

# R\_10001

## Guideline for the laser marking layout of WLCSP devices

Rev. 01 — 10 February 2010

Report

### Document information

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| <b>Abstract</b>                | This document presents the NXP laser marking guideline for the delivery of Wafer-Level Chip-Scale Package (WLCSP) devices of the product line Integrated Discretes (IDs). |

**Revision history**

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## 1. Introduction

The laser marking on the back side of the device supports the process of identification as well as internal and external traceability. To encode all relevant information into the device marking the following parameters are used:

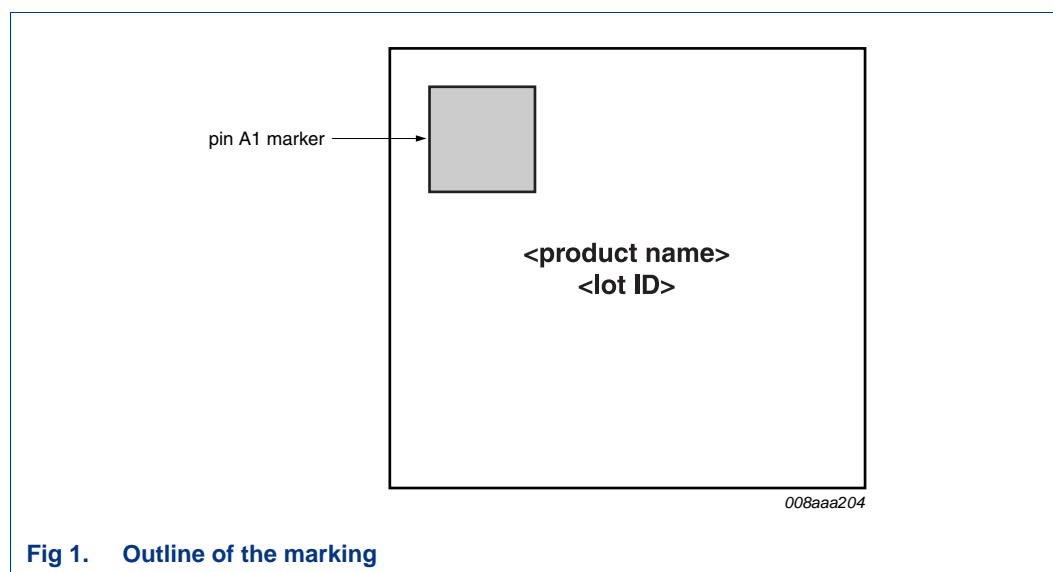
- Orientation of pin A1 marker
- Orientation of lot ID with respect to the pin A1 marker
- Lot ID and product name characters

## 2. Layout rules for laser marking

### 2.1 Lot ID and product name marking

The standard marking consists of three lines. [Figure 1](#) shows the outline of the marking. The first line consists of the pin A1 marker. The second line (placeholder <product name>) indicates the product name. If there is enough space all 4 product name numbers are marked.

The third line (placeholder <lot ID>) denotes the lot ID. If possible all 5 characters of the lot ID are marked.



**Fig 1. Outline of the marking**

[Figure 2](#) shows an example of IP4035CX24/LF. The 'YYYY' is the placeholder for the lot ID. This is a standard solder ball device with 500  $\mu\text{m}$  bump-to-bump pitch.

Special rules apply if there are space constraints:

- If there is not enough space for three lines the lot ID line has precedence. In this case, only the lot ID and the pin A1 indicator are marked
- The leading numbers are omitted if there is not enough space for all characters of the lot ID or product name. This is true in the example in [Figure 2](#) where the leading two product name numbers are left out

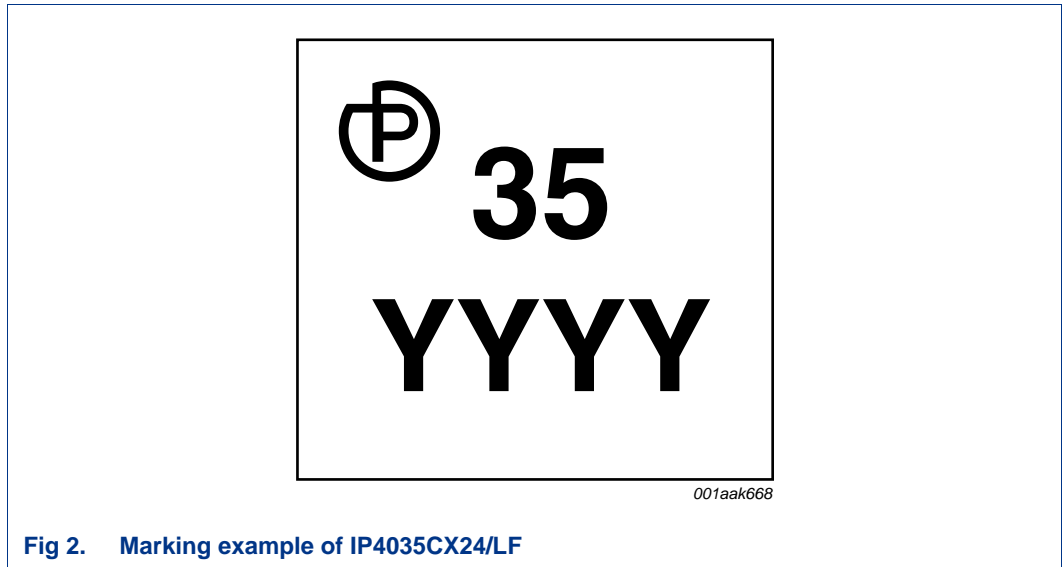


Fig 2. Marking example of IP4035CX24/LF

## 2.2 Pin A1 marking

The location of the pin A1 is indicated by a 'P' encompassed by a  $\frac{3}{4}$  circle with a diameter of 300  $\mu\text{m}$  (typical). This marker will be referred to as 'P' in the following text.

The design of the pin A1 marker is shown in [Figure 3](#). The 'P' can be freely rotated. The 'P' can also be mirrored with regards to the circle as shown in [Figure 4](#).

**Notice:** There is no special meaning associated with the mirrored 'P'. The mirroring enables the marking of vertical or horizontal lines on the die.



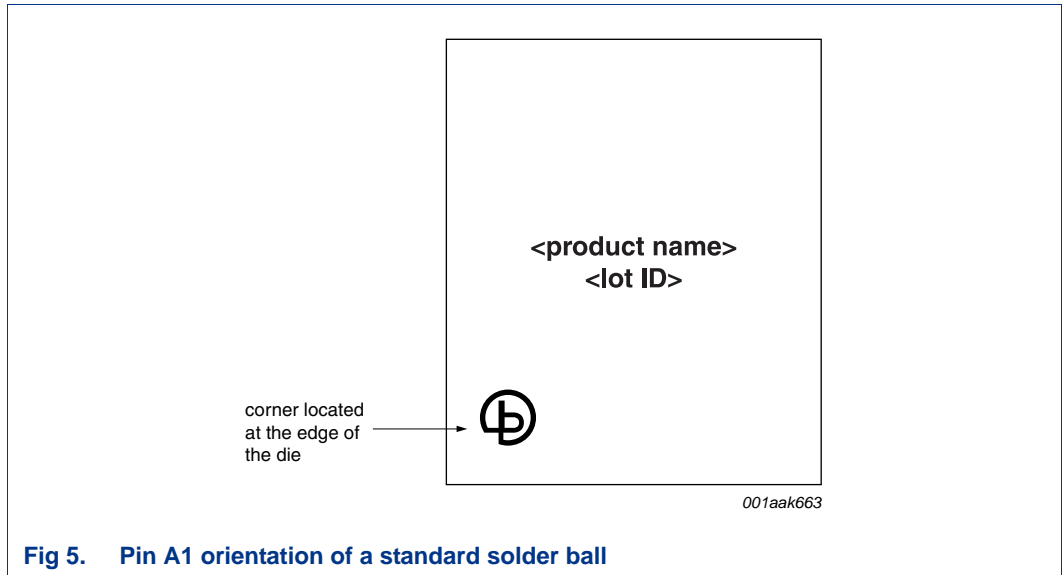
Fig 3. Pin A1 marker design



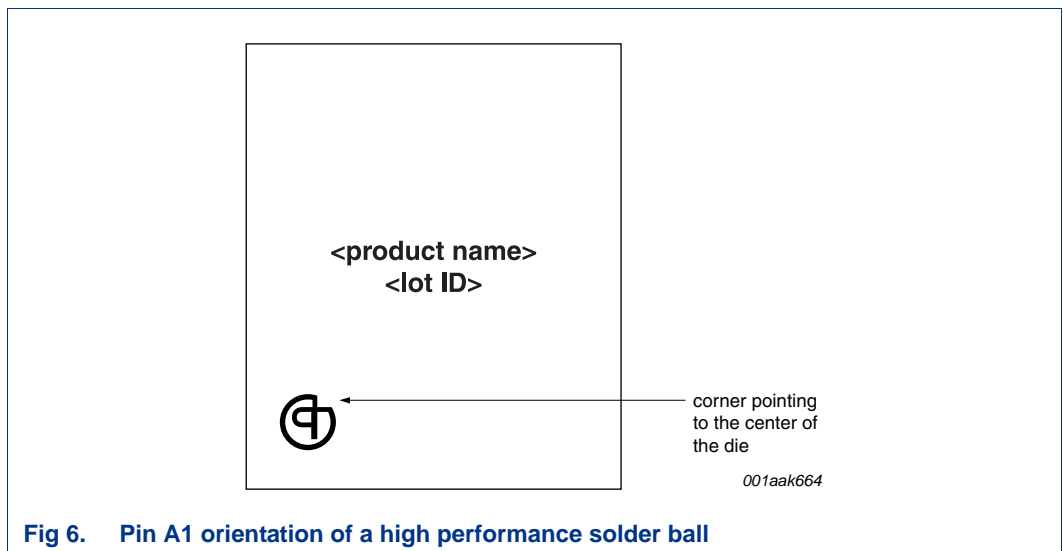
Fig 4. Mirrored pin A1 marker design

Two rules allow a differentiation between the used ball material and between the bumping pitch.

**Rule 1a:** If a standard solder ball is used the corner of the pin A1 circle is located near to the edge of the die as shown in [Figure 5](#).

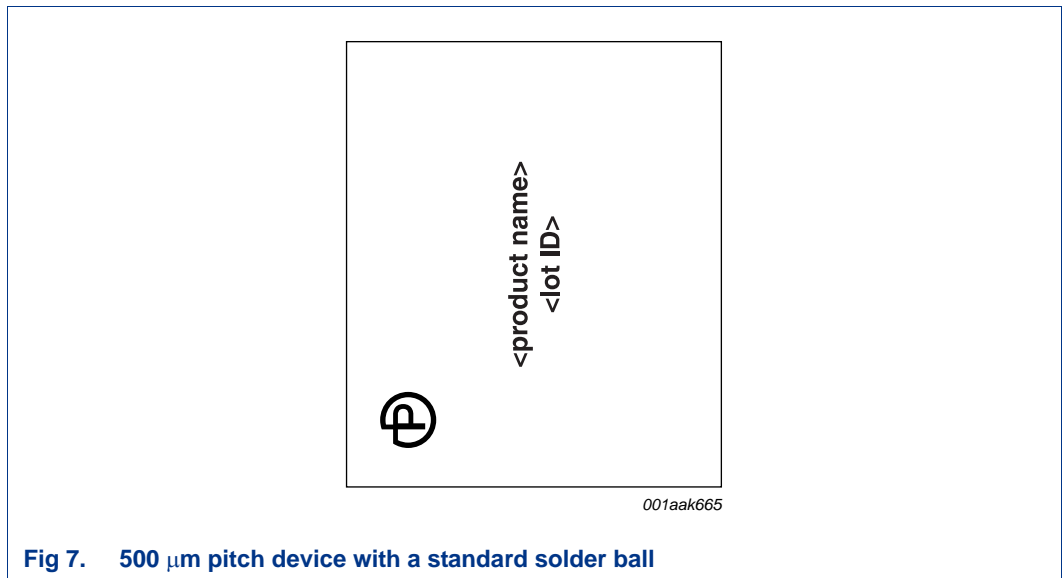


**Rule 1b:** If a high performance solder ball is used the corner of the pin A1 circle is pointing into the opposite direction, i.e. inside the die. This is depicted in [Figure 6](#).



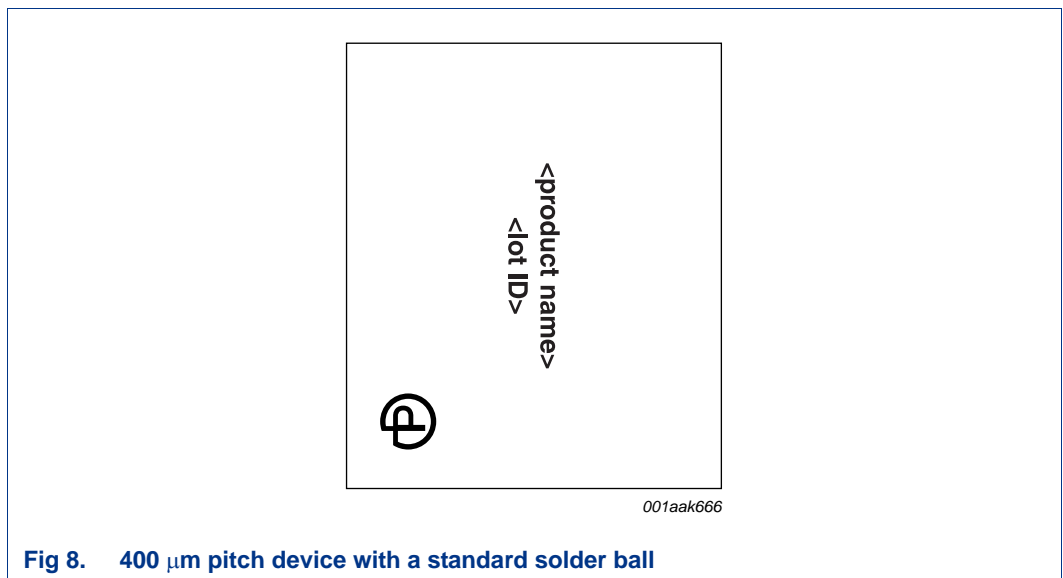
The differentiation between a 500 μm and a 400 μm solder ball pitch is possible by looking at the orientation of the 'P' and the product name or lot ID characters. The following two rules govern this relationship.

**Rule 2a:** If it is a 500 μm pitch product, the 'P' character and the product name or lot ID lines have the same orientation. An example is shown in [Figure 7](#).



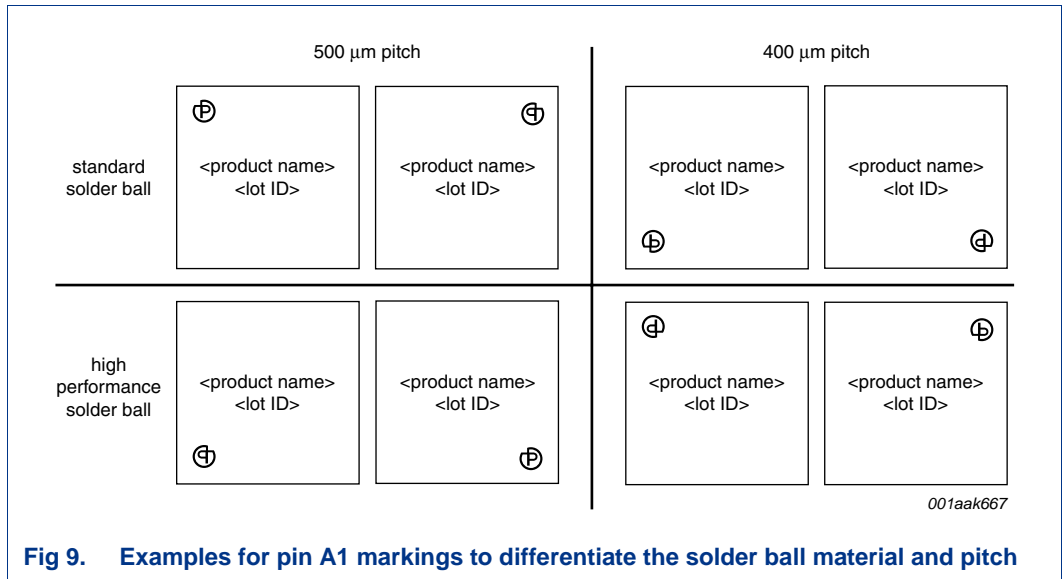
**Fig 7. 500 μm pitch device with a standard solder ball**

**Rule 2b:** If it is a 400 μm pitch product, the 'P' character and the product name or lot ID lines have the opposite orientation. An example is shown in [Figure 8](#).



**Fig 8. 400 μm pitch device with a standard solder ball**

The following figure shows several examples in order to clarify the marking rules.



**Fig 9. Examples for pin A1 markings to differentiate the solder ball material and pitch**

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