
Output stage power supply	8 V – 23 V	5 A

The recommended TAS5102/3 power-up sequence is shown in Figure 4. For proper TAS5102/3 operation, the  $\overline{\text{RESET}}$  signal should be kept low during power up.  $\overline{\text{RESET}}$  is pulled low during power up for 200 ms by the onboard reset generator (U2).

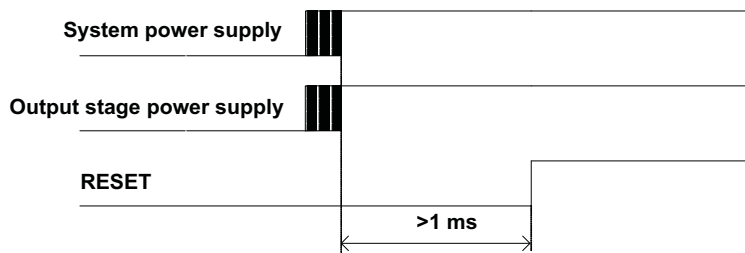


Figure 4. Recommended Power-Up Sequence

## 4.2 J1 Amplifier Connection to MC012 Controller Module

Table 4. J9/J10 Pin Description Amplifier/Controller Connector

Pin No.	Net-Name at Schematics	Description
1, 2, 5, 6, 10, 11, 28	DGND	Low-current ground for modulator/controller
3, 4	PVDD1	PVDD buffered through 24-Ω resistor to power the modulator/controller
7	OTW	Overtemperature warning from the amplifier ( $T > 125^{\circ}\text{C}$ )
8, 9, 13, 15, 17, 19, 20, 21, 22, 23, 25, 27	NC	Not connected
12	PWM_A	Channel A PWM signal from modulator
14	PWM_B	Channel B PWM signal from modulator
16	PWM_C	Channel C PWM signal from modulator
18	PWM_D	Channel D PWM signal from modulator
24	$\overline{\text{RESET}}$	Resets the TAS5102/3
26	$\overline{\text{FAULT}}$	Power stage fault indicator

## 4.3 Loudspeaker Connectors (J3 - J6)

### CAUTION

Both positive and negative speaker outputs are floating and may not be connected to ground (e.g., through an oscilloscope).

Table 5. Output Pin Description

Net-Name at Schematics	Description
OUT_A	Speaker positive output
OUT_B	Speaker negative output
OUT_C	Speaker positive output
OUT_D	Speaker negative output

#### 4.4 SPDIF Optical Input Connector

This connector is a standard TOSLINK connector that connects the SPDIF digital audio input to the SPDIF receiver on the HPL-MC012 PCB. This connector, or the SPDIF co-axial input, is used, but not both connectors at the same time.

#### 4.5 SPDIF Co-Axial Input Connector

This connector is a standard RCA connector that connects the SPDIF digital audio input to the SPDIF receiver on the HPL-MC012 PCB. This connector, or the SPDIF optical Input, is used, but not both connectors at the same time.

#### 4.6 USB Connector

This connector is a standard USB connector and is used to connect GUI control information from a PC to the HPL-MC012 PCB. The USB system does not stream audio from a PC.

### 5 Protection

This section describes the short-circuit protection and fault-reporting circuitry of the TAS5102/3 device.

#### 5.1 Short-Circuit Protection and Fault-Reporting Circuitry

The TAS5102/3 is a self-protecting device that provides fault reporting (including high-temperature protection and short-circuit protection). For highest possible reliability, recovering from a fault requires external reset of the device. This is done by the TAS5086 on the HPL-MC012 board. See the TAS5102/3 data sheet for more information regarding the  $\overline{\text{RESET}}$  function.

#### 5.2 Fault Reporting

The OTW and  $\overline{\text{FAULT}}$  outputs from TAS5102/3 indicate fault conditions. See the TAS5102/3 data sheet ([SLLS801](#)) for a description of these pins.

**Table 6. TAS5102 Warning/Error Signal Decoding**

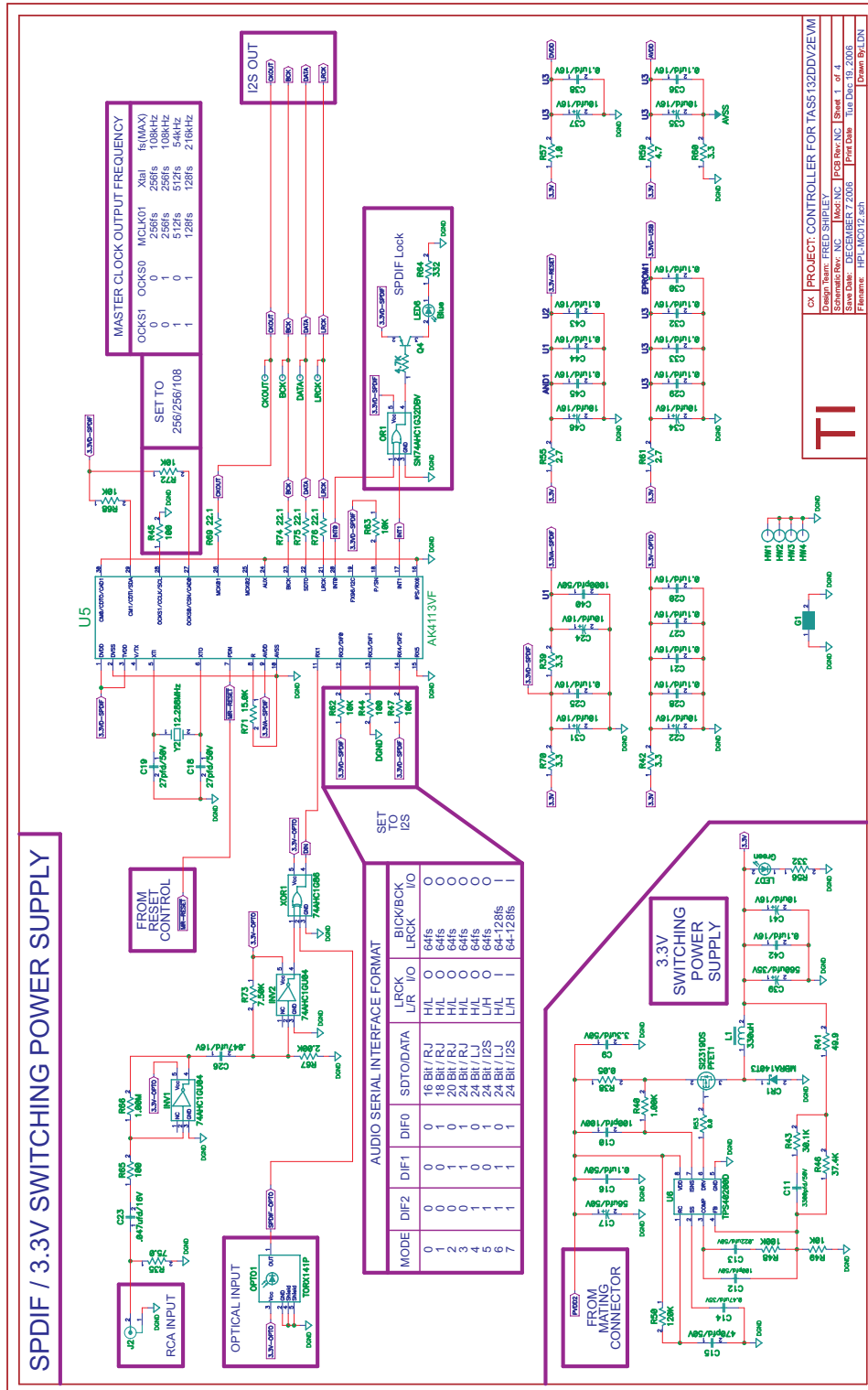
$\overline{\text{FAULT}}$	OTW	Device Condition
0	0	Overcurrent (OC) or undervoltage (UVP) warning or overtemperature error (OTE)
0	1	Overtemperature warning (OTW) or overcurrent (OC) or undervoltage (UVP)
1	0	Junction temperature lower than 125°C and no faults (normal operation)
1	1	Junction temperature higher than 125°C (overtemperature warning)

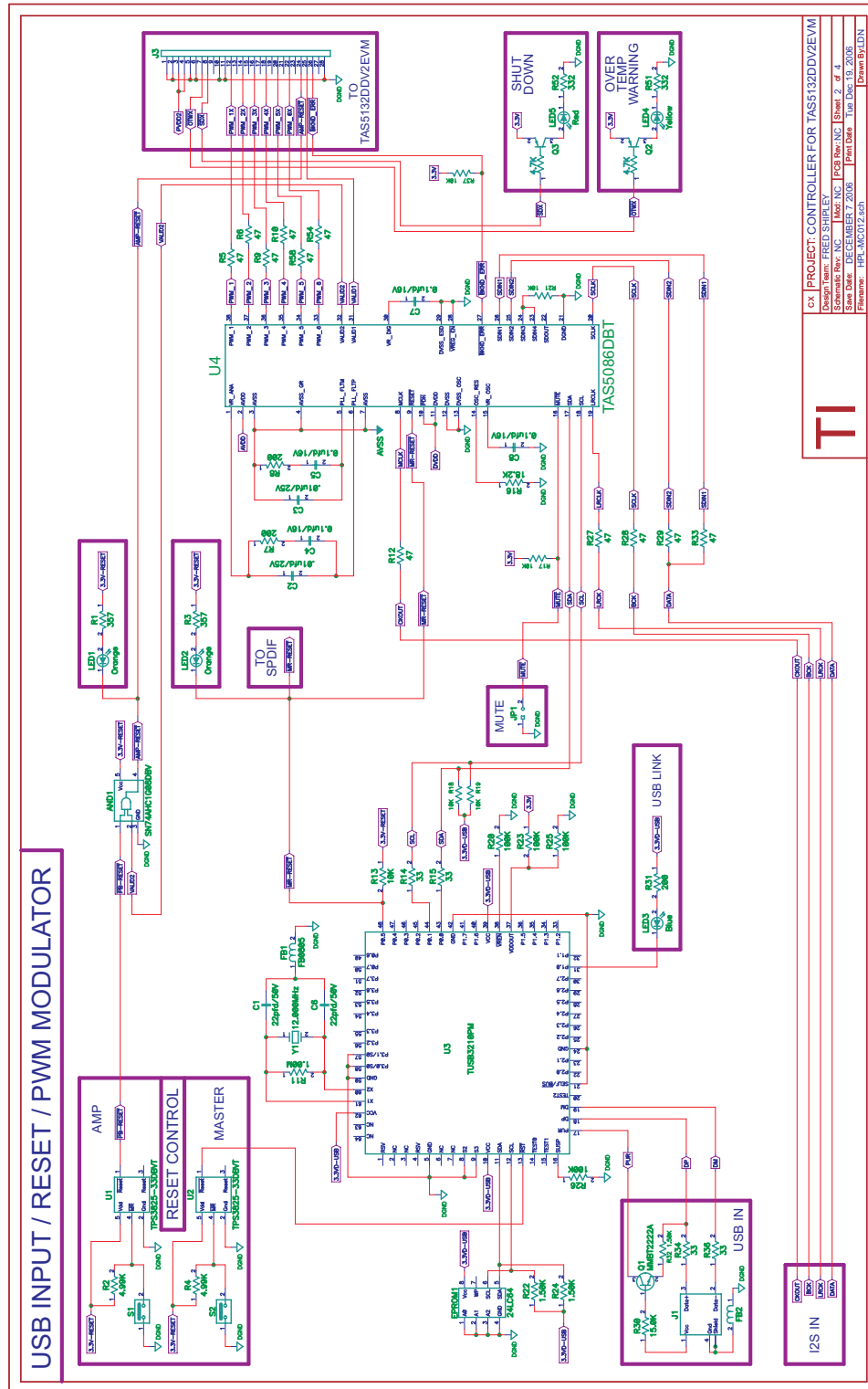
The  $\overline{\text{FAULT}}$  output is open-drain. The OTW output is push-pull active high.

The OTW LED on the MC012 is illuminated when the temperature of the TAS5102/3 is okay (less than 125°C.) The LED turns off when the TAS5102/3 is warning of overtemperature on the device ( $T_J > 125^\circ\text{C}.$ ) This polarity is due to a reversal of polarity of the OTW pin from other devices (e.g., TAS5132) which also use this modulator board.

Appendix A Design Documents

A.1 HPL-MC012 Schematic

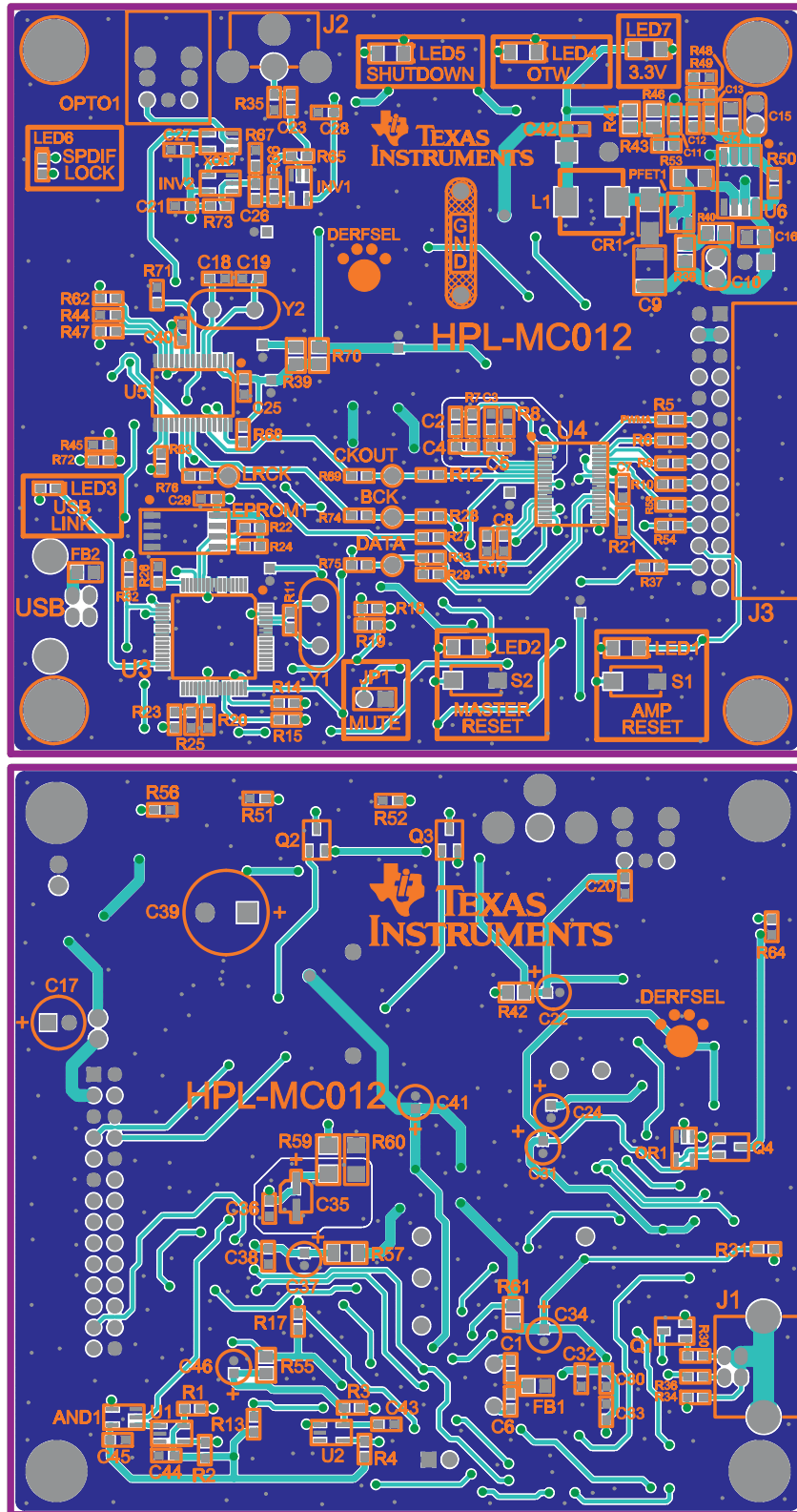




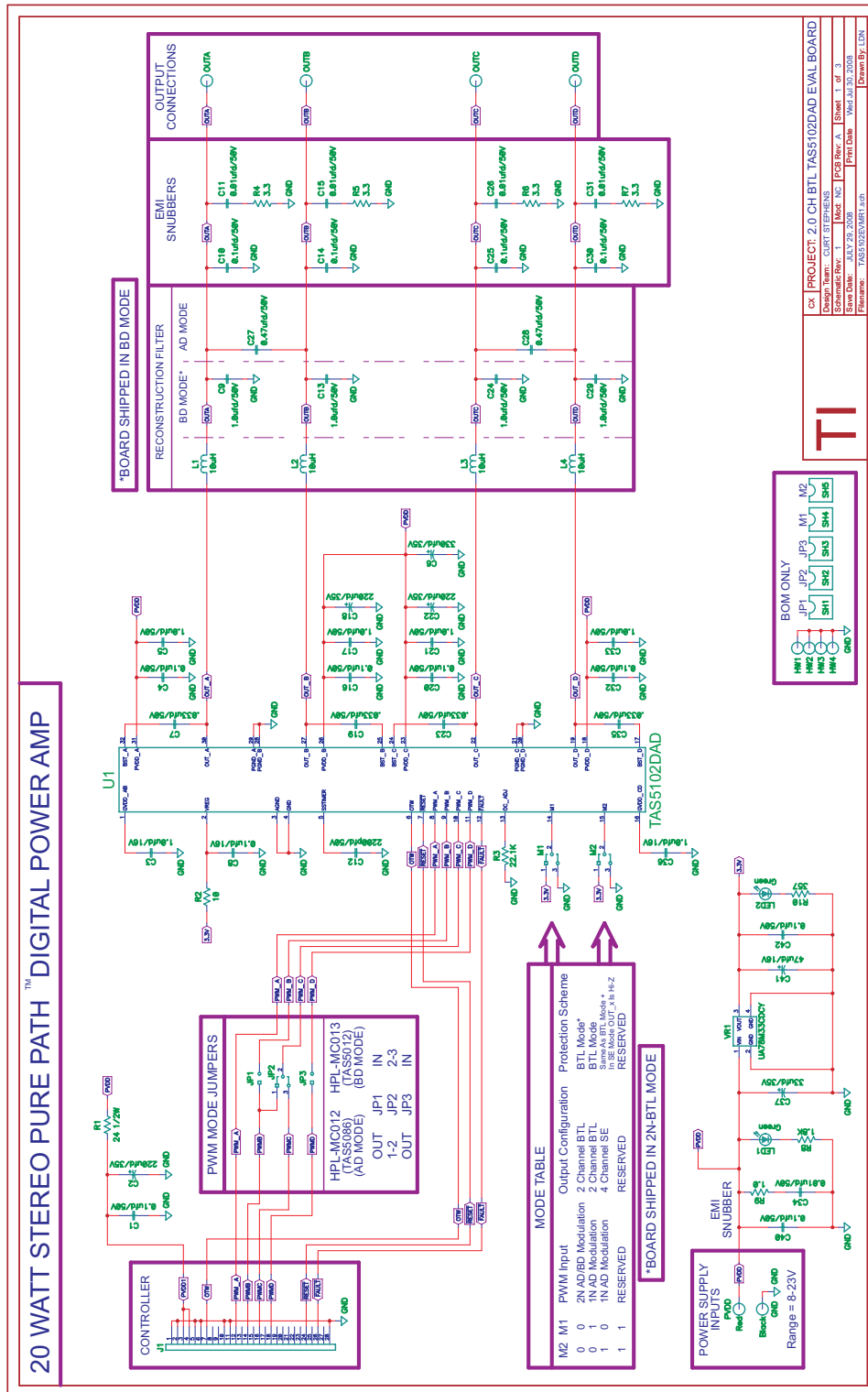
CA	PROJECT CONTROLLER FOR TAS5132DDV2EVM
Design Name:	FRED STREIBER
PCB Rev:	NC
Sheet:	2 of 4
Save Date:	DECEMBER 7, 2006
Print Date:	Time Dec 19, 2006
Filename:	HPL-MC012.sch
Drawn By:	LDN



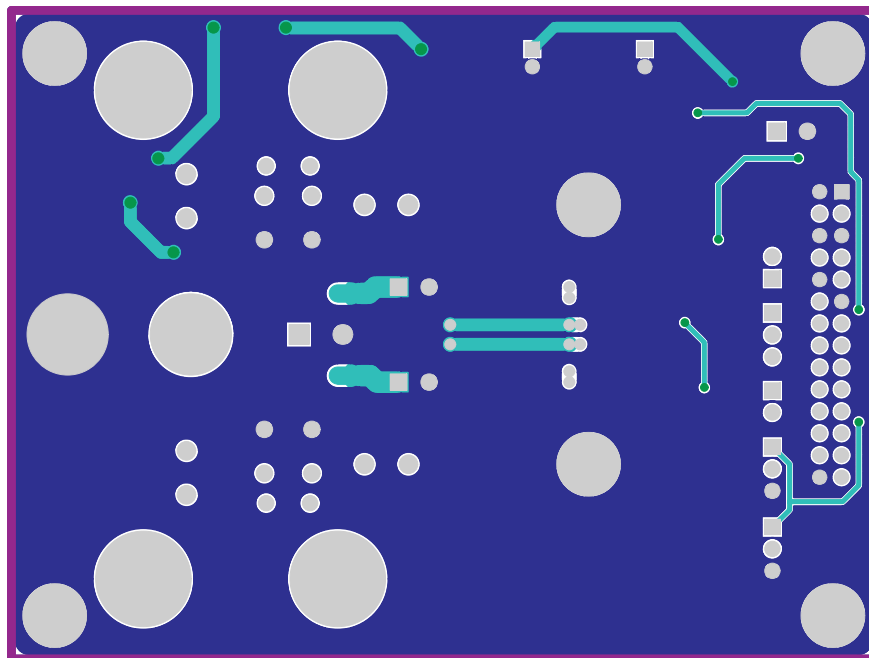
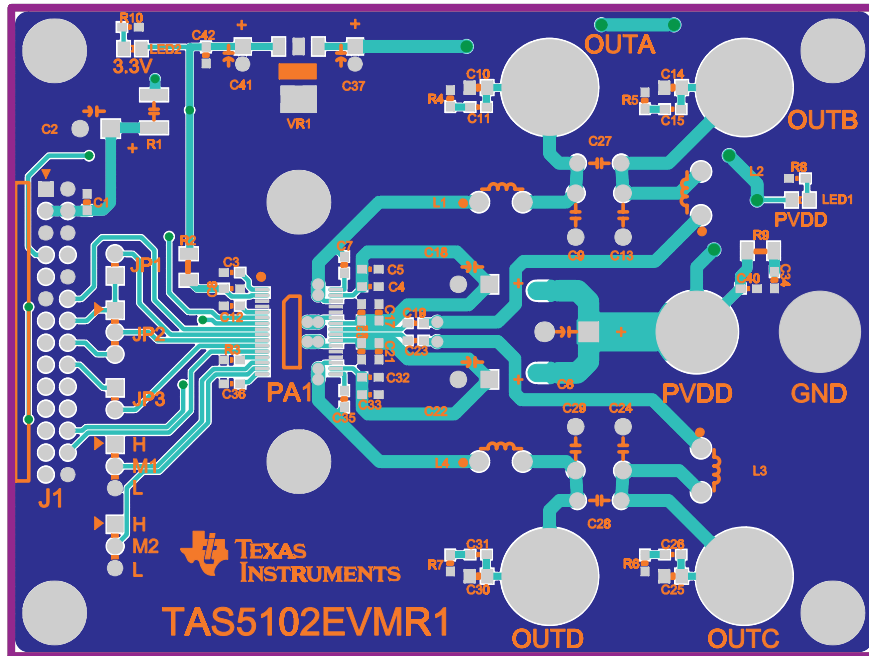
A.2 HPL-MC012 Composite Drawings



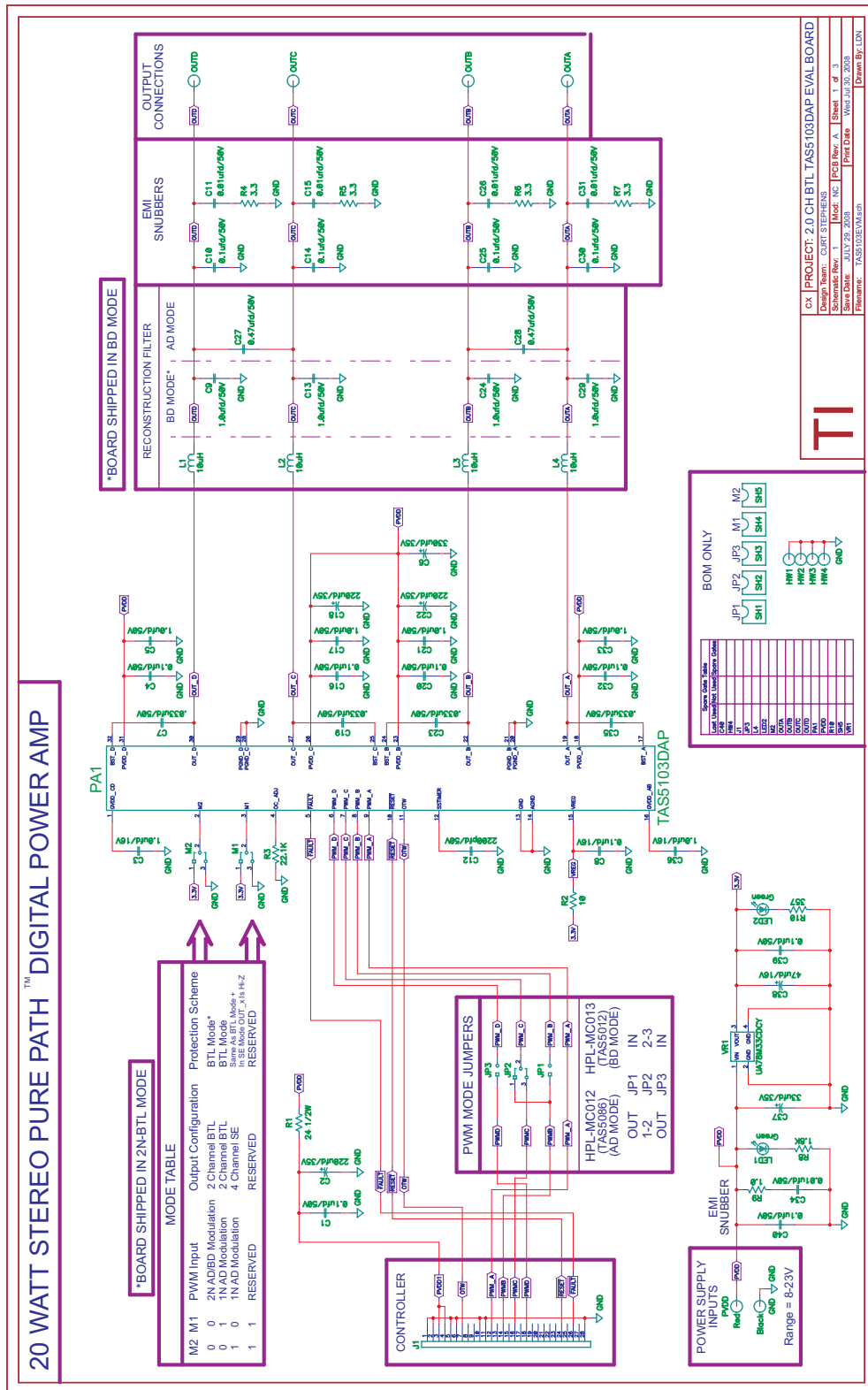
A.3 TAS5102/3EVM Schematic

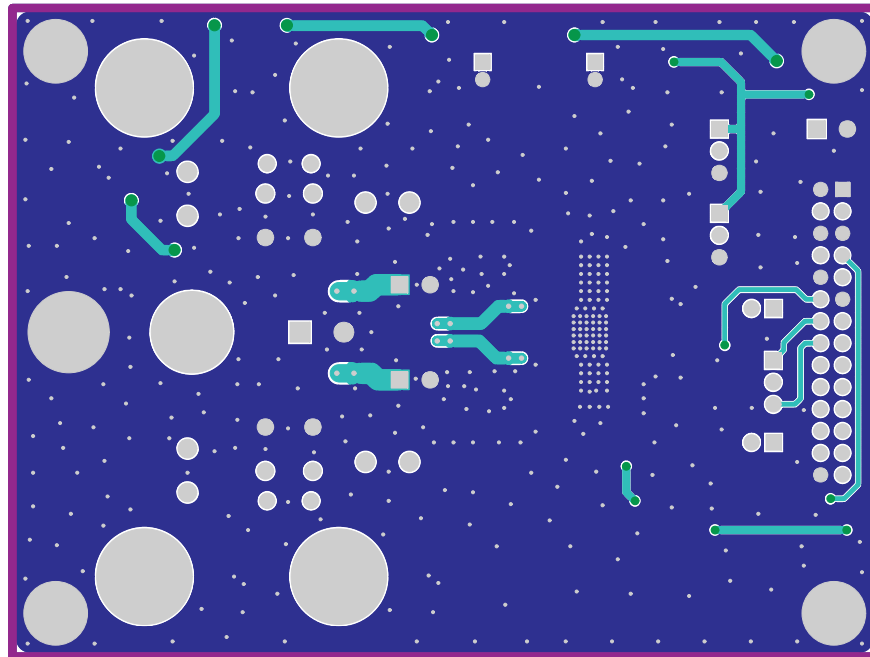
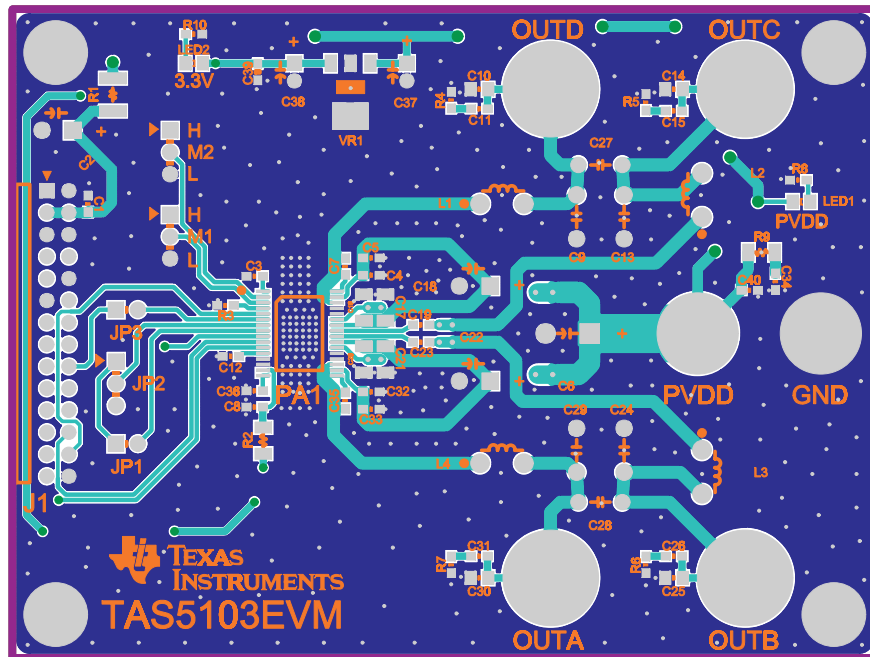


A.4 TAS5102/3EVM Composite Drawings









**A.5 Heat Sink Drawing**

<h1 style="margin: 0;">HEAT SINK FOR TAS5102EVM</h1>	LAST EDIT: 26MAR2008 CONTACT: LES NANCE (214) 480-3848
<p>ALL DIMS IN MILLIMETERS, UNLESS OTHERWISE SPECIFIED                  TOLERANCE = +/- .1mm                  MATERIAL = ALUMINUM                  Stamp "5102EVM" On End Where Indicated</p> <p style="text-align: right;">NO SHARP EDGES</p>	

**A.6 Parts List**

**Table A-1. Bill of Materials for HPL-MC012**

Description	RefDes	QTY	MFG	MFG Part#
PWM MODULATOR, 6 CH, TSSOP38-DBT	U4	1	Texas Instruments	TAS5086DBT
USB, GENERAL PURPOSE DEVICE CONTROLLER, LQFP64-PM	U3	1	Texas Instruments	TUSB3210PM
Single Inverter Gate, SOT23-DBV5	INV1, INV2	2	Texas Instruments	SN74AHC1GU04DBVR
Single 2-Input Positive-AND Gate, SOT23-DBV5	AND1	1	Texas Instruments	SN74AHC1G08DBVR
Single 2-Input Positive-OR Gate, SOT23-DBV5	OR1	1	Texas Instruments	SN74AHC1G32DBVR
Single 2-Input Exclusive-OR Gate, SOT23-DBV5	XOR1	1	Texas Instruments	SN74AHC1G86DBVR
Processor Supervisor Circuit, 3.3V	U1, U2	2	Texas Instruments	TPS3825-33DBVT
WIDE INPUT RANGE VOLTAGE MODE CONTROLLER, SOP8-D	U6	1	Texas Instruments	TPS40200D
SPDIF RECEIVER, 192KHZ 6-1 SEL, SSOP30-DB	U5	1	AKM Semiconductor/Texas Instruments	AK4113VF/DIR9001
OPTICAL RECEIVER, 3.3V, EDGE PCB-RA	OPTO1	1	Toshiba	TORX141P
Crystal, 12.000MHz, HC49US	Y1	1	ECS	ECS-120-32-4
Crystal, 12.288MHz, HC49US	Y2	1	ECS	ECS-122.8-S-4
EEPROM, SERIAL 64K 2.5V SOP8-PS	EPROM1	1	Microchip Technology	24LC64-I/SM
PFET -3.0A -40V 0.1 OHM SOT23-DBV3	PFET1	1	Vishay Siliconix	SI2319DS-T1
TRANSISTOR NPN, 40V 600mA, SOT-23	Q1	1	Diodes, Inc.	MMBT2222A-7
Transistor PNP 50V PreBiased/4.7K 100mA SOT23-DBV3	Q2, Q3, Q4	3	Diodes Inc.	DDTA143TCA-7
SCHOTTKY DIODE, 1A 40V, SMA	CR1	1	ON SEMI	MBRA140T3
LED, BLUE SMD0603	LED3, LED6	2	Lite-on Trading	LTST-C191TBKT
LED, Orange SM1206	LED1, LED2	2	Lumex Opto	SML-LX1206SOC-TR

**Table A-1. Bill of Materials for HPL-MC012 (continued)**

Description	RefDes	QTY	MFG	MFG Part#
LED, Red SM1206	LED5	1	Chicago Miniature	CMD15-21VRD/TR8
LED, Yellow SM1206	LED4	1	Chicago Miniature	CMD15-21VYD/TR8
LED, Green SM1206	LED7	1	Chicago Miniature	CMD15-21VGD/TR8
CAP 22PFD 50V CERM 0603 NPO	C1, C6	2	Panasonic	ECJ-1VC1H220J
CAP 27PFD 50V CERM 0603 NPO	C18, C19	2	Panasonic	ECU-V1H270JCV
CAP 100PFD 50V CERM 0603 NPO	C12	1	Panasonic	ECU-V1H101JCV
CAP 1000PFD 50V CERM 0603 X7R	C40	1	Panasonic	ECU-V1H102KBV
CAP 3300PFD 50V CERM 0603 X7R	C11	1	Panasonic	ECJ-1VB1H332K
CAP .01UFD 25V CERM 0603 X7R	C2, C3	2	Panasonic	ECJ-1VB1E103K
CAP .022UFD 50V CERM 0603 X7R	C13	1	Panasonic	ECJ-1VB1H223K
CAP .047UFD 16V CERM 0603 X7R	C23, C26	2	Panasonic	ECJ-1VB1C473K
CAP 0.1UFD 16V CERM 0603 X7R	C4, C5, C7, C8, C20, C21, C25, C27-C30		Panasonic	ECJ-1VB1C104K
	C32, C33, C36, C38, C42-C45,	19	Panasonic	ECJ-1VB1C104K
CAP CERAMIC 100PFD 100V 5% RADIAL COG	C10	1	EPCOS	B37979N1101J054
CAP 470PFD 50V 5% MULTILAYER CERAMIC COG	C15	1	EPCOS	B37979N5471J054
CAP 0.1UFD 50V CERM 0805 X7R	C16	1	Panasonic	ECJ-2YB1H104K
CAP 0.47UFD 35V CERM 0805 X5R	C14	1	Taiyo Yuden	GMK212BJ474KG-T
CAP 3.3UFD 50V CERM 1210 X7R	C9	1	TDK Corp.	C3225X7R1H335M
CAP 10UFD 16V ALUM ELEC SMD VSA	C35	1	Panasonic	ECE-V1CS100SR
CAP 10UFD 16V RAD ALUM ELEC KGA	C22, C24, C31, C34, C37, C41, C46	7	Panasonic	ECE-A1CKG100
CAP 56UFD 50V RAD ALUM ELEC FC	C17	1	Panasonic	EEU-FC1H560
CAP 560UFD 35V RAD ALUM ELEC FC	C39	1	Panasonic	EEU-FC1V561
RES 22.1 OHM 1/16W 1% SMD 0603	R69, R74, R75, R76	4	Panasonic	ERJ-3EKF22R1V
RES 33 OHM 1/10W 5% SMD 0603	R14, R15, R34, R36	4	YAGEO	9C06031A33R0JLHFT
RES 47 OHM 1/16W 5% SMD 0603	R5, R6, R9, R10, R12, R27-R29, R33, R54, R58	11	YAGEO	9C06031A47R0JLHFT
RES 75.0 OHM 1/16W 1% SMD 0603	R35	1	Panasonic	ERJ-3EKF75R0V
RES 100 OHM 1/16W 5% SMD 0603	R44, R45, R65	3	YAGEO	9C06031A1000JLHFT
RES 200 OHM 1/16W 1% SMD 0603	R7, R8, R31	3	Panasonic	ERJ-3EKF2000V
RES 332 OHM 1/16W 1% SMD 0603	R51, R52, R64, R56	4	Panasonic	ERJ-3EKF3320V
RES 357 OHM 1/16W 1% SMD 0603	R1, R3	2	Panasonic	ERJ-3EKF3570V
RES 1.50K OHM 1/16W 1% SMD 0603	R22, R24, R32	3	Panasonic	ERJ-3EKF1501V
RES 2.00K OHM 1/16W 1% SMD 0603	R67	1	Panasonic	ERJ-3EKF2001V
RES 4.99K OHM 1/16W 1% SMD 0603	R2, R4	2	Panasonic	ERJ-3EKF4991V
RES 7.50K OHM 1/16W 1% SMD 0603	R73	1	Panasonic	ERJ-3EKF7501V
RES 10K OHM 1/16W 5% SMD 0603	R17-R19, R21, R37, R13, R47, R49, R62, R63, R68, R72	12	Panasonic	9C06031A1002JLHFT
RES 15.0K OHM 1/16W 1% SMD 0603	R30, R71	2	Panasonic	ERJ-3EKF1502V
RES 18.2K OHM 1/10W 1% SMD 0603	R16	1	Yageo	9C06031A1822FKHFT
RES 30.1K OHM 1/16W 1% SMD 0603	R43	1	Panasonic	ERJ-3EKF3012V
RES 100K OHM 1/16W 5% SMD 0603	R20, R23, R25, R26, R48	5	Yageo	9C06031A1003JLHFT
RES 120K OHM 1/16W 5% SMD 0603	R50	1	Yageo	9C06031A1203JLHFT
RES 1.00M OHM 1/16W 1% SMD 0603	R11, R66	2	Panasonic	ERJ-3EKF1004V

**Table A-1. Bill of Materials for HPL-MC012 (continued)**

Description	RefDes	QTY	MFG	MFG Part#
RES 0.05 OHM 1/4W 1% SMD 0805	R38	1	Vishay/Dale	WSL0805R0500FEA18
RES 2.7 OHM 1/10W 5% SMD 0805	R55, R61	2	Panasonic	ERJ-6RQJ2R7V
RES 3.3 OHM 1/10W 5% SMD 0805	R39, R42, R70	3	Panasonic	ERJ-6RQJ3R3V
RES 49.9 OHM 1/10W 1% SMD 0805	R41	1	Panasonic	ERJ-6ENF49R9V
RES 1.00K OHM 1/10W 1% SMD 0805	R40	1	Panasonic	ERJ-6ENF1001V
RES 37.4K OHM 1/10W 1% SMD 0805	R46	1	Panasonic	ERJ-6ENF3742V
RES 0.0 OHM 1/8W 5% SMD 1206	R53	1	Panasonic	ERJ-8GEY0R00V
RES 1.0 OHM 1/8W 5% SMD 1206	R57	1	Panasonic	ERJ-8GEYJ1R0V
RES 3.3 OHM 1/8W 5% SMD 1206	R60	1	Panasonic	ERJ-8RQJ3R3V
RES 4.7 OHM 1/8W 5% SMD 1206	R59	1	Panasonic	ERJ-8RQJ4R7V
Ferrite Bead, 11 Ohms 1.5A SM0805	FB1	1	Steward	MI0805K110R-00
Ferrite Bead, 39 Ohms 4A SM0805	FB2	1	Panasonic	EXC-ML20A390U
INDUCTOR, 330UH, SMD-DR74	L1	1	Coiltronics	DR74-331
JACK, RCA, PCB-RA, ECONO ALL-METAL	J2	1	CUI Stack	RCJ-017
Jack, USB PCB-Right Angle	J1	1	Assmann	AU-Y1007
Header, 2 Pin Male, Straight, Gold	JP1	1	Sullins	PZC02SAAN
SOCKET HEADER, 2x14 PIN FEMALE GOLD PCB-RA	J3	1	Samtec	SSW-114-02-G-D-RA
Switch, Momentary SMT-Short, Black Tab, 160g	S1, S2	2	Panasonic	EVQ-PPBA25
PC Testpoint, Orange	BCK, CKOUT, DATA, LRCK	4	Keystone Electronics	5003
BUS WIRE GROUND LOOP, 25MM LENGTH, 18 AWG	GND	1	Belden CDT	8019000100
Standoff 4-40 Threaded M/F 1.50 in. ALUM-HEX	HW1, HW2, HW3, HW4	4	Keystone Electronics	8409
LockWasher, #4 Internal-Tooth, Zinc/Steel	HW1, HW2, HW3, HW4	4	Building Fasteners	INT LWZ 004
Hex Nut, 4-40, Zinc/Steel	HW1, HW2, HW3, HW4	4	Building Fasteners	HNZ440

**Table A-2. Bill of Materials for TAS5103EVM**

Description	RefDes	QTY	MFG	MFG Part#
15W DIG AMP PWR STAGE HTSSOP32-DAP	PA1	1	Texas Instruments	TAS5103DAP
LED, GREEN 2.0V SMD0805	LED1, LED2	2	Lumex Optical	SML-LXT0805GW-TR
VOLTAGE REGULATOR, 3.3V 500mA SOT223-DCY	VR1	1	Texas Instruments	UA78M33CDCYR
CAP 2200PF 50V CERM 0603 X7R	C12	1	Panasonic	ECJ-1VB1H222K
CAP 0.01UFD 50V CERM 0603 X7R	C11, C15, C26, C31, C34	5	Panasonic	ECU-V1H103KBV
CAP 0.033UFD 50V CERM 0603 X7R	C7, C19, C23, C35	4	Panasonic	ECJ-1VB1H333K
CAP 0.1UFD 16V CERM 0603 X7R	C8	1	Panasonic	ECJ-1VB1C104K
CAP 0.1UFD 50V CERM 0603 X7R	C1, C4, C16, C20, C32, C39, C40	5	Murata	GRM188R71H104KA93D
CAP 1.0UFD 16V CERM 0603 X5R	C3, C36	2	Panasonic	ECJ-1VB1C105K
CAP 1.0UFD 50V CERM 0603 X5S	C5, C33	2	Taiyo Yuden	UMK107C105KA-T
CAP 0.1UFD 50V CERM 0805 X7R	C10, C14, C25, C30	4	Panasonic	ECJ-2YB1H104K
CAP 0.1UFD 50V CERM 1206 X7R	C16, C20	2	Panasonic	ECJ-3VB1H104K
CAP 1.0UFD 50V CERM 1206 X7R	C17, C21	2	TDK Corp.	C3216X7R1H105K
CAP 0.47UFD 50V METAL POLYESTER FILM MKT	C27, C28	2	EPCOS	B32529C5474J
CAP 1.0UFD 50V METAL POLYESTER FILM MKT	C9, C13, C24, C29	4	EPCOS	B32529C5105J
CAP 33UFD 35V RAD ALUM ELEC FC	C37	1	Panasonic	EEU-FC1V330

**Table A-2. Bill of Materials for TAS5103EVM (continued)**

Description	RefDes	QTY	MFG	MFG Part#
CAP 47UF 16V RAD ALUM ELEC FC	C38	1	Panasonic	EEU-FC1C470
CAP 220UF 35V ALUM ELEC M-SERIES ROHS	C2, C18, C22	3	Panasonic	ECA-1VM221BJ
CAP 330UF 35V ALUM ELEC M-SERIES ROHS	C6	1	Panasonic	ECA-1VM331B
RES 3.3 OHM 1/16W 5% SMD 0603	R4, R5, R6, R7	4	Yageo	9C06031A3R30JLHFT
RES 357 OHM 1/16W 1% SMD 0603	R10	1	Panasonic	ERJ-3EKF3570V
RES 1.8K OHM 1/16W 5% SMD 0603	R8	1	Yageo	9C06031A1801JLHFT
RES 22.1K OHM 1/16W 1% SMD 0603	R3	1	Panasonic	ERJ-3EKF2212V
RES 1.0 OHM 1/4W 5% SMD 1206	R9	1	Yageo	9C12063A1R00JLHFT
RES 10 OHM 1/4W 5% SMD 1206	R2	1	Yageo	9C12063A10R0JLHFT
RES 24 OHM 1/2W 5% SMD 1210	R1	1	Panasonic	ERJ-P14J240U
INDUCTOR, SERIES 11RHBP, 10UH	L1, L2, L3, L4	4	Toko America	A7503AY-100M
HEADER, 2 PIN MALE, PCB, STRAIGHT GOLD ROHS	JP1, JP3	2	Sullins	PBC02SAAN
HEADER, 3 PIN MALE, PCB, STRAIGHT GOLD ROHS	JP2, M1, M2	3	Sullins	PBC03SAAN
HEADER, 2x14 PIN MALE GOLD PCB-RA	J1	1	Sullins	PZC14DBAN
BINDING POST, 15A, UNINSULATED	OUTA, OUTB, OUTC, OUTD	4	Johnson Components	111-2223-001
BINDING POST, BLACK, 15A ECONO	GND	1	Keystone Electronics	7007
BINDING POST, RED, 15A ECONO	PVDD	1	Keystone Electronics	7006
SHUNT, BLACK AU FLASH 0.100	JP1, JP2, JP3, M1, M2	5	SULLINS	SPC02SYAN
Hex Nut, 4-40, Zinc/Steel	HW1, HW2, HW3, HW4	4	Building Fasteners	HNZ440
Standoff 4-40 Threaded M/F 0.75 in. ALUM-HEX	HW1, HW2, HW3, HW4	4	Keystone Electronics	8403

**Table A-3. Bill of Materials for TAS5102EVM**

Description	RefDes	QTY	MFG	MFG Part#
20W STEREO DIG AMP PWR STAGE HTSSOP32-DAD	PA1	1	Texas Instruments	TAS5102DAD
VOLTAGE REGULATOR, 3.3V 500mA SOT223-DCY	VR1	1	Texas Instruments	UA78M33CDCYR
LED, GREEN 2.0V SMD0805	LED1, LED2	2	Lumex Optical	SML-LXT0805GW-TR
CAP 2200PFD 50V CERM 0603 X7R	C12	1	Panasonic	ECJ-1VB1H222K
CAP 0.01UF 50V CERM 0603 X7R	C11, C15, C26, C31, C34	5	Panasonic	ECU-V1H103KBV
CAP 0.033UF 50V CERM 0603 X7R	C7, C19, C23, C35	4	Panasonic	ECJ-1VB1H333K
CAP 0.1UF 16V CERM 0603 X7R	C8	1	Panasonic	ECJ-1VB1C104K
CAP 0.1UF 50V CERM 0603 X7R	C1, C4, C16, C20, C32, C40, C42	7	Murata	GRM188R71H104KA93D
CAP 1.0UF 16V CERM 0603 X5R	C3, C36	2	Panasonic	ECJ-1VB1C105K
CAP 1.0UF 50V CERM 0603 X5S	C5, C17, C21, C33	4	Taiyo Yuden	UMK107C105KA-T
CAP 0.1UF 50V CERM 0805 X7R	C10, C14, C25, C30	4	Panasonic	ECJ-2YB1H104K
CAP 0.47UF 50V METAL POLYESTER FILM MKT	C27, C28	2	EPCOS	B32529C5474J
CAP 1.0UF 50V METAL POLYESTER FILM MKT	C9, C13, C24, C29	4	EPCOS	B32529C5105J
CAP 33UF 35V RAD ALUM ELEC FC	C37	1	Panasonic	EEU-FC1V330
CAP 47UF 16V RAD ALUM ELEC FC	C41	1	Panasonic	EEU-FC1C470
CAP 220UF 35V ALUM ELEC M-SERIES ROHS	C2, C18, C22	3	Panasonic	ECA-1VM221BJ
CAP 330UF 35V ALUM ELEC M-SERIES ROHS	C6	1	Panasonic	ECA-1VM331B

**Table A-3. Bill of Materials for TAS5102EVM (continued)**

Description	RefDes	QTY	MFG	MFG Part#
RES 3.3 OHM 1/16W 5% SMD 0603	R4, R5, R6, R7	4	Yageo	9C06031A3R30JLHFT
RES 357 OHM 1/16W 1% SMD 0603	R10	1	Panasonic	ERJ-3EKF3570V
RES 1.8K OHM 1/16W 5% SMD 0603	R8	1	Yageo	9C06031A1801JLHFT
RES 22.1K OHM 1/16W 1% SMD 0603	R3	1	Panasonic	ERJ-3EKF2212V
RES 1.0 OHM 1/4W 5% SMD 1206	R9	1	Yageo	9C12063A1R00JLHFT
RES 10 OHM 1/4W 5% SMD 1206	R2	1	Yageo	9C12063A10R0JLHFT
RES 24 OHM 1/2W 5% SMD 1210	R1	1	Panasonic	ERJ-P14J240U
INDUCTOR, SERIES 11RHBP, 10UH	L1, L2, L3, L4	4	Toko America	A7503AY-100M
HEADER, 2 PIN MALE, PCB, STRAIGHT GOLD ROHS	JP1, JP3	2	Sullins	PBC02SAAN
HEADER, 3 PIN MALE, PCB, STRAIGHT GOLD ROHS	JP2, M1, M2	3	Sullins	PBC03SAAN
HEADER, 2x14 PIN MALE GOLD PCB-RA	J1	1	Sullins	PZC14DBAN
BINDING POST, 15A, UNINSULATED	OUTA, OUTB, OUTC, OUTD	4	Johnson Components	111-2223-001
BINDING POST, BLACK, 15A ECONO	GND	1	Keystone Electronics	7007
BINDING POST, RED, 15A ECONO	PVDD	1	Keystone Electronics	7006
SHUNT, BLACK AU FLASH 0.100	JP1, JP2(2-3), JP3, M1(2-3), M2(2-3)	5	Sullins	SPC02SYAN
Standoff 4-40 Threaded M/F 1.50 in. ALUM-HEX	HW1, HW2, HW3, HW4	4	Keystone Electronics	8409
Hex Nut, 4-40, Zinc/Steel	HW1, HW2, HW3, HW4	4	Building Fasteners	HNZ440



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It is important to operate this EVM within the input voltage range of 12 V to 18 V and the output voltage range of 12 V to 18 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.

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