# TAS5132DDV6EVM

This user's guide describes the operation of the evaluation module for the TAS5132 Digital Amplifier Power Output Stage using the TAS5086 Digital Audio PWM Processor from Texas Instruments. The document also provides measurement data and design information including the schematic, the bill of materials, and the PCB layout.

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# 1 Overview

The TAS5132DDV6EVM PurePath Digital ™customer evaluation module demonstrates the integrated circuits TAS5132DDV and TAS5086DBT from Texas Instruments (TI).

The TAS5132 is an integrated stereo digital amplifier power stage with an advanced protection system. The TAS5132 is capable of driving a 6-Ω bridge-tied load at up to 25 W per channel with low integrated noise at the output, low THD+N, and low idle power dissipation.

The TAS5086 is a six-channel digital pulse-width modulator (PWM) that provides advanced performance and a high level of system integration. The TAS5086 is designed to interface seamlessly with most audio digital signal processors and MPEG decoders, accepting a wide range of input data and clock formats.

This EVM is configured with four single-ended (SE) channels and two bridge-tied load (BTL) channels for center and subwoofer channel.

Together with a TI input-USB board, this EVM is a complete 5.1-channel 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 multiplexers, and automute. A configuration option is available for power-stage failure protection.

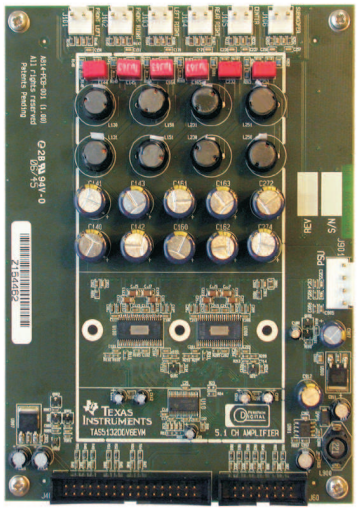
**Table 1. TAS5132DDV6EVM Specification**

| **Key Parameters** | |
|---|---|
| Output stage supply voltage | 0 V – 18 V |
| System supply Voltage | 15 V – 20 V |
| Number of channels | 4x SE, 2x BTL |
| Load impedance SE | 3 Ω– 4 Ω |
| Load impedance BTL | 6 Ω– 8 Ω |
| Output power SE | 9 W/ 4 Ω/ 10% THD or 12.5 W/ 3 Ω/ 10% THD |
| Output power BTL | 20 W/ 8 Ω / 10% THD or 26 W/ 6 Ω / 10% THD |
| DNR | >105 dB |
| PWM processor | TAS5086DBT |
| Output stage | TAS5132DDV |

PurePath Digital is a trademark of Texas Instruments.
Windows is a trademark of Microsoft Corporation.

This 5.1-channel system is designed for home theater applications such as DVD receivers, DVD mini-component systems or home theater in a box (HTIB), and LCD TVs.

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



Gerber (layout) files are available on the TI Web site at www.ti.com.

The EVM is delivered with cables and an input-USB board for connection to an input source and for control by a personal computer.

## 1.1 TAS5132DDV6EVM Features

- 6-channel PurePath Digital™ evaluation module (double-sided, plated-through PCB layout).
- 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.

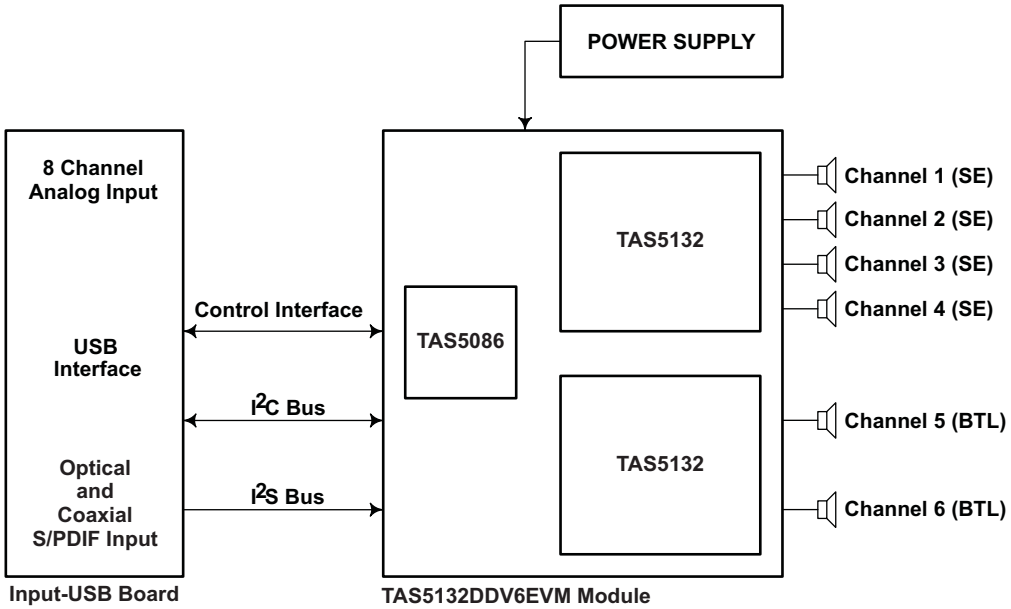



**Figure 1. Integrated PurePath Digital™ Amplifier System**

### 1.2 PCB Key Map

Physical structure for the TAS5132DDV6EVM is illustrated in Figure 2.

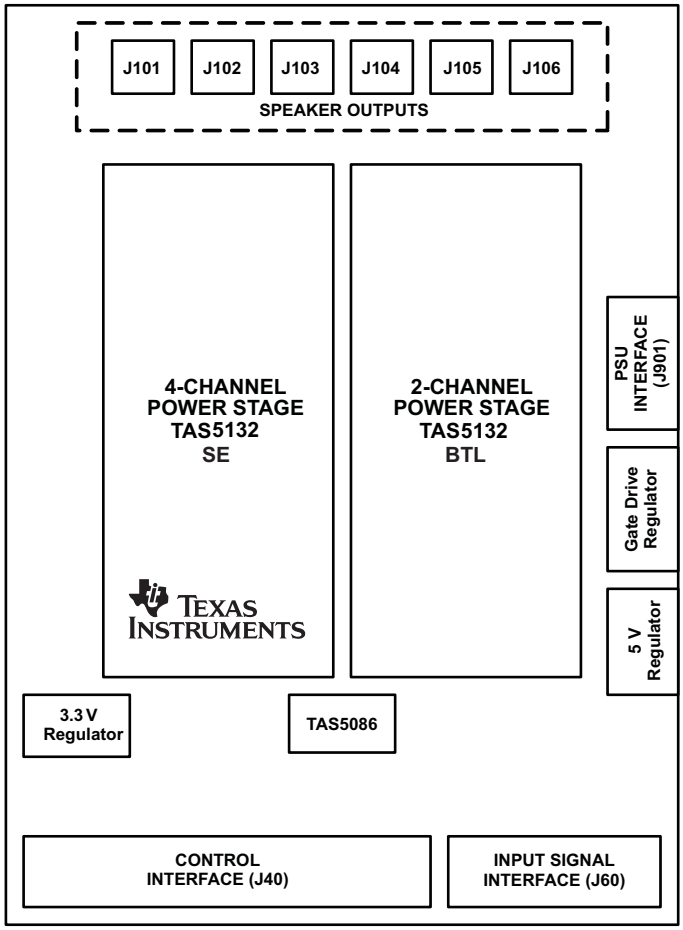



**Figure 2. Physical Structure for TAS5132DDV6EVM (Approximate Layout)**

## 2 Quick Setup Guide

This section describes the TAS5132DDV6EVM 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.

This section also provides a step-by-step guide to configuring the TAS5132DDV6EVM for device evaluation.

### 2.1 Electrostatic Discharge Warning

Many of the components on the TAS5132DDV6EVM 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.

## 2.2 Unpacking the EVM

On opening the TAS5132DDV6EVM package, ensure that the following items are included:

- 1 pc. TAS5132DDV6EVM board using one TAS5086DBT and two TAS5132DDV.
- 1 pc. TI Input-USB board for interfacing TAS5132DDV6EVM with SPDIF/analog sources and PC for control.
- 1 pc. Signal interface IDC cable for connection to an $I^2S$ front-end like the attached TI Input-USB board.
- 1 pc. Control interface IDC cable for connection to an $I^2C$ front-end like the attached TI Input-USB board.
- 1 pc Cable for connecting Input-USB board to a USB port on a PC for TAS5086 control by software.
- 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 is missing, contact the Texas Instruments Product Information Center nearest you to inquire about a replacement.

Connect Input-USB board to TAS5132DDV6EVM using the two 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.

A single 15-V to 18-V power supply can be used if the user connects black/black to GND and red/white to 15/18 V.

**Table 2. Recommended Supply Voltages**

| Description | Voltage Limitations | Current Requirement | Cable |
|---|---|---|---|
| System power supply | 15 V – 20 V | 0.3 A | Red/black |
| Output stage power supply | 0 V – 18 V | 2 A | White/black |

**CAUTION**

Applying voltages above the limitations given in Table 2 can cause permanent damage to your 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 TAS5086 GUI provides easy control of all registers in TAS5086. To install the GUI, run the 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 the GUI program from Windows™ menu. Start-up of the GUI takes a few seconds.




**Figure 3. TAS5086 GUI Window**

From the files menu, load the configuration file:

TAS5132DDV6EVM Configuration (2.00).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 a directory where the GUI is installed. Default is C:\Program Files\Texas Instruments Inc\TAS5086\

For more advanced use of the GUI, see the GUI User's Guide and the TAS5086 data sheet (SLES131).

# 3 Protection

This section describes the short-circuit protection and fault-reporting circuitry of the TAS5132 device.

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

The TAS5132 is a self-protecting device that provides fault reporting (including high-temperature protection and short-circuit protection). TAS5132 is configured in back-end auto-recovery mode and therefore resets automatically after all errors (M1, M2, and M3 are set low); see the TAS5086 data sheet for further explanation. This mean that the device restarts itself after an error occasion and reports shortly through the $\overline{SD}$ error signal.

### 3.2 Fault Reporting

The $\overline{OTW}$ and $\overline{SD}$ outputs from TAS5132 indicate fault conditions. See the TAS5132 data sheet (SLES190) for a description of these pins.

**Table 3. TAS5132 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 TAS5132DDV6EVM 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 TAS5132DDV6EVM Performance

**Table 4. General Test Conditions**

| General Test Conditions | | Notes |
|---|---|---|
| Output stage supply voltage: | 18 V | Laboratory power supply (EA-PS 7065-10A) |
| System supply voltage: | 15 V | |
| Load impedance SE: | 4 Ω | |
| Load impedance BTL: | 8 Ω | |
| Input signal 1-kHz sine | | |
| Sampling frequency | 48 kHz | |
| Gain setting in TAS5086 | 0 dB | |
| Measurement filter | AES17 | |
| TI input-USB board | Input-USB | Rev 10 |
| EVM configuration file | Version 2.00 | TAS5132DDV6EVM configuration (2.00).cfg |

**Table 5. TAS5086 Register Settings[(1)]**

| Register | Register | Value | Notes |
|---|---|---|---|
| Oscillator trim register | 0x1B | 00 | Initiate factory trim |
| Split-capacitor register | 0x1A | 1C | Set split-capacitor charge period to 4160 ms |
| Master volume register | 0x07 | 30 | Master volume set to 0 dB |
| Modulation limit register | 0x10 | 04 | Modulation index set to 96.1% |
| PWM start register | 0x18 | 30 | Channel 1-4 set to start part 2 |
| | | | Channel 5-6 set to start part 1 |

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

**Table 5. TAS5086 Register Settings (continued)**

| Register | Register | Value | Notes |
|---|---|---|---|
| Input multiplexer register | 0x20 | 00 01 23 45 | |
| Output multiplexer register | 0x25 | 00 01 23 45 | |
| System control register | 0x05 | 20 | PWM start |

**Table 6. Electrical Data**

| Electrical Data | | Notes/Conditions |
|---|---|---|
| Ch 1-4 output power, 3 Ω: | 9 W | 1 kHz, unclipped (0 dBFS), $T_A$ = 25°C |
| Ch 1-4 output power, 3 Ω: (10% THD+N) | 12.5 W | 1 kHz, $T_A$ = 25°C |
| Ch 1-4 output power, 4 Ω: | 7.5 W | 1 kHz, unclipped (0 dBFS), $T_A$ = 25°C |
| Ch 1-4 output power, 4 Ω: (10% THD+N) | 10 W | 1 kHz, $T_A$ = 25°C |
| Ch 5-6 output power, 6 Ω: | 20 W | 1 kHz, unclipped (0 dBFS), $T_A$ = 25°C |
| Ch 5-6 output power, 6 Ω: (10% THD+N) | 26 W | 1 kHz, $T_A$ = 25°C |
| Ch 5-6 output power, 8 Ω: | 15.5 W | 1 kHz, unclipped (0 dBFS), $T_A$ = 25°C |
| Ch 5-6 output power, 8 Ω: (10% THD+N) | 21 W | 1 kHz, $T_A$ = 25°C |
| Ch 1-4 maximum peak current: | > 3.0 A | 1 kHz burst, 1 Ω, ROC = 39 kΩ |
| Ch 5-6 maximum peak current: | > 5.2 A | 1 kHz burst, 1 Ω, ROC = 22 kΩ |
| Ch 1-4 damping factor: | 10 | 1 kHz, relative to 4-Ω load |
| Ch 5-6 damping factor: | 10 | 1 kHz, relative to 8-Ω load |
| Output stage efficiency: | 89 % | 1 kHz, 2 × 7.5 W, 4 Ω + 1 × 16 W |
| System supply current: | < 145 mA | 1 kHz, –60-dBFS signal (with TI Input-USB Board) |
| H-bridge supply current: | < 60 mA | 1 kHz, –60-dBFS signal |
| Total board idle power consumption: | 3.3 W | H-bridge supply + system supply, –60-dBFS signal |

**Table 7. Audio Performance**

| Audio Performance | | | Notes/Conditions |
|---|---|---|---|
| Ch 1-4 THD+N, 4 Ω: | 1 W | < 0.1% | 1 kHz |
| Ch 1-4 THD+N, 4 Ω: | 5 W | < 0.1% | 1 kHz |
| Ch 1-4 THD+N, 4 Ω: | 7.5 W | < 0.1% | 1 kHz |
| Ch 5-6 THD+N, 8 Ω: | 1 W | < 0.09% | 1 kHz |
| Ch 5-6 THD+N, 8 Ω: | 10 W | < 0.09% | 1 kHz |
| Ch 5-6 THD+N, 8 Ω: | 15 W | < 0.09% | 1 kHz |
| Ch 1-4 dynamic range: | | > 108 dB | Reference: rated power, A-weighted, AES17 filter |
| Ch 1-4 noise voltage | | < 20 μVrms | A-weighted, AES17 filter |
| Ch 5-6 dynamic range: | | > 108 dB | Reference: rated power, A-weighted, AES17 filter |
| Ch 5-6 noise voltage | | < 40 μVrms | A-weighted, AES17 filter |
| Ch 1-4 click/pop | | < 10 mV | Mute/Unmute, no input signal, 4 Ω, 5.5-second start-up delay |
| Ch 5-6 click/pop | | < 20 mV | Mute/Unmute, no input signal, 8 Ω |
| Ch 1-6 channel separation | | > 60 dB | 1 kHz, unclipped (0 dBFS) |
| Ch 1-4 frequency response 200 Hz – 20 kHz | | ± 0.5 dB | 7.5 W/ 4 Ω, unclipped (0 dBFS) |
| Ch 5-6 frequency response 20 Hz – 20 kHz | | ± 0.5 dB | 15 W/ 8 Ω, unclipped (0 dBFS) |

**Table 8. Thermal Specification**

| General Test Conditions | $T_{DEVICE}$ (1) | Notes/Conditions |
|---|---|---|
| Idle, all channels switching | 42°C | 1 kHz, 15 minutes, –60 dBFS signal, $T_A$ = 25°C |

(1) Measured on devices (average) No heatsink.

**Table 8. Thermal Specification (continued)**

| General Test Conditions | $T_{DEVICE}$ (1) | Notes/Conditions |
|---|---|---|
| 4 x 1.25 W, 4 Ω + 2 x 2.5 W, 8 Ω (1/8) | 57°C | 1 kHz, 1 hour, $T_A$ = 25°C |
| 2 x 10 W, 4 Ω + 1 x 20 W, 8 Ω (full power) | 92°C | 1 kHz, 5 minutes, $T_A$ = 25°C |

**Table 9. Physical Specifications (1)**

| General Test Conditions | | Notes/Conditions |
|---|---|---|
| PCB dimensions | 112 mm × 154 mm | Width × length (mm) |
| Total weight | 130 g | Components + PCB + mechanics |

(1) All electrical and audio specifications are typical values.

## 4.1 THD+N vs Power (SE - 3 Ω)

Gain: +2.5 dB set in TAS5086

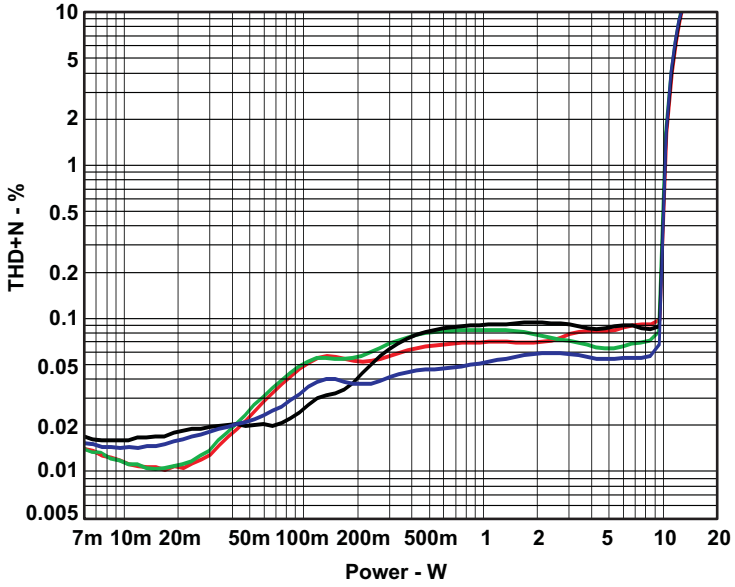



**Figure 4. THD+N vs Power (SE – 3 Ω)**

### 4.2 THD+N vs Power (SE - 4 Ω)

Gain: +2.5 dB set in TAS5086

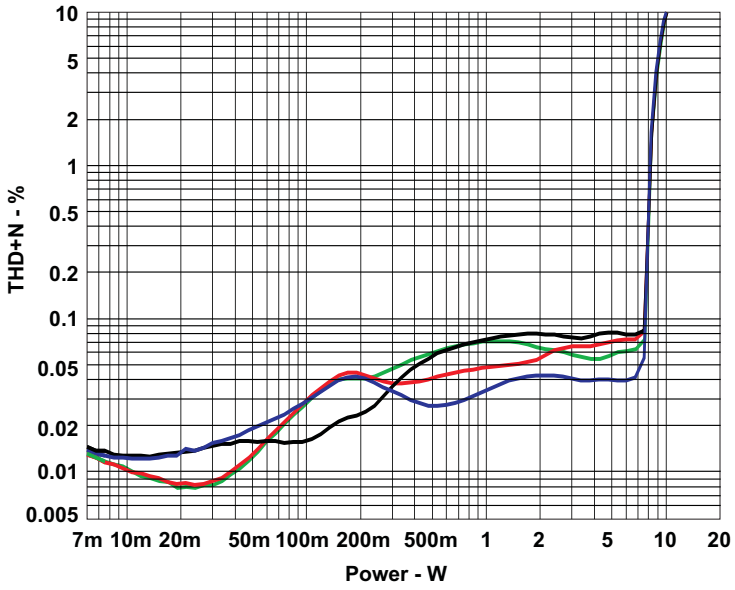



**Figure 5. THD+N vs Power (SE – 4 Ω)**

### 4.3 THD+N vs Power (BTL - 6 Ω)

Gain: +2.5 dB set in TAS5086

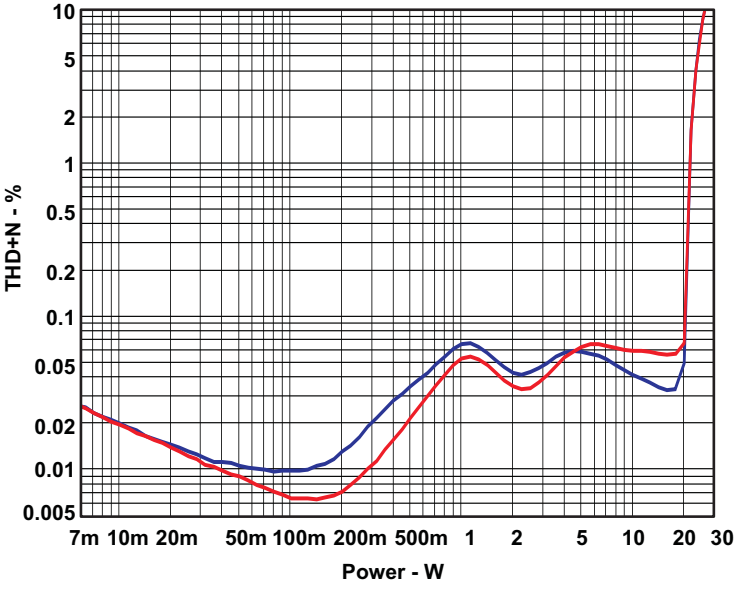



**Figure 6. THD+N vs Power (BTL – 6 Ω)**

## 4.4 THD+N vs Power (BTL - 8 Ω)

Gain: +2.5 dB set in TAS5086

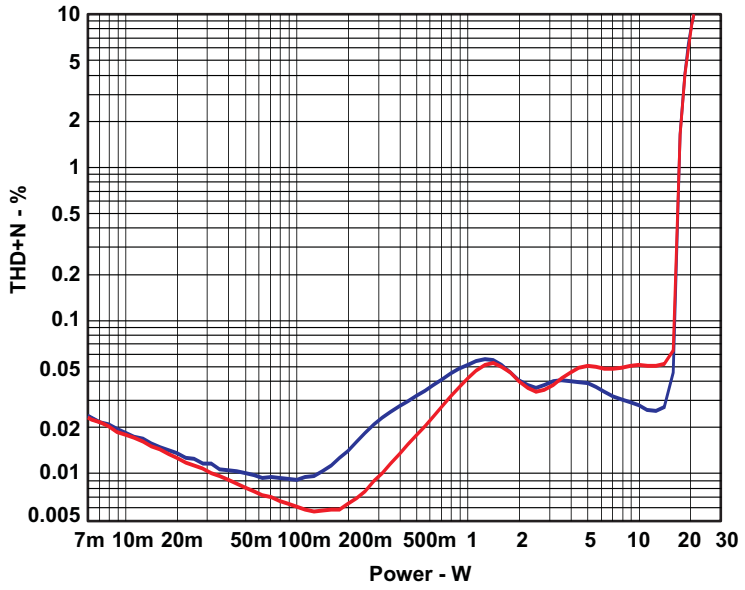



**Figure 7. THD+N vs Power (BTL –8 Ω)**

## 4.5 THD+N vs Frequency (SE - 3 Ω)

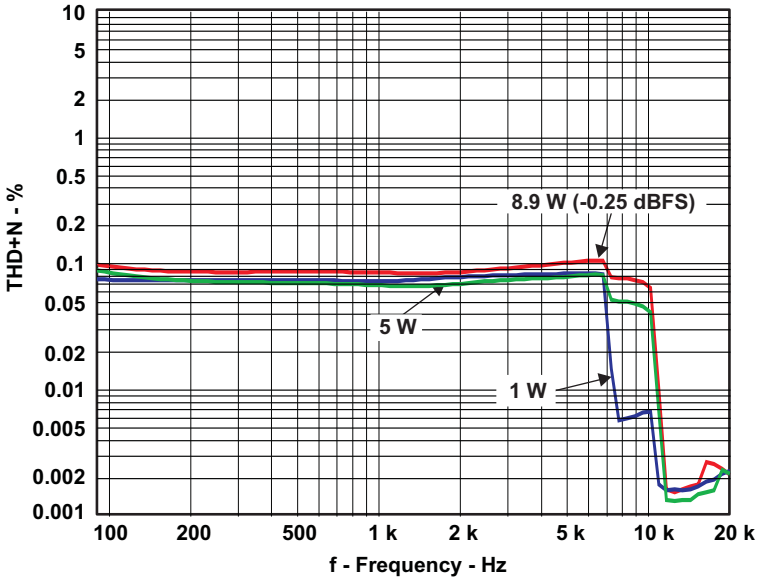



**Figure 8. THD+N vs Frequency (SE – 3 Ω)**

### 4.6 THD+N vs Frequency (SE - 4 Ω)

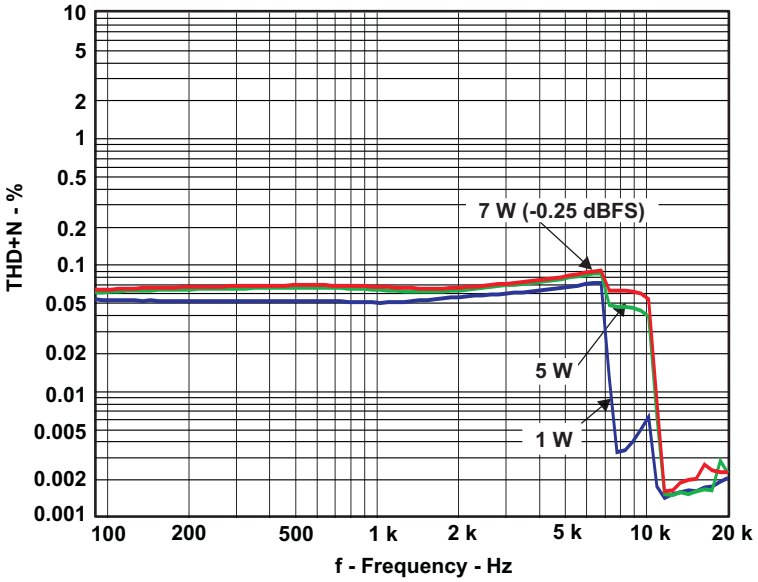



**Figure 9. THD+N vs Frequency (SE – 4 Ω)**

### 4.7 THD+N vs Frequency (BTL - 6 Ω)

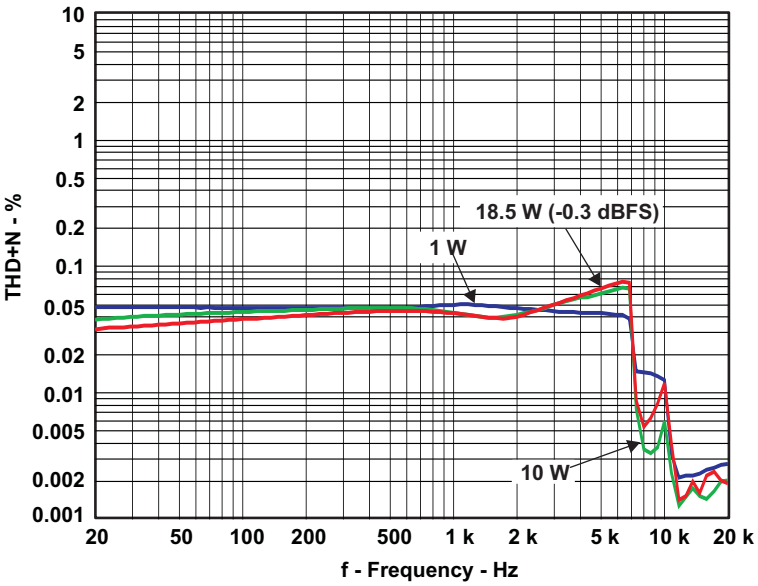



**Figure 10. THD+N vs Frequency (BTL – 6 Ω)**

### 4.8 THD+N vs Frequency (BTL - 8 Ω)

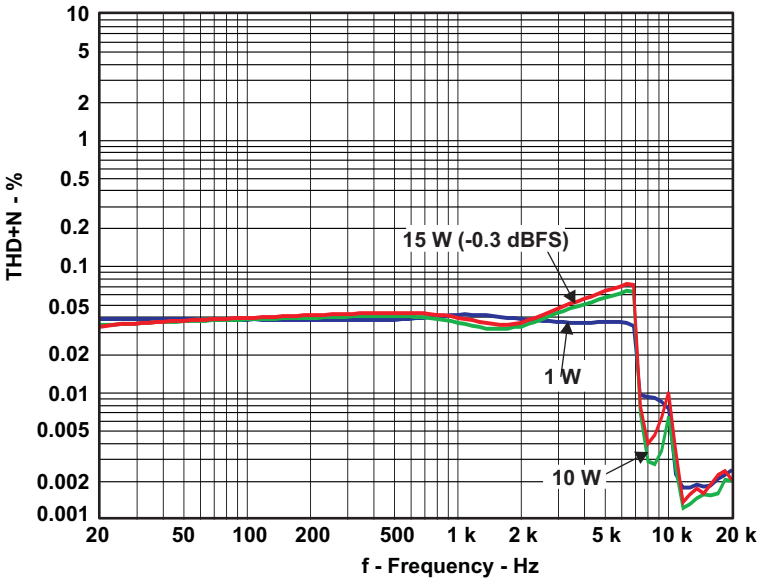



**Figure 11. THD+N vs Frequency (BTL – 8 Ω)**

### 4.9 FFT Spectrum with -60-dBFS Tone (SE)

Reference voltage is 5.48 V. FFT size is 16k.

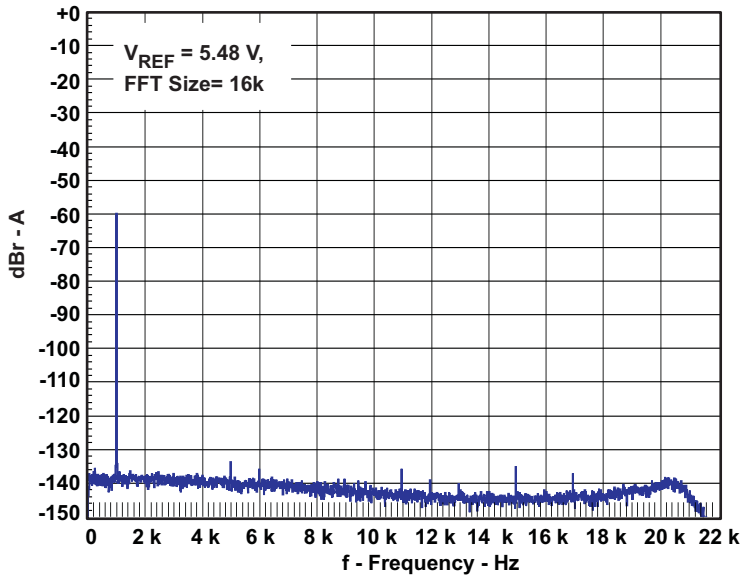



**Figure 12. FFT Spectrum With –60-dBFS Tone (SE)**

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

Reference voltage is 11.18 V. FFT size is 16k.

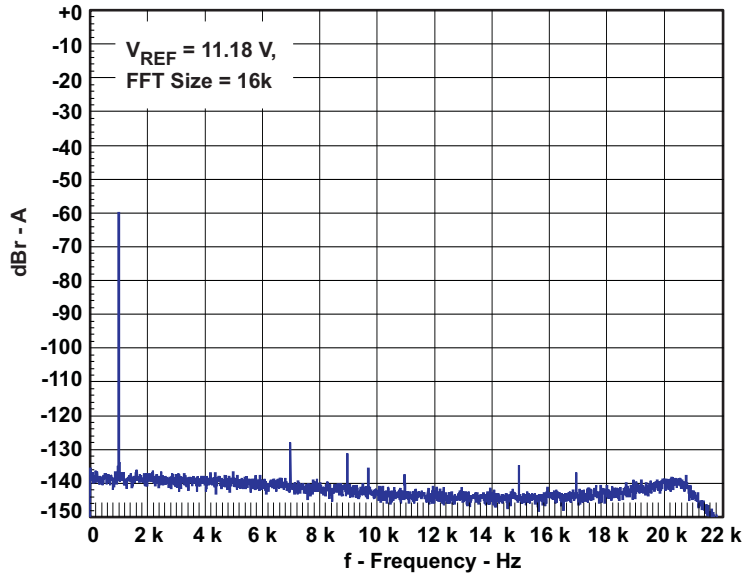



**Figure 13. FFT Spectrum With –60-dBFS Tone (BTL)**

### 4.11 Idle Noise FFT Spectrum (SE)

Reference voltage is 5.49 V. FFT size is 16k.

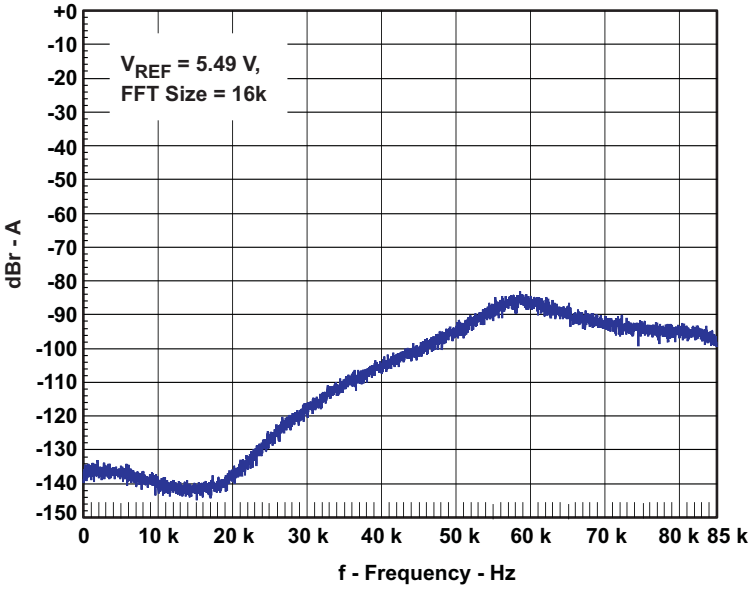



**Figure 14. Idle Noise FFT Spectrum (SE)**

## 4.12 Idle Noise FFT Spectrum (BTL)

Reference voltage is 11.18 V. FFT size is 16k.

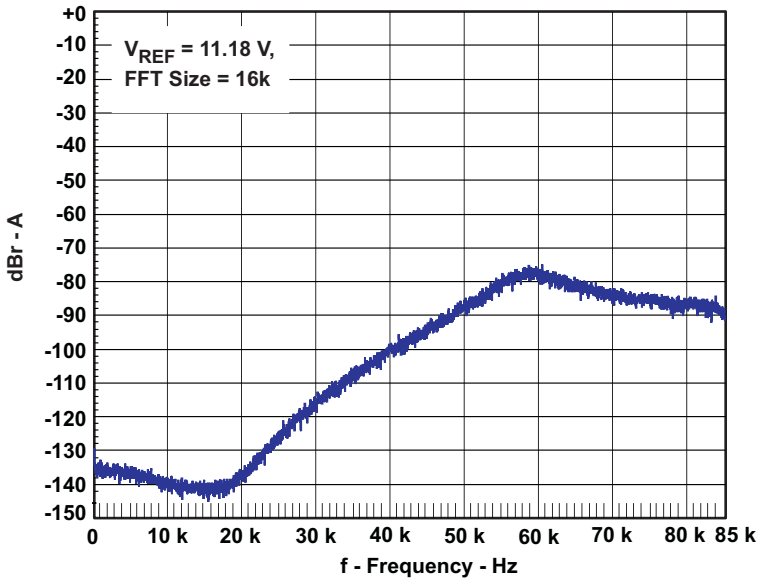



**Figure 15. Idle Noise FFT Spectrum (BTL)**

## 4.13 Channel Separation (1-2)

Channel separation is tested for two channels in the same package, channel 1 and channel 2. Four-ohm loads are used for both channels. Channel 1 input signal is 0 dBFS; channel 2 is muted. Reference voltage is 5.49 Vrms. Shielded output inductors provide better channel separation.

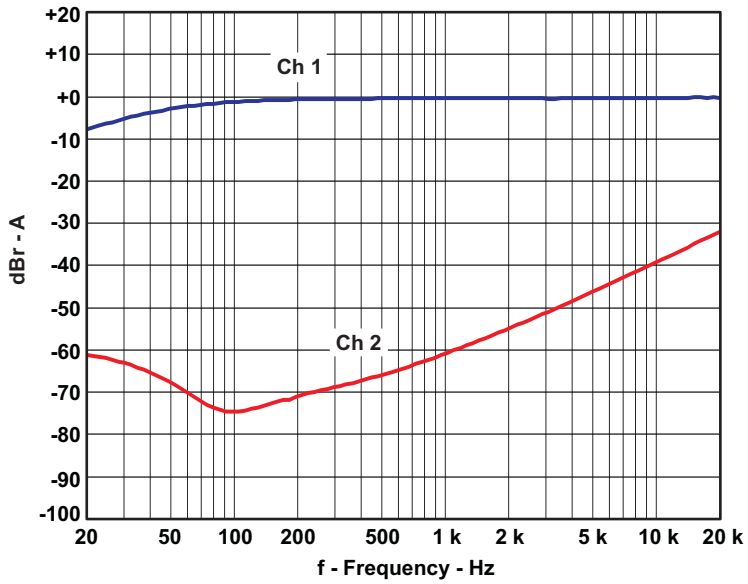



**Figure 16. Channel Separation (1-2)**

## 4.14 Channel Separation (4-5)

Channel separation is tested for two channels in a different package, channel 4 and channel 5. A 4-Ω load is used for channel 4 SE; an 8-Ω load is used for channel 5 BTL. The channel 5 input signal is 0 dBFS; channel 4 is muted. Reference voltage is 11.19 Vrms. Shielded output inductors provide better channel separation.

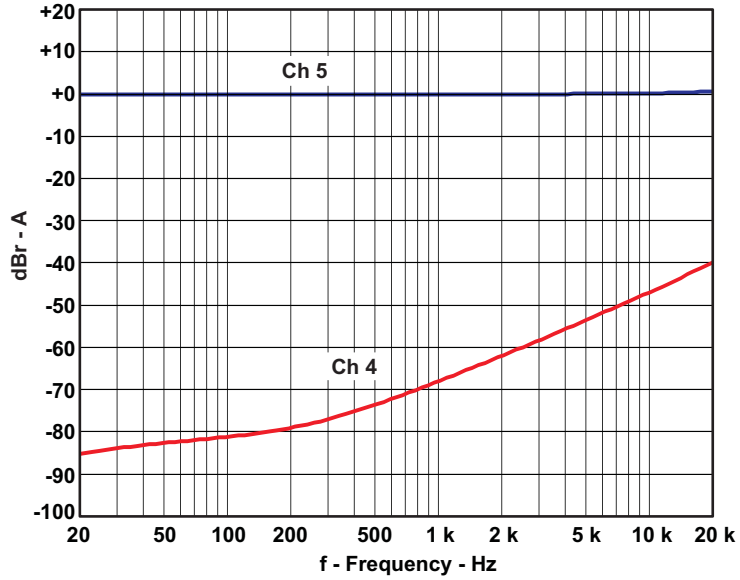



**Figure 17. Channel Separation (4-5)**

## 4.15 Channel Separation (5-6)

Channel separation is tested for two channels in the same package, channel 5 and channel 6. Eight-ohm loads are used for both channels. The channel 5 input signal is 0 dBFS; channel 6 is muted. Reference voltage is 11.19 Vrms.

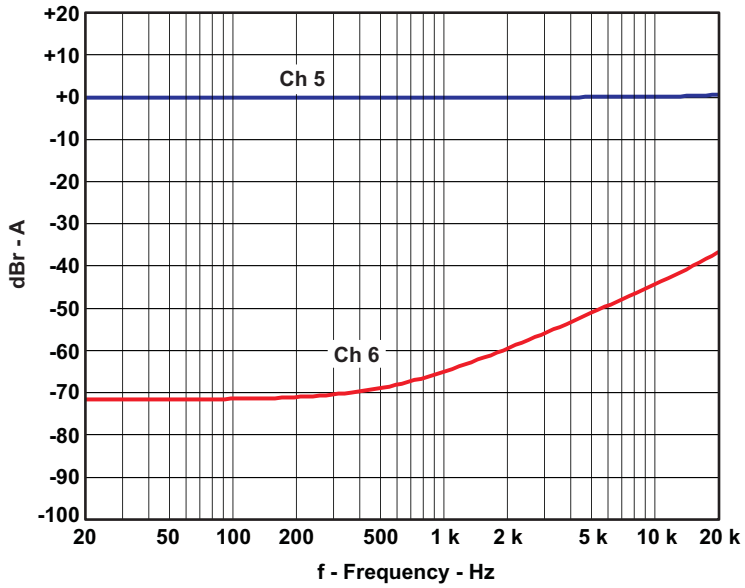



**Figure 18. Channel Separation (5-6)**

## 4.16 Frequency Response (SE)

Measurement bandwidth filter is 80 kHz.

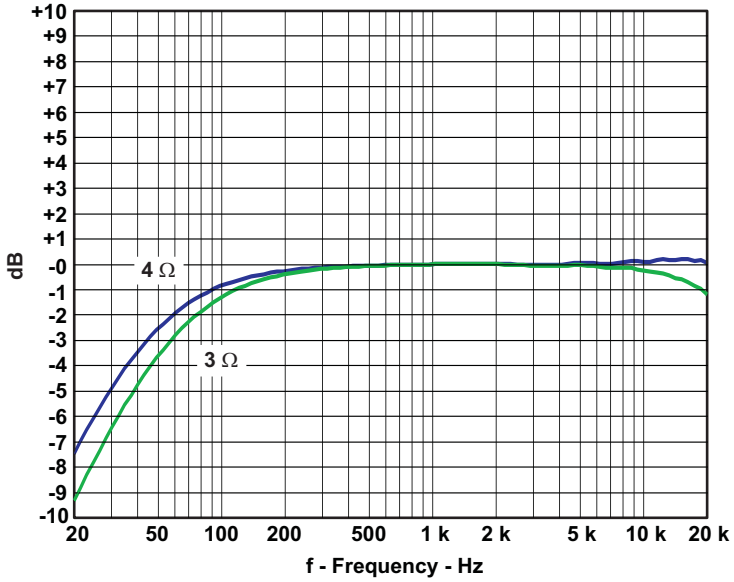



**Figure 19. Frequency Response (SE)**

## 4.17 Frequency Response (BTL)

Measurement bandwidth filter is 80 kHz.

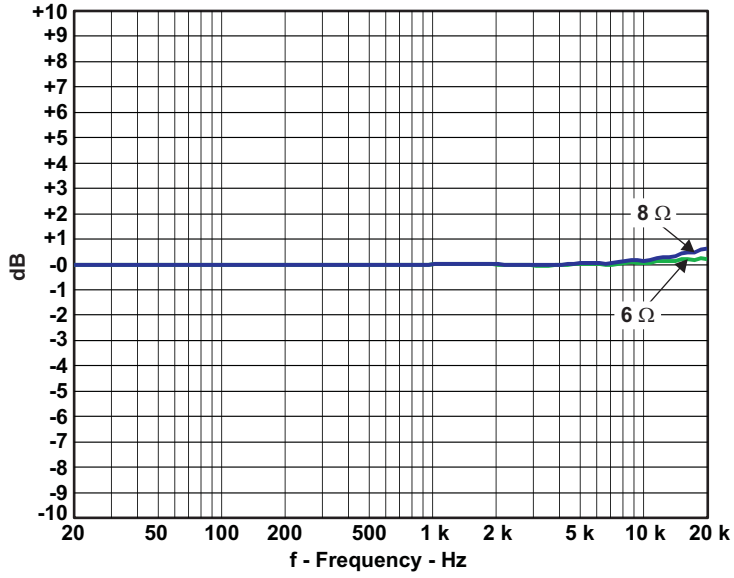



**Figure 20. Frequency Response (BTL)**

## 4.18 High-Current Protection (SE)

Input bursted signal is 1 kHz; load is 1 Ω.

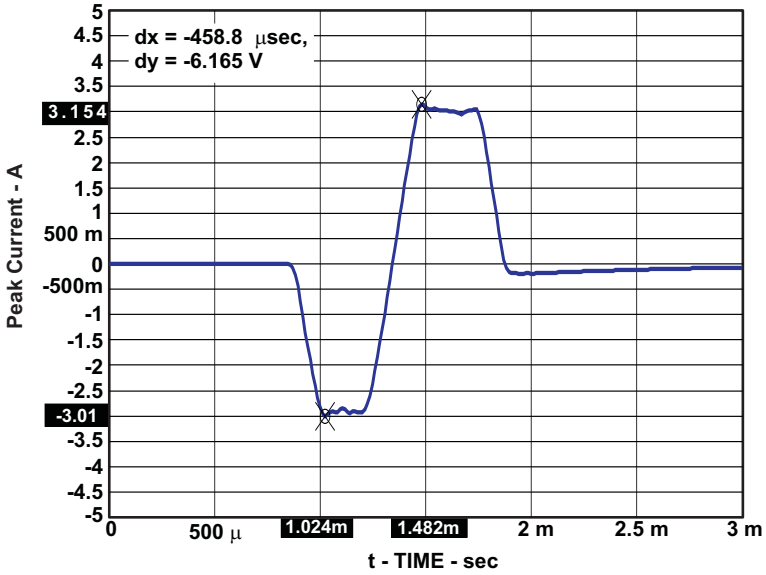



**Figure 21. High-Current Protection (SE)**

## 4.19 High-Current Protection (BTL)

Input bursted signal is 1 kHz; load is 1 Ω.

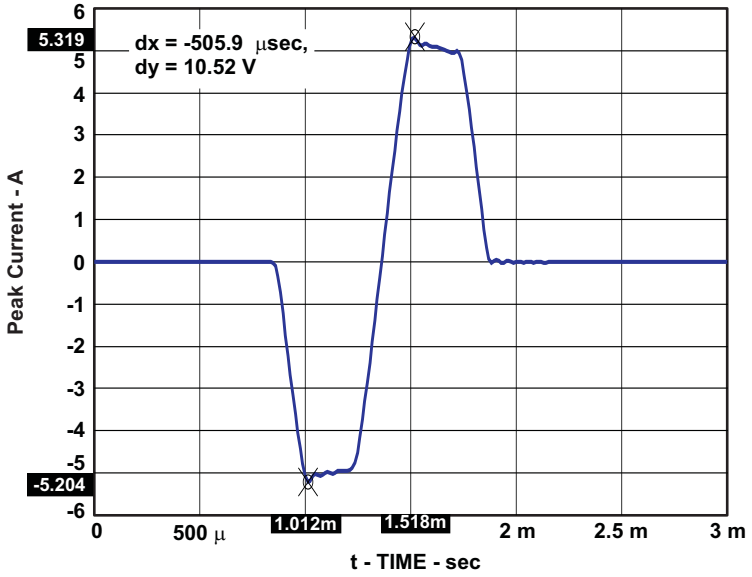



**Figure 22. High-Current Protection (BTL)**

## 4.20 Pop/Click (SE)

Start of SE channels is tested for different charge times. Charge time period is controlled by changing register x1Ah in TAS5086. No input signal is applied. Load is 4 Ω. Measurement is done according to SLEA044. The measurement results are presented both in time domain and in frequency domain.

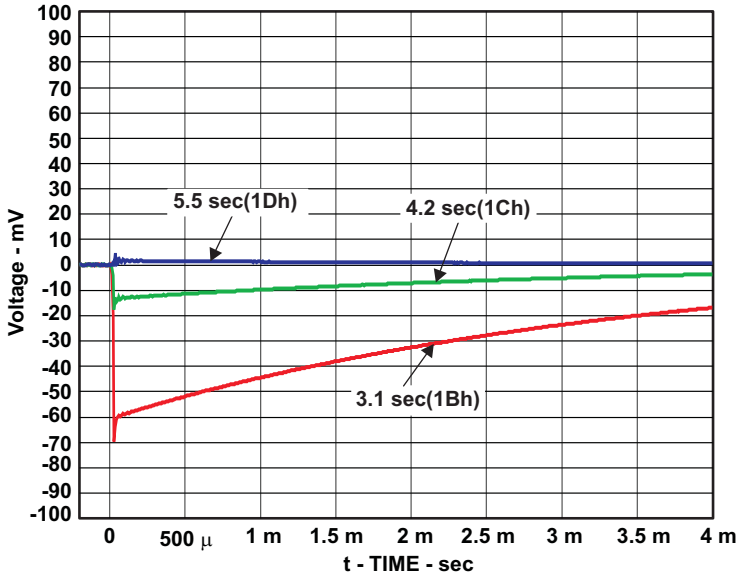



**Figure 23. Pop/Click (SE) Time Domain**

Reference voltage is 5.49 Vrms.

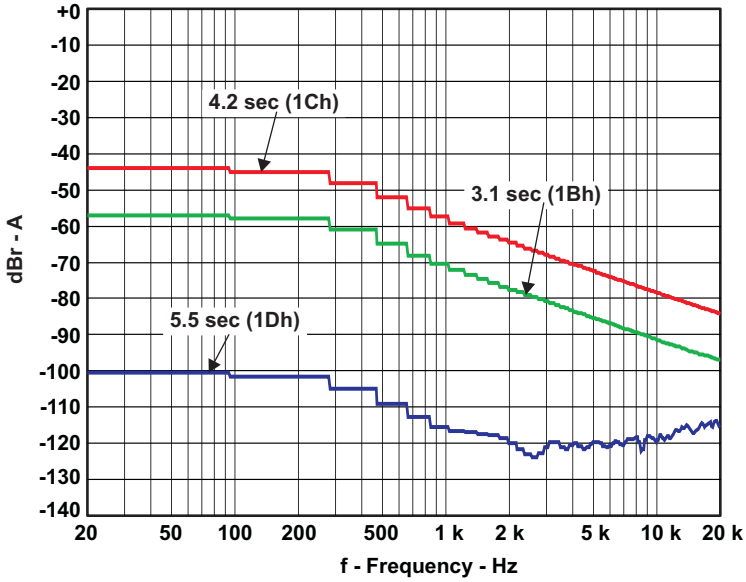



**Figure 24. Pop/Click (SE) FFT ($V_{REF}$ = 5.49 Vrms)**

### 4.21 Pop/Click (BTL)

No input signal is applied. Measurement results are presented in time domain and in frequency domain.

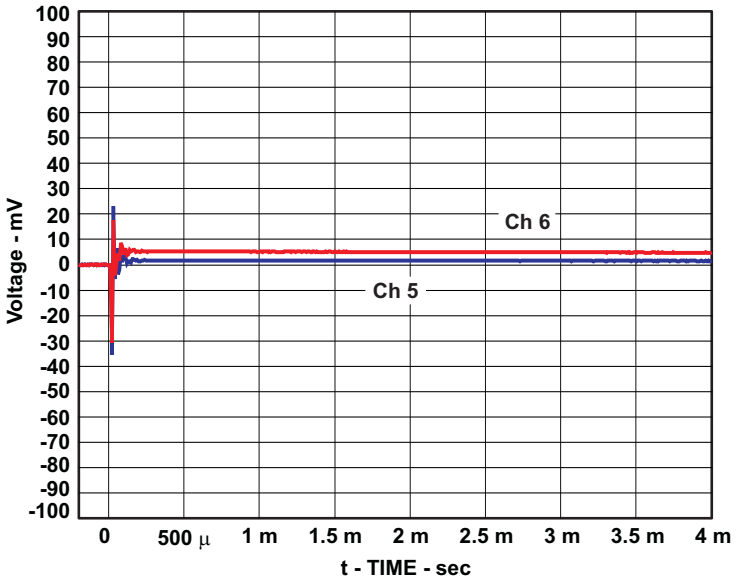



**Figure 25. Pop/Click (BTL) Time Domain**

Reference voltage is 11.19 Vrms

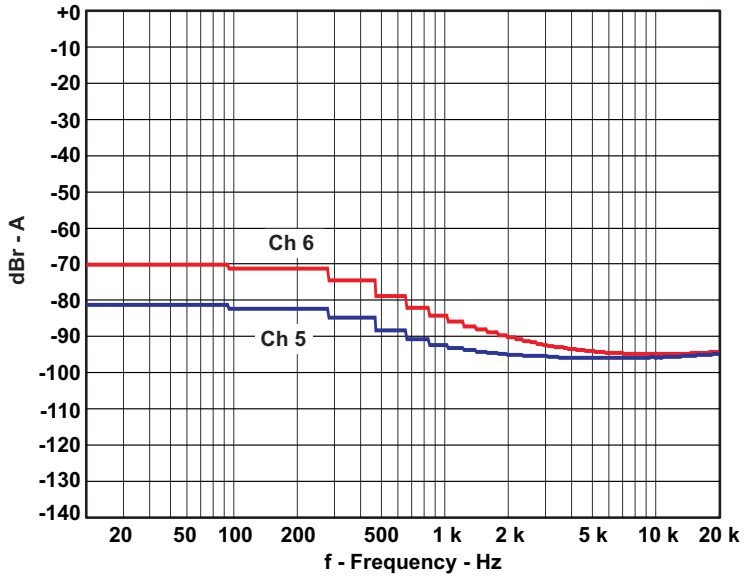



**Figure 26. Pop/Click (BTL) FFT ($V_{REF}$ = 11.19 Vrms)**

### *4.22 Output Stage Efficiency*

Efficiency is tested with two SE channels loaded 4 Ω and one BTL loaded 8 Ω. The board has been preheated for 1 hour at 1/8 output power for all channels.

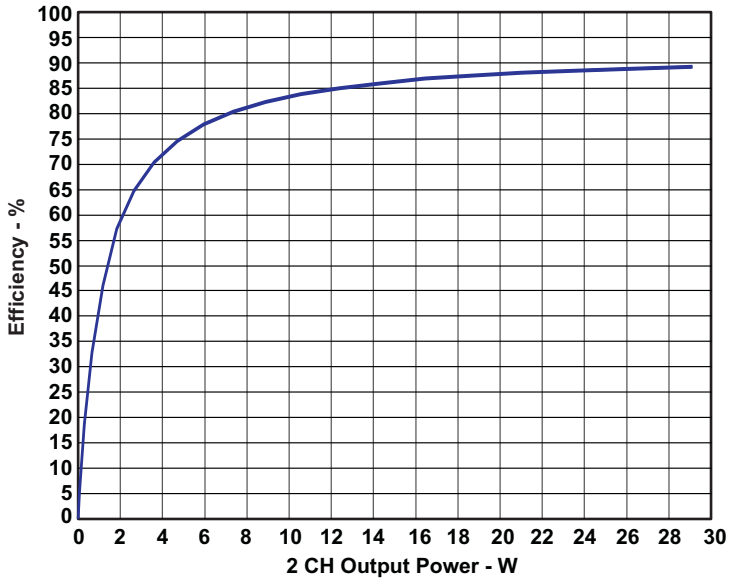



**Figure 27. Output Stage Efficiency**

## 5 Relevant Texas Instruments Data Sheets

The following contains a list of data sheets that have detailed descriptions of the integrated circuits used in the design of the TAS5132DDV6EVM. These data sheets can be obtained from the Texas Instruments Web site at http://www.ti.com.

| Part Number | Literature Number |
|---|---|
| TAS5086 | SLES131 |
| TAS5132 | SLES190 |
| TPS5430 | SLVS632 |
| TPS3801K33 | SLVS219 |
| UA78M12 | SLVS059 |
| TLV2217-33 | SLVS067 |

## 5.1 Additional Documentation

1. *PC Configuration Tool for TAS5086* (TAS5086 GUI ver. 4.0 or later). Located on PurePath CD-ROM.
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 Amplifiers* (SLEA047)
6. *PurePath Digital™ AM Interference Avoidance* (SLEA040)
7. *Click and Pop Measurements Technique* (SLEA044)
8. *Power Supply Recommendations for DVD Receivers* (SLEA027)
9. *Implementation of Power Supply Volume Control* (SLEA038)

# Appendix A Design Documents

The following sections comprise this appendix.


- A.1. TAS5132DDV6EVM Schematic
- A.2. TAS5132DDV6EVM Parts List
- A.3. TAS5132DDV6EVM PCB Specification
- A.4. TAS5132DDV6EVM PCB Layers

## A.1 TAS5132DDV6EVM Schematic

The TAS5132DDV6EVM schematic drawing sheets are appended to this page.

| | |
|---|---|
| Design Name: | **TAS5132DDV6EVM** |
| Type: | Mass Market Evaluation Module |
| File Name: | A814-SCH-001(4.00).DSN |
| Version: | 4.00 |
| Date: | 10.Jan.2007 |
| Design Engineer: | Tomas Bruunshuus (tbs@ti.com), Jonas Holm (jlh@ti.com) |
| Audio Configuration: | 5.1 PurePath Digital Amplifier Design<br>1 x TAS5086, 2 x TAS5132DDV |
| Interfaces: | J40: 34 pin IDC Header for Control, I2C and +5V<br>J60: 16 pin IDC Header for I2S Audio<br>J101-J106: 2 pin 3.96mm Headers for Speakers<br>J901: 4 pin 3.96mm Header for H-Bridge and System Power Supply |
| Setup: | 4 x 3 ohm and 2 x 6 ohm Speaker Loads<br>+18V H-Bridge and +18V System Power Supplies |
| Performance: | 4 x 13W/3ohm (SE) + 2 x 26W/6ohm (BTL) - all 10% THD+N<br>105dB Dynamic Range |

Page


1/6: Front Page and Schematic Disclaimer
2/6: Overview - Modulator, Input/Output Connectors
3/6: 4 Channel SE Power Stage (FL, FR, SL, and SR)
4/6: 2 Channel BTL Power Stage (C and LFE SW)
5/6: Power Supplies
6/6: Mechanics



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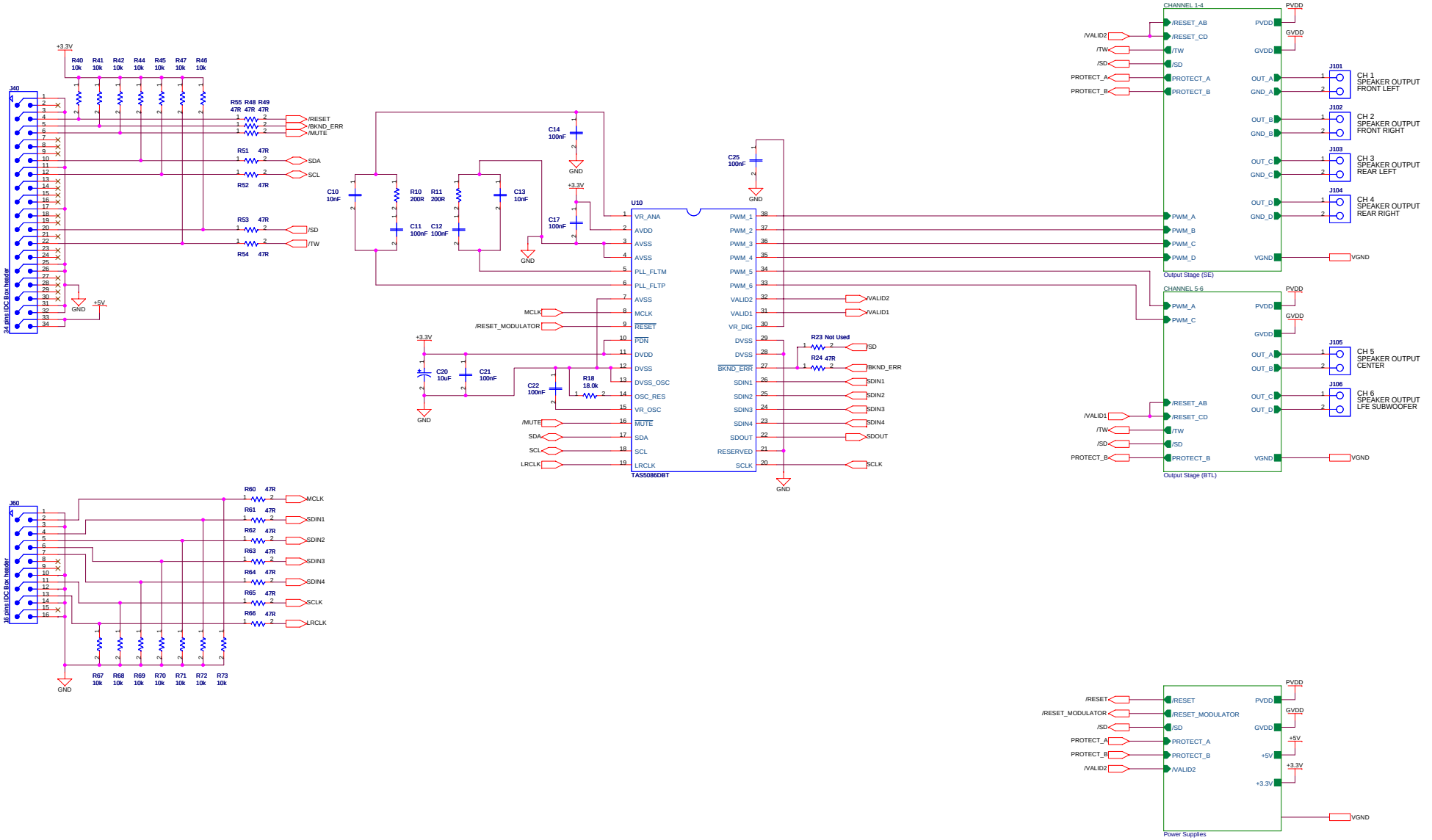
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Parts List No.2

| | |
|---|---|
| Texas Instruments | DIGITAL AUDIO & VIDEO DIVISION<br>ALL RIGHTS RESERVED - PATENTS PENDING<br>TEXAS INSTRUMENTS INCORPORATED |
| Project: TAS5132DDV6EVM | Rev: 4.00 |
| Page Title: Schematic Disclaimer | Size: A2 |
| File Name: A814-SCH-001.DSN | Engineer: Tomas Bruunshuus |
| Date: Wednesday, January 10, 2007 | Page: 1 of 6 |

# TAS5132DDV6EVM




Parts List No.2

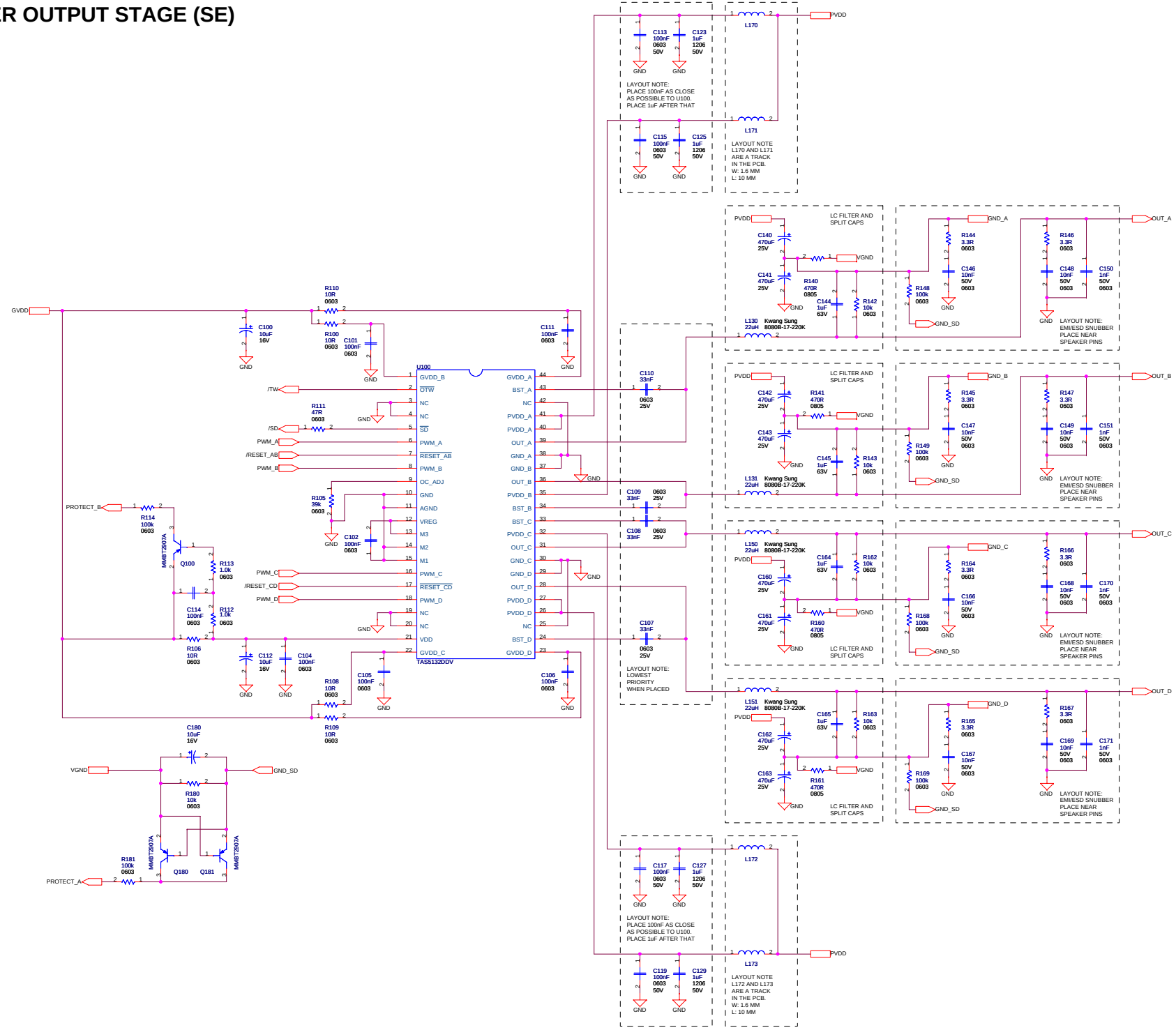
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|---|---|
| Project: TAS5132DDV6EVM | Rev: 4.00 |
| Page Title: Overview | Size: A2 |
| File Name: A814-SCH-001.DSN | Engineer: Tomas Bruunshuus |
| Date: Wednesday, January 10, 2007 | Page: 2 of 6 |

# POWER OUTPUT STAGE (SE)

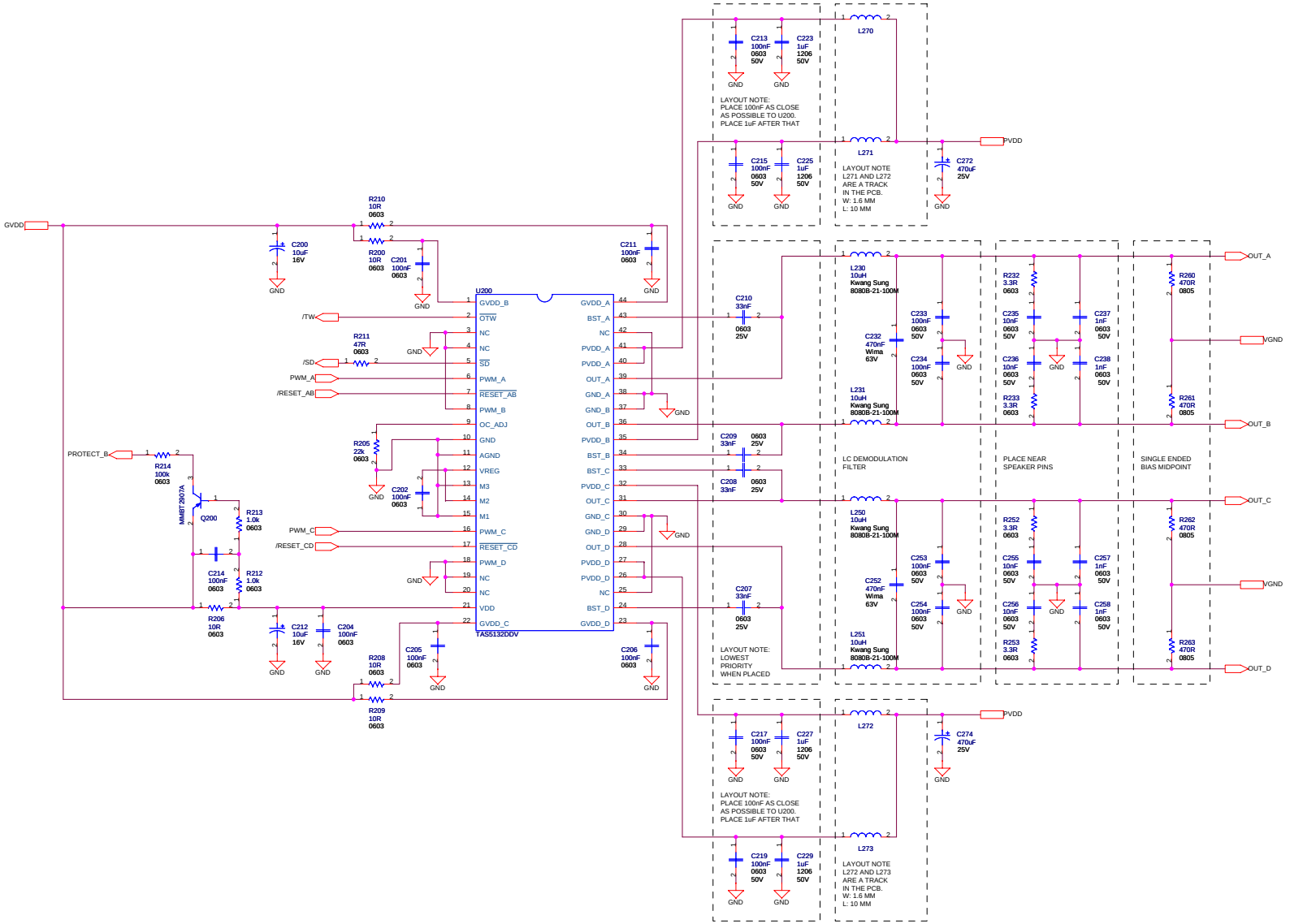



Patents pending in circuitry design and layout (WO99/59241 & WO99/59242). This circuitry may only be used together with the integrated circuit TAS5142DDV from Texas Instruments Incorporated.

Parts List No.2

| | |
|---|---|
| TEXAS INSTRUMENTS | DIGITAL AUDIO & VIDEO DIVISION |
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| Project: TAS5132DDV6EVM | Rev: 4.00 |
| Page Title: Power Output Stage (SE) | Size: A2 |
| File Name: A814-SCH-001.DSN | Engineer: Tomas Bruunshuus |
| Date: Tuesday, January 02, 2007 | Page: 3 of 6 |

# POWER OUTPUT STAGE (BTL)




Patents pending in circuitry design and layout (WO99/59241 & WO99/59242). This circuitry may only be used together with the integrated circuit TAS5142DDV from Texas Instruments Incorporated.

Parts List No.2

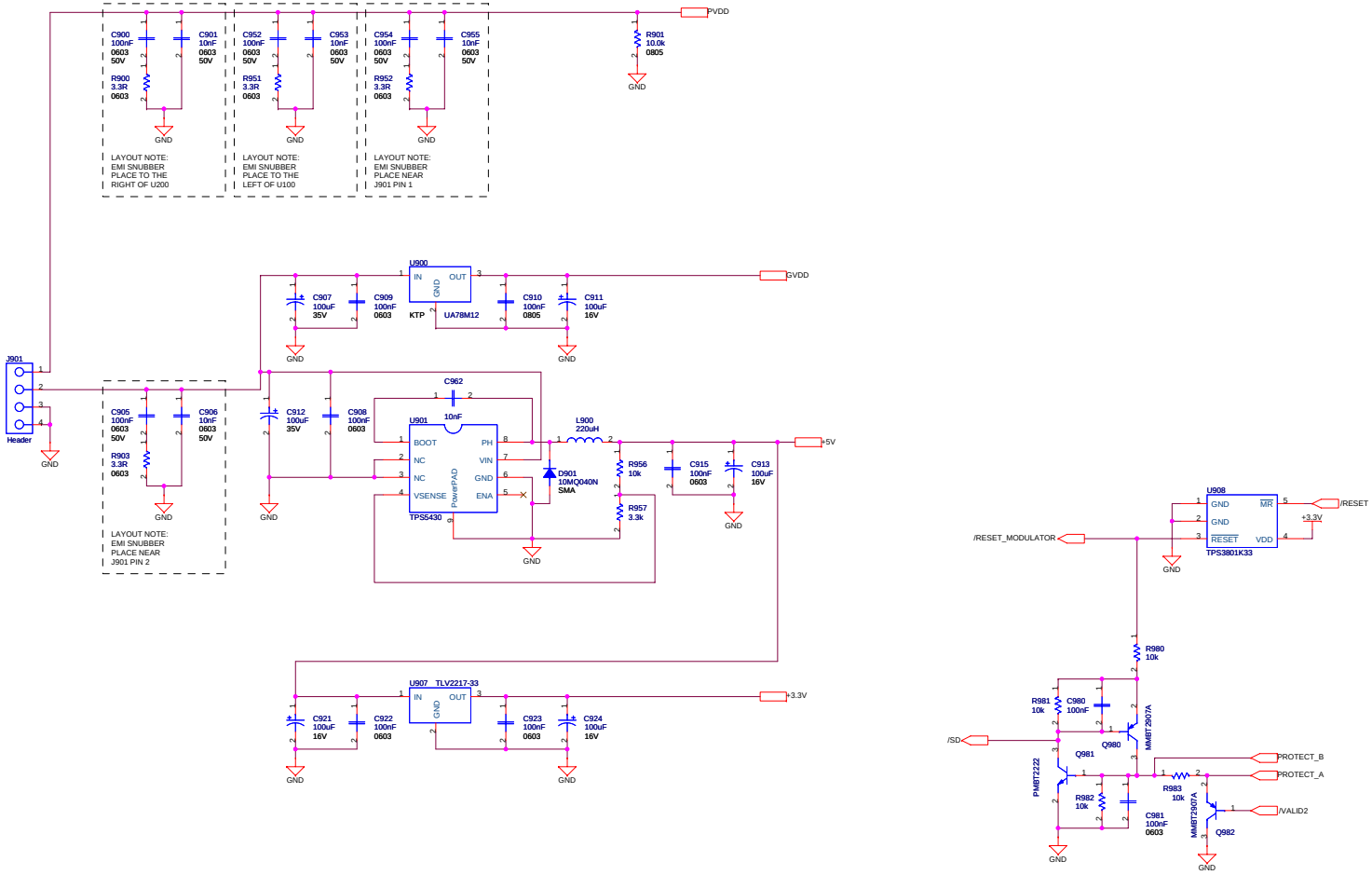
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|---|---|
| Project: TAS5132DDV6EVM | Rev: 4.00 |
| Page Title: Power Output Stage (BTL) | Size: A2 |
| File Name: A814-SCH-001.DSN | Engineer: Tomas Bruunshuus |
| Date: Wednesday, January 10, 2007 | Page: 4 of 6 |

# POWER SUPPLIES




Parts List No.2

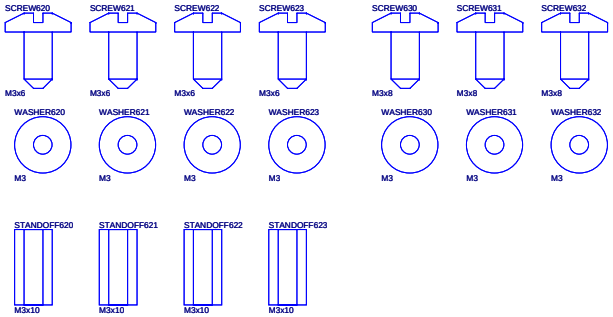
TEXAS INSTRUMENTS

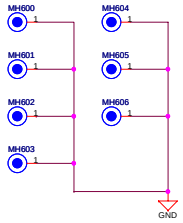
DIGITAL AUDIO & VIDEO DIVISION

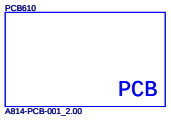
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| | |
|---|---|
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| Page Title: Power Supplies | Size: A2 |
| File Name: A814-SCH-001.DSN | Engineer: Tomas Bruunshuus |
| Date: Tuesday, January 02, 2007 | Page: 5 of 6 |

# MECHANICS




Parts List No.2

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| Project: TAS5132DDV6EVM | Rev: 4.00 |
| Page Title: Mechanics | Size: A2 |
| File Name: A814-SCH-001.DSN | Engineer: Tomas Bruunshuus |
| Date: Wednesday, January 10, 2007 | Page: 6 of 6 |

## A.2 TAS5132DDV6EVM Parts List

The TAS5132DDV6EVM parts lists is appended to this page.

# TAS5132DDV6EVM Parts List (2.00)

| Qty | Part Reference | Description | Manufacture | First Mfr P/N |
|---|---|---|---|---|
| 1 | R901 | 10.0k/125mW 1% 0805 Metal Film Resistor | BC Components | DCU 0805 1% 10k0 |
| 8 | R140 R141 R160 R161 R260 R261 R262 R263 | 470R/125mW 1% 0805 Metal Film Resistor | BC Components | DCU 0805 1% 470R |
| 4 | R112 R113 R212 R213 | 1.0k/100mW 5% 0603 Metal Film Resistor | BC Components | DCT 0603 5% 1k00 |
| 24 | R40 R41 R42 R44 R45 R46 R47 R67 R68 R69 R70 R71 R72 R73 R142 R143 R162 R163 R180 R956 R980 R981 R982 R983 | 10k/100mW 5% 0603 Metal Film Resistor | BC Components | DCT 0603 5% 10k0 |
| 7 | R114 R148 R149 R168 R169 R181 R214 | 100k/100mW 5% 0603 Metal Film Resistor | BC Components | DCT 0603 5% 100k |
| 10 | R100 R106 R108 R109 R110 R200 R206 R208 R209 R210 | 10R/100mW 5% 0603 Metal Film Resistor | BC Components | DCT 0603 5% 10R0 |
| 1 | R18 | 18.0k/100mW 1% 0603 Metal Film Resistor | BC Components | DCT 0603 1% 18k0 |
| 2 | R10 R11 | 200R/100mW 5% 0603 Metal Film Resistor | BC Components | DCT 0603 5% 200R |
| 1 | R205 | 22k/100mW 5% 0603 Metal Film Resistor | BC Components | DCT 0603 5% 22k0 |
| 1 | R957 | 3.3k/100mW 5% 0603 Metal Film Resistor | BC Components | DCT 0603 5% 3k30 |
| 16 | R144 R145 R146 R147 R164 R165 R166 R167 R232 R233 R252 R253 R900 R903 R951 R952 | 3.3R/100mW 5% 0603 Metal Film Resistor | BC Components | DCT 0603 5% 3R30 |
| 1 | R105 | 39k/100mW 5% 0603 Metal Film Resistor | BC Components | DCT 0603 5% 39k0 |
| 17 | R24 R48 R49 R51 R52 R53 R54 R55 R60 R61 R62 R63 R64 R65 R66 R111 R211 | 47R/100mW 5% 0603 Metal Film Resistor | BC Components | DCT 0603 5% 47R0 |
| 1 | C910 | Ceramic 100nF/50V 20% X7R 0805 Capacitor | BC Components | 0805B104M500NT |
| 8 | C123 C125 C127 C129 C223 C225 C227 C229 | Ceramic 1uF/50V 10% X7R 1206 Capacitor | TDK | C3216X7R1H105K |
| 19 | C10 C13 C146 C147 C148 C149 C166 C167 C168 C169 C235 C236 C255 C256 C901 C906 C953 C955 C962 | Ceramic 10nF/50V 20% X7R 0603 Capacitor | BC Components | 0603B103M500NT |
| 23 | C11 C12 C14 C17 C21 C22 C25 C101 C102 C104 C105 C106 C111 C114 C201 C202 C204 C205 C206 C211 C214 C980 C981 | Ceramic 100nF/16V 20% X7R 0603 Capacitor | BC Components | 0603B104M160NT |
| 21 | C113 C115 C117 C119 C213 C215 C217 C219 C233 C234 C253 C254 C900 C905 C908 C909 C915 C922 C923 C952 C954 | Ceramic 100nF/50V 20% X7R 0603 Capacitor | Vishay | VJ0603Y104MXATW1BC |
| 8 | C107 C108 C109 C110 C207 C208 C209 C210 | Ceramic 33nF/25V 20% X7R 0603 Capacitor | BC Components | 0603B333M250NT |
| 8 | C150 C151 C170 C171 C237 C238 C257 C258 | Ceramic 1nF/50V 10% NP0 0603 Capacitor | BC Components | 0603N102K500NT |
| 6 | C20 C100 C112 C180 C200 C212 | Electrolytic 10uF/16V 20% Aluminium 1.5mm ø4mm Ultra-Mini Series Capacitor | Sang Jing Electronics | UMR16V106M4X5 |
| 2 | C907 C912 | Electrolytic 100uF/35V 20% Aluminium 3.5mm ø8mm FC Series - Low Impedance Capacitor | Panasonic | EEUFC1V101 |
| 4 | C911 C913 C921 C924 | Electrolytic 100uF/16V 20% Aluminium 2.5mm ø6.3mm Ultra-Mini Series Capacitor | Sang Jing Electronics | UMR16V107M6.3X5 |
| 10 | C140 C141 C142 C143 C160 C161 C162 C163 C272 C274 | Electrolytic 470uF/25V 20% Aluminium 5mm ø10mm FC Series - Low Impedance Capacitor | Panasonic | EEUFC1E471 |
| 4 | C144 C145 C164 C165 | Metal Film 1uF/63V 10% Polyester 5mm (W:5.0mm L:7.2mm) Capacitor | Wima | MKS 2 1uF/10%/63Vdc PCM5 |
| 2 | C232 C252 | Metal Film 470nF/63V 10% Polyester 5mm (W:4.5mm L:7.2mm) Capacitor | Wima | MKS 2 0.47uF/10%/63Vdc PCM5 |
| 1 | L900 | 220uH/0.5A 20% (390mR) Magnetically shielded Ferrite Inductor | CoilCraft | DT3316P-224 |
| 4 | L230 L231 L250 L251 | 10uH/Ferrite Inductor | Kwang Sung | 8080B-21-100M |
| 4 | L130 L131 L150 L151 | 22uH/Ferrite Inductor | Kwang Sung | 8080B-17-220K |
| 1 | D901 | 1A/40V Schottky Diode (SMA) | Int. Rectifier | 10MQ040N |
| 1 | Q981 | 600mA/40V NPN Small signal Transistor (SOT-23) | Philips | PMBT2222 |
| 6 | Q100 Q180 Q181 Q200 Q980 Q982 | 800mA/40V PNP Small signal Transistor (SOT-23) | Fairchild | MMBT2907A |
| 1 | U10 | 6 ch PWM processor (SE, VOL, 192kHz, I2S out) (TSSOP38) | Texas Instruments | TAS5086DBT |
| 2 | U100 U200 | 4ch/2ch/1ch Digital Audio PWM Power Output Stage (DDV44) | Texas Instruments | TAS5132DDV |
| 1 | U908 | 3.3V Supply Voltage Supervisor (SOT323-5) | Texas Instruments | TPS3801K33DCK |
| 1 | U900 | 12V/500mA Positive Voltage Regulator (KTP) | Texas Instruments | UA78M12CKTPR |
| 1 | U907 | 3.3V Low Dropout Voltage Regulator (KTP) | Texas Instruments | TLV2217-33KTPR |
| 1 | U901 | 5V/3A Buck Converter (SO8) | Texas Instruments | TPS5430DDA |
| 4 | SCREW620 SCREW621 SCREW622 SCREW623 | M3x6, Pan Head, Pozidriv, A2 Screw | Bossard | BN 81882 M3x6 |
| 3 | SCREW630 SCREW631 SCREW632 | M3x8, Pan Head, Pozidriv, A2 Screw | Bossard | BN 81882 M3x8 |
| 4 | WASHER620 WASHER621 WASHER622 WASHER623 | M3 Stainless Steel Washer | Bossard | BN 670 M3 |
| 3 | WASHER630 WASHER631 WASHER632 | M3 Stainless Steel Spring Washer | Bossard | BN 760 M3 |
| 4 | STANDOFF620 STANDOFF621 STANDOFF622 STANDOFF623 | M3x10 Aluminium Stand-off | Ettinger | 05.03.108 |
| 6 | J101 J102 J103 J104 J105 J106 | 2 pins/1 row/3.96mm Pitch Vertical Male Pin header | JST | B2P-VH |
| 1 | J901 | 4 pins/1 row/3.96mm Pitch Vertical Male Pin header | JST | B4P-VH |
| 1 | J60 | 16 pins/2 rows/2.54mm Pitch Vertical Male IDC | Molex | 87256-1611 |
| 1 | J40 | 34 pins/2 rows/2.54mm Pitch Vertical Male IDC | Molex | 87256-3411 |
| 1 | PCB610 | TAS5132DDV6EVM Printed Circuit Board (ver. 2.00) | Printline | A814-PCB-001(2.00) |

## A.3 TAS5132DDV6EVM Specifications

The TAS5132DDV6EVM PCB specification is appended to this page.

*Jonas Holm*

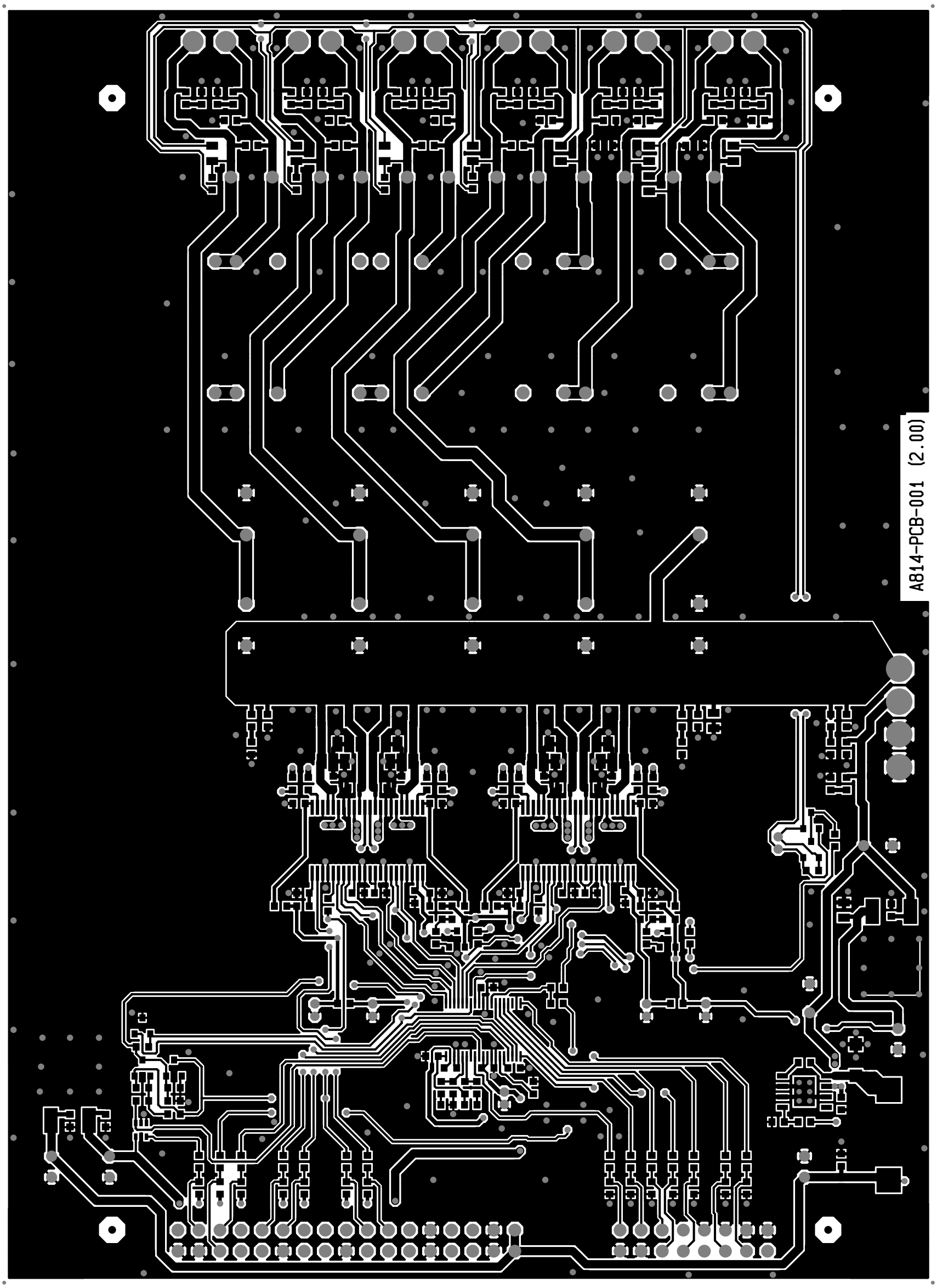
# TAS5132DDV6EVM
# PCB SPECIFICATION
Version 2.00

| | |
|---|---|
| BOARD IDENTIFICATION: | A814-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: | 112 x 154 mm |
| COMMENTS: | SEE DRILL INFORMATION FILE (5209pcb.PDF). |

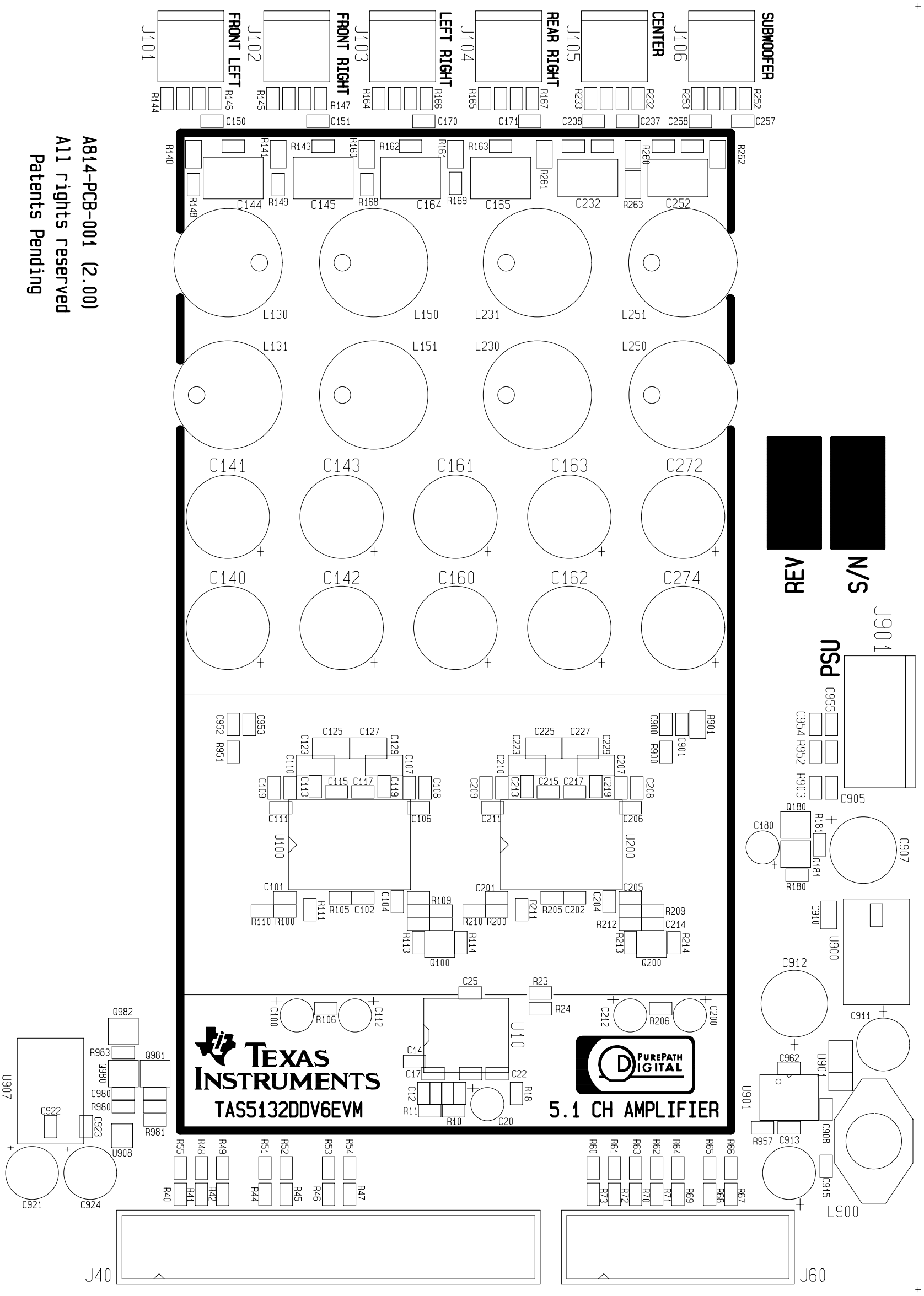
## A.4 TAS5132DDV6EVM PCB Layers

The PCB layers are appended to this page.

| COMPONENT SIDE | DpS 5209 070110 |
| --- | --- |
| TI Denmark A814-PCB-001 (2.00) | |

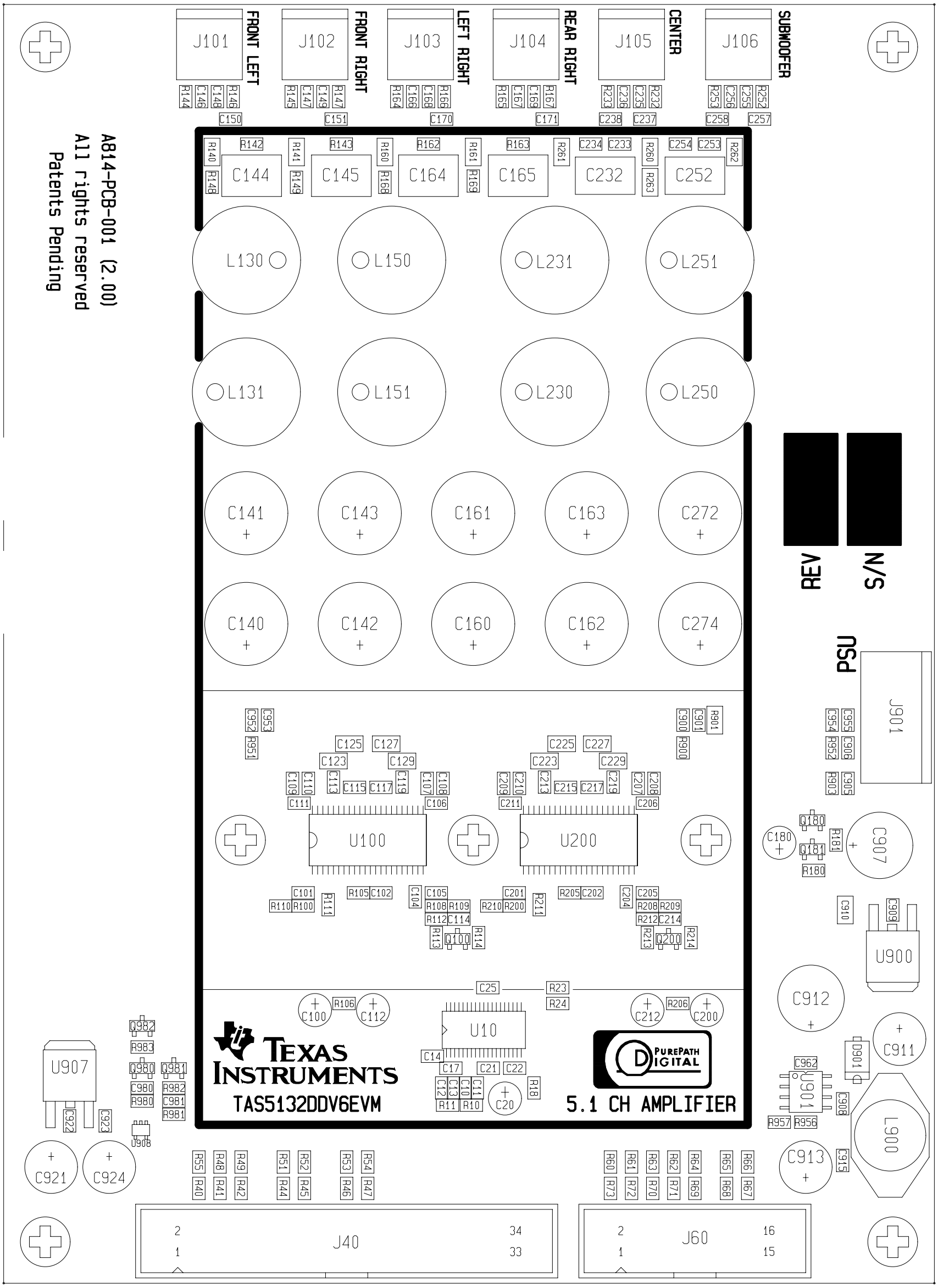


| SILKSCREEN COMP | DpS 5209 070110 |
|---|---|
| TI Denmark A814-PCB-001 (2.00) | |

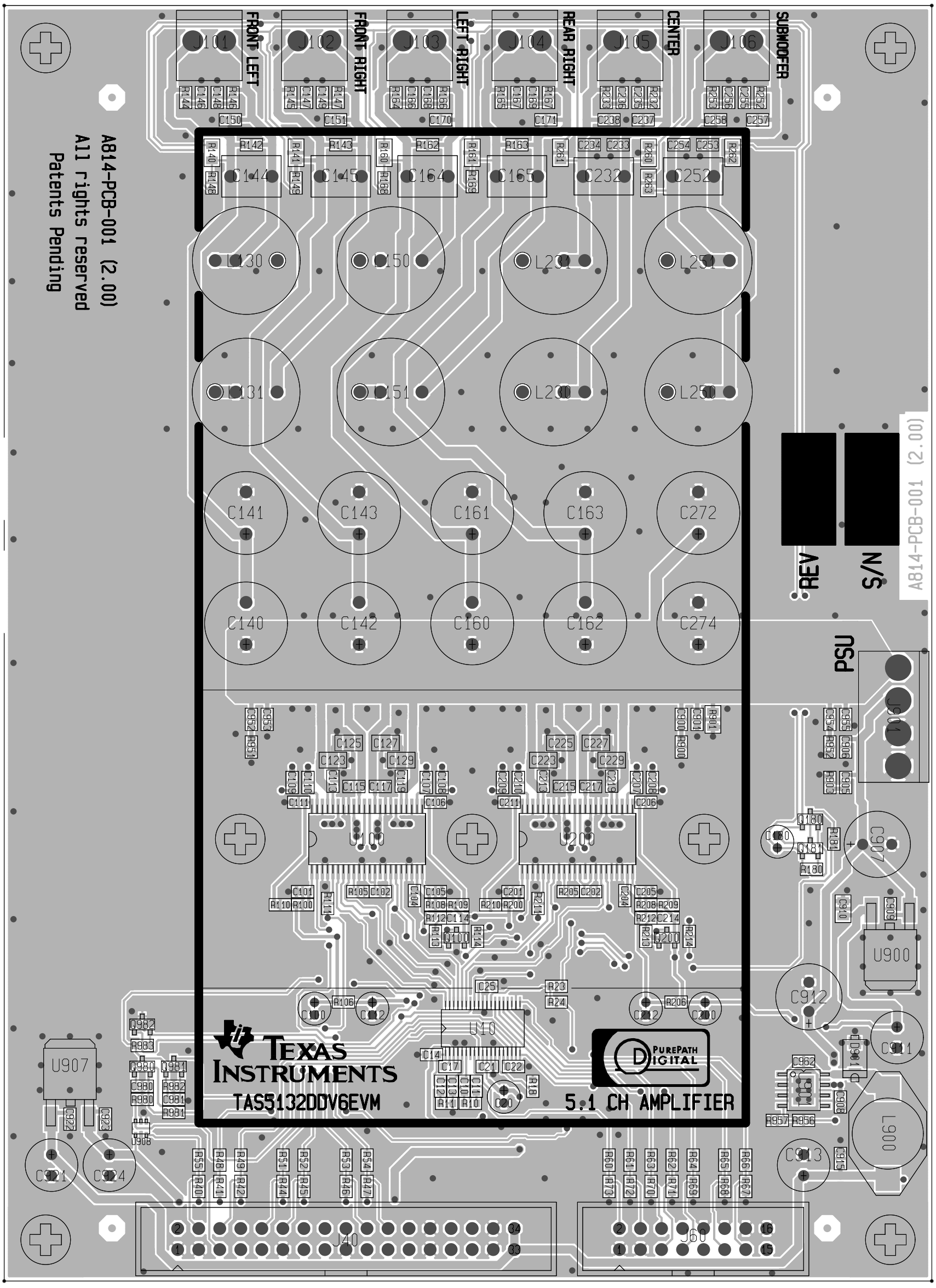



A814-PCB-001 (2.00)
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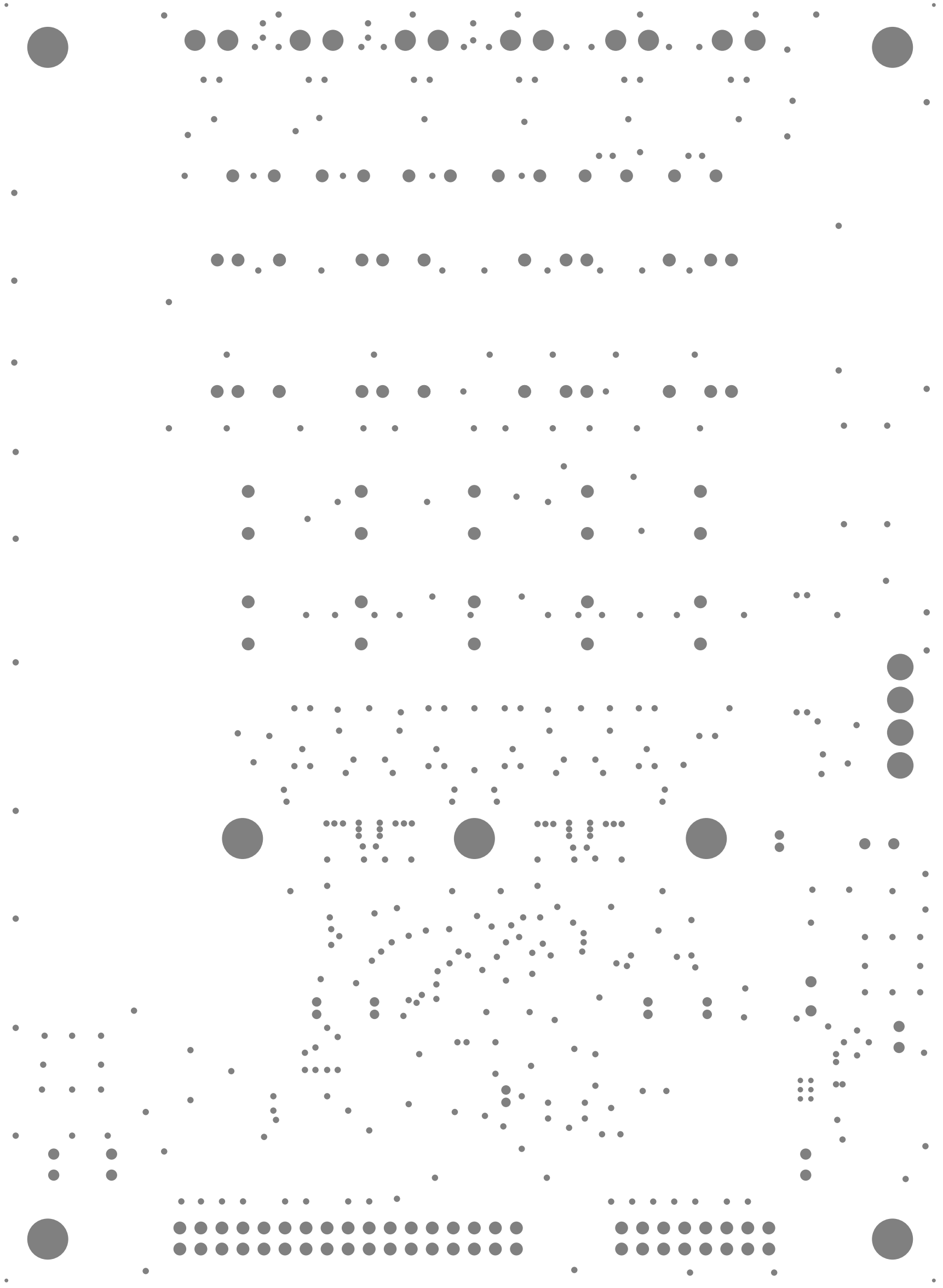
| COMP. LAYOUT COMP | DpS 5209 070110 |
|---|---|
| TI Denmark A814-PCB-001 (2.00) | |



| COMP. LAYOUT COMP | DpS 5209 070110 |
| --- | --- |
| TI Denmark A814-PCB-001 (2.00) | |



| INNERLAYER NO : | DpS 5209 070110 |
| --- | --- |
| TI Denmark A814-PCB-001 (2.00) | |



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## EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 15 V to 20 V and the output voltage range of 0 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.

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 75°C. The EVM is designed to operate properly with certain components above 75°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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