TAS5105EVM for the TAS5105 Digital Amplifier Power Output Stage

User's Guide

Literature Number: SLLU138
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TAS5105EVM for the TAS5105 Digital Amplifier Power Output Stage

This user's guide describes the operation of the TAS5105 evaluation module (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 MC016 Modulator/Controller Module which accompanies the TAS5105EVM as well as the link to the TAS5105 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
TAS5012	SLES006
TAS5105	SLES258
UA78M12CKTPR	SLVS059
TPS40200D	SLUS659
TPS3825-33DBVT	SLVS165

2 Overview

The TAS5105EVM package is composed of two separate modules, the MC016 Modulator/Controller Module and the TAS5105EVM Amplifier Module. They are designed so that the user can separate the two modules and connect the TAS5105EVM 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 TAS5105 customer evaluation amplifier modules each demonstrate two audio integrated circuits — the TAS5012 and the TAS5105 from Texas Instruments (TI).

The TAS5012 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 TAS5105 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.

The TAS5105 EVM and the MC016 form a complete two-channel, digital audio amplifier system which includes digital input (S/PDIF) 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.

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2.1 TAS5105EVM Features

- Modular approach composed of TAS5105EVM Amplifier Modules and MC016 Modulator/Controller Module
- Two-channel evaluation module
- Self-contained protection system (short-circuit and thermal)
- No programming required
- Double-sided, plated-through printed-circuit board (PCB) layout
- Single power supply operation

NOTE: The TAS5105 and MC016 require no programming, but this means that volume must be controlled through the SPDIF or ADC source.

2.2 PCB Key Map

Physical structure for the TAS5105EVM is illustrated in Figure 1.

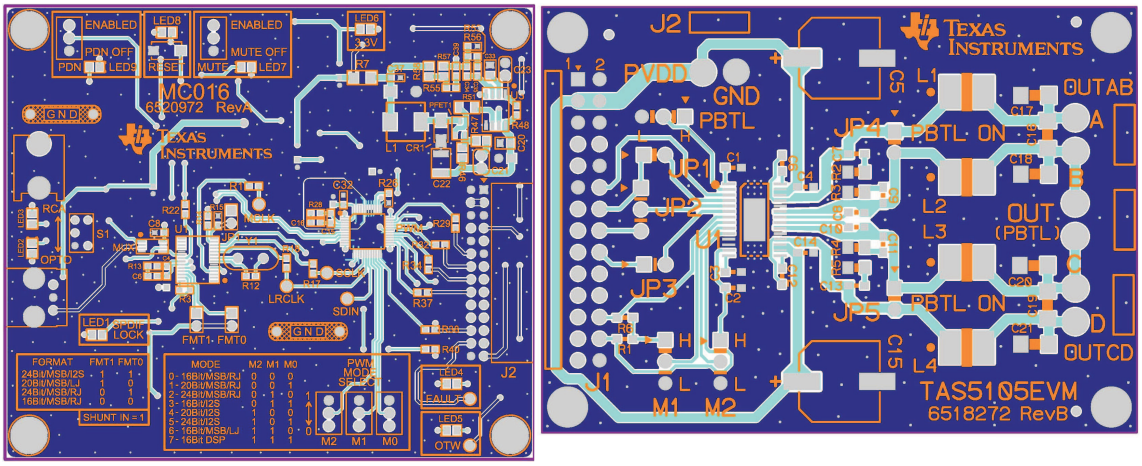

Figure 1. Physical Structure for TAS5105EVM

3 Quick-Setup Guide

This section describes the TAS5105EVM 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 TAS5105EVM for device evaluation.

3.1 Electrostatic Discharge Warning

Many components on the TAS5105EVM 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.

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3.2 Unpacking the EVM

On opening the TAS5105EVM package, ensure that the following items are included:

- 1 pc. TAS5105EVM Power Stage Board
- 1 pc. MC016 Modulator/Controller Board

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

Connect the MC106 Modulator/Controller Board to the TAS5105 Power Stage Board with the docking connectors on each board. Use care because this connector is not keyed.

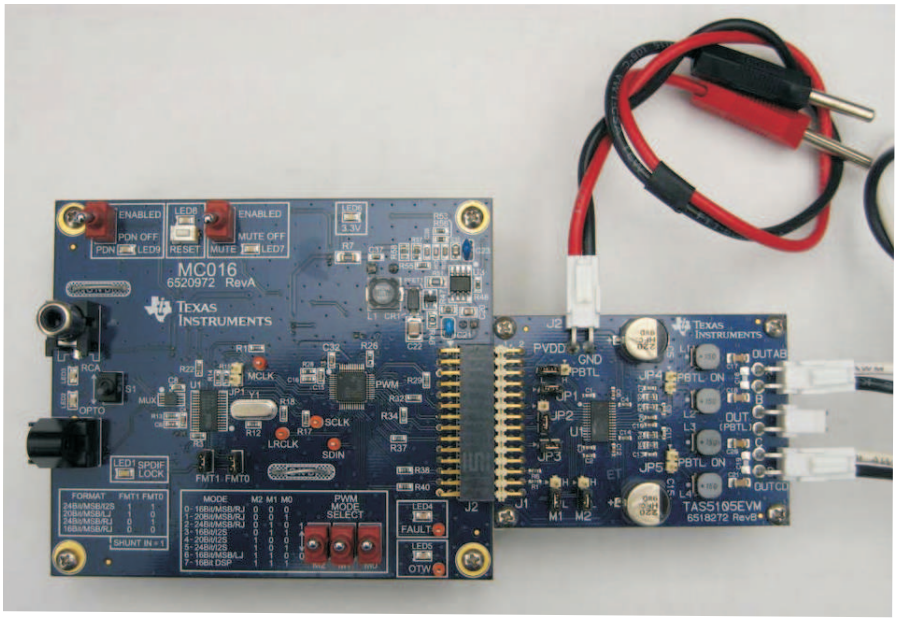

Figure 2. Modulator and Power Stage Board Connection Example

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 – 26 V	5 A	Red/black

CAUTION

Applying voltages above the limitations given in Table 2 can cause permanent damage to your hardware.

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3.4 Operational Sequence and Indicators

1. Connect the MC016 board to the TAS5105EVM.
2. On the TAS5105 EVM, make sure JP1 and JP3 are in, and JP2 is set to pins 2 and 3.
3. Connect loads to the output of the TAS5105EVM.
4. Connect an SPDIF cable, optical or coaxial, to the MC016 board. Be sure to flip the dipswitch to "RCA" for coaxial and "OPTO" for optical.
5. Connect the power supply and turn it on.
6. After connecting the power supply and turning it on, the power supply current must read ~50 mA. The amplifier reset LED must be on. This indicates the board is working and drawing a normal amount of current.
   - The PVDD and 3.3-V LEDs must be on. If not, check the connections to the power supply.
7. Connect the SPDIF cable, either optical or coaxial, to an SPDIF source.

If the preceding conditions are met, the EVM system is ready to accept audio data.

4 System Interfaces

This section describes the TAS5105 EVM board in regards to power supplies and system interfaces.

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

The TAS5105 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.

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.

Maximum output stage supply voltage depends of the speaker load resistance. For the recommended maximum supply voltage, see the TAS5105 data sheet (SLES258).

Table 3. Recommended Supply Voltages

Description	Voltage Limitations (8-Ω Load)	Current Recommendations
Output stage power supply	8 V – 26 V	5 A

The recommended TAS5105 power-up sequence is shown in Figure 3. For proper TAS5105 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).

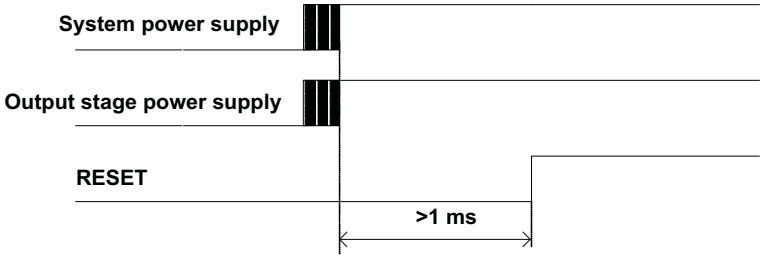

Figure 3. Recommended Power-Up Sequence

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4.2 J1 Amplifier Connection to MC016 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°C)
8, 9, 13, 15, 17, 19, 20, 21, 22, 23, 25	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 TAS5105
26	$\overline{\text{FAULT}}$	Power stage fault indicator
27	PVDD	3.3V power supply

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 MC016 PCB. Either the SPDIF optical input connector or the SPDIF coaxial input connector can be used, but not both connectors at the same time. Switch S1 on the MC016 Modulator/Controller Board controls which connector is used.

4.5 SPDIF Coaxial Input Connector

This connector is a standard RCA connector that connects the SPDIF digital audio input to the SPDIF receiver on the MC016 PCB. Either the SPDIF coaxial input connector or the SPDIF optical input connector can be used, but not both connectors at the same time. Switch S1 on the MC016 Modulator/Controller Board controls which connector is used.

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5 Protection

This section describes the short-circuit protection and fault-reporting circuitry of the TAS5105 device.

5.1 Short-Circuit Protection and Fault-Reporting Circuitry

The TAS5105 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 TAS5012 on the MC016 board. See the TAS5105 data sheet for more information regarding the $\overline{\text{RESET}}$ function.

5.2 Fault Reporting

The OTW and $\overline{\text{FAULT}}$ outputs from TAS5105 indicate fault conditions. See the TAS5105 data sheet (SLES258) for a description of these pins.

Table 6. TAS5105 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 MC016 is illuminated when the temperature of the TAS5105 is okay (less than 125°C.) The LED turns off when the TAS5105 is warning of overtemperature on the device (T_J > 125°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.

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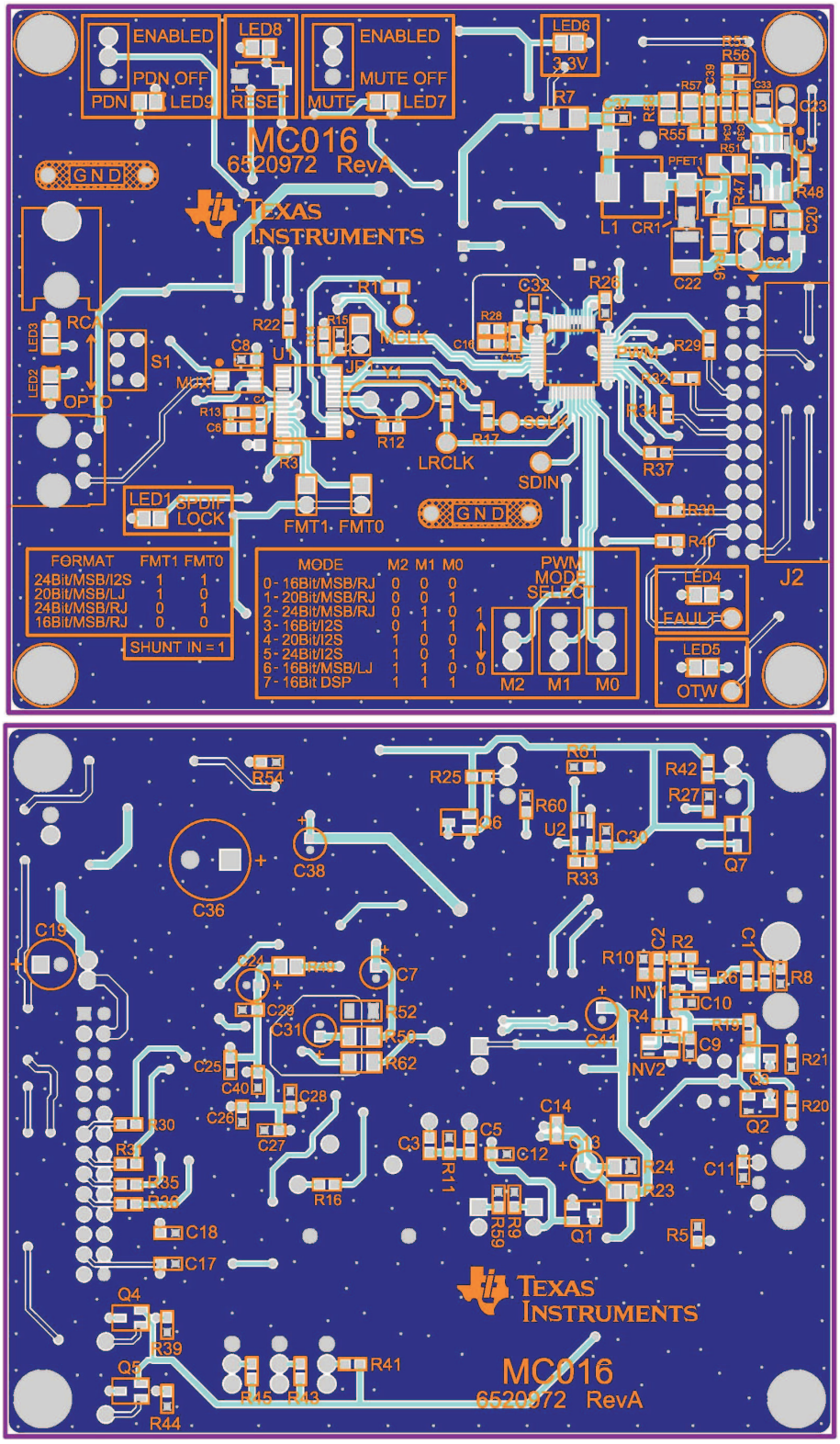
Appendix A Design Documents

A.1 MC016 Composite Drawings



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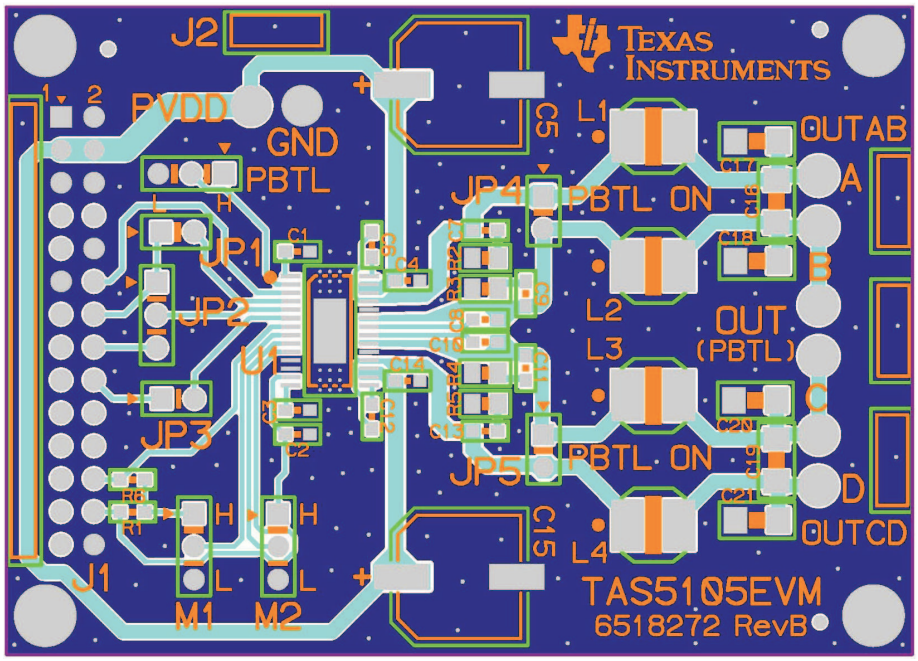
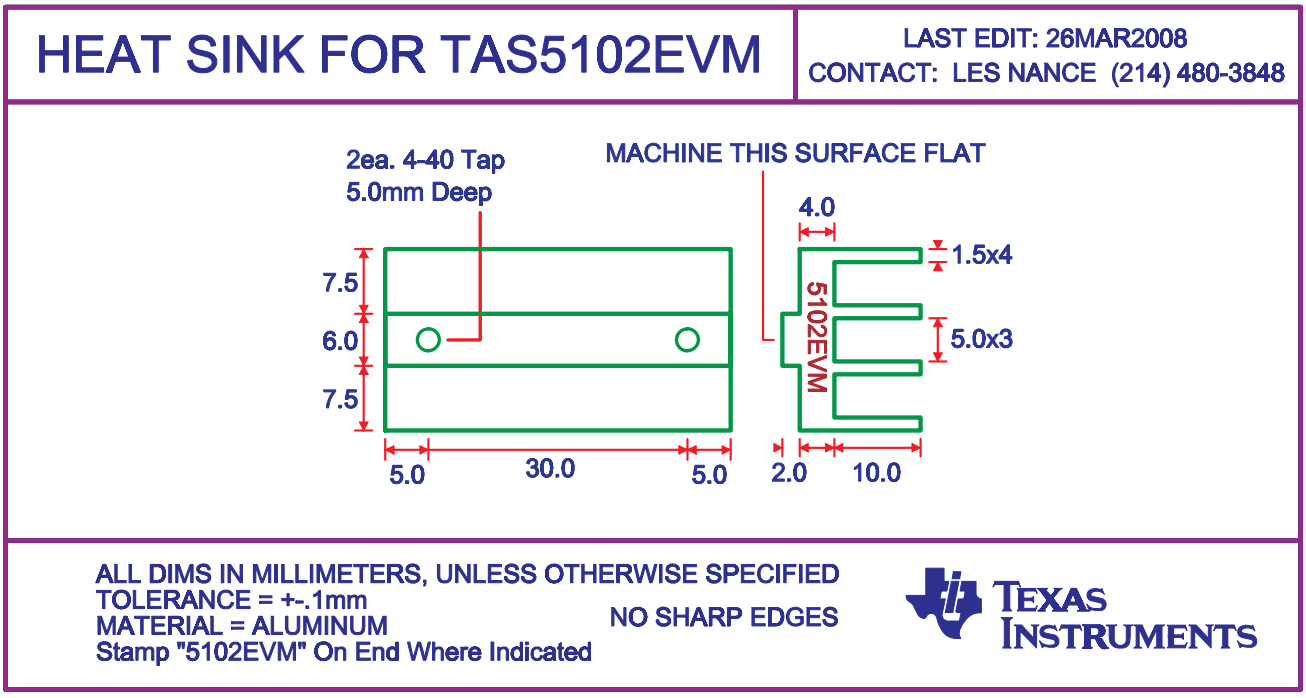
A.2 TAS5105EVM Composite Drawings



A.3 Heat Sink Drawing



The MC016 and TAS5105EVM schematics are found at the end of this document

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A.4 Parts List

Table 7. Bill of Materials for TAS5105EVM

TI-SEMICONDUCTORS							
ITEM	**MANUFACTURER PART NUM**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
1	TAS5105PWP	1	U1	TAS5105PWP	20W STEREO DIGITAL AMPLIFIER POWER STAGE TSSOP28-PWP ROHS	TEXAS INSTRUMENTS	TEXAS INSTRUMENTS
CAPACITORS							
ITEM	**MANUFACTURER PART NUM**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
2	ECJ-1VC1H331J	4	C7, C9, C11, C13	PCC331ACVCT	CAP SMD0603 CERM 330PFD 50V 5% COG ROHS	DIGI-KEY	PANASONIC
3	GRM188R71H222KA01D	1	C1	490-1500-1	CAP SMD0603 CERM 2200PFD 50V 10% X7R ROHS	DIGI-KEY	MURATA
4	ECJ-1VB1H333K	4	C6, C8, C10, C12	PCC2284CT	CAP SMD0603 CERM 0.033UFD 50V 10% X7R ROHS	DIGI-KEY	PANASONIC
5	ECJ-1VB1H104K	3	C2, C4, C14	PCC2398CT	CAP SMD0603 CERM 0.1UFD 50V 10% X7R ROHS	DIGI-KEY	PANASONIC
6	C1206C684K5RACTU	4	C17, C18, C20, C21	399-3500-1	CAP SMD1206 CERM 0.68UFD 50V 10% X7R ROHS	DIGI-KEY	KEMET
7	C0603C105K4PACTU	1	C3	399-5090-1	CAP SMD0603 CERM 1.0ufd 16V 10% X5R ROHS	DIGI-KEY	KEMET
8	EEE-FC1H221P	2	C5, C15	PCE4016CT	CAP SMD ELECT 220ufd 50V 20% FC-G ROHS	DIGI-KEY	PANASONIC
RESISTORS							
ITEM	**MANUFACTURER PART NUM**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
9	ESR10EZPJ180	4	R2, R3, R4, R5	RHM18KCT	RESISTOR SMD0805 18 OHMs 5% 1/4W ROHS	DIGI-KEY	ROHM
10	ERJ-3GEYJ103V	2	R1, R6	P10KGCT	RES SMT0603 10K 5% 1/10W ROHS	DIGI-KEY	PANASONIC
INDUCTORS							
ITEM	**MANUFACTURER PART NUM**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
11	DG6045C-150M	4	L1, L2, L3, L4	DG6045C-150M	INDUCTOR SMT 15uH X.XA X.X mOHMS 20% DG6045C ROHS	TOKO JAPAN	TOKO JAPAN
HEADERS AND JACKS							
ITEM	**MANUFACTURER PART NUM**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
12	PBC02SAAN	4	JP1, JP3, JP4, JP5	S1011E-02	HEADER THRU MALE 2 PIN 100LS GOLD ROHS	DIGI-KEY	SULLINS
13	PBC03SAAN	4	M1, M2, JP2, PBTL	S1011E-03-ND	HEADER THRU MALE 3 PIN 100LS GOLD ROHS	DIGI-KEY	SULLINS
14	PBC14DBAN	1	J1	S2111E-14	HEADER MALE THRU-RA 2x14 100LS GOLD ROHS	DIGI-KEY	SULLINS
15	B2PS-VH(LF)(SN)	4	J2, OUT, OUTAB, OUTCD	455-1648	JACK JST-VH RA 2-PIN 3.96mmLS ROHS	DIGI-KEY	JST
SHUNTS							

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Table 7. Bill of Materials for TAS5105EVM (continued)

ITEM	MANUFACTURER PART NUM	QTY	REF DESIGNATORS	VENDOR PART NUM	DESCRIPTION	VENDOR	MANUFACTURER
16	SPC02SYAN	4	JP2(1-2), M1(2-3), M2(1-2), PBTL(2-3)	S9001	SHUNT, BLACK AU FLASH 0.100LS	DIGI-KEY	SULLINS
17	SPC02SYAN	4	PLACE IN BAG	S9001	SHUNT, BLACK AU FLASH 0.100LS	DIGI-KEY	SULLINS
STANDOFFS AND HARDWARE							
ITEM	**MANUFACTURER PART NUM**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
18	PMS 440 0025 PH	4	NA	H342	4-40 SCREW, STEEL 0.250 IN	DIGI-KEY	BUILDING FASTENERS
19	2031	4	NA	2031K	STANDOFF ,4-40 1.0 IN 3/16IN DIA ALUM RND F-F	DIGI-KEY	KEYSTONE ELECTRONICS
	Component Count:	59					
COMPONENTS NOT ASSEMBLED							
C16, C19							

Table 8. Bill of Materials for MC016

TI-SEMICONDUCTORS							
ITEM	**MANUFACTURER PART NUMBER**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
1	TAS5012PFB	1	PWM	296-12558	DIGITAL AUDIO PWM PROCESSOR TQFB48-PFB	DIGI-KEY	TEXAS INSTRUMENTS
2	SN74AHC1GU04DBVR	2	INV1, INV2	296-1095-1	Single Inverter Gate, SOT23-DBV5	DIGI-KEY	TEXAS INSTRUMENTS
3	SN74LVC2G157DCTR	1	MUX	296-13266-1	Single 2to1 MUX W/Common Stroibe, TSSOP8-DCT	DIGI-KEY	TEXAS INSTRUMENTS
4	TPS3825-33DBVT	1	U2	296-2636-1	Processor Supervisor Circuit, 3.3V	DIGI-KEY	TEXAS INSTRUMENTS
5	TPS40200D	1	U3	296-21153-5	WIDE INPUT RANGE VOLTAGE MODE CONTROLLER SOP8-D	DIGI-KEY	TEXAS INSTRUMENTS
6	DIR9001PW	1	U1	DIR9001PW	DIG AUDIO INTERFACE RECEIVER TSSOP28-PW	DIGI-KEY	TI - BURR BROWN
SEMICONDUCTORS							
ITEM	**MANUFACTURER PART NUMBER**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
7	TORX147LFT	1	OPTO	TORX147LFT	OPTICAL RECEIVER, 3.3V, PCB-RA ROHS	DIGI-KEY	TOSHIBA
8	ECS-122.8-S-4	1	Y1	X174	Crystal, 12.288MHz, HC49US	DIGI-KEY	ECS
9	SI2319DS-T1-E3	1	PFET1	SI2319DS-T1-E3CT	PFET -3.0A -40V 0.1 OHM SOT23-DBV3	DIGI-KEY	VISHAY SILICONIX
10	DDTC143TCA-7-F	1	Q2	DDTC143TCA-FDICT	Transistor NPN 50V PreBiased/4.7K 100mA SOT23-DBV3	DIGI-KEY	DIODES INC.
11	DDTA143TCA-7-F	6	Q4, Q5, Q6, Q7, Q1, Q3	DDTA143TCA-FDICT	Transistor PNP 50V PreBiased/4.7K 100mA SOT23-DBV3	DIGI-KEY	DIODES INC.
12	SS14-TP	1	CR1	SS14-TPCT	SCHOTTKY DIODE, 1A 40V, SMA	DIGI-KEY	MICRO COMMERCIAL
13	LTST-C170TBKT	1	LED1	160-1579-1	LED, BLUE 2.8-3.8V SMD0805	DIGI-KEY	LITE ON INC.
14	SML-LXT0805GW-TR	4	LED2, LED3, LED6, LED8	67-1553-1	LED, GREEN 2.0V SMD0805	DIGI-KEY	LUMEX OPTICAL
15	SML-LXT0805IW-TR	1	LED4	67-1552-1	LED, RED 2.0V SMD0805	DIGI-KEY	LUMEX OPTICAL

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Table 8. Bill of Materials for MC016 (continued)

16	SML-LXT0805YW-TR	3	LED5, LED7, LED9	67-1554-1	LED, YELLOW 2.0V SMD0805	DIGI-KEY	LUMEX OPTICAL
CAPACITORS							
ITEM	**MANUFACTURER PART NUMBER**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
17	RPE5C2A101J2P1Z03B	1	C21	490-3622	CAP CERAMIC 100PFD 100V 5% RADIAL COG	DIGI-KEY	MURATA
18	FK18C0G1H471J	1	C23	445-4779	CAP 470PFD 50V 5% MULTILAYER CERAMIC COG	DIGI-KEY	TDK CORP.
19	ECJ-1VC1H330J	2	C3, C5	PCC330ACVCT	CAP 33PFD 50V CERM 0603 NPO	DIGI-KEY	PANASONIC
20	C1608C0G1H101J	1	C34	445-1281-1	CAP 100PFD 50V CERM 0603 NPO	DIGI-KEY	TDK CORP.
21	ECJ-1VB1H332K	1	C39	PCC1778CT	CAP 3300PFD 50V CERM 0603 X7R	DIGI-KEY	PANASONIC
22	ECJ-1VB1H472K	2	C15, C4	PCC1780CT	CAP 4700PFD 50V CERM 0603 X7R	DIGI-KEY	PANASONIC
23	ECJ-1VB1H223K	1	C35	PCC2282CT	CAP .022UFD 50V CERM 0603 X7R	DIGI-KEY	PANASONIC
24	ECJ-1VB1C473K	3	C16, C1, C2	PCC1758CT	CAP .047UFD 16V CERM 0603 X7R	DIGI-KEY	PANASONIC
25	C1608X7R1C683K	1	C6	445-5120-1	CAP .068UFD 16V CERM 0603 X7R	DIGI-KEY	TDK CORP.
26	ECJ-1VB1C104K	15	C8, C9, C10, C11, C12, C14, C25, C26, C27, C28, C29, C30, C32, C37, C40	PCC1762CT	CAP 0.1UFD 16V CERM 0603 X7R	DIGI-KEY	PANASONIC
27	C1608X5R0J105K	2	C17, C18	445-1322-1	CAP 1.0UFD 6.3V CERM 0603 X5R	DIGI-KEY	TDK CORP.
28	C2012X7R1H104K	1	C20	445-1349-1	CAP 0.1UFD 50V CERM 0805 X7R	DIGI-KEY	TDK CORP.
29	GMK212BJ474KG-T	1	C33	587-1289-1	CAP 0.47UFD 35V CERM 0805 X5R	DIGI-KEY	TAIYO YUDEN
30	C3225X7R1H335M	1	C22	445-1432-1	CAP 3.3UFD 50V CERM 1210 X7R	DIGI-KEY	TDK CORP.
31	ECE-A1CKG100	6	C7, C13, C24, C31, C38, C41	P910	CAP 10UFD 16V RAD ALUM ELEC KGA	DIGI-KEY	PANASONIC
32	EEU-FC1H560	1	C19	P10322	CAP 56UFD 50V RAD ALUM ELEC FC	DIGI-KEY	PANASONIC
33	EEU-FC1V561	1	C36	P11238	CAP 560UFD 35V RAD ALUM ELEC FC	DIGI-KEY	PANASONIC
RESISTORS							
ITEM	**MANUFACTURER PART NUMBER**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
34	ERJ-3GEY0R00V	4	R11, R22, R38, R40	P0.0GCT	RES 0.0 OHM 1/16W 5% SMD 0603	DIGI-KEY	PANASONIC
35	RC0603JR-0747RL	12	R29, R30, R31, R32, R34, R35, R36, R37, R1, R16, R17, R18	311-47GRCT	RES 47 OHM 1/16W 5% SMD 0603	DIGI-KEY	YAGEO
36	ERJ-3EKF75R0V	1	R8	P75.0HCT	RES 75.0 OHM 1/16W 1% SMD 0603	DIGI-KEY	PANASONIC
37	RC0603JR-07100RL	2	R3, R6	311-100GRCT	RES 100 OHM 1/16W 5% SMD 0603	DIGI-KEY	YAGEO
38	ERJ-3EKF2210V	1	R28	P221HCT	RES 221 OHM 1/16W 1% SMD 0603	DIGI-KEY	PANASONIC
39	ERJ-3EKF3320V	6	R27, R39, R44, R60, R61, R54	P332HCT	RES 332 OHM 1/16W 1% SMD 0603	DIGI-KEY	PANASONIC
40	ERJ-3EKF3570V	2	R20, R21	P357HCT	RES 357 OHM 1/16W 1% SMD 0603	DIGI-KEY	PANASONIC
41	ERJ-3EKF3920V	1	R5	P392HCT	RES 392 OHM 1/10W 1% SMD 0603	DIGI-KEY	PANASONIC
42	ERJ-3GEYJ471V	1	R12	P470GCT	RES 470 OHM 1/10W 5% SMD 0603	DIGI-KEY	PANASONIC

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Table 8. Bill of Materials for MC016 (continued)

43	RMCF0603JT680R	1	R13	RMCF0603JT680RCT	RES 680 OHM 1/10W 5% SMD 0603	DIGI-KEY	STACKPOLE ELECTRONICS
44	RC0603JR-071KL	1	R19	311-1.0KGRCT	RES 1K OHM 1/16W 5% SMD 0603	DIGI-KEY	YAGEO
45	ERJ-3EKF2001V	1	R10	P2.00KHCT	RES 2.00K OHM 1/16W 1% SMD 0603	DIGI-KEY	PANASONIC
46	ERJ-3EKF4991V	4	R14, R15, R26, R33	P4.99KHCT	RES 4.99K OHM 1/16W 1% SMD 0603	DIGI-KEY	PANASONIC
47	ERJ-3EKF7501V	1	R4	P7.50KHCT	RES 7.50K OHM 1/16W 1% SMD 0603	DIGI-KEY	PANASONIC
48	RMCF0603JT10K0	3	R9, R56, R59	RMCF0603JT10K0CT	RES 10K OHM 1/16W 5% SMD 0603	DIGI-KEY	STACKPOLE ELECTRONICS
49	ERJ-3EKF1002V	5	R25, R41, R42, R43, R45	P10.0KHCT	RES 10.0K OHM 1/16W 1% SMD 0603	DIGI-KEY	PANASONIC
50	ERJ-3EKF3012V	1	R55	P30.1KHCT	RES 30.1K OHM 1/16W 1% SMD 0603	DIGI-KEY	PANASONIC
51	RC0603JR-07100KL	1	R53	311-100KGRCT	RES 100K OHM 1/10W 5% SMD 0603	DIGI-KEY	YAGEO
52	RC0603JR-07120KL	1	R48	311-120KGRCT	RES 120K OHM 1/10W 5% SMD 0603	DIGI-KEY	YAGEO
53	ERJ-3EKF1004V	1	R2	P1.00MHCT	RES 1.00M OHM 1/16W 1% SMD 0603	DIGI-KEY	PANASONIC
54	ERJ-GEY0R00V	2	R23, R24	P0.0ACT	RES 0.0 OHM 1/10W 5% SMD 0805	DIGI-KEY	PANASONIC
55	WSL0805R0500FEA18	1	R46	WSLB-.05CT	RES 0.05 OHM 1/4W 1% SMD 0805	DIGI-KEY	VISHAY/DALE
56	ERJ-6RQJ1R0V	1	R49	P1.0BCT	RES 1.0 OHM 1/10W 5% SMD 0805	DIGI-KEY	PANASONIC
57	ERJ-6ENF49R9V	1	R58	P49.9CCT	RES 49.9 OHM 1/10W 1% SMD 0805	DIGI-KEY	PANASONIC
58	ERJ-6ENF1001V	1	R47	P1.00KCCT	RES 1.00K OHM 1/10W 1% SMD 0805	DIGI-KEY	PANASONIC
59	ERJ-6ENF3742V	1	R57	P37.4KCCT	RES 37.4K OHM 1/10W 1% SMD 0805	DIGI-KEY	PANASONIC
60	ERJ-8GEY0R00V	2	R51, R62	P0.0ECT	RES 0.0 OHM 1/8W 5% SMD 1206	DIGI-KEY	PANASONIC
61	RC1206JR-071RL	1	R7	311-1.0ERCT	RES 1.0 OHM 1/4W 5% SMD 1206	DIGI-KEY	YAGEO
62	ERJ-8GEYJ1R0V	2	R50, R52	P1.0ECT	RES 1.0 OHM 1/8W 5% SMD 1206	DIGI-KEY	PANASONIC
INDUCTORS							
ITEM	**MANUFACTURER PART NUMBER**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
63	DR74-331	1	L1	DR74-331	INDUCTOR, 330UH, SMD-DR74	DIGI-KEY	COILTRONICS
HEADERS AND JACKS							
ITEM	MANUFACTURER PART NUMBER	QTY	REF DESIGNATORS	VENDOR PART NUM	DESCRIPTION	VENDOR	MANU
64	PBC02SAAN	3	FMT0, FMT1, JP1	S1011E-02	Header, 2 Pin Male, Straight, Gold	DIGI-KEY	SULLINS
65	SSW-114-02-G-D-RA	1	J2	SSW-114-02-G-D-RA	SOCKET HEADER, 2x14 PIN FEMALE GOLD PCB-RA	SAMTEC	SAMTEC
66	RCJ-051	1	RCA	CP-1424	Jack, RCA, PCB-Vertical, Black	DIGI-KEY	CUI STACK
NON-INSULATED WIRE GROUND LOOPS							
ITEM	**MANUFACTURER PART NUMBER**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
BEND THE WIRE LENGTHS INTO A 'U' SHAPE AND SOLDER TO THE BOARD. LEAVE A GAP OF AROUND 0.3 INCHES BETWEEN THE BOARD AND THE WIRE.							
67	8019000100	2	GNDx2	566-8019	NON-INSULATED BUS WIRE, 25MM LENGTH, 18 AWG, ROHS	MOUSER	BELDEN CDT

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Table 8. Bill of Materials for MC016 (continued)

TESTPOINTS AND SWITCHES							
ITEM	**MANUFACTURER PART NUMBER**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
68	5003	6	FAULT, LRCLK, MCLK, OTW, SCLK, SDIN	500K	PC Testpoint, Orange	DIGI-KEY	KEYSTONE ELECTRONICS
69	EVQ-PNF04M	1	RESET	P13597SCT	SWITCH, SMT,2P,SPST-NOM,ROHS	DIGI-KEY	PANASONIC
70	ET01MD1V3BE	5	M0, M1, M2, MUTE, PDN	CKN1071	Switch, SPST, Vert-PCB	DIGI-KEY	C&K COMPONENTS
71	G12AP-RO	1	S1	360-1758	SWITCH, SPST, VERT-PCB ROHS	DIGI-KEY	NKK SWITCHES
SHUNTS							
ITEM	**MANUFACTURER PART NUMBER**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
72	SPC02SYAN	2	FMT0, FMT1	S9001	SHUNT, BLACK AU FLASH 0.100LS	DIGI-KEY	SULLINS
STANDOFFS AND HARDWARE							
ITEM	**MANUFACTURER PART NUMBER**	**QTY**	**REF DESIGNATORS**	**VENDOR PART NUM**	**DESCRIPTION**	**VENDOR**	**MANUFACTURER**
73	PMS 440 0025 PH	4	NA	H342	4-40 SCREW, STEEL 0.250 IN	DIGI-KEY	BUILDING FASTENERS
74	3483	4	NA	3483K	STANDOFF, 4-40 1.5 IN 3/16IN DIA ALUM RND F-F	DIGI-KEY	KEYSTONE

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SPDIF RECEIVER

ENGINEERING EVALUATION ONLY

SPDIF INPUT

RCA

OPTO

TORX147LFT

R8 75.0

C1 0.047ufd/16V

R6 100

R2 1.00M

INV1 74AHC1GU04

C2 0.047ufd/16V

R4 7.50K

INV2 74AHC1GU04

R10 2.00K

SCKO

R1 47

U1 DIR9001PW

AUDIO, FSOUT0, FSOUT1, SCKO, Vdd, DGND, XTO, XTI, CLKST, LRCKO, BCKO, DOUT, PSCK0, PSCK1, CKSEL, ERROR, FMT1, FMT0, Vcc, AGND, FILT, RST, RXIN, RSV, BFRAME, EMPH, UOUT, COUT

R3 100

R11 0.0

C3 33pfd/50V

R12 470

Y1 12.288MHz

C5 33pfd/50V

C4 4700pfd/50V

R13 680

C6 0.068ufd/16V

AGND–SPDIF

R14 4.99K

JP1

R15 4.99K

JP1 IN: SCKO = 512 Fs
JP1 OUT: SCKO = 256 Fs (DEFAULT)

R16 47

R17 47

R18 47

SPDIF LOCK

4.7K, LED1 Blue, R5 392

FMT1 / FMT0

R9 10K, R59 10K

DATA FORMAT FMT1 FMT0

24Bit/MSB/I2S*	H	H
24Bit/MSB/LJ	H	L
24Bit/MSB/RJ	L	H
16Bit/MSB/RJ	L	L

*=DEFAULT

TO TAS5012

MCLK, SDIN, SCLK, LRCLK

SPDIF INPUT SELECT

1-2: OPTO INPUT
2-3: COAX INPUT

R19 1.0K, S1

MUX SN74LVC2G157DCT

OPTO INPUT

LED2 Green, Q2, 4.7K, R20 357

COAX INPUT

Q3, 4.7K, LED3 Green, R21 357

FROM MASTER RESET

RESET, R22 0.0, RST

DECOUPLING

U1–5, INV1–5, INV2–5, MUX–8, OPTO–3

C7 10ufd/16V, C8 0.1ufd/16V, C9 0.1ufd/16V, C10 0.1ufd/16V, C11 0.1ufd/16V, C12 0.1ufd/16V

DECOUPLING

R23 0.0, R24 0.0

U1–24, U1–24

C13 10ufd/16V, C14 0.1ufd/16V

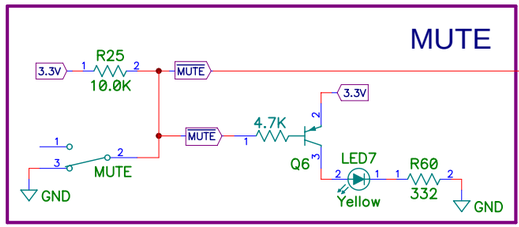
EDGE# 6520972

TEXAS INSTRUMENTS

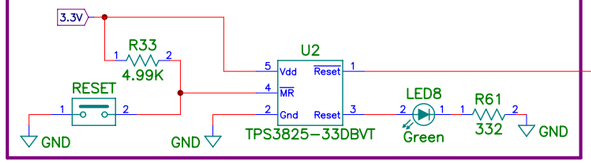
CX	PROJECT: CONTROLLER FOR TAS51xxEVMs		
Design Team: TUAN LUU			
Schematic Rev: A	Mod:	PCB Rev: A	Sheet 1 of 4
Save Date: AUGUST 18, 2010		Print Date	Wed Aug 18, 2010
Filename: MC016.sch			Drawn By: LDN

PWM MODULATOR / RESET / POWER SUPPLY

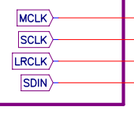
MUTE



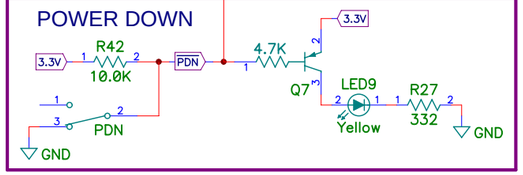
RESET CONTROL



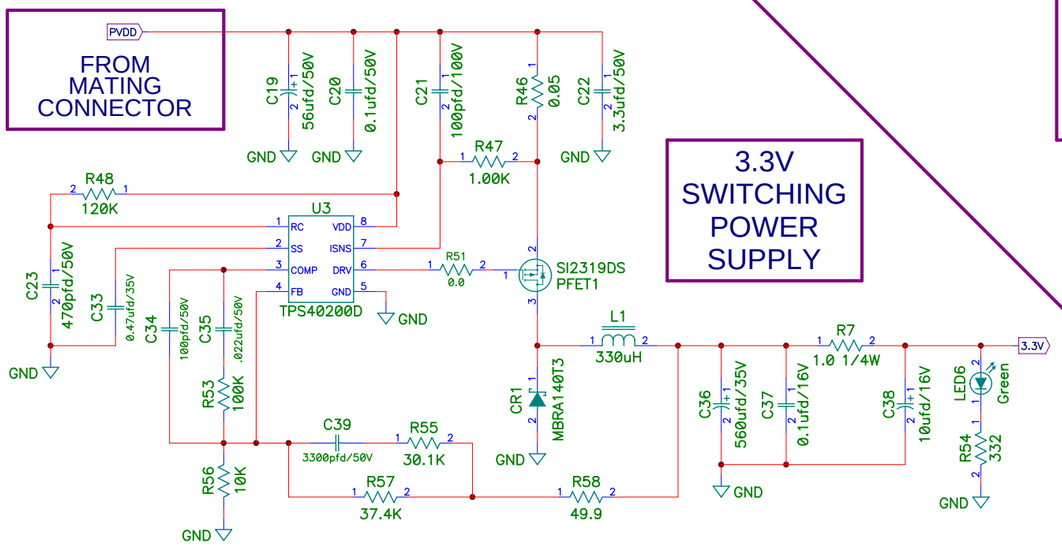
FROM SPDIF



POWER DOWN

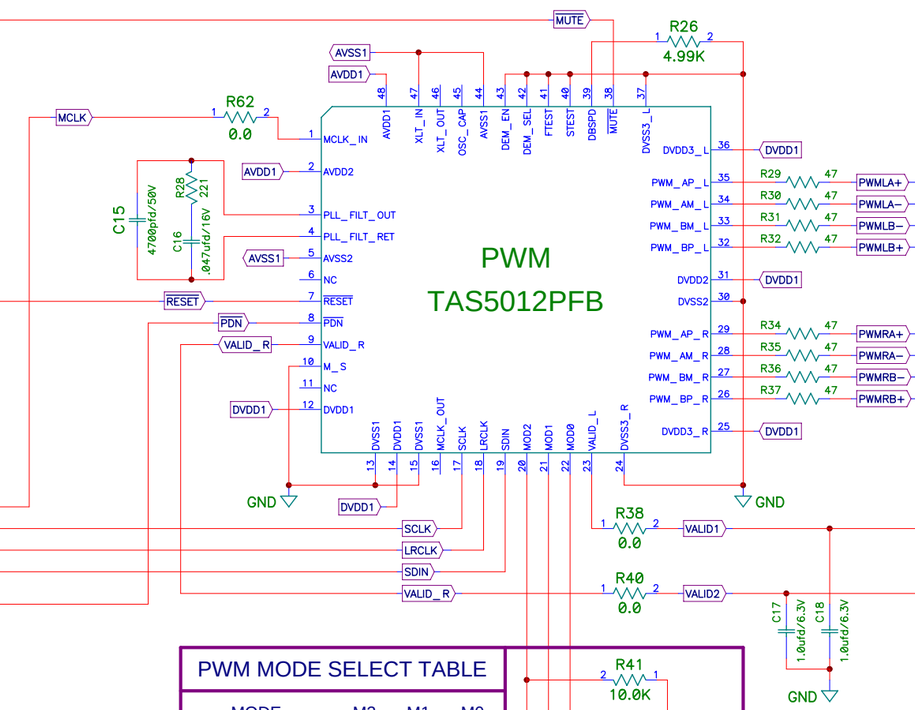


FROM MATING CONNECTOR



3.3V SWITCHING POWER SUPPLY

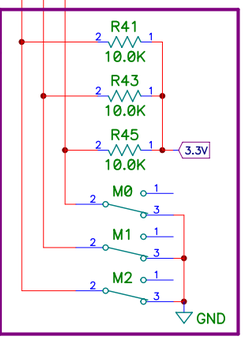
BD MODE



PWM MODE SELECT TABLE

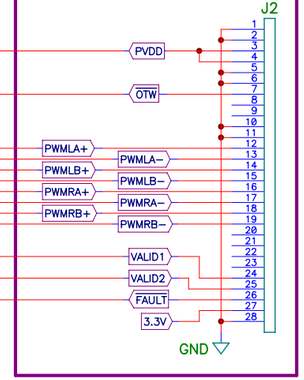
MODE	M2	M1	M0
0-16Bit/MSB/RJ	0	0	0
1-20Bit/MSB/RJ	0	0	1
2-24Bit/MSB/RJ	0	1	0
3-16Bit/IIS	0	1	1
4-20Bit/IIS	1	0	0
5-24Bit/IIS #	1	0	1
6-16Bit/MSB/LJ	1	1	0
7-16Bit DSP	1	1	1

- DEFAULT JUMPER SETTINGS

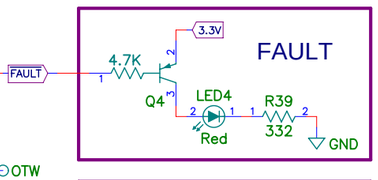


TO POWER SUPPLY

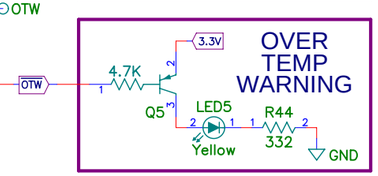
TAS5102EVM INTERFACE



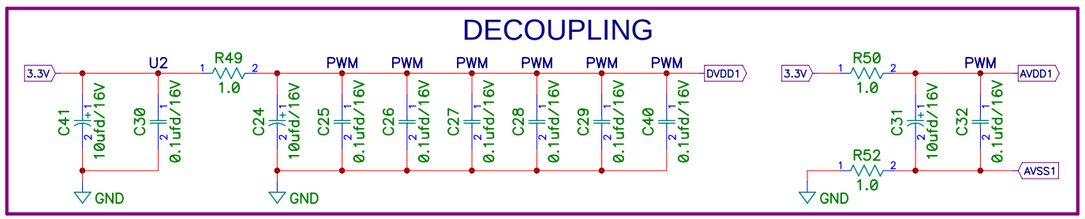
FAULT



OVER TEMP WARNING



DECOUPLING



EDGE# 6520972

CX	PROJECT: CONTROLLER FOR TAS51xxEVMs			
Design Team: TUAN LUU				
Schematic Rev: A	Mod:	PCB Rev: A	Sheet 2 of 4	
Save Date: AUGUST 18, 2010		Print Date	Wed Aug 18, 2010	
Filename: MC016.sch				Drawn By: LDN

TAS5105 EVALUATION BOARD

CONTROLLER BOARD

J1

PVDD
PWMA
PWMB
PWMC
PWMD
RESET
FAULT
+3.3V
PGND

PWM MODE JUMPERS

JP1 PWM_B
JP2 PWM_C
JP3 PWM_D

HPL-MC012 (TAS5086) (AD MODE)	MC016 (TAS5012) (BD MODE)
OUT	JP1 IN
1-2	JP2 2-3
OUT	JP3 IN

J2 PVDD JST-VH2 PGND

MODE TABLE

M2	M1	PWM INPUT	Output Config.
0	0	2N AD/BD Modulation	2 Chan BTL
0	1	1N AD Modulation	2 Chan BTL
1	0	1N AD Modulation	4 Chan SE
1	1	Reserved	Reserved

U1

TAS5105PWP
TSSOP28-PWP

SSTIMER, PBTL, PWM_A, PWM_B, PWM_C, PWM_D, RESET, M1, M2, FAULT, GND, DGND, DVDD, GVDD, BST_A, PVDD_AB, PVDD_AB, OUT_A, PGND_AB, BST_B, BST_C, OUT_C, PGND_CD, OUT_D, PVDD_CD, PVDD_CD, BST_D

C1 2200pfd/50V 0603
PBTL +3.3V
R6 +3.3V 10K 0603
M1 +3.3V
M2 +3.3V
R1 +3.3V 10K 0603
C2 0.1ufd/50V 0603
C3 1.0ufd/16V 0603

C4 0.1ufd/50V 0603
C5 220ufd/50V FC-G
C6 0.033ufd/50V 0603
C7 330pfd/50V 0603
R2 18 1/4W 0805
C8 0.033ufd/50V 0603
C9 330pfd/50V 0603
R3 18 1/4W 0805
C10 0.033ufd/50V 0603
C11 330pfd/50V 0603
R4 18 1/4W 0805
C12 0.033ufd/50V 0603
C13 330pfd/50V 0603
R5 18 1/4W 0805
C14 0.1ufd/50V 0603
C15 220ufd/50V FC-G
C16 0.68ufd/50V 1206
C17 0.68ufd/50V 1206
C18 0.68ufd/50V 1206
C19 0.68ufd/50V 1206
C20 0.68ufd/50V 1206
C21 0.68ufd/50V 1206
L1 15uH DG6045C
L2 15uH DG6045C
L3 15uH DG6045C
L4 15uH DG6045C
JP4
JP5
DNP
DNP
PVDD
PGND

U1 TSSOP28-PWP PowerPad PGND

OUTPUTS ARE CONFIGURED FOR BD MODE OPERATION

OUTAB: OUTA, OUTB — JST-VH2 — BTL
OUT: OUTB, OUTC — JST-VH2 — PBTL
OUTCD: OUTC, OUTD — JST-VH2 — BTL

STANDOFFS

1.0in 1.0in 1.0in 1.0in
PGND PGND PGND PGND

TEXAS INSTRUMENTS

PAGE INFO: TAS5105 EVALUATION BOARD		DATE AUGUST 17, 2010	SCH REV B
			PCB REV A
DESIGN LEAD TUAN LUU	EDGE # 6518272	FILENAME TAS5105EVM_RevB.sbk	SHEET 1 OF 2
			DRAWN BY LDN

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It is important to operate this EVM within the input voltage range of –0.3 V to 4.2 V and the output voltage range of swing of 26 Vp-p .

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 80°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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