![Texas Instruments logo]

TAS5162DDV6EVM

This user's guide describes the operation of the evaluation module for the TAS5162 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 such as the schematic, bill of materials, and printed-circuit board layout

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1 Overview

The TAS5162DDV6EVM PurePath Digital ™ customer evaluation module (Figure 1) demonstrates the integrated circuits TAS5162DDV and TAS5086DBT from Texas Instruments (TI).
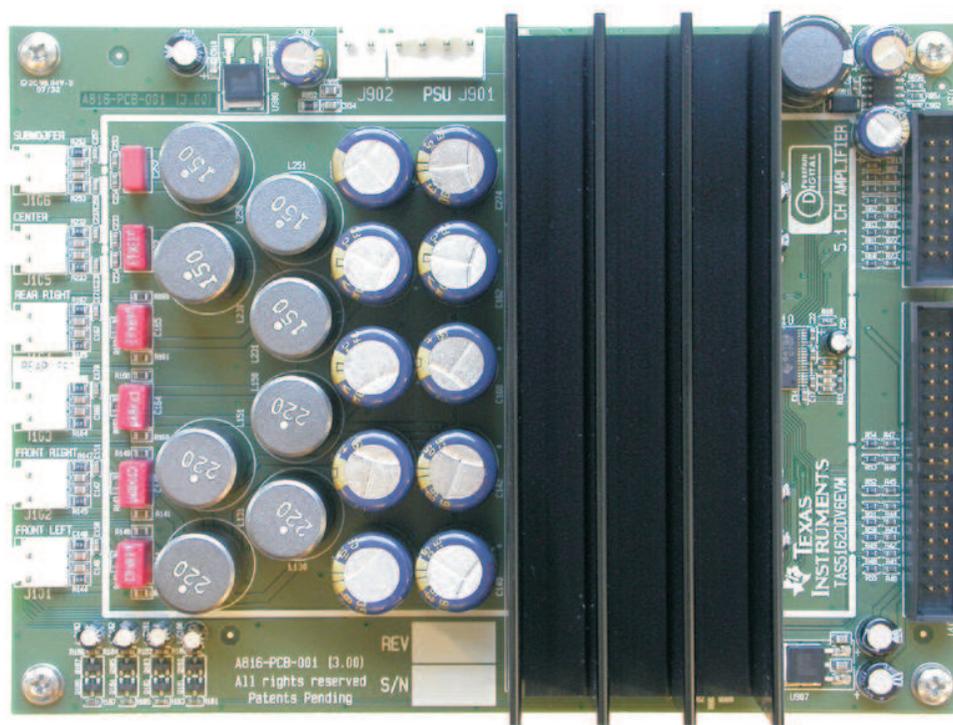
Figure 1. TAS5162DDV6EVM Board

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 (Figure 2). This system requires only a simple, passive demodulation filter to deliver high-quality, high-efficiency audio amplification.

TAS5086DBT is a high-performance, 32-bit (24-bit input), multichannel PurePath Digital™ pulse width modulator (PWM) based on Equibit™ technology with fully symmetrical analog-to-digital modulation scheme.

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

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 mixers, automute, tone controls, loudness, EQ filters, and dynamic range compression (DRC). Table 1 lists the key parameters of the EVM. There are configuration option for power stage failure protection and a mini-jack connector for headphone.

Table 1. TAS5162DDV6EVM Specification

Key Parameters	
Output Stage Supply Voltage:	0 V–50 V
System Supply Voltage:	15 V–20 V
Number of Channels	4 x SE, 2 x BTL
Load Impedance SE:	4–8 Ω
Load Impedance BTL:	6–8 Ω
Output power SE	80 W / 4 Ω 10% THD
Output power BTL	160 W / 8 Ω / 10% THD or 210 W / 6 Ω / 10% THD

Table 1. TAS5162DDV6EVM Specification (continued)

DNR	>109 dB
PWM Processor	TAS5086DBT
Output Stage	TAS5162DDV

This 6.1 system 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.

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

1.1 TAS5162DDV6EVM Features

- 7/8-channel PurePath Digital™ evaluation module (double-sided, plated-through PCB layout).
- Self-contained protection system (short-circuit and thermal).
- Standard I^{2}S and I^{2}C™ / Control connector for TI input board
- Double-sided, plated-through PCB layout.
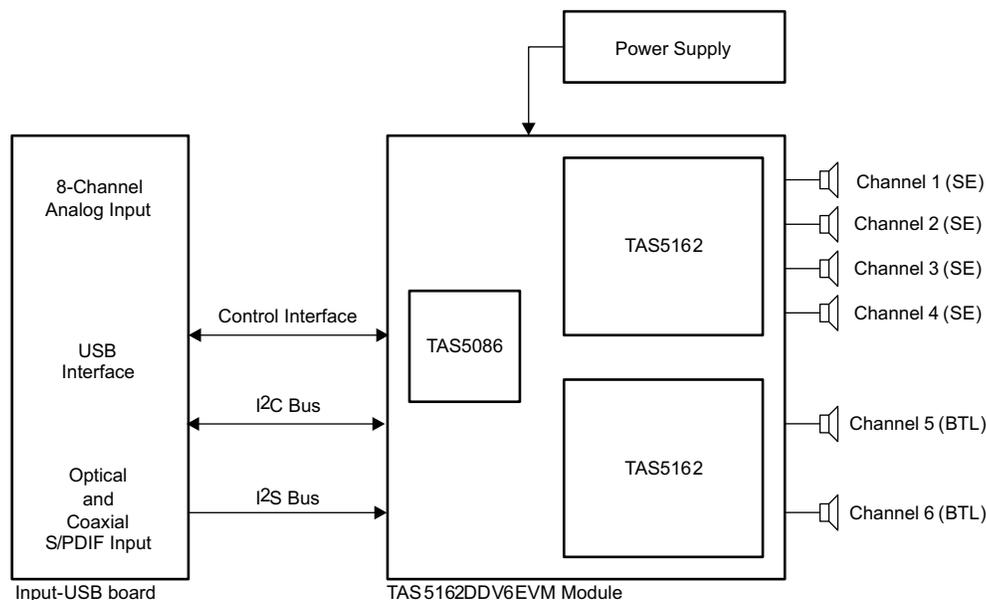
Figure 2. Integrated PurePath Digital™ Amplifier System

1.2 *PCB Key Map*

Physical structure for the TAS5162DDV6EVM is illustrated in Figure 3.

Figure 3. Physical structure for the TAS5162DDV6EVM (Approximate Layout)

2 Quick-Setup Guide

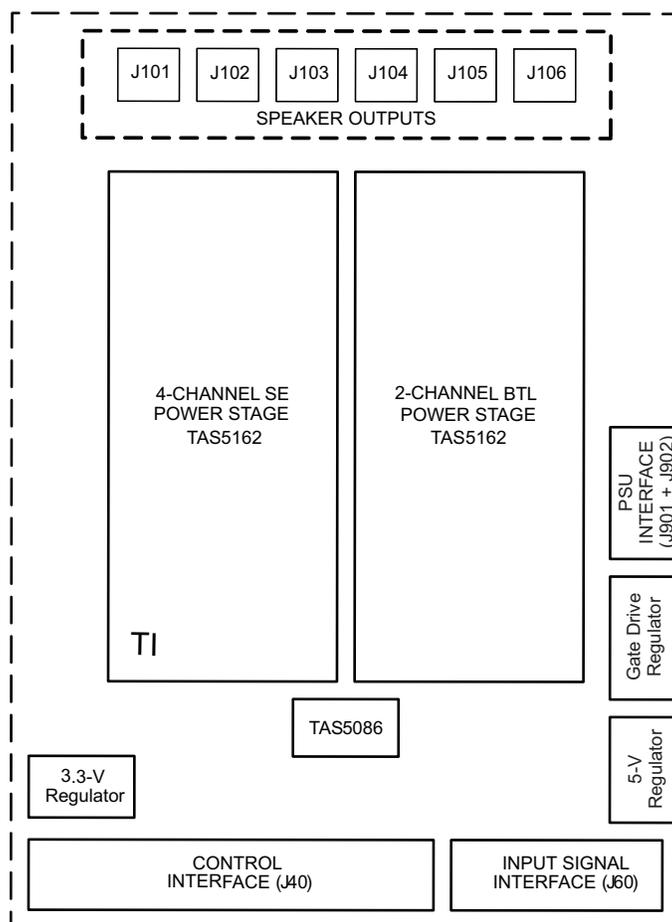This section describes the TAS5162DDV6EVM board in regards to power supplies and system interfaces. The section provides information regarding handling and unpacking, absolute operating conditions, and a description of the factory default switch and jumper configuration.

This section provides a step–by–step guide to configuring the TAS5162DDV6EVM for device evaluation.

2.1 *Electrostatic Discharge Warning*

Many of the components on the TAS5162DDV6EVM 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

On opening the TAS5162DDV6EVM package, check to ensure that the following items are included:

- 1 pc. TAS5162DDV6EVM board using one TAS5086DBT and two TAS5162DDV.
- 1 pc. TI Input-USB board for interfacing TAS5162DDV6EVM with SPDIF/analog sources and PC for control.
- 1 pc. Signal Interface IDC cable for connection to an I^{2}S front-end like the attached TI Input-USB board.
- 1 pc. Control Interface IDC cable for connection to an I^{2}C™ 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 Digital™ 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 TAS5162DDV6EVM using the two delivered IDC cables.

2.3 Power Supply Setup

Two power supplies are required to power up the EVM: one for system power, logic, and gate-drive, and one for output stage supply. Power supplies are connected to the EVM using the 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 the length of the PSU cable is equivalent 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 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 the Windows™ menu. Start up of GUI will take few seconds.

Figure 4. TAS5518 GUI Window

From the files menu, load the configuration file:
TAS5162DDV6EVM Configuration (3.00).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 data sheet for the TAS5086.

3   Protection

This section describes the short-circuit protection and fault-reporting circuitry of the TAS5162 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 means that the device restarts itself after an error occasion and reports shortly thereafter through the $\overline{SD}$ error signal.

3.2 Fault Reporting

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

Table 3. TAS5162 Warning/Error Signal Decoding

$\overline{\text{OTW}}$	$\overline{\text{SD}}$	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 TAS5162DDV6EVM board are wired-OR to one temperature warning signal ($\overline{\text{OTW}}$ – pin 22 in control interface connector). Shutdown signals are wired-OR into one shutdown signal ($\overline{\text{SD}}$ – 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 TAS5162DDV6EVM Performance

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 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 and AUX0025	
TI Input-USB Board	Input-USB	Rev 10
EVM Configuration File	Ver 3.00	TAS5162DDV6EVM Configuration (3.00).cfg

[1] These test conditions are used for all tests, unless otherwise specified.

Table 5. TAS5086 Register Settings

Register[1]		Value	Notes
Oscillator Trim Register	0x1B	0x00	Initiate Factory Trim
Master Volume Register	0x07	0x30	Master Volume 0 dB
Split Cap Register	0x1A	0x00	No Split Capacitor Charge Period.
Modulation Index Limit Register	0x10	0x04	Set Modulation Index to 96.1%
PWM Start Register	0x18	0xF0	Mid-Z Sequence Enabled For All Channels.
Input Multiplexer Register	0x20	00 01 23 45	
Output Mulitplexer Register	0x25	00 01 23 45	
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
Output Power, SE, 4 Ω:	60 W	1 kHz, Unclipped (0 dBFS), $T_A = 25°C$
Output Power, SE, 4 Ω:	80 W	1 kHz, 10% THD+N, $T_A = 25°C$
Output Power, BTL, 6 Ω:	161 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:	122 W	1 kHz, Unclipped (0 dBFS), $T_A = 25°C$
Output Power, BTL, 8 Ω:	160 W	1 kHz, 10% THD+N, $T_A = 25°C$
Maximum Peak Current, SE:	>9.9 A	1 kHz Burst, 1 Ω, $R_{OC} = 22$ k
Maximum Peak Current, BTL:	>9.9 A	1 kHz Burst, 1 Ω, $R_{OC} = 22$ k
Output Stage Efficiency:	>90%	1 x SE Channels, 4 Ω + 1 × BTL Channel, 8 Ω
Damping Factor SE:	14	1 kHz, Relative to 4-Ω load
Damping Factor BTL:	15	1 kHz, relative to 8-Ω Load
System Supply Current:	<195 mA	1 kHz, –60-dBFS Signal, With TI Input Board
H-Bridge Supply Current:	<190 mA	1 kHz, –60-dBFS Signal
Total Board Idle Power Consumption:	12.5 W	H-Bridge Supply + System Supply, –60-dBFS Signal

Table 7. Audio Performance

Audio Performance			Notes/Conditions
THD+N, SE, 4 Ω:	1 W	<0.09%	1 kHz
THD+N, SE, 4 Ω:	10 W	<0.09%	1 kHz
THD+N, SE, 4 Ω:	50 W	<0.08%	1 kHz
THD+N, BTL, 6 Ω:	1 W	<0.009%	1 kHz
THD+N, BTL, 6 Ω:	10 W	<0.05%	1 kHz
THD+N, BTL, 6 Ω:	50 W	<0.03%	1 kHz
THD+N, BTL, 6 Ω:	100 W	<0.12%	1 kHz
THD+N, BTL, 6 Ω:	150 W	<0.14%	1 kHz
THD+N, BTL, 8 Ω:	1 W	<0.007%	1 kHz
THD+N, BTL, 8 Ω:	10 W	<0.04%	1 kHz
THD+N, BTL, 8 Ω:	50 W	<0.03%	1 kHz
THD+N, BTL, 8 Ω:	100 W	<0.08%	1 kHz
Dynamic Range:		>109 dB	Ref: Rated Power, A-Weighted, AES17 Filter, 4 Ch Avg
Noise Voltage SE:		<50 µVrms	A-weighted, AES17 Filter
Noise Voltage BTL:		<100 µVrms	A-weighted, AES17 Filter
Channel Separation:		>68 dB	1 kHz
Frequency Response SE (100 Hz–20 kHz):		±0.5 / –1.0 dB	62.5 W / 4 Ω, Unclipped (0 dBFS)
Frequency Response BTL (20 Hz–20 kHz):		±0.3	125 W / 8 Ω, Unclipped (0 dBFS)

Table 8. Thermal Specifications

Thermal Specifications	T$_{HEATSINK}$[1]	Notes/Conditions
Idle, All Channels Switching	46°C	1 kHz, 15 min, –60-dBFS signal, T$_A$ = 25°C
4 x 7.5 W, 4 Ω + 2 × 16 W , 8 Ω (1/8 power)	66°C	1 kHz, 1 hour, T$_A$ = 25°C
2 x 60 W, 4 Ω	73°C	1 kHz, 5 min, T$_A$ = 25°C

[1] Measured on surface of heatsink.

Table 9. Physical Specifications[1]

Physical Specification		Notes/Conditions
PCB Dimensions:	112 x 154 x 54	Width x Length x Height (mm)
Total Weight:	350 g	Components + PCB + Heat-Sink + Mechanics

[1] All electrical and audio specifications are typical values.

4.1 THD+N vs Power (SE –4 Ω)
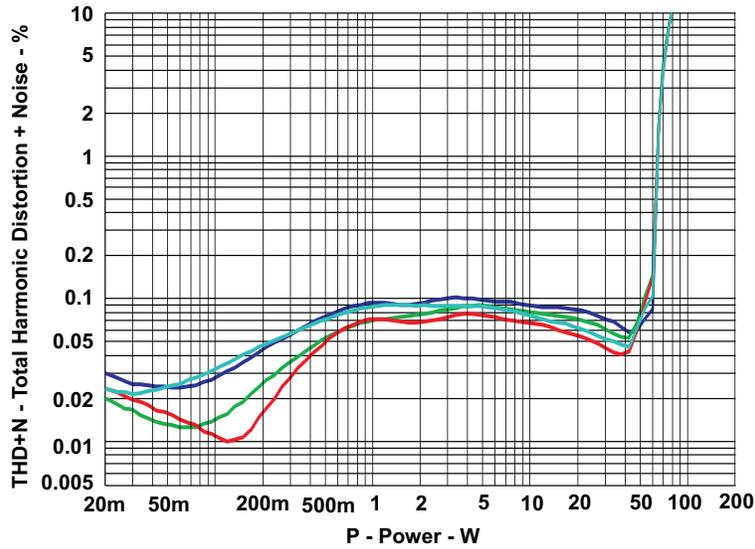
Gain: 2.5 dB set in TAS5086

Figure 5. THD+N vs Power (SE –4 Ω)

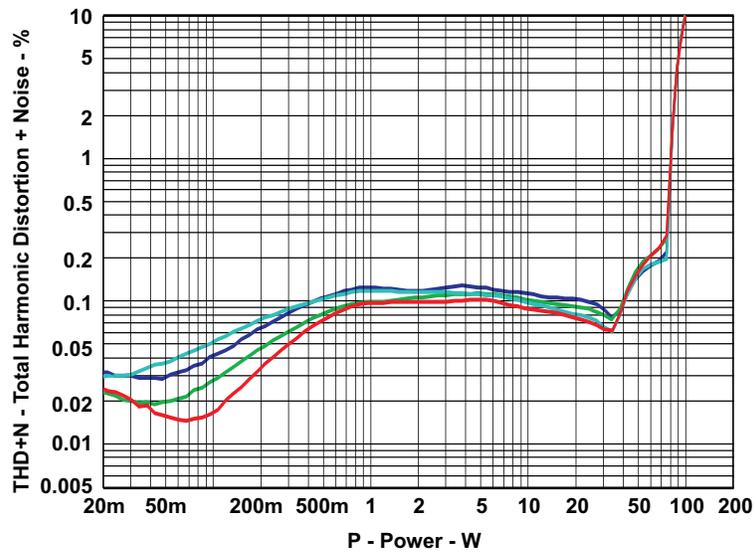## 4.2 THD+N vs Power (SE – 3 Ω)

Gain: 2.5 dB set in TAS5086

Figure 6. THD+N vs Power (SE – 3 Ω)

4.3 THD+N vs Power (BTL – 8 Ω)
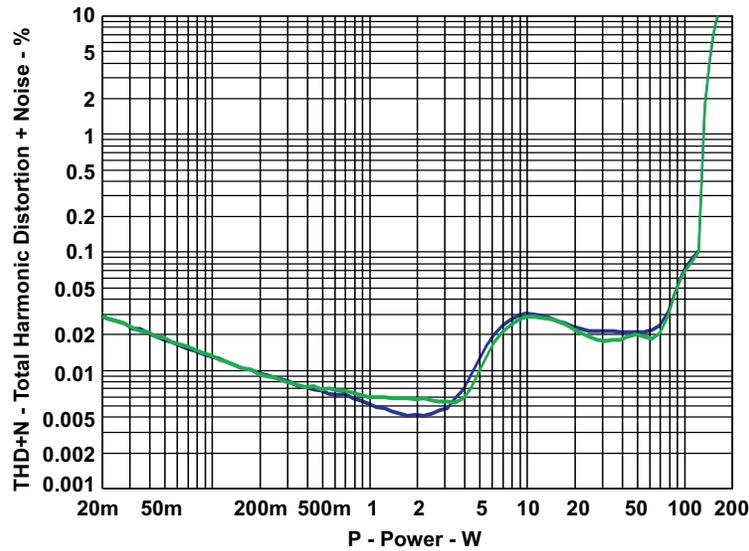
Gain: 2.5 dB set in TAS5086

Figure 7. THD+N vs Power (BTL – 8 Ω)

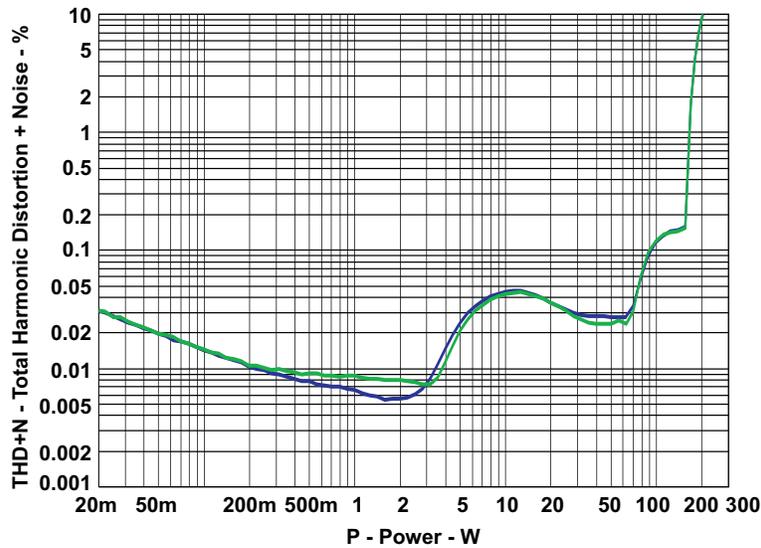### 4.4 THD+N vs Power (BTL – 6 Ω)

Gain: 2.5 dB set in TAS5086

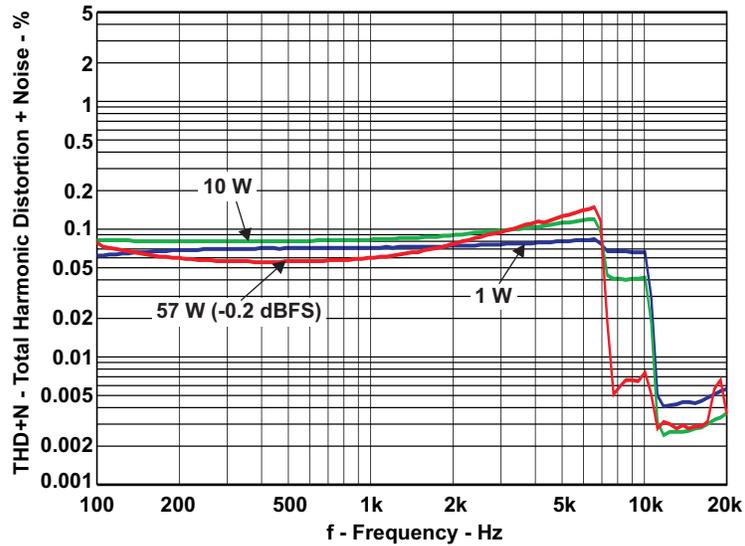**Figure 8. THD+N vs Power (BTL – 6 Ω)**

4.5 THD+N vs Frequency (SE – 4 Ω)

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

4.6 THD+N vs Frequency (SE – 3 Ω)
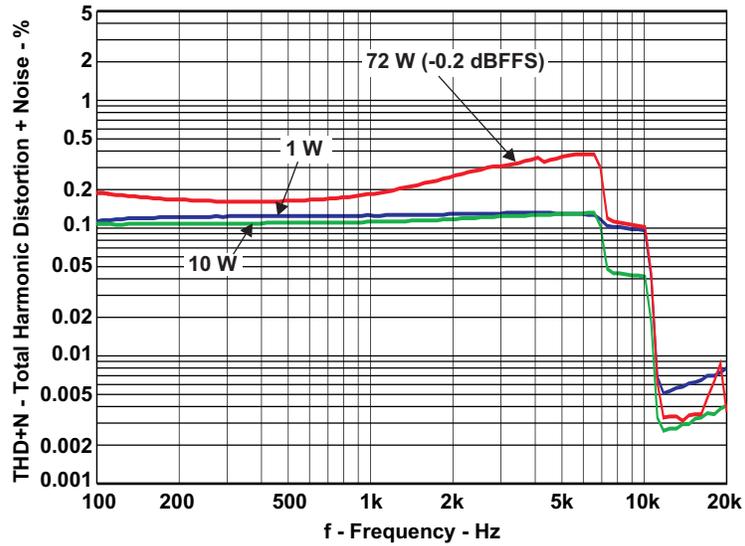
Figure 10. THD+N vs Frequency (SE – 3 Ω)
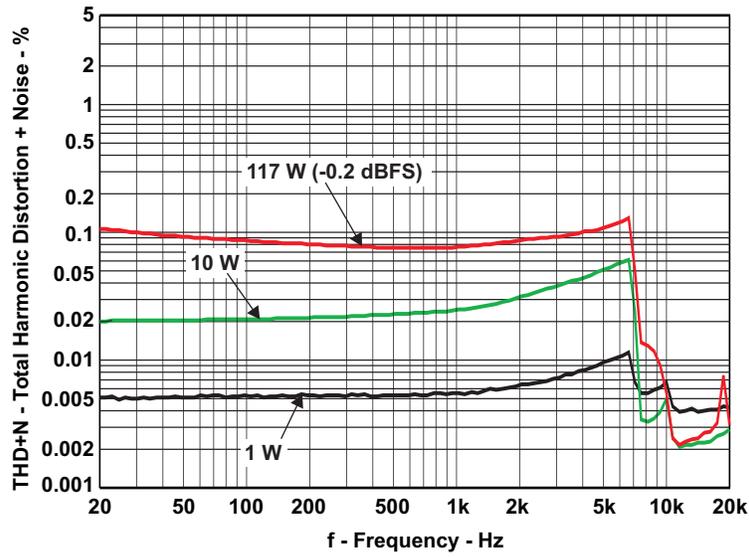
4.7 THD+N vs Frequency (BTL – 8 Ω)

Figure 11. THD+N vs Frequency (BTL – 8 Ω)
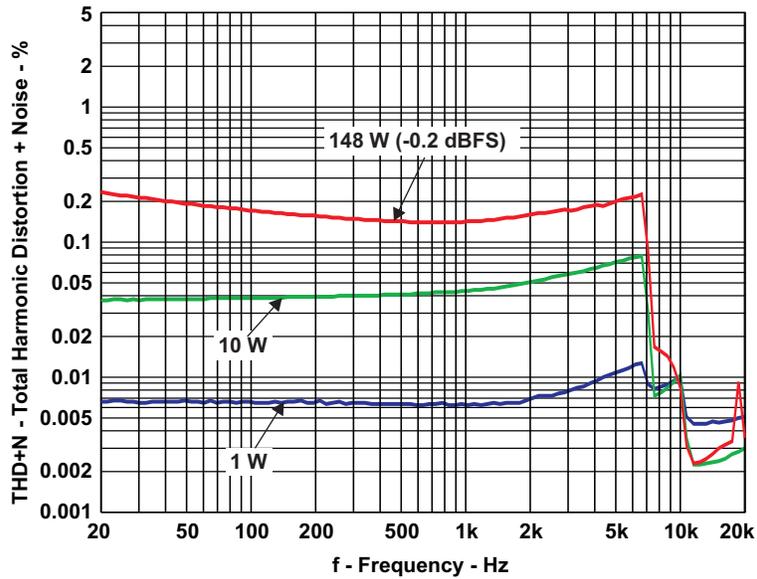
4.8 THD+N vs Frequency (BTL – 6 Ω)

Figure 12. THD+N vs Frequency (BTL – 6 Ω)

4.9 *FFT Spectrum With –60-dBFS Tone (SE)*

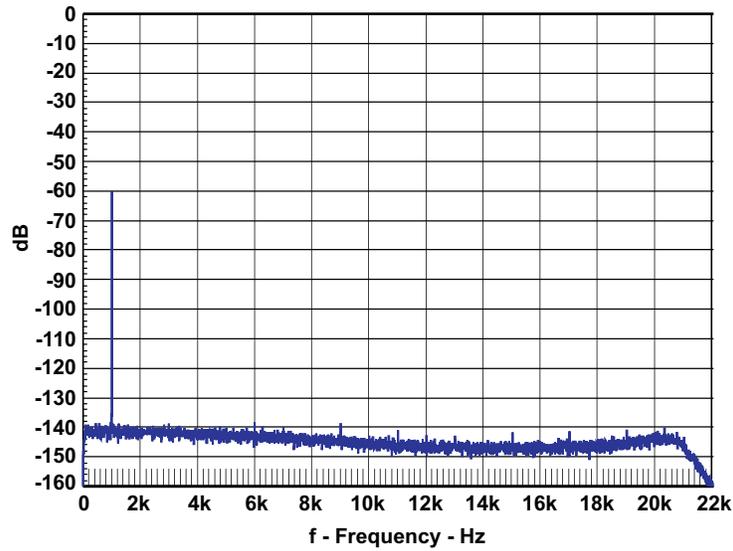Reference voltage is 15.5 V. FFT size 16 k.

Figure 13. FFT Spectrum With –60 dBFS Tone (SE)

4.10 *FFT Spectrum With –60-dBFS Tone (BTL)*

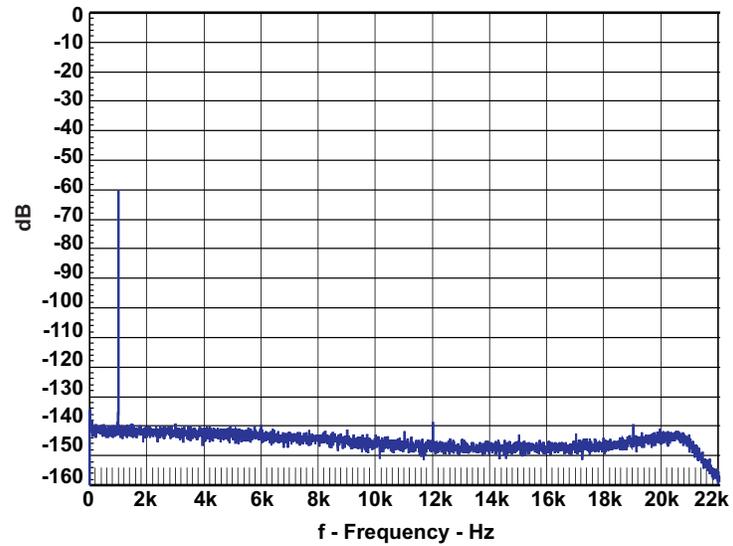Reference voltage is 31.2 V. FFT size 16 k.

Figure 14. FFT Spectrum With –60-dBFS Tone (BTL)

4.11 Idle Noise FFT Spectrum (SE)

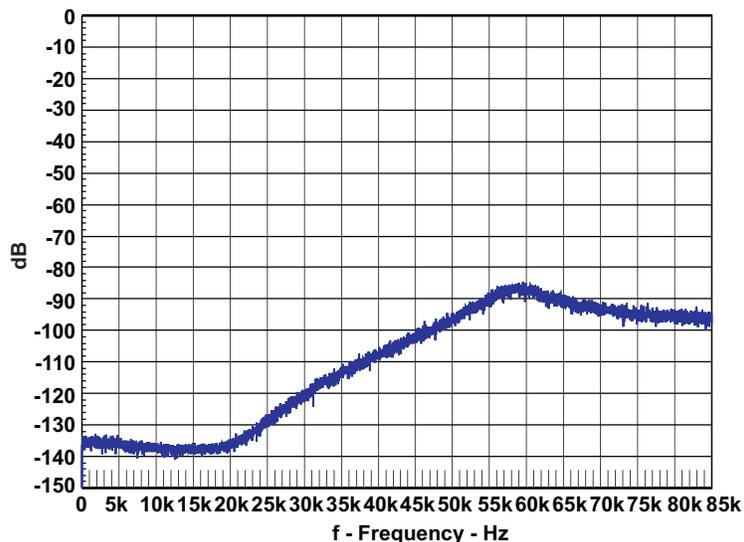Reference voltage is 15.5 V. FFT size 16 k.

Figure 15. Idle Noise FFT Spectrum (SE)

4.12 Idle Noise FFT Spectrum (BTL)
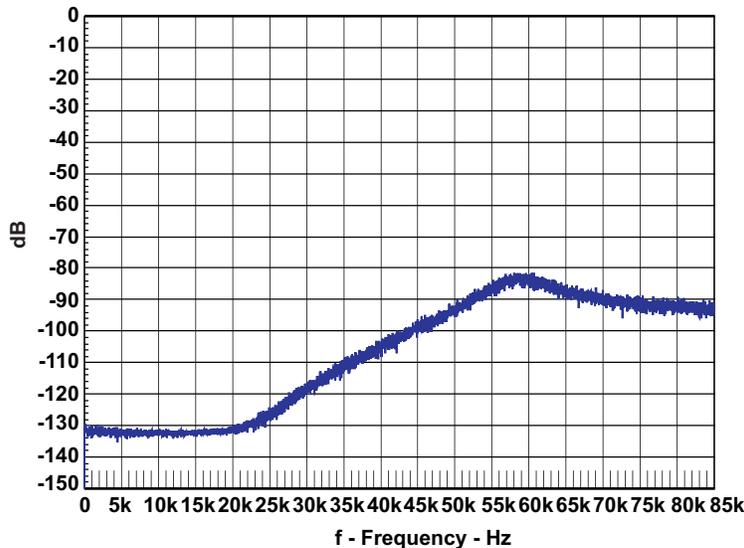
Reference voltage is 31.2 V. FFT size 16 k.

Figure 16. Idle Noise FFT Spectrum (BTL)

4.13 Channel Separation

Channel separation is tested for two channels, channel 1 and channel 2. Both channels use 4-Ω loads. Channel-1 input signal is 0 dBFS, channel 2 is muted. Reference voltage is 15.5 Vrms.
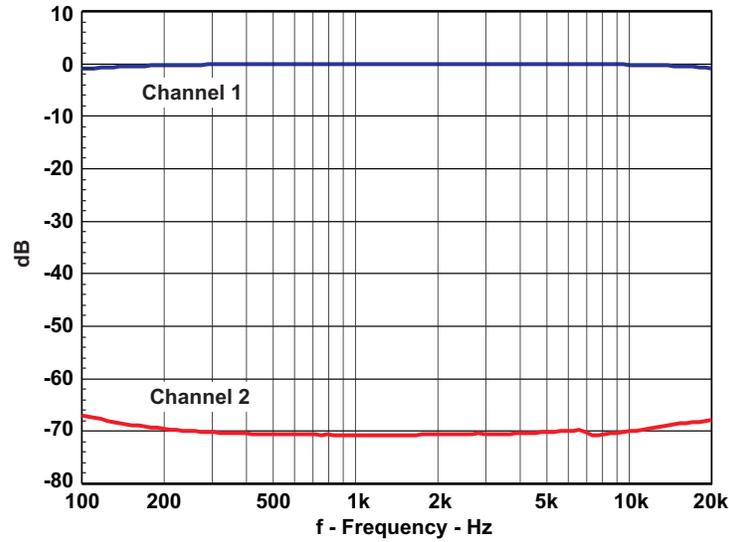

Figure 17. Channel Separation

4.14 Frequency Response (SE)
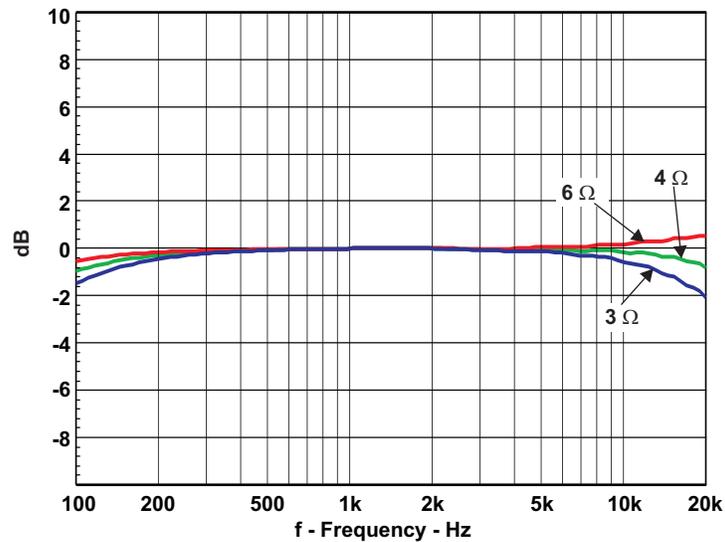
Measurement bandwidth filter is 80 kHz.

Figure 18. Frequency Response (BTL)

4.15 Frequency Response (BTL)

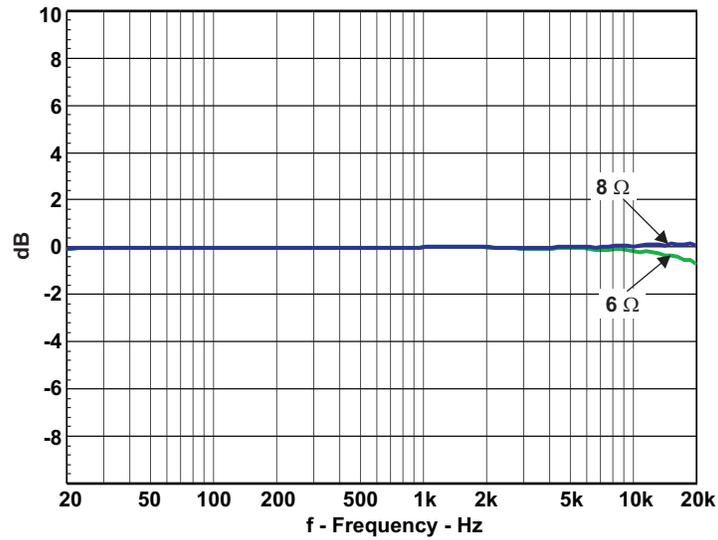Measurement bandwidth filter is 80 kHz.

Figure 19. Frequency Response (BTL)

4.16 High-Current Protection (SE)

Input 1-kHz bursted signal, Load 1 Ω.

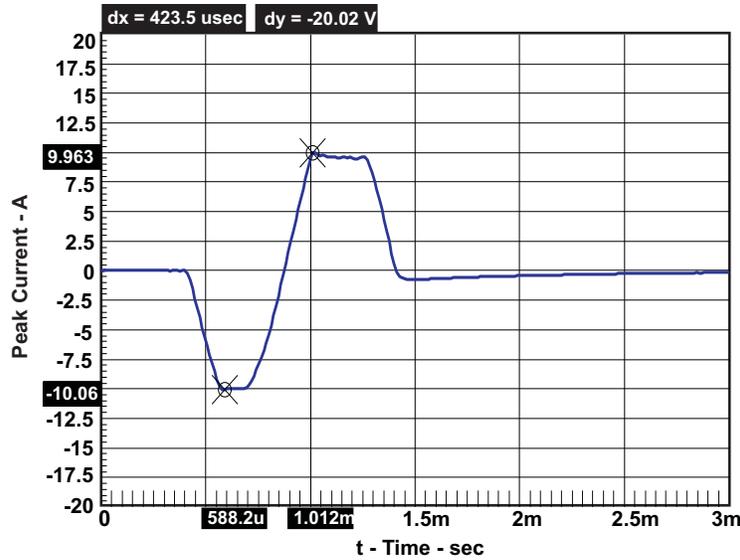**Figure 20. High Current Protection (SE)**

4.17 *High-Current Protection (BTL)*
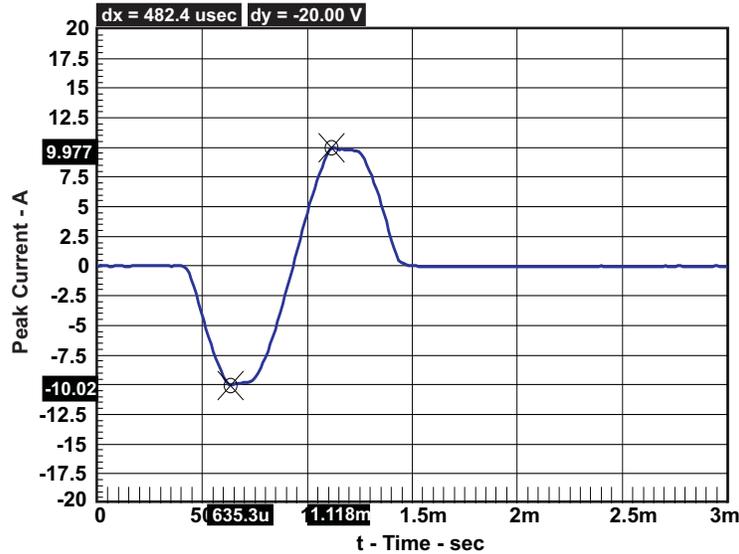
Input 1-kHz bursted signal, Load 1 Ω.

Figure 21. High Current Protection (PBTL)

4.18 *Pop/Click (BTL)*

No input signal applied, Load 8 Ω. FFT Analyzer Setup: Size = 32768, Window = Blackman Harris, Sample Rate = 48 kHz, DC Coupled.
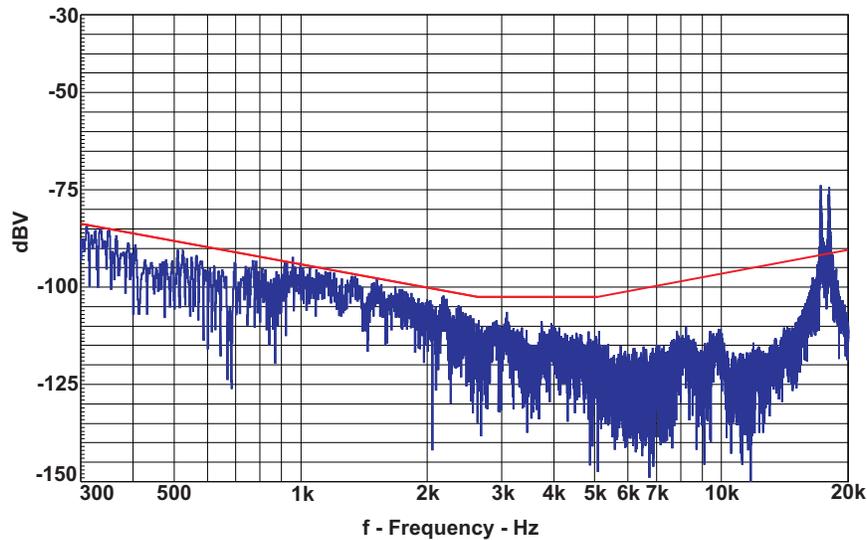
Figure 22. Pop/Click (BTL)

4.19 Pop/Click (SE)

No input signal applied, Load 4 Ω. FFT Analyzer Setup: Size = 32768, Window = Blackman Harris, Sample Rate = 48 kHz, DC Coupled.
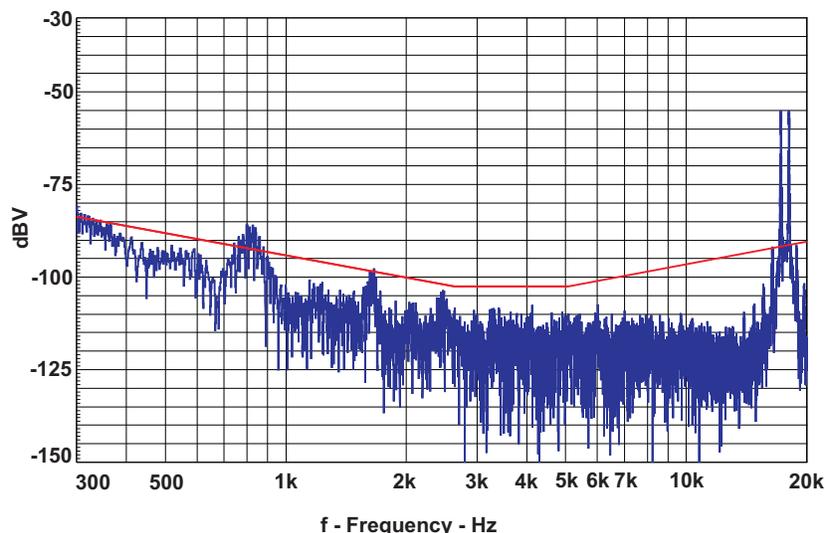
Figure 23. Pop/Click (SE)

4.20 Output Stage Efficiency

Efficiency is tested with one SE channel loaded 4 Ω and one BTL channel loaded with 8 Ω. The board has been preheated for 1 hour at 1/8 output power.
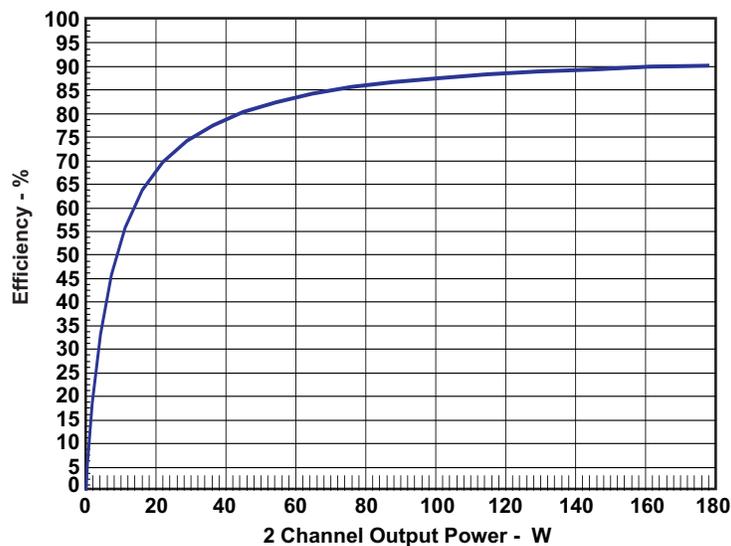
Figure 24. Output Stage Efficiency

5 Related Documentation from Texas Instruments

Table 10 contains a list of data sheets that have detailed descriptions of the integrated circuits used in the design of the TAS5162DDV6EVM. The data sheets can be obtained at http://www.ti.com.

Table 10. Related Documentation from Texas Instruments

Part Number	Literature Number
TAS5086	SLES131
TAS5162	SLES194
TLV272	SLOS351
TPS5430	SLVS632
TPS3801K33	SLVS219
TLV2217-33	SLVS067
UA78M12	SLVS059

5.1 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 Measurement Technique* (SLEA044)
8. *Power Supply Recommendations for DVD Receivers* (SLEA027)
9. *Implementation of Power Supply Volume Control* (SLEA038)

Appendix A Design Documents

This appendix comprises design documents pertaining to the TAS5162DDV6EVM evaluation module. The documents are presented in the following order.

- Schematic (6 pages)
- Parts List (2 pages)
- PCB Specification (1 page)
- PCB Layers (4 pages)
- Heat-Sink Drawing (1 page)

TEXAS INSTRUMENTS

Design Name: **TAS5162DDV6EVM**

Type: Mass Market Evaluation Module

File Name: A816-SCH-001(4.00).DSN

Version: 4.00

Date: 7.September 2007

Design Engineer: Jonas L. Holm (jlh@ti.com)

Audio Configuration: 5.1 PurePath Digital Amplifier Design
1 x TAS5086, 2 x TAS5162DDV

Interfaces: J40: 34 pin IDC Header for Control, I2C and +5V
J60: 16 pin IDC Header for I2S Audio
J101-J106: 2 pin 3.96mm Headers for Speakers
J901: 4 pin 3.96mm Header for H-Bridge and System Power Supply

Setup: 4 x 4 Ohm and 2 x 8 Ohm Speaker Loads
+50V H-Bridge and +15V System Power Supplies

Performance: 4 x 62.5 W/4 Ohm (SE) + 2 x 125 W/8 Ohm (BTL) - all unclipped.
105 dB Dynamic Range

TAS5162DDV6EVM

Project: TAS5162DDV6EVM	Rev: 4.00
Page Title: Overview	Size: A2
File Name: A816-SCH-001.DSN	Engineer: Jonas L. Holm
Date: Tuesday, June 19, 2007	Page: 2 of 6

POWER OUTPUT STAGE (SE)

STUFFING OPTION

L132 Not Used
L130_1 — L130_2
L133 Not Used
L131_1 — L131_2
L152 Not Used
L150_1 — L150_2
L153 Not Used
L151_1 — L151_2

PVDD

C113 100nF 0603 100V — C123 1uF 1210 100V
GND GND

LAYOUT NOTE:
PLACE 100nF AS CLOSE
AS POSSIBLE TO U100.
PLACE 1uF AFTER THAT

C115 100nF 0603 100V — C125 1uF 1210 100V
GND GND

LC FILTER AND SPLIT CAPS

PVDD
C140 390uF 63V
C141 390uF 63V
C144 680nF 63V — R142 10.0k 0805
L130 Kwang Sung 22uH 8019P-22-220L
GND_A — OUT_A
R146 3.30R 0805
R144 3.30R 0805
C146 10nF 100V 0805
C148 10nF 100V 0805 — C150 1nF 100V 0603
GND LAYOUT NOTE: EMI/ESD SNUBBER PLACE NEAR SPEAKER PINS
L130_1 — L130_2

PVDD
C142 390uF 63V
C143 390uF 63V
C145 680nF 63V — R143 10.0k 0805
L131 Kwang Sung 22uH 8019P-22-220L
GND_B — OUT_B
R147 3.30R 0805
R145 3.30R 0805
C147 10nF 100V 0805
C149 10nF 100V 0805 — C151 1nF 100V 0603
GND LAYOUT NOTE: EMI/ESD SNUBBER PLACE NEAR SPEAKER PINS
L131_1 — L131_2

PVDD
C160 390uF 63V
C161 390uF 63V
C164 680nF 63V — R162 10.0k 0805
L150 Kwang Sung 22uH 8019P-22-220L
GND_C — OUT_C
R166 3.30R 0805
R164 3.30R 0805
C166 10nF 100V 0805
C168 10nF 100V 0805 — C170 1nF 100V 0603
GND LAYOUT NOTE: EMI/ESD SNUBBER PLACE NEAR SPEAKER PINS
L150_1 — L150_2

PVDD
C162 390uF 63V
C163 390uF 63V
C165 680nF 63V — R163 10.0k 0805
L151 Kwang Sung 22uH 8019P-22-220L
GND_D — OUT_D
R167 3.30R 0805
R165 3.30R 0805
C167 10nF 100V 0805
C169 10nF 100V 0805 — C171 1nF 100V 0603
GND LAYOUT NOTE: EMI/ESD SNUBBER PLACE NEAR SPEAKER PINS
L151_1 — L151_2

U100 TAS5162DDV

Pin	Name		Pin	Name
1	GVDD_B		44	GVDD_A
2	/OTW		43	BST_A
3	NC		42	NC
4	NC		41	PVDD_A
5	/SD		40	PVDD_A
6	PWM_A		39	OUT_A
7	/RESET_AB		38	GND_A
8	PWM_B		37	GND_B
9	OC_ADJ		36	OUT_B
10	GND		35	PVDD_B
11	AGND		34	BST_B
12	VREG		33	BST_C
13	M3		32	PVDD_C
14	M2		31	OUT_C
15	M1		30	GND_C
16	PWM_C		29	GND_D
17	/RESET_CD		28	OUT_D
18	PWM_D		27	PVDD_D
19	NC		26	PVDD_D
20	NC		25	NC
21	VDD		24	BST_D
22	GVDD_C		23	GVDD_D

GVDD
R110 10R 0603
C100 10uF 16V
R100 10R 0603 — C101 100nF 0603
C111 100nF 0603
GND

/TW — /OTW
R111 47R 0603
/SD — /SD
PWM_A
/RESET_AB
PWM_B
R105 22k 0603 — R104 1R 0603
PROTECT_B
R114 100k 0603
Q100 MMBT2907A
R113 1.0k 0603
C102 100nF 0603
PWM_C
/RESET_CD
PWM_D
C114 100nF 0603 — R112 1.0k 0603
GND
R106 10R 0603
C112 10uF 16V — C104 100nF 0603
C105 100nF 0603
R108 10R 0603
R109 10R 0603

C110 33nF 0805 50V
C109 33nF 0805 50V
C108 33nF 0805 50V
C107 33nF 0805 50V
LAYOUT NOTE: LOWEST PRIORITY WHEN PLACED

C106 100nF 0603 GND
C111 100nF 0603 GND

PVDD

C117 100nF 0603 100V — C127 1uF 1210 100V
GND GND

LAYOUT NOTE:
PLACE 100nF AS CLOSE
AS POSSIBLE TO U100.
PLACE 1uF AFTER THAT

C119 100nF 0603 100V — C129 1uF 1210 100V
GND GND

/CHANNEL 1-4

GND_A
R140 100k 0603
C180 10uF 16V
R148 100k 0603 — OUT_A
R180 6.8k 0603
R181 100k 0603
Q180 MMBT2907A Q181

PROTECT_A

GND_B
R141 100k 0603
C181 10uF 16V
R149 100k 0603 — OUT_B
R182 6.8k 0603
R183 100k 0603
Q183 MMBT2907A Q182

PROTECT_A

GND_C
R160 100k 0603
C182 10uF 16V
R168 100k 0603 — OUT_C
R184 6.8k 0603
R185 100k 0603
Q185 MMBT2907A Q184

PROTECT_A

GND_D
R161 100k 0603
C183 10uF 16V
R169 100k 0603 — OUT_D
R186 6.8k 0603
R187 100k 0603
Q187 MMBT2907A Q186

PROTECT_A

DESIGN NOTE:
IF PVDD < 35 V, THEN R180 = R182 = R184 = R186 = 30k Ohm

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.

POWER OUTPUT STAGE (BTL)

STUFFING OPTION

L230_1 — L232 Not Used — L230_2
L231_1 — L233 Not Used — L231_2
L250_1 — L252 Not Used — L250_2
L251_1 — L253 Not Used — L251_2

LAYOUT NOTE:
PLACE 100nF AS CLOSE
AS POSSIBLE TO U200.
PLACE 1uF AFTER THAT

C213 100nF 0603 100V   C223 1uF 1210 100V
C215 100nF 0603 100V   C225 1uF 1210 100V
C272 390uF 63V
PVDD

C217 100nF 0603 100V   C227 1uF 1210 100V
C274 390uF 63V
PVDD
C219 100nF 0603 100V   C229 1uF 1210 100V

LAYOUT NOTE:
PLACE 100nF AS CLOSE
AS POSSIBLE TO U200.
PLACE 1uF AFTER THAT

GVDD

R210 10R 0603
C200 10uF 16V
R200 10R 0603   C201 100nF 0603
C211 100nF 0603
R211 47R 0603

U200 TAS5162DDV

Pin	Name	Name	Pin
1	GVDD_B	GVDD_A	44
2	/OTW	BST_A	43
3	NC	NC	42
4	NC	PVDD_A	41
5	/SD	PVDD_A	40
6	PWM_A	OUT_A	39
7	/RESET_AB	GND_A	38
8	PWM_B	GND_B	37
9	OC_ADJ	OUT_B	36
10	GND	PVDD_B	35
11	AGND	BST_B	34
12	VREG	BST_C	33
13	M3	PVDD_C	32
14	M2	OUT_C	31
15	M1	GND_C	30
16	PWM_C	GND_D	29
17	/RESET_CD	OUT_D	28
18	PWM_D	PVDD_D	27
19	NC	PVDD_D	26
20	NC	NC	25
21	VDD	BST_D	24
22	GVDD_C	GVDD_D	23

/TW   /SD   PWM_A   /RESET_AB   PWM_C   /RESET_CD

R205 22k 0603   R204 1R 0603
C202 100nF 0603

PROTECT_B
R214 100k 0603
Q200 MMBT2907A
R213 1.0k 0603
R212 1.0k 0603
C214 100nF 0603
R206 10R 0603
C212 10uF 16V   C204 100nF 0603
C205 100nF 0603
R208 10R 0603
R209 10R 0603
C206 100nF 0603

C210 33nF 0805 50V
C209 33nF 0805 50V
C208 33nF 0805 50V
C207 33nF 0805 50V

LAYOUT NOTE:
LOWEST
PRIORITY
WHEN PLACED

LC DEMODULATION FILTER

L230_1 — L230 15uH Kwang Sung 8019P-21-150L — L230_2 — OUT_A
L231_1 — L231 15uH Kwang Sung 8019P-21-150L — L231_2 — OUT_B
L250_1 — L250 15uH Kwang Sung 8019P-21-150L — L250_2 — OUT_C
L251_1 — L251 15uH Kwang Sung 8019P-21-150L — L251_2 — OUT_D

C233 100nF 0603 100V   C232 330nF Wima 63V   C234 100nF 0603 100V
C253 100nF 0603 100V   C252 330nF Wima 63V   C254 100nF 0603 100V

PLACE NEAR SPEAKER PINS

R232 3.30R 0805   C235 10nF 0805 100V   C237 1nF 0603 100V
R233 3.30R 0805   C236 10nF 0805 100V   C238 1nF 0603 100V
R252 3.30R 0805   C255 10nF 0805 100V   C257 1nF 0603 100V
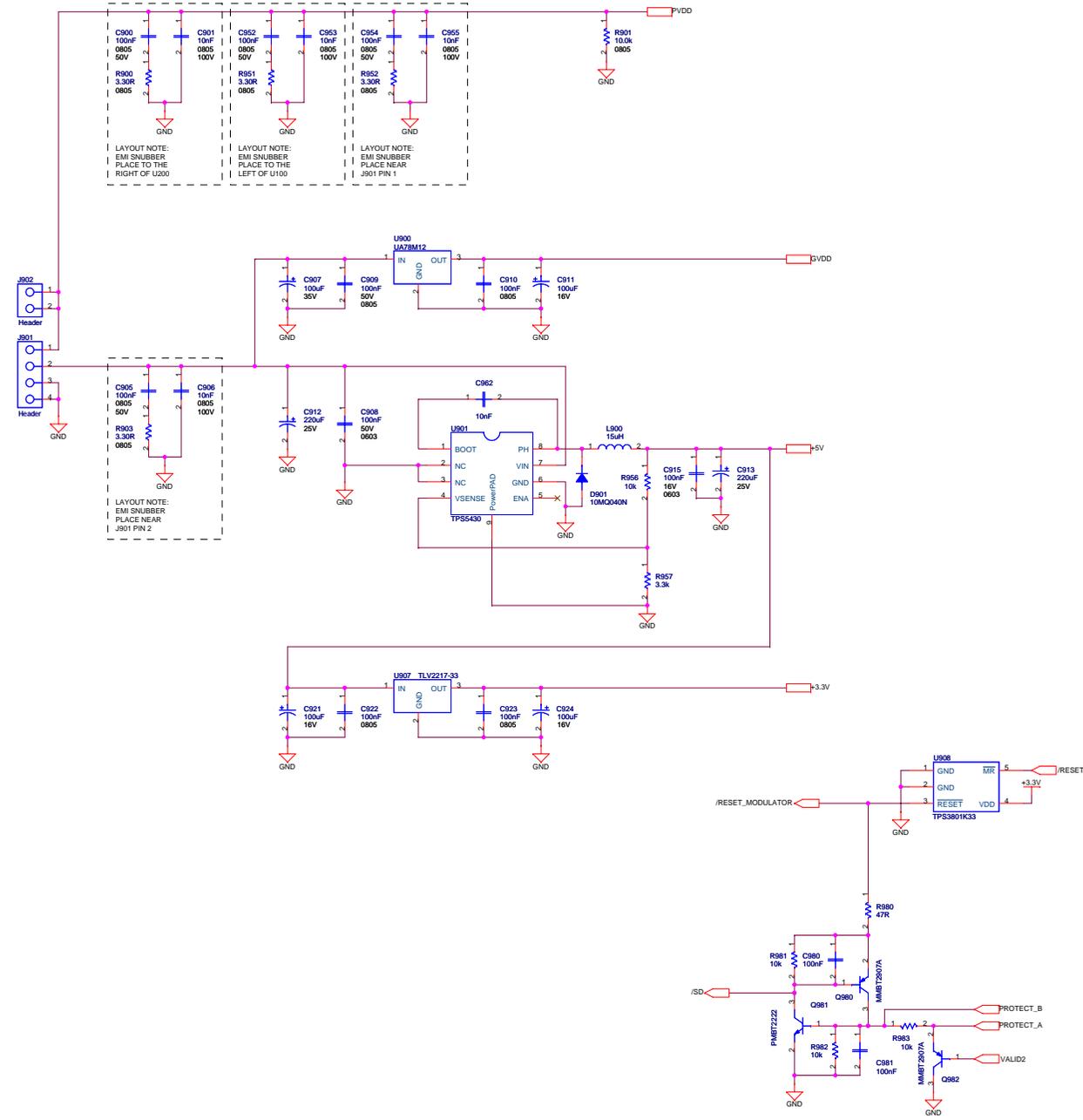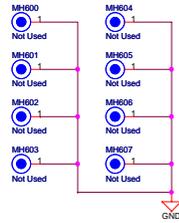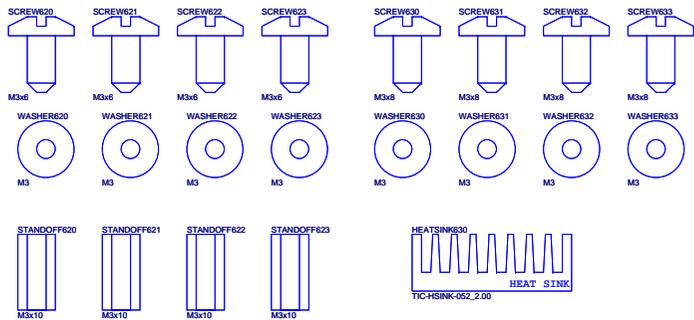R253 3.30R 0805   C256 10nF 0805 100V   C258 1nF 0603 100V

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.

POWER SUPPLIES

PVDD

C900 100nF 0805 50V
C901 10nF 0805 100V
C952 100nF 0805 50V
C953 10nF 0805 100V
C954 100nF 0805 50V
C955 10nF 0805 100V

R900 3.30R 0805
R951 3.30R 0805
R952 3.30R 0805

R901 10.0k 0805

GND

LAYOUT NOTE:
EMI SNUBBER
PLACE TO THE
RIGHT OF U200

LAYOUT NOTE:
EMI SNUBBER
PLACE TO THE
LEFT OF U100

LAYOUT NOTE:
EMI SNUBBER
PLACE NEAR
J901 PIN 1

U900 UA78M12
IN OUT
GND
GVDD

C907 100uF 35V
C909 100nF 50V 0805
C910 100nF 0805
C911 100uF 16V

GND

J902
1
2
Header

J901
1
2
3
4
Header

C905 100nF 0805 50V
C906 10nF 0805 100V
R903 3.30R 0805

GND

LAYOUT NOTE:
EMI SNUBBER
PLACE NEAR
J901 PIN 2

C912 220uF 25V
C908 100nF 50V 0603

GND

C962 10nF

U901
1 BOOT PH 8
2 NC VIN 7
3 NC GND 6
4 VSENSE ENA 5
PowerPAD
9
TPS5430

L900 15uH
R956 10k
D901 10MQ040N

C915 100nF 16V 0603
C913 220uF 25V

+5V

GND

R957 3.3k

GND

U907 TLV2217-33
IN OUT
GND
+3.3V

C921 100uF 16V
C922 100nF 0805
C923 100nF 0805
C924 100uF 16V

GND

U908
1 GND MR 5
2 GND
3 RESET VDD 4
TPS3801K33

/RESET
+3.3V

/RESET_MODULATOR

GND

R980 47R

R981 10k
C980 100nF
Q980
MMBT2907A

/SD

Q981
PMBT2222

R982 10k

R983 10k

C981 100nF

Q982
MMBT2907A

PROTECT_B
PROTECT_A
VALID2

GND
GND

MECHANICS

SCREW620 SCREW621 SCREW622 SCREW623   SCREW630 SCREW631 SCREW632 SCREW633

M3x6   M3x6   M3x6   M3x6   M3x8   M3x8   M3x8   M3x8

WASHER620 WASHER621 WASHER622 WASHER623   WASHER630 WASHER631 WASHER632 WASHER633

M3   M3   M3   M3   M3   M3   M3   M3

STANDOFF620 STANDOFF621 STANDOFF622 STANDOFF623   HEATSINK630

M3x10   M3x10   M3x10   M3x10   HEAT SINK

TIC-HSINK-052_2.00

MH600   MH604
Not Used   Not Used

MH601   MH605
Not Used   Not Used

MH602   MH606
Not Used   Not Used

MH603   MH607
Not Used   Not Used

GND

PCB610

PCB

A816-PCB-001_3.00

TAS5162DDV6EVM Parts List (4.00)

TEXAS INSTRUMENTS

Qty	Part Reference	Description	Manufacture	First Mfr P/N
5	R142 R143 R162 R163 R901	10.0k / 125mW / 1% / 0805 Thick Film Resistor	Yageo	RC0805FR-0710KL
16	R144 R145 R146 R147 R164 R165 R166 R167 R232 R233 R252 R253 R900 R903 R951 R952	3.30R / 125mW / 1% / 0805 Thick Film Resistor	Yageo	RC0805FR-073R3L
4	R112 R113 R212 R213	1.0k / 100mW / 5% / 0603 Thick Film Resistor	Yageo	RC0603JR-071KL
19	R40 R41 R42 R43 R44 R45 R46 R47 R67 R68 R69 R70 R71 R72 R73 R956 R981 R982 R983	10k / 100mW / 5% / 0603 Thick Film Resistor	Yageo	RC0603JR-0710KL
14	R114 R140 R141 R148 R149 R160 R161 R168 R169 R181 R183 R185 R187 R214	100k / 100mW / 5% / 0603 Thick Film Resistor	Yageo	RC0603JR-07100KL
2	R104 R204	1R / 100mW / 5% / 0603 Thick Film Resistor	Yageo	RC0603JR-071RL
10	R100 R106 R108 R109 R110 R200 R206 R208 R209 R210	10R / 100mW / 5% / 0603 Thick Film Resistor	Yageo	RC0603JR-0710RL
1	R18	18.0k / 100mW / 1% / 0603 Thick Film Resistor	Yageo	RC0603FR-0718KL
2	R10 R11	200R / 100mW / 5% / 0603 Thick Film Resistor	Yageo	RC0603JR-07200RL
2	R105 R205	22k / 100mW / 5% / 0603 Thick Film Resistor	Yageo	RC0603JR-0722KL
1	R957	3.3k / 100mW / 5% / 0603 Thick Film Resistor	Yageo	RC0603JR-073K3L
19	R23 R48 R49 R50 R51 R52 R53 R54 R55 R60 R61 R62 R63 R64 R65 R66 R111 R211 R980	47R / 100mW / 5% / 0603 Thick Film Resistor	Yageo	RC0603JR-0747RL
4	R180 R182 R184 R186	6.8k / 100mW / 5% / 0603 Thick Film Resistor	Yageo	RC0603JR-076K8L
16	C146 C147 C148 C149 C166 C167 C168 C169 C235 C236 C255 C256 C901 C906 C953 C955	Ceramic 10nF / 100V / 20% X7R 0805 Capacitor	BC Components	0805B103M101NT
8	C900 C905 C909 C910 C922 C923 C952 C954	Ceramic 100nF / 50V / 20% X7R 0805 Capacitor	BC Components	0805B104M500NT
8	C107 C108 C109 C110 C207 C208 C209 C210	Ceramic 33nF / 50V / 20% X7R 0805 Capacitor	BC Components	0805B333M500NT
8	C123 C125 C127 C129 C223 C225 C227 C229	Ceramic 1uF / 100V / 10% X7R 1210 Capacitor	Murata	GRM32ER72A105KA01L
8	C150 C151 C170 C171 C237 C238 C257 C258	Ceramic 1nF / 100V / 10% X7R 0603 Capacitor	Murata	GRM188R72A102KA01
3	C10 C13 C962	Ceramic 10nF / 50V / 20% X7R 0603 Capacitor	Vishay	VJ0603Y103MXA
24	C11 C12 C14 C17 C21 C22 C25 C101 C102 C104 C105 C106 C111 C114 C201 C202 C204 C205 C206 C211 C214 C915 C980 C981	Ceramic 100nF / 16V / 20% X7R 0603 Capacitor	Vishay	VJ0603Y104MXJ
1	C908	Ceramic 100nF / 50V / 20% X7R 0603 Capacitor	Vishay	VJ0603Y104MXA
12	C113 C115 C117 C119 C213 C215 C217 C219 C233 C234 C253 C254	Ceramic 100nF / 100V / 10% X7R 0603 Capacitor	Murata	GRM188R72A104KA35D
9	C20 C100 C112 C180 C181 C182 C183 C200 C212	Electrolytic 10uF / 16V / 20% Aluminium 1.5mm ø4mm Ultra-Mini Series Capacitor	Sang Jing Electronics	UMR16V106M4X5
1	C907	Electrolytic 100uF / 35V / 20% Aluminium 3.5mm ø8mm FC Series - Low Impedance Capacitor	Panasonic	EEUFC1V101
3	C911 C921 C924	Electrolytic 100uF / 16V / 20% Aluminium 2.5mm ø6.3mm Ultra-Mini Series Capacitor	Sang Jing Electronics	UMR16V107M6.3X5
2	C912 C913	Electrolytic 220uF / 25V / 20% Aluminium 3.5mm ø8mm FC Series - Low Impedance Capacitor	Panasonic	EEUFC1E221
10	C140 C141 C142 C143 C160 C161 C162 C163 C272 C274	Electrolytic 390uF / 63V / 20% Aluminium 5mm ø12.5mm FC Series - Low Impedance Capacitor	Panasonic	EEUFC1J391
2	C232 C252	Metal Film 330nF / 63V / 10% Polyester 5mm (W:4.5mm L:7.2mm) Capacitor	Wima	MKS 2 0.33uF/10%/63Vdc PCM5
4	C144 C145 C164 C165	Metal Film 680nF / 63V / 10% Polyester 5mm (W:4.5mm L:7.2mm) Capacitor	Wima	MKS 2 0.68uF/10%/63Vdc PCM5
4	L230 L231 L250 L251	15uH / Ferrite Inductor	Kwang Sung	8019P-21-150L
1	L900	15uH / Ferrite Inductor	Kwang Sung	8020P-06-150L
4	L130 L131 L150 L151	22uH / Ferrite Inductor	Kwang Sung	8019P-22-220L
1	D901	1A / 40V Schottky 10MQ040N Diode (SMA)	Int. Rectifier	10MQ040N
1	Q981	600mA / 40V NPN Small signal PMBT2222 Transistor (SOT-23)	Philips	PMBT2222
12	Q100 Q180 Q181 Q182 Q183 Q184 Q185 Q186 Q187 Q200 Q980 Q982	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
2	U100 U200	TAS5162DDV / 4ch/2ch/1ch Digital Audio PWM Power Output Stage (DDV44)	Texas Instruments	TAS5162DDV
1	U908	TPS3801K33 / 3.3V Supply Voltage Supervisor (SOT323-5)	Texas Instruments	TPS3801K33DCK
1	U900	UA78M12 / 12V/500mA Positive Voltage Regulator (PFM2-KTP)	Texas Instruments	UA78M12CKTPR

2007-08-22 / JLH

TAS5162DDV6EVM Parts List (4.00)

TEXAS INSTRUMENTS

1	U907	TLV2217-33 / 3.3V Low Dropout Voltage Regulator (PFM2-KTP)	Texas Instruments	TLV2217-33KTPR
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	SCREW630 SCREW631 SCREW632 SCREW633	M3x8 Pan Head, Pozidriv, A2 Screw	Bossard	BN 81882 M3x8
4	WASHER620 WASHER621 WASHER622 WASHER623	M3 Stainless Steel Washer	Bossard	BN 670 M3
4	WASHER630 WASHER631 WASHER632 WASHER633	M3 Stainless Steel Spring Washer	Bossard	BN 760 M3
4	STANDOFF620 STANDOFF621 STANDOFF622 STANDOFF623	M3x10 Aluminium Stand-off	Ettinger	05.03.108
7	J101 J102 J103 J104 J105 J106 J902	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
1	PCB610	A816-PCB-001_4.00 / TAS5162DDV6EVM Printed Circuit Board (ver. 4.00)	Printline	A816-PCB-001(4.00)
1	HEATSINK630	TIC-HSINK-052_2.00 / Heatsink for 2 DDV packages length 106 mm	THF-Teknik	TIC-HSINK-052(2.00)

TAS5162DDV6EVM
PCB SPECIFICATION
Version 4.00

BOARD IDENTIFICATION:	A816-PCB-001(4.00)
BOARD TYPE:	DOUBLE-SIDED PLATED-THROUGH BOARD
LAMINATE TYPE:	FR4
LAMINATE THICKNESS:	1.6mm
COPPER THICKNESS:	70 µm (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
Aprox. Number of holes	600
COMMENTS:	SEE DRILL INFORMATION FILE (5201pcb.PDF).

A816-PCB-001 (4.00)

FRONT LEFT J101
FRONT RIGHT J102
J103 REAR LEFT
J104 REAR RIGHT
CENTER J105
SUBWOOFER J106

A816-PCB-001 (4.00)
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Patents Pending

REV S/N

C183 C182 C181 C180

C144 C145 C164 C165 C232 C252

L131 L151 L230 L250

L130 L150 L231 L251

C141 + C143 + C161 + C163 + C272 +
C140 + C142 + C160 + C162 + C274 +

C911 +
C910
U900
C909
C907 +

PSU

J902
J901

U100 U200

C123 C125 C127 C129
C223 C225 C227 C229

C100 + C112 +
U10
C200 + C212 +

U907

C921 + C924 +

TEXAS INSTRUMENTS
TAS5162DDV6EVM

PurePath DIGITAL
5.1 CH AMPLIFIER

L900
U901 C912 +
C913

J40   2 / 1   34 / 33
J60   2 / 1   16 / 15

FRONT LEFT
FRONT RIGHT
REAR LEFT
REAR RIGHT
CENTER
SUBWOOFER

A816-PCB-001 (4.00)

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Patents Pending

S/N

REV

PSU

L131   L151   L230   L250
L130   L150   L231   L251

C141   C143   C161   C163   C272
C140   C142   C160   C162   C274

U100   U200

U10

U907

TEXAS INSTRUMENTS
TAS5162DDV6EVM

PurePath DIGITAL

5.1 CH AMPLIFIER

L900

C913   U901   C912

J40   J60

SOLDER SIDE	DpS 5201 070821
TI Denmark A816-PCB-001 (4.00)	
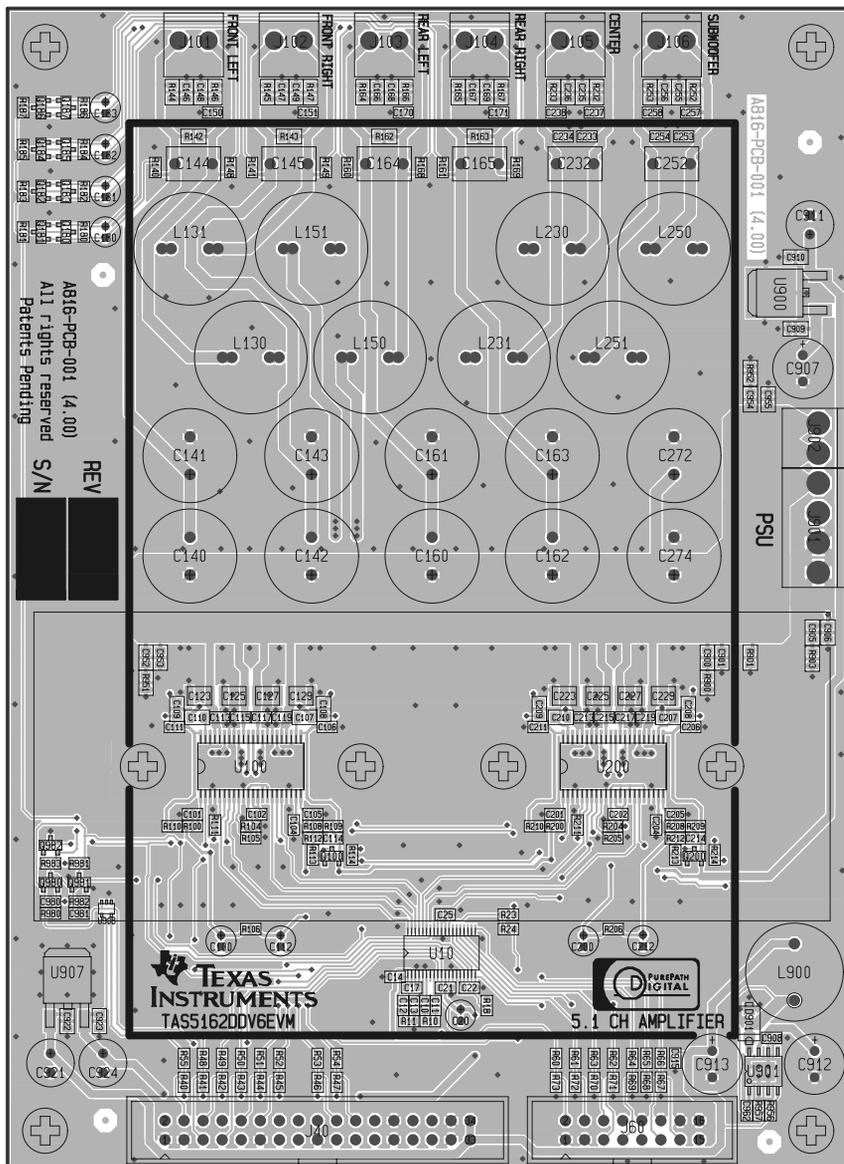
TEXAS INSTRUMENTS

TIC-HSINK-052(2.00)

Heatsink for 2 DDV packages length 106 mm

19.June 2007
TIC-HSINK-052(2.00).dwg
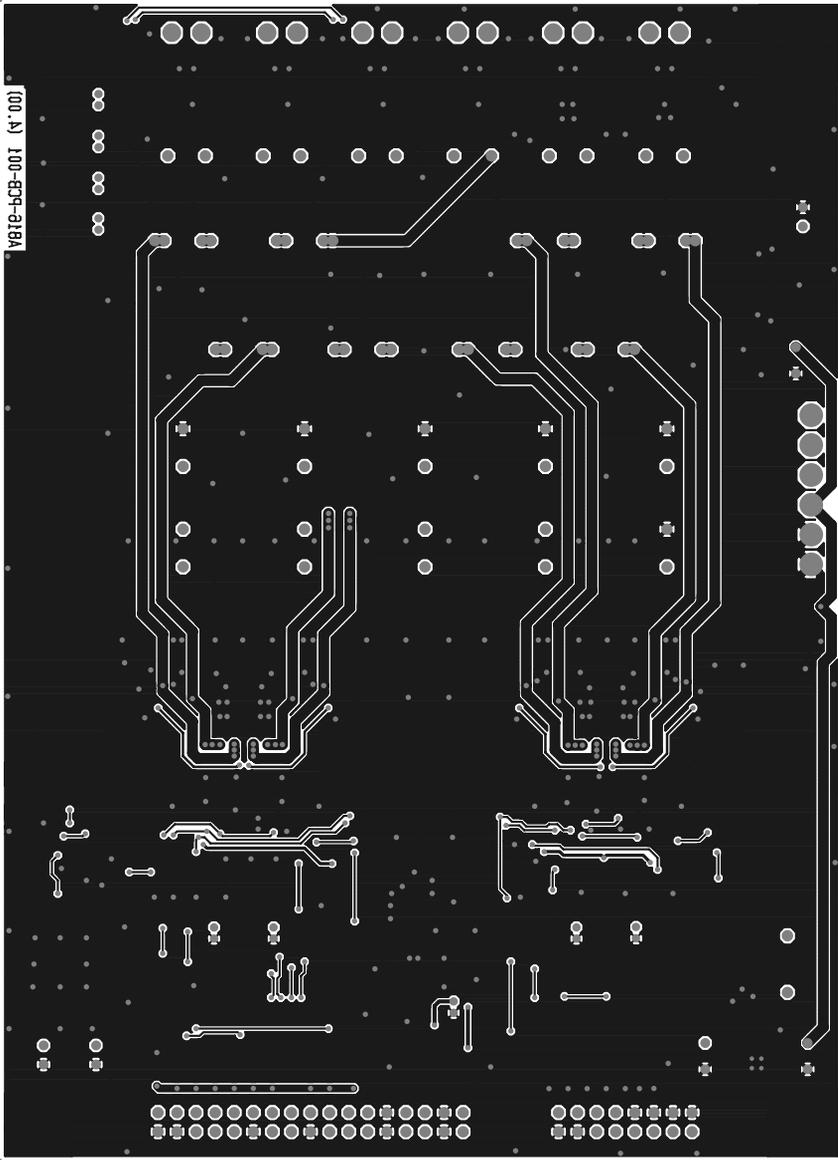
Jonas L. Holm
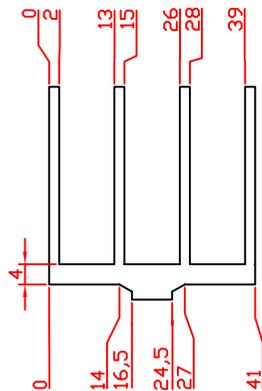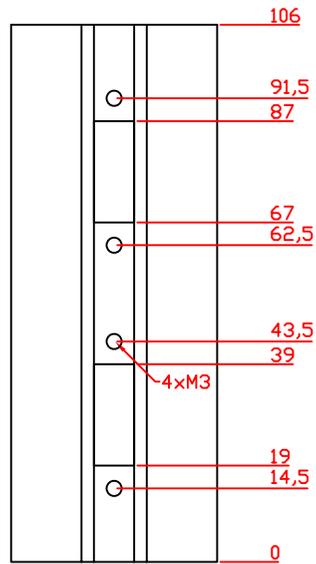
SCALE: 1:1.5
PROFILE: TIC-HSINK-050(1.00)
DIMENSIONS: mm
MATERIAL: ALUMINUM
INTERNAL SCREW THREADS: M3
SURFACE: FREE OF SHARP EDGES
SURFACE TREATMENT: BLACK ANODIZED
TOLERANCES: +/- 0.1 mm

EVALUATION BOARD/KIT IMPORTANT NOTICE

Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

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EVM WARNINGS AND RESTRICTIONS

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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- Комплексную поставку.
- Работу по проектам и поставку образцов.
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- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.

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