Semi-High
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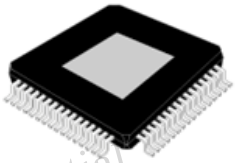
SMH8086

2x200W Class D digital input automotive power amplifier with diagnostics features and low voltage



LQFP64 10x10x1.4 mm
(exposed pad up)

Order code	SMH8086
Package	LQFP64 (exp. pad up)
Packing	Tray

Features

- AEC-Q100 qualification
- Integrated 110 dB D/A conversion
- I²S and TDM digital input (3.3/1.8 V)
- Input sampling frequency: 44.1kHz, 48kHz, 96kHz, 192kHz
- Full I²C bus driving (3.3/1.8 V) with 8 different I²C bus addresses
- EMI control for FM/AM compatibility
- EMI compliance evaluated following normative CISPR25 (class V) with PWM frequency spread
- Low radiation function (LRF)
- Low quiescent current
- Output low-pass filter included in the feedback allowing outstanding audio performances
- Wide operating supply range: target 5.5 V-42 V
- Supply voltage monitoring on I²C
- MOSFET power outputs allowing high output power capability under step-up voltage:
  - 2 x 65 W /4Ω @ 25 V, 1 kHz THD = 1%
  - 2 x 81 W /4Ω @ 25 V, 1 kHz THD = 10%
  - 2 x 127 W /4Ω @ 35 V, 1 kHz THD = 1%
  - 2 x 158 W /4Ω @ 35 V, 1 kHz THD = 10%
  - 2 x 208 W /4Ω @ 38 V, 1 kHz Max power
- Operation under standard car battery with high output power:
  - 2 x 22 W /4Ω @ 14 V, 1 kHz THD = 1%
  - 2 x 28 W /4Ω @ 14 V, 1 kHz THD = 10%
  - 2 x 37 W /2Ω @ 14 V, 1 kHz THD = 1%
  - 2 x 46 W /2Ω @ 14 V, 1 kHz THD = 10%
- Possibility to drive 2Ω loads:
  - up to 18 V in normal mode
  - up to 35 V in parallel mode
- Independent channel operation
- I²C bus diagnostics:
  - Short to VCC/GND diagnostic (including soft shorts up to 1kΩ)
  - DC load diagnostic
  - AC load diagnostic (working both with internally generated and externally generated tone)
- Digital impedance-meter (DIM)
- Integrated fault protection
- Input and output offset detector
- Clipping detector
- Legacy mode ('no I²C' mode)
- Short circuit and ESD integrated protections
- Package: LQFP64 exposed pad up

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1 Description

The SMH8086 is a dual bridge class D amplifier, designed in the most advanced BCD technology specially intended for car radio applications.

The SMH8086 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 the device to achieve outstanding performance (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 42 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.

SMH8086 is fully configurable through I²C 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, SMH8086 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

2.1 Block diagram

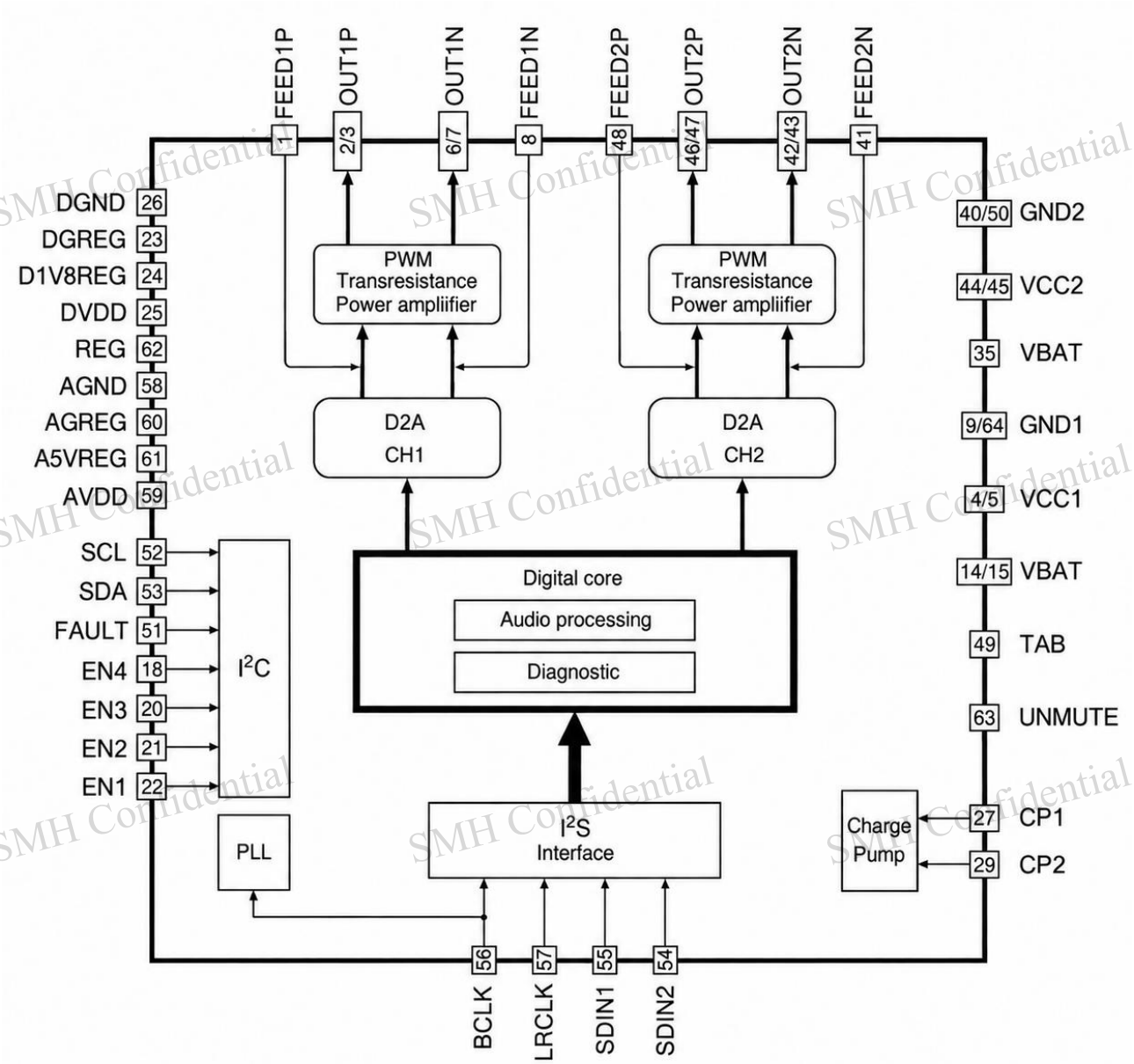

Figure 1. Block diagram

2.2 Pins description

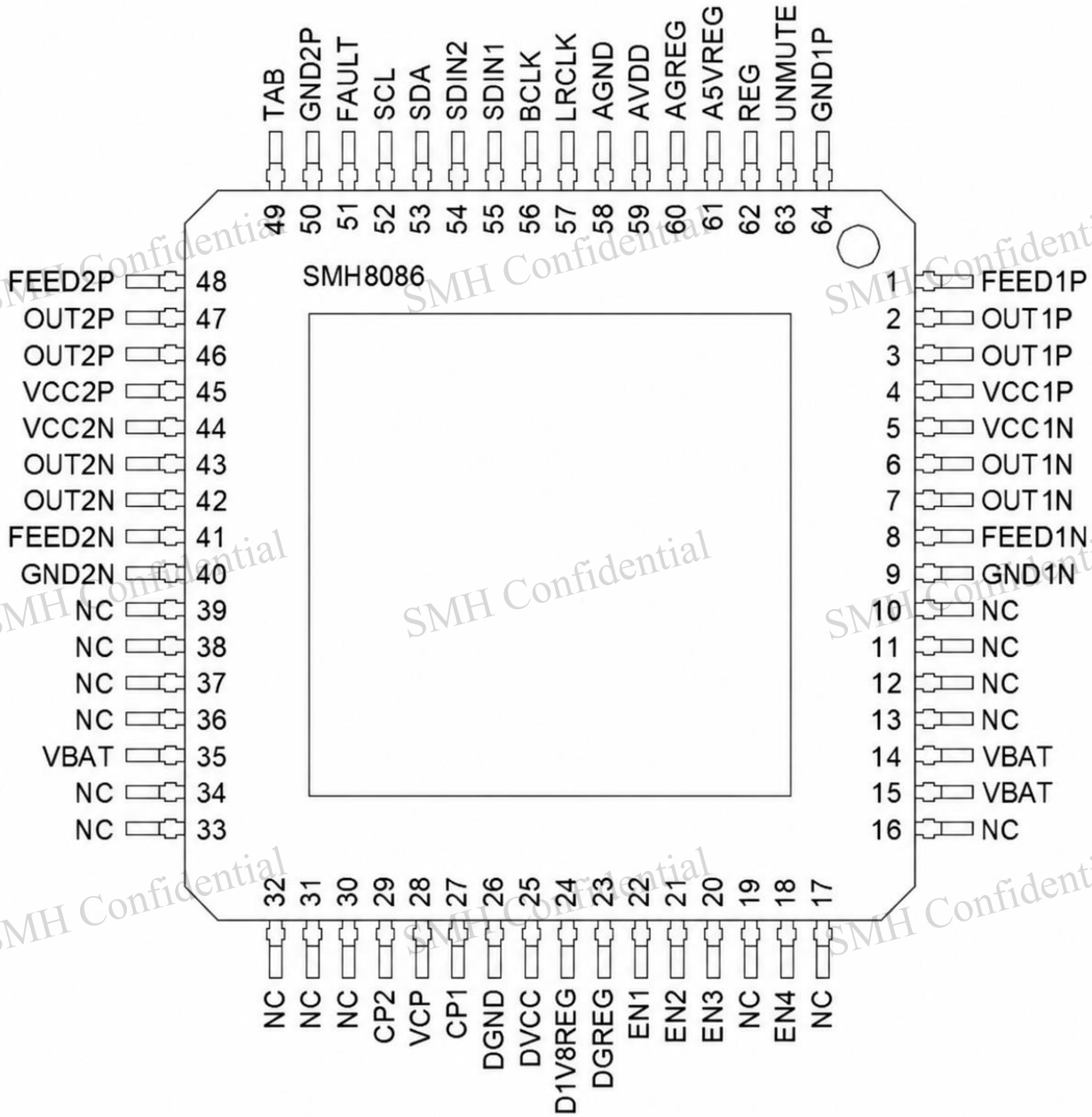

Figure 2. Pins connection diagram

Table 1. Pins list description

Pin number	Pin	Function
1	FEED1P	Channel 1, half bridge plus, Feedback
2-3	OUT1P	Channel 1, half bridge plus, Output
4	VCC1P	Channel 1, half bridge plus, Boosted Power Supply
5	VCC1N	Channel 1, half bridge minus, Boosted Power Supply
6	OUT1N	Channel 1, half bridge minus, Output
7	OUT1N	Channel 1, half bridge minus, Output
8	FEED1N	Channel 1, half bridge minus, Feedback
9	GND1N	Channel 1, half bridge minus, Power Ground
10-13	NC	Not connected
14	VBAT	Main battery voltage (14V)
15	VBAT	Main battery voltage (14V)
16-17	NC	Not connected
18	EN4	Chip Enable 4
19	NC	Not connected
20	EN3	Chip Enable 3
21	EN2	Chip Enable 2
22	EN1	Chip Enable 1
23	DGREG	Negative Analog Supply V(REG)-0.9V (Internally generated)
24	D1V8REG	Positive Digital Supply V(REG)+0.9V (Internally generated)
25	DVCC	Digital supply
26	DGND	Digital ground
27	CP1	Charge Pump pin1
28	VCP	Charge Pump output voltage
29	CP2	Charge Pump pin2
30-34	NC	Not connected
35	VBAT	Main battery voltage (14V)
36-39	NC	Not connected
40	GND2N	Channel 2, half bridge minus, Power Ground
41	FEED2N	Channel 2, half bridge minus, Feedback
42	OUT2N	Channel 2, half bridge minus, Output
43	OUT2N	Channel 2, half bridge minus, Output
44	VCC2N	Channel 2, half bridge minus, Boosted Power Supply
45	VCC2P	Channel 2, half bridge plus, Boosted Power Supply
46-47	OUT2P	Channel 2, half bridge plus, Output
48	FEED2P	Channel 2, half bridge plus, Feedback
49	TAB	Device slug connection
50	GND2P	Channel 2, half bridge plus, Power Ground
51	FAULT	Clip detector / diagnostic pin (output, open drain)
52	SCL	I²C clock
53	SDA	I²C Data Input
54	SDIN2	I²S/TDM SDIN 2 (Data input, NOT used in TDM mode)
55	SDIN1	I²S/TDM SDIN 1 (Data input)
56	BCLK	I²S/TDM Clock

Pin number	Pin	Function
57	LRCLK	I²S/TDM LRCLK (Frame Sync Input)
58	AGND	Analog ground
59	AVDD	Analog supply
60	AGREG	Negative Analog Supply V(REG)-2.5V (Internally generated)
61	A5VREG	Positive Analog Supply V(REG)+2.5V (Internally generated)
62	REG	Supply Voltage Ripple Rejection Capacitor
63	UNMUTE	Hardware mute pin
64	GND1P	Channel 1, half bridge plus, Power Ground

3 Package information

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

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

Sym	Dimension(mm)		
	Min	Nom	Max
A			1.49
A1	-0.05		0.05
A2	1.35	1.40	1.45
b			0.27
b1	0.17	0.20	0.23
c	0.09		0.20
c1	0.09	0.127	0.16
D1	9.90	10.00	10.10
E1	9.90	10.00	10.10
e	0.50 BSC		
D	11.90	12.00	12.10
D2	6.40	6.50	6.60
E	11.90	12.00	12.10
E2	6.40	6.50	6.60
L	0.45	0.60	0.75
L1	1.00 REF		
S	0.20		
θ	0°	3.5°	6°
θ1	0°		
θ2	12° REF		
θ3	12° REF		
R1	0.08		
R2	0.08		0.20
aaa	0.20		
bbb	0.20		
ccc	0.08		
ddd	0.08		

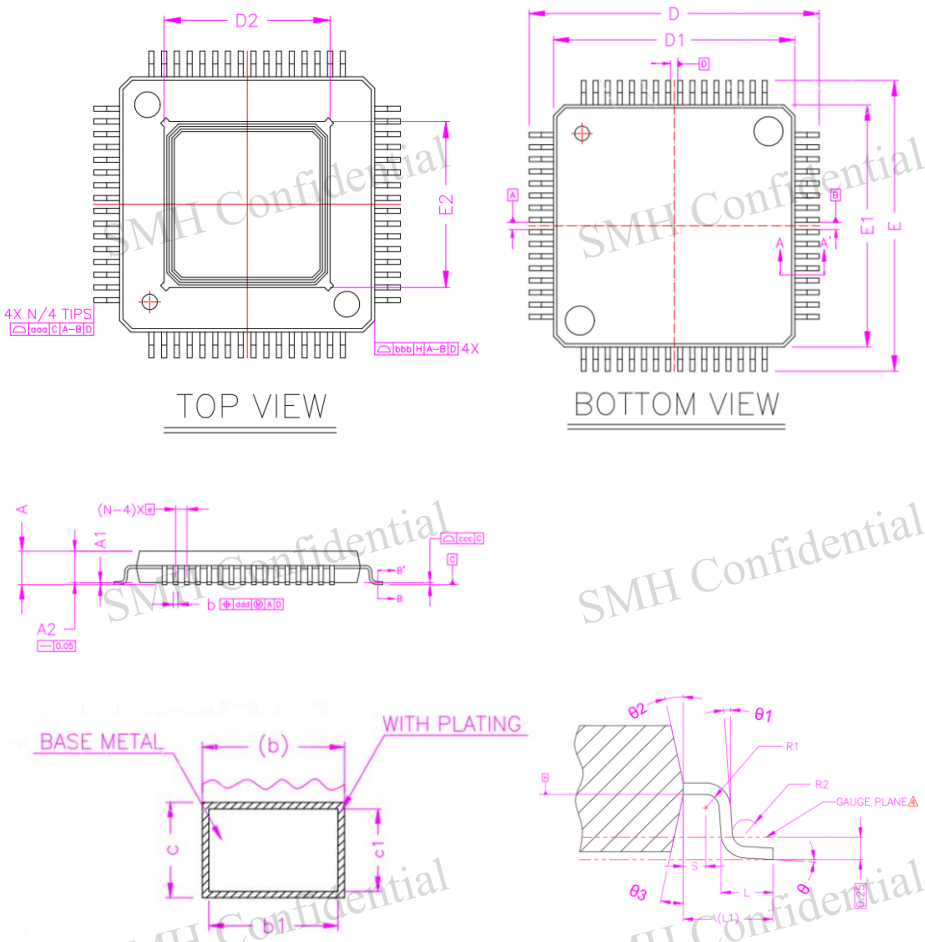

Figure 3. LQFP64 (10x10x1.4 mm exp. pad up) package information

1) Refer to JEDEC STD. MS-026 Issue. D
2) Dimension D1 and E1 do not include mold protrusion.
   Allowable mold flash or protrusion is 0.25 mm per side.
   D1 and E1 are maximum plastic body size dimension include mold mismatch.
3) Dimension b does not include dambar protrusion.
   Allowable dambar protrusion shall not cause the lead width to exceed the maximum b dimension by more than 0.08 mm.
4) All dimensions are in millimeters.

3.2 Generic Package View

This image is a representation of the package family; actual package may vary. Refer to the product data sheet for package details.

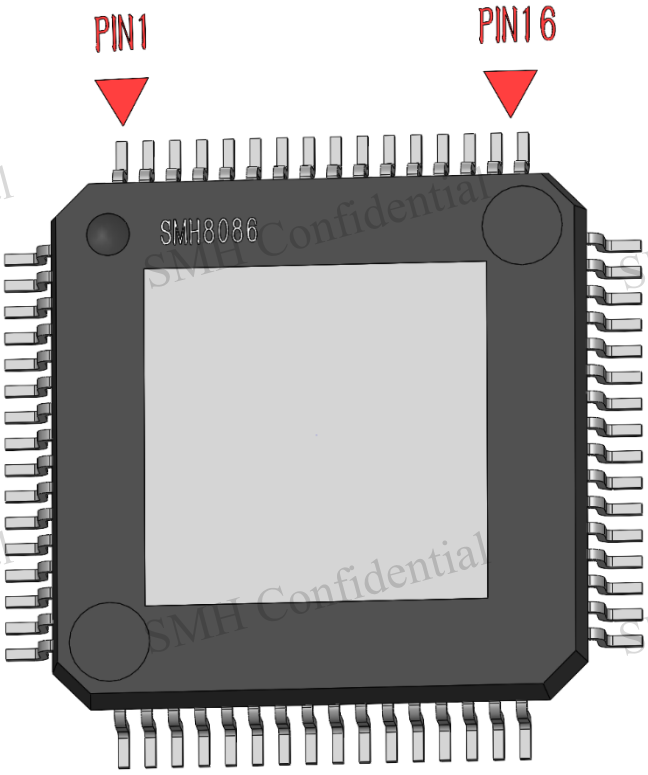

Figure 4. Generic Package View (top view)

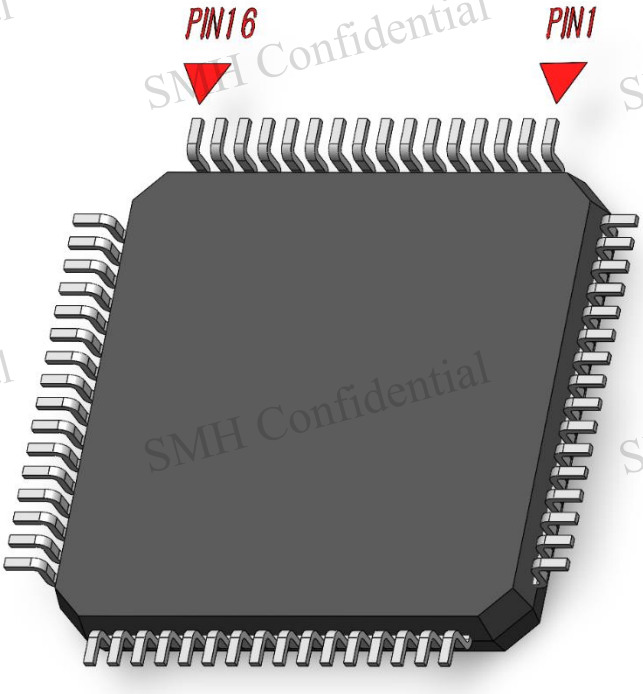

Figure 5. Generic Package View (bottom view)