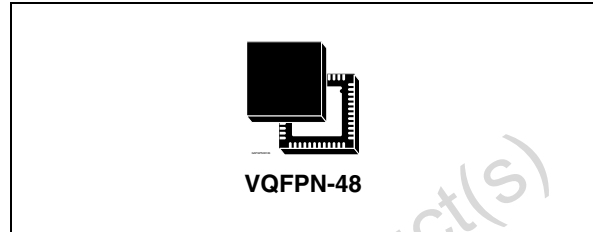


Automotive class-D audio power DAC with backlight LED driver and voice encoder

Data brief – target specification

Features

- FDA001 - dPal integrates:
 - a LED driver with dimming capability
 - an audio DAC converting a digital input into an analog stereo signal
 - a stereo headphone output
 - a class-D amplifier with programmable output power
 - a configurable DSP for sound equalization and volume/gain control
 - a CODEC for microphone input
 - a DC/DC converter that can be used to step-down the car battery to supply the portable device directly with car battery with no need of CLA, or to step-up the input USB voltage to have higher output power
- Synchronous switching voltage pre-regulator:
 - Internal high-side/low-side NDMOS
 - $V_{out} = 5/6/7/8$ V selectable through I²C bus
 - 3 A load current capability in step-down mode
 - Out-of-regulation flag on dedicated hardware pin
- Step-up switching voltage regulator for 10 LEDs driving:
 - Internal NDMOS switch
 - LED current control through dedicated pin
 - LED current selectable between 2.5 and 20 mA through I²C bus, allowing LED luminosity dimming
- Audio DSP and DAC with class-D power output and class-AB stereo headset output:
 - $P_{out} = 6$ W on 4 Ω load with pre-regulator output set to 7 V
 - 93 dB dynamic range output signal for headset
 - -60 dB \Rightarrow +12 dB volume control selectable through I²C bus
 - 5-bands equalizer
 - signal dynamic compression



- Voice CODEC for microphone input:
 - 0/+20 dB pre-amplifier Gain, selectable through I²C bus
 - 0 \Rightarrow 22.5 dB amplifier gain, selectable through I²C bus with 1.5 dB steps
- Load dump protection
- Thermal protection
- Robustness against ESD events

Description

FDA001 - dPal (digital Portable Audio and Led driver) is a very compact and complete companion IC for portable navigation devices or for advanced navigation head units.

It enhances the multimedia experience of navigation sets by adding a powerful and clear audio while allowing a very bright and uniform display backlighting.

The automotive compatibility is ensured by the integrated DC/DC converter which allows to connect the IC directly to the car battery. The same DC/DC boosts up the output audio power when connected to USB supply.

It is designed in a proprietary advanced BCD (Bipolar Cmos Dmos) silicon technology which allows to integrate in one chip both high-speed logic and power stages.

Table 1. Device summary

| Order code | Package | Packing |
|------------|----------|---------|
| FDA001 | VQFPN-48 | Tray |

1 Pin description

1.1 Pin connection

Figure 1. Pin connection (bottom view)

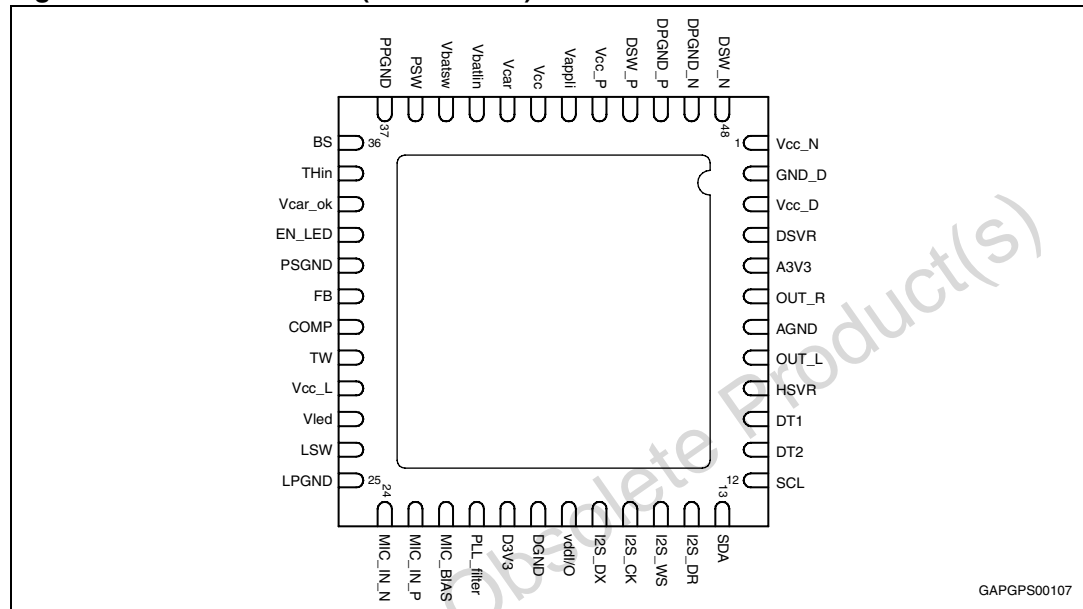


Table 2. Pin description

| Pin # | Pin name | Pin function | Pin type |
|-------|----------|--|----------|
| 1 | Vcc_N | Supply voltage for negative class-D output | Supply |
| 2 | GND_D | Ground for class-D low-signal circuit | Ground |
| 3 | Vcc_D | Supply voltage for class-D low-signal circuit | Supply |
| 4 | DSVR | Bias of class-D low-signal circuit | Output |
| 5 | A3V3 | 3.3V supply voltage for audio low-signal circuit | Supply |
| 6 | OUT_R | Right-channel headset output | Output |
| 7 | AGND | Ground for audio low-signal circuit | Ground |
| 8 | OUT_L | Left-channel headset output | Output |
| 9 | HSVR | Bias of headset output | Output |
| 10 | DT1 | Digital circuit test | Test |
| 11 | DT2 | Digital circuit test | Test |
| 12 | SCL | I2Cbus Clock | Input |
| 13 | SDA | I2Cbus Data | Input |
| 14 | I2S_DR | I2S input Data Receiver | Input |
| 15 | I2S_WS | I2S input Word Select | Input |
| 16 | I2S_OK | I2S input Clock | Input |

Table 2. Pin description (continued)

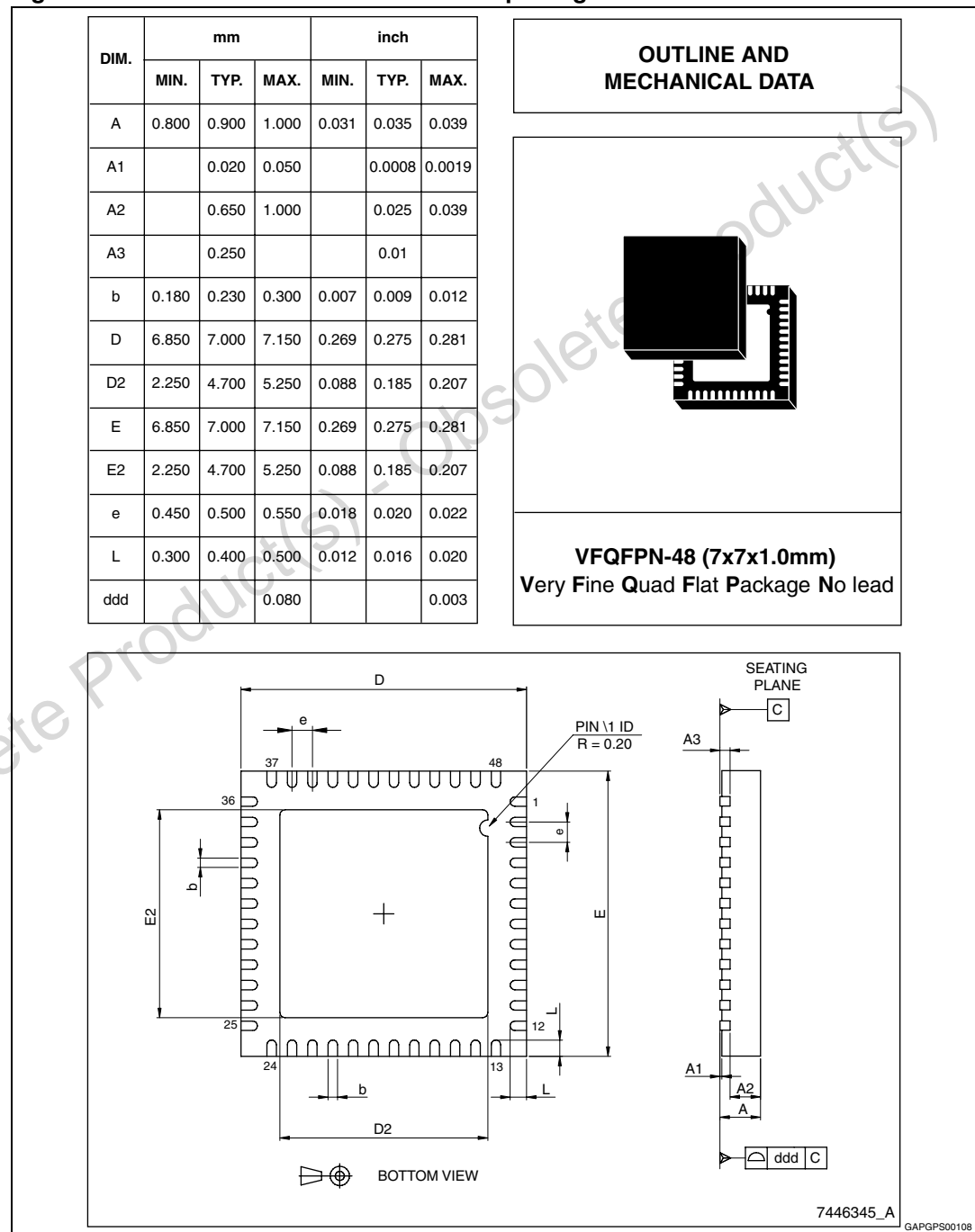
| Pin # | Pin name | Pin function | Pin type |
|-------|------------|---|----------|
| 17 | I2S_DX | I2S output Data Transmitter | Output |
| 18 | vddl/O | Digital Interfaces Supply | Supply |
| 19 | DGND | Ground for audio digital circuit | Ground |
| 20 | D3V3 | 3.3V supply voltage for audio digital circuit | Supply |
| 21 | PLL_filter | PLL filter | Input |
| 22 | MIC_BIAS | Microphone output bias | Output |
| 23 | MIC_IN_P | Microphone positive input | Input |
| 24 | MIC_IN_N | Microphone negative input | Input |
| 25 | LPGND | Power ground for LED Driver | Ground |
| 26 | LSW | LED Driver switching output | Output |
| 27 | Vled | LED Driver output voltage | Input |
| 28 | Vcc_L | Supply Voltage for LED Driver | Supply |
| 29 | TW | Thermal Warning | Output |
| 30 | COMP | Compensation for LED Driver | Output |
| 31 | FB | LED Driver feedback voltage | Input |
| 32 | PSGND | Pre-regulator signal ground | Ground |
| 33 | EN_LED | LED Driver Enable | Input |
| 34 | Vcar_ok | Pre-regulator in regulation flag | Output |
| 35 | THin | Thermal protection input | Test |
| 36 | BS | Boot-strap | Supply |
| 37 | PPGND | Pre-regulator power ground | Ground |
| 38 | PSW | Pre-regulator switching output | Output |
| 39 | Vbatsw | Car battery supply voltage for switching circuits | Supply |
| 40 | Vbatlin | Car battery supply voltage for linear circuits | Supply |
| 41 | Vcar | Pre-regulator output voltage | Input |
| 42 | Vcc | Selected supply voltage | Supply |
| 43 | Vappli | Auxiliary supply voltage | Supply |
| 44 | Vcc_P | Supply voltage for positive class-D output | Supply |
| 45 | DSW_P | Class-D positive switching output | Output |
| 46 | DPGND_P | Power ground for positive class-D output | Ground |
| 47 | DPGND_N | Power ground for negative class-D output | Ground |
| 48 | DSW_N | Class-D negative switching output | Output |

2 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.

Figure 2. VQFPN-48 mechanical data and package dimensions



3 Revision history

Table 3. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 23-Jul-2009 | 1 | Initial release. |
| 29-Jul-2009 | 2 | Modified <i>Features</i> and <i>Section 1: Pin description</i> . |
| 13-Sep-2012 | 3 | Added maturity status in cover page. |

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