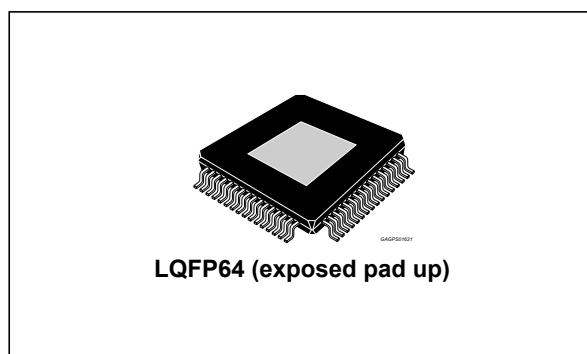


## 4 x 50 W class-D digital input power amplifier with I<sup>2</sup>C diagnostics and low voltage operation

Data brief



### Features

- 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
- Class-D channels with 93% efficiency
- EMI control for AM compatibility
- EMI compliance evaluated following normative IEC61967-4 and IEC62132-4
- Low radiation function (LRF)
- Idle tones free DAC
- Output lowpass filter included in the feedback allowing lower cost filter components
- Max. output power
  - 4 x 50 W/4  $\Omega$  @ 15.2 V, 1 kHz
- High output power capability
  - 28 W/4  $\Omega$  10 % THD, V<sub>d</sub> = 14.4 V
- Full I<sup>2</sup>C bus driving (3.3/1.8 V):
  - Channels independent tristate
  - Channel independent soft play/mute
  - I<sup>2</sup>C bus diagnostics, including DC and AC load detection
- Integrated fault protection
- Input and output offset detector
- Clipping detector

- ESD protection
- 6 V operation (“Start - Stop” engines compatibility)
- 2 and 1  $\Omega$  load driving capability

### Description

FDA801 is a new BCD technology quad BRIDGE class D amplifier, specially intended for automotive applications.

Thanks to the technology used, it is possible to integrate 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 to reach outstanding performances (110 dB S/N ratio with 108 dB of dynamic range). The feedback loop includes the output L-C low-pass filter, allowing superior frequency response linearity and lower distortion independently from the inductor and capacitor quality.

FDA801 is fully configurable through I<sup>2</sup>C bus interface and integrates a full diagnostics array specially intended for automotive applications. Thanks to the solutions implemented to contain EMI emissions, the device is intended to be used in the standard single DIN car-radio box together with the tuner.

Moreover FDA801 is able to work with power supply as low as 6 V, thus supporting the most recent low voltage ('start-stop') car-makers specification.

**Table 1. Device summary**

| Order code | Package              | Packing     |
|------------|----------------------|-------------|
| FDA801-VYY | LQFP64 (exp. pad up) | Tray        |
| FDA801-VYT | LQFP64 (exp. pad up) | Tape & Reel |

Contents

1      **Block diagram and pins description** ..... 3

2      **General introduction** ..... 7

3      **Package information** ..... 8

      3.1    LQFP64 (10x10x1.4 mm exp. pad up) package information ..... 8

4      **Revision history** ..... 10



# 1 Block diagram and pins description

Figure 1. Block diagram

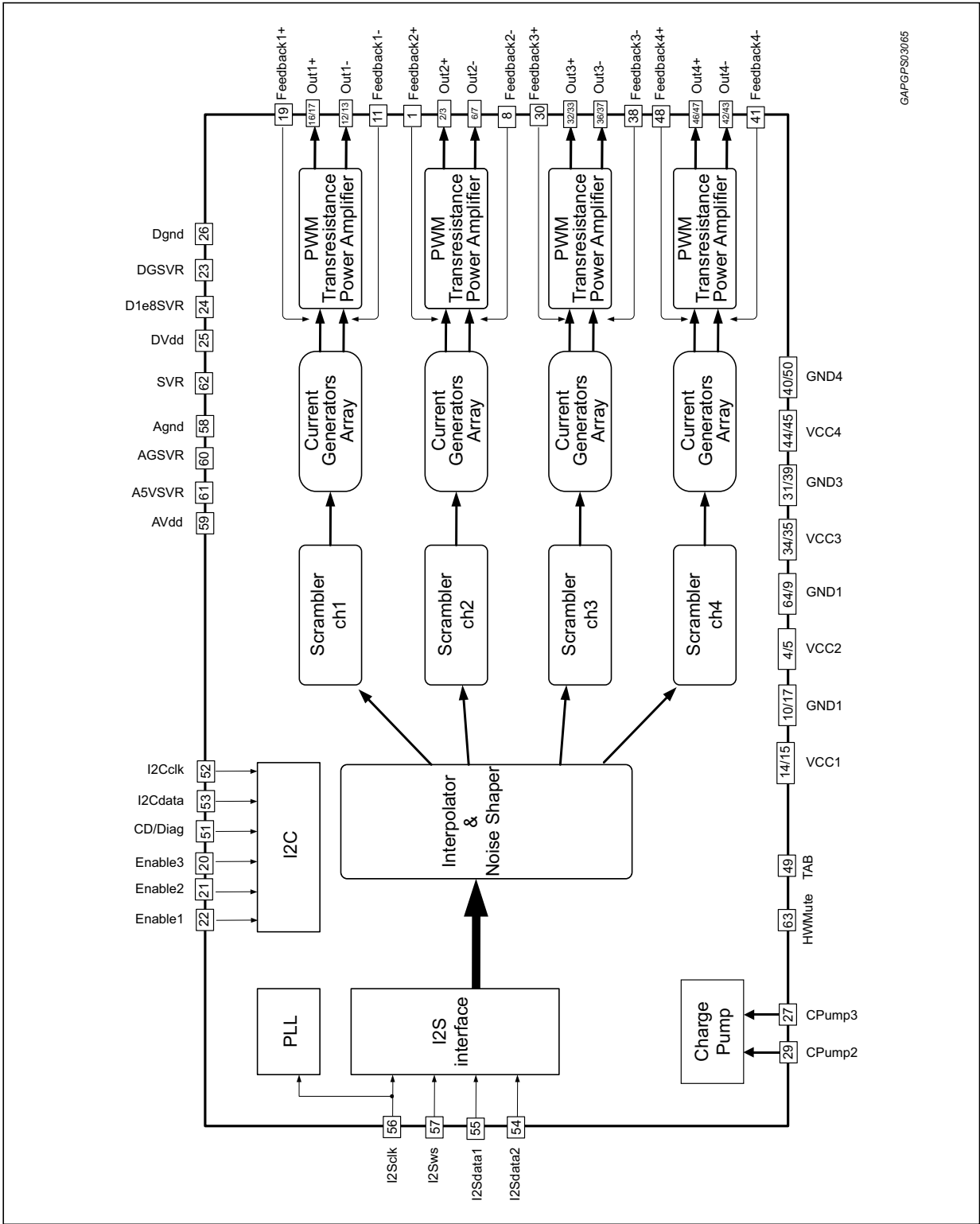


Figure 2. Tentative pins connection diagram (top view)

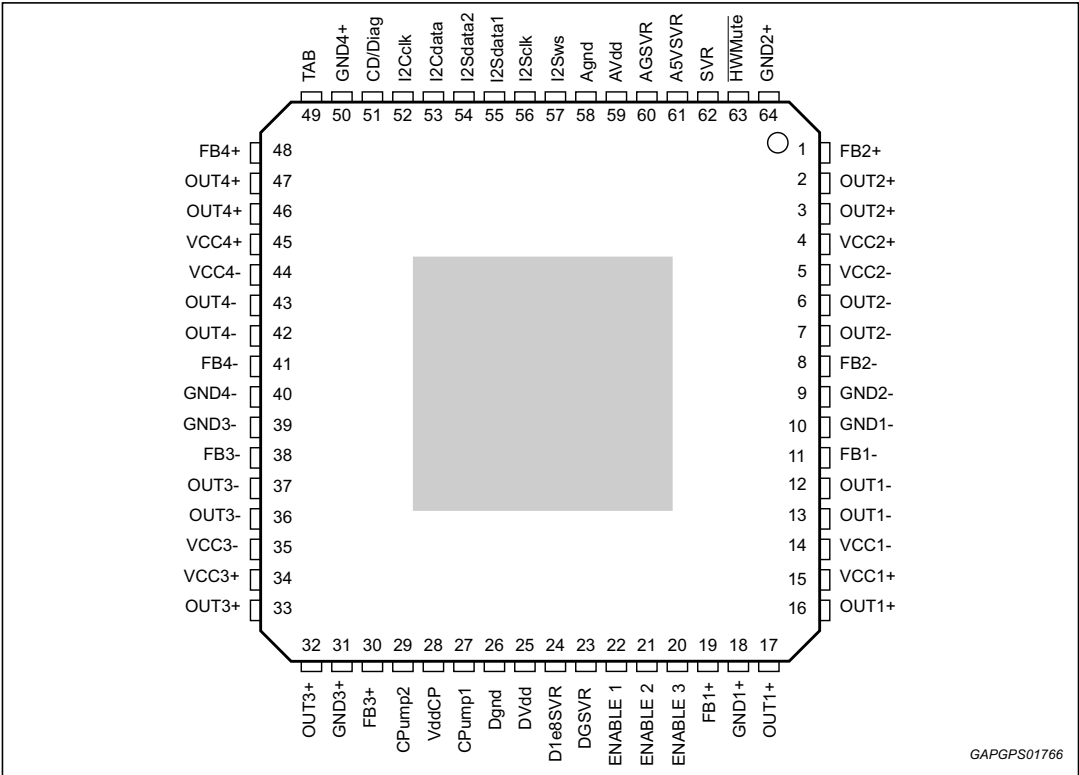


Table 2. Pins list description

| N# | Pin   | Function                                   |
|----|-------|--------------------------------------------|
| 1  | FB2+  | Channel 2, half bridge plus, Feedback      |
| 2  | OUT2+ | Channel 2, half bridge plus, Output        |
| 3  | OUT2+ | Channel 2, half bridge plus, Output        |
| 4  | VCC2+ | Channel 2, half bridge plus, Power Supply  |
| 5  | VCC2- | Channel 2, half bridge minus, Power Supply |
| 6  | OUT2- | Channel 2, half bridge minus, Output       |
| 7  | OUT2- | Channel 2, half bridge minus, Output       |
| 8  | FB2-  | Channel 2, half bridge minus, Feedback     |
| 9  | GND2- | Channel 2, half bridge minus, Power Ground |
| 10 | GND1- | Channel 1, half bridge minus, Power Ground |
| 11 | FB1-  | Channel 1, half bridge minus, Feedback     |
| 12 | OUT1- | Channel 1, half bridge minus, Output       |
| 13 | OUT1- | Channel 1, half bridge minus, Output       |
| 14 | VCC1- | Channel 1, half bridge minus, Power Supply |
| 15 | VCC1+ | Channel 1, half bridge plus, Power Supply  |
| 16 | OUT1+ | Channel 1, half bridge plus, Output        |

Table 2. Pins list description (continued)

| N# | Pin      | Function                                                   |
|----|----------|------------------------------------------------------------|
| 17 | OUT1+    | Channel 1, half bridge plus, Output                        |
| 18 | GND1+    | Channel 1, half bridge plus, Power Ground                  |
| 19 | FB1+     | Channel 1, half bridge plus, Feedback                      |
| 20 | ENABLE 3 | Enable 3                                                   |
| 21 | ENABLE 2 | Enable 2                                                   |
| 22 | ENABLE 1 | Enable 1                                                   |
| 23 | DGSVR    | Negative digital supply V(SVR)-0.9V (Internally generated) |
| 24 | D1e8SVR  | 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                                           |
| 30 | FB3+     | Channel 3, half bridge plus, Feedback                      |
| 31 | GND3+    | Channel 3, half bridge plus, Power Ground                  |
| 32 | OUT3+    | Channel 3, half bridge plus, Output                        |
| 33 | OUT3+    | Channel 3, half bridge plus, Output                        |
| 34 | VCC3+    | Channel 3, half bridge plus, Power Supply                  |
| 35 | VCC3-    | Channel 3, half bridge minus, Power Supply                 |
| 36 | OUT3-    | Channel 3, half bridge minus, Output                       |
| 37 | OUT3-    | Channel 3, half bridge minus, Output                       |
| 38 | FB3-     | Channel 3, half bridge minus, Feedback                     |
| 39 | GND3-    | Channel 3, half bridge minus, Power Ground                 |
| 40 | GND4-    | Channel 4, half bridge minus, Power Ground                 |
| 41 | FB4-     | Channel 4, half bridge minus, Feedback                     |
| 42 | OUT4-    | Channel 4, half bridge minus, Output                       |
| 43 | OUT4-    | Channel 4, half bridge minus, Output                       |
| 44 | VCC4-    | Channel 4, half bridge minus, Power Supply                 |
| 45 | VCC4+    | Channel 4, half bridge plus, Power Supply                  |
| 46 | OUT4+    | Channel 4, half bridge plus, Output                        |
| 47 | OUT4+    | Channel 4, half bridge plus, Output                        |
| 48 | FB4+     | Channel 4, half bridge plus, Feedback                      |
| 49 | TAB      | Device slug connection                                     |
| 50 | GND4+    | Channel 4, half bridge plus, Power Ground                  |

Table 2. Pins list description (continued)

| N# | Pin                        | Function                                                                                                                                                                                |
|----|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 51 | CD/Diag                    | Clipping detector and diagnostic output pin: <ul style="list-style-type: none"><li>– Overcurrent protection intervention</li><li>– Thermal warning</li><li>– Offset detection</li></ul> |
| 52 | I2Cclk                     | I2C Clock                                                                                                                                                                               |
| 53 | I2Cdata                    | I2C Data                                                                                                                                                                                |
| 54 | I2Sdata2                   | I2S/TDM Data input 2                                                                                                                                                                    |
| 55 | I2Sdata1                   | I2S/TDM Data input 1                                                                                                                                                                    |
| 56 | I2Sclk                     | I2S/TDM Clock input                                                                                                                                                                     |
| 57 | I2Sws                      | I2S/TDM Sinc 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 | $\overline{\text{HWMute}}$ | Hardware mute pin                                                                                                                                                                       |
| 64 | GND2+                      | Channel 2, half bridge plus, Power Ground                                                                                                                                               |

## 2 General introduction

FDA801 is a fully digital single chip class D amplifier with high immunity to the demodulation filter effects. The high integration level and the on-board signal processing allow excellent audio performance to be achieved.

Thanks to the digital input and to the feedback strategy in the power stage that make the amplifier immune from the output filter components non-linearity, the number and size of the external components are minimized.

A number of features are included to reduce EMI and the fully digital approach provides a strong GSM immunity.

FDA801 includes: digital I<sup>2</sup>C and I<sup>2</sup>S interfaces, internal 24 bits DAC conversion, digital signal processing for interpolation and noise shaping, innovative self-diagnostic functions and automatic detection of wrong load connections or variation of the load, internal PLL for a clock generation.

### 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

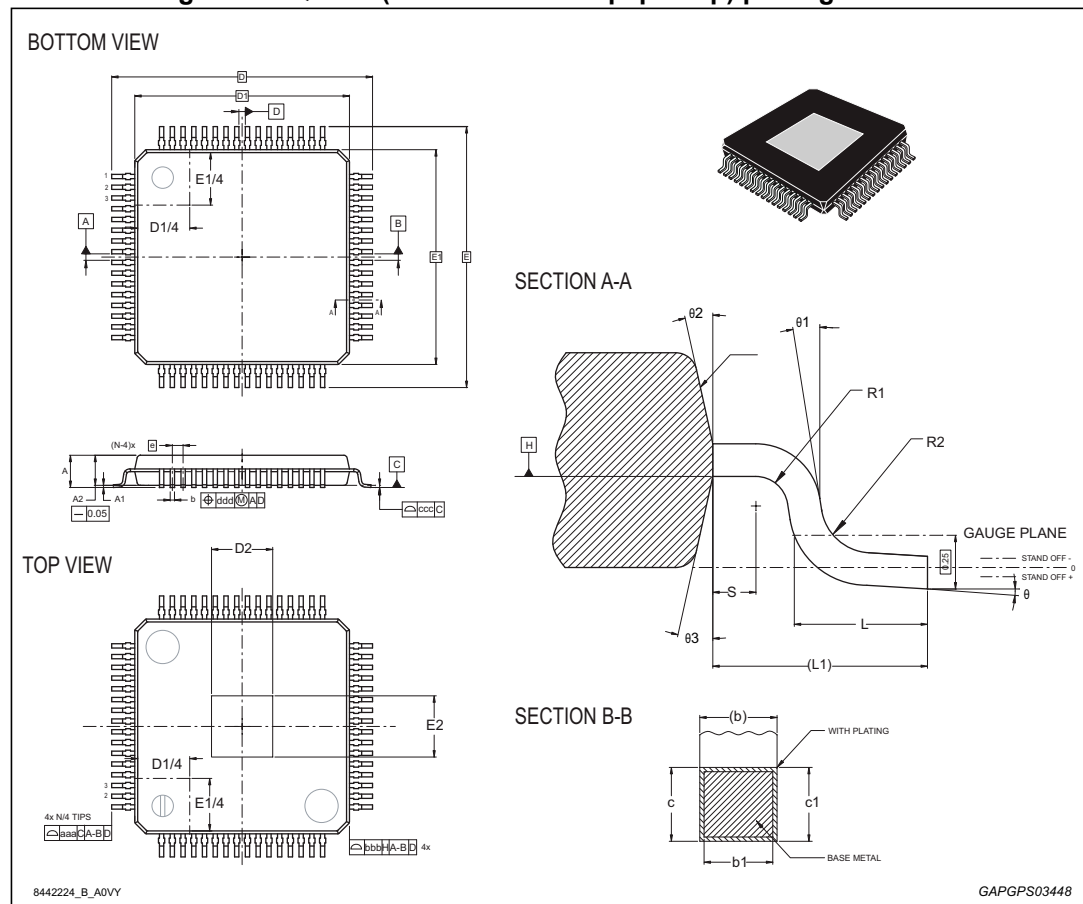


Table 3. LQFP64 (10x10x1.4 mm exp. pad up) package mechanical data

| Ref               | Dimensions  |       |       |                       |        |        |
|-------------------|-------------|-------|-------|-----------------------|--------|--------|
|                   | Millimeters |       |       | Inches <sup>(1)</sup> |        |        |
|                   | Min.        | Typ.  | Max.  | Min.                  | Typ.   | Max.   |
| Θ                 | 0°          | 3.5°  | 6°    | 0°                    | 3.5°   | 6°     |
| Θ1                | 0°          | 9°    | 12°   | 0°                    | 9°     | 12°    |
| Θ2                | 11°         | 12°   | 13°   | 11°                   | 12°    | 13°    |
| Θ3                | 11°         | 12°   | 13°   | 11°                   | 12°    | 13°    |
| A                 | -           | -     | 1.49  | -                     | -      | 0.0587 |
| A1                | -0.04       | -     | 0.04  | -0.0016               | -      | 0.0016 |
| A2                | 1.35        | 1.4   | 1.45  | 0.0531                | 0.0551 | 0.0571 |
| b                 | -           | -     | 0.255 | -                     | -      | 0.0100 |
| b1                | 0.17        | 0.20  | 0.23  | 0.0067                | 0.0079 | 0.0091 |
| c                 | 0.09        | -     | 0.20  | 0.0035                | -      | 0.0079 |
| c1                | 0.09        | -     | 0.16  | 0.0035                | -      | 0.0063 |
| D                 | -           | 12.00 | -     | -                     | 0.4724 | -      |
| D1 <sup>(2)</sup> | -           | 10.00 | -     | -                     | 0.3937 | -      |
| D2 <sup>(3)</sup> | -           | 6.00  | -     | -                     | 0.2362 | -      |
| e                 | -           | 0.50  | -     | -                     | 0.0197 | -      |
| E                 | -           | 12.00 | -     | -                     | 0.4724 | -      |
| E1 <sup>(2)</sup> | -           | 10.00 | -     | -                     | 0.3937 | -      |
| E2 <sup>(3)</sup> | -           | 6.00  | -     | -                     | 0.2362 | -      |
| L                 | 0.45        | 0.60  | 0.75  | 0.0177                | 0.0236 | 0.0295 |
| L1                | -           | 1.00  | -     | -                     | 0.0394 | -      |
| N                 | -           | 64.00 | -     | -                     | 2.5197 | -      |
| R1                | 0.08        | -     | -     | 0.0031                | -      | -      |
| R2                | 0.08        | -     | 0.20  | 0.0031                | -      | 0.0079 |
| S                 | 0.20        | -     | -     | 0.0079                | -      | -      |
| aaa               | -           | 0.20  | -     | -                     | 0.0079 | -      |
| bbb               | -           | 0.20  | -     | -                     | 0.0079 | -      |
| ccc               | -           | 0.08  | -     | -                     | 0.0031 | -      |
| ddd               | -           | 0.08  | -     | -                     | 0.0031 | -      |

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.
3. The optional exposed pad is generally coincident with the top or bottom side of the package and not allowed to protrude beyond that surface.

# 4      Revision history

Table 4. Document revision history

| Date        | Revision | Changes          |
|-------------|----------|------------------|
| 13-Nov-2015 | 1        | Initial release. |



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