
Evaluation board for FDA903U power amplifier

Introduction

This document describes how to use the evaluation board in order to check FDA903U device performance; for any other information and deeper details please refer to the FDA903U datasheet.

1 Purpose

The purpose of this document is to describe the FDA903U Stand Alone Demo Module for Slug Up package.

Table 1. Board summary

Order Code	Device supported
EVAL-FDA903U-SA	FDA903U

It contains the module description, the schematic, the bill of materials and the board layout of the following module:

6038-492.19

In the following chapters it will be referred as 492 module.

2 Warning

This evaluation board/kit is intended for the following uses:

- Engineering development
- Demonstrations
- Evaluation purposes only

and is not considered by ST Microelectronics (ST) to be a finished end-product fit for general consumer use. The people who handle the product(s) must have electronics training and observe good engineering standard practices.

As such, the goods being provided are not intended to be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including product safety and environmental measures typically found in end products that incorporate such semiconductor components or circuit boards.

This evaluation board/kit does not fall within the purpose of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

3 Module description

This board is a 1x45W class D amplifier based on the ST FDA903U and is intended to demonstrate the device's capabilities.

Figure 1. 6038-492.19 - top view

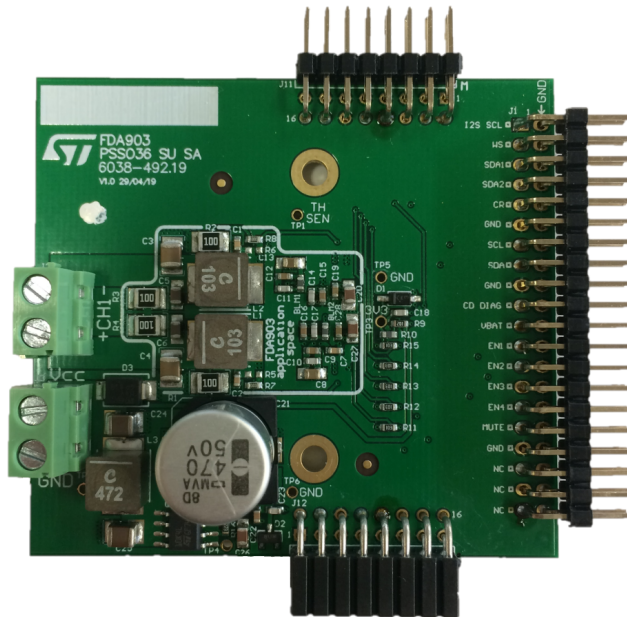
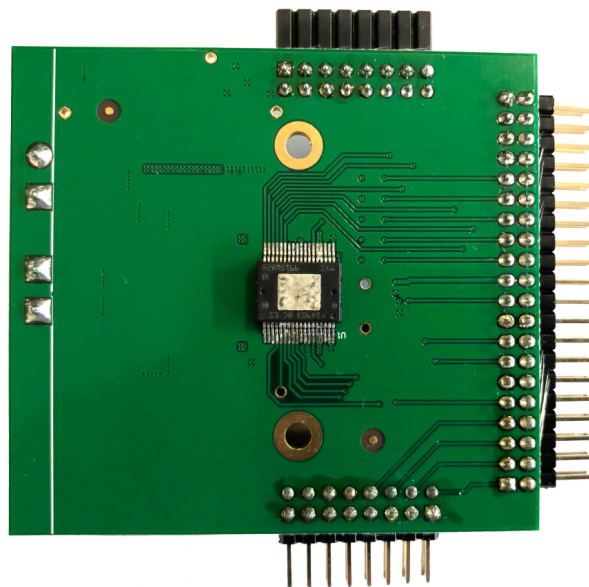


Figure 2. 6038-492.19 with Coilcraft XAL4040 - bottom view



Note: The output LC filter in this module can be assembled with different values and kind of coils and capacitors. By default it is assembled for a 14.4V application with ferrite coils that are a good compromise considering performances, price and availability that allow to drive 4 ohm.

3.1 HW Configuration and Control SW

3.1.1 Connectors and connections

The 492 module embeds a **Stand Alone connection** which is different from the previous power amplifiers boards developed.

Based on that:

- **The Voltage Supply** to the power amplifier can be provided through J3 connector (Vbat 3.3–18V, GND) with the chance to use the sense technique close to the device through the VCC/GND test points;
- **The Feedback default configuration** including the output L-C low-pass filter, allowing superior frequency response linearity and lower distortion. Furthermore, there is also the chance to use the FDA903U as traditional class D amplifiers with the feedback directly connected to the PWM output (before L-C filter stage). Both working modes can be selected mounting or not the following resistors:

Table 2. Working mode selection

	R5, R6	R7, R8
Traditional feedback	0 Ω	DO NOT MOUNT
Feedback after the demodulation filter	DO NOT MOUNT	0 Ω

- **The Device State and Address Selection** of the power amplifier can be set through the ENABLE pins ENx (x = 1, 2, 3, 4) on J10 connector. With an open connection the ENx is set to high logical value and through a jumper it is possible to pull down (to GND) the ENx desired thus setting the low logical value. In this way it is possible to select different I2C addresses (up to 8) or to configure the device in 4 different legacy modes according to the Data Sheet table;
- **The HW Mute** of the power amplifier can be set through the MUTE pin on J10 connector. With an open connection the MUTE pin is set to high value (the amplifier is in play state) and through a jumper it is possible to pull down (to GND) the MUTE pin thus setting the low value and put in mute state the amplifier;
- **The Output Channel** of the power amplifier can be monitored/analyzed through the J1 connector (CH+/CH-);

3.1.2 How to manage the I²C

3.1.2.1 I²C HW & SW control

For the programmability of a “Stand Alone module” in terms of I²C settings, there is the J10 connector on 424 stand alone module (I²C SCL, I²C SDA, GND).

GUI is available and it is running on a Windows PC if the user adopts ST interface board (description available in the dedicated user manual)

For the GUI description, please refer to its own manuals.

There are other possibilities to control the device in terms of I²C settings (e.g. FTDI, etc) but the SW control needs to be implemented by the final user.

3.1.2.2 I²S HW & SW control

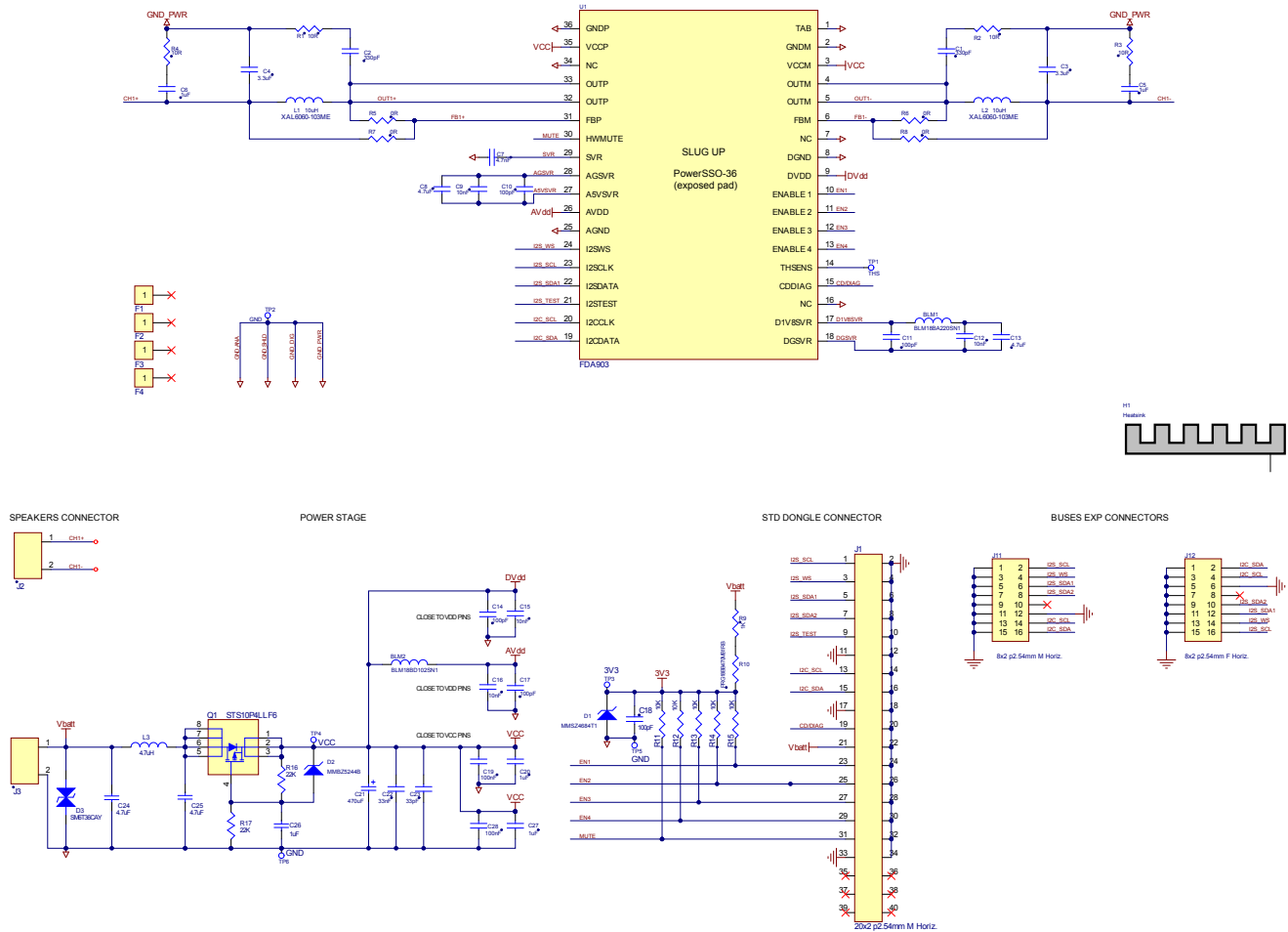
The I²S signals (I2S SCL, I2S WS, I2S SDA1) of 492 “Stand Alone module” can be provided through the J10 connector with different HW configurations:

1. Directly from Audio Precision instruments:
 - a. PSIA controller (AP 2700 series)
 - b. Digital Serial Transmitter (APx5xx series)
2. ST interface board (description available in the dedicated user manual)

4 Schematic, BOM and layouts

4.1 Schematic

Figure 3. Schematic



4.2 Bill of materials

Table 3. Bill of materials

Quantity	Designator	Description	VALUE	RATED				TOLERANCE	PACKAGE
				V	I	P	F		
1	U1	FDA903U - Fully digital class D amplifier 1ch							PSSOP36
1	R9	SMD Resistor	1 K					1%	0805
2	R7, R8	SMD Resistor	0 R					1%	0603
2	R5, R6	SMD Resistor	0 R					1%	0603
2	R16, R17	SMD Resistor	22 K					1%	0603

Quantity	Designator	Description	VALUE	RATED				TOLERANCE	PACKAGE
				V	I	P	F		
5	R11, R12, R13, R14, R15	SMD Resistor	10 K					1%	0603
1	R10	SMD PTC Thermistor	47 R					20%	0603
4	R1, R2, R3, R4	SMD Resistor	10 R			0.5 W		1%	1210
1	Q1	P-Channel MOSFET		40 V	10 A				SOIC
1	L3	Inductor	4.7 μ H		11 A			20%	
2	L1, L2	Inductor	10 μ H		7.6 A				
2	J2, J3	Terminal Block 2position p5.08mm							
1	J12	Header, 8-Pin, Dual row, Female, TH, Right Angle							
1	J11	Header, 8-Pin, Dual row, Right Angle							
1	J1	Header Male, Dual row, SMD, Horiz.							
1	H1	Heatsink							
4	F1, F2, F3, F4	FIDUCIAL							
1	D3	Bidirectional 36V Transil		36 V		600 W			DO-214AA
1	D2	14V Zener Diode		14 V		0.225 W		5%	SOT-23
1	D1	3.3V Zener Diode		3.3 V		0.5 W		5%	SOD-23
4	C9, C12, C15, C16	SMD MLCC X7R Capacitor	10 nF	50 V				10%	0603
2	C8, C13	SMD MLCC X7R Capacitor	4.7 μ F	25 V				10%	0805
1	C7	SMD MLCC C0G/NP0 Capacitor	4.7 nF	50 V				5%	0603
5	C5, C6, C20, C26, C27	SMD MLCC X7R Capacitor	1 μ F	50 V				10%	0805
2	C3, C4	SMD MLCC X7R Capacitor	3.3 μ F	50 V				20%	1210
2	C24, C25	SMD MLCC X7R Capacitor	4.7 μ F	100 V				10%	2020
1	C23	SMD MLCC C0G/NP0 Capacitor	33 pF	50 V				5%	0603
1	C22	SMD MLCC X7R Capacitor	33 nF	50 V				10%	0603
1	C21	Alluminium Polarized Capacitor SMD	470 μ F	50 V					
2	C19, C28	SMD MLCC X7R Capacitor	100 nF	50 V				10%	0603
5	C10, C11, C14, C17, C18	SMD MLCC C0G/NP0 Capacitor	100 pF	50 V				5%	0603
2	C1, C2	SMD MLCC C0G/NP0 Capacitor	330 pF	50 V				5%	0603
1	BLM2	SMD EMI Suppression Filter			0.2 A		100 MHz		0603
1	BLM1	SMD EMI Suppression Filter			0.5 A		100 MHz		0603

4.3 PCB layouts

All the useful circuitry/components for the FDA903U, in terms of PCB space occupation, are highlighted by the black rectangle while outside there are the power supply stage and connectors (V_{bat} , Out, Signal Controls I²C, I²S, Enables, Mute, CDDIAG).

Figure 4. 6038-492.19 - FDA903U – Top layer and silkscreen

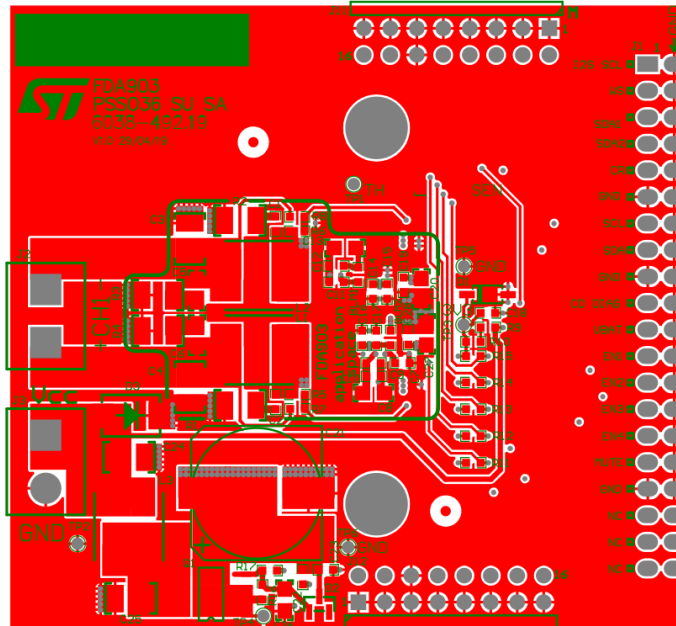


Figure 5. 6038-492.19 - FDA903U – Inner1 layer

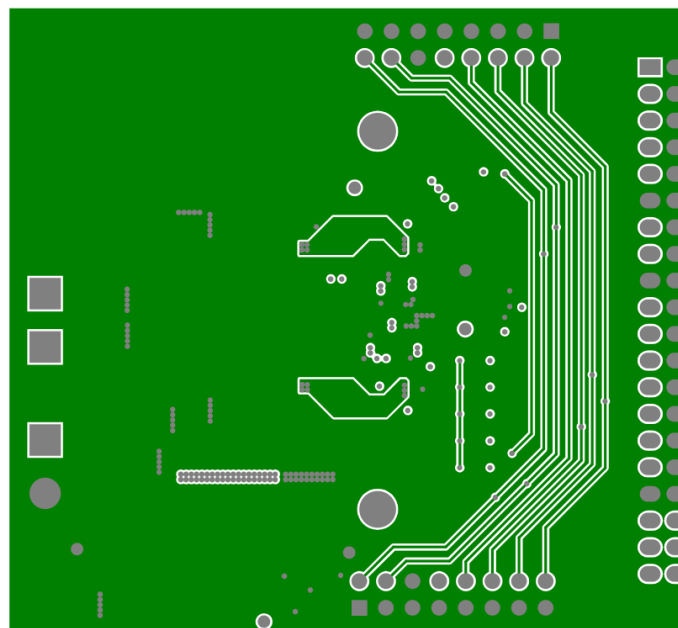


Figure 6. 6038-492.19 - FDA903U – Inner2 layer

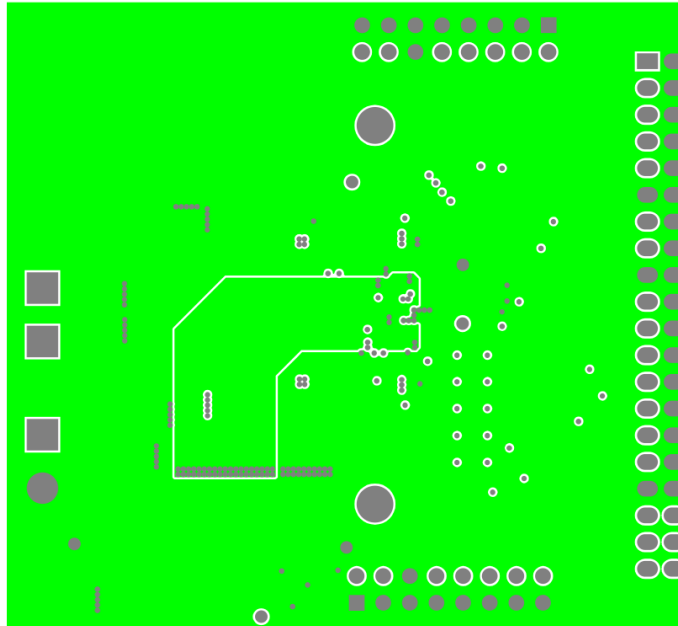
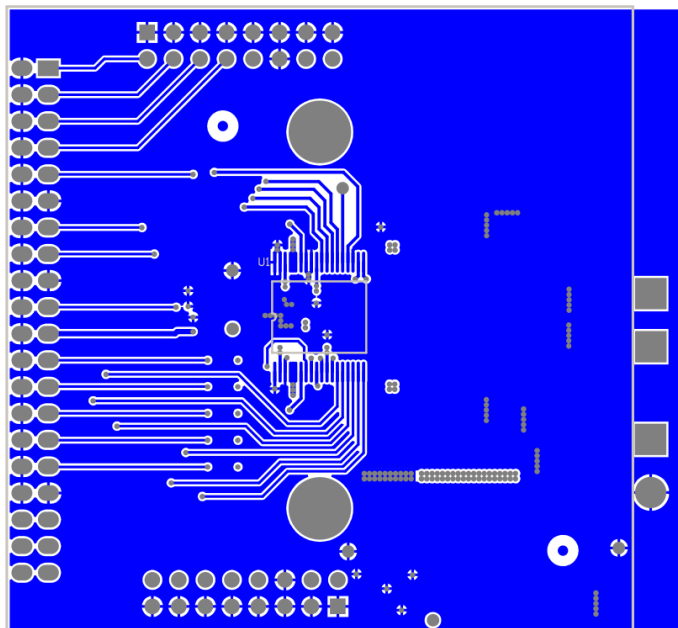


Figure 7. 6038-492.19 - FDA903U – Bottom layer and silkscreen



Revision history

Table 4. Document revision history

Date	Version	Changes
17-Sep-2019	1	Initial release.

Contents

1	Purpose	2
2	Warning	3
3	Module description	4
3.1	HW Configuration and Control SW	4
3.1.1	Connectors and connections	5
3.1.2	How to manage the I ² C	5
4	Schematic, BOM and layouts	6
4.1	Schematic	6
4.2	Bill of materials	6
4.3	PCB layouts	8
	Revision history	10

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