Evaluation boards for FDA803D and FDA903D power amplifiers

Introduction

This document describes how to use the evaluation board in order to check FDA803D and FDA903D devices' performance; for any other information and deeper details please refer to the FDA803D and FDA903D datasheets.

1 Purpose

The purpose of this document is to describe the FDA803D (and FDA903D) Stand Alone Demo Module for Slug Down package.

Table 1. Board summary

Order Code	Device supported
EVAL-FDA803D-SA	FDA803D
EVAL-FDA903D-SA	FDA903D

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

6038-443.16

In the following chapters it will be referred as 443 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.

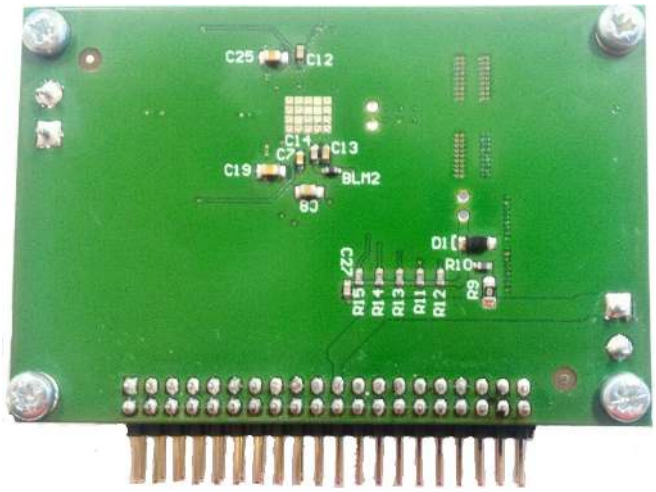
This evaluation board/kit does not fall within the purpose of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and therefore may not meet the technical requirements of these directives or other related directives.

3 Module description

This board is a 1x45W class D amplifier based on the ST FDA803D (or FDA903D) and is intended to demonstrate the device's capabilities.

Figure 1. 6038-443.16 - top view

Figure 2. 6038-443.16 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 443 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 FDA803D (or FDA903D) 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*

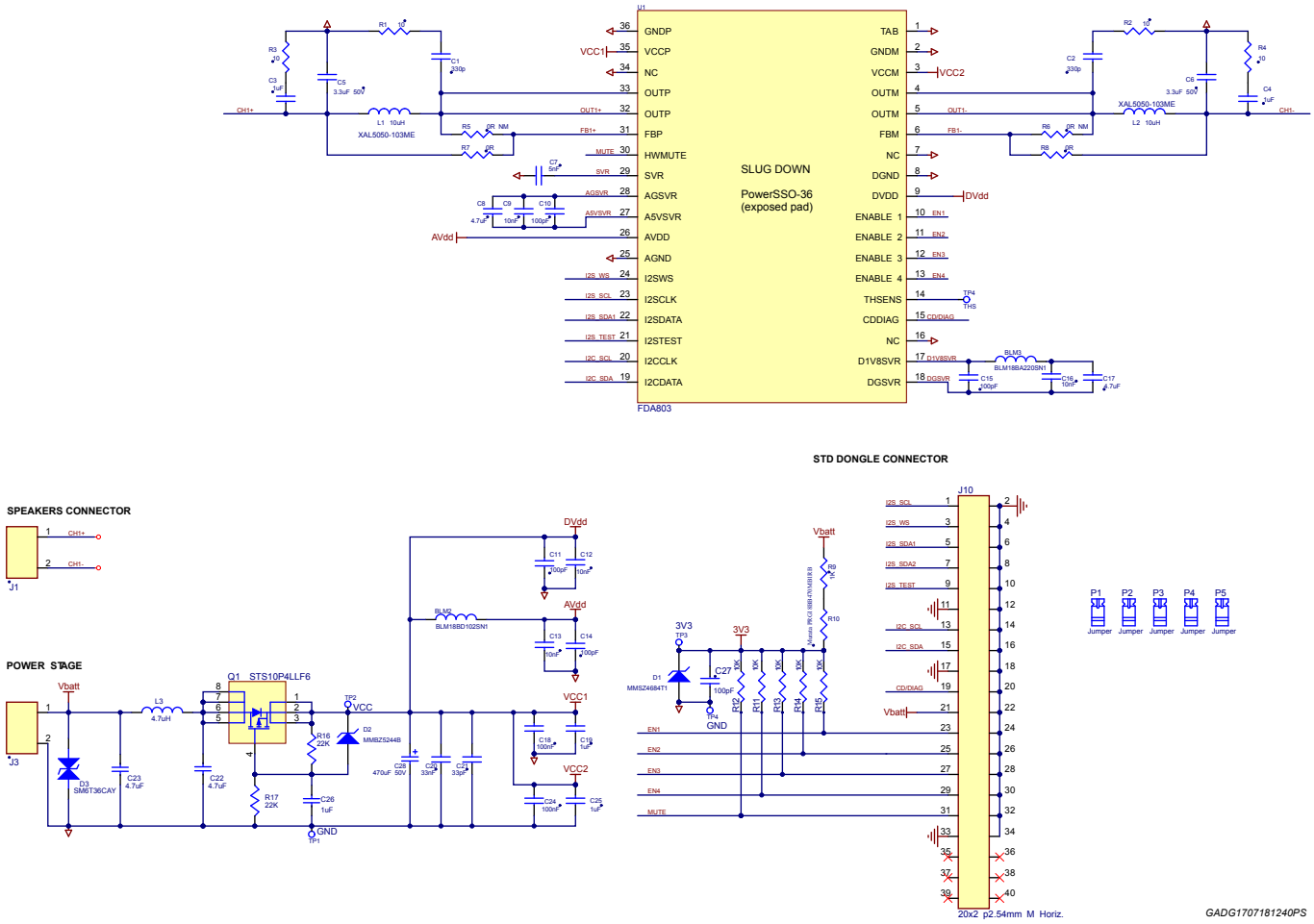
The I²S signals (I2S SCL, I2S WS, I2S SDA1) of 424 “Stand Alone module” can be provided through the J10 connector with different HW configurations:

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

Comment	Description	Designator	Package	Voltage rate	Quantity
0R	Surface mount chip resistor	R7, R8	0603		2
0R NM	Surface mount chip resistor	R5, R6	0603		2
20x2 p2.54mm M Horiz.	Header Male, Dual row, SMD, Horiz.	J10			1
4.7 µH	Inductor	L3			1
BLM18BA220SN1	Inductor	BLM3	0603		1
BLM18BD102SN1	Inductor	BLM2	0603		1

Comment	Description	Designator	Package	Voltage rate	Quantity
FDA803	Fully digital class D amplifier 1ch	U1	PSSOP36		1
Jumper	Top Jumper Socket With Handle red gold p127	P1, P2, P3, P4, P5			5
MC000034	Terminal Block 2position p5.08mm	J1, J3			2
MMBZ5244B	3.3V Zener Diode	D2			1
MMSZ4684T1	3.3V Zener Diode	D1			1
Murata PRG18BB470MB1RB	Surface mount chip resistor	R10	0603		1
SM6T36AY	Transil	D3			1
STS10P4LLF6		Q1			1
1K	Surface mount chip resistor	R9	0805		1
1µF	MLCC X7R Capacitor	C3, C4, C19, C25, C26	0805	50 V	5
3.3 µF 50V	MLCC X7R Capacitor	C5, C6	1210	50 V	2
4.7 µF	MLCC X7R Capacitor	C22, C23	2020	100 V	2
4.7 µF	MLCC X7R Capacitor	C8, C17	0805	25 V	2
5 nF	MLCC X7R Capacitor	C7	0603	50 V	1
10	Surface mount chip resistor	R1, R2, R3, R4	1210		4
10 kΩ	Surface mount chip resistor	R11, R12, R13, R14, R15	0603		5
10 nF	MLCC X7R Capacitor	C9, C12, C13, C16	0603	25 V	4
XAL5050-103ME	Inductor	L1, L2			2
22 kΩ	Surface mount chip resistor	R16, R17	0603		2
33 nF	MLCC X7R Capacitor	C20	0603	50 V	1
33 pF	MLCC X7R Capacitor	C21	0603	50 V	1
100 nF	MLCC X7R Capacitor	C18, C24	0603	50 V	2
100 pF	MLCC X7R Capacitor	C10, C11, C14, C15	0603	50 V	4
100 pF	MLCC X7R Capacitor	C27	0603	50 V	1
330 pF	MLCC X7R Capacitor	C1, C2	0603	50 V	2
470 µF 50 V	Alluminium Polarized Capacitor SMD	C28		50 V	1

4.3 PCB layouts

All the useful circuitry/components for the FDA803/903, in terms of PCB space occupation, is highlighted by the black rectangle while outside there are the power supply stage and connectors (V_{bat}, Out, Signal Controls I^2C, I^2S, Enables, Mute, CDDIAG).

Figure 4. 6038-443.16 - FDA803 (903) – Top layer and silkscreen

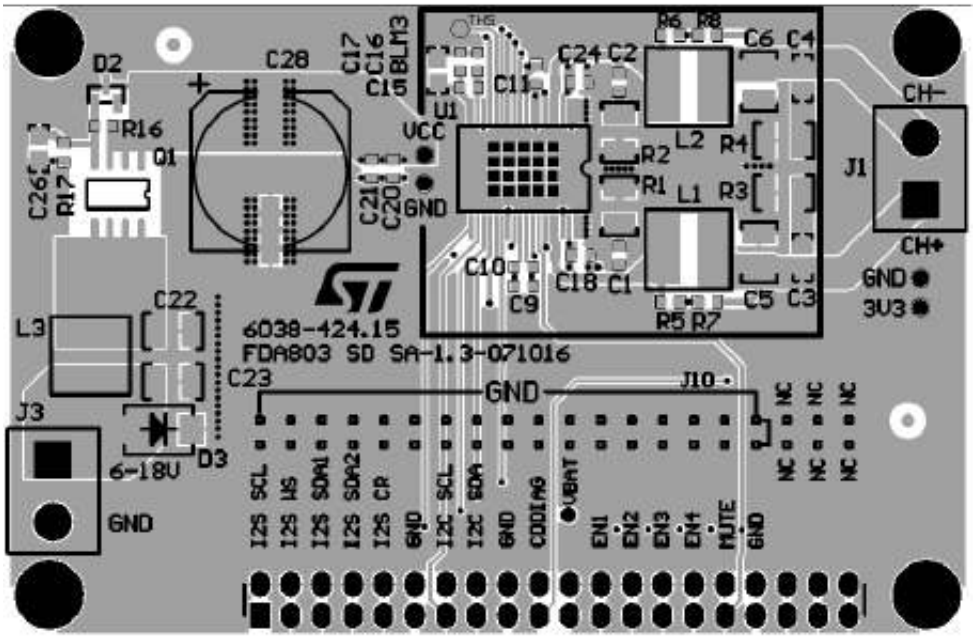
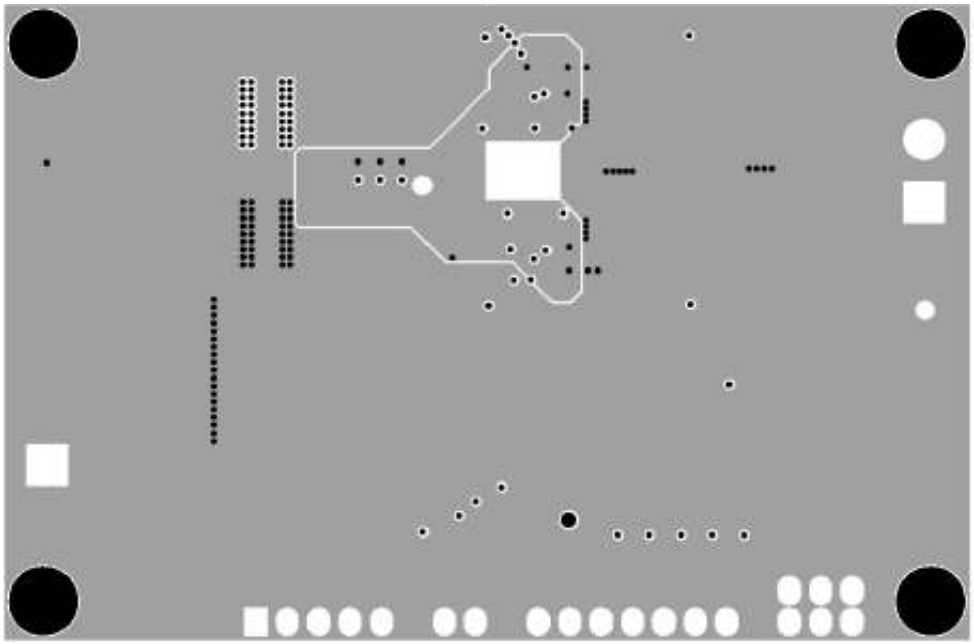


Figure 5. 6038-443.16 - FDA803D (903D) – Inner1 layer



Note: It is possible that some boards are produced with different marking: 6038-424.15 - FDA803 SD SA – 1.2 – 101016. No differences respect to the one marked 6038-443.16 - FDA803D (903D) SD SA.

Figure 6. 6038-443.16 - FDA803D (903D) – Inner2 layer

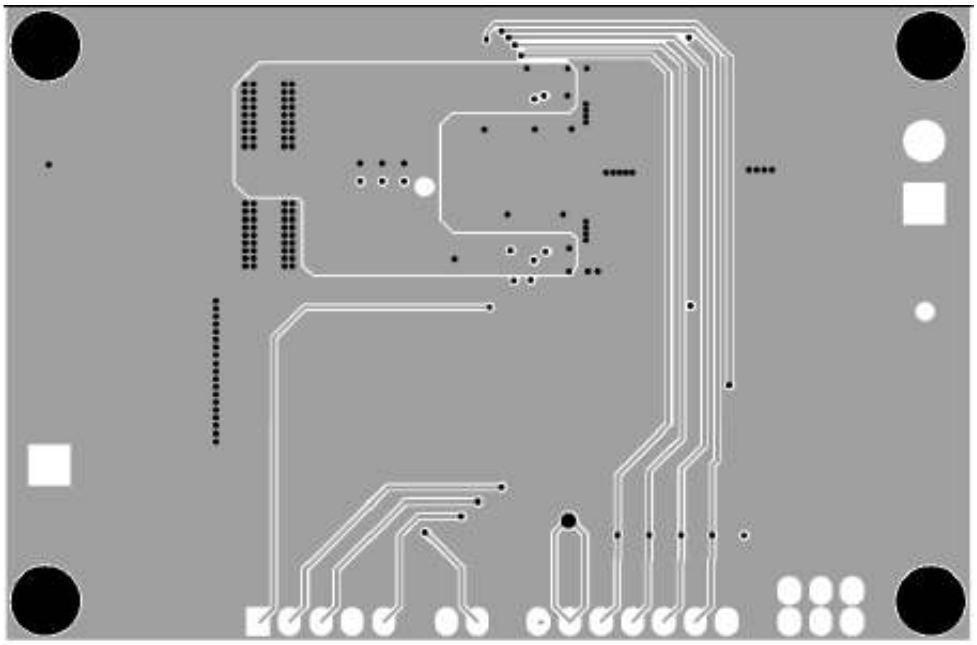
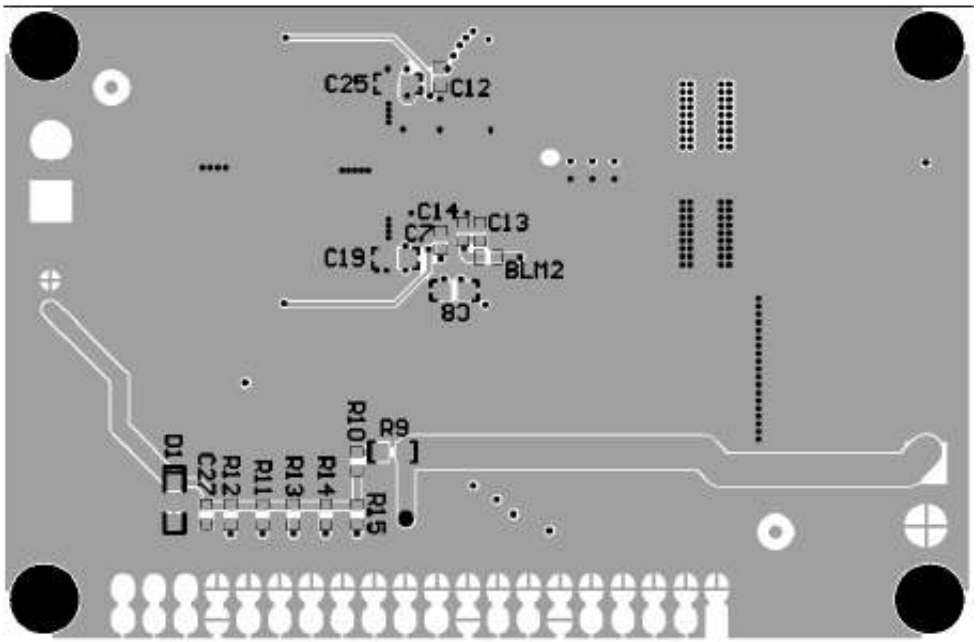


Figure 7. 6038-443.16 - FDA803D (903D) – Bottom layer and silkscreen



Revision history

Table 4. **Document revision history**

Date	Version	Changes
20-Mar-2019	1	Initial release.

Contents