

AN12153

Non-HDI PCB load switch layout guidelines for WLCSP packages

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Application note

Document information

Information	Content
Keywords	Load switch, non-HDI PCB, Layout guideline, WLCSP package
Abstract	This application note provides PCB layout guidelines for NXP load switches, which allow use of non-HDI PCB while benefiting from ultra small 0.4mm and 0.5mm pitch WLCSP packages



Revision history

Rev	Date	Description
v.1	20180409	Initial version

1 Introduction

NXP provides load switch products for USB Type C/PD and general power distribution applications. The product family includes sink switches with OVP, source switches with OCP, and combo switches. This application note offers layout guideline recommendations, allowing the use of non-HDI PCBs while benefiting from ultra small 0.4mm and 0.5mm pitch WLCSP packages.

2 Layout guidelines

The pin assignment of NXP load switch products are designed to be connected with one metal layer. Following the layout guidelines in the following chapter, the customer can use a non-HDI PCB process to save PCB cost.

2.1 Product layout guidelines

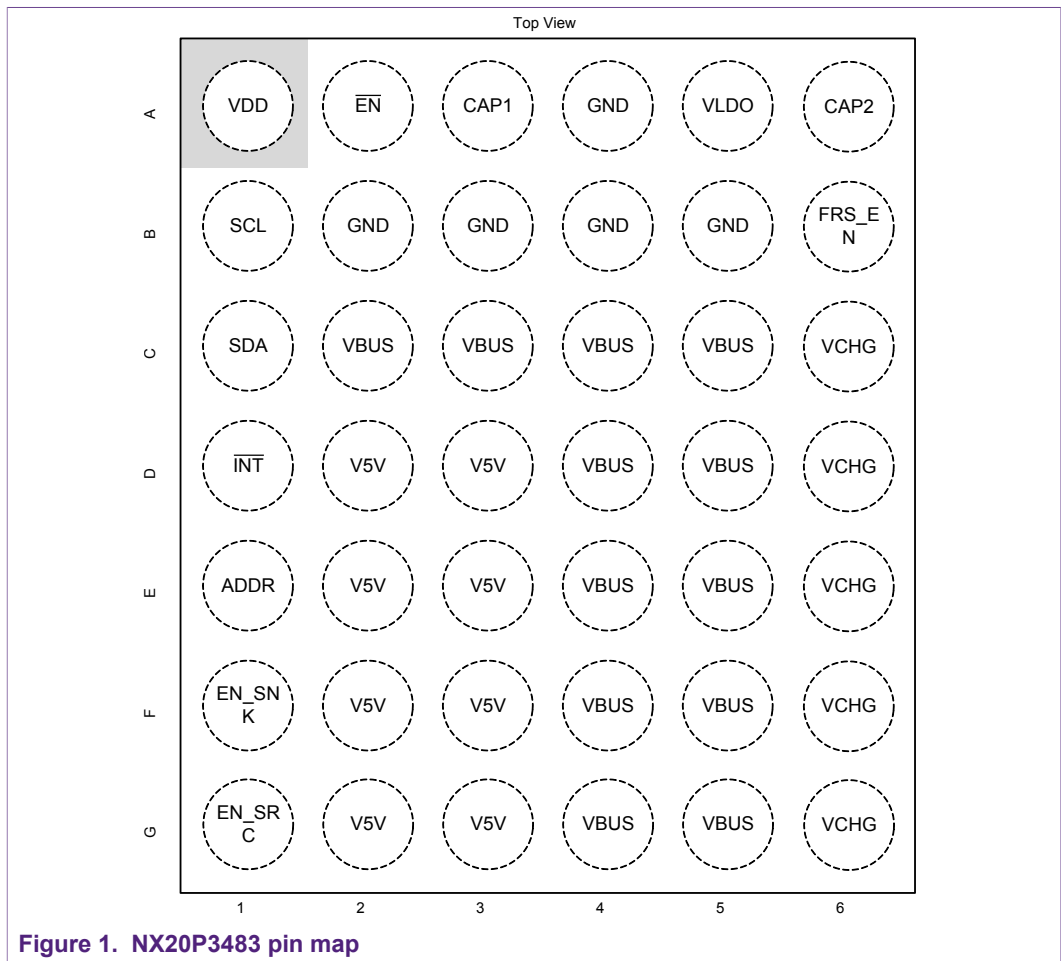
The layout guidelines for each load switch product are described in the following sections:

- [Section 3: NX20P3483 layout guidelines](#)
- [Section 4: NX5P3290 and NX5P3290A layout guidelines](#)
- [Section 5: NX20P5090 layout guidelines](#)
- [Section 6: NX5P3090 layout guidelines](#)
- [Section 7: NX5P3201 layout guidelines](#)

3 NX20P3483 layout guidelines

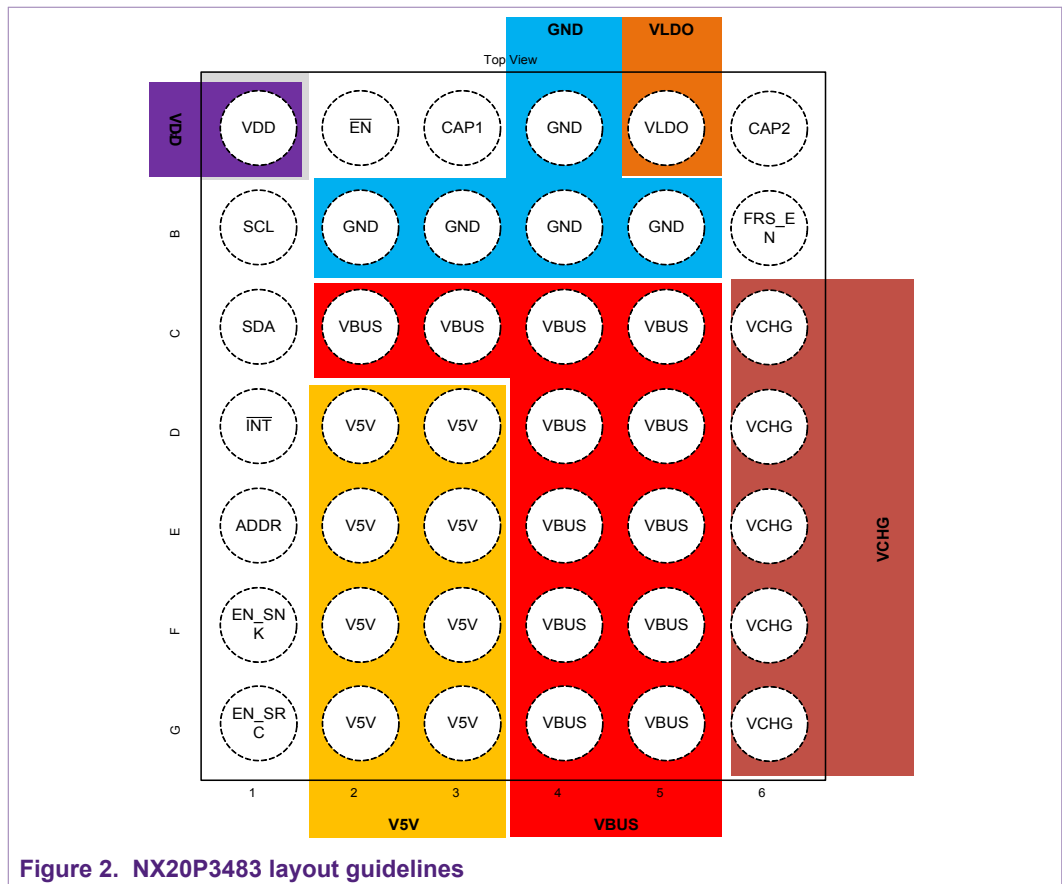
NX20P3483 is a product with combined multiple power switches and an LDO for USB PD application. The device includes a bi-directional high voltage power switch which supports both 20V sink and source, a 5V power switch for source, and a 100mA LDO which provides a power supply for dead battery operation.

3.1 NX20P3483 pin map



3.2 NX20P3483 layout guidelines

The following layout guidelines provide all the connections for power path, including VBUS, VCHG, V5V, GND, VDD and VLDO. The signal pins are all at the edge of the ball array, hence all of them can be connected out with one metal layer.

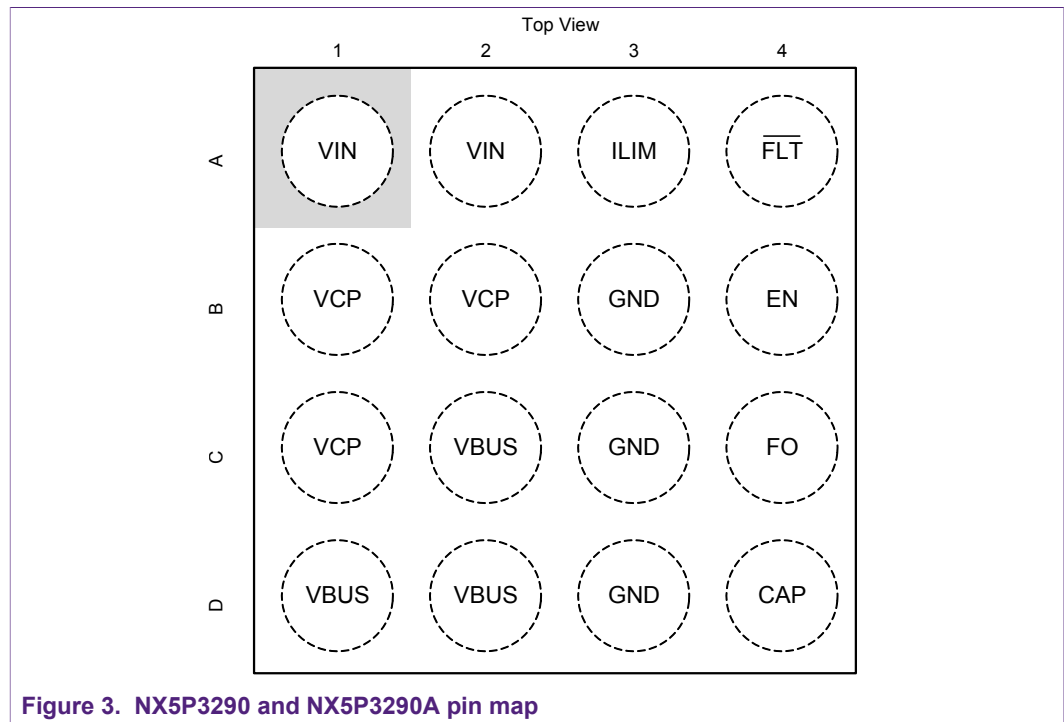


4 NX5P3290 and NX5P3290A layout guidelines

NX5P3290 is a precision adjustable current-limited power switch for USB PD application. The device includes under voltage lockout, over-temperature protection, and reverse current protection circuits to automatically isolate the switch terminals when a fault condition occurs. The 29 V tolerance on VBUS pin ensures the device is able to work on a USB PD port; a current limit input (ILIM) pin defines the over-current limit threshold; an open-drain fault output (FLT) indicates when a fault condition has occurred.

NX5P3290A is a pin to pin compatible product with NX5P3290 but larger package size from 2.05x2.05 mm² to 2.2x2.2 mm². So, the two products can share the same layout guidelines.

4.1 NX5P3290 and NX5P3290A pin map



4.2 NX5P3290 and NX5P3290A layout guidelines

The following layout guidelines provide all the connections for power path, including VBUS, VIN, VCP and GND. The signal pins are all at the edge of the ball array, hence all of them can be connected out with one metal layer.

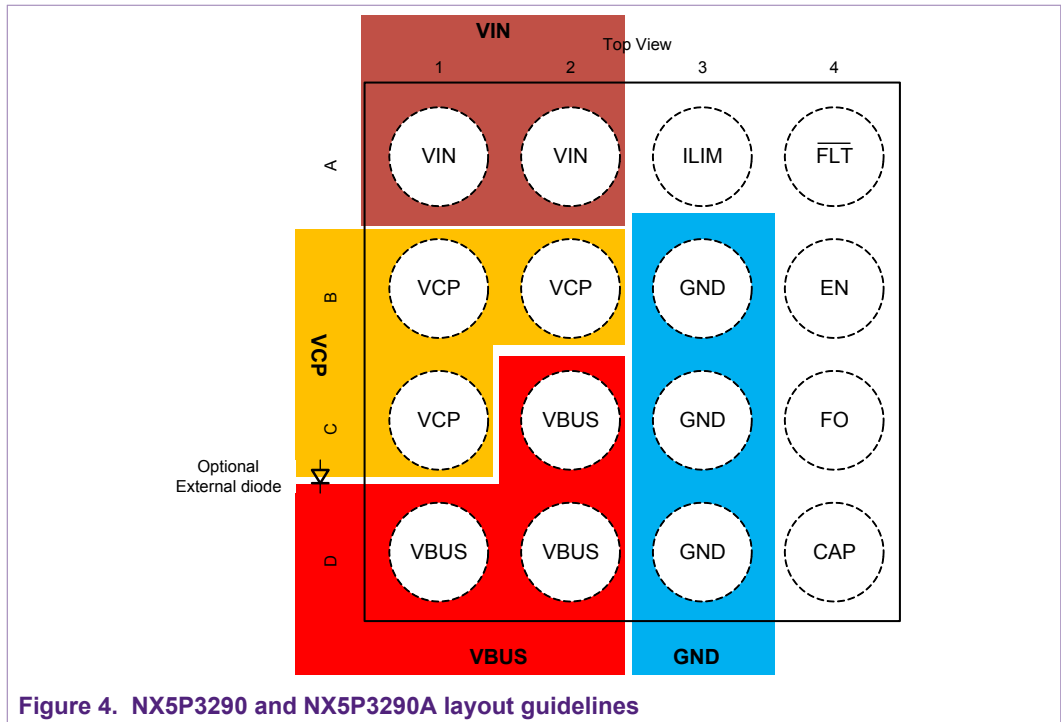
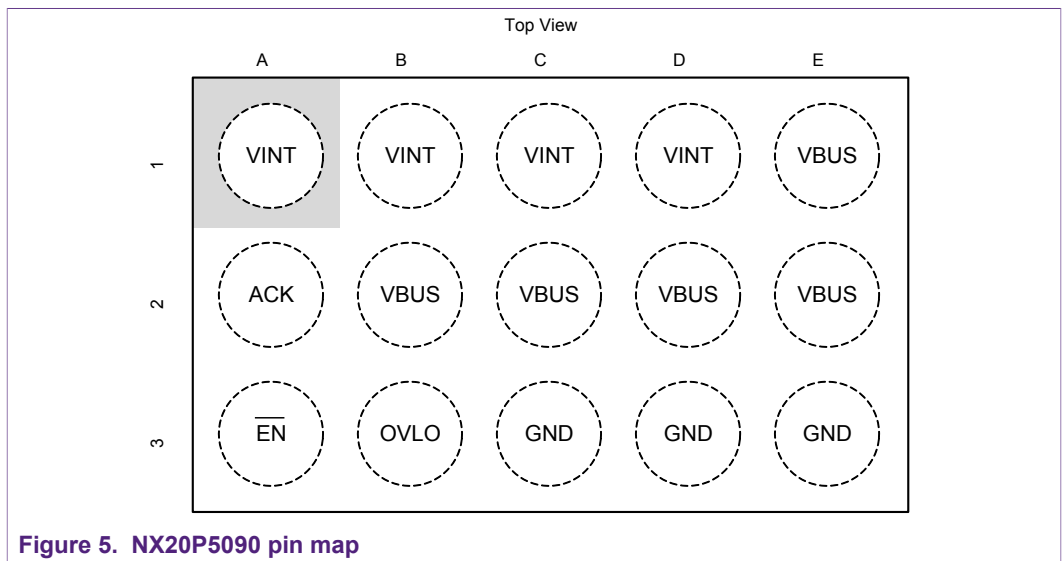


Figure 4. NX5P3290 and NX5P3290A layout guidelines

5 NX20P5090 layout guidelines

NX20P5090 is an advanced 5 A unidirectional power switch for USB PD. It includes under voltage lockout, over voltage lockout, reverse current protection and over-temperature protection circuits. It is designed to automatically isolate the power switch terminals when a fault condition occurs. Both VBUS and VINT pins have 29 V tolerance in shutdown mode. Two NX20P5090 chips can be used in parallel to support dual power inputs connecting to the same charging circuit.

5.1 NX20P5090 pin map



5.2 NX20P5090 layout guidelines

The following layout guidelines provide all the connections for power path, including VBUS, VINT and GND. The signal pins are all at the edge of the ball array, hence all of them can be connected out with one metal layer.

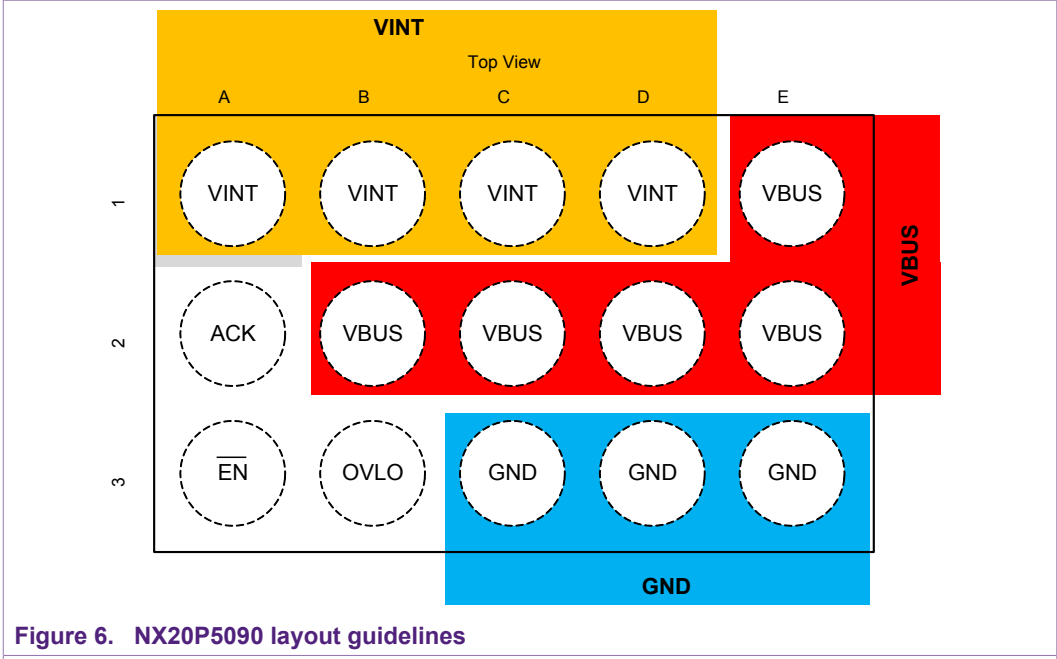
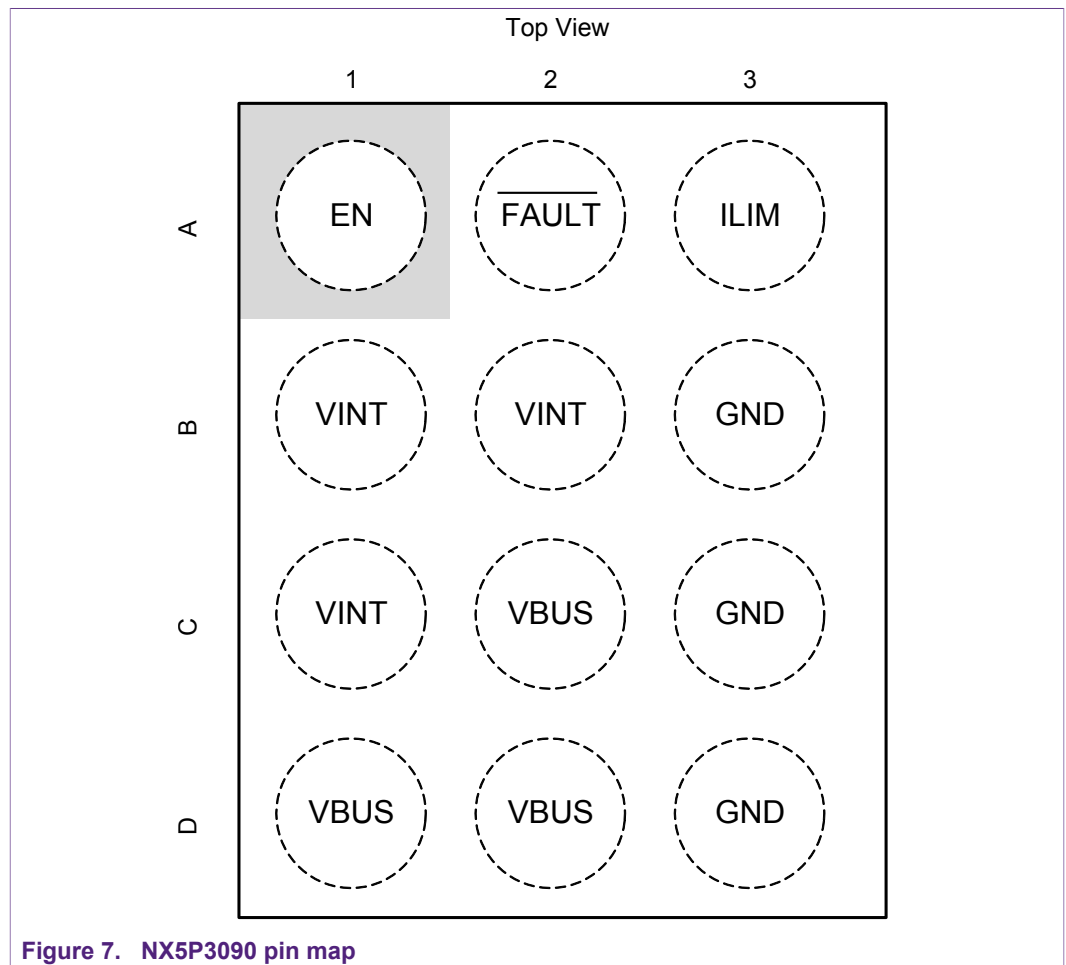


Figure 6. NX20P5090 layout guidelines

6 NX5P3090 layout guidelines

NX5P3090 is a precision adjustable current-limited power switch for USB PD application. The device includes under voltage lockout, over-temperature protection, and reverse current protection circuits to automatically isolate the switch terminals when a fault condition occurs. The 29 V tolerance on VBUS pin ensures the device is able to work on a USB PD port; a current limit input (ILIM) pin defines the over-current limit threshold; an open-drain fault output (FAULT) indicates when a fault condition has occurred.

6.1 NX5P3090 pin map



6.2 NX5P3090 layout guidelines

The following layout guidelines provide all the connections for power path, including VBUS, VINT and GND. The signal pins are all at the edge of the ball array, hence all of them can be connected out with one metal layer.

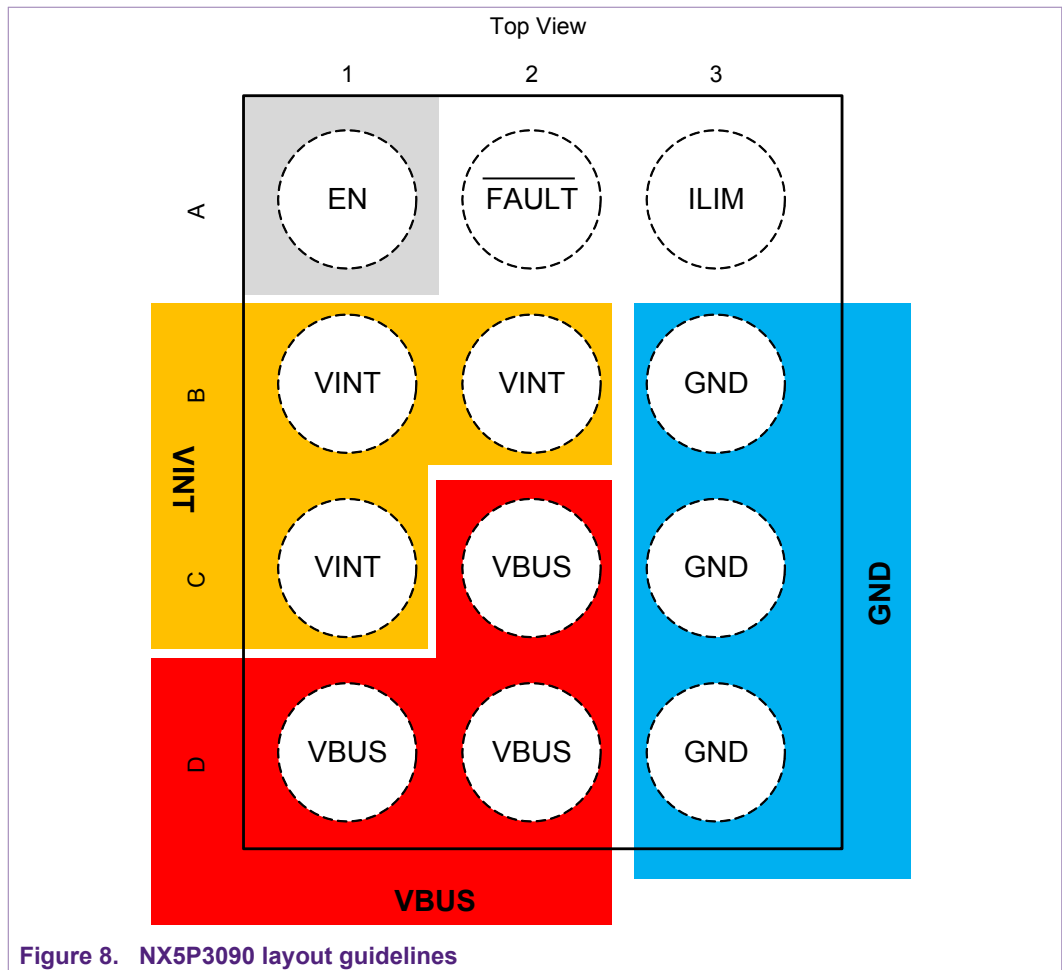
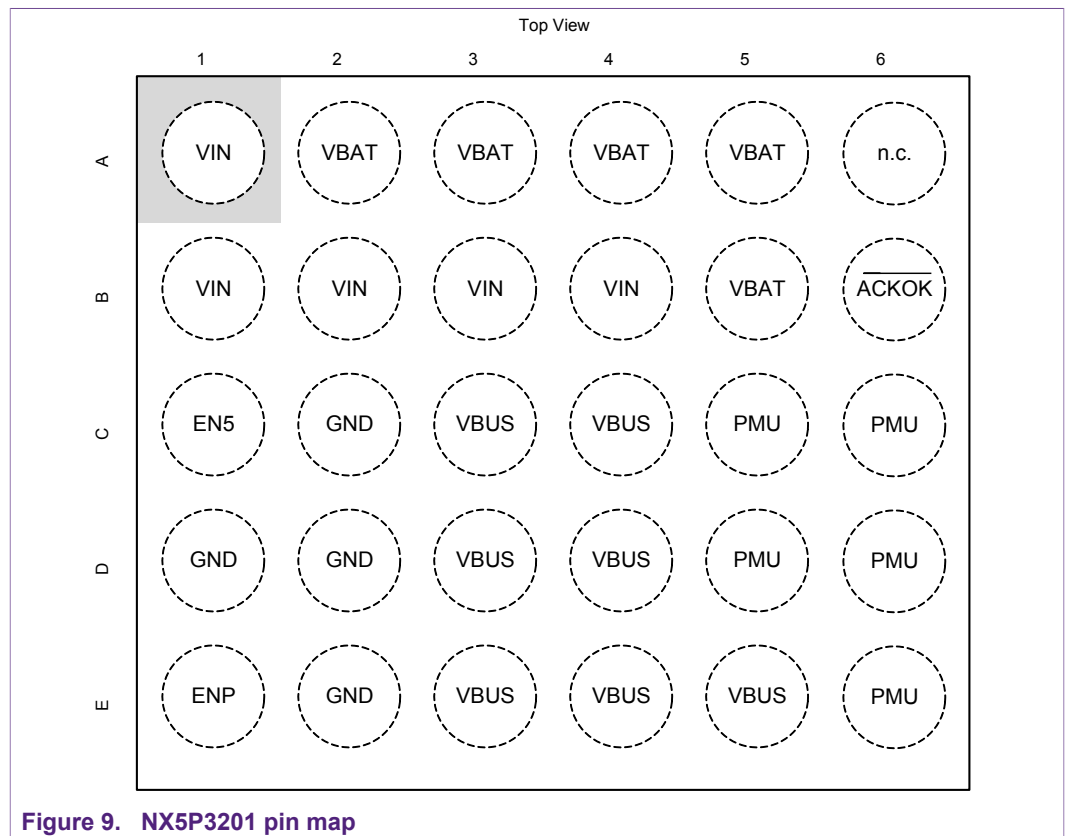


Figure 8. NX5P3090 layout guidelines

7 NX5P3201 layout guidelines

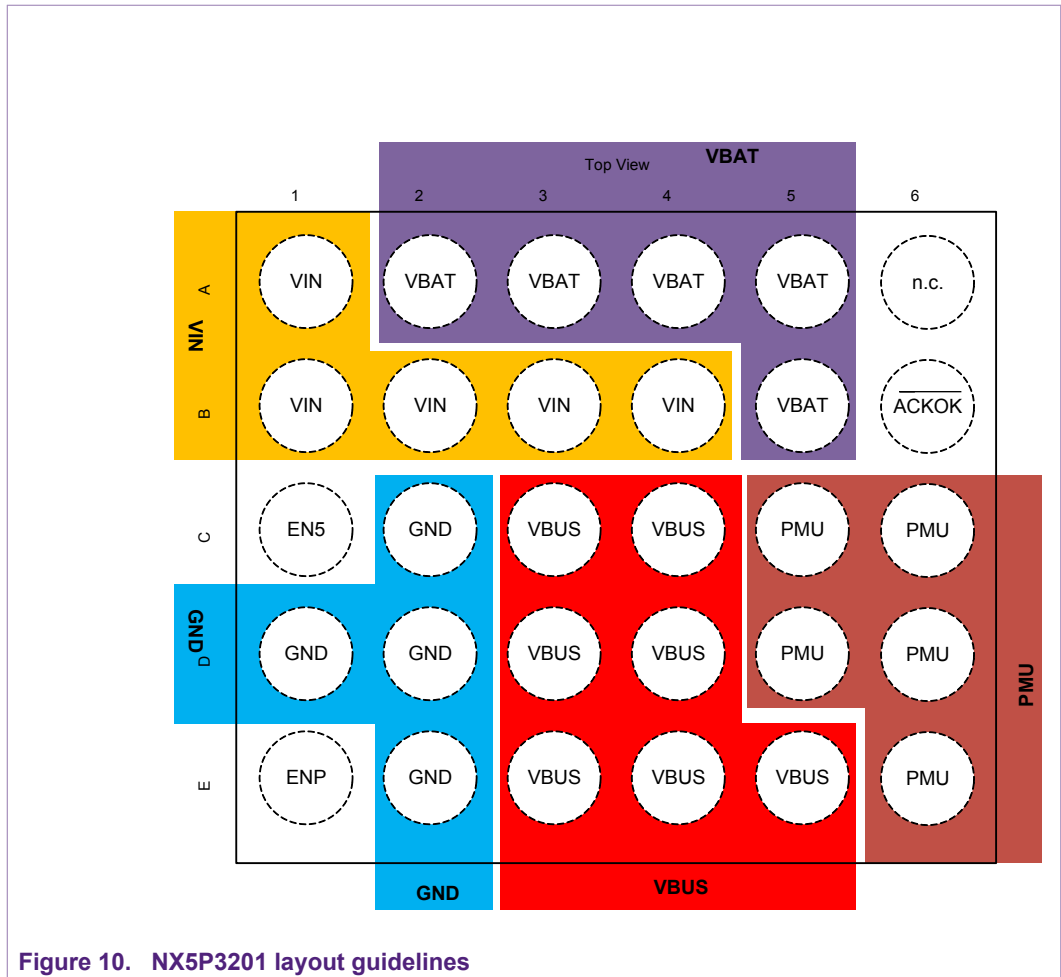
The NX5P3201 is an advanced dual power switch consisting of two independent switches. They are an advanced 3 A bidirectional power switch (SWP) for USB OTG and charger port applications, and a high-side 6 A load switch (SW5).

7.1 NX5P3201 pin map



7.2 NX5P3201 layout guidelines

The following layout guidelines provide all the connections for power path, including VBUS, VIN, VBAT, PMU and GND. The signal pins are all the at edge of the ball array, hence all of them can be connected out with one metal layer.



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