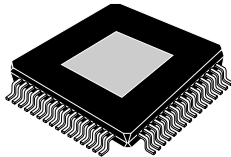



## 2 channels class-D digital input automotive power amplifier with I<sup>2</sup>C diagnostics and low voltage operation for car radio applications


**LQFP64 (exposed pad up)**

### Features

- AEC-Q100 qualified 
- Integrated 110 dB D/A conversion
- I<sup>2</sup>S and TDM digital input (3.3/1.8 V)
- Input sampling frequency: 44.1 kHz, 48 kHz, 96 kHz and 192 kHz
- Full I<sup>2</sup>C bus driving (3.3/1.8 V) with 8 different I<sup>2</sup>C bus addresses
- Operating supply range: 5.5 V - 25 V
- EMI compliance evaluated following normative:
  - CISPR25 Class V
  - ISO 11452 2
- Low radiation function (LRF)
- Very low quiescent current
- Output lowpass filter is included in the feedback for outstanding audio performance
- Operation under standard car battery with high output power:
  - 2 x 22 W /4 Ω @ 14 V, 1 kHz THD = 1%
  - 2 x 28 W /4 Ω @ 14 V, 1 kHz THD = 10%
  - 2 x 37 W /2 Ω @ 14 V, 1 kHz THD = 1%
  - 2 x 46 W /2 Ω @ 14 V, 1 kHz THD = 10%
- Possibility to drive 2 Ω loads (up to 18 V)
- Parallel mode for 1 Ω loads (up to 18 V)
- I<sup>2</sup>C bus diagnostics:
  - Short to V<sub>CC</sub>/GND diagnostic
  - DC load diagnostic
  - AC load diagnostic (working both with internally and externally generated tone)
- Integrated fault protection
- Input and output offset detector
- Clipping detector
- Short circuit and ESD integrated protections

Product status link		
<a href="#">FDA802S</a>		
Device summary		
Order code	Package	Packing
FDA802S-VYY	LQFP64	Tray
FDA802S-VYT	(exposed pad up)	Tape & Reel

### Description

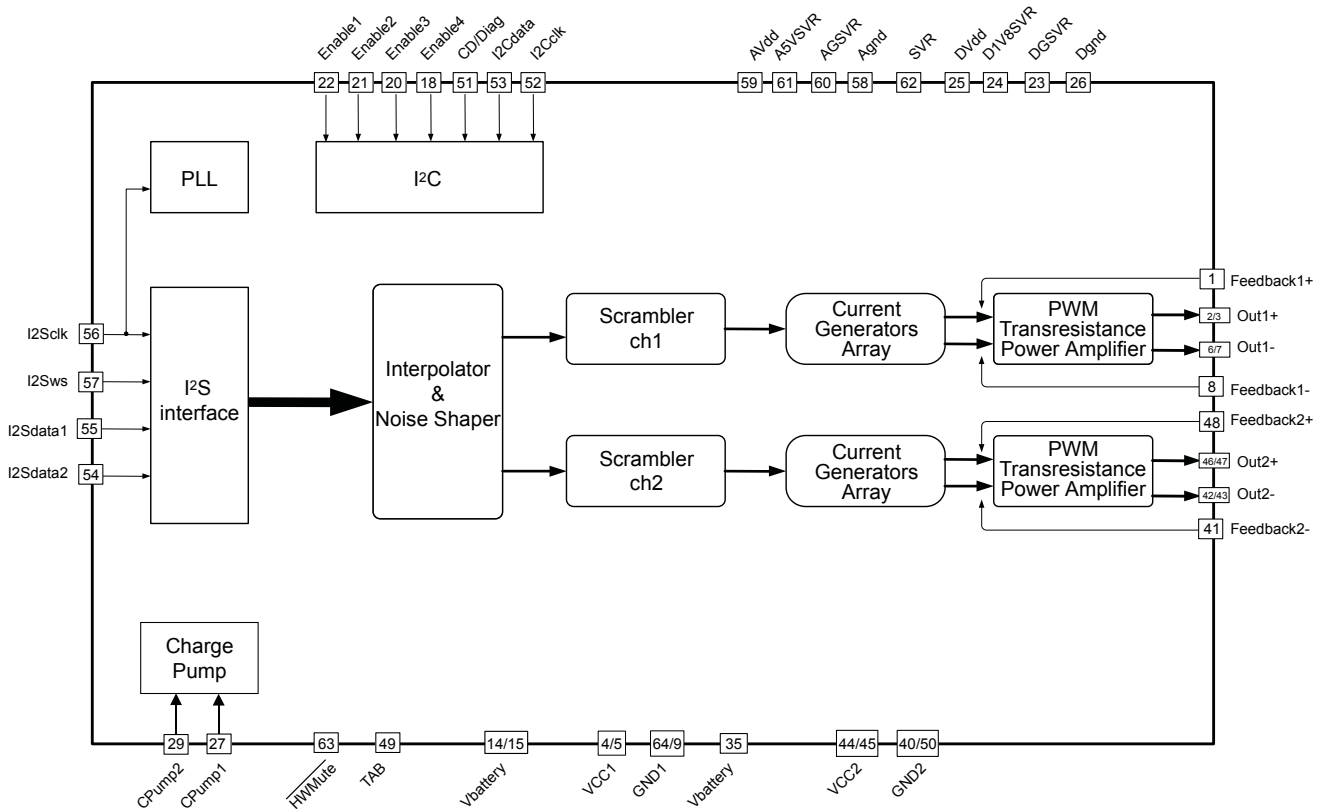
The **FDA802S** is a dual bridge class D amplifier, designed in the most advanced BCD technology specially intended for car radio applications. The **FDA802S** integrates a high performance D/A converter together with powerful MOSFET outputs in class D, to get an outstanding efficiency compared with the standard class AB.

The integrated D/A converter allows to reach outstanding performances (110 dB S/N ratio with 108 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 25 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.

FDA802S is fully configurable through I<sup>2</sup>C 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 the FDA802S 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.

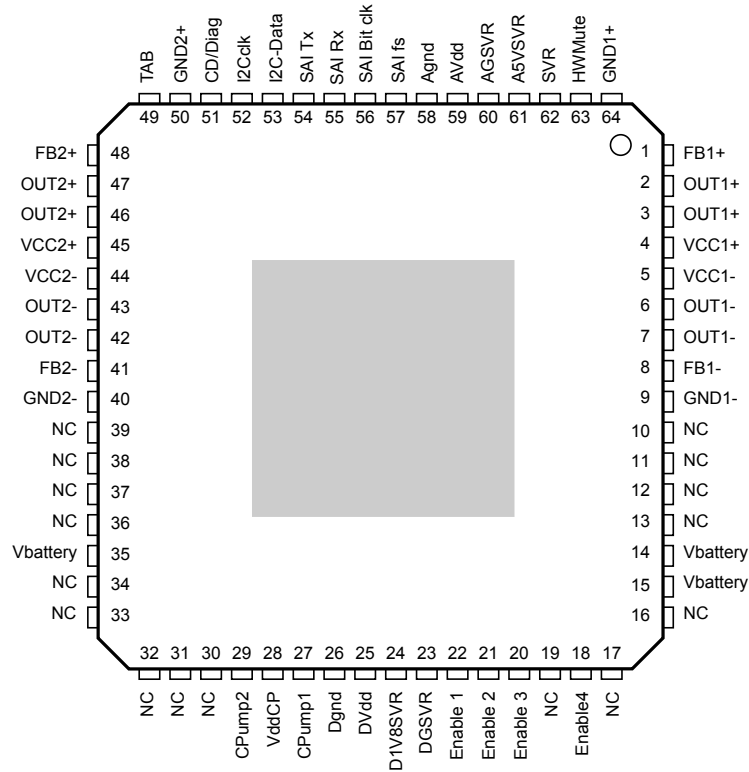
# 1 Block diagram and pins description

## 1.1 Block diagram

**Figure 1. Block diagram**


## 1.2 Pins description

**Figure 2. Pins connection diagram (top view)**



**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	Vbattery	Main battery voltage (14V)
15	Vbattery	Main battery voltage (14V)
16-17	N.C.	Not connected
18	Enable4	Chip Enable 4
19	N.C.	Not connected
20	Enable3	Chip Enable 3
21	Enable2	Chip Enable 2

N#	Pin	Function
22	Enable1	Chip Enable 1
23	DGSVR	Negative Digital Supply V(SVR)-0.9V (Internally generated)
24	D1V8SVR	Positive Digital Supply V(SVR)+0.9V (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 pin2
30-34	N.C.	Not connected
35	Vbattery	Main battery voltage (14V)
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
52	I2CCLK	I <sup>2</sup> C clock
53	I2C-Data	I <sup>2</sup> C Data Input
54	SAI <sup>(1)</sup> Tx	I <sup>2</sup> S/TDM Data 2 (Data input, not used) <sup>(2)</sup>
55	SAI <sup>(1)</sup> Rx	I <sup>2</sup> S/TDM Data 1 (Data input)
56	SAI <sup>(1)</sup> Bit clk	I <sup>2</sup> S/TDM Clock
57	SAI <sup>(1)</sup> fs	I <sup>2</sup> S/TDM Sws (Frame Sync Input)
58	Agnd	Analog ground
59	AVdd	Analog supply
60	AGSVR	Negative Analog Supply V(SVR)-2.5V (Internally generated)
61	A5VSVR	Positive Analog Supply V(SVR)+2.5V (Internally generated)
62	SVR	Supply Voltage Ripple Rejection Capacitor
63	HWMute	Hardware mute pin
64	GND1+	Channel 1, half bridge plus, Power Ground

1. SAI: serial audio interface.

2. Connect to ground through resistance (10 k $\Omega$ ).



## 3 Electrical specifications

### 3.1 Absolute maximum ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CC}$	DC supply voltage	-0.3 to 26 <sup>(1)</sup>	V
$V_{peak}^{(2)}$	Transient supply voltage (for $t = 50$ ms) not operating	60	V
$Gnd_{max}$	Ground pin voltage difference	-0.3 to 0.3	V
$V_{i2c}$	I <sup>2</sup> C bus pins voltage	-0.3 to 5.5	V
$V_{i2s}$	I <sup>2</sup> S bus pins voltage	-0.3 to 5.5	V
Enable 1, 2, 3, 4	Enable pins voltage	-0.3 to 5.5	V
$V_{CD}$	CD/DIAG pin	-0.3 to 5.5	V
$I_O$	Output current (repetitive $f > 10$ Hz)	Internally limited	A
$T_{amb}$	Ambient operating temperature	-40 to 105	°C
$T_{stg}, T_j$	Storage and junction temperature	-55 to 150	°C
ESDHBM	ESD protection HBM <sup>(3)</sup>	2000	V
ESDCDM	ESD protection CDM <sup>(3)</sup>	500	V

1. Refer to section 5 (Load possibilities and operating range, DS12482) for I<sup>2</sup>C configuration of operating supply range.
2. Max rating valid for  $V_{battery}/AVdd/DVdd/Vccx$ .
3. Conforming to ESD standard.

### 3.2 Thermal data

**Table 3. Thermal data**

Symbol	Parameter	Typ	Max	Unit
$R_{th\ j-case}$	Thermal resistance junction-to-case	1.15	1.6	°C/W

## 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](http://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

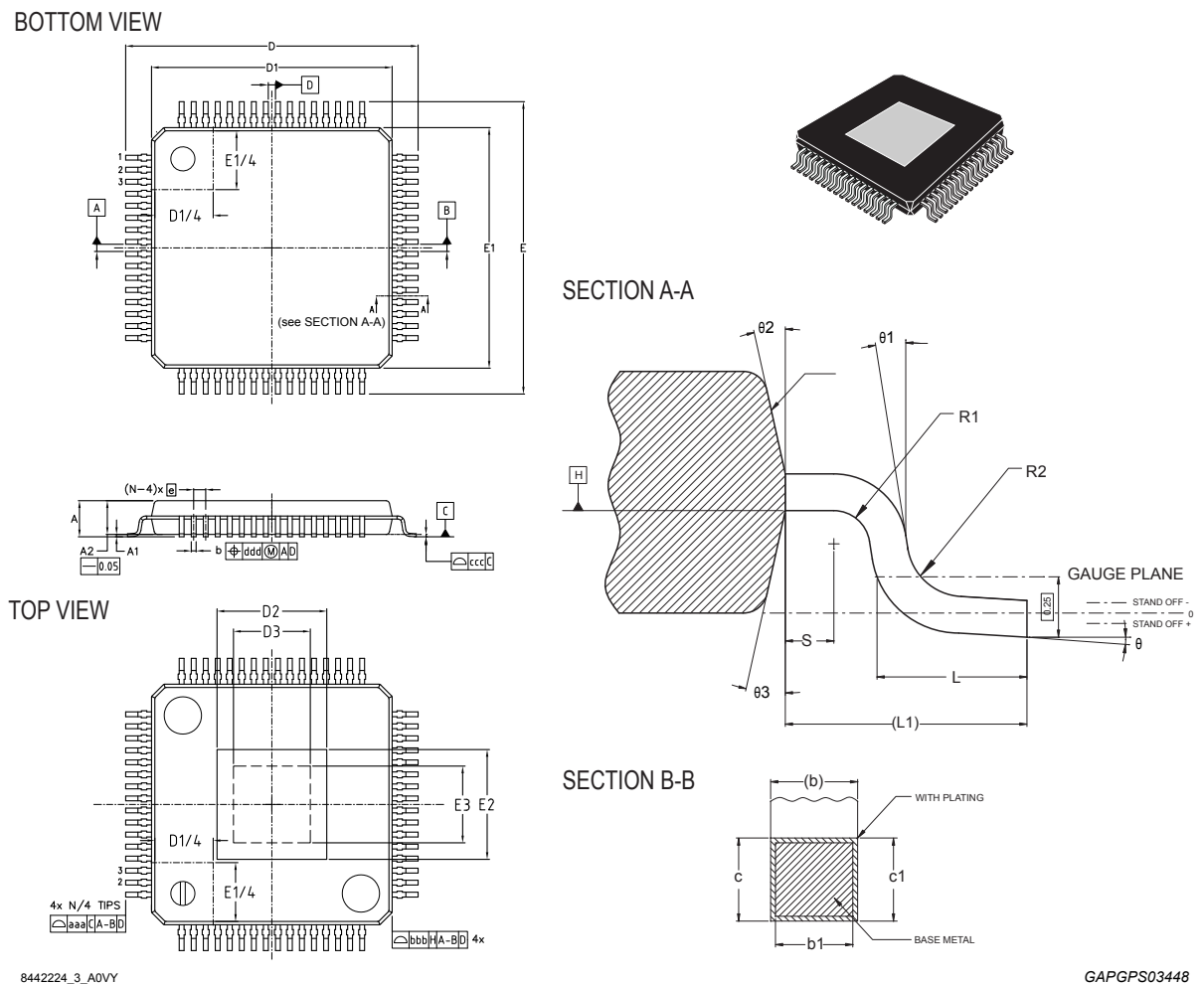


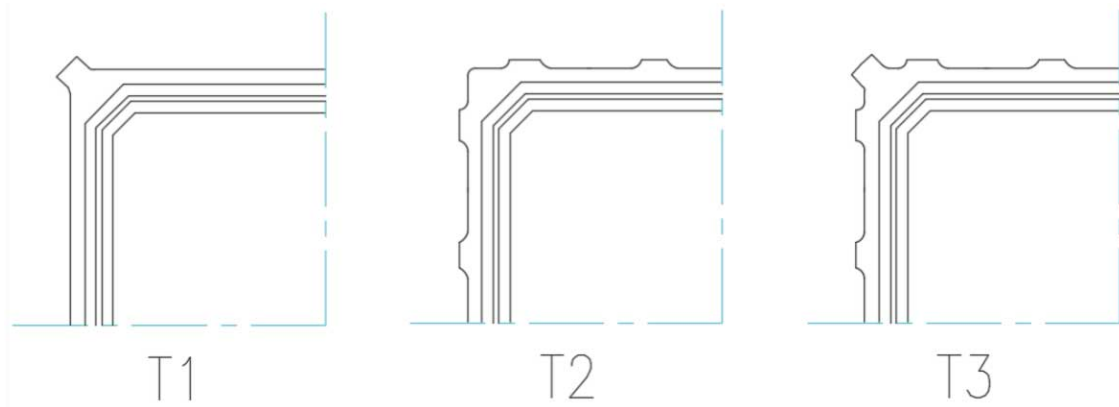
Table 4. LQFP64 (10x10x1.4 mm exp. pad up) package mechanical data

Symbol	Dimensions in mm		
	Min.	Typ.	Max.
$\Theta$	0°	3.5°	6°
$\Theta 1$	0°	-	-
$\Theta 2$	10°	12°	14°
$\Theta 3$	10°	12°	14°
A	-	-	1.49



Symbol	Dimensions in mm		
	Min.	Typ.	Max.
A1	-0.04	-	0.04
A2	1.35	1.40	1.45
b	0.17	0.22	0.27
b1	0.17	0.20	0.23
c	0.09	-	0.20
c1	0.09	-	0.16
D	12.00 BSC		
D1 <sup>(1) (2)</sup>	10.00 BSC		
D2	See <b>VARIATIONS</b>		
D3	See <b>VARIATIONS</b>		
e	0.50 BSC		
E	12.00 BSC		
E1 <sup>(1)(2)</sup>	10.00 BSC		
E2	See <b>VARIATIONS</b>		
E3	See <b>VARIATIONS</b>		
L	0.45	0.60	0.75
L1	1.00 REF		
N	64		
R1	0.08	-	-
R2	0.08	-	0.20
S	0.20	-	-
<b>Tolerance of form and position</b>			
aaa	0.20		
bbb	0.20		
ccc	0.08		
ddd	0.08		
<b>VARIATIONS</b>			
Pad option 6.0x6.0 (T1-T3) <sup>(3)</sup>			
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 of 0.15 mm.
3. Number, dimensions and position of groves shown in [Figure 5](#) are for reference only.

**Figure 5. Exposed-pad groove's shapes**

GADG2108170827PS

## Revision history

**Table 5. Document revision history**

Date	Version	Changes
30-Aug-2021	1	Initial release.

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