

**Figure 1**  
**2 x In, 3 x Out Audio**  
**Digital Signal Processor**  
**Application Version - APM1**  
(parts in red area is not included)  
**AA-AP23111**

## Features

- 2 x 2 inches(50 x 50 mm) Compact PCB Size
- 28/56 bit DSP Engine
- 24 bit ADC/DAC Resolution
- 48kHz Sampling Rate
- 5V USB Power Supply
- Debug Port for Sigma Studio through USBi or Sure Electronics ICP1 (Available only in evaluation version)
- Extension Board Port



**Figure 2**  
**2 x In, 3 x Out Audio**  
**Digital Signal Processor**  
**Evaluation Version - APM2**  
**AA-AP23122**

## Applications

- Speaker Equalization
- Active Crossovers
- Subwoofer Integration
- Noise Cancellation System
- Digital Car Audio System
- Home Theater, Karaoke, Musical Instruments

## Introduction

Sure Electronics is pleased to release the new Digital Signal Processor Series to meet flexible requirements of audiophiles and industrial customers. 2 x In, 3 x Out Audio Digital Signal Processor - APM2 is available for audiophiles or industrial customers who need functional samples for testing. The APM2 Board comes with all the necessary components and demonstration firmware, which is convenient for integration and what customers need to do is to connect and play. 2 x In, 3 x Out Audio Digital Processor - APM1 is the simplified version to meet the customizable requirements and save the final cost of industrial customers. This board is available with MOQ 500pcs.

Digital Signal Processor Series Interface Extension Kit - APM3 with 3.5mm jack and RCA jack is available for a quick connection to the stereo audio player and the audio amplifier(or headphone). And most of all, it can be quick connected to Sure Electronics DSP Kernel Board with only "one click"(10Pin Extension cable). With special interface design, the interface board can support RCA, 3.5mm AUX, molex Micro-Fit 4 Pin input and RCA, headphone, molex Micro-Fit 4 Pin output. Please kindly be noticed that three inputs and three outputs can not work at the same time.

Thanks for all the available interface of the Audio DSP, including analog and digital audio input and output, universal IOs and I2C programming interface, this Audio DSP board can provide a platform with the ADAU1701 for easy integration of digital audio applications at an favourable price. See more details about connections, please find PIN Definition chapter on Page 5.

## 1 High sound quality

This Audio DSP board employs the Analog Device ADAU1701 whose signal processing is comparable to that found in high end studio equipment. The dynamic range of its Two  $\Sigma$ - $\Delta$  ADCs and four  $\Sigma$ - $\Delta$  DACs reaches high up to 98.5dB. Each ADC has a THD + N of -83 dB, and each DAC has a THD + N of -90 dB. Besides, the optimal PCB layout of power filtering and signal loop as well as the capacitive components also contribute to the high sound quality.

Frequency Response

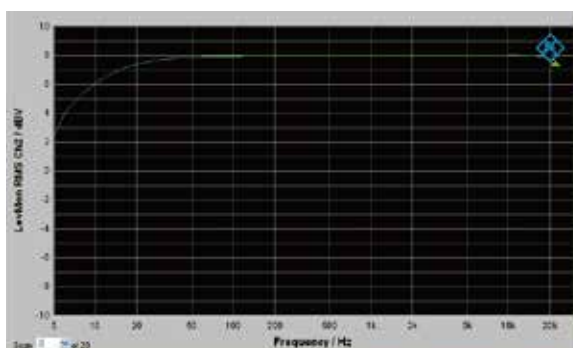


Figure 3

Distortion Spectrum

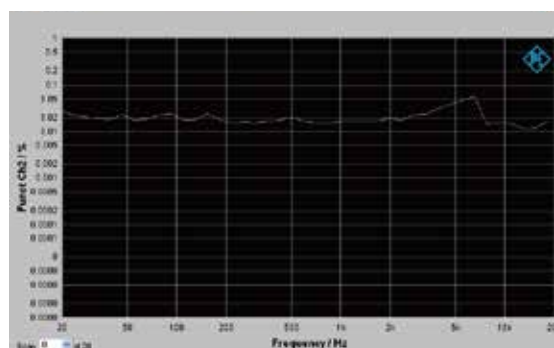


Figure 4

## 2 Affordable price

Selecting a proper audio DSP module for DIY applications with reasonable speed, cost, precision, data word length, I/O capabilities and SNR is usually not an easy task, especially when budget is only several or tens of dollars.

The Audio DSP board serves as a cost effective platform for those new to the digital signal processing with interest in digital audio.

Simple connection but rich potential configurations and low cost without hidden cost but high performance are the reasons of the affordable price.

## 3 Easy for integration

If you plan to develop a high performance audio systems, whether a car or a home theater focused application, using Kernel Audio DSP board is a turn-key approach to the system development that free up your development resources to focus on the global performance instead of spending time developing the audio DSP.

All the necessary interfaces have been rearranged according to signal chain and the programming requirement.

## 4 Transparent to design resources

For sake of saving the development investment, we've also attached the schematics, demonstration project resources and datasheet for the reference. The project files of DSP series board programming part are available for distributors and final customers. All the files can be downloaded from our website store [www.sure-electronics.com](http://www.sure-electronics.com). If you have further OEM requirement or application questions, please contact our technical support.

## 5 Fully protected

The ESD and TVS components and resistors arrays are used throughout input and output interface in order to avoid plug-in play damage to the ports.

We also use JST PH side entry connector and IDC connectors to prevent pin connection mistake.

Preliminary

## 6 Differences between application and evaluation version

The difference between APM1(application version) and AMP2(evaluation version) lies mainly in their structure.

The APM2 board, which is with all connectors soldered, is available for audiophiles and customers who need functional samples for testing. These connectors include two control ports on both sides of the board, each of them has 20 PINs to integrate the board. Besides, the APM2 board has 4 potentiometers at the bottom of the board and one debug port for SigmaStudio through USBi or Sure Electronics ICP1. Customers bought this board only need to connect the board and play it.

We know that different industrial customers have different requirements on connectors, so in order to save their final cost and make them put into use quickly, the APM1(application version) is available with MOQ 500pcs. The structure of the APM1 board is little different from APM2, we removed connectors mentioned above and there are only 2 potentiometers on the lower left corner of APM1 board. However, industrial customers can send emails to [store@sure-electronics.com](mailto:store@sure-electronics.com) for customization of special connections.

## 7 Transparent to SigmaStudio (Fully programmable with SigmaStudio graphical tool)

The SigmaStudio development environment Analog Device provides a graphical user interface to help you build and deploy signal processing systems quickly and efficiently. A wide variety of signal processing blocks can be wired together, as shown in a schematic diagram on the right, and the SigmaStudio compiler generates production-ready code while providing a control interface for setting and tuning parameters.

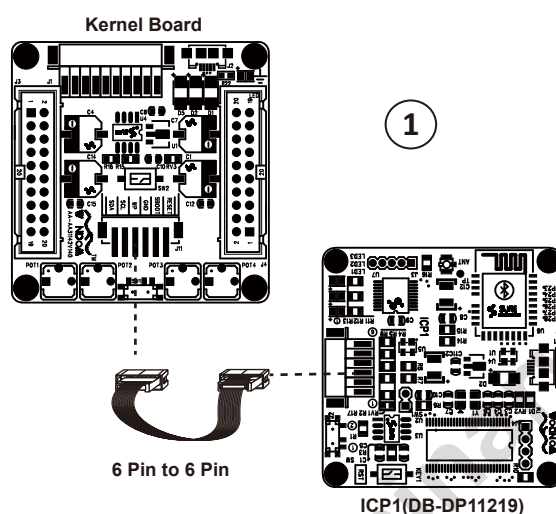
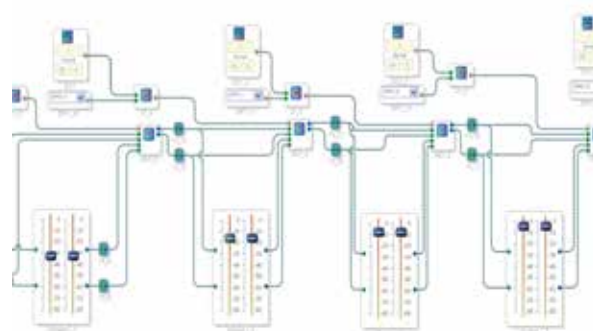
With the programmer USBi connected from PC to the kernel board, real time audio application debugging and programming may be implemented flexibly.

There are two methods to connect Kernel Board and programming board, customers can choose one of them freely.

### Method 1:

Sure Electronics can provide our own IC Programming Board - ICP1(DB-DP11219) for SigmaStudio, which can be connected directly with Sure Electronics Kernel Board by a 6 Pin cable. For customers like simple style, this way is more suitable and it is very convenient for connection. It has a 6 Pin connector and can connected directly with Kernel Board using a 6 Pin to 6 Pin cable. This Programming kit costs \$19.9. Please feel free to contact with [info@sure-electronics.com](mailto:info@sure-electronics.com) for more detailed information about our programming board.

Figure 5. SigmaStudio graphical tool

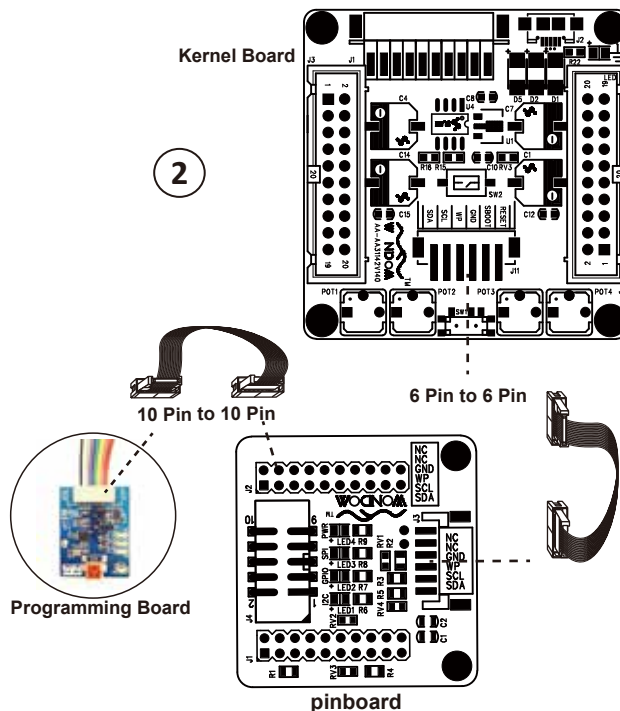


## Method 2:

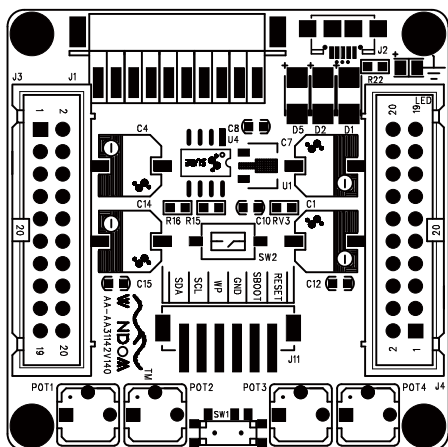
Sure Electronics can provide customers with Analog Devices EVAL-ADUSB2Z from the same company as Kernel Board for programming. There is a 10 Pin connector on the board for connection. A 10 Pin to 10 Pin cable will be provided together with the original programming board. This kit cost \$99.9.

Customers also need a pinboard to connect the two boards. The pinboard has a 10 Pin connector to connect with programming board and a 6 Pin connector to connect with Kernel Board. However, the pinboard is not included in the kit, it costs \$9.99, including a 6 Pin to 6 Pin cable.

Sure Electronics can provide programming service for OEM customers, MOQ 500 pcs and engineering cost will be requested. Please send your requirement document to [info@sure-electronics.com](mailto:info@sure-electronics.com) for confirmation.



## 8 PIN Definition



### Control Port:

J3

Pin	Definition	Pin	Definition
1	AD0	2	GND
3	AD1	4	GND
5	SCL	6	WB
7	SDA	8	WP
9	RST	10	OR1
11	MP2	12	OL1
13	MP3	14	OR2
15	MP8	16	OL2
17	MP9	18	GND
19	DPW	20	3.3V

### Control Port Pins:

J4

Pin	Definition	Pin	Definition
1	GND	2	MCLK
3	GND	4	MP11
5	GND	6	MP10
7	GND	8	MP6
9	GND	10	MP7
11	GND	12	MP0
13	GND	14	MP1
15	GND	16	MP5
17	GND	18	MP4
19	GND	20	VIN

### Extension Kit

#### Connector:

J1 PH-10PIN-2MM

Pin	Definition
1	AINL
2	SGND
3	AINR
4	+3.3V
5	OUTR1
6	OUTL1
7	OUTR2
8	OUTL2
9	GND
10	VIN

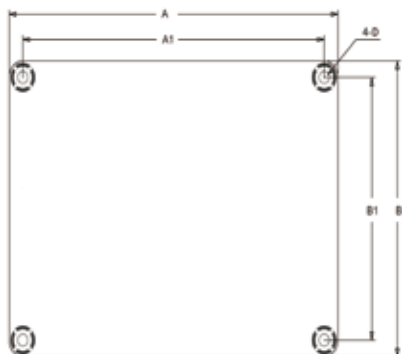
### Program Port:

J11 PH-6PIN-2MM

Pin	Definition
1	SDA
2	SCL
3	WP
4	GND
5	SBOOT
6	RESET

Preliminary

## 9 Dimensional drawing



### Notes:

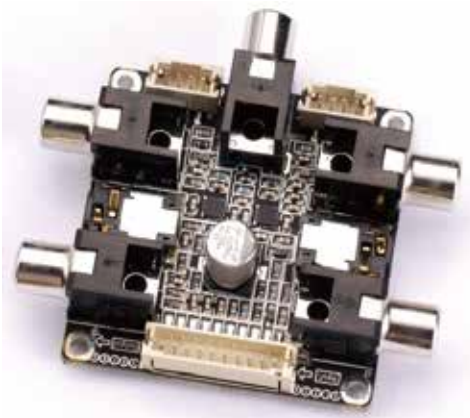
- All dimensions are typical in inch (mm)
- Tolerance x.xx =  $\pm 0.02$  ( $\pm 0.50$ )
- Sure Electronics provides connecting and dimensional diagrams for customers. Under no circumstance do we provide schematics.

Dimension	A(inch/mm)	A1(inch/mm)	B(inch/mm)	B1(inch/mm)	R(inch/mm)
1	2.0/50.0	1.75/44.45	2.0/50.0	1.75/44.45	0.11/2.80

## 10 Price List

Package	P/N	Item	Listed price
APM1(Application Version)	AA-AP23111	2 x In, 3 x Out Audio Digital Signal Processor - APM1	\$9.99(MOQ 500pcs)
APM2(Evaluation Version)	AA-AP23122	2 x In, 3 x Out Audio Digital Signal Processor - APM2	\$19.90

**Note:** Please refer to Figure 1, Figure 2 on Page 1 and chapter 6 on Page 3 to find the differences between APM1 and APM2.



**Digital Signal Processor  
Interface Extension Kit - APM3  
AA-AA11428**

## Introduction

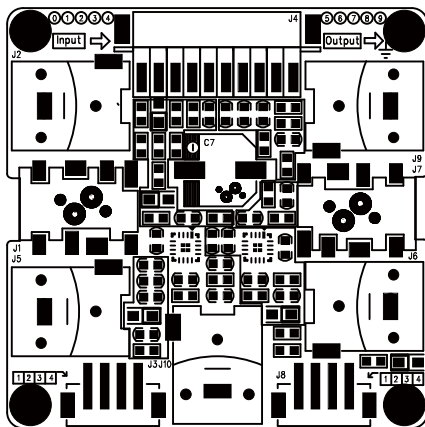
Sure Electronics has released one interface extension board to provide a simple connection solution for customers' applications and it only costs \$9.99. Interfaces on board include 2 RCA input jacks, 2 RCA output jacks, 2 3.5mm AUX jacks, 2 PH-4PIN-2MM vertical headers.

With the headers and a 10 pin cable, the interface extension board can be integrated to the DSP Kernel board quickly. For more detailed connection information, please refer to "Connection" chapter.

## Features

- 2 x 2 inches(50 x 50 mm) Compact PCB Size
- 2 RCA input, 3 RCA output
- 1 AUX input, 1 AUX output
- 1 PH-4PIN-2MM input, 1 PH-4PIN-2MM output
- Powered by DSP kernel board

## 1 PIN Definition



**Note:**The left and right corresponding relation is based on the diagram that 3.5mm Headphone Jack is on the right.

### RCA Right Input:

J2 RCA Jack

### RCA Left Input:

J5 RCA Jack

### Extension Kit Connector:

J4

Pin	Definition
0	AINL
1	AGND
2	AINR
3	+3.3V
4	OUTR
5	OUTL
6	AGND
7	SUB
8	GND
9	VIN

### RCA Left Output:

J6 RCA Jack

### RCA Right Output:

J9 RCA Jack

### Subwoofer Output:

J10 RCA Jack

### AUX In:

J1 3.5mm AUX Jack

### Headphone Output:

J7 3.5mm AUX Jack

### Input (PH):

J3 PH-4Pin-2mm  
Vertical Header

Pin	Definition
1	INL
2	GND
3	GND
4	INR

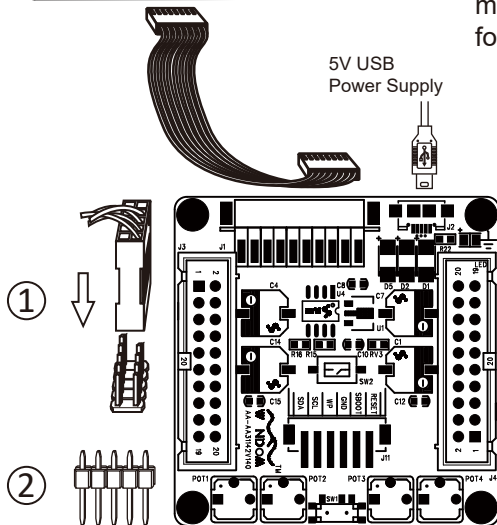
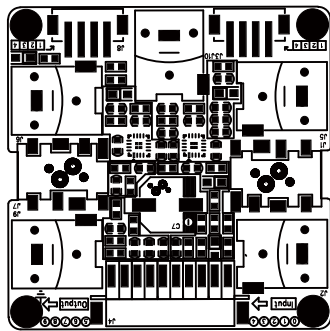
### Output (PH):

J8 PH-4Pin-2mm  
Vertical Header

Pin	Definition
1	OUTR
2	GND
3	GND
4	OUTL

1/2

## 2 Connection



### How to connect audio DSP Kernel Board with interface extension board ?

All useful Pins of DSP Kernel Board have been included in 2 sockets on both sides of the board. It is easy for customers to integrate this board into their projects. A 10 Pin terminal on board is also provided to connect with Analog Devices EVAL-ADUSB2Z or Sure Electronics IC Programmer - ICP1 for programming.

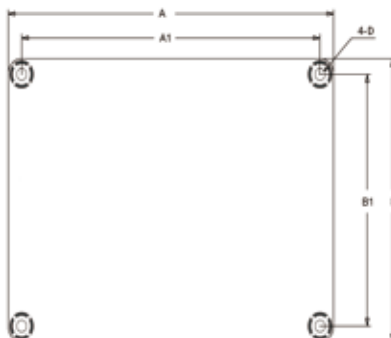
Choose our extension board for more generic connector interfaces. 2 pieces RCA and a 3.5mm AUX jack are provided for input, 2 pieces RCA and a headphone jack for output. Also molex Micro-Fit 4 Pin terminals have been provided on board for more complex application solutions.

A 10 Pin extension cable which is attached with extension kit package is provided to connect the two boards.

Installation kit is also help for a quick connection and convenient programming.



## 3 Dimensional drawing



### Notes:

- All dimensions are typical in inch (mm)
- Tolerance x.xx =  $\pm 0.02$  ( $\pm 0.50$ )
- Sure Electronics provides connecting and dimensional digrams for customers. Under no circumstance do we provide schematics.

Dimension	A(inch/mm)	A1(inch/mm)	B(inch/mm)	B1(inch/mm)	R(inch/mm)
1	2.0/50.0	1.75/44.45	2.0/50.0	1.75/44.45	0.11/2.80

## 4 Price List

Package	P/N	Item	Listed Price
Extension Kit	AA-AA11428	Audio Digital Signal Processor Interface Extension Kit	\$9.99

Preliminary