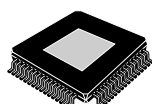


## 2 x 180 W / 1 x 300 W PWM digital input power amplifier with built-in diagnostics features and step-up driver

Data brief - production data



TQFP64 (exposed pad up)

### Features

- Integrated 105 dB D/A conversion
- I<sup>2</sup>S & TDM digital input (3.3/1.8 V)
- Input sampling frequency: 44.1kHz, 48 kHz, 96 kHz, 192 kHz
- Step-up driver included
- EMI control for FM/AM compatibility
- Dithering possibility
- Capable to operate down to 6 V (e.g. "start-stop")
- 6 V - 35 V operating range ( $R_L = 8 \Omega$ )
- Low component count output low-pass filter
- Output low-pass filter included in the feedback
- Low radiation function (LRF)
- High output power capability
  - 2 x 80 W/4  $\Omega$  @ 25 V, 1 kHz, 10 % THD
  - 2 x 120 W/4  $\Omega$  @ 30 V, 1 kHz, 10 % THD
  - 1 x 150 W/2  $\Omega$  @ 25 V, 1 kHz, 10 % THD
- Full I<sup>2</sup>C bus driving (3.3/1.8 V):
  - I<sup>2</sup>C bus digital diagnostics (including DC and AC load detection); AC and DC loudspeaker diagnostic
- Very flexible fault detection through integrated diagnostic
- Protected against several kinds of misconnections
- Offset detector (play or mute mode)
- Two independent short circuit protections
- Clipping detector
- C-MOS compatible enable pin (3.3/5 V)
- ESD protection
- Package: TQFP64 exposed pad up

### Description

The FDA2100LV is a new BCD technology dual bridge class D amplifier, specially intended for car radio applications.

Thanks to the BCD6-SOI (Silicon On Insulation) technology it is possible to integrate a high performance D/A converter together with powerful MOSFET output amplifier working in class D, to get outstanding efficiency with respect to the standard class AB.

The D/A conversion on board allows the performance to reach an outstanding 110 dB S/N ratio with 105 dB of dynamic range. The feedback loop includes the output L-C low-pass filter, allowing superior frequency response linearity and lower distortion independently of the inductor and capacitor quality.

A full diagnostics array communicates the status of each speaker through the I<sup>2</sup>C bus. The possibility to control the device by means of the I<sup>2</sup>C bus makes FDA2100LV very flexible.

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

A built-in step-up driver allows up to 150 W output power with the standard 14 V supply voltage.

The FDA2100LV is moreover compliant to the most recent OEM specifications for low voltage operation (so called 'start-stop' battery profile during engine stop), helping car manufacturers to reduce the overall emissions and thus contributing to environment protection.

Table 1. Device summary

| Order code  | Package         | Packing     |
|-------------|-----------------|-------------|
| FDA2100LV   | TQFP64 (e.p.u.) | Tray        |
| FDA2100LV-T |                 | Tape & reel |

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Table 2. Pins list description

| Pin # | Pin name   | Function                                                                                        |
|-------|------------|-------------------------------------------------------------------------------------------------|
| 64    | N.C.       | Not connected                                                                                   |
| 63    | Gnd1-      | Channel 1, half bridge power ground -                                                           |
| 51-62 | N.C.       | Not connected                                                                                   |
| 50    | Gnd2-      | Channel 2, half bridge power ground -                                                           |
| 49    | TAB        | TAB connection                                                                                  |
| 48    | Feedback2- | Channel 2 half bridge feedback -                                                                |
| 47    | Out2-      | Channel 2 half bridge output -                                                                  |
| 46    | Out2-      | Channel 2 half bridge output -                                                                  |
| 45    | Vdd2-      | Channel 2 half bridge power supply -                                                            |
| 44    | Vdd2+      | Channel 2 half bridge power supply +                                                            |
| 43    | Out2+      | Channel 2 half bridge output +                                                                  |
| 42    | Out2+      | Channel 2 half bridge output +                                                                  |
| 41    | Feedback2+ | Channel 2 half bridge feedback +                                                                |
| 40    | Gnd2+      | Channel 2, half bridge power ground +                                                           |
| 39    | N.C.       | Not connected                                                                                   |
| 38    | I2S-Clock  | I2S/TDM clock Input                                                                             |
| 37    | I2S-Sinc   | I2S/TDM sinc Input                                                                              |
| 36    | I2S-Data   | I2S/TDM data Input                                                                              |
| 35    | Test       | Test pin (do not use)                                                                           |
| 34    | I2C-Clock  | I2C data Clock                                                                                  |
| 33    | I2C-Data   | I2C data input                                                                                  |
| 32    | CD/DIAG    | Clip detector and diagnostic output: over-current protection, thermal warning, offset detection |
| 31    | Enable 2   | Chip enable 2                                                                                   |
| 30    | Enable 1   | Chip enable 1                                                                                   |
| 29    | PLL_Filter | PLL filter network                                                                              |
| 28    | Mute       | Mute input (6 $\mu$ A source current)                                                           |
| 27    | D-Gnd      | Digital ground                                                                                  |
| 26    | Dig-P      | Positive digital supply V(svr)+1.65 (internally generated)                                      |
| 25    | Dig-N      | Negative digital supply V(svr)-1.65 (internally generated)                                      |
| 24    | ExtTher    | External thermal protection input                                                               |
| 23    | IsetProt   | Current protection resistor setting                                                             |
| 22    | SVR        | Supply voltage ripple rejection capacitor                                                       |
| 21    | An-N       | Negative analog supply V(svr)-1.65 (internally generated)                                       |
| 20    | An-P       | Positive analog supply V(svr)+1.65 (internally generated)                                       |

Table 2. Pins list description (continued)

| Pin # | Pin name    | Function                              |
|-------|-------------|---------------------------------------|
| 19    | A-Gnd       | Analog ground                         |
| 18    | D-Vdd       | Digital power supply                  |
| 17    | A-Vdd       | Analog power supply                   |
| 16    | Enable 3    | Chip enable 3                         |
| 15    | I2          | Step-up current limiting reference    |
| 14    | I1          | Step-up current limiting input        |
| 13    | Comp        | Step-up compensation input            |
| 12    | Vbat        | Power supply (battery)                |
| 11    | Gate-driver | External PowerMOS gate drive output   |
| 10    | SU-Gnd      | Step-up power ground                  |
| 9     | Gnd1+       | Channel 1, half bridge power ground + |
| 8     | Feedback1+  | Channel 1 half bridge feedback +      |
| 7     | Out1+       | Channel 1 half bridge output +        |
| 6     | Out1+       | Channel 1 half bridge output +        |
| 5     | Vdd1+       | Channel 1 half bridge power supply +  |
| 4     | Vdd1-       | Channel 1 half bridge power supply -  |
| 3     | Out1-       | Channel 1 half bridge output -        |
| 2     | Out1-       | Channel 1 half bridge output -        |
| 1     | Feedback1-  | Channel 1 half bridge feedback -      |

## 2 Device overview

The FDA2100LV is a fully digital single chip class D amplifier with high immunity to the demodulation filter effects, built-in diagnostic functions and step-up driver. The high integration level and the on-board signal processing allow an excellent audio performance to be achieved. Thanks to the digital input and a feedback strategy in the power stage that make the amplifier robust with respect to the output filter non-idealities, the number and size of the external components are minimized.

Differently from the typical PWM switching amplifiers, a new feedback technique is adopted by FDA2100LV. The LC filter is included in the feedback loop making the amplifier highly insensitive to the characteristics of such a demodulator group. This solution optimizes the system performance in terms of THD and frequency response. Regardless of the big phase shifting introduced by the output filter the device shows a great phase margin for any load condition.

A number of features has also been included to reduce EMI, making the system compliant with the stringent limits typical of automotive applications and the fully digital approach provides a strong GSM immunity.

The FDA2100LV includes digital I<sup>2</sup>C and I<sup>2</sup>S interfaces, internal 20 bits DAC conversion, digital signal processing for interpolation and noise shaping, step-up driver, internal PLL for a pure clock generation and self diagnostic functions and automatic detection of wrong load connections or variation of the load with respect to the expected one.

In particular, considering diagnostic feature, the FDA amplifiers family provides different functions to detect several possible fault conditions. Any warning information will be stored in the I<sup>2</sup>C interface and kept until the first I<sup>2</sup>C bus reading operation. The main FDA2100LV's diagnostic features are the following ones:

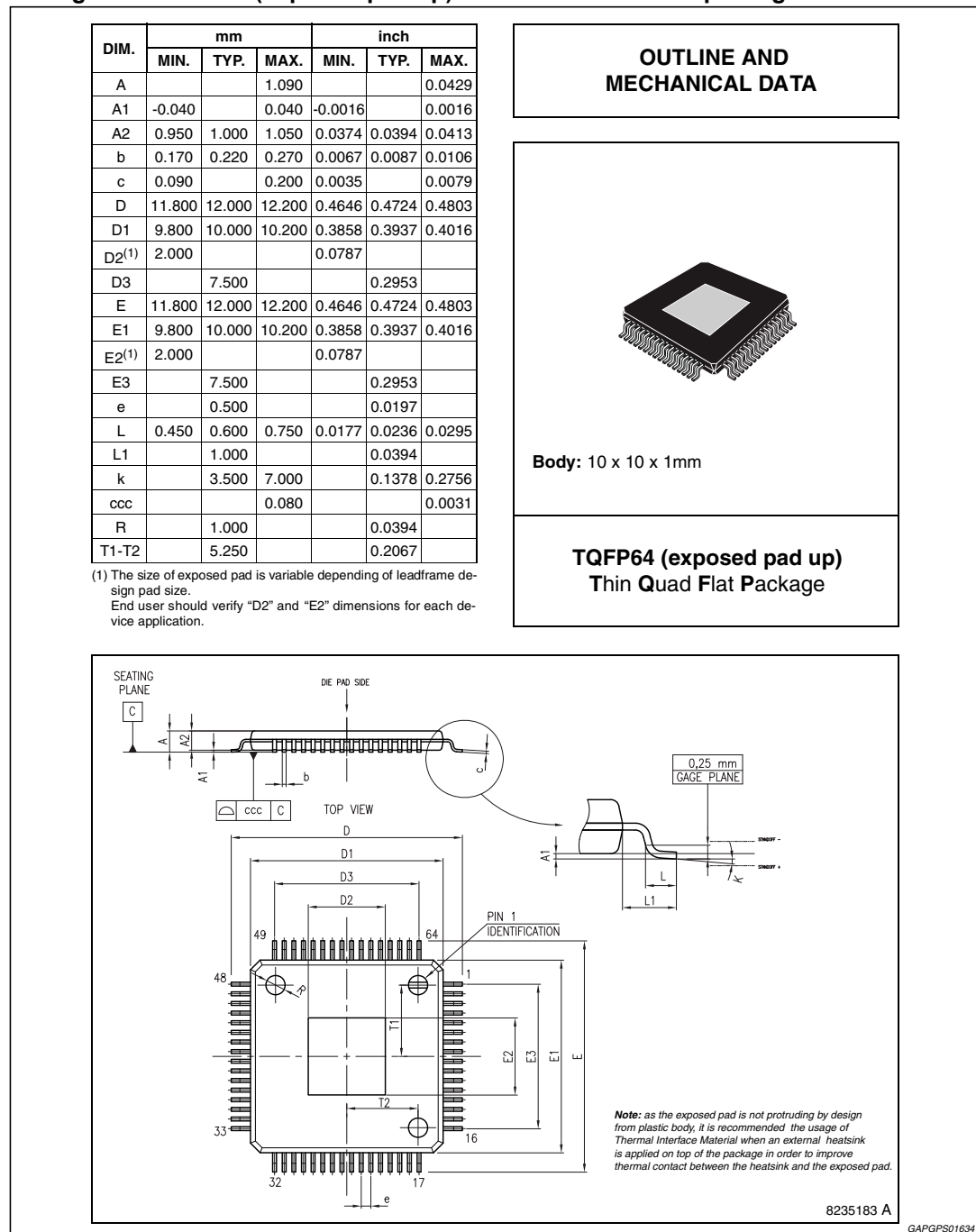
- Load detection
- Under/over voltage events
- Chip over temperature
- Digital input offset
- Output clipping
- Over temperature of an external component (i.e. step-up DMOS) through a suitable NTC external sensor
- Output current digital acquisition

### 3 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com).

ECOPACK<sup>®</sup> is an ST trademark.

**Figure 3. TQFP64 (exposed pad up) mechanical data and package dimensions**



## 4 Revision history

**Table 3. Document revision history**

| <b>Date</b> | <b>Revision</b> | <b>Changes</b>   |
|-------------|-----------------|------------------|
| 11-Oct-2013 | 1               | Initial release. |

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