

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

Data brief



### Features



- AEC-Q100 (rev. G) 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, 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
- EMI control for FM/AM compatibility
- EMI compliance evaluated following normative IEC61967-4 and IEC62132-4
- 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
- MOSFET power outputs allowing high output power capability under step-up voltage:
  - 2 x 120 W /4 Ω @ 35 V, 1 kHz THD = 1% (2 x 150 W /4 Ω @ 35 V, 1 kHz THD = 10%)
  - 2 x 140 W /8 Ω @ 50 V, 1 kHz THD = 1% (2 x 180 W /8 Ω @ 50 V, 1 kHz THD = 10%)
  - 2 x 270 W /8 Ω @ 50 V max output power
- 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 (until 18 V)
- Independent channel operation
- I<sup>2</sup>C bus diagnostics:
  - Short to Vcc/GND diagnostic (including soft shorts up to 1k Ω)
  - 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<sup>2</sup>C' mode)
- Short circuit and ESD integrated protections
- Package: LQFP64 exposed pad up

Table 1. Device summary

| Order code | Package              | Packing     |
|------------|----------------------|-------------|
| FDA802-VYY | LQFP64 (exp. pad up) | Tray        |
| FDA802-VYT | LQFP64 (exp. pad up) | Tape & reel |

# Contents

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>Description</b> .....                                    | <b>3</b>  |
| <b>2</b> | <b>Block and pins description diagrams</b> .....            | <b>4</b>  |
| <b>3</b> | <b>Package information</b> .....                            | <b>7</b>  |
| 3.1      | LQFP64 (10x10x1.4 mm exp. pad up) package information ..... | 7         |
| 3.2      | LQFP64 (10x10x1.4 mm exp. pad up) marking information ..... | 9         |
| <b>4</b> | <b>Revision history</b> .....                               | <b>10</b> |

# 1 Description

The FDA802 is a dual bridge class D amplifier, designed in the most advanced BCD technology specially intended for car radio applications.

The FDA802 integrates a high performance D/A converter together with powerful MOSFET outputs in class D, to get an outstanding efficiency compared to the standard class AB.

The integrated D/A converter allows to reach outstanding performances (110 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 is including the output L-C low-pass filter, allowing superior frequency response linearity and lower distortion independently from the inductor and capacitor quality.

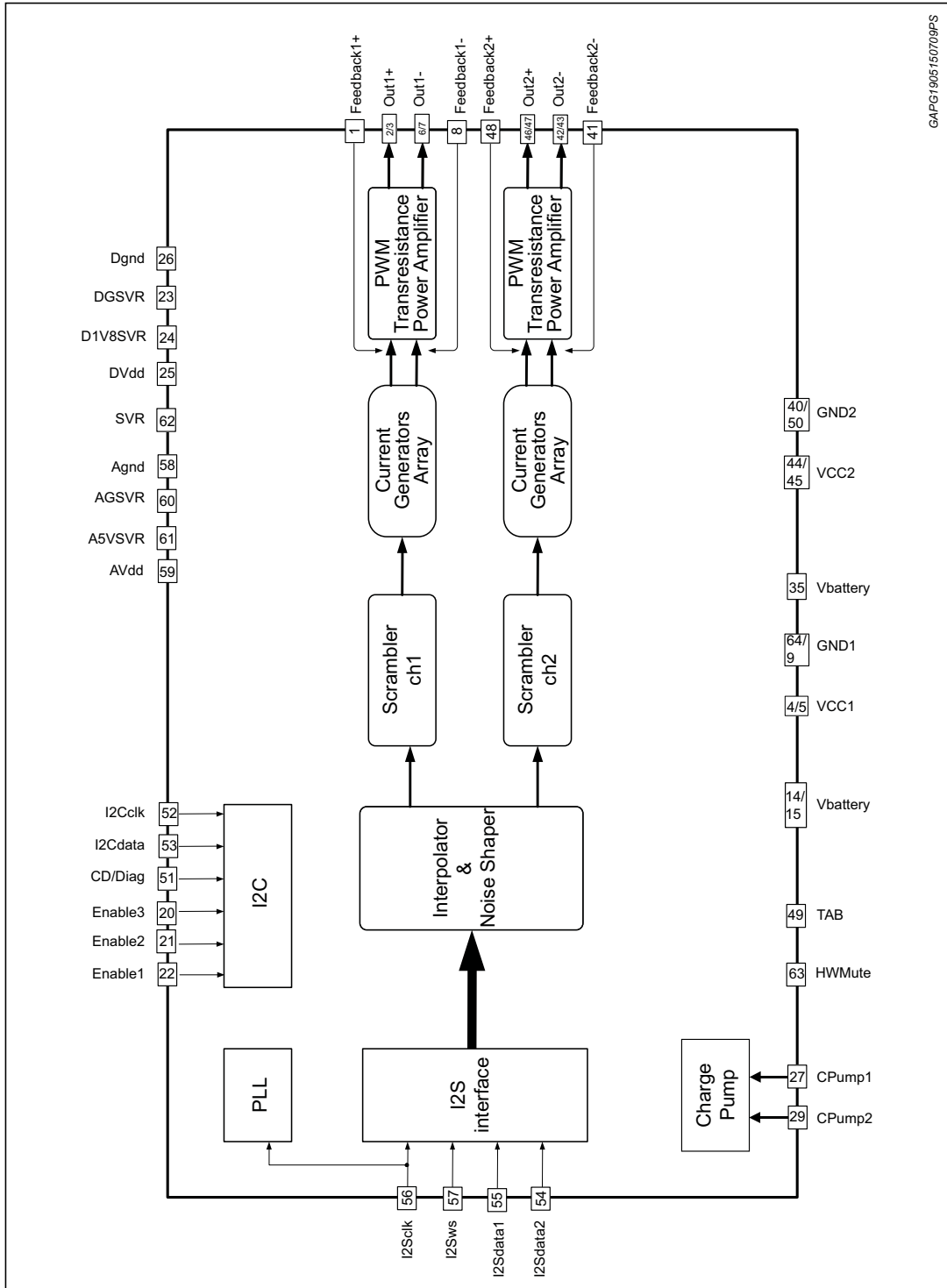
FDA802 is fully configurable through I<sup>2</sup>C bus interface and integrates a complete diagnostics array specially intended for automotive applications.

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 FDA802 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.

## 2 Block and pins description diagrams

Figure 1. Block diagram



GAPG1905150709PS

Figure 2. Pins connection diagram



Table 2. 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,<br>16-17, 19,<br>30-34,<br>36-39 | N.C.     | Not connected                                      |
| 14                                      | Vbattery | Main battery voltage (14V)                         |
| 15                                      | Vbattery | Main battery voltage (14V)                         |
| 18                                      | Enable4  | Chip Enable 4                                      |
| 20                                      | Enable3  | Chip Enable 3                                      |

Table 2. Pins list description (continued)

| N# | Pin         | Function   |
|----|-------------|--|
| 21 | Enable2     | Chip Enable 2  |
| 22 | Enable1     | Chip Enable 1  |
| 23 | DGSVR       | Negative Analog 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   |
| 35 | Vbattery    | Main battery voltage (14V)                                 |
| 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 Tx      | I <sup>2</sup> S/TDM Data 2 (Data output)                  |
| 55 | SAI Rx      | I <sup>2</sup> S/TDM Data 1 (Data input)                   |
| 56 | SAI Bit clk | I <sup>2</sup> S/TDM Clock                                 |
| 57 | SAI 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                  |

### 3 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.

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

Figure 3. LQFP64 (10x10x1.4 mm exp. pad up) package outline



Table 3. LQFP64 (10x10x1.4 mm exp. pad up) package mechanical data

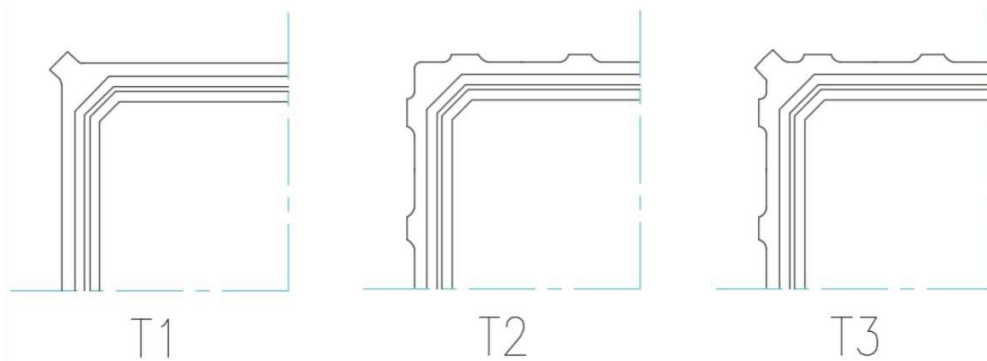
| Symbol                                | Dimensions in mm |       |      |
|---------------------------------------|------------------|-------|------|
|                                       | Min.             | Typ.  | Max. |
| $\Theta$                              | 0°               | 3.5°  | 6°   |
| $\Theta 1$                            | 0°               | 9°    | 12°  |
| $\Theta 2$                            | 11°              | 12°   | 13°  |
| $\Theta 3$                            | 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 <sup>(1)(2)</sup>                  | 10.00 BSC        |       |      |
| D2                                    | See VARIATIONS   |       |      |
| e                                     | 0.50 BSC         |       |      |
| E                                     | 12.00 BSC        |       |      |
| E1 <sup>(1)(2)</sup>                  | 10.00 BSC        |       |      |
| E2                                    | See VARIATIONS   |       |      |
| 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  | -    |



**Table 3. LQFP64 (10x10x1.4 mm exp. pad up) package mechanical data (continued)**

| Symbol  | Dimensions in mm |      |      |
|---|------------------|------|------|
|   | Min.             | Typ. | Max. |
| <b>VARIATIONS</b>                               |                  |      |      |
| <b>Pad option 6.0x6.0 (T1-T3)<sup>(3)</sup></b> |                  |      |      |
| D2  | -                | -    | 6.61 |
| E2  | -                | -    | 6.61 |
| D3  | 4.8              | -    | -    |
| E3  | 4.8              | -    | -    |

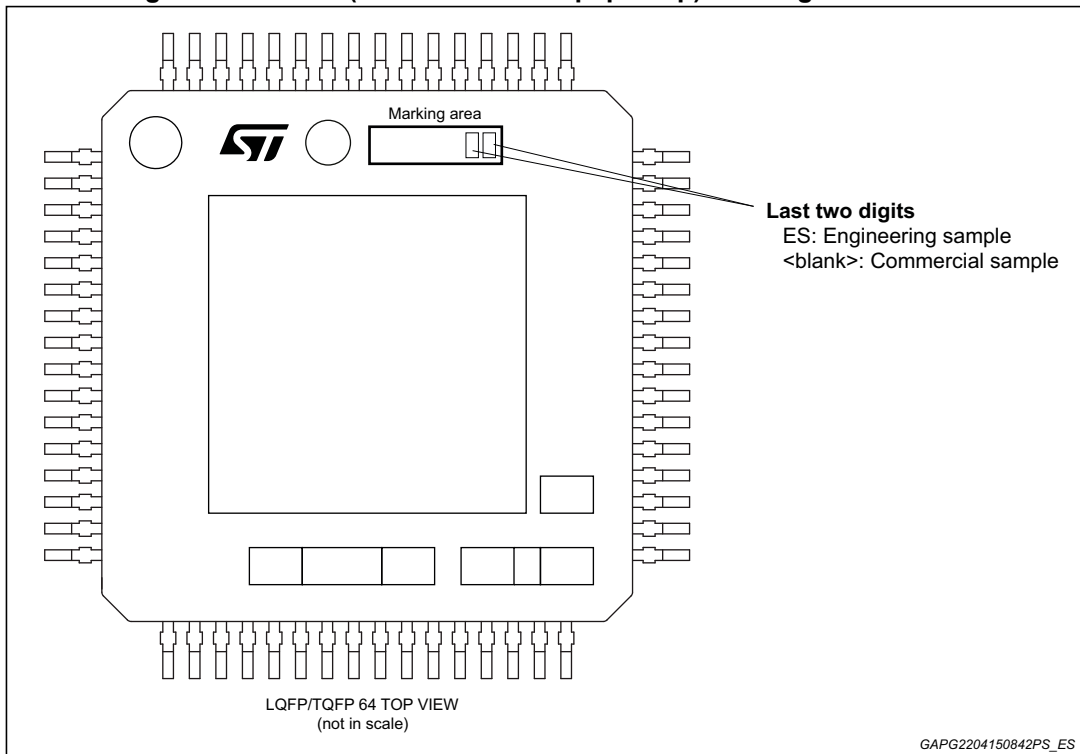
1. Dimensions D1 and E1 do not include mold flash or protrusions. Allowable mold flash or protrusion is "0.25 mm" per side.
2. The Top package body size may be smaller than the bottom package size by much as 0.15 mm.
3. Number, dimensions and position of shown grooves are for reference only:



GADG2108170827PS

### 3.2 LQFP64 (10x10x1.4 mm exp. pad up) marking information

Figure 4. LQFP64 (10x10x1.4 mm exp. pad up) marking information



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## 4 Revision history

Table 4. Document revision history

| Date        | Revision | Changes   |
|-------------|----------|---|
| 14-Jun-2017 | 1        | Initial release.  |
| 22-Aug-2017 | 2        | Updated <i>LQFP64 (10x10x1.4 mm exp. pad up) package information.</i> |

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