Evaluation board for FDA803Q and FDA903Q power amplifiers

Introduction

This document describes how to use the evaluation board in order to check FDA803Q and FDA903Q device’s performance; for any other information and deeper details please refer to the FDA803Q and FDA903Q datasheets.

1 Ordering information

The board can only be ordered with the FDA903Q mounted on it. The ordering information is shown in Table 1.

Table 1. Ordering information

Order code	Device mounted on the board
EVAL-FDA903Q-SA	FDA903Q

2 Purpose

The purpose of this document is to describe the EVAL-FDA903Q-SA compatible with the FDA803Q and FDA903Q.

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

- 6038-502.20 v1.0

In the following chapters it will be referred as 502 module.

3 Warning

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

- Engineering development
- Demonstrations
- Evaluation purposes only

It 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 completed 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.

4 Module description

This board is a single channel up 30 W (14.4 V @ 4 Ω) class D amplifier based on the FDA903Q and is intended to demonstrate the device's capabilities.

Figure 1. Top view

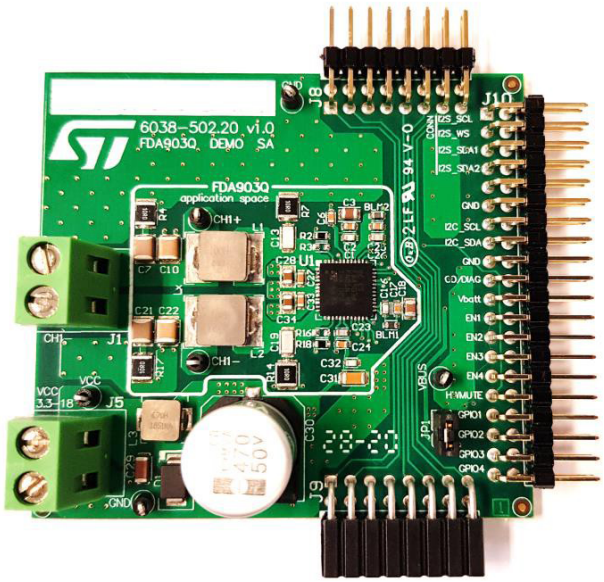
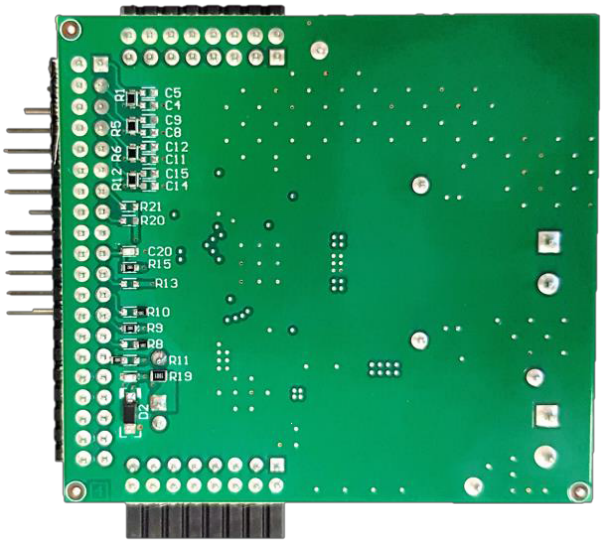


Figure 2. Bottom view



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 14.4 V application with ferrite coils that are a good compromise considering performances, price and availability that allow to drive 4 Ω.

4.1 Board connection

The demo board can be connected directly to the other ST modules (USB interface, audio extender) by the J10 connector.

Otherwise it is possible to connect a single connection of I^2C and I^2S command by the J10 connector.

For configuration and startup of the other modules (USB interface, audio extender) please refer to the proper manual.

4.2 Startup sequence

For this silicon revision ST recommend the following startup procedure:

- Set supply at 14.4 V;
- Supply a correct I^2S signal (clock is needed for the device functioning);
- Write all suggested I^2C settings by the proper GUI (load the correct *.dev* file);
- if present in sw kit tool, load the *.cfg* file also.

Now the device is up and running and it is possible to move the supply at the desired level.

4.3 Connectors and connections

Power supply

The power supply, ranging from 3.3 V to 18 V can be connected on the J5 terminal following the labels.

Outputs

The amplifier outputs are present on the J1 terminals.

Board cascading

Through buses expansion connectors (J8-J9) it is possible to address and drive other amplifier cards using the same data bus (TDM mode).

4.4 Board option

Vbus voltage reference

Onboard voltage reference is used for pull-up resistor of digital lines. When accurate current measurement is needed (i.e. efficiency measurements) voltage reference could be disabled by removing the P1 jumper. In this case an external voltage reference must be provided for the Vbus line (injected from TP3Vbus).

Address selection

According to the DS configuration, it is possible to make an address selection removing R8, R9, R10, R11 (default configuration is Legacy mode: low voltage mode; out-phase).

HWMUTE

Hardware mute/unmute is controlled through the J10 connector (pin 31, MUTE).

CD/DIAG

CD/DIAG function can be monitored through the J10 connector, pin19.

Feedback configuration

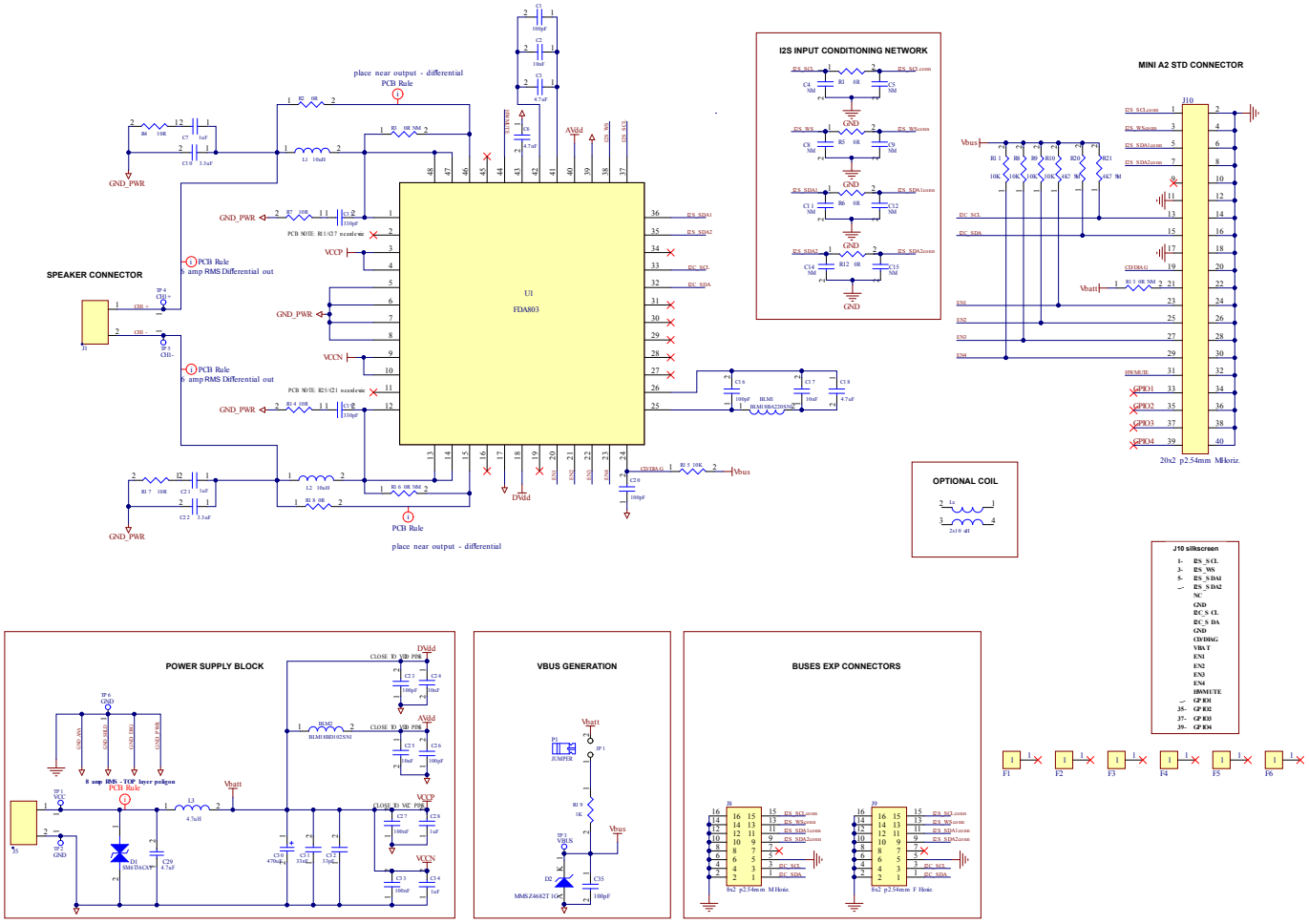
Only feedback after LC filter configuration is supported:

- AF: R2 and R18 are mounted, R3 and R16 are not soldered.

5 Schematic, BOM and layouts

5.1 Schematic

Figure 3. Schematic



5.2 Bill of materials

Table 2. Bill of materials

Comment	Description	Designator	Package	LibRef	Quantity
BLM18BA220SN1	SMD EMI Suppression Filter	BLM1	L-0603	INDUCTOR	1
BLM18BD102SN1	SMD EMI Suppression Filter	BLM2	L-0603	INDUCTOR	1
100 pF	SMD MLCC C0G/NP0 Capacitor	C1, C16, C20, C23, C26, C35	C-0603	CAPACITOR NON-POL	6
10 nF	SMD MLCC X7R Capacitor	C2, C17, C24, C25	C-0603	CAPACITOR NON-POL	4
4.7 µF	SMD MLCC X7R Capacitor	C3, C18	C-0805	CAPACITOR NON-POL	2
N.M.	SMD MLCC X7R Capacitor	C4, C5, C8, C9, C11, C12, C14, C15	C-0603	CAPACITOR NON-POL	8
4.7 nF	SMD MLCC X7R Capacitor	C6	C-0603	CAPACITOR NON-POL	1
1 µF	SMD MLCC X7R Capacitor	C7, C21	C-1210	CAPACITOR NON-POL	2
3.3 µF	SMD MLCC X7R Capacitor	C10, C22	C-1210	CAPACITOR NON-POL	2
330 pF	SMD MLCC C0G/NP0 Capacitor	C13, C19	C-1206	CAPACITOR NON-POL	2
100 nF	SMD MLCC X7R Capacitor	C27, C33	C-0603	CAPACITOR NON-POL	2
1 µF	SMD MLCC X7R Capacitor	C28, C34	C-0805	CAPACITOR NON-POL	2
4.7 µF	SMD MLCC X7R Capacitor	C29	C-1206	CAPACITOR NON-POL	1
470 µF	Alluminium Polarized Capacitor	C30	CAPE-SMT-D12500H16000	CAP POL2	1
33 nF	SMD MLCC X7R Capacitor	C31	C-1206	CAPACITOR NON-POL	1
33 pF	SMD MLCC C0G/NP0 Capacitor	C32	C-0603	CAPACITOR NON-POL	1
SM6T36CAY	Bidirectional 36 V Transil	D1	D-DO214AA-SMB	DIODE TRANSIL	1
MMSZ4682T1G	SMD 2.7 V Zener Diode	D2	D-SOD123-AK	DZener	1
MC000034	Terminal Block 2 position p5	J1, J5	TBV-SCREW-5080P-02-WE-	6J2_2	2

Comment	Description	Designator	Package	LibRef	Quantity
8x2p2.54mm M Horiz.	Header, 8-Pin, Dualrow, TH,	J8	2540P-08X02-THT-M-H-TS	WHeader 8X2H	1
8x2p2.54mm F Horiz.	Header, 8-Pin, Dualrow, TH,	J9	PRECIDIP-2540P-08X02-THT	Header 8X2H	1
20x2 p2.54mmM Horiz.	TH Header Male,Dual row, 2J	10	2540P-20X02-THT-M-H-TS	WCONN 20X2	1
JUMPER	JUMPER p.2.54 mm	JP1	2540P-02X01-THT-M-V	JUMPER_10	1
IHLP-2525BD-A1	SMD Inductor	L1, L2	L-VISHAY-IHLP2525DB-CUS	TInductor	2
IHLP-2020CZ-4R7M-A1	SMD Inductor	L3	L-VISHAY-IHLP2020CZ	INDUCTOR	1
2x10 µH	SMD Coupled Inductor	Lx	-	INDUCTOR DOUBLE	1
JUMPER	Top Jumper Socket With Ha	nP1	-	JUMPERSOCKET	1
0 Ω	SMD Chip Resistor	R1, R2, R5, R6, R12, R18	R-0603	RESISTOR	6
0 Ω, N.M.	SMD Chip Resistor	R3, R13, R16	R-0603	RESISTOR	3
10 Ω	SMD Chip Resistor	R4, R7, R14, R17	R-1210	RESISTOR	4
10 KΩ	SMD Chip Resistor	R8, R9, R10, R11, R15	R-0603	RESISTOR	5
1 KΩ	SMD Chip Resistor	R19	R-0603	RESISTOR	1
4.7 KΩ, N.M.	Surface mount Chip Resistor	R20, R21	R-0603	RESISTOR	2
VCC	TH Test Point terminal Asse m	TP1	PAD-PTH_1100C2000	TPOINT R	1
GND	TH Test Point terminal Asse m	TP2, TP6	PAD-PTH_1100C2000	TPOINT R	2
VBUS	TH Test Point terminal Asse m	TP3	PAD-PTH_1100C2000	TPOINT R	1
CH1+	TH Test Point terminal Asse m	TP4	PAD-PTH_1100C2000	TPOINT R	1
CH1-	TH Test Point terminal Asse m	TP5	PAD-PTH_1100C2000	TPOINT R	1
FDA803	1x45 W Class-D Digital input	U1	QFN0500P-48E-7000X7000X	Component_1	1

5.3 PCB layouts

All the useful circuitry/components for the FDA803Q/903Q, in terms of PCB space occupation, are highlighted by the black rectangle while outside there are the power supply stage and connectors (Vbat, Out, Signal Controls, I^2C, I^2S, Enables, Mute, CDDIAG).

Figure 4. Top layer

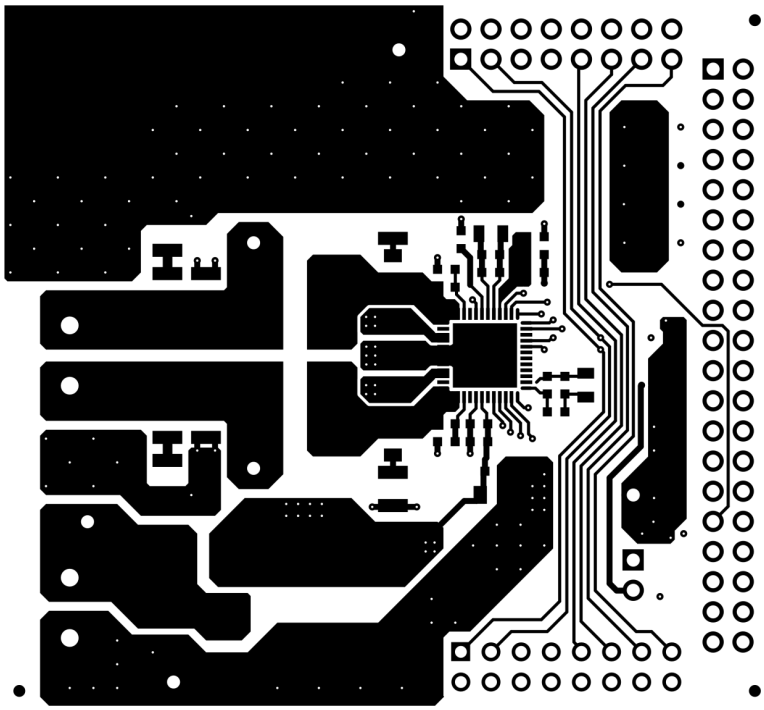


Figure 5. Inner 1

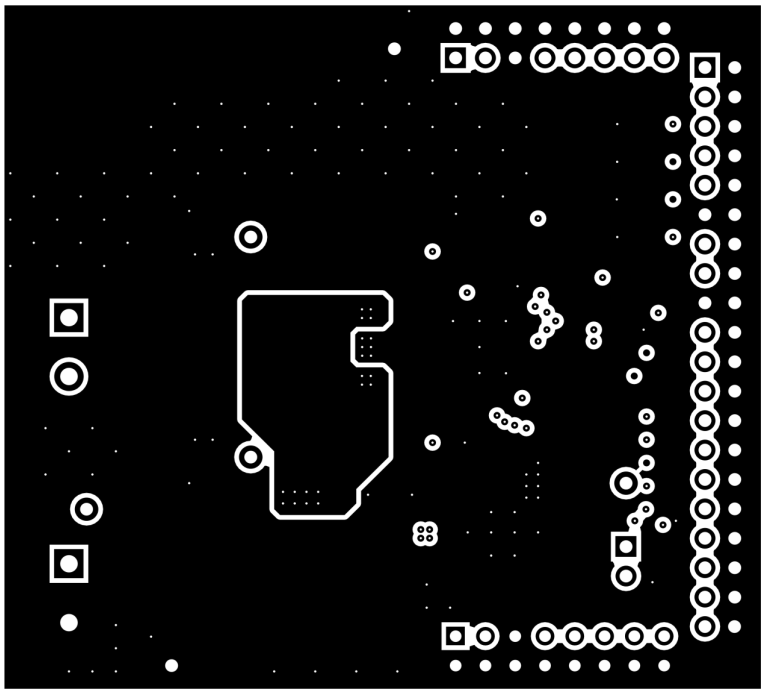


Figure 6. **Inner 2**

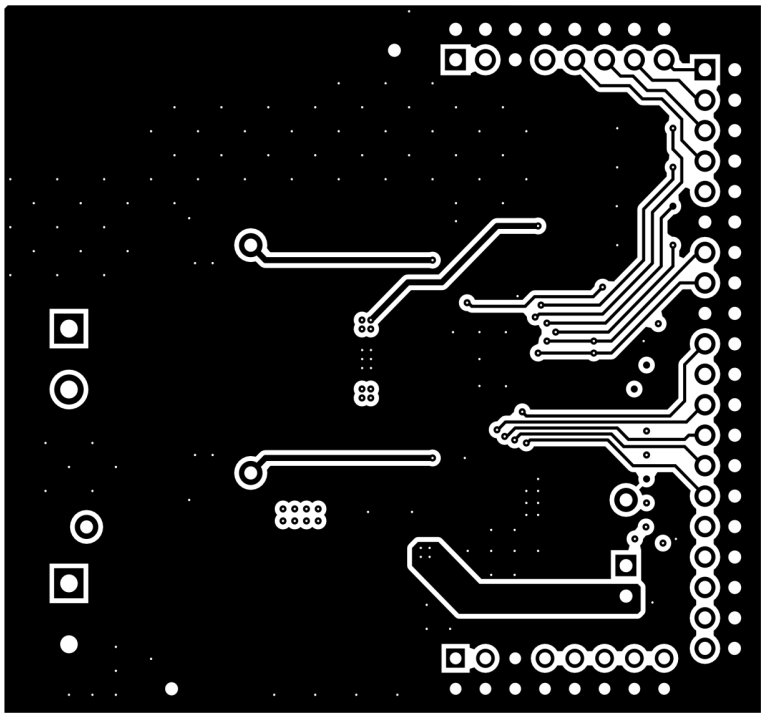


Figure 7. **Bottom layer**

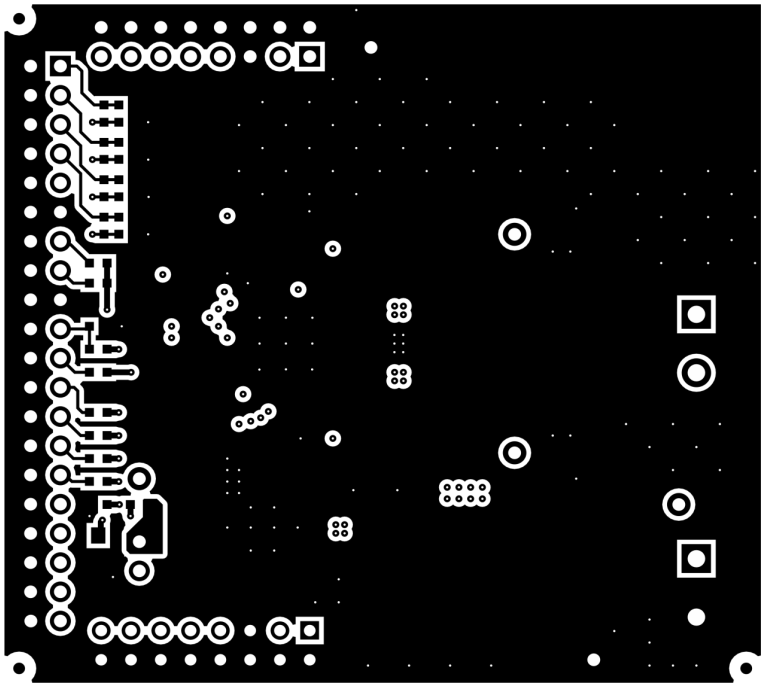


Figure 8. **Silkscreen Top**

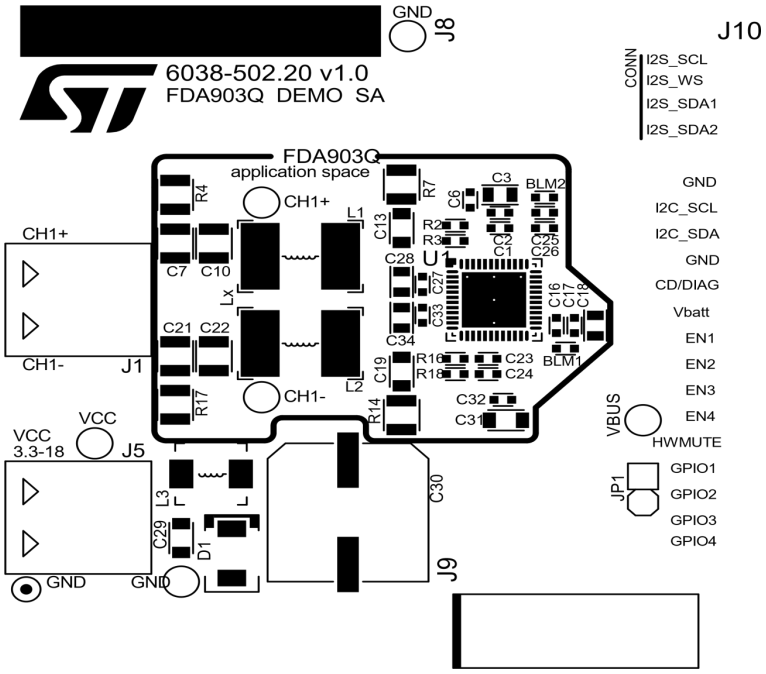
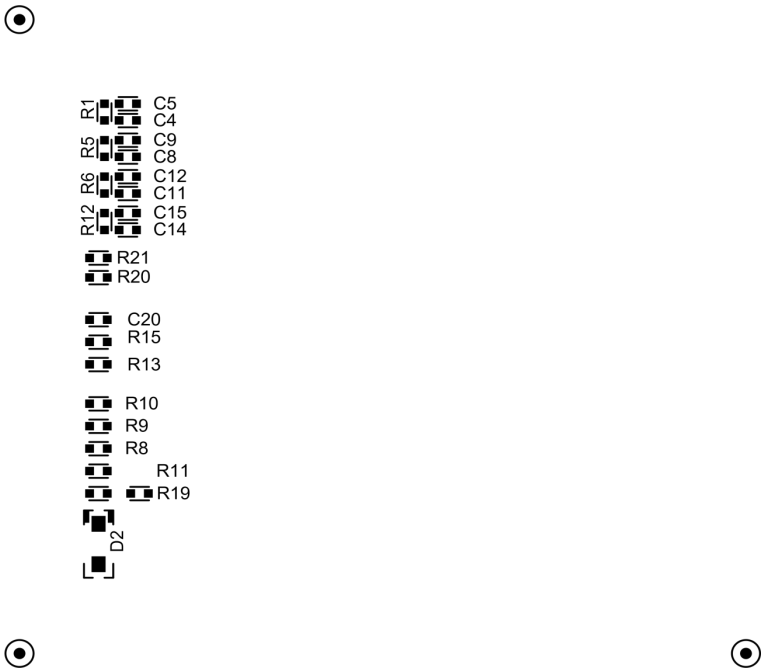


Figure 9. **Silkscreen Bottom**



Revision history

Table 3. **Document revision history**

Date	Version	Changes
25-Jun-2021	1	Initial release.
05-Apr-2022	2	Added Section 1 Ordering information.

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List of tables

List of figures