

TAS5176DDW6EVM

This user's guide describes the operation of the evaluation module for the TAS5176 Digital Amplifier Power Output Stage using the TAS5086 Digital Audio PWM Processor from Texas Instruments. The user's guide also provides measurement data and design information including schematic, BOM, and PCB layout.

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1 Overview

The TAS5176DDW6EVM PurePath Digital™ customer evaluation module demonstrates the integrated circuits TAS5176DDW and TAS5086DBT from Texas Instruments (TI).

The TAS5176 is a high performance, six-channel, digital-amplifier system with an advanced protection system. The TAS5176 together with a high performance modulator like the TAS5086 shows low noise, low THD+N and low idle power dissipation. Driving into clipping, 10% THD+N, the TAS5176 is capable of sourcing more than 15W into an 8-Ω single-ended load (SE) per each front/satellite channel and a 4-Ω single-ended load (SE) subwoofer greater than 25W.

The TAS5086 is a six-channel digital pulse-width modulator (PWM) that provides both 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, together with a TI input-USB board, is a complete 5.1 channels 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 muxes, and automute. There is a configuration option for power stage failure protection.

Table 1. TAS5176DDW6EVM Specification

Key Parameters	
Output Stage Supply Voltage:	0V – 28V
System Supply Voltage	15V – 28V
Number of Channels	5 x SE 8R, 1x SE 4R
Load Impedance Front/Satellites	8Ω
Load Impedance Subwoofer	4Ω
Output Power Front/Satellites	12W (10% THD+N)
Output Power Subwoofer	24W (10% THD+N)
DNR	>105 dB
PWM Processor	TAS5086DBT
Output Stage	TAS5176DDW
Other Features	—

This 5.1 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 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 TAS5176DDW6EVM Features

- 6 Channel PurePath Digital™ evaluation module (double-sided plated-through PCB layout)
- Self-contained protection system (short circuit and thermal)
- Standard I²S and I²C / control connector for TI input board
- Double-sided plated-through PCB layout

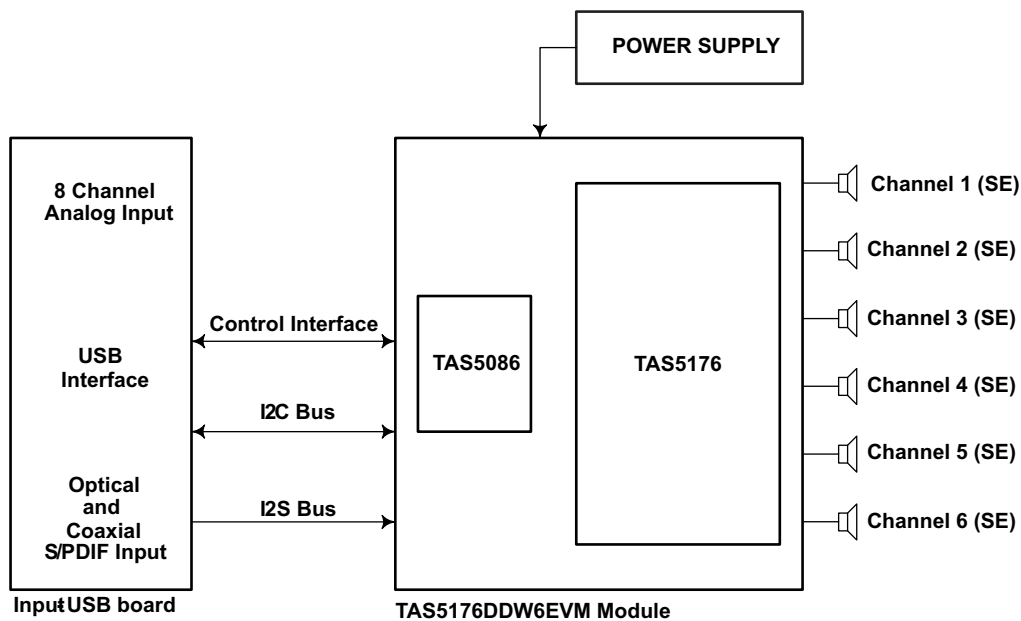


Figure 1. Integrated PurePath Digital™ Amplifier System

1.2 PCB Key Map

The physical structure of the TAS5176DDW6EVM is shown in [Figure 2](#).

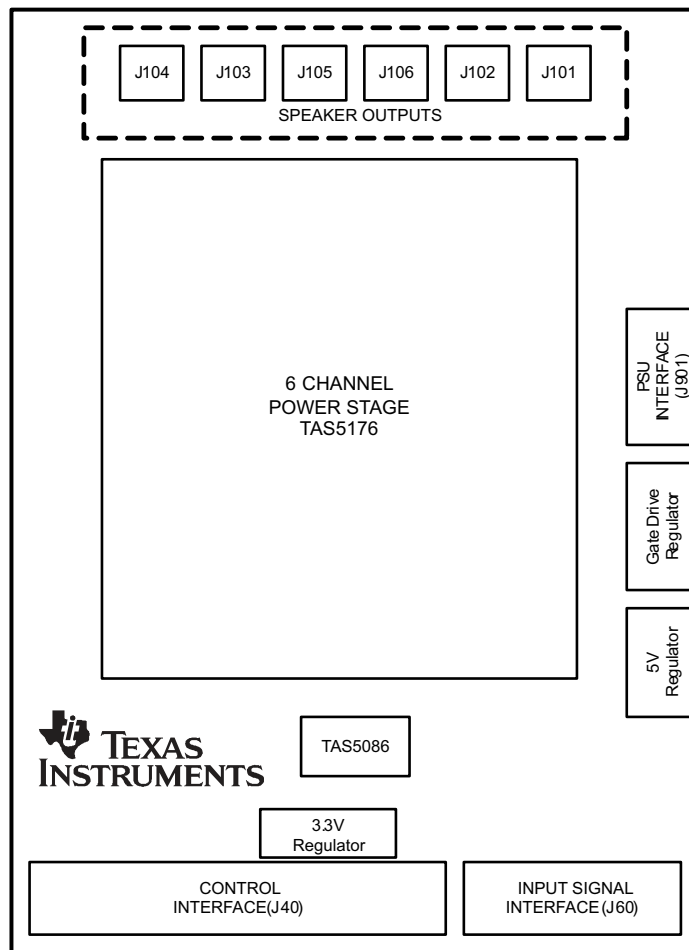


Figure 2. Physical Structure of the TAS5176DDW6EVM (Approximate Layout)

2 Quick Setup Guide

This chapter describes the TAS5176DDW6EVM 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 TAS5176DDW6EVM for device evaluation.

2.1 Electrostatic Discharge Warning

Many of the components on the TAS5176DDW6EVM 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 TAS5176DDW6EVM package, check to make sure that the following items are included:

- 1 TAS5176DDW6EVM board using one TAS5086DBT and one TAS5176DDW
- 1 TI input-USB board for interfacing TAS5176DDW6EVM with SPDIF/analog sources and PC for control
- 1 Signal interface IDC cable for connection to an I²S front-end like the attached TI Input-USB board
- 1 Control interface IDC cable for connection to an I²C front-end like the attached TI Input-USB board
- 1 Cable for connecting input-USB board to a USB port on a PC for TAS5086 control by software
- 1 Power supply cable for two regulated power supplies (H-bridge and system supply)
- 1 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 the input-USB board to the TAS5176DDW6EVM 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. The power supplies are connected to the EVM using the delivered power cable Red/Black, White/Black.

Table 2. Recommended Supply Voltage

Description	Voltage Limitations	Current Requirement	Cable
System power supply	15 V to 28 V	0.3 A	Red/Black
Output stage power supply	0 V to 28 V	2.0 A	White/Black

CAUTION

Applying voltages above the limitations listed in the table above may cause permanent damage to your hardware.

Note: The length of the 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.

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 the 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 the windows menu. Start-up of the GUI will take a few seconds.



Figure 3. TAS5086 GUI Window

From the files menu load the configuration file:

TAS5176DDW6EVM 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 the directory where the GUI is installed. The default is C:\Program Files\Texas Instruments Inc\TAS5086\

For more advanced use of the GUI, refer to the GUI User's Guide and the data manual for the TAS5086.

3 Protection

This chapter describes the short circuit protection and fault reporting circuitry of the TAS5176 device.

3.1 Short Circuit Protection and Fault Reporting Circuitry

The TAS5176 is a self-protecting device that provides fault reporting (including high-temperature protection and short circuit protection). The TAS5176 is configured in back-end auto-recovery mode and therefore resets automatically after all errors (M1 and M2 are set low), see the datasheet for further explanation. This means that the device will re-start itself after an error occurs and report shortly through the \overline{SD} error signal.

3.2 Fault Reporting

The \overline{OTW} and \overline{SD} outputs from the TAS5176 indicate fault conditions. Refer to the TAS5176 data manual for a description of these pins.

Table 3. TAS5176 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	Under voltage lockout or high current error
1	1	Normal operation, no errors/warnings

The temperature warning signals at the TAS5176DDW6EVM board are wire-ORed to the temperature warning signal (\overline{OTW} – pin 22 in the control interface connector).

Shutdown signals are wire-ORed into the shutdown signal (\overline{SD} – pin 20 in the control interface connector).

The shutdown signals will together with the temperature warning signal provide chip state information as described in [Table 3](#). Device fault reporting outputs are open-drain outputs.

4 TAS5176DDW6EVM Performance

Table 4. General Test Specifications

General Test Conditions		Notes
Output Stage Supply Voltage	28 V	Laboratory Power Supply (EA-PS 7065-10A)
System Supply Voltage	15 V	
Load Impedance Front/Satellites	8 Ω	
Load Impedance Subwoofer	4 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 1.00	TAS5176DDW6EVM Configuration (1.00).cfg

Table 5. TAS5086 Register Settings⁽¹⁾

Register	Register	Value	Notes
Oscillator Trim Register	0x1B	00	Initiate factory trim
Split Cap Register	0x1A	1F	Set split-cap charge period to 9.6 sec
Master Volume Register	0x07	4E	Master volume set to -15 dB
Modulation Limit Register	0x10	04	Modulation Index set to 96.1%
PWM Start Register	0x18	3F	Channel 1-6 set to start part 1
System Control Register	0x05	20	PWM start

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

Table 6. Electrical Data

Electrical Data		Notes/Conditions
Ch 1-5 Output Power, 8 Ω	10 W	1 kHz, unclipped (0 dBFS), $T_A = 25^\circ\text{C}$
Ch 1-5 Output Power, 8 Ω : (10% THD+N)	12 W	1 kHz, $T_A = 25^\circ\text{C}$
Ch 6 Output Power, 4 Ω	20 W	1 kHz, unclipped (0 dBFS), $T_A = 25^\circ\text{C}$
Ch 6 Output Power, 4 Ω : (10% THD+N)	24 W	1 kHz, $T_A = 25^\circ\text{C}$
Ch 1-5 Maximum Peak Current	>4 A	1 kHz burst, 1 Ω , $R_{OC} = 27\text{ k}\Omega$
Ch 6 Maximum Peak Current	>6 A	1 kHz burst, 1 Ω , $R_{OC} = 27\text{ k}\Omega$
Ch 1-5 Damping Factor	16	1 kHz, relative to 8 Ω load
Ch 6 Damping Factor	14	1 kHz, relative to 4 Ω load
Output Stage Efficiency	88%	1 kHz, $2 \times 7.5\text{ W}$, 4 Ω + $1 \times 16\text{ W}$
System Supply Current	<150 mA	1 kHz, -60 dBFS signal (with TI Input-USB Board)
H-Bridge Supply Current	<100 mA	1 kHz, -60 dBFS signal
Total Board Idle Power Consumption	5 W	H-Bridge supply + System supply, -60dBFS signal

Table 7. Audio Performance Data

Audio Performance			Notes/Conditions
Ch 1-5 THD+N, 8 Ω:	1 W	< 0.1 %	1 kHz
Ch 1-5 THD+N, 8 Ω:	5 W	< 0.2 %	1 kHz
Ch 1-5 THD+N, 8 Ω:	12 W	< 0.2 %	1 kHz
Ch 6 THD+N, 4 Ω:	1 W	< 0.09 %	1 kHz
Ch 6 THD+N, 4 Ω:	10 W	< 0.09 %	1 kHz
Ch 6 THD+N, 4 Ω:	24 W	< 0.09 %	1 kHz
Ch 1-5 Dynamic Range:		> 105 dB	Ref: rated power, A-weighted, AES17 filter
Ch 1-5 Noise Voltage		< 50 μVrms	A-weighted, AES17 filter
Ch 6 Dynamic Range:		> 105 dB	Ref: rated power, A-weighted, AES17 filter
Ch 6 Noise Voltage		< 50 μVrms	A-weighted, AES17 filter
Ch 1-5 Click/Pop		< 5 mV	Mute/Unmute, No input signal, 8 Ω, 9.6 sec start-up delay
Ch 6 Click/Pop		< 20 mV	Mute/Unmute, No input signal, 4 Ω, 9.6 sec start-up delay
Ch 1-2 Channel Separation		> 60 dB	1 kHz, unclipped (0 dBFS)
Ch 1-5 Frequency Response 100 Hz–20 kHz		±0.75 dB	10 W / 8 Ω, unclipped (0 dBFS)
Ch 6 Frequency Response 20 Hz–1 kHz		±0.75 dB	20 W / 4 Ω, unclipped (0 BFS)

Table 8. Thermal Specification

Thermal specification	T _{DEVICE} ⁽¹⁾	Notes/Conditions
Idle, All Channels Switching	52°C	1 kHz, 15 min, –60 dBFS signal, T _A = 25°C
5 × 1.5 W, 8 Ω + 1 × 3 W, 4 Ω (1/8)	78°C	1 kHz, 1 hour, T _A = 25°C
2 × 12 W, 8 Ω (full power)	85°C	1 kHz, 5 min, T _A = 25°C

⁽¹⁾ Measured on devices (average) **NO HEATSINK!**

Table 9. Physical Specifications

Physical Specifications ⁽¹⁾		Notes/Conditions
PCB Dimensions	88 mm × 147 mm	Width × Length (mm)
Total Weight	140 g	Components + PCB + Mechanics

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

4.1 THD+N vs Power (ch 1-5 / 8 Ω)

Gain: +2.2 dB set in the TAS5086

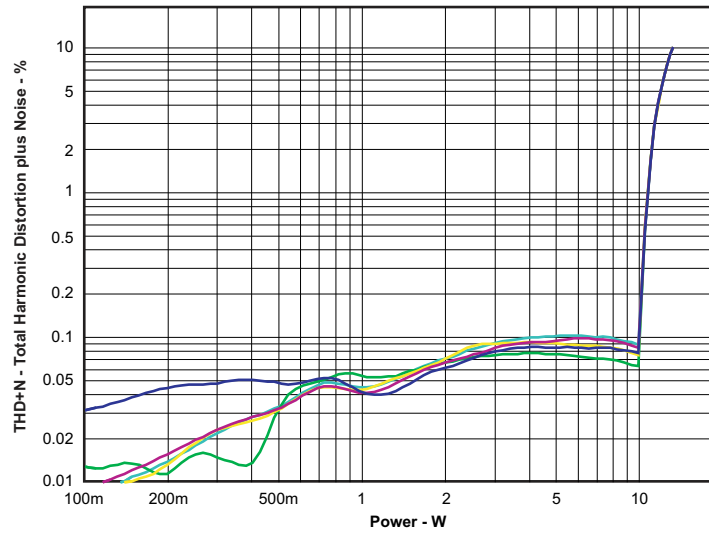


Figure 4. THD+N vs Power (ch 1-5 / 8 Ω)

4.2 THD+N vs Power (ch 6 / 4 Ω)

Gain: +2.2 dB set in the TAS5086

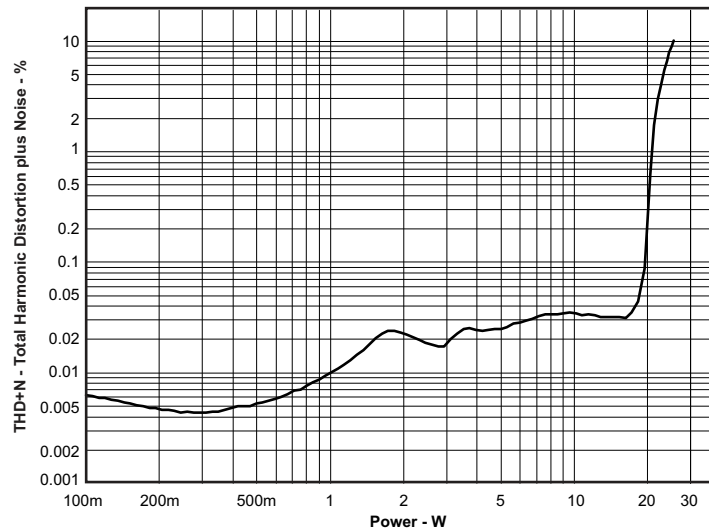


Figure 5. THD+N vs Power (ch 6 / 4 Ω)

4.3 THD+N vs Frequency (ch 1 / 8 Ω)

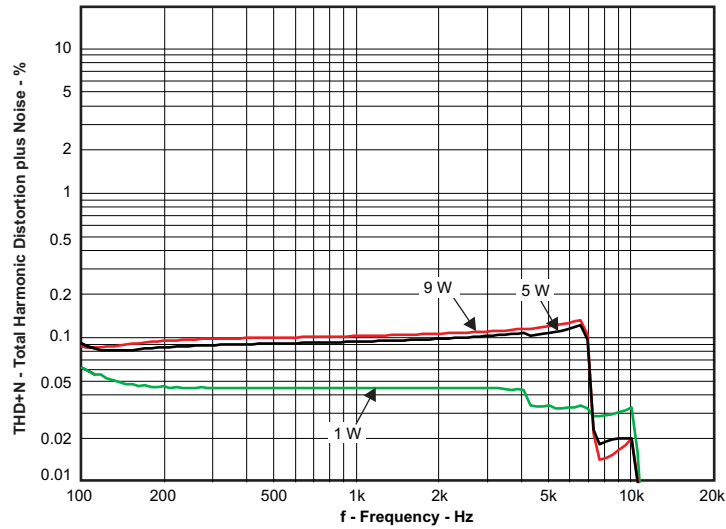


Figure 6. THD+N vs Frequency (ch 1 / 8 Ω)

4.4 THD+N vs Frequency (ch 6 / 4 Ω)

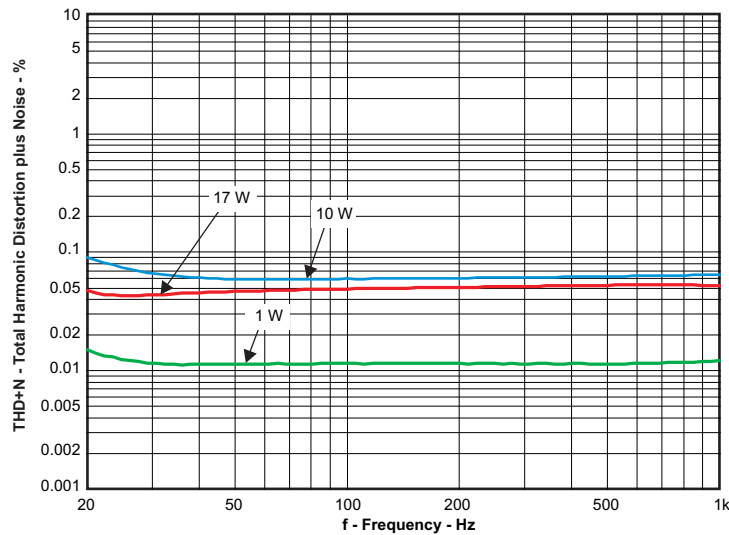


Figure 7. THD+N vs Frequency (ch 6 / 4 Ω)

4.5 FFT Spectrum with -60 dBFS (ch 1)

Reference voltage is 9.0 V_{RMS}, FFT size 16k.

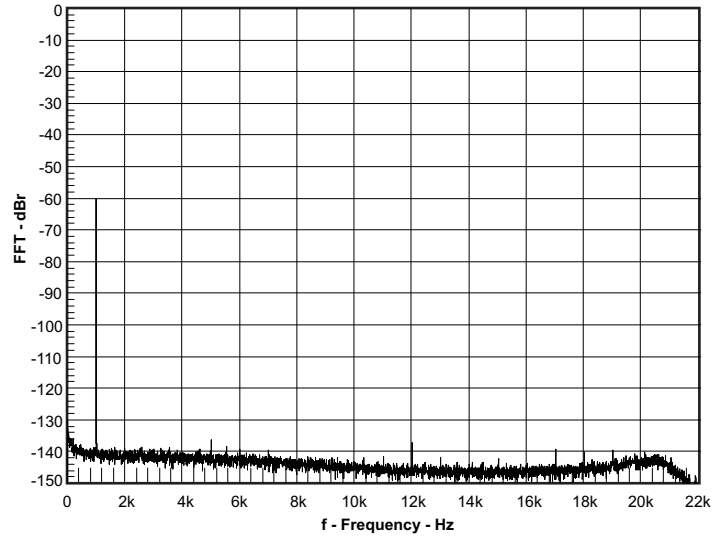


Figure 8. FFT Spectrum with -60 dBFS (ch 1)

4.6 FFT Spectrum with -60 dBFS Signal (ch 6)

Reference voltage is 9.3 V_{RMS}, FFT size 16k.

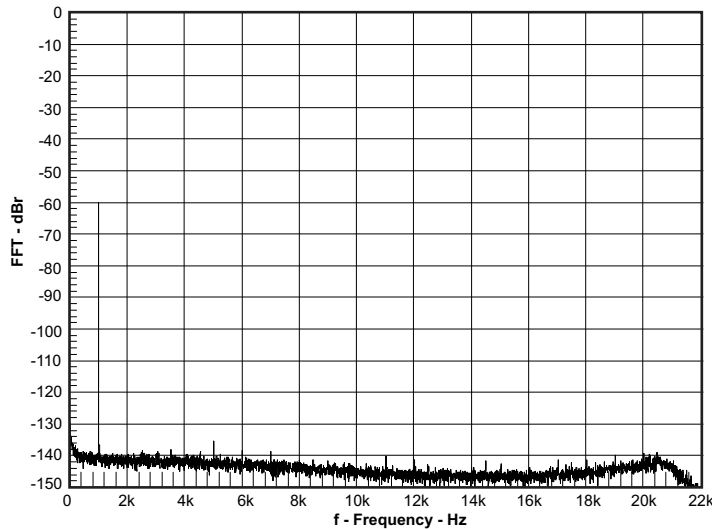


Figure 9. FFT Spectrum with -60 dBFS Signal (ch 6)

4.7 Idle Noise FFT Spectrum (ch 1)

Reference voltage is 9.0 V_{RMS}, FFT size 16k.

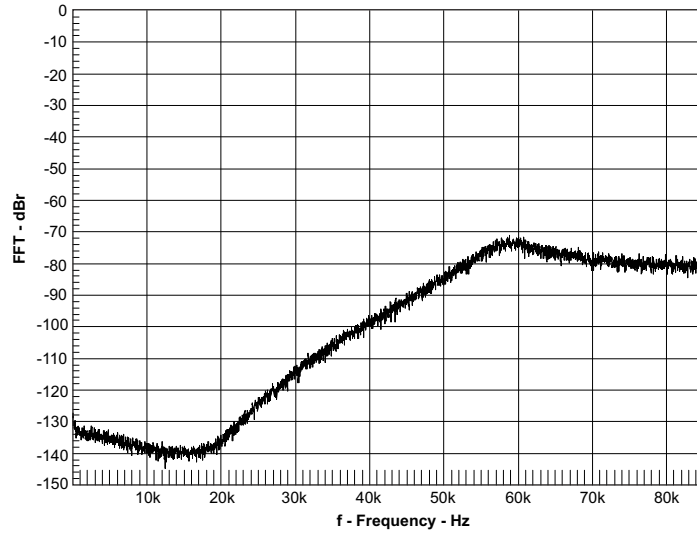


Figure 10. Idle Noise FFT Spectrum (ch 1)

4.8 Idle Noise FFT Spectrum (ch 6)

Reference voltage is 9.3 V_{RMS}, FFT size 16k.

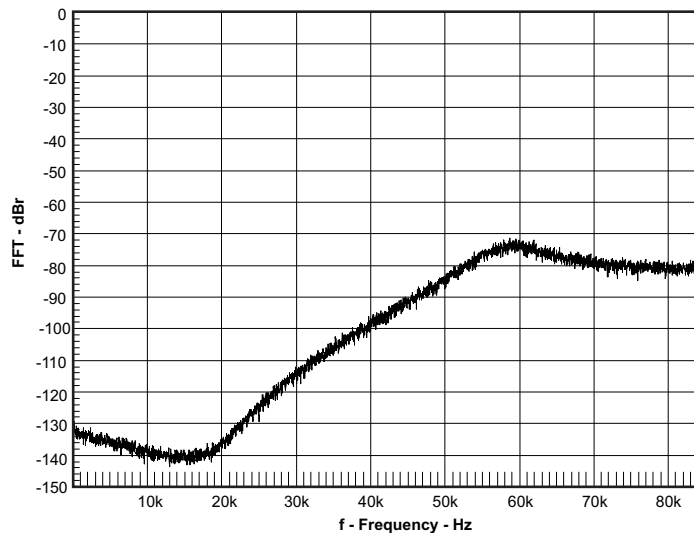


Figure 11. Idle Noise FFT Spectrum (ch 6)

4.9 Channel Separation (1-2)

Channel separation is tested for front two channels, channel 1 and channel 2.
 8 Ω Loads are used for both channels.
 Channel 1 input signal is 0dBFS, channel 2 is muted.
 Reference voltage is 9.0 V_{RMS}.

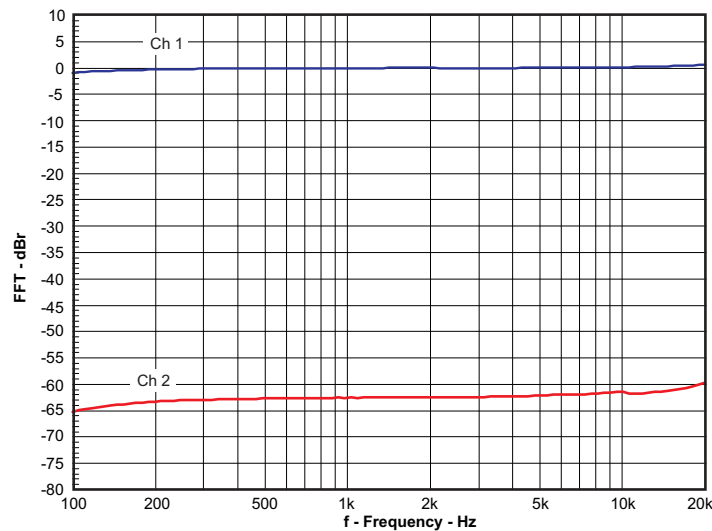


Figure 12. Channel Separation (1-2)

4.10 Channel Separation (6-5)

Channel separation is tested for subwoofer to center channel, channel 6 and channel 5.
 8 Ω Load is used for channel 5, 4 Ω load is used for channel 6.
 Channel 6 input signal is 0dBFS, channel 5 is muted.
 Reference voltage is 9.3 V_{RMS}.

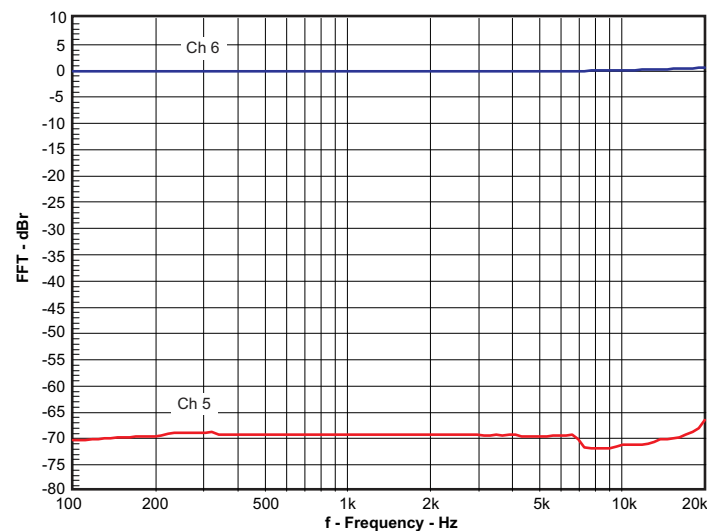


Figure 13. Channel Separation (6-5)

4.11 Frequency Response (ch 1)

Measurement bandwidth filter 80 kHz.

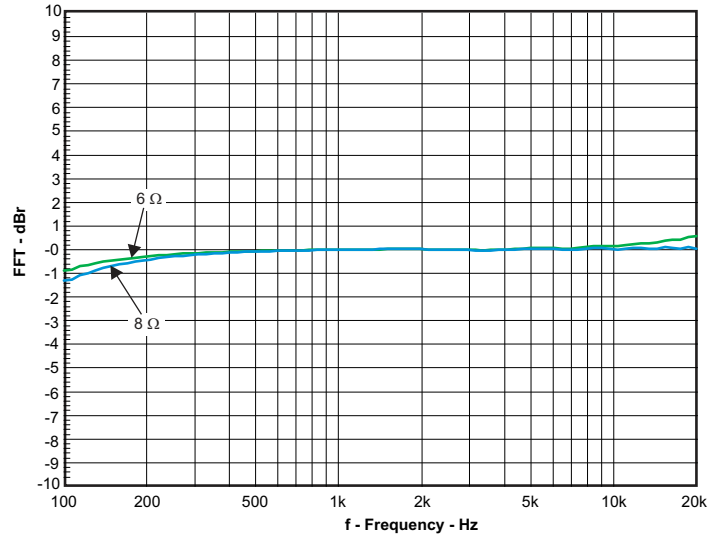


Figure 14. Frequency Response (ch 1)

4.12 Frequency Response (ch 6)

Measurement bandwidth filter 80 kHz.

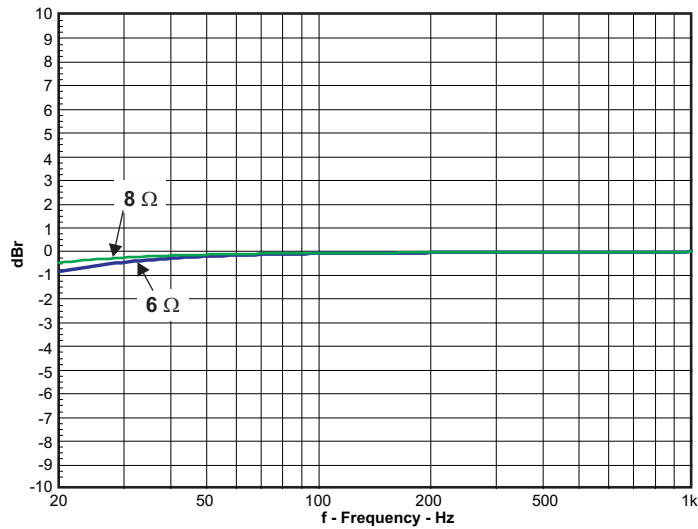


Figure 15. Frequency Response (ch 6)

4.13 High Current Protection (ch 1)

Input 1 kHz bursted signal, Load 1 Ω .

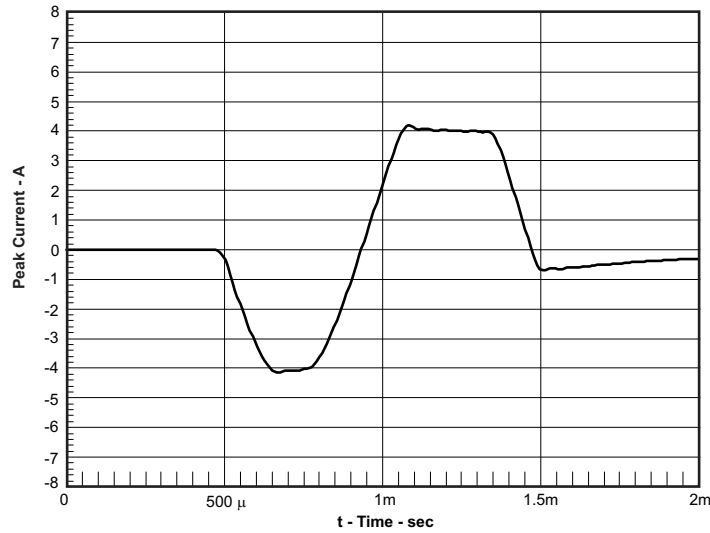


Figure 16. High Current Protection (ch 1)

4.14 High Current Protection (ch 6)

Input 1 kHz bursted signal, Load 1 Ω .

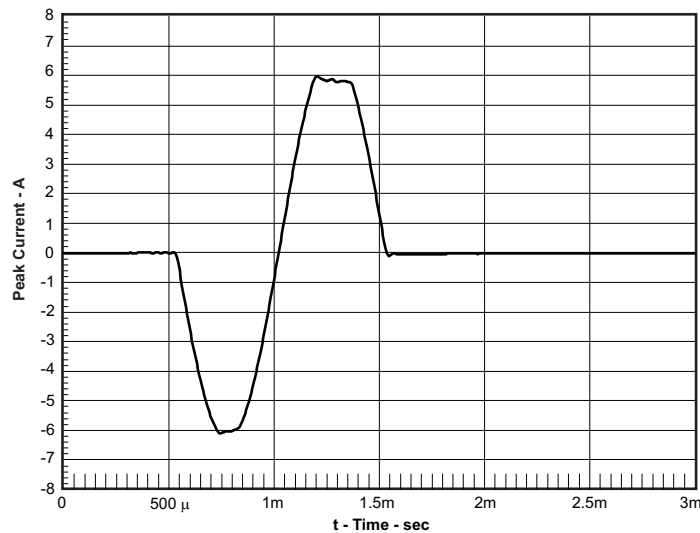


Figure 17. High Current Protection (ch 6)

4.15 Pop/Click (ch 1)

Start of SE channels is tested for different charge times.

Charge time period is controlled by changing register x1Ah in the TAS5086.

No input signal applied, Load 8 Ω .

The measurement is done according to application note [SLEA044](#).

The measurement results are presented both in time domain and in frequency domain.

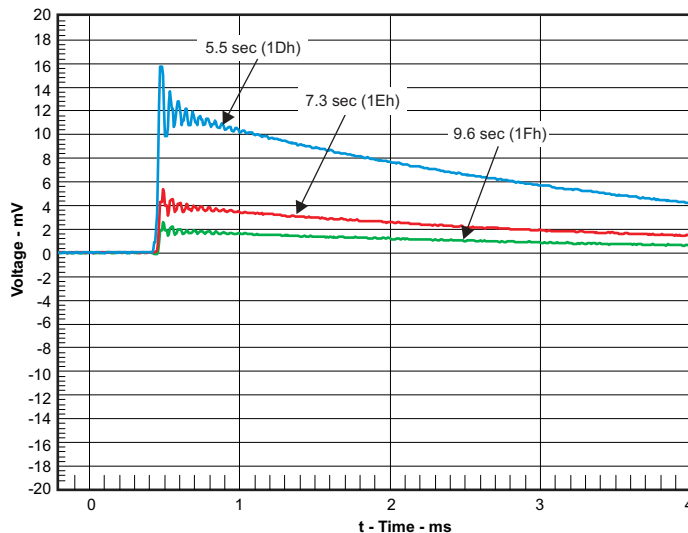


Figure 18. Pop/Click Time Domain (ch 1)

Reference voltage 9.0 V_{RMS}

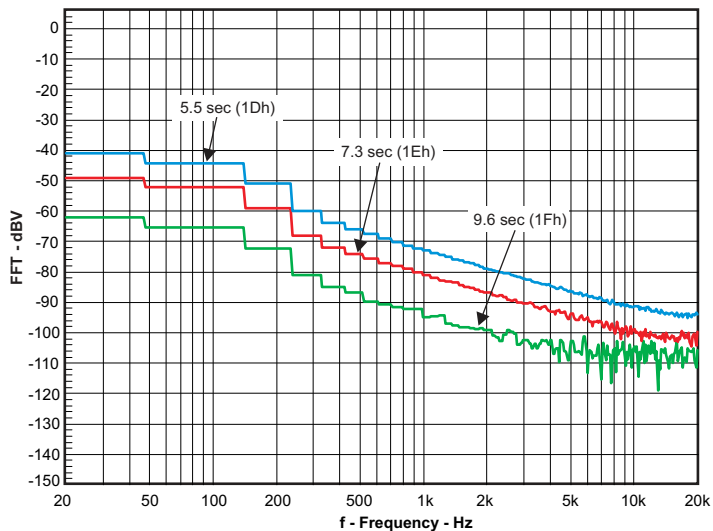


Figure 19. Pop/Click FFT(ch 1)

4.16 Pop/Click (ch 6)

No input signal applied.

The measurement results are presented both in time domain and in frequency domain.

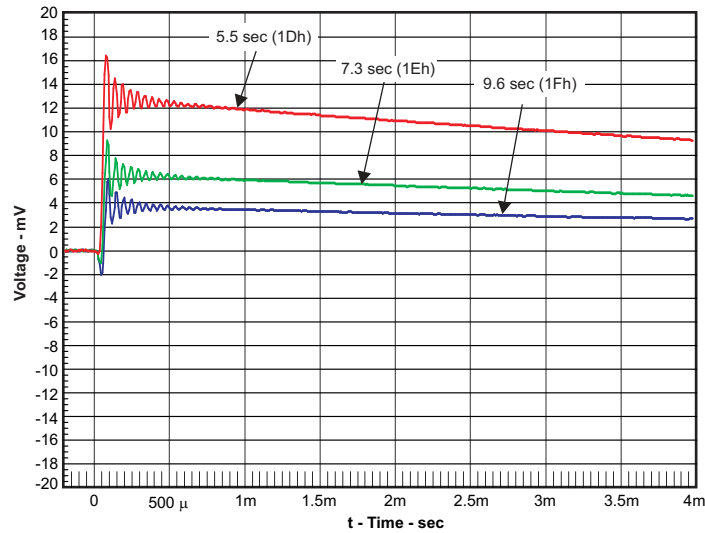


Figure 20. Pop/Click Time Domain (ch 6)

Reference voltage 9.0 V_{RMS}

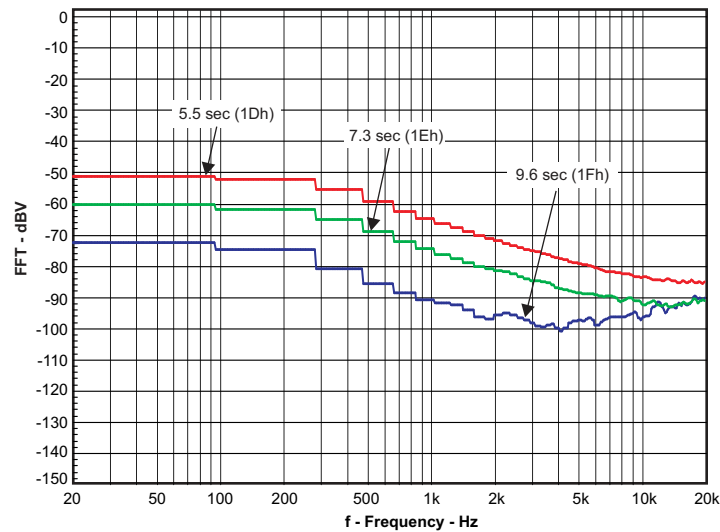


Figure 21. Pop/Click FFT(ch 6)

4.17 Output Stage Efficiency

Efficiency is tested with two front channels loaded 8 Ω and 1 subwoofer loaded 4 Ω . The board is preheated for 1 hour at 1/8 output power for all channels.

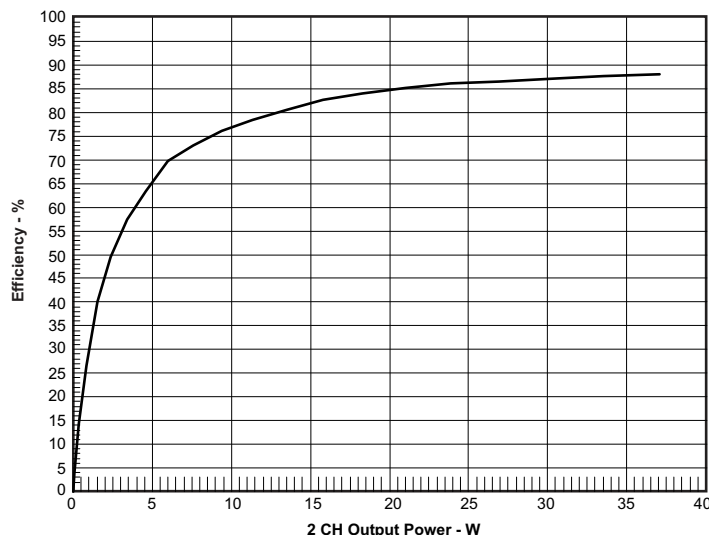


Figure 22. Output Stage Efficiency

5 Related Documentation from Texas Instruments

Table 10 contains a list of data manuals that have detailed descriptions of the integrated circuits used in the design of the TAS5176DDW6EVM. The data manuals can be obtained at the URL: <http://www.ti.com>.

Table 10. Related Documentation From Texas Instruments

Part Number	Literature Number
TAS5086	SLES131
TAS5176	SLES196
TPS5430	SLVS632
TPS3801K33	SLVS219
UA78M12	SLVS059
TLV2217-33	SLVS067

6 Additional Documentation

1. *PC Configuration Tool for TAS5086* (TAS5086 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 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 TAS5176DDW6EVM bill of materials, PCB specification, schematic, and PCB layers are included in this appendix.

Table A-1. Bill of Materials

Qty	Ref	Description	Manufacture	First Mfr P/N
6	R150 R151 R152 R153 R154 R155	2.70k / 250mW / 1% / 1206 Thick Film Resistor	Yageo	RC1206FR-072K7L
2	R115 R116	10.0k / 125mW / 1% / 0805 Thick Film Resistor	BC Components	RC0805FR-0710KL
15	R160 R161 R162 R163 R164 R165 R166 R167 R168 R169 R170 R171 R900 R940 R952	1.00R / 125mW / 1% / 0805 Thick Film Resistor	BC Components	RC0805FR-071RL
4	R50 R53 R57 R58	1.0k / 100mW / 5% / 0603 Thick Film Resistor	BC Components	DCT 0603 5% 1k00
19	R40 R42 R44 R45 R46 R47 R67 R68 R69 R70 R71 R72 R73 R80 R81 R82 R83 R113 R941	10k / 100mW / 5% / 0603 Thick Film Resistor	BC Components	DCT 0603 5% 10k0
7	R114 R156 R157 R158 R159 R172	100k / 100mW / 5% / 0603 Thick Film Resistor	BC Components	DCT 0603 5% 100k
1	R18	18.0k / 100mW / 1% / 0603 Thick Film Resistor	BC Components	DCT 0603 1% 18k0
4	R10 R11 R55 R56	200R / 100mW / 5% / 0603 Thick Film Resistor	BC Components	DCT 0603 5% 200R
1	R103	27k / 100mW / 5% / 0603 Thick Film Resistor	BC Components	DCT 0603 5% 27k
1	R942	3.3k / 100mW / 5% / 0603 Thick Film Resistor	BC Components	DCT 0603 5% 3k30
7	R60 R61 R62 R63 R64 R65 R66	47R / 100mW / 5% / 0603 Thick Film Resistor	BC Components	DCT 0603 5% 47R0
1	R117	15R / 500mW / 5% / SFR16 Metal Film Resistor	BC Components	SFR16S-15R-5
5	R120 R121 R123 R124 R125	1.8k / 500mW / 5% / SFR16 Metal Film Resistor	BC Components	SFR16S-1k80-5
1	R122	470R / 500mW / 5% / SFR16 Metal Film Resistor	BC Components	SFR16S-470R-5
34	C103 C110 C111 C112 C113 C114 C115 C160 C161 C162 C163 C164 C165 C166 C167 C168 C169 C170 C171 C172 C173 C174 C175 C176 C177 C178 C179 C180 C181 C182	Ceramic 10nF / 50V / 20% X7R 0805 Capacitor	BC Components	0805B103M500NT
12	C104 C105 C106 C107 C108 C109 C900 C908 C909 C915 C940 C954	Ceramic 100nF / 50V / 20% X7R 0805 Capacitor	BC Components	0805B104M500NT
2	C100 C102	Ceramic 1µF / 16V / 20% X7R 0805 Capacitor	BC Components	0805B105M160NT
6	C10 C13 C80 C81 C925 C926	Ceramic 10nF / 50V / 20% X7R 0603 Capacitor	BC Components	0603B103M500NT
12	C11 C12 C14 C17 C21 C22 C25 C26 C101 C910 C922 C923	Ceramic 100nF / 16V / 20% X7R 0603 Capacitor	BC Components	0603B104M160NT
4	C184 C911 C921 C924	Electrolytic 10µF / 16V / 20% Aluminium 1.5mm Ø4mm Ultra-Mini Series Capacitor	Sang Jing Electronics	UMR16V106M4X5

Table A-1. Bill of Materials (continued)

Qty	Ref	Description	Manufacture	First Mfr P/N
3	C907 C912 C913	Electrolytic 150 μ F / 35V / 20% Aluminium 3.5mm \emptyset 8mm FC Series - Low Impedance Capacitor	Panasonic	EEUFC1V151
10	C120 C121 C122 C123 C126 C127 C128 C129 C130 C131	Electrolytic 220 μ F / 25V / 20% Aluminium 3.5mm \emptyset 8mm FC Series - Low Impedance Capacitor	Panasonic	EEUFC1E221
2	C124 C125	Electrolytic 2200 μ F / 25V / 20% Aluminium 7.5mm \emptyset 18mm FC Series - Low Impedance Capacitor	Panasonic	EEUFC1E222S
1	C142	Metal Film 1 μ F / 63V / 10% Polyester 5mm (W:5.0mm L:7.2mm) Capacitor	Wima	MKS 2 1 μ F/10%/63Vdc PCM5
5	C140 C141 C143 C144 C145	Metal Film 470nF / 63V / 10% Polyester 5mm (W:4.5mm L:7.2mm) Capacitor	Wima	MKS 2 0.47 μ F/10%/63Vdc
1	L900	6.8 μ H / 1.5 20% 50m Ω Ferrite Inductor	Epcos	B82462-G4682-M
1	L142	10 μ H / Ferrite Inductor	Kwang Sung	8020P-02-100L
5	L140 L141 L143 L144 L145	20 μ H / Ferrite Inductor	Kwang Sung	8020P-01-200L
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 Q82 Q102 Q103	800mA / 40V PNP Small signal MMBT2907A Transistor (SOT-23)	Fairchild	MMBT2907A
1	U10	TAS5086DBT / 6 ch PWM processor (SE, VOL, 192kHz, I2S out) (TSSOP38)	Texas Instruments	TAS5086DBT
1	U100	TAS5176DDW / 6 ch (SE) or 3 ch (BTL) Digital Audio PWM Power Output Stage (DDW44)	Texas Instruments	TAS5176DDW
1	U908	TPS3801K33 / 3.3V Supply Voltage Supervisor (SOT323-5)	Texas Instruments	TPS3801K33DCK
1	U903	UA78L12A / 12V, 100mA Fixed Positive Voltage Regulator (SOT89)	Texas Instruments	UA78L12ACPK
1	U902	TPS73033 / Low-Noise, High PSRR, 200-mA Low-Dropout (SOT23-5)	Texas Instruments	TPS73033DBVR
1	U901	TPS5430 / 5V/3A Buck Converter (HSOP8-DDA)	Texas Instruments	TPS5430DDA
4	SCREW620 SCREW621 SCREW622 SCREW623	M3x6 Pan Head, Pozidriv, A2 Screw	Bossard	BN 81882 M3x6
4	WASHER620 WASHER621 WASHER622 WASHER623	M3 Stainless Steel Washer	Bossard	BN 670 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 Header	JST	B2P-VH
1	J901	4 pins / 1 row / 3.96mm Pitch Vertical Male Pin header Header	JST	B4P-VH
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
6	MH600 MH601 MH602 MH603 MH604 MH605	Mounting Hole 3mm Mounting Hole	n/a	n/a

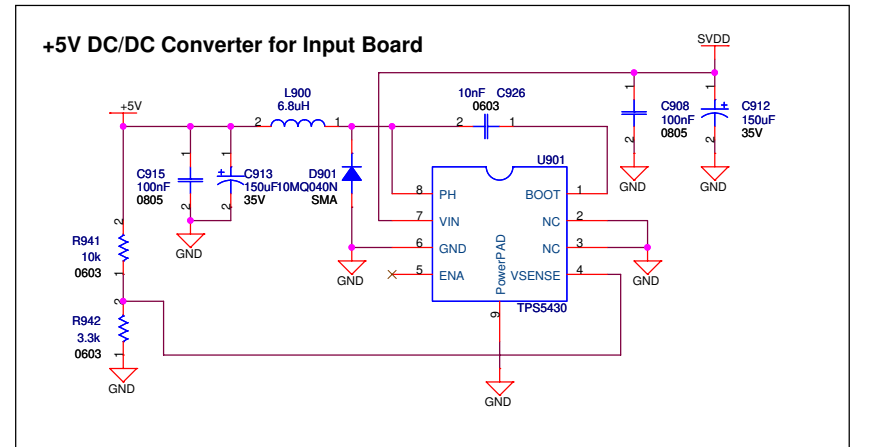
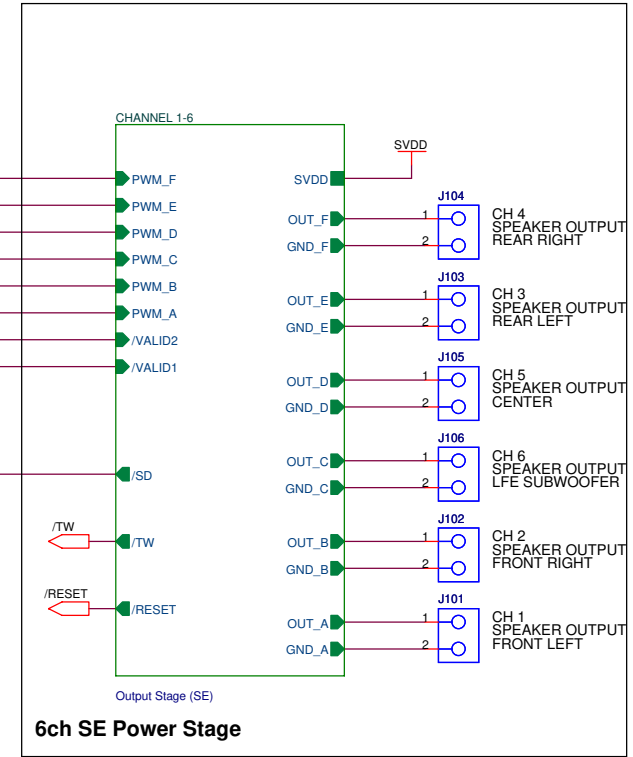
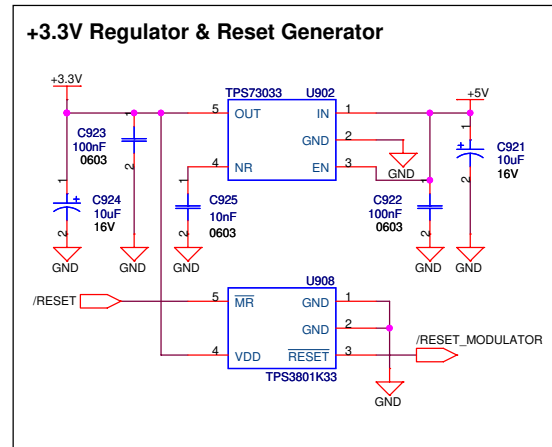
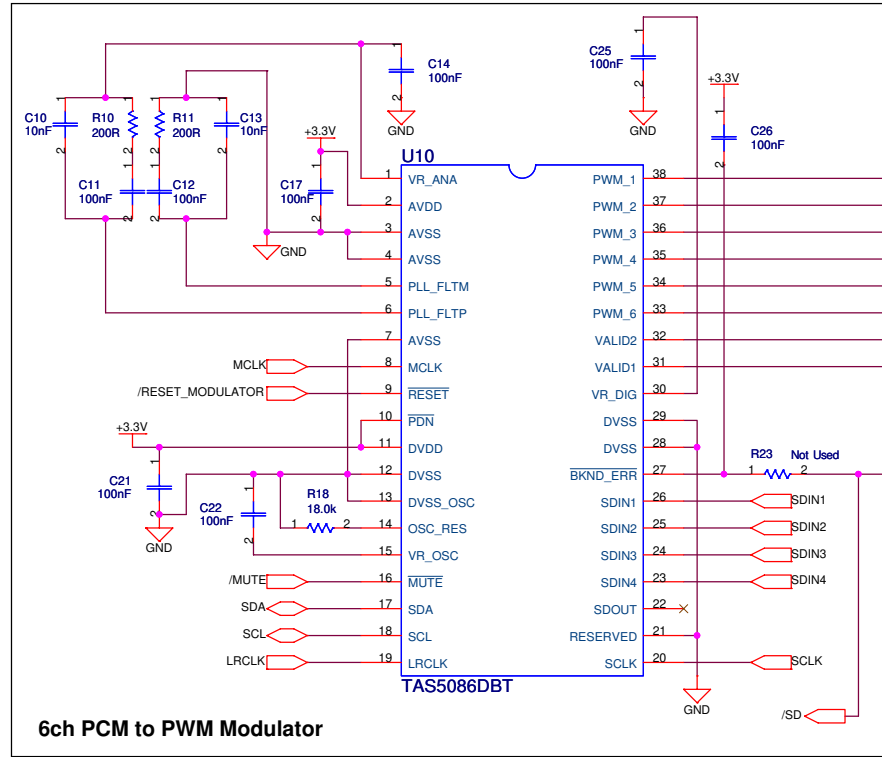
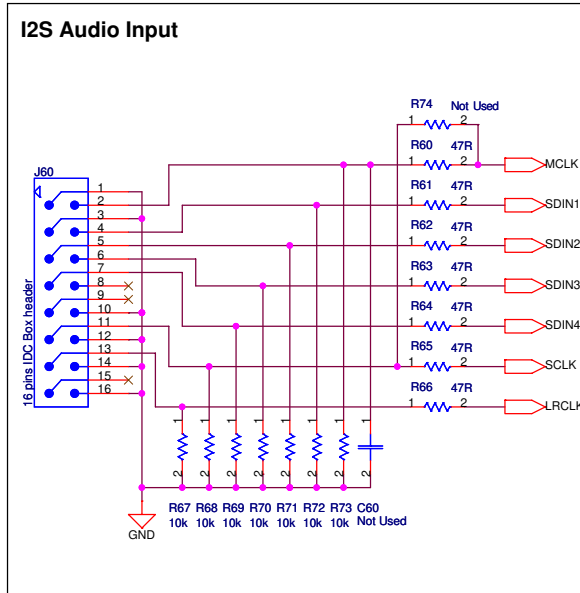
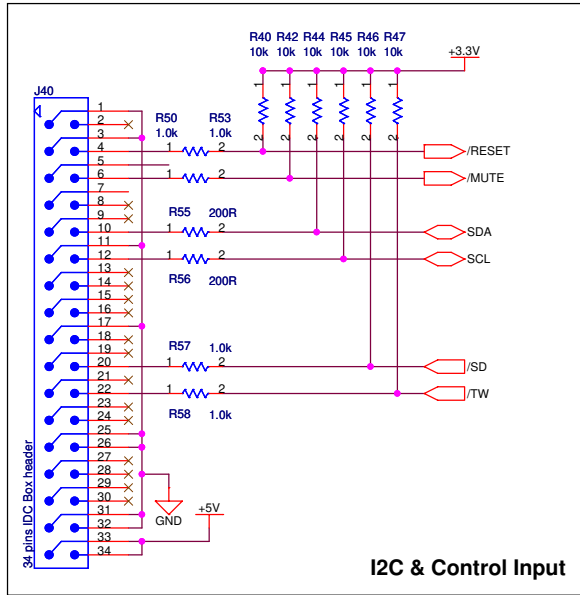
Table A-1. Bill of Materials (continued)

Qty	Ref	Description	Manufacture	First Mfr P/N
1	PCB610	A819-PCB-001_2.00 / TAS5176DDW6EVM Printed Circuit Board (ver. 2.00)	Printline	A819-PCB-001(2.00)

Table A-2. PCB Specification

Board identification	A819-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 and 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	88 x 147.5 mm
Comments	See drill information file (5210pcb.pdf)

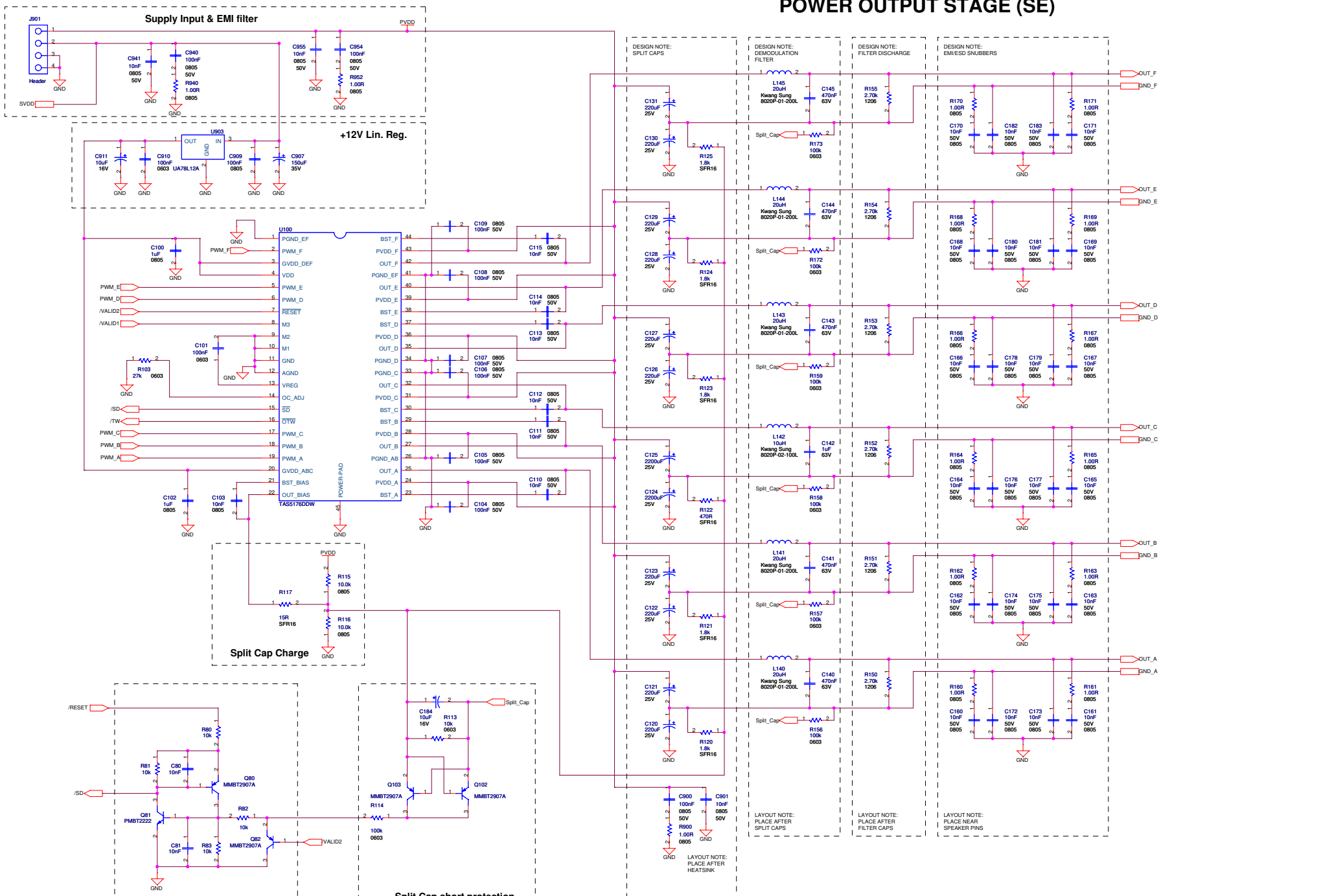
TAS5176DDW6EVM



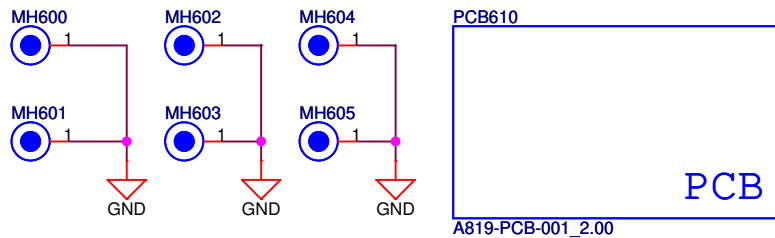
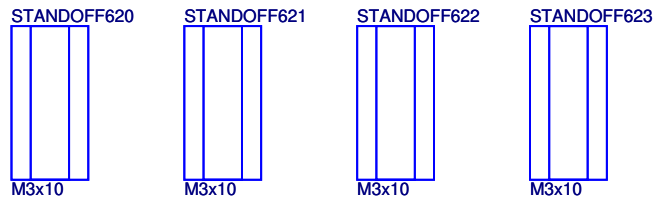
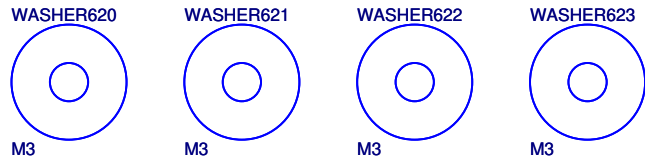
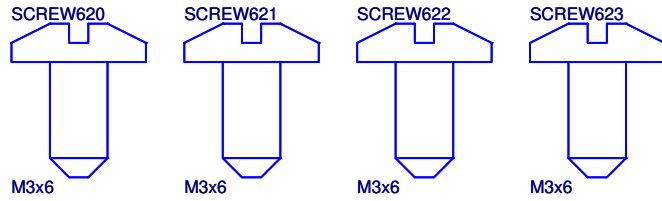
Parts List 2.00

TEXAS INSTRUMENTS		HPL AUDIO ALL RIGHTS RESERVED - PATENTS PENDING TEXAS INSTRUMENTS INCORPORATED	
Project: TASS176DDW6EVM	Rev: 2.00	Page Title: Interface & Modulator	Size: A3
File Name: A819-PCB-001_2.00	Engineer: Kim N Madsen	Date: Tuesday, February 20, 2007	Page: 2 of 4


POWER OUTPUT STAGE (SE)



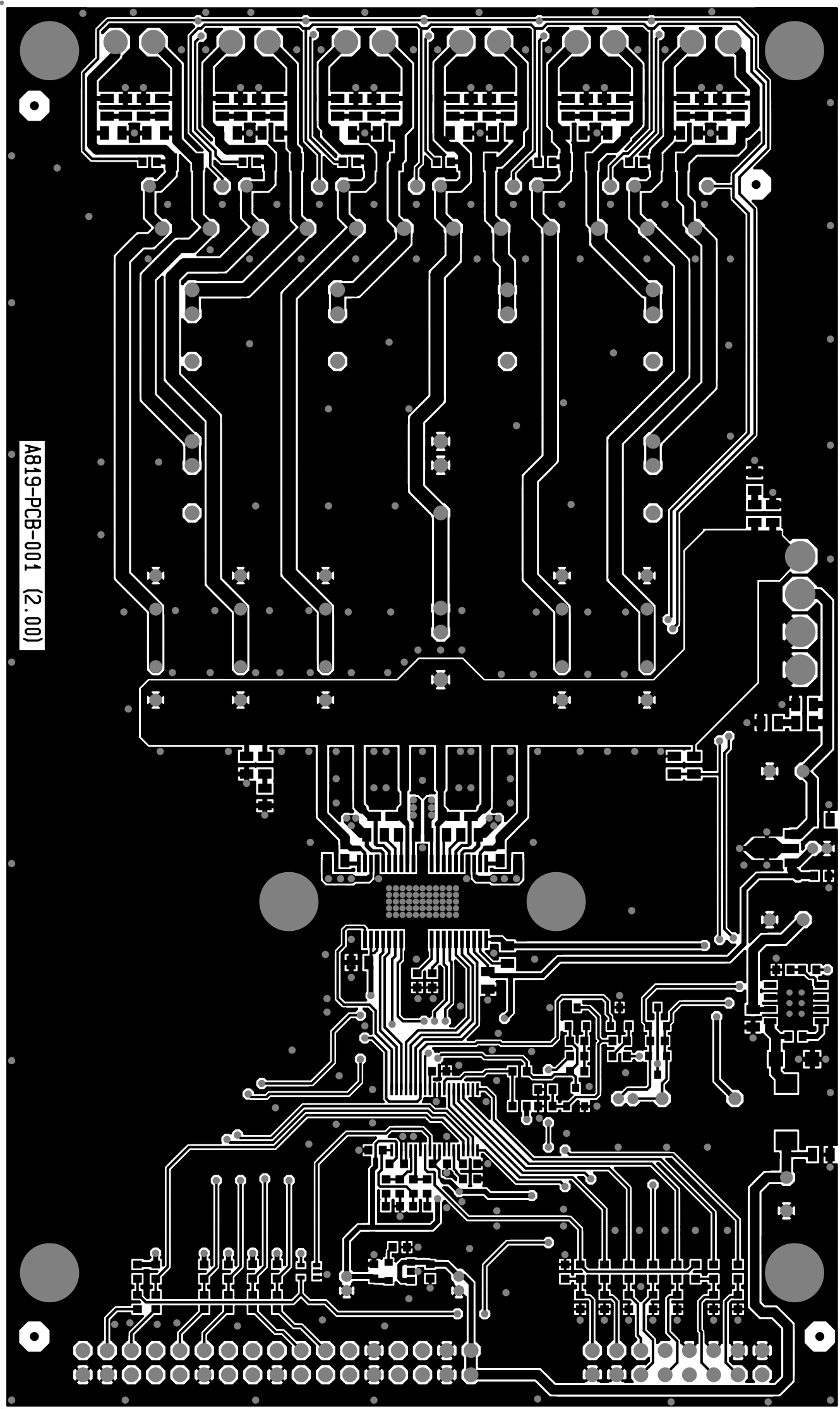
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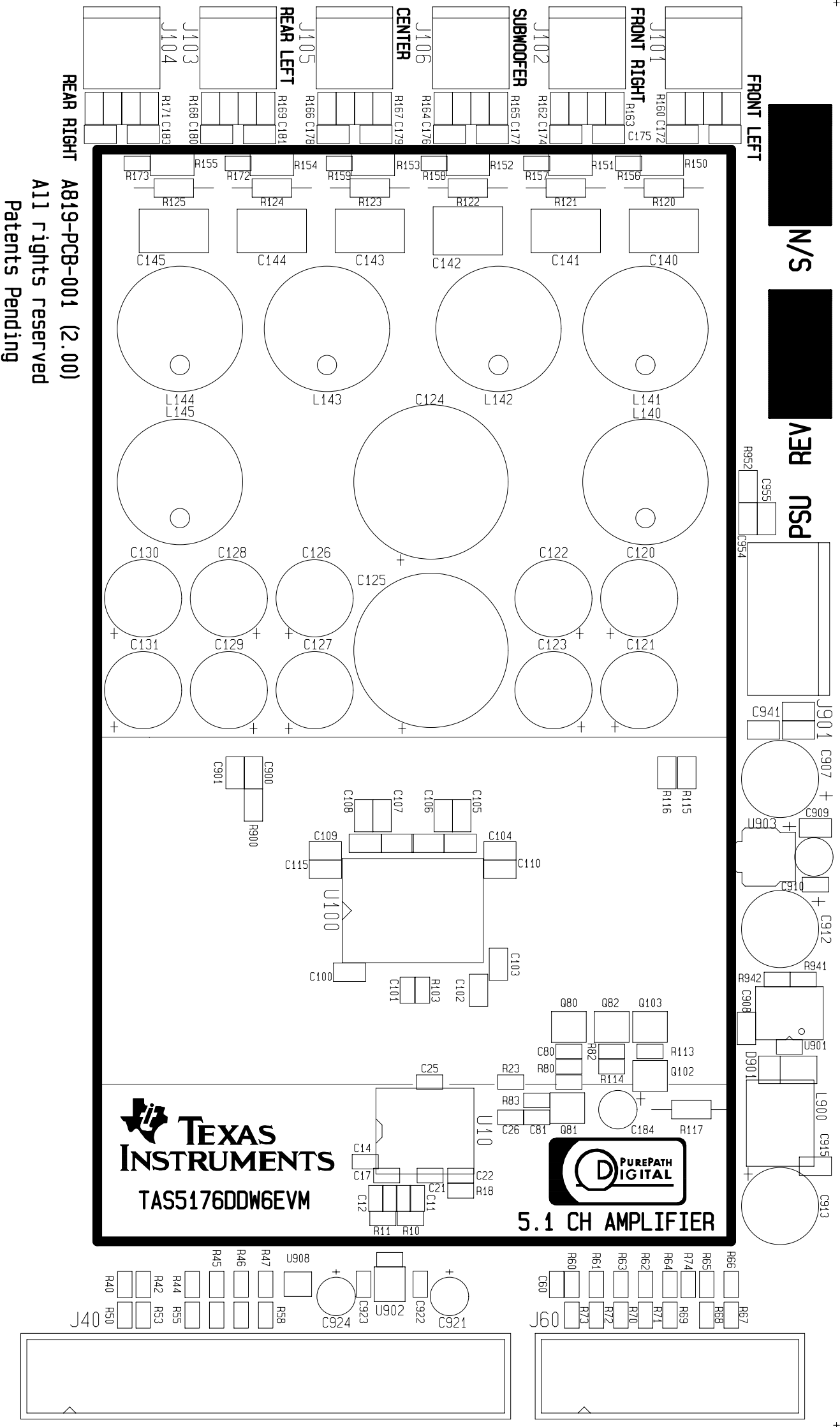
Parts List 2.00

 TEXAS INSTRUMENTS		HPL AUDIO ALL RIGHTS RESERVED - PATENTS PENDING TEXAS INSTRUMENTS INCORPORATED	
Project: TAS5176DDW6EVM		Rev: 2.00	
Page Title: Mechanics		Size: A4	
File Name: A819-SCH-001_2.00		Engineer: Kim N Madsen	
Date: Friday, March 30, 2007		Page: 4 of 4	

COMPONENT SIDE	DpS 5210 070221
TI Denmark A819-PCB-001 (2.00)	

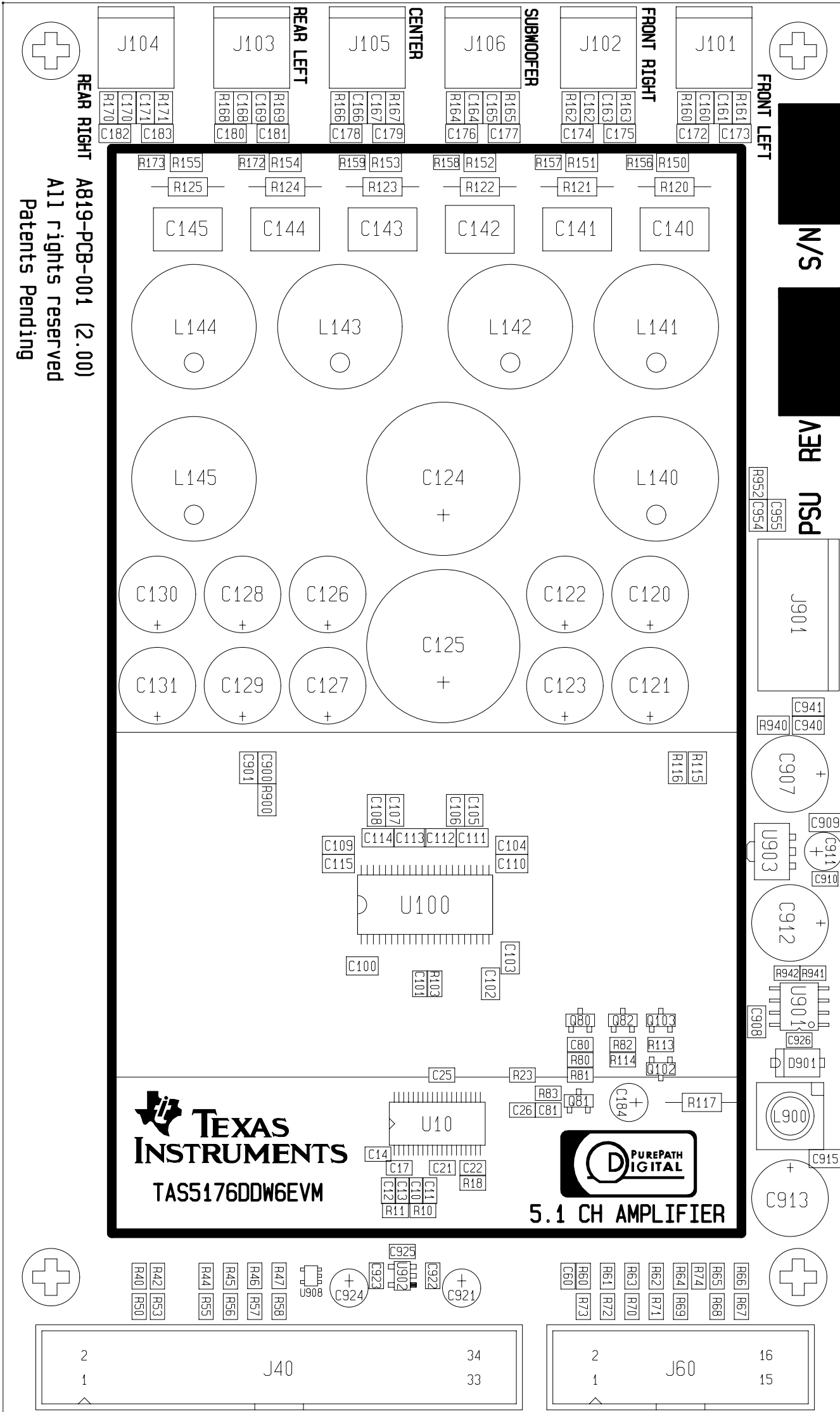


SILKSCREEN COMP	Dps 5210 070221
TI Denmark A819-PCB-001 (2.00)	



COMP. LAYOUT COMP | DpS 5210 070221

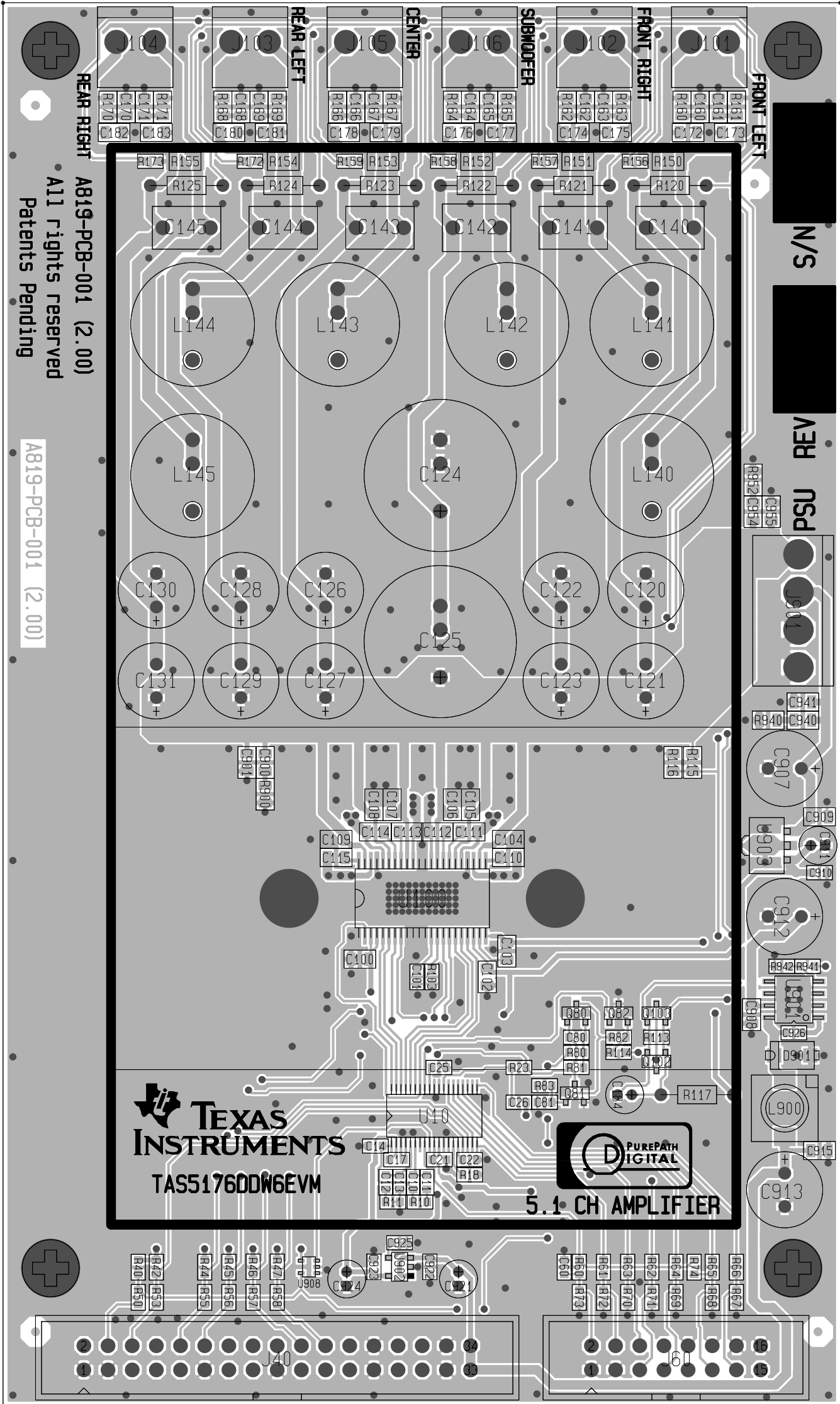
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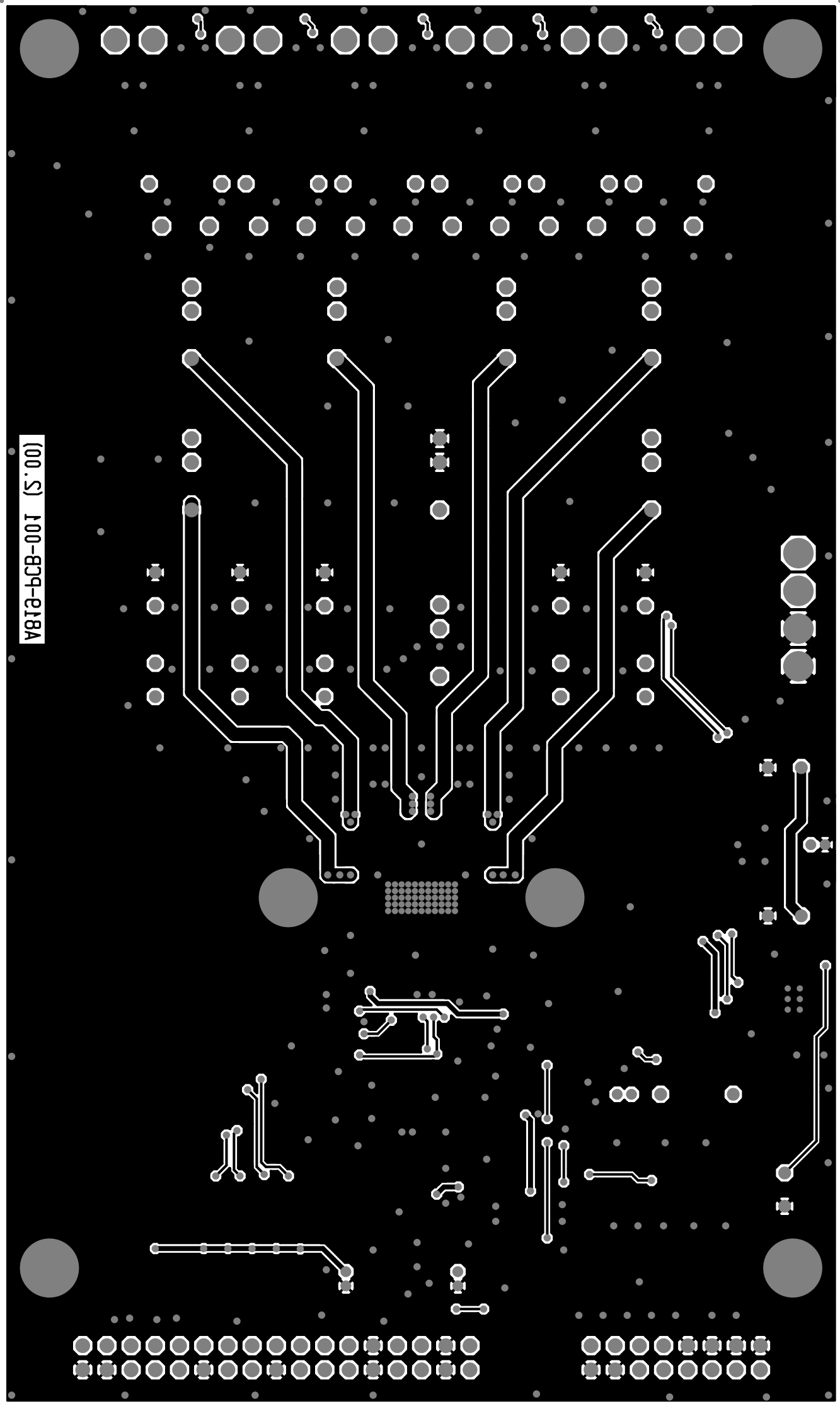
COMP.LAYOUTS.COM

DpS 5210 070221

TI Denmark A819-PCB-001 (2.00)



TI Designmark A819-PCB-001 (S.00)	SOLDER SIDE	0152 2q0 2510 070551
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