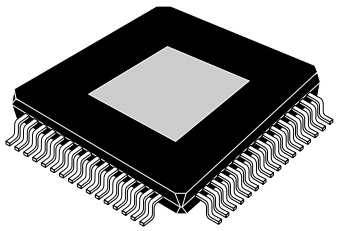
FDA802A

Data brief

2x150 W/1x300 W class D digital input automotive power amplifier with diagnostics features and low voltage



LQFP64 10x10x1.4 mm
(exposed pad up)

Product status link
FDA802A

Product summary		
Order code	**Package**	**Packing**
FDA802A-VYY	LQFP64 (exp. pad up)	Tray
FDA802A-VYT		Tape and reel

Features

- AEC-Q100 qualified
- Integrated 110 dB D/A conversion
- I^2S and TDM digital input (3.3/1.8 V)
- Input sampling frequency: 44.1 kHz, 48 kHz, 96 kHz, 192 kHz
- Full I^2C bus driving (3.3/1.8 V) with 8 different I^2C bus addresses
- EMI control for FM/AM compatibility
- EMI compliance evaluated following normative CISPR25 (class V)
- Low radiation function (LRF)
- Very low quiescent current
- Output low-pass filter included in the feedback allowing outstanding audio performances
- Wide operating supply range: target 5.5 V-50 V
- Supply voltage monitoring on I^2C
- MOSFET power outputs allowing high output power capability under step-up voltage:
  - 2x120 W /4 Ω at 35 V, 1 kHz THD = 1%
    (2x150 W /4 Ω at 35 V, 1 kHz THD = 10%)
  - 2x140 W /8 Ω at 50 V, 1 kHz THD = 1%
    (2x180 W /8 Ω at 50 V, 1 kHz THD = 10%)
  - 2x270 W /8 Ω at 50 V max output power
- Operation under standard car battery with high output power:
  - 2x22 W /4 Ω at 14 V, 1 kHz THD = 1%
    (2x28 W /4 Ω at 14 V, 1 kHz THD = 10%)
  - 2x37 W /2 Ω at 14 V, 1 kHz THD = 1%
    (2x46 W /2 Ω at 14 V, 1 kHz THD = 10%)
- Possibility to drive 2 Ω loads:
  - up to 18 V in normal mode
  - up to 35 V in parallel mode
- Independent channel operation
- I^2C bus diagnostics:
  - Short to V_{CC}/GND diagnostic (including soft shorts up to 1 kΩ)
  - DC load diagnostic
  - AC load diagnostic (working both with internally generated and externally generated tone)
- Integrated fault protection
- Input and output offset detector
- Clipping detector
- Legacy mode ('no I^2C' mode)
- Short circuit and ESD integrated protections
- Package: LQFP64 exposed pad up

Description

The FDA802A is a dual bridge class D amplifier, designed in the most advanced BCD technology specially intended for car radio applications.

The FDA802A integrates a high performance D/A converter together with powerful MOSFET outputs in class D, to get an outstanding efficiency compared with the standard class AB.

The integrated D/A converter allows to reach outstanding performances (115 dB S/N ratio with 110 dB of dynamic range).

Thanks to the high-voltage MOSFET output stages it can operate both under standard car battery (6 -18 V) and under boosted power supply (up to 50 V) to reach the highest possible power with integrated solution.

The feedback loop includes the output L-C low-pass filter, allowing superior frequency response linearity and lower distortion independently from the inductor and capacitor quality.

FDA802A is fully configurable through I^2C bus interface and integrates a complete diagnostics array specially intended for automotive applications.

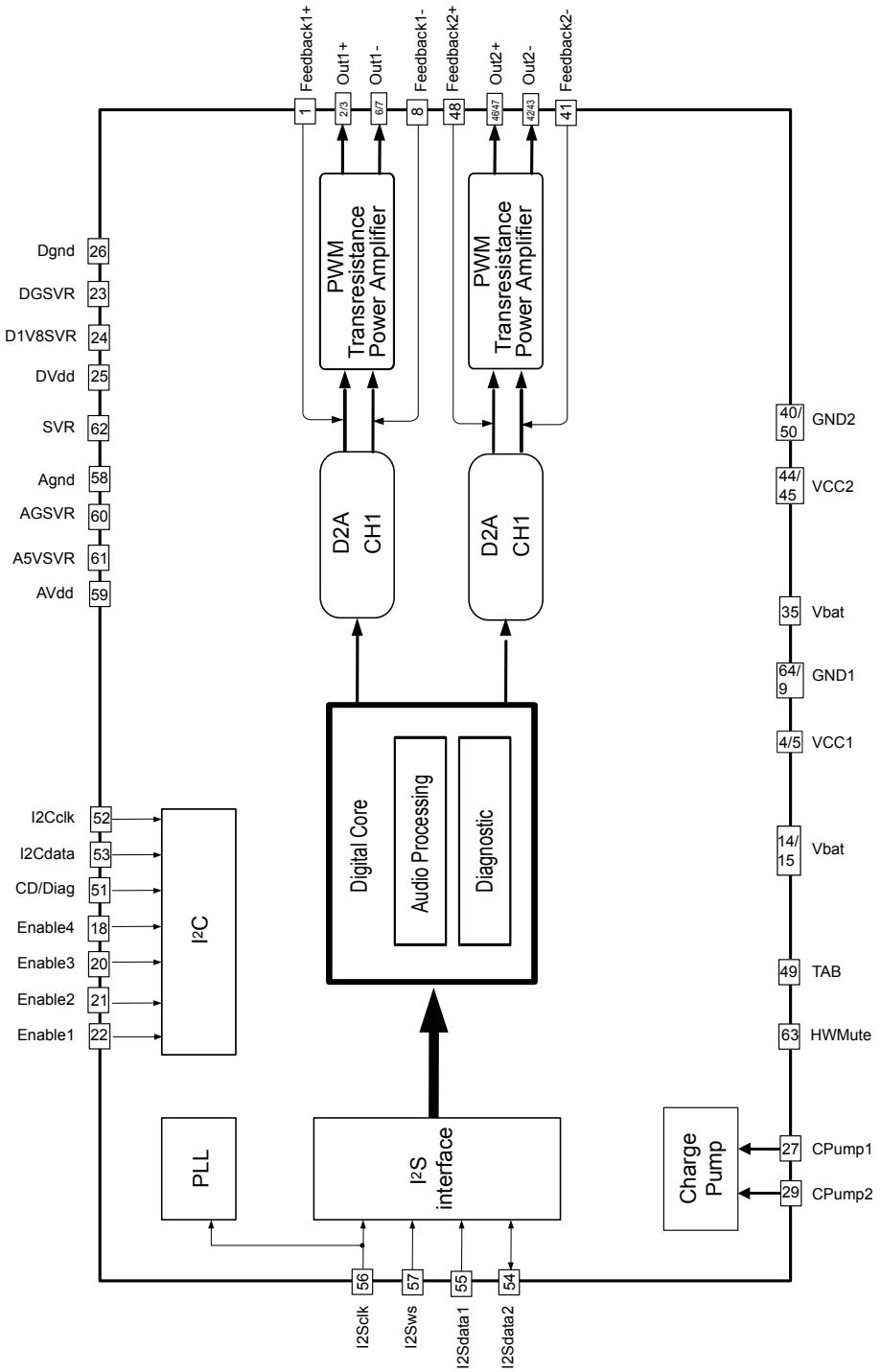
Thanks to the solutions implemented to solve the EMI problems, the device is intended to be used in the standard single DIN car-radio box together with the tuner.

Moreover FDA802A is able to work with power supply as low as 5.5 V, thus supporting the most recent low voltage ('start-stop') car-makers specification.

1 Block and pins description diagrams

1.1 Block diagram

Figure 1. **Block diagram**



1.2 Pins description

Figure 2. **Pins connection diagram**

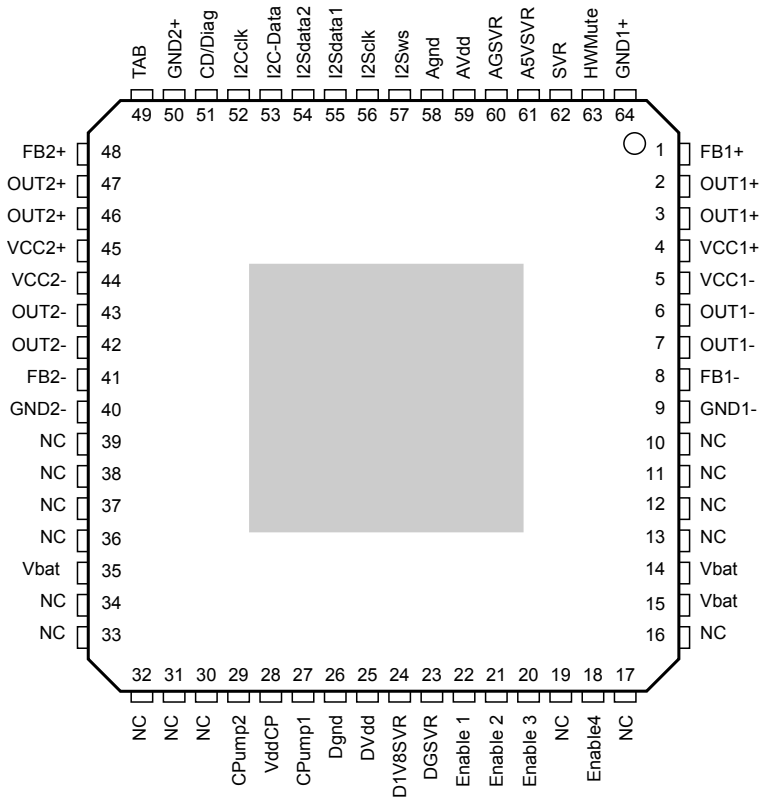


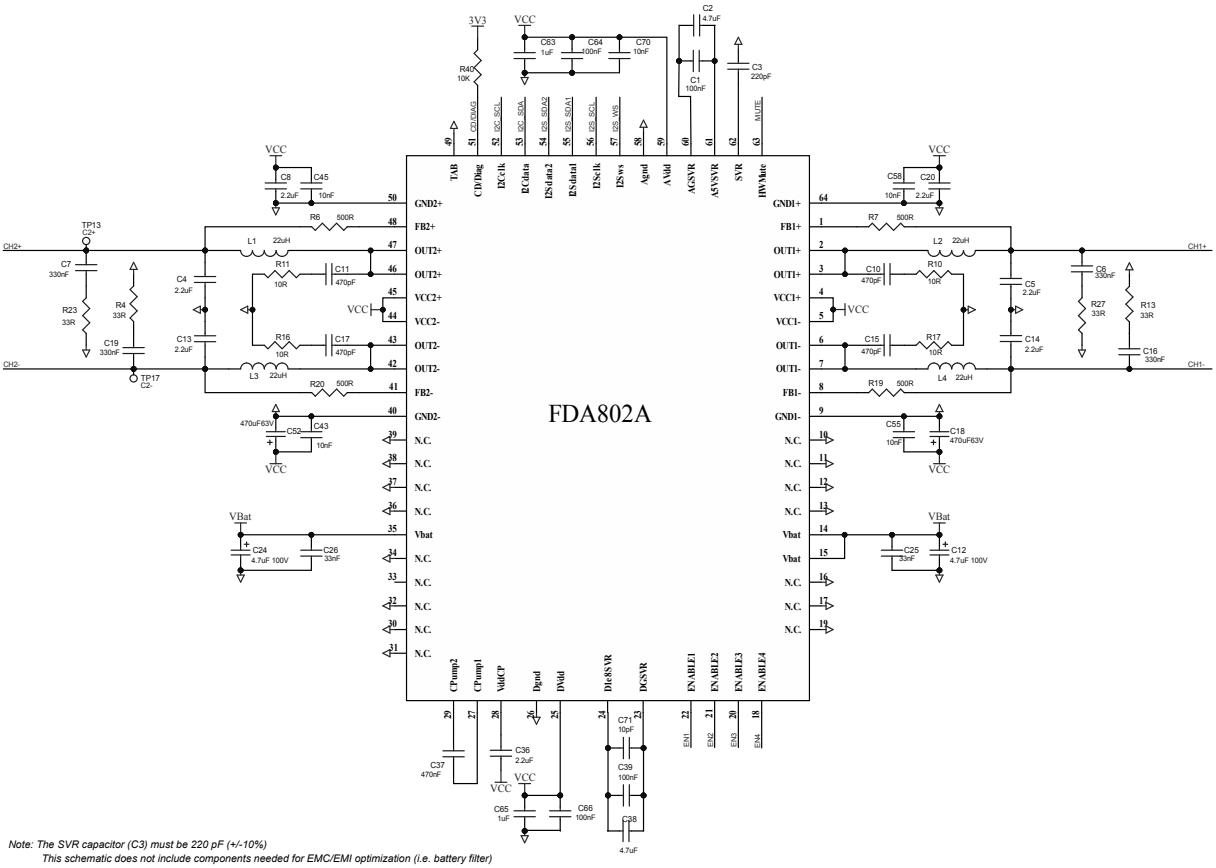
Table 1. **Pins list description**

N#	Pin	Function
1	FB1+	Channel 1, half bridge plus, feedback
2	OUT1+	Channel 1, half bridge plus, output
3	OUT1+	Channel 1, half bridge plus, output
4	VCC1+	Channel 1, half bridge plus, boosted power supply
5	VCC1-	Channel 1, half bridge minus, boosted power supply
6	OUT1-	Channel 1, half bridge minus, output
7	OUT1-	Channel 1, half bridge minus, output
8	FB1-	Channel 1, half bridge minus, feedback
9	GND1-	Channel 1, half bridge minus, power ground
10-13	N.C.	Not connected
14	Vbat	Main battery voltage (14 V)
15	Vbat	Main battery voltage (14 V)
16-17	N.C.	Not connected
18	Enable4	Chip enable 4
19	N.C.	Not connected
20	Enable3	Chip enable 3

N#	Pin	Function
21	Enable2	Chip enable 2
22	Enable1	Chip enable 1
23	DGSVR	Negative analog supply V(SVR)-0.9 V (internally generated)
24	D1V8SVR	Positive digital supply V(SVR)+0.9 V (internally generated)
25	DVdd	Digital supply
26	Dgnd	Digital ground
27	CPump1	Charge pump pin1
28	VddCP	Charge pump output voltage
29	CPump2	Charge pump pin 2
30-34	N.C.	Not connected
35	Vbat	Main battery voltage (14 V)
36-39	N.C.	Not connected
40	GND2-	Channel 2, half bridge minus, power ground
41	FB2-	Channel 2, half bridge minus, feedback
42	OUT2-	Channel 2, half bridge minus, output
43	OUT2-	Channel 2, half bridge minus, output
44	VCC2-	Channel 2, half bridge minus, boosted power supply
45	VCC2+	Channel 2, half bridge plus, boosted power supply
46	OUT2+	Channel 2, half bridge plus, output
47	OUT2+	Channel 2, half bridge plus, output
48	FB2+	Channel 2, half bridge plus, feedback
49	TAB	Device slug connection
50	GND2+	Channel 2, half bridge plus, power ground
51	CD/Diag	Clip detector / diagnostic pin (output, open drain)
52	I2CClk	I^2C clock
53	I2C-Data	I^2C data input
54	I2Sdata2	I^2S/TDM data 2 (data input, NOT used in TDM mode)
55	I2Sdata1	I^2S/TDM data 1(data input)
56	I2Sclk	I2S/TDM clock
57	I2Sws	I^2S/TDM ws (frame sync Input)
58	Agnd	Analog ground
59	AVdd	Analog supply
60	AGSVR	Negative analog supply V(SVR)-2.5 V (internally generated)
61	A5VSVR	Positive analog supply V(SVR)+2.5 V (internally generated)
62	SVR	Supply voltage ripple rejection capacitor
63	HWMute	Hardware mute pin
64	GND1+	Channel 1, half bridge plus, power ground

2 Application diagram

Figure 3. **Application diagram**



Note: The SVR capacitor (C3) must be 220 pF (+/-10%)
This schematic does not include components needed for EMC/EMI optimization (i.e. battery filter)
C18 is optional: when VCC is higher than 25 V this capacitor should be added to reach up the customer requirements

3 General introduction

FDA802A is a fully digital single chip class D amplifier with high immunity to the demodulation filter effects. The high integration level and the on-board signal processing allow excellent audio performance to be achieved.

Thanks to the digital input and to the feedback strategy in the power stage (that makes the amplifier immune from the output filter components non-linearity), the number and size of the external components are minimized.

A number of features is included to reduce EMI and the fully digital approach provides a very high immunity to GSM/RF interferences.

FDA802A includes: digital I^2C and I^2S interfaces, internal 24 bits DAC conversion, digital signal processing for interpolation and noise shaping, innovative self-diagnostic functions and automatic detection of wrong load connections or variation of the load, internal PLL for a clock generation.

4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

4.1 LQFP64 (10x10x1.4 mm exp. pad up) package information

Figure 4. LQFP64 (10x10x1.4 mm exp. pad up) package outline

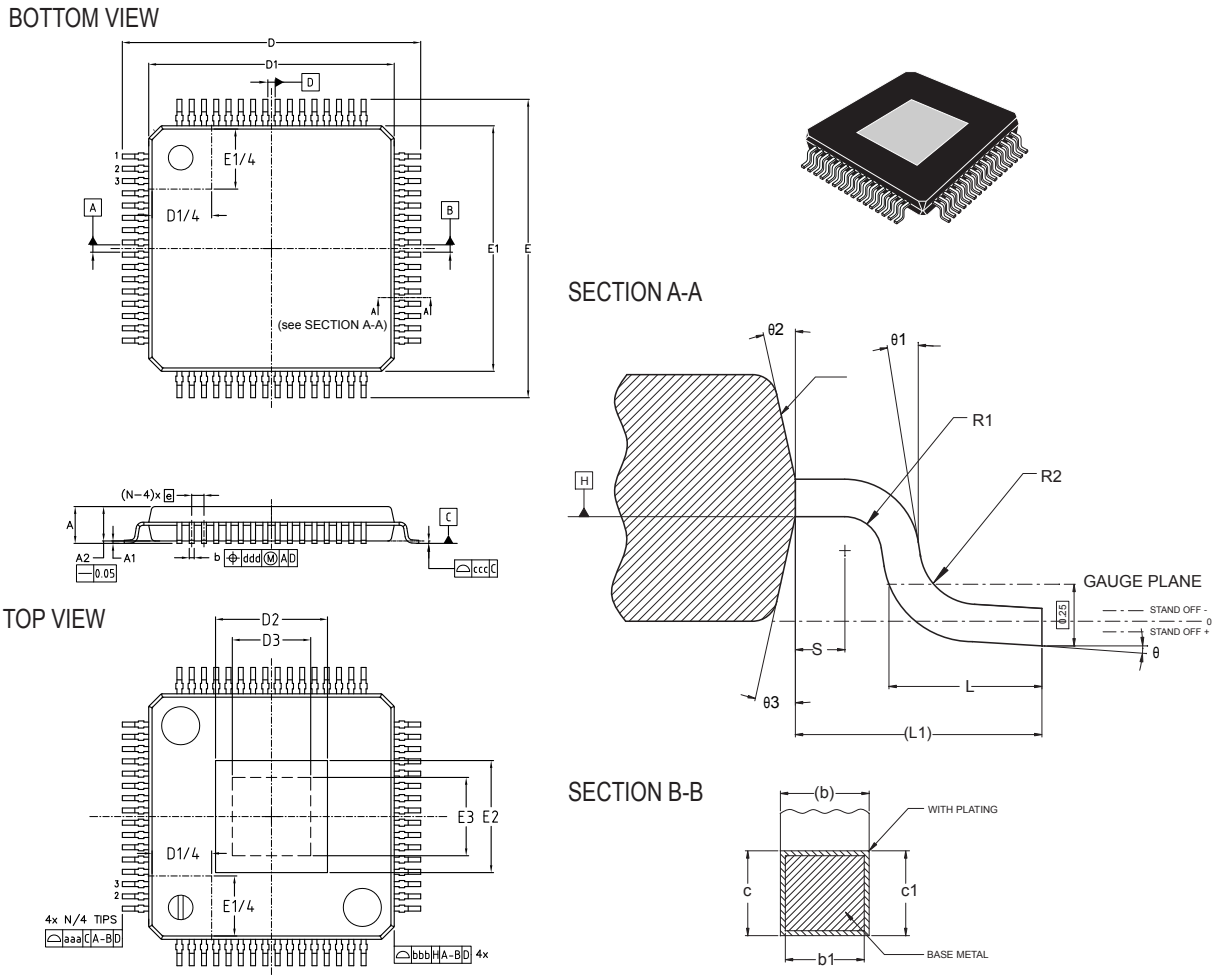


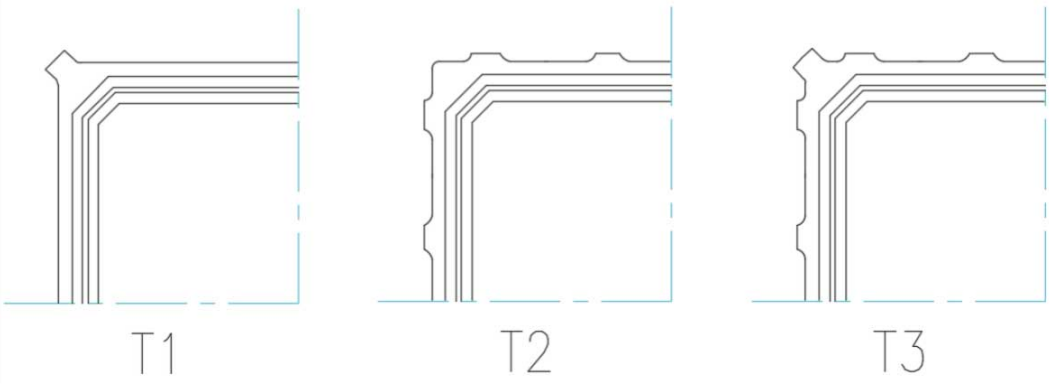
Table 2. LQFP64 (10x10x1.4 mm exp. pad up) package mechanical data

Symbol	Dimension in mm		
	Min.	Typ.	Max.
Θ	0°	3.5°	6°
Θ1	0°	9°	12°
Θ2	11°	12°	13°
Θ3	11°	12°	13°
A	-	-	1.49
A1	-0.04	-	0.04
A2	1.35	1.4	1.45
b	-	-	0.27
b1	0.17	0.20	0.23
c	0.09	-	0.20
c1	0.09	0.127	0.16
D	12.00 BSC		
D1(1)(2)	10.00 BSC		
D2	**See VARIATIONS**		
D3	**See VARIATIONS**		
e	0.50 BSC		
E	12.00 BSC		
E1(1)(2)	10.00 BSC		
E2	**See VARIATIONS**		
E3	**See VARIATIONS**		
L	0.45	0.6	0.75
L1	1.00 REF		
N	-	64	-
R1	0.08	-	-
R2	0.08	-	0.20
S	0.20	-	-
Tolerance of form and position			
aaa	-	0.20	-
bbb	-	0.20	-
ccc	-	0.08	-
ddd	-	0.08	-
VARIATIONS			
Pad option 6.0x6.0 (T1-T3)(3)			
D2	-	-	6.61
E2	-	-	6.61
D3	4.8	-	-
E3	4.8	-	-

1. *Dimensions D1 and E1 do not include mold flash or protrusions. Allowable mold flash or protrusion is “0.25 mm” per side.*
2. *The Top package body size may be smaller than the bottom package size by as much as 0.15 mm.*

3. *Number, dimension and position of groves shown in Figure 5 are for reference only.*

Figure 5. Exposed-pad groove's shapes



Revision history

Table 3. **Document revision history**

Date	Version	Changes
28-Sep-2022	1	Initial release.

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