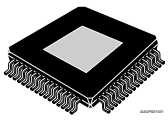
FDA2100BLV

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

Data brief



TQFP64 (exposed pad up)

Features

- AEC-Q100 qualified
- Integrated 105 dB D/A conversion
- I^2S & 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
- 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 Ω @ 25 V, 1 kHz, 10% THD
  - 2 x 140 W/4 Ω @ 35 V, 1 kHz, 10% THD
  - 1 x 150 W/2 Ω @ 25 V, 1 kHz, 10% THD
- Full I^2C bus driving (3.3/1.8 V):
  - I^2C bus digital diagnostics (including DC and AC load detection); AC and DC loudspeaker diagnostic
- Very flexible fault detection though 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 FDA2100BLV 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 an 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^2C bus. The possibility to control the device by means of the I^2C bus makes FDA2100BLV 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 FDA2100BLV 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
FDA2100BLV	TQFP64 (exp.pad up)	Tray
FDA2100BLV-T		Tape & reel

Contents

1 Block diagram and pins description

Figure 1. Block diagram

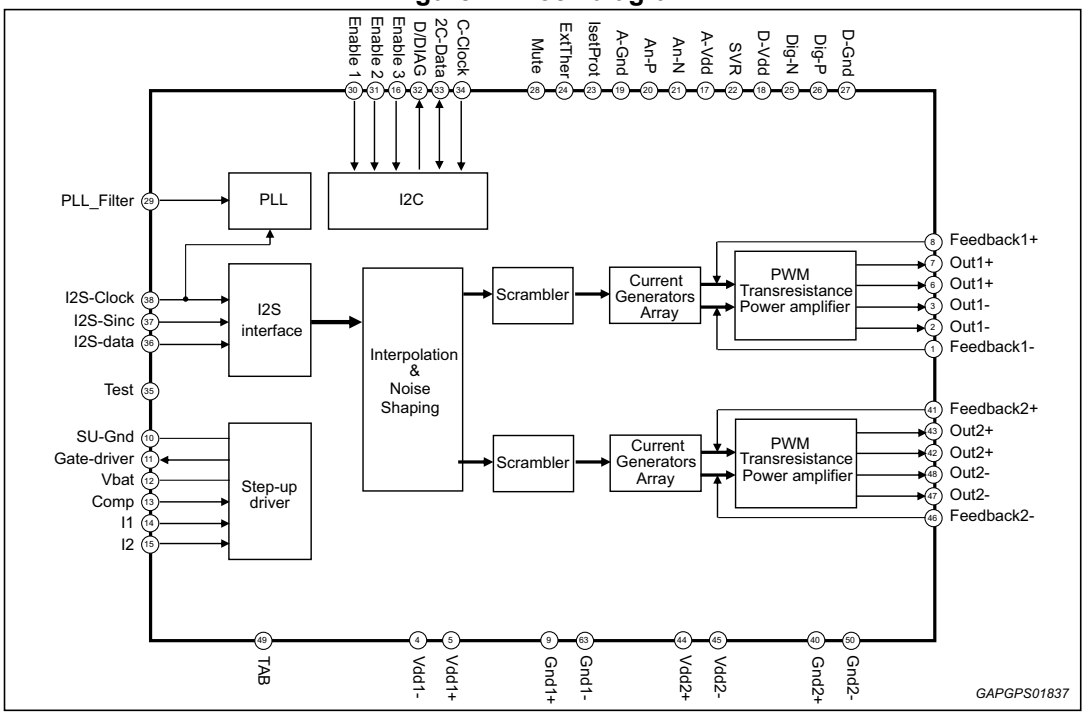


Figure 2. Pins connection diagram (top view)

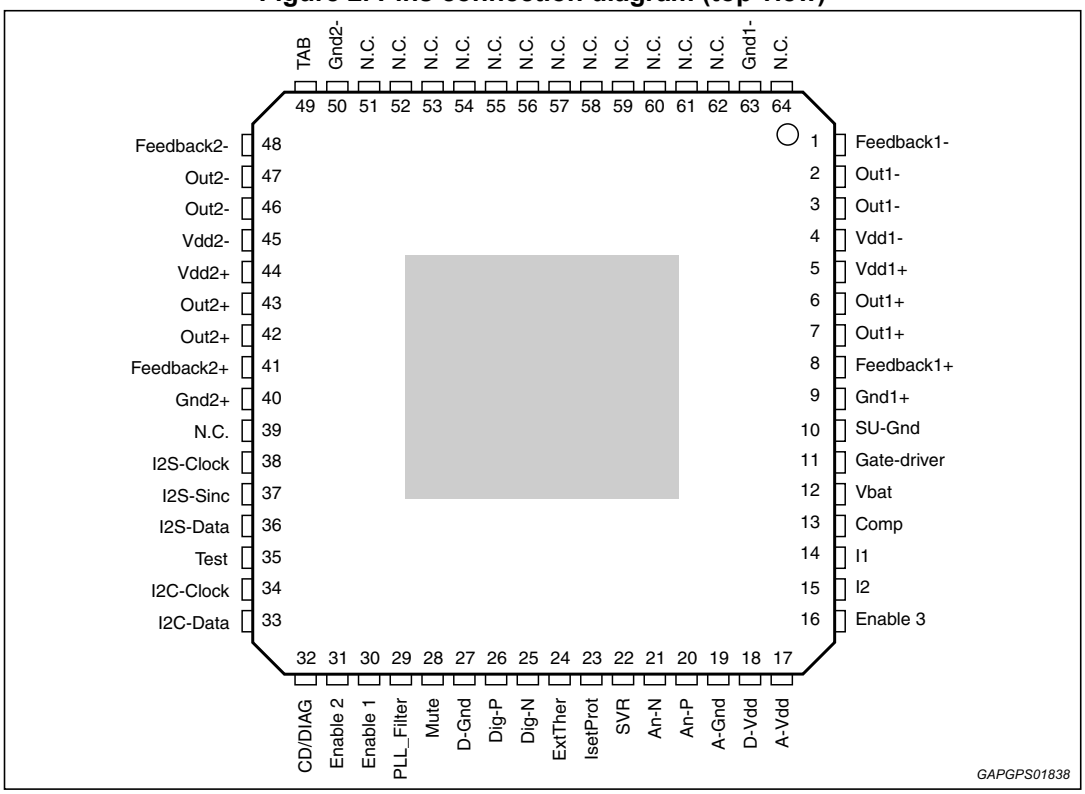


Table 2. Pins list description

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 µA 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 FDA2100BLV 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 FDA2100BLV. 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 FDA2100BLV includes digital I^2C and I^2S 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^2C interface and kept until the first I^2C bus reading operation.
The main FDA2100BLV's diagnostic features are the following ones:

- Load detection;
- Under/over voltage evens;
- 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.

FDA2100BLV can drive two 4 Ω speakers with an operating voltage up to 35 V.

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*. ECOPACK® is an ST trademark.

3.1 TQFP64 (10x10x1 mm exp. pad up) package information

Figure 3. TQFP64 (10x10x1 mm exp. pad up) package outline

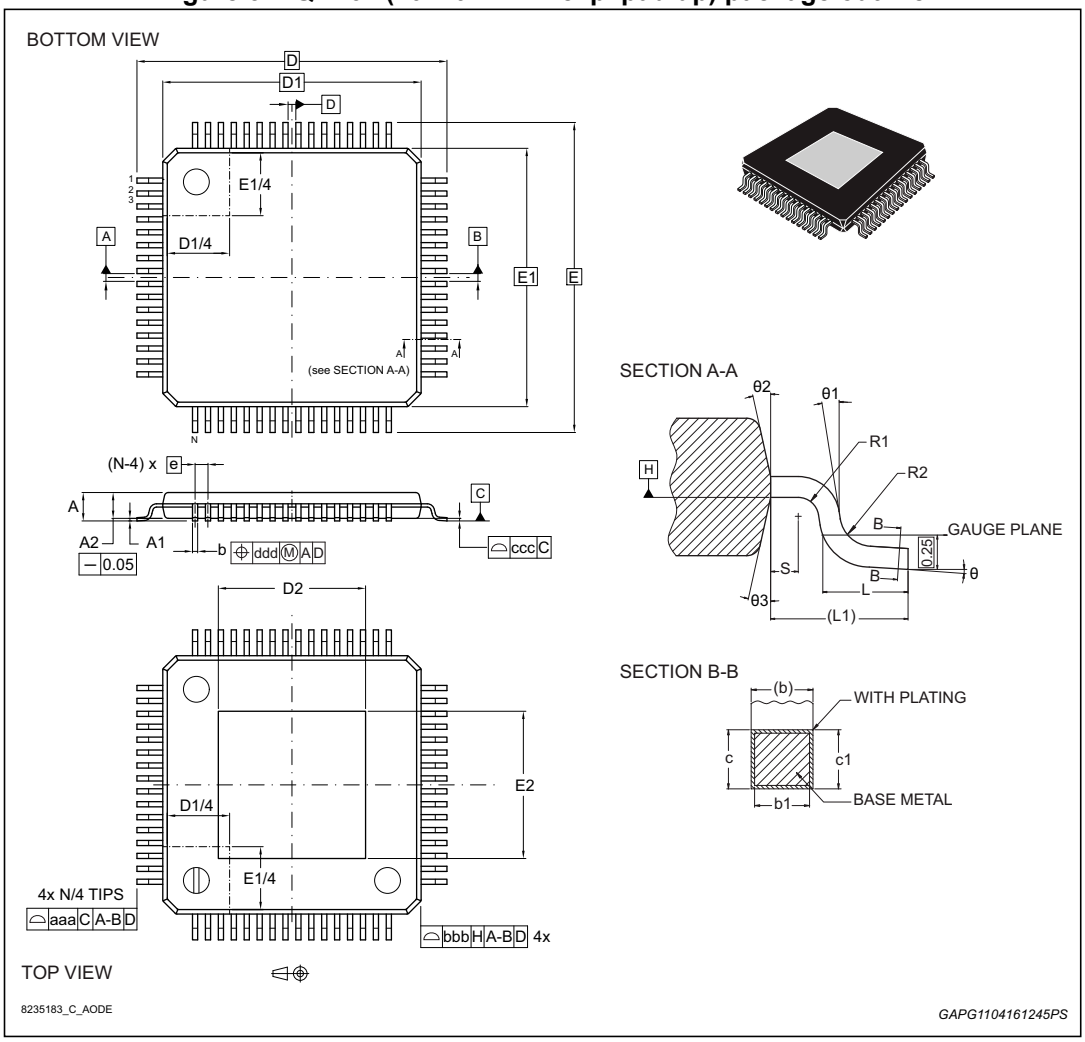


Table 3. TQFP64 (10x10x1 mm exp. pad up) package mechanical data

Ref	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
Θ	0°	3.5°	7°	0°	3.5°	6°
Θ1	0°	-	-	0°	-	-
Θ2	11°	12°	13°	11°	12°	13°
Θ3	11°	12°	13°	11°	12°	13°
A	-	-	1.20	-	-	0.0472
A1	-0.04	-	-0.15	-0.0016	-	-0.0059
A2	0.95	1.0	1.05	0.0374	0.0394	0.0413
b	0.17	0.22	0.27	0.0067	0.0079	0.0091
b1	0.17	0.20	0.23	0.0067	0.0079	0.0091
c	0.9	-	0.20	0.0354	-	0.0079
c1	0.9	-	0.16	0.0354	-	0.0063
D	-	12.00 BSC	-	-	0.4724 BSC	-
D1[2]	-	10.00 BSC	-	-	0.3937 BSC	-
D2	VARIATION					
e	-	0.50 BSC	-	-	0.0197 BSC	-
E	-	12.00 BSC	-	-	0.4724 BSC	-
E1[*]	-	10.00 BSC	-	-	0.3937 BSC	-
E2	VARIATION					
L	0.45	0.60	0.75	0.0177	0.0236	0.0295
L1	-	1.00 REF	-	-	0.0394 REF	-
N	-	64.00	-	-	2.5197	-
R1	0.08	-	-	0.0031	-	-
R2	0.08	-	0.20	0.0031	-	0.0079
S	0.20	-	-	0.0079	-	-
TOLERANCE OF FORM AND POSITION						
aaa	-	0.20	-	-	0.0079	-
bbb	-	0.20	-	-	0.0079	-
ccc	-	0.08	-	-	0.0031	-
ddd	-	0.07	-	-	0.0028	-

Table 3. TQFP64 (10x10x1 mm exp. pad up) package mechanical data (continued)

Ref	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
VARIATIONS						
Option A						
D2	-	4.50	-	-	0.1772	-
E2	-	4.50	-	-	0.1772	-
Option B						
D2	-	6.0	-	-	0.2362	-
E2	-	6.0	-	-	0.2362	-
Option C						
D2	-	2.0	-	-	0.0787	-
E2	-	2.0	-	-	0.0787	-

1. Values in inches are converted from mm and rounded to 4 decimal digits.
2. Dimensions D1 and E1 do not include mold flash or protrusions.
Allowable mold flash or protrusion is “0.25 mm” per side.

4 Revision history

Table 4. Document revision history

Date	Revision	Changes
12-Jan-2017	1	Initial release.