# TAS5162DDV6EVM2

This user's guide describes the operation of the evaluation module for the TAS5162 Digital Amplifier Power Output Stage using TAS5518 Digital Audio PWM Processor from Texas Instruments. The user's guide also provides measurement data and design information such as the schematic, BOM, and PCB layout

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## Trademarks

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# 1 Overview

The TAS5162DDV6EVM2 PurePath Digital ™ customer evaluation module demonstrates the integrated circuits TAS5162DDV and TAS5518PAG from Texas Instruments.

The TAS5162DDV is a high-performance, integrated stereo Digital Amplifier Power Stage designed to drive 6-Ω speakers at up to 210 W per channel. The device incorporates PurePath Digital™ technology and is designed to be used with PurePath Digital™ modulators. This system requires only a simple passive demodulation filter to deliver high-quality, high-efficiency audio amplification.

TAS5518PAG is a high performance 32 bit (24 bit input) multi channel PurePath Digital™ Pulse Width Modulator (PWM) based on Equibit™ technology with fully symmetrical AD modulation scheme. The device also has Digital Audio Processing (DAP) that provides 48 bit signal processing, advanced performance and a high level of system integration. The device has interfaces for headphone output and Power Supply Volume Control (PSVC).

This EVM is configured with 4 BTL channels and 1 PBTL (parallel BTL) channel for the subwoofer channel.

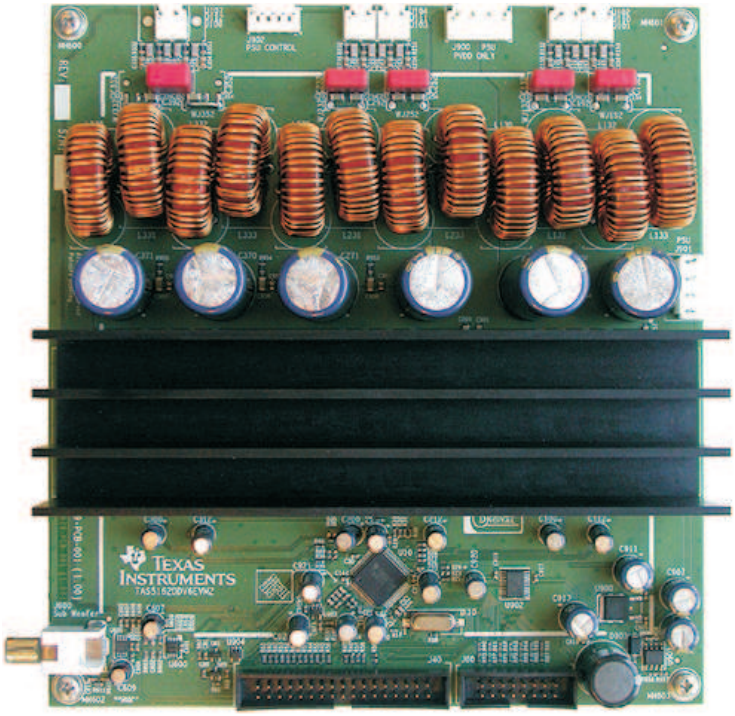
This EVM, together with a TI input-USB board, is a complete 5 channels + subwoofer line output digital audio amplifier system which includes digital input (S/PDIF), analog inputs, interface to PC and DAP features like digital volume control, input and output mixers, automute, tone controls, loudness, EQ filters and dynamic range compression (DRC). There are configuration option for power stage failure protection and a mini-jack connector for headphone.

**Table 1. TAS5162DDV6EVM2 Specification**

| **Key Parameters** | |
|---|---|
| Output Stage Supply Voltage: | 0V – 50 V |
| System Supply Voltage: | 15V – 20 V |
| Number of Channels | 4 x BTL, 1x PBTL |
| Load Impedance BTL: | 6-8 Ω |
| Load Impedance PBTL: | 4-8 Ω |
| Output power BTL | 160W / 8 Ω 10% THD or 210W / 6 Ω / 10% THD |
| Output power PBTL | 310W / 4 Ω / 10% THD |
| DNR | >110 dB |
| PWM Processor | TAS5518PAG |
| Output Stage | TAS5162DDV |
| Other Features | Subwoofer line output |

This 5 channel system + subwoofer line output is designed for home theater applications such as A/V receivers, DVD receivers, DVD mini-component systems or home theater in a box (HTIB).

This document covers EVM specifications, audio performance and power efficiency measurements graphs, and design documentation that includes schematics, parts list, layout and mechanical design.



Gerber (layout) files are available at www.ti.com.

The EVM is delivered with cables and Input-USB board to connect to an input source and be controlled from a PC.

## *1.1 1.1 TAS5162DDV6EVM2 Features*

- 5/6 channel PurePath Digital™ evaluation module (double-sided plated-through PCB layout).
- Subwoofer Line Output (LFE Output).
- Self-contained protection system (short-circuit and thermal
- Standard $I^2S$ and $I^2C$™ / Control connector for TI input board
- Double-sided plated-through PCB layout.

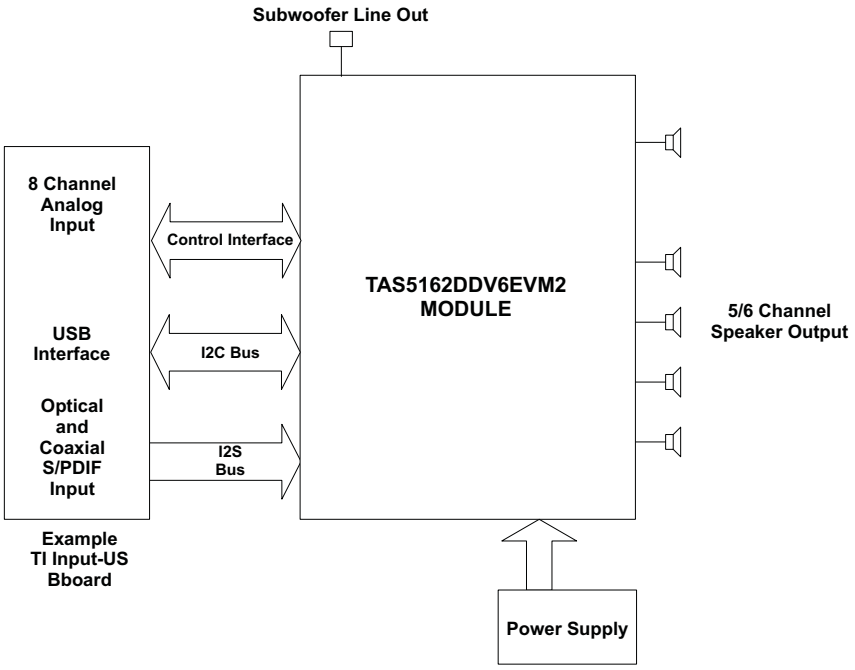



**Figure 1. Integrated PurePath Digital™ Amplifier System**

## 1.2 PCB Key Map

Physical structure for the TAS5162DDV6EVM2 is illustrated in Figure 2.

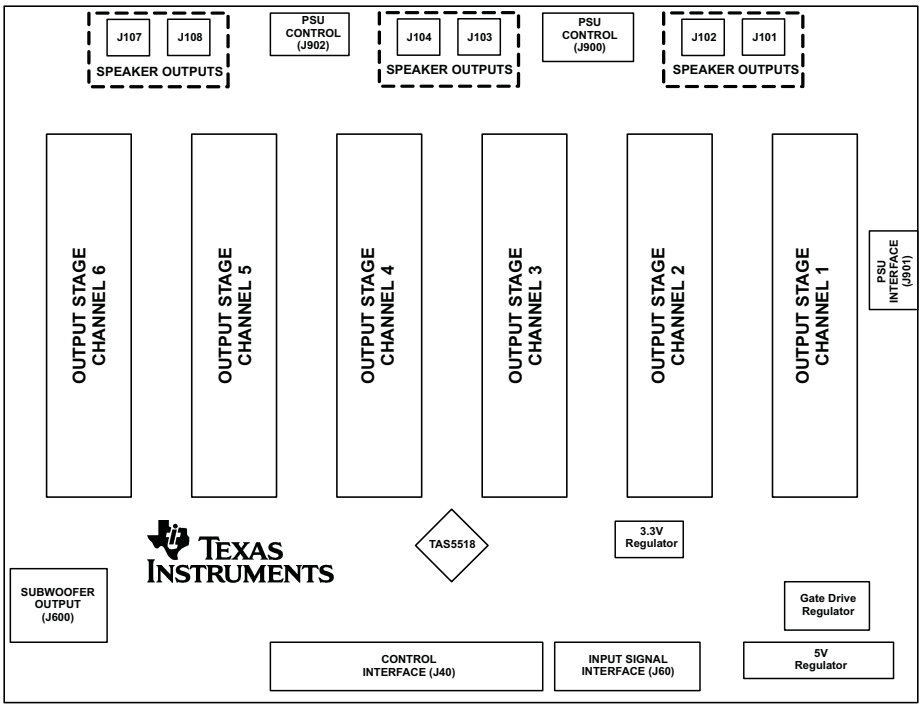



**Figure 2. Physical structure for the TAS5162DDV6EVM2 (Approximate Layout)**

# 2 Quick Setup Guide

This chapter describes the TAS5162DDV6EVM2 board in regards to power supplies and system interfaces. The chapter provides information regarding handling and unpacking, absolute operating conditions, and a description of the factory default switch and jumper configuration.

This chapter provides a step-by-step guide to configuring the TAS5162DDV6EVM2 for device evaluation.

## 2.1 Electrostatic Discharge Warning

Many of the components on the TAS5162DDV6EVM2 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 may result in damage to EVM components.

## 2.2 Unpacking the EVM

Upon opening the TAS5162DDV6EVM2 package, check to make sure that the following items are included:

- 1 pc. TAS5162DDV6EVM2 board using one TAS5518PAG and four TAS5162DDV.
- 1 pc. TI Input-USB board for interfacing TAS5162DDV6EVM2 with SPDIF/analog sources and PC for control.
- 1 pc. Signal Interface IDC cable for connection to an $I^2S$ front-end like the TI Input-USB board.
- 1 pc. Control Interface IDC cable for connection to an $I^2C$™ front-end like the TI Input-USB board.
- 1 pc Cable for connecting Input-USB board to a USB port on a PC for TAS5518 control by software.
- 1 pc. Power supply cable for one regulated power supplies (H-bridge).
- 1 pc. Power supply cable for two regulated power supplies (H-bridge and System supply).
- 1 pc. PurePath™ 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 Input-USB board to TAS5162DDV6EVM2 using the 2 delivered IDC cables.

## 2.3 Power Supply Setup

To power up the EVM two power supplies are needed. One for system power, logic and gate-drive, and one for output stage supply. Power supplies are connected to the EVM using delivered power cable Red/Black, White/Black.

**Table 2. Recommended Supply Voltages**

| Description | Voltage Limitations | Current Requirement | Cable |
|---|---|---|---|
| System power supply | 15 – 20 V | 0.3 A | Red/Black |
| Output stage power supply | 0 – 50 V | 10 A | White/Black |

**CAUTION**

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

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

## 2.4 Speaker Connection

**CAUTION**

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

## 2.5 GUI Software Installation

The TAS5518 GUI provides easy control of all registers in the TAS5518. To install the GUI, run setup file from the PurePath™ CD-ROM.

After installation, turn on the power supplies and connect the USB cable to the Input-USB board.

Start GUI program from windows menu. Start up of GUI will take few seconds.


**Figure 3. TAS5518 GUI Window**

From the files menu load the configuration file:

TAS5162DDV6EVM2 Configuration (1.00).cfg

The file is located on the PurePath™ 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\TAS5518\

For more advanced use of the GUI, refer to the GUI User's Guide and data manual for the TAS5518.

# 3 Protection

This chapter describes the short-circuit protection and fault reporting circuitry of the TAS5162 (SLES194) device.

## 3.1 Short Circuit Protection and Fault Reporting Circuitry

The TAS5162 is a self-protecting device that provides fault reporting (including high-temperature protection and short-circuit protection). TAS5162 is configured in back-end auto-recovery mode, and therefore, resets automatically after all errors (M1, M2 and M3 is set low), see the data sheet for further explanation. This mean that the device will restart it self after an error occasion and report shortly through the $\overline{SD}$ error signal.

## 3.2 Fault Reporting

The $\overline{OTW}$ and $\overline{SD}$ outputs from TAS5162 indicate fault conditions. See the TAS5162 data manual for a description of these pins.

**Table 3. TAS5162 Warning/Error Signal Decoding**

| $\overline{OTW}$ | $\overline{SD}$ | Device Condition |
|---|---|---|
| 0 | 0 | High temperature error and/or high current error |
| 0 | 1 | High temperature warning |
| 1 | 0 | Undervoltage lockout or high current error |
| 1 | 1 | Normal operation, no errors/warnings |

The temperature warning signals at the TAS5162DDV6EVM2 board are wired — or to one temperature warning signal ($\overline{OTW}$ – pin 22 in control interface connector). Shutdown signals are wired-or into one shutdown signal ($\overline{SD}$ – pin 20 in control interface connector).

The shutdown signals together with the temperature warning signal give chip state information as described in Table 3. Device fault reporting outputs are open-drain outputs.

# 4 TAS5162DDV6EVM2 Performance

All electrical and audio specifications are typical values.

**Table 4. General Test Conditions**

| General Test Conditions[1] | | Notes |
|---|---|---|
| Output Stage Supply Voltage: | 50 V | Laboratory Power Supply (EA-PS 7065-10A) |
| System Supply Voltage: | 15 V | |
| Load Impedance BTL: | 6-8 Ω | |
| Load Impedance PBTL: | 3-4 Ω | |
| Input Signal | 1kHz Sine | |
| Sampling Frequency | 48 kHz | |
| Gain setting in TAS5518 | 0 dB | |
| Measurement Filter | AES17 and AUX0025 | |
| TI Input-USB Board | Input-USB | Rev 10 |
| EVM configuration file | Ver 1.00 | TAS5162DDV6EVM2 Configuration (1.00).cfg |

(1) These test conditions are used for all tests, unless otherwise specified.

**Table 5. TAS5518 Register Settings**

| Register[1] | | Value | Notes |
|---|---|---|---|
| Modulation Index Limit Register | 0x16 | 0x04 | Set Modulation Index to 96.1% |
| Master Volume Register | 0xD9 | 00 00 00 48 | Master Volume set to 0 dB |

(1) These register settings are used for all test, unless otherwise specified.

**Table 6. Electrical Data**

| Electrical Data | | Notes/Conditions |
|---|---|---|
| Output Power, BTL, 6 Ω: | 155 W | 1 kHz, unclipped (0 dBFS), $T_A$ = 25°C |
| Output Power, BTL, 6 Ω: | 210 W | 1 kHz, 10% THD+N, $T_A$ = 25°C |
| Output Power, BTL, 8 Ω: | 125 W | 1 kHz, unclipped (0 dBFS), $T_A$ = 25°C |
| Output Power, BTL, 8 Ω: | 160 W | 1 kHz, 10% THD+N, $T_A$ = 25°C |
| Output Power, PBTL, 4 Ω: | 240 W | 1 kHz, unclipped (0 dBFS), $T_A$ = 25°C |
| Output Power, PBTL, 4 Ω: | 315 W | 1 kHz, 10% THD+N, $T_A$ = 25°C |
| Maximum Peak Current, BTL: | >10 A | 1 kHz burst, 1 Ω, $R_{OC}$ = 22k |
| Maximum Peak Current, PBTL: | >20 A | 1 kHz burst, 1 Ω, $R_{OC}$ = 22k |
| Output Stage Efficiency: | 90% | 2 x channels, 8 Ω |
| Damping Factor BTL: | 15 | 1 kHz, relative to 8 Ω load |
| Damping Factor PBTL: | 15 | 1 kHz, relative to 4 Ω load |
| System Supply Current: | <270 mA | 1 kHz, -60 dBFS signal, with TI input board |
| H-Bridge Supply Current: | <187 mA | 1 kHz, -60 dBFS signal |
| Total Board Idle Power Consumption: | 13.4 W | H-Bridge supply + System supply, -60 dBFS signal |

## Table 7. Audio Performance

| Audio Performance | | | Notes/Conditions |
|---|---|---|---|
| THD+N, BTL, 6 Ω: | 1 W | <0.02% | 1 kHz |
| THD+N, BTL, 6 Ω: | 10 W | <0.06% | 1 kHz |
| THD+N, BTL, 6 Ω: | 50 W | <0.10% | 1 kHz |
| THD+N, BTL, 6 Ω: | 100 W | <0.10% | 1 kHz |
| THD+N, BTL, 6 Ω: | 150 W | <0.13% | 1 kHz |
| THD+N, BTL, 8 Ω: | 1 W | <0.02% | 1 kHz |
| THD+N, BTL, 8 Ω: | 10 W | <0.06% | 1 kHz |
| THD+N, BTL, 8 Ω: | 50 W | <0.08% | 1 kHz |
| THD+N, BTL, 8 Ω: | 100 W | <0.07% | 1 kHz |
| THD+N, PBTL, 4 Ω: | 1 W | <0.009% | 1 kHz |
| THD+N, PBTL, 4 Ω: | 10 W | <0.05% | 1 kHz |
| THD+N, PBTL, 4 Ω: | 50 W | <0.04% | 1 kHz |
| THD+N, PBTL, 4 Ω: | 100 W | <0.05% | 1 kHz |
| THD+N, PBTL, 4 Ω: | 200 W | <0.12% | 1 kHz |
| Dynamic Range: | | >109 dB | Ref: rated power, A-weighted, AES17 filter, 4 ch avg |
| Noise Voltage: | | <110 µVrms | A-weighted, AES17 filter |
| Click/Pop, DC step BTL: | | 10 mV | Mute/Unmute, No signal, 6 Ω |
| Click/Pop, DC step PBTL: | | 23 mV | Mute/Unmute, No signal, 4 Ω |
| Channel Separation: | | >65 dB | 1 kHz |
| Frequency Response: | | +0.8 / 0.0 dB | 125 W / 8 Ω, unclipped (0 dBFS) |

## Table 8. Audio Performance Subwoofer Line Output

| Audio Performance | | | Notes/Conditions |
|---|---|---|---|
| Full Scale Output Voltage Swing, 0 dBFS: | | 1.275 Vrms | 1 kHz, 10 kΩ load |
| Full Scale Output Voltage Swing, 10 % THD+N: | | 1.5 Vrms | 1 kHz, 10 kΩ load |
| THD+N, 10 kΩ: | 1 V | <0.009% | 1 kHz |
| THD+N, 10 kΩ: | 100 mV | <0.01% | 1 kHz |
| Frequency Response: | | +1, -4 dB | 20 Hz – 20 kHz |
| Dynamic Range: | | >102 dB | 20 Hz – 20 kHz |
| Noise Voltage: | | <10 µV | 20 Hz – 20 kHz |

## Table 9. Thermal Specifications

| Thermal Specifications | $T_{HEATSINK}$ (1) | Notes/Conditions |
|---|---|---|
| Idle, All Channels Switching | 41°C | 1 kHz, 15 min, -60 dBFS signal, $T_A$ = 25°C 1 kHz |
| 6 x 16 W, 8 Ω + 1 x 32 W , 4 Ω (1/8 power) | 63°C | 1 hour, $T_A$ = 25°C |
| 2 x 125 W, 8 Ω | 76°C | 1 kHz, 5 min, $T_A$ = 25°C |

(1) Measured on surface of heatsink.

## Table 10. Physical pecifications

| Physical Specification | | Notes/Conditions |
|---|---|---|
| PCB Dimensions: | 160 x 172 x 55 | Width x Length x Height (mm) |
| Total Weight: | 640 gr. | Components + PCB + Heat-sink + Mechanics |

### 4.1 THD+N vs Power (BTL - 6Ω)

Gain: 2.5 dB set in TAS5518

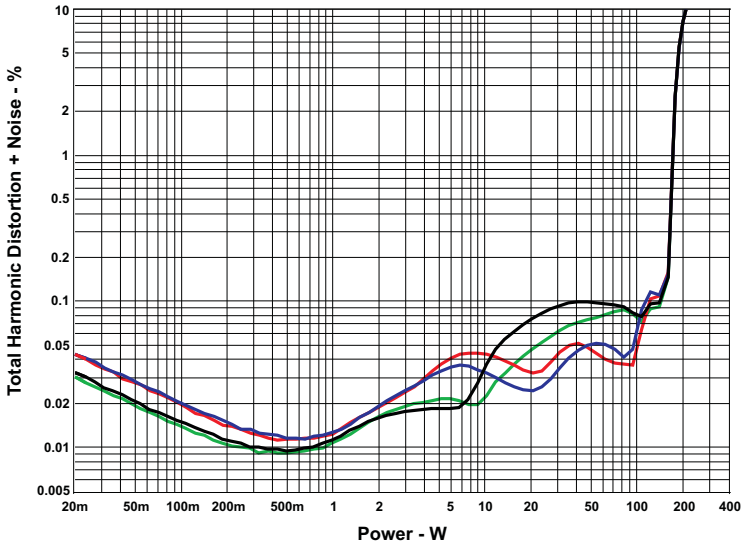



**Figure 4. THD+N vs Power (BTL - 6Ω)**

### 4.2 THD+N vs Power (BTL - 8Ω)

Gain: 2.5 dB set in TAS5518

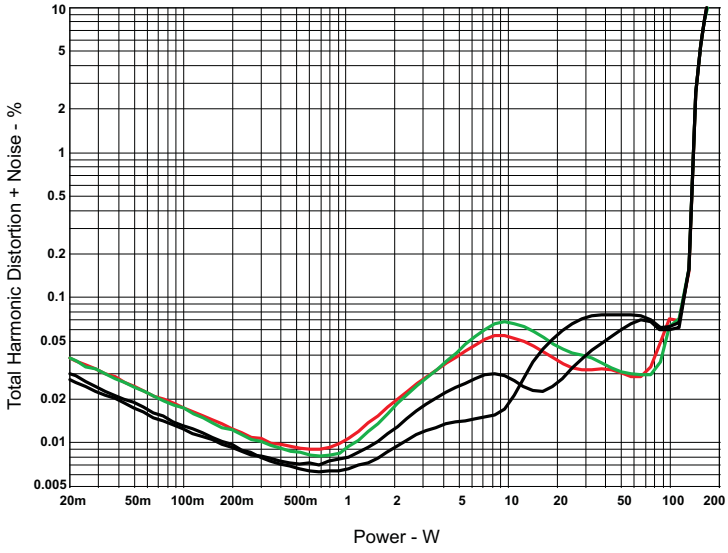



**Figure 5. THD+N vs Power (BTL - 8Ω)**

### 4.3 THD+N vs Power (PBTL - 4Ω)

Gain: 2.5 dB set in TAS5518

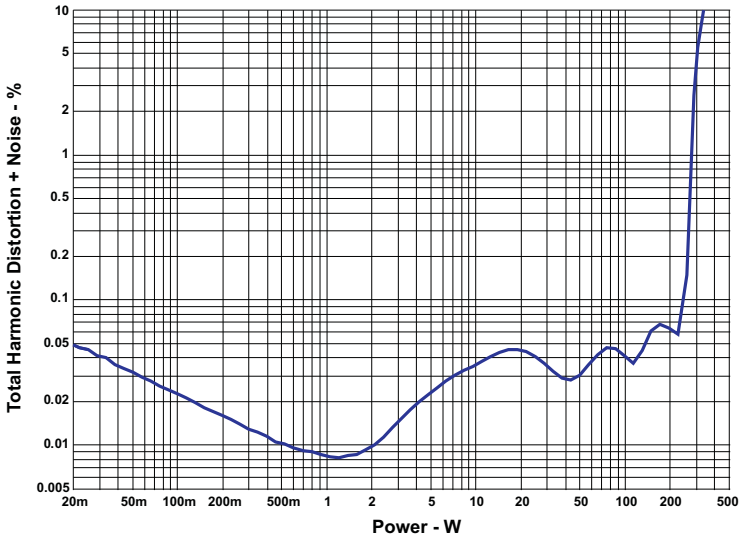



**Figure 6. THD+N vs Power (PBTL - 4Ω)**

### 4.4 THD+N vs Frequency (BTL - 6Ω)

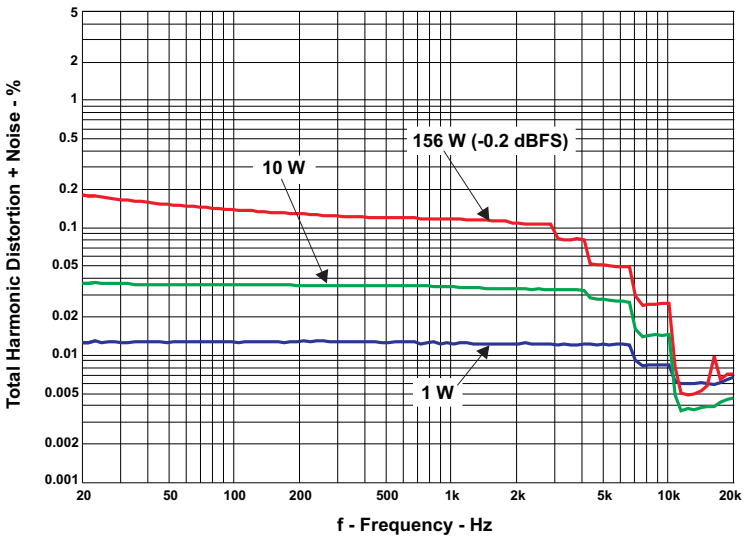



**Figure 7. THD+N vs Frequency (BTL - 6Ω)**

## 4.5 THD+N vs Frequency (BTL - 8Ω)

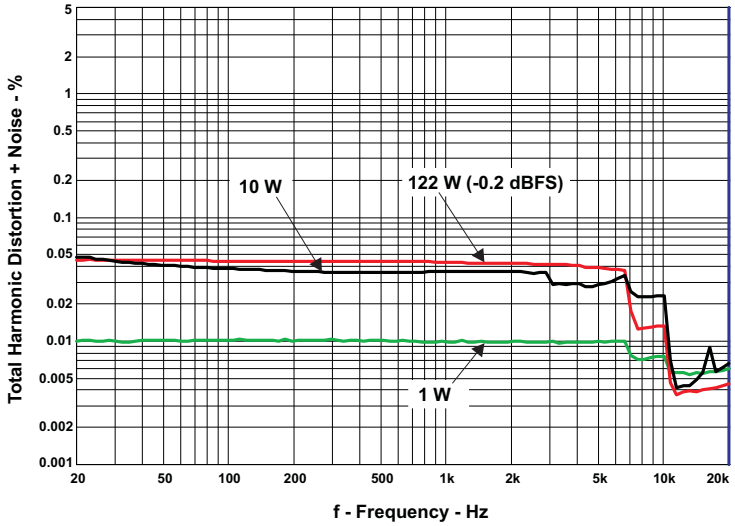



**Figure 8. THD+N vs Frequency (BTL - 8Ω)**

## 4.6 THD+N vs Frequency (PBTL - 4Ω)

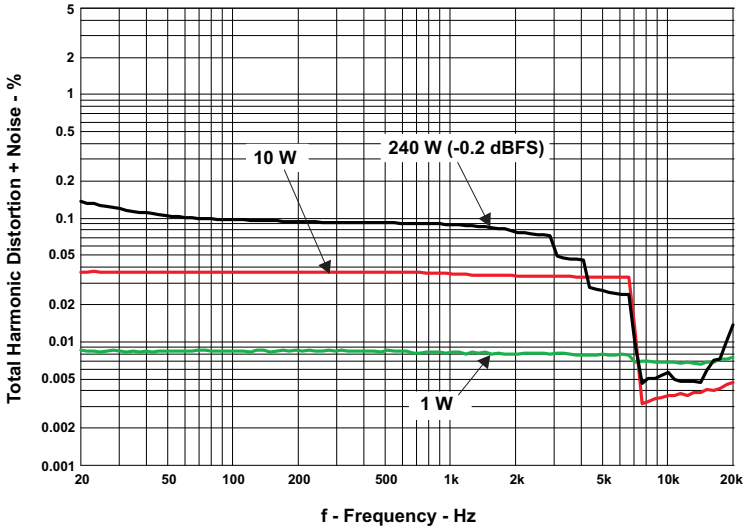



**Figure 9. THD+N vs Frequency (PBTL - 4Ω)**

## 4.7 FFT Spectrum With -60 dBFS Tone (BTL)

Reference voltage is 31.9 V. FFT size 16k.

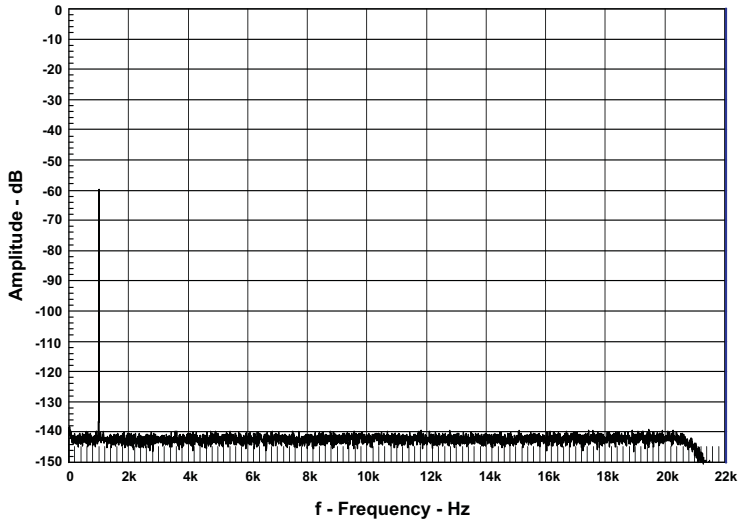



**Figure 10. Figure 10. FFT Spectrum With -60 dBFS Tone (BTL)**

## 4.8 FFT Spectrum With -60 dBFS Tone (PBTL)

Reference voltage is 31.7 V. FFT size 16k.

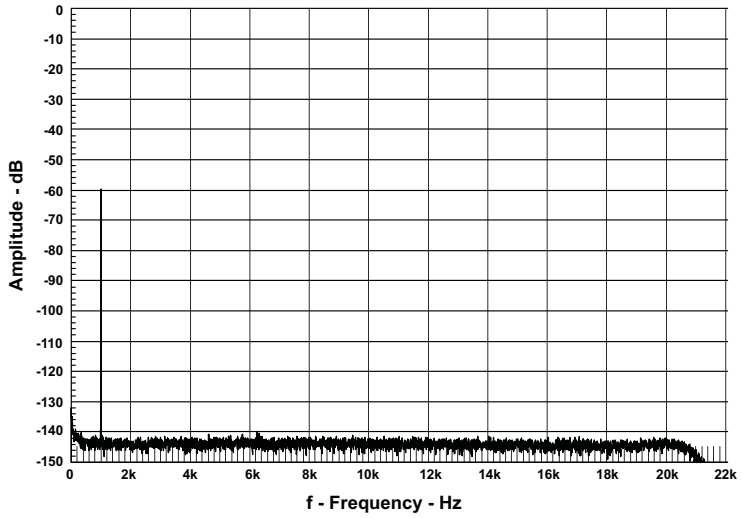



**Figure 11. 4.8 FFT Spectrum With -60 dBFS Tone (PBTL)**

## 4.9 Idle Noise FFT Spectrum (BTL)

Automute disabled — Register x04h set to x60h. Reference voltage is 31.6 V. FFT size 16k.

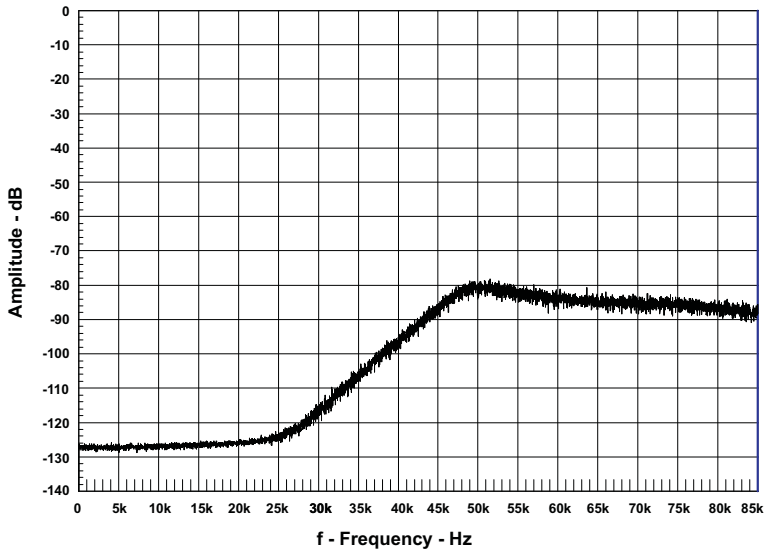



**Figure 12. Idle Noise FFT Spectrum (BTL)**

## 4.10 Idle Noise FFT Spectrum (PBTL)

Automute disabled — Register x04h set to x60h. Reference voltage is 31.6V. FFT size 16k.

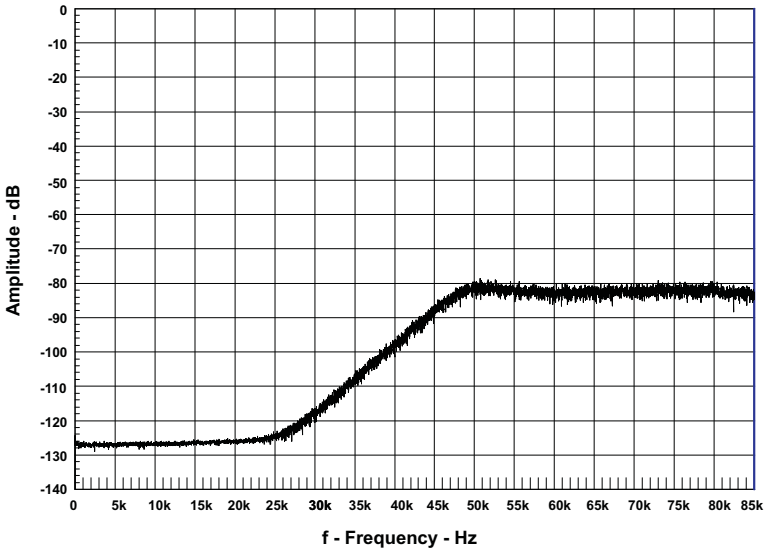



**Figure 13. Idle Noise FFT Spectrum (PBTL)**

## 4.11 Channel Separation

Channel separation is tested for two channels in different package, channel 1 and channel 2. 8 Ω loads are used for both channels. Channel 1 input signal is 0 dBFS, channel 2 muted. Reference voltage is 31.9 Vrms

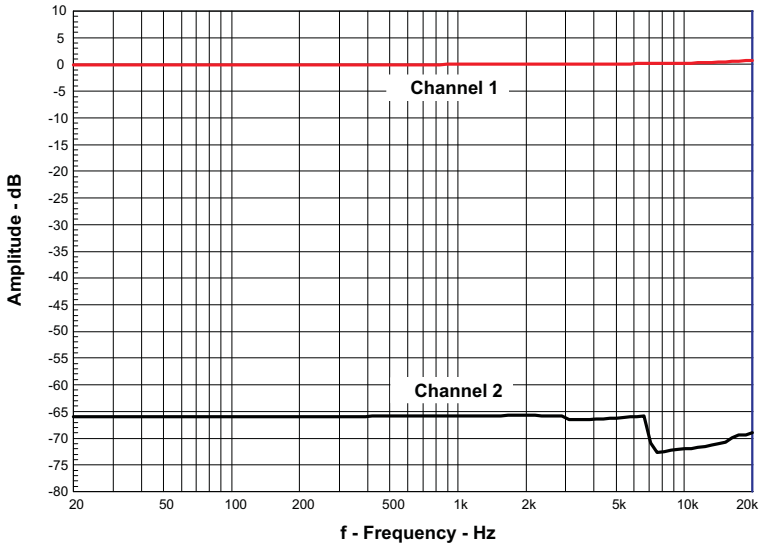



**Figure 14. Channel Separation**

## 4.12 Frequency Response (BTL)

Measurement bandwidth filter 80 kHz.

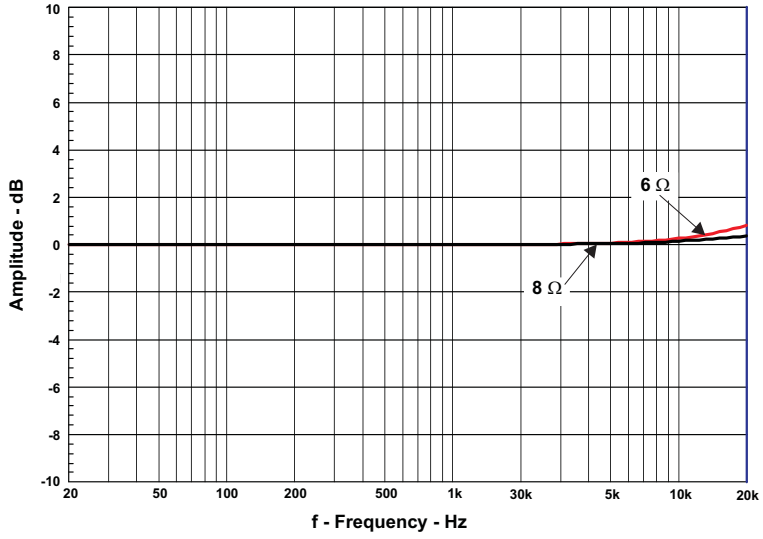



**Figure 15. Frequency Response (BTL)**

## 4.13 Frequency Response (PBTL)

Measurement bandwidth filter 80 kHz.

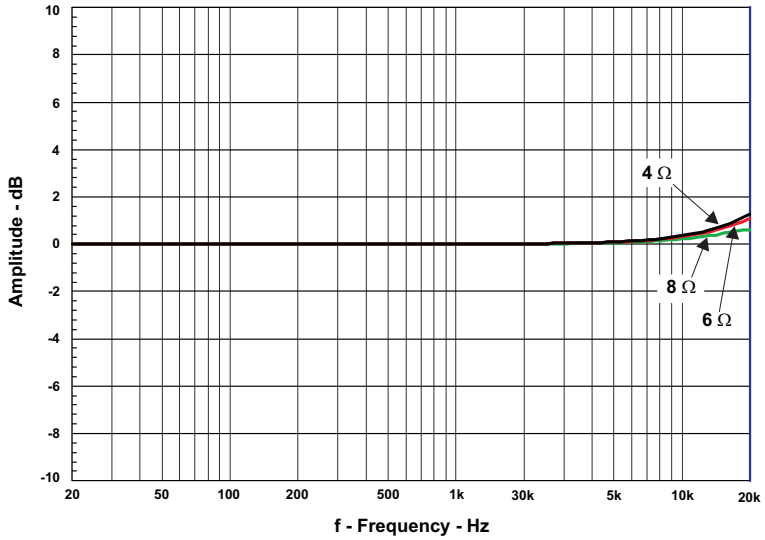



**Figure 16. Frequency Response (PBTL)**

## 4.14 High Current Protection (BTL)

Input 1 kHz bursted signal, Load 1 Ω.

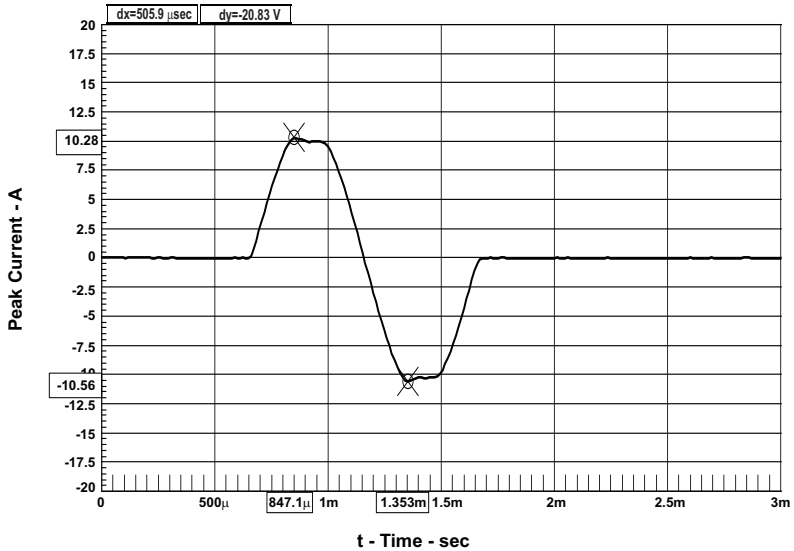



**Figure 17. High Current Protection (BTL)**

## 4.15 High Current Protection (PBTL)

Input 1 kHz bursted signal, Load 1 Ω.

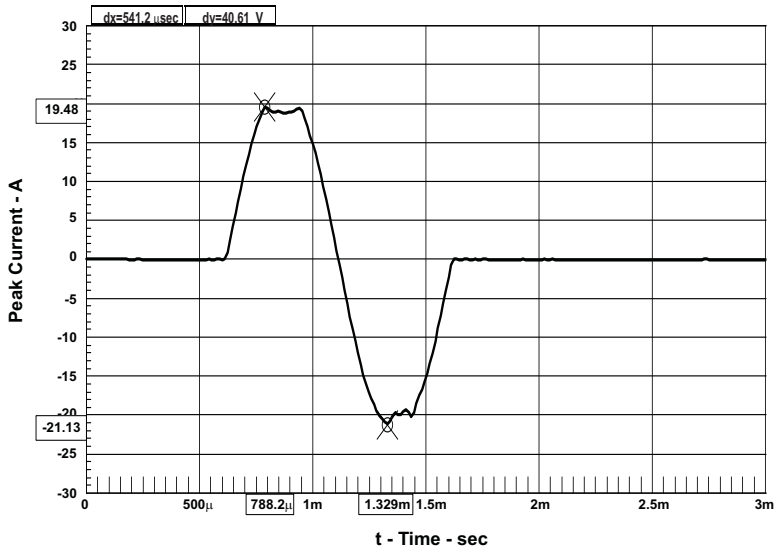



**Figure 18. High Current Protection (PBTL)**

## 4.16 Pop/Click (BTL)

No input signal applied. The measurement results are presented both in time domain and in frequency domain.

Test with automute disabled — Register x04h set to x60h. No input signal applied. Load 6 Ω.

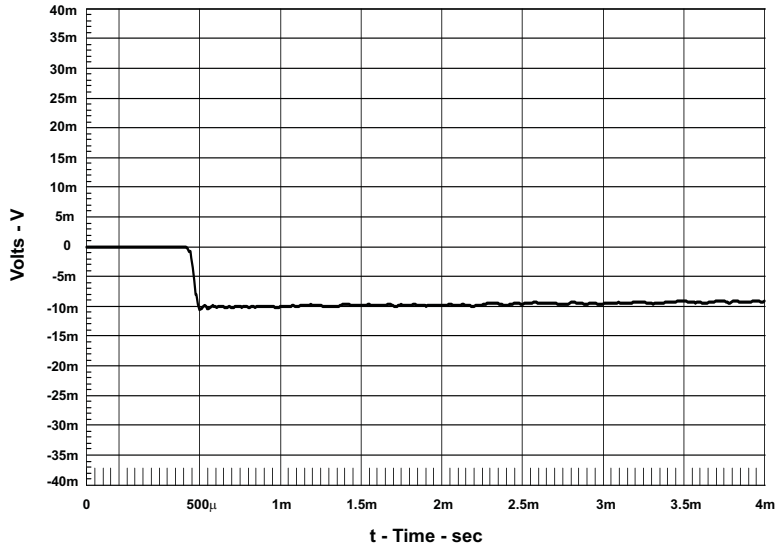



**Figure 19. Pop/Click (BTL)**

## 4.17 Pop/Click (PBTL)

No input signal applied. The measurement results are presented both in time domain and in frequency domain.

Test with automute disabled — Register x04h set to x60h. No input signal applied. Load 4 Ω.

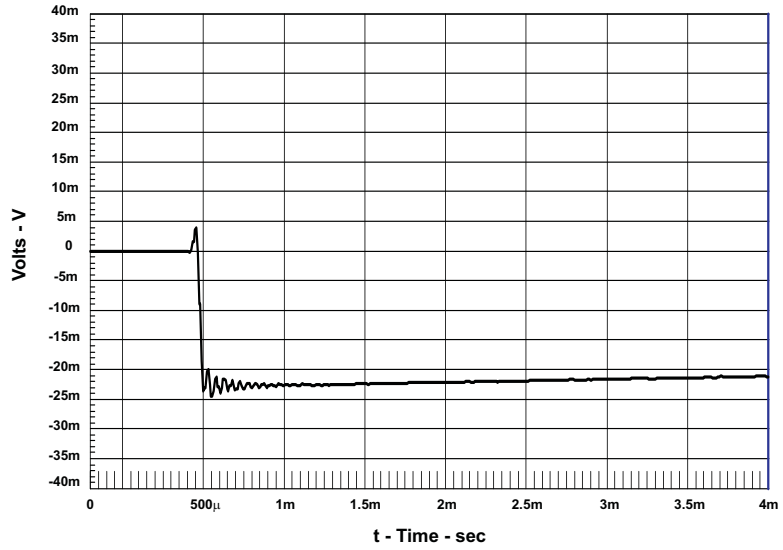



**Figure 20. Pop/Click (PBTL)**

## 4.18 Output Stage Efficiency

Efficiency is tested with 2 channels loaded 8 Ω. The board has been preheated for 1 hour at 1/8 output power.

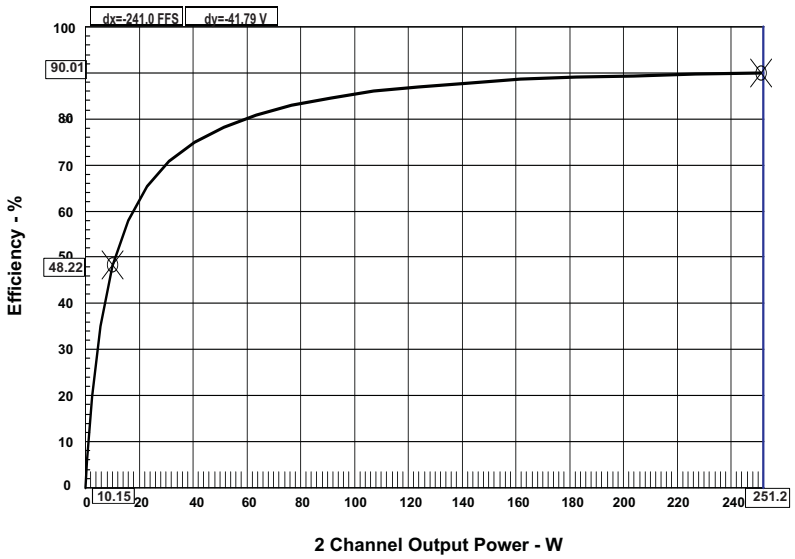



**Figure 21. Output Stage Efficiency**

## 4.19 Subwoofer Line Out THD Vs. Output Voltage

Gain: 2.5 dB set in TAS5518

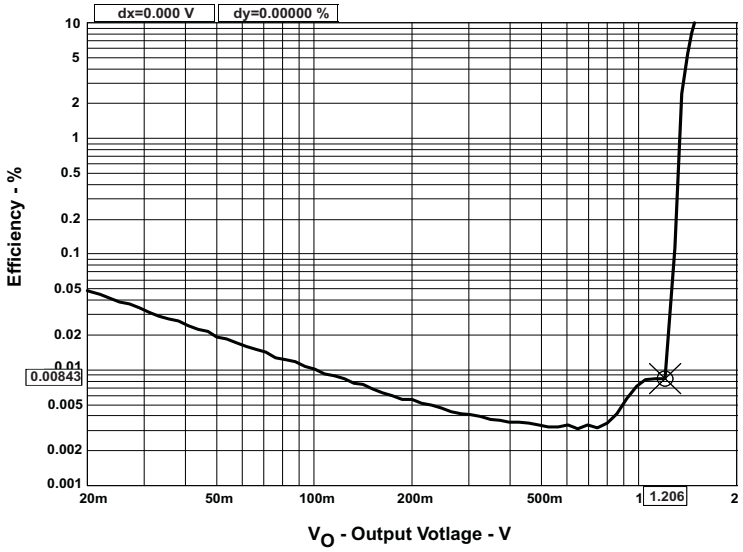



**Figure 22. Subwoofer Line Out THD Vs. Output Voltage**

## 4.20 Subwoofer Line Out THD+N vs. Frequency

Load 10 kΩ.

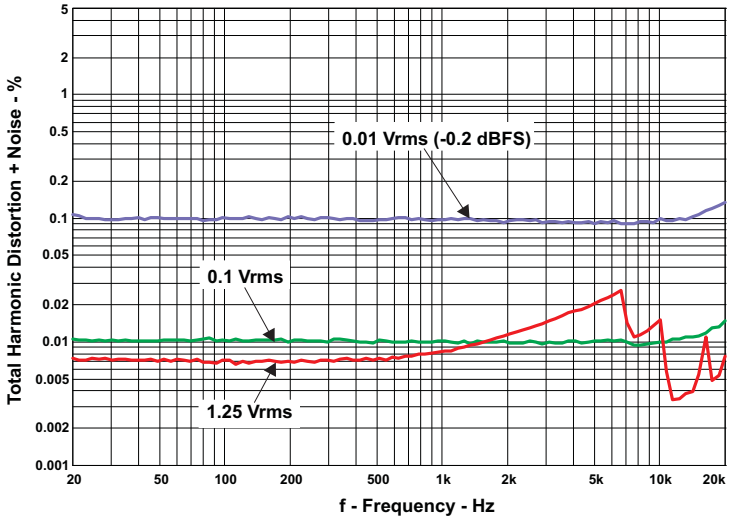



**Figure 23. Subwoofer Line Out THD+N vs. Frequency**

### 4.21 Subwoofer Line Out Frequency Response

Measurement bandwidth filter 80 kHz. Load 10 kΩ.

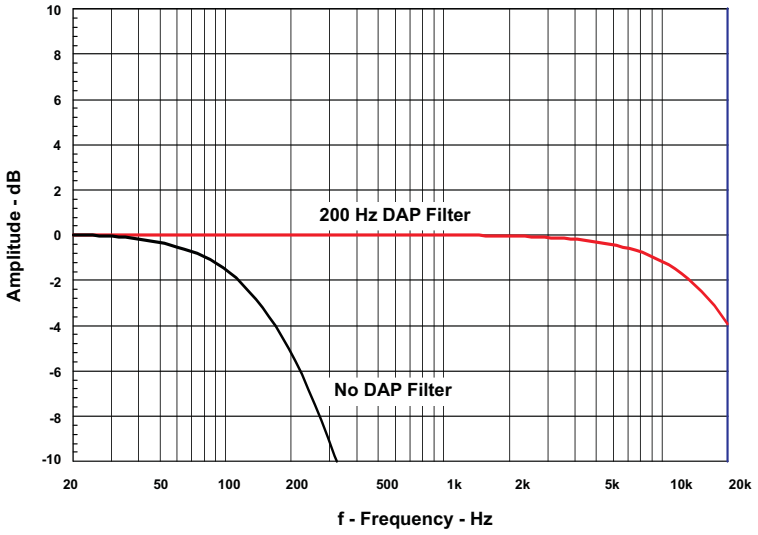



**Figure 24. Subwoofer Line Out Frequency Response**

## 5 Related Documentation from Texas Instruments

Table 11 contains a list of data manuals that have detailed descriptions of the integrated circuits used in the design of the TAS5162DDV6EVM2. The data manuals can be obtained at the http://www.ti.com.

**Table 11. Related Documentation from Texas Instruments**

| Part Number | Literature Number |
|---|---|
| TAS5518 | SLES115 |
| TAS5162 | SLES194 |
| TLV272 | SLOS351 |
| TPS3825-33 | SLVS165 |
| TPS5430 | SLVS632 |
| TPS76733 | SLVS208 |
| TPS79133 | SLVS325 |

### 5.1 Additional Documentation

1. PC Configuration Tool for TAS5518 (TAS5518 GUI ver. 4.0 or later)
2. System Design Considerations for True Digital Audio Power Amplifiers (SLAA117)
3. Digital Audio Measurements (SLAA114)
4. PSRR for PurePath Digital Audio Amplifiers (SLEA049)
5. Power Rating in Audio Amplifier (SLEA047)
6. PurePath Digital AM Interference Avoidance (SLEA040)
7. Click & Pop Measurements Technique (SLEA044)
8. Power Supply Recommendations for DVD-Receivers (SLEA027)
9. Implementation of Power Supply Volume Control (SLEA038)

# Appendix A

## *A.1 Design Documents*

**Table A-1. Design Documents**

| Appendix | Document | Version | Pages |
|---|---|---|---|
| A.1 | TAS5162DDV6EVM2 Schematic | Version 2.00 | 8 pages |
| A.2 | TAS5162DDV6EVM2 Parts List | Version 2.00 | 2 pages |
| A.3 | TAS5162DDV6EVM2 PCB Specification | Version 2.00 | 1 pages |
| A.4 | TAS5162DDV6EVM2 PCB Layers | Version 2.00 | 6 pages |
| A.5 | Heat Sink Drawing | Version 2.00 | 1 pages |

| | |
|---|---|
| Board Name: | **TAS5162DDV6EVM2** |
| Type: | Mass Market Evaluation Module |
| File Name: | A829-SCH-001.DSN |
| Version: | 2.00 |
| Date: | 27.April 2007 |
| Engineer: | Jonas L. Holm |
| Audio Configuration: | 3-6 Channel PurePath Digital Amplifier Design with Subwoofer line out<br>1 x TAS5518PAG, 3 x TAS5162DDV<br>1 x Subwoofer Line Out |
| Interfaces: | J30: 34 pin IDC Header for Control, I2C and +5V<br>J60: 16 pin IDC Header for I2S Audio<br>J101-J108: 2 pin 3.96mm Headers for Speakers<br>J600: RCA Connector for Subwoofer Line Out<br>J900: 4 pin 3.96mm Header for H-Bridge Power Supply (Optional)<br>J901: 4 pin 3.96mm Header for H-Bridge and System Power Supply<br>J902: 5 pin 2.54mm Header for PSU Control |
| Setup: | 8 Ohm (BTL) and 4 Ohm (PBTL) Speaker Loads<br>+50V H-Bridge and +15V System Power Supplies |
| Performance: | 125 W / 8 Ohm (BTL) unclipped, or 210 W / 6 Ohm (BTL) 10% THD+N<br>110 dB Dynamic Range |

Page





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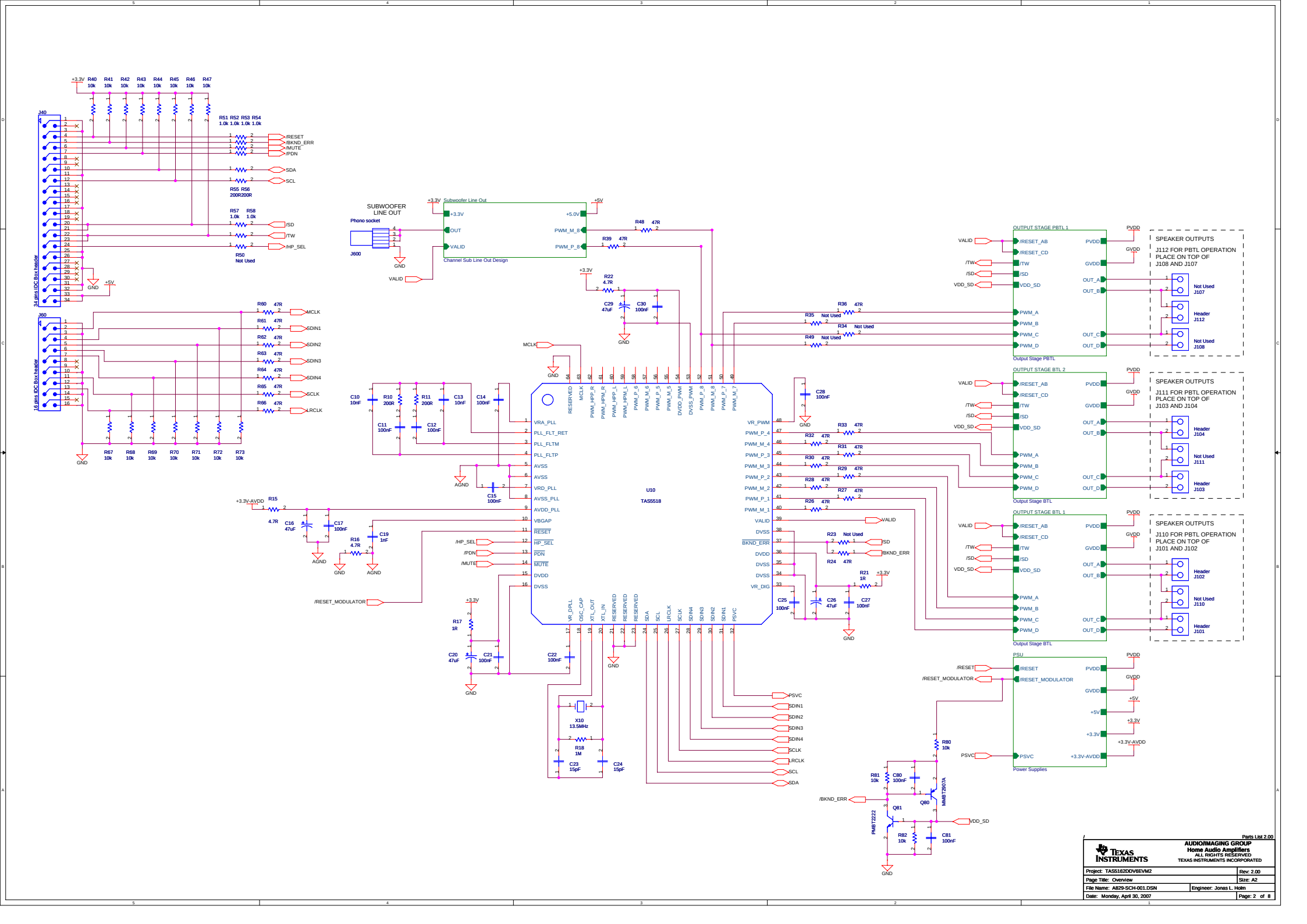
Parts List 2.00

AUDIO/IMAGING GROUP
Home Audio Amplifiers

TEXAS INSTRUMENTS INCORPORATED

| | | |
|---|---|---|
| Project: TAS5162DDV6EVM2 | | Rev: 2.00 |
| Page Title: TAS5162DDV6EVM2 - 3-6 Ch Digital Amplifier Design | | Size: A2 |
| File Name: A829-SCH-001.DSN | Engineer: Jonas L. Holm | |
| Date: Monday, April 30, 2007 | | Page: 1 of 8 |


J40
34 pins IDC Box header
R40 10k
R41 10k
R42 10k
R43 10k
R44 10k
R45 10k
R46 10k
R47 10k
R51 1.0k
R52 1.0k
R53 1.0k
R54 1.0k
/RESET
/BKND_ERR
/MUTE
/PDN
SDA
SCL
R55 200R
R56 200R
R57 1.0k
R58 1.0k
/SD
/TW
/HP_SEL
R50 Not Used
GND
+5V
J60
16 pins IDC Box header
R60 47R
R61 47R
R62 47R
R63 47R
R64 47R
R65 47R
R66 47R
MCLK
SDIN1
SDIN2
SDIN3
SDIN4
SCLK
LRCLK
R67 10k
R68 10k
R69 10k
R70 10k
R71 10k
R72 10k
R73 10k
SUBWOOFER LINE OUT
Phono socket
J600
+3.3V
Subwoofer Line Out
+5V
+3.3V
OUT
VALID
+5.0V
PWM_M_8
PWM_P_8
Channel Sub Line Out Design
R48 47R
R39 47R
R22 4.7R
C29 47uF
C30 100nF
C10 10nF
R10 200R
R11 200R
C13 10nF
C14 100nF
C11 100nF
C12 100nF
C15 100nF
AGND
+3.3V-AVDD
R15 4.7R
C16 47uF
C17 100nF
C19 1nF
R16 4.7R
/HP_SEL
/PDN
/MUTE
/RESET_MODULATOR
R17 1R
C20 47uF
C21 100nF
C22 100nF
X10 13.5MHz
R18 1M
C23 15pF
C24 15pF
U10
TAS5518
RESERVED
MCLK
PWM_HPP_R
PWM_HPM_R
PWM_HPP_L
PWM_HPM_L
PWM_P_6
PWM_M_6
PWM_P_5
PWM_M_5
DVDD_PWM
DVSS_PWM
PWM_P_8
PWM_M_8
PWM_P_7
PWM_M_7
VRA_PLL
PLL_FLT_RET
PLL_FLTM
PLL_FLTP
AVSS
AVSS
VRD_PLL
AVSS_PLL
AVDD_PLL
VBGAP
RESET
HP_SEL
PDN
MUTE
DVDD
DVSS
VR_PWM
PWM_P_4
PWM_M_4
PWM_P_3
PWM_M_3
PWM_P_2
PWM_M_2
PWM_P_1
PWM_M_1
VALID
DVSS
BKND_ERR
DVDD
DVSS
DVSS
VR_DIG
VR_DPLL
OSC_CAP
XTL_OUT
XTL_IN
RESERVED
RESERVED
RESERVED
SDA
SCL
LRCLK
SCLK
SDIN4
SDIN3
SDIN2
SDIN1
PSVC
R33 47R
R32 47R
R31 47R
R30 47R
R29 47R
R28 47R
R27 47R
R26 47R
R23 Not Used
R24 47R
R21 1R
C25 100nF
C26 47uF
C27 100nF
C28 100nF
PSVC
SDIN1
SDIN2
SDIN3
SDIN4
SCLK
LRCLK
SCL
SDA
OUTPUT STAGE PBTL 1
OUTPUT STAGE BTL 2
OUTPUT STAGE BTL 1
/RESET_AB
/RESET_CD
/TW
/SD
VDD_SD
PWM_A
PWM_B
PWM_C
PWM_D
PVDD
GVDD
OUT_A
OUT_B
OUT_C
OUT_D
Output Stage PBTL
Output Stage BTL
SPEAKER OUTPUTS
J112 FOR PBTL OPERATION PLACE ON TOP OF J108 AND J107
J111 FOR PBTL OPERATION PLACE ON TOP OF J103 AND J104
J110 FOR PBTL OPERATION PLACE ON TOP OF J101 AND J102
Not Used J107
Header J112
Not Used J108
Header J104
Not Used J111
Header J103
Header J102
Not Used J110
Header J101
R35 Not Used
R34 Not Used
R49 Not Used
PSU
/RESET
/RESET_MODULATOR
+5V
+3.3V
+3.3V-AVDD
PSVC
Power Supplies
R80 10k
R81 10k
C80 100nF
Q80
MMBT2907A
Q81
PMBT2222
R82 10k
C81 100nF
/BKND_ERR
VDD_SD
Parts List 2.00
AUDIO/IMAGING GROUP
Home Audio Amplifiers
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TEXAS INSTRUMENTS INCORPORATED
Project: TAS5182DDV6EVM2
Rev: 2.00
Page Title: Overview
Size: A2
File Name: A829-SCH-001.DSN
Engineer: Jonas L. Holm
Date: Monday, April 30, 2007
Page: 2 of 8

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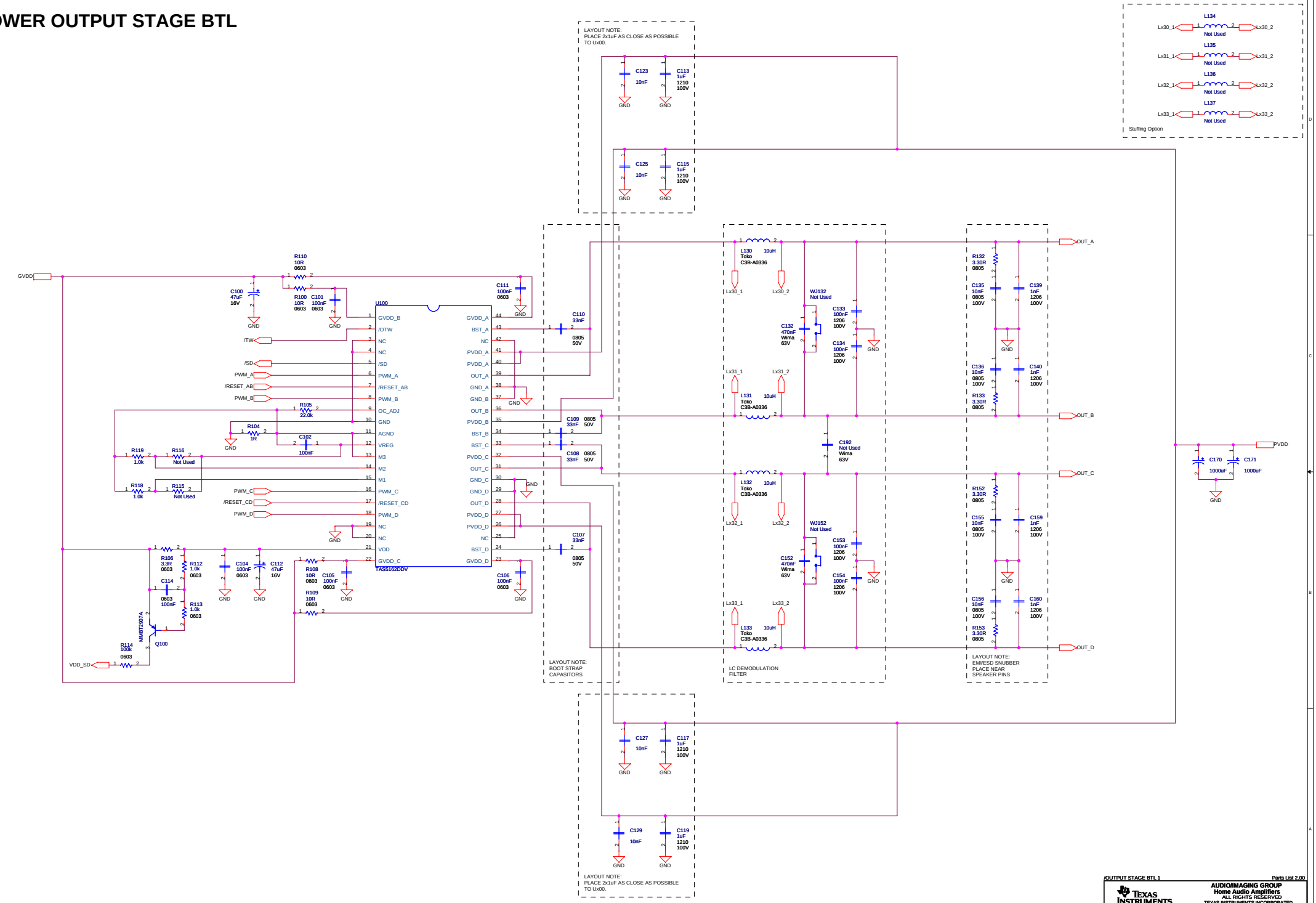


Patents pending in circuitry design and layout (WO99/59241 & WO99/59242). This circuitry may only be used together with the integrated circuit TAS5162DDV from Texas Instruments Incorporated.

/OUTPUT STAGE BTL 1 Parts List 2.00

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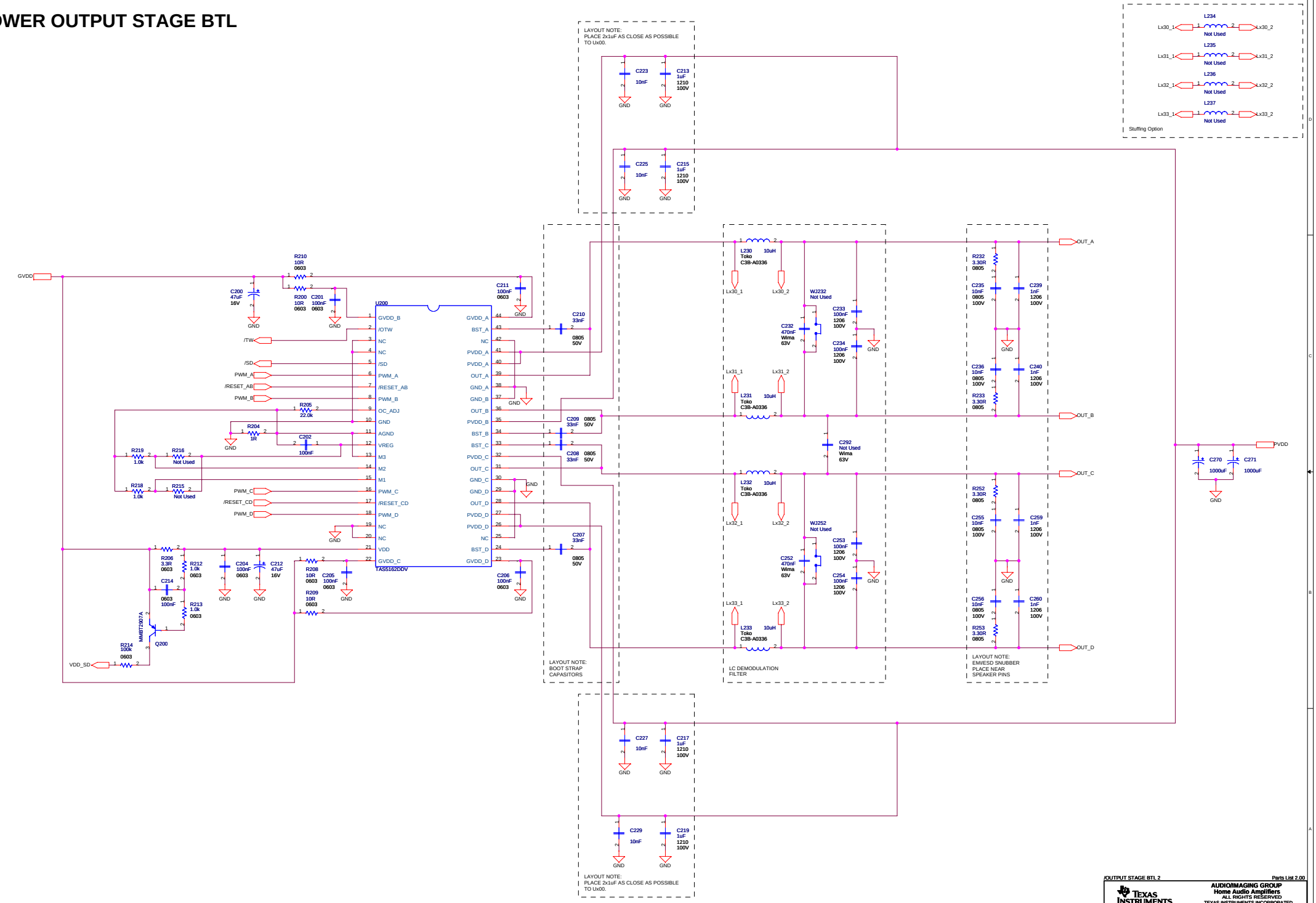


Patents pending in circuitry design and layout (WO99/59241 & WO99/59242). This circuitry may only be used together with the integrated circuit TAS5162DDV from Texas Instruments Incorporated.

/OUTPUT STAGE BTL 2 Parts List 2.00

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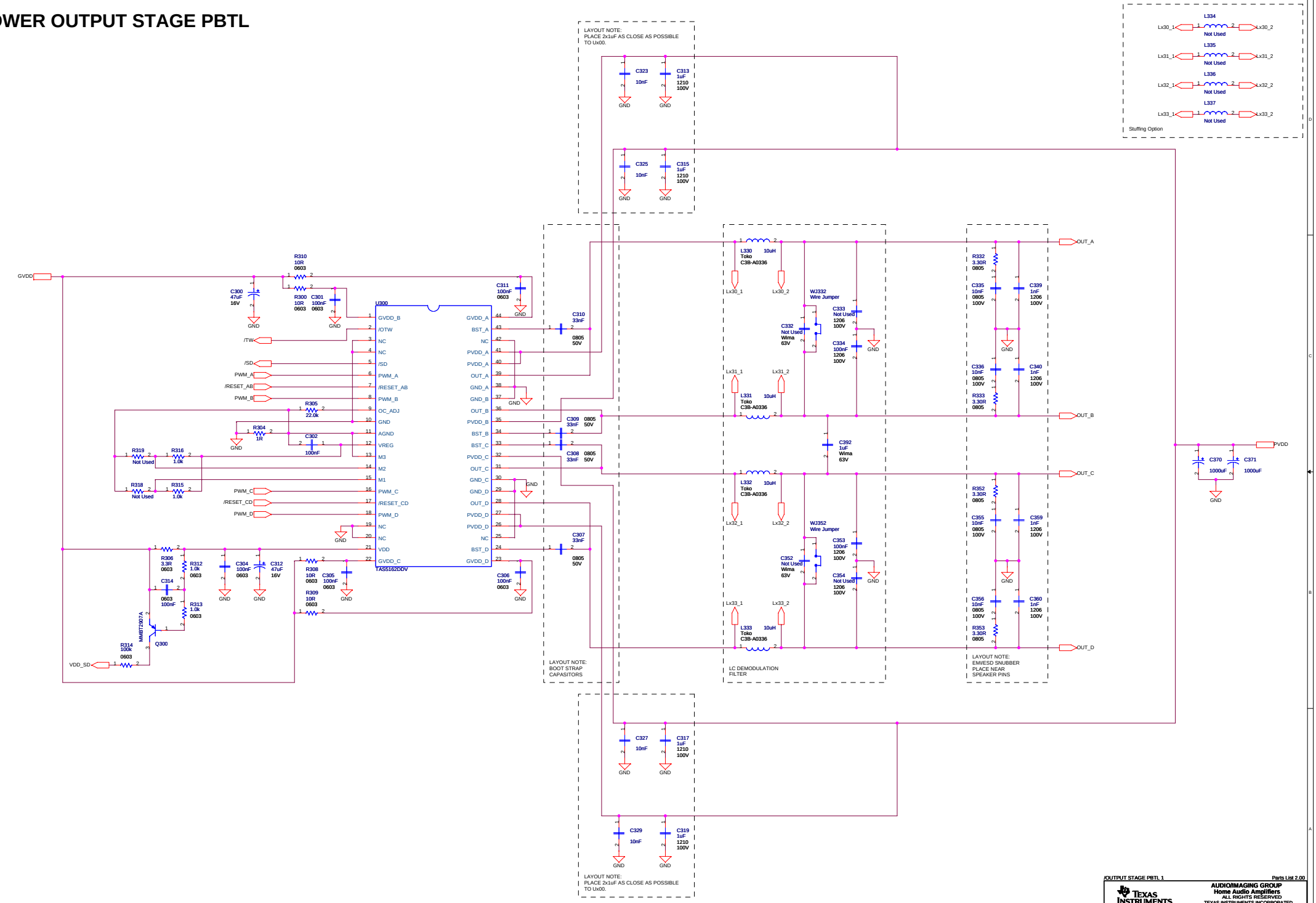


Patents pending in circuitry design and layout (WO99/59241 & WO99/59242). This circuitry may only be used together with the integrated circuit TAS5162DDV from Texas Instruments Incorporated.

/OUTPUT STAGE PBTL 1 Parts List 2.00

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| Page Title: PAGE TITLE | Size: A2 |
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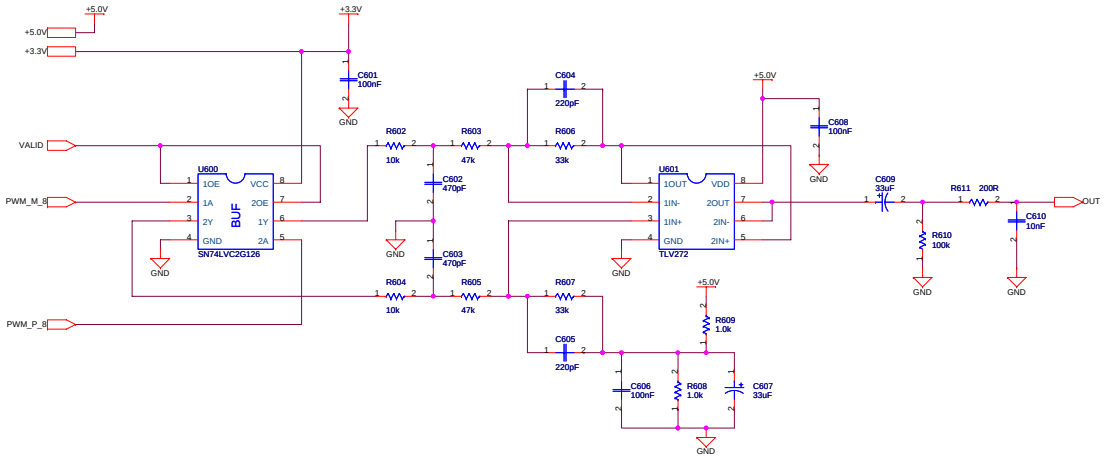


/Subwoofer Line Out

Parts List 2.00

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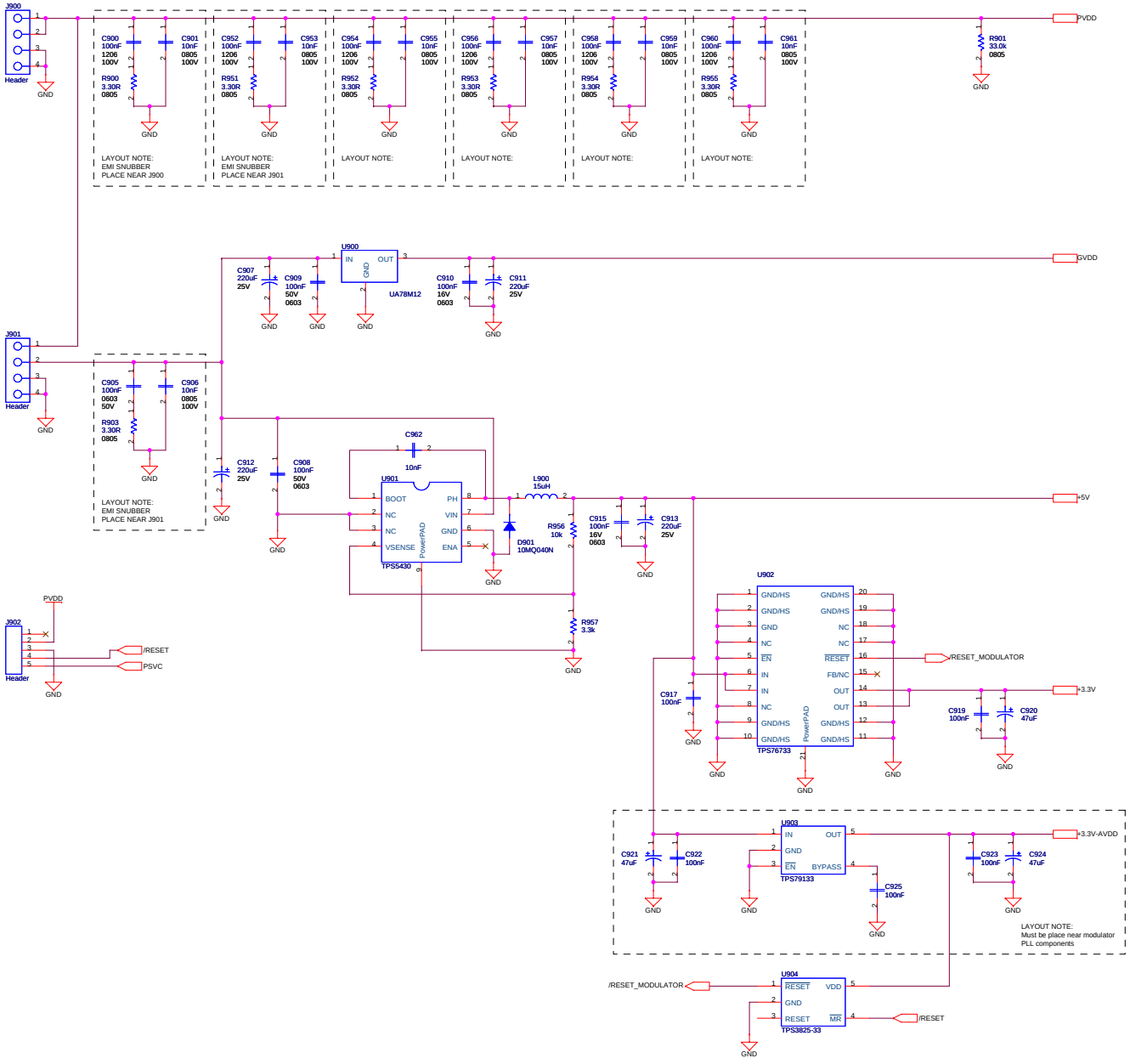
| Page Title: Subwooler Line Out | Size: A2 |
| File Name: A829-SCH-001.DSN | Engineer: Jonas L. Holm |
| Date: Tuesday, May 01, 2007 | Page: 6 of 8 |

# POWER SUPPLIES

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Parts List 2.00

TEXAS INSTRUMENTS

AUDIO/IMAGING GROUP
Home Audio Amplifiers


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| Page Title: Power Supplies | Size: A2 |
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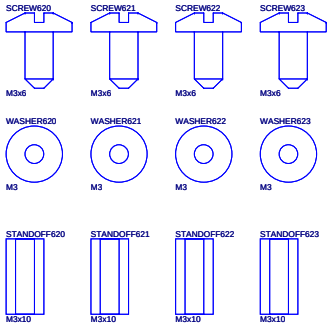
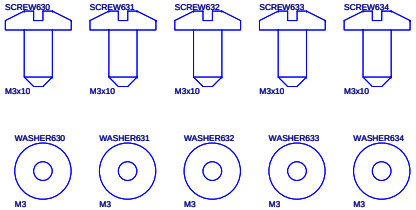
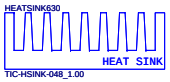
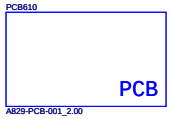
| Date: Monday, April 30, 2007 | Page: 7 of 8 |

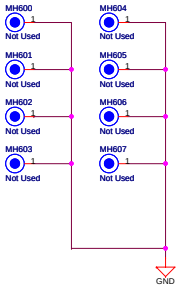
# MECHANICS

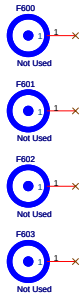



Parts List 2.00

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| Texas Instruments | AUDIO/IMAGING GROUP<br>Home Audio Amplifiers<br>ALL RIGHTS RESERVED<br>TEXAS INSTRUMENTS INCORPORATED |
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| Page Title: Mechanics | Size: A2 |
| File Name: AB29-SCH-001.DSN | Engineer: Jonas L. Holm |
| Date: Tuesday, May 01, 2007 | Page: 8 of 8 |

# TAS5162DDV6EVM2 Partslist (2.00).xls

| Qty | Part Reference | Description | Manufacture | First Mfr P/N |
|---|---|---|---|---|
| 1 | R901 | 33.0k / 125mW / 1% / 0805 Thick Film Resistor | Yageo | RC0805FR-0733KL |
| 19 | R132 R133 R152 R153 R232 R233 R252 R253 R332 R333 R352 R353 R900 R903 R951 R952 R953 R954 R955 | 3.30R / 125mW / 1% / 0805 Thick Film Resistor | Yageo | RC0805FR-073R3L |
| 20 | R51 R52 R53 R54 R57 R58 R112 R113 R118 R119 R212 R213 R218 R219 R312 R313 R315 R316 R608 R609 | 1.0k / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-071KL |
| 21 | R40 R41 R42 R43 R44 R45 R46 R47 R67 R68 R69 R70 R71 R72 R73 R80 R81 R82 R602 R604 R956 | 10k / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-0710KL |
| 4 | R114 R214 R314 R610 | 100k / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-07100KL |
| 1 | R18 | 1M / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-071ML |
| 5 | R17 R21 R104 R204 R304 | 1R / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-071RL |
| 12 | R100 R108 R109 R110 R200 R208 R209 R210 R300 R308 R309 R310 | 10R / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-0710RL |
| 5 | R10 R11 R55 R56 R611 | 200R / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-07200RL |
| 3 | R105 R205 R305 | 22.0k / 100mW / 1% / 0603 Thick Film Resistor | Yageo | RC0603FR-0722KL |
| 1 | R957 | 3.3k / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-073K3L |
| 2 | R606 R607 | 33k / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-0733KL |
| 3 | R106 R206 R306 | 3.3R / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-073R3L |
| 2 | R603 R605 | 47k / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-0747KL |
| 3 | R15 R16 R22 | 4.7R / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-074R7L |
| 19 | R24 R26 R27 R28 R29 R30 R31 R32 R33 R36 R39 R48 R60 R61 R62 R63 R64 R65 R66 | 47R / 100mW / 5% / 0603 Thick Film Resistor | Yageo | RC0603JR-0747RL |
| 31 | C123 C125 C127 C129 C135 C136 C155 C156 C223 C225 C227 C229 C235 C236 C255 C256 C323 C325 C327 C329 C335 C336 C355 C356 C901 C906 C953 C955 C957 C959 C961 | Ceramic 10nF / 100V / 20% X7R 0805 Capacitor | BC Components | 0805B103M101NT |
| 12 | C107 C108 C109 C110 C207 C208 C209 C210 C307 C308 C309 C310 | Ceramic 33nF / 50V / 20% X7R 0805 Capacitor | BC Components | 0805B333M500NT |
| 12 | C139 C140 C159 C160 C239 C240 C259 C260 C339 C340 C359 C360 | Ceramic 1nF / 100V / 10% NP0 1206 Capacitor | BC Components | 1206N102K101NT |
| 16 | C133 C134 C153 C154 C233 C234 C253 C254 C334 C353 C900 C952 C954 C956 C958 C960 | Ceramic 100nF / 100V / 20% X7R 1206 Capacitor | BC Components | 1206B104M101NT |
| 12 | C113 C115 C117 C119 C213 C215 C217 C219 C313 C315 C317 C319 | Ceramic 1uF / 100V / 10% X7R 1210 Capacitor | Murata | GRM32ER72A105KA01L |
| 4 | C10 C13 C610 C962 | Ceramic 10nF / 50V / 20% X7R 0603 Capacitor | Vishay | VJ0603Y103MXA |
| 44 | C11 C12 C14 C15 C17 C21 C22 C25 C27 C28 C30 C80 C81 C101 C102 C104 C105 C106 C111 C114 C201 C202 C204 C205 C206 C211 C214 C301 C302 C304 C305 C306 C311 C314 C601 C606 C608 C910 C915 C917 C919 C922 C923 C925 | Ceramic 100nF / 16V / 20% X7R 0603 Capacitor | Vishay | VJ0603Y104MXJ |
| 3 | C905 C908 C909 | Ceramic 100nF / 50V / 20% X7R 0603 Capacitor | Vishay | VJ0603Y104MXA |
| 1 | C19 | Ceramic 1nF / 50V / 10% NP0 0603 Capacitor | BC Components | 0603N102K500NT |
| 2 | C23 C24 | Ceramic 15pF / 50V / 10% NP0 0603 Capacitor | BC Components | 0603N150K500NT |
| 2 | C604 C605 | Ceramic 220pF / 50V / 10% NP0 0603 Capacitor | BC Components | 0603N221K500NT |
| 2 | C602 C603 | Ceramic 470pF / 50V / 10% NP0 0603 Capacitor | BC Components | 0603N471K500NT |
| 6 | C170 C171 C270 C271 C370 C371 | Electrolytic 1000uF / 63V / 20% Aluminium 7.5mm ø16mm FC Series - Low Impedance Capacitor | Panasonic | EEUFC1J102 |
| 4 | C907 C911 C912 C913 | Electrolytic 220uF / 25V / 20% Aluminium 3.5mm ø8mm FC Series - Low Impedance Capacitor | Panasonic | EEUFC1E221 |
| 2 | C607 C609 | Electrolytic 33uF / 16V / 20% Aluminium 2mm ø5mm Capacitor | Panasonic | ECEA1CKA330 |
| 13 | C16 C20 C26 C29 C100 C112 C200 C212 C300 C312 C920 C921 C924 | Electrolytic 47uF / 16V / 20% Aluminium 2mm ø5mm FC Series - Low Impedance Capacitor | Panasonic | EEUFC1C470 |
| 1 | C392 | Metal Film 1uF / 63V / 10% Polyester 7.5mm (W:6mm L:10mm) Capacitor | Wima | MKS 4 1uF/10%/63Vdc PCM7.5 |
| 4 | C132 C152 C232 C252 | Metal Film 470nF / 63V / 10% Polyester 7.5mm (W:4.5mm L:10mm) Capacitor | Wima | MKS 4 0.47uF/10%/63Vdc PCM7.5 |
| 12 | L130 L131 L132 L133 L230 L231 L232 L233 L330 L331 L332 L333 | 10uH / Ferrite Inductor | Toko | C3B-A0336 |
| 1 | L900 | 15uH / Ferrite Inductor | Kwang Sung | 8020P-06-150L |
| 2 | WJ332 WJ352 | Wire Jumper / Wire ø0.9mm (SWG20), Pitch 7.5mm, Copper Tinned Wire Jumper Inductor | n/a | n/a |
| 1 | D901 | 1A / 40V Schottky 10MQ040N Diode (SMA) | Int. Rectifier | 10MQ040N |
| 1 | Q81 | 600mA / 40V NPN Small signal PMBT2222 Transistor (SOT-23) | Philips | PMBT2222 |
| 4 | Q80 Q100 Q200 Q300 | 800mA / 40V PNP Small signal MMBT2907A Transistor (SOT-23) | Fairchild | MMBT2907A |
| 3 | U100 U200 U300 | TAS5162DDV / 4ch/2ch/1ch Digital Audio PWM Power Output Stage (DDV44) | Texas Instruments | TAS5162DDV |
| 1 | U10 | TAS5518 / 8 ch PWM processor (AD, DAP, 192kHz, PWM-VOL) (TQFP64) | Texas Instruments | TAS5518PAG |
| 1 | U601 | TLV272 / Dual RtR Output Opamp (VSSOP8) | Texas Instruments | TLV272CDGK |

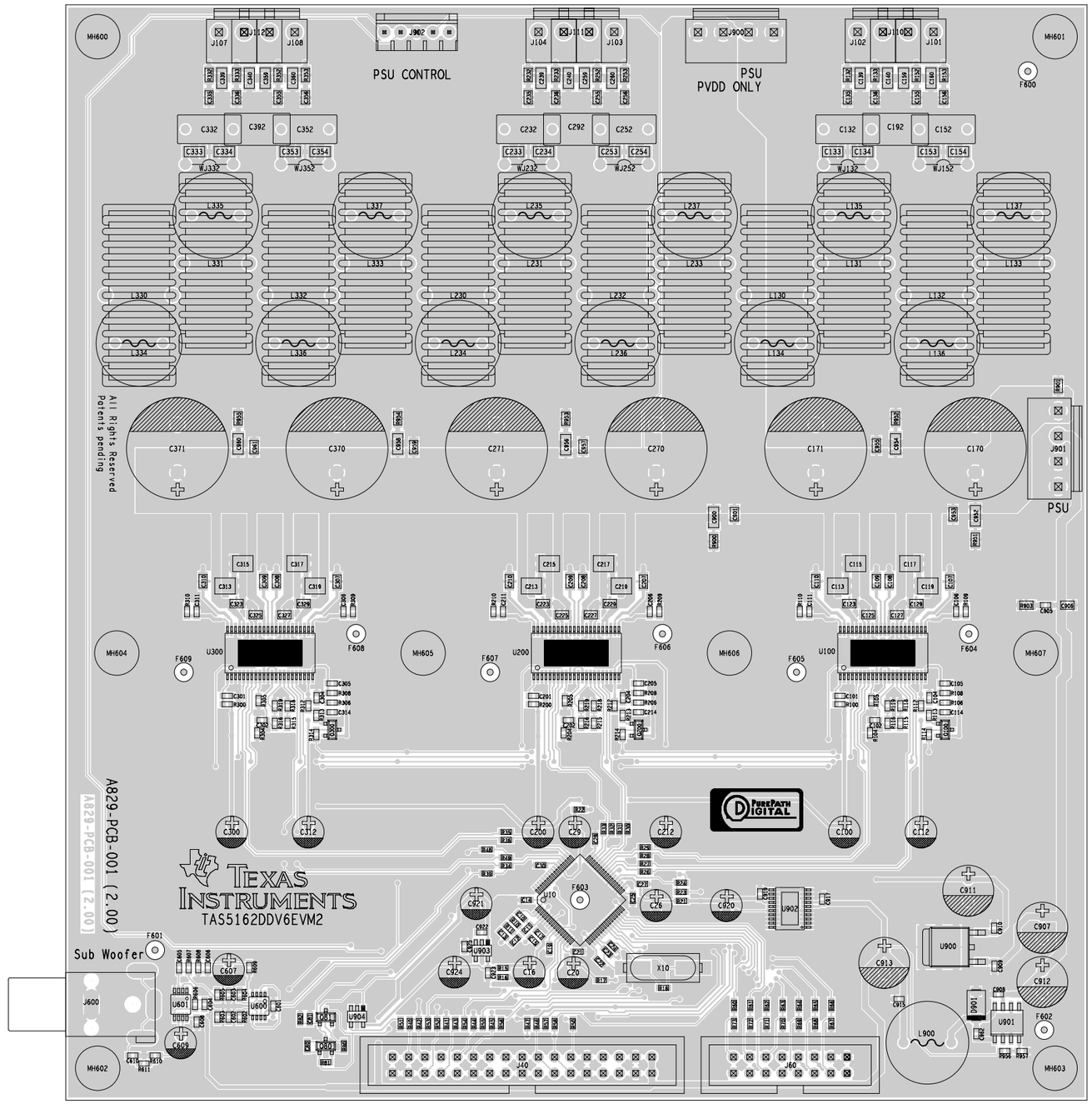
| | | | | |
|---|---|---|---|---|
| 1 | U600 | SN74LVC2G126 / Dual Buffer, LVC (SSOP8) | Texas Instruments | SN74LVC2G126DCT |
| 1 | U904 | TPS3825-33 / 3.3V Supply Voltage Supervisor (SOP5-DBV) | Texas Instruments | TPS3825-33DBVT |
| 1 | U900 | UA78M12 / 12V/500mA Positive Voltage Regulator (PFM2-KTP) | Texas Instruments | UA78M12CKTPR |
| 1 | U901 | TPS5430 / 5V/3A Buck Converter (HSOP8-DDA) | Texas Instruments | TPS5430DDA |
| 1 | U902 | TPS76733 / 3.3V/1A Low Drop Voltage Regulator (HTSSOP20-PWP) | Texas Instruments | TPS76733QPWP |
| 1 | U903 | TPS79133 / 3.3V/100mA Low Dropout Regulator (Ultra Low Noise) (SOP5-DBV) | Texas Instruments | TPS79133DBVR |
| 4 | SCREW620 SCREW621 SCREW622 SCREW623 | M3x6 Pan Head, Pozidriv, A2 Screw | Bossard | BN 81882 M3x6 |
| 5 | SCREW630 SCREW631 SCREW632 SCREW633 SCREW634 | M3x10 Pan Head, Pozidriv, A2 Screw | Bossard | BN 81882 M3x10 |
| 4 | WASHER620 WASHER621 WASHER622 WASHER623 | M3 Stainless Steel Washer | Bossard | BN 670 M3 |
| 5 | WASHER630 WASHER631 WASHER632 WASHER633 WASHER634 | M3 Stainless Steel Spring Washer | Bossard | BN 760 M3 |
| 4 | STANDOFF620 STANDOFF621 STANDOFF622 STANDOFF623 | M3x10 Aluminium Stand-off | Ettinger | 05.03.108 |
| 1 | J902 | 5 pins / 1 row / 2.54mm Pitch Vertical Male Friction lock Pin header Header | Molex | 22-27-2051 |
| 5 | J101 J102 J103 J104 J112 | 2 pins / 1 row / 3.96mm Pitch Vertical Male Pin header Header | JST | B2P-VH |
| 2 | J900 J901 | 4 pins / 1 row / 3.96mm Pitch Vertical Male Pin header Header | JST | B4P-VH |
| 1 | J600 | Horizontal Female w. Switch Coax Phono socke | Chunfeng | RJ843-4W |
| 1 | J60 | 16 pins / 2 rows / 2.54mm Pitch Vertical Male IDC 16 pins IDC Box header | Molex | 87256-1611 |
| 1 | J40 | 34 pins / 2 rows / 2.54mm Pitch Vertical Male IDC 34 pins IDC Box header | Molex | 87256-3411 |
| 1 | X10 | 13.5MHz 13.5MHz SMD Crystal (HCM49) | Citizen | HCM49-13.500MABJT |
| 1 | PCB610 | A829-PCB-001_2.00 / TAS5162DDV6EVM2 Printed Circuit Board (ver. 2.00) | Printline | A829-PCB-001(2.00) |
| 1 | HEATSINK630 | TIC-HSINK-048_2.00 / Heatsink for 3 DDV packages length 154mm | THF-Teknik | TIC-HSINK-048(2.00) |

Jonas Holm

# TAS5162DDV6EVM2
# PCB SPECIFICATION
Version 2.00

| | |
|---|---|
| BOARD IDENTIFICATION: | A829-PCB-001(2.00) |
| BOARD TYPE: | DOUBLE-SIDED PLATED-THROUGH BOARD |
| LAMINATE TYPE: | FR4 |
| LAMINATE THICKNESS: | 1.6mm |
| COPPER THICKNESS: | 70µm (INCL. PLATING EXTERIOR LAYER) |
| COPPER PLATING OF HOLES: | >25µm |
| MINIMUM HOLE DIAMETER | 0.3 mm |
| SILKSCREEN COMPONENT SIDE: | WHITE - REMOVE SILKSCREEN FROM SOLDER AREA & PRE-TINNED AREAS |
| SILKSCREEN SOLDER SIDE: | None |
| SOLDER MASK COMPONENT SIDE: | GREEN |
| SOLDER MASK SOLDER SIDE: | GREEN |
| PROTECTIVE COATING: | SOLDER COATING AND CHEMICAL SILVER ON FREE COPPER |
| ELECTRICAL TEST: | PCB MUST BE ELECTRICAL TESTED |
| MANUFACTURED TO: | PERFAG 2E (www.perfag.dk) |
| APERTURE TABLE: | PERFAG 10A (www.perfag.dk) |
| BOARD SIZE: | 160 x 171.5 mm |
| Aprox. Number of holes | 1200 |
| COMMENTS: | SEE DRILL INFORMATION FILE (pdfdoc\FAB1_DRAWING.pdf). |

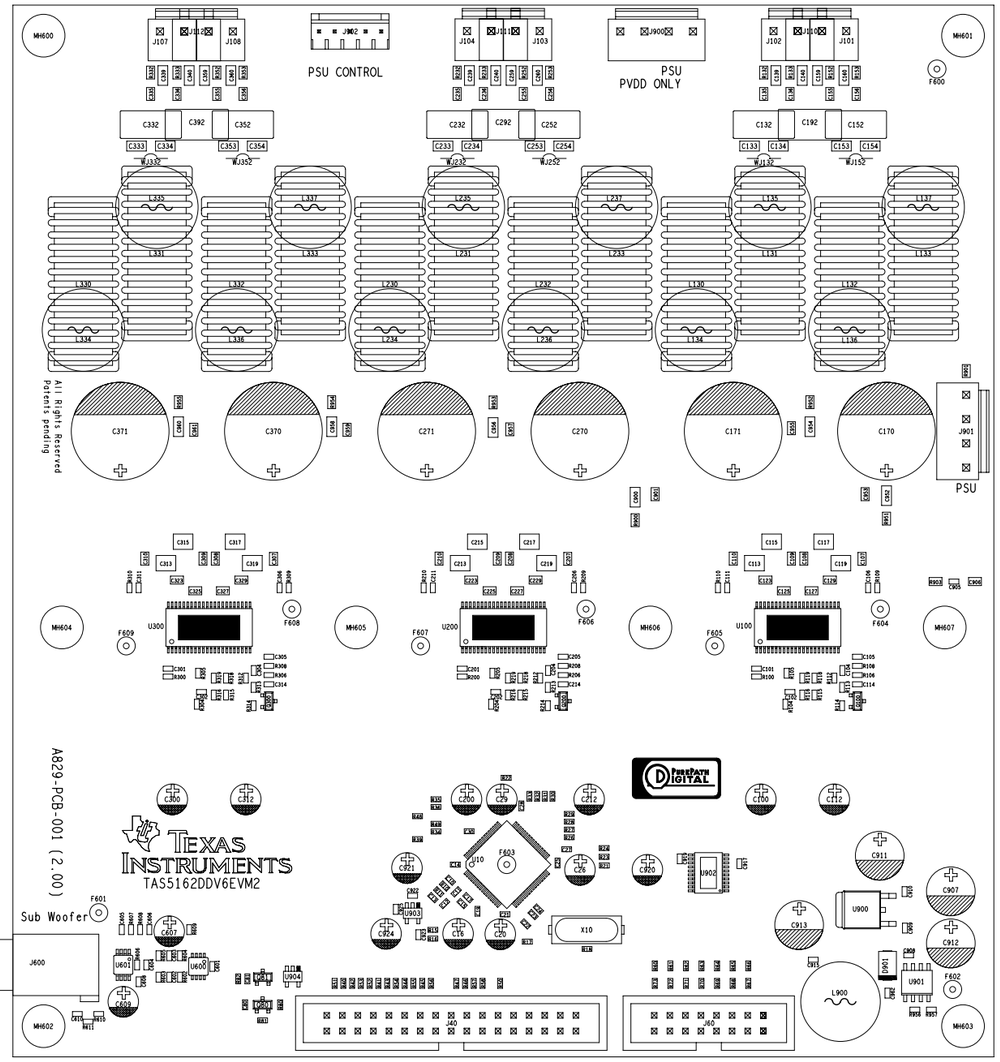
| POS | Texas Instruments<br>Lyngby Hovedgade 4, DK-2800 Lyngby | | |
|---|---|---|---|
| | Title TAS5162DDV6EVM2 | Date 2007/MAY/03 | |
| | P/N A829-PCB-001-2.00 | REV 1 | Designer KR |
| | LAYER 01 - SHEET 01 OF 07 | Engineer Jonas Holm | |



| RevNo | Revision note | Date | Signature | Checked |
|---|---|---|---|---|
| 1 | INITIAL RELEASE | 2007/MAY/03 | KR | CMS |

NOTES: UNLESS OTHERWISE SPECIFIED.

1. COMPONENT MOUNTING TYPES TOP/BOTTOM : SMD-Leaded / SMD.
2. X,Y COORDINATES AND ROTATION PROVIDED IN DATA FILES.
3. SOLDERING METHODS TYPE TOPSIDE : RES
4. SOLDERING METHODS TYPE BOTSIDE : RES / WAS
   WAS - Wave soldering
   RES - Reflow soldering
   IRS - Infrared soldering
   MHS - Manual hand-soldering
5. PCBLAYOUT BY GHDSIGN DENMARK. (+45)44441482
6. PCB CONTAINS BGA AND NSMD LEADLESS PACKAGES.




| | | | |
|---|---|---|---|
| A3 | Texas Instruments<br>Lyngby Hovedgade 4, DK-2800 Lyngby | PCB No. | A829-PCB-001-2 |
| | | Engineer | Jonas Holm |

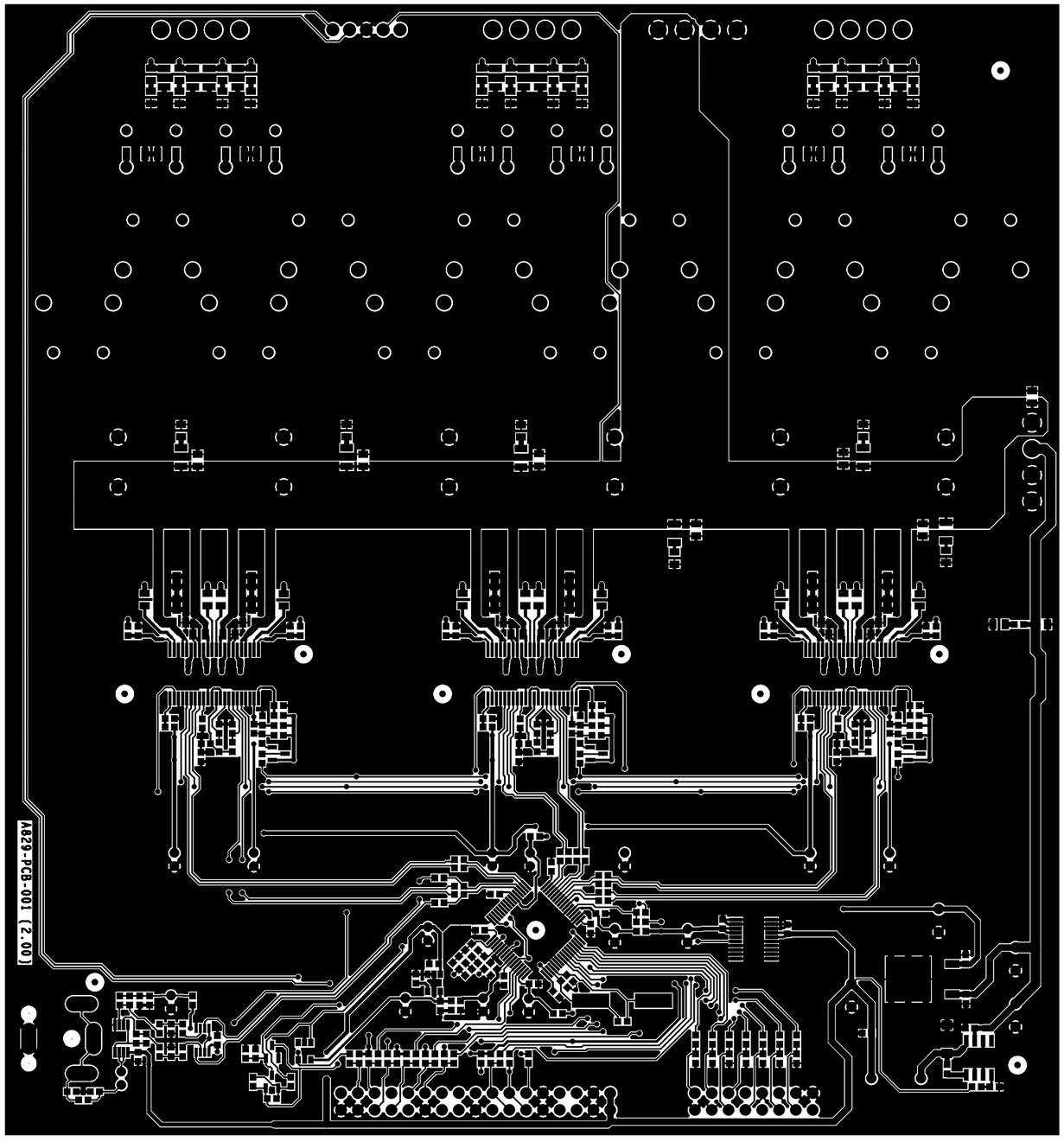
| Designed by | Checked by | Approved by | Date | Scale |
|---|---|---|---|---|
| KR | CMS | Jonas Holm | 2007/MAY/03 | 100 % |

# ASSY DRAWING

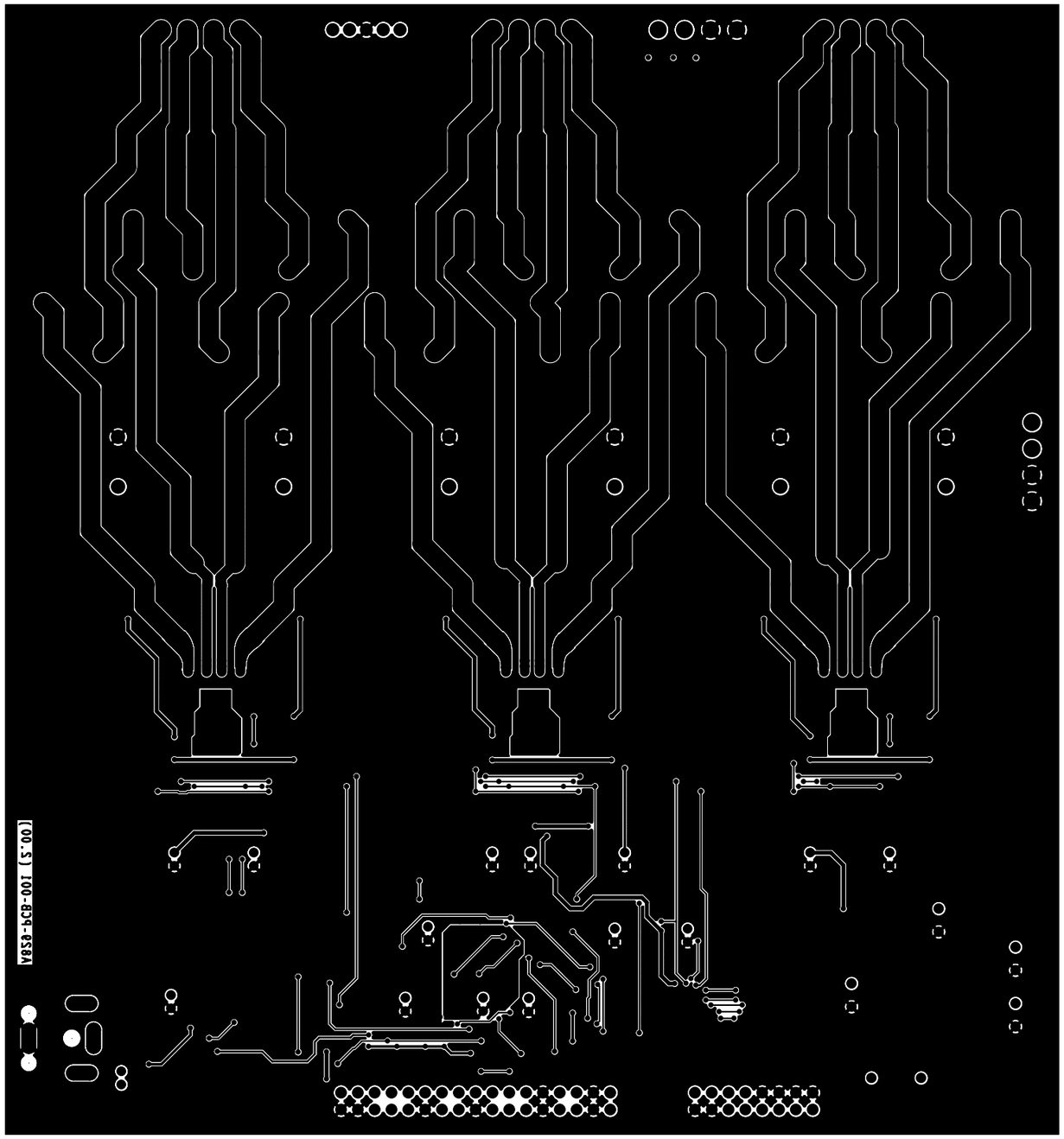
TAS5162DDV6EVM2

| A829-PCB-001 | Rev 1 | Sheet 1 OF 1 |
|---|---|---|

| POS | Texas Instruments<br>Lyngby Hovedgade 4, DK-2800 Lyngby | |
|---|---|---|
| | Title TAS5162DDV6EVM2 | Date 2007/MAY/03 |
| | P/N A829-PCB-001-2.00 \| REV 1 | Designer KR |
| | LAYER 01 - SHEET 01 OF 07 | Engineer Jonas Holm |



| POS | Texas Instruments<br>Lyngby Hovedgade 4, DK-2800 Lyngby | |
|---|---|---|
| | Title TAS5162DDV6EVM2 | Date 2007/MAY/03 |
| | P/N A829-PCB-001-2.00 \| REV 1 | Designer KR |
| | LAYER 02 - SHEET 02 OF 07 | Engineer Jonas Holm |

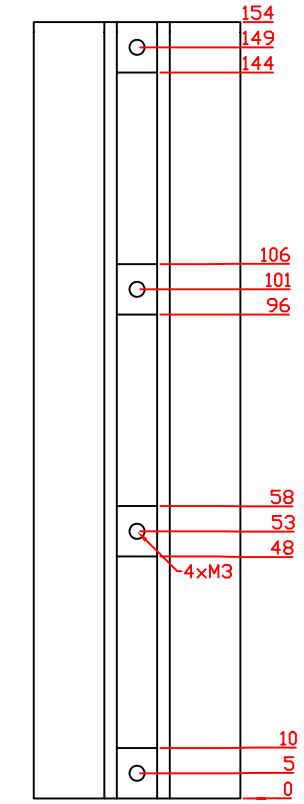


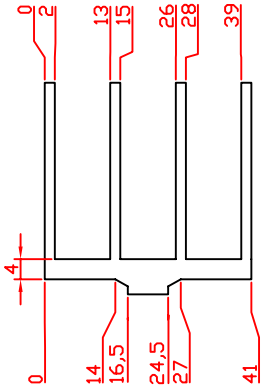
# TIC-HSINK-048(2.00)

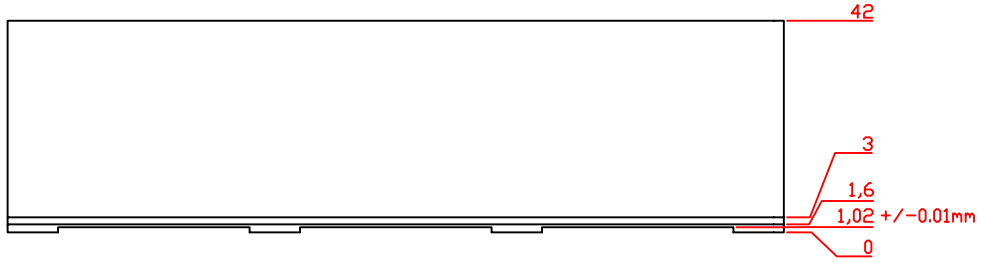
Heatsink for 3 DDV packages

7.May 2007
TIC-HSINK-048(2.00).dwg

Jonas L. Holm




**SCALE:** 1:1.5
**PROFILE:** TIC-HSINK-050(1.00)
**DIMENSIONS:** mm
**MATERIAL:** ALUMINUM
**INTERNAL SCREW THREADS:** M3
**SURFACE**: FREE OF SHARP EDGES
**SURFACE TREATMENT:** BLACK ANODIZED
**TOLERANCES:** +/- 0.1 mm

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It is important to operate this EVM within the input voltage range of 3.3 V to 5 V and the output voltage range of 0 V to 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 30°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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