EVAL_XDPP1188_DB user guide

About this document

Scope and purpose

This user guide provides a comprehensive overview of the hardware setup and serves as a user manual for the EVAL_XDPP1188_DB daughterboard. The XDPP1188-200C belongs to Infineon XDP™ digital power controller family, which is optimized to provide high-performance and design flexibility for DC-DC converters. This controller is designed for achieving high efficiency, advanced system control, and cost savings, making it an ideal solution for a wide range of applications, including telecom, server, data centers, and computing DC-DC power solutions. The daughterboard is designed to facilitate testing and firmware development for XDPP1188. This document also describes the configuration of various jumper pins based on the device, features, and applications.

Intended audience

This document is intended for power supply design engineers, system engineers, and embedded power designers.

Evaluation board

This board is to be used during the design-in process for evaluating and measuring device characteristics, and for checking datasheet specifications.

Note: PCB and auxiliary circuits are NOT optimized for final customer design.

About this product group

Target applications

- Isolated/non-isolated DC-DC converters
- Intermediate bus converters for datacenter/computing system
- Power supplies for telecom infrastructure/brick modules
- Smart power systems for Industrial applications

Product family

XDP™ digital power controllers

About this product group

Important notice

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Safety precautions

Note: *Note that the following warnings regarding the hazards associated with development systems.*

Table 1 Safety precautions

	**Caution:** *The evaluation or reference board contains parts and assemblies sensitive to electrostatic discharge (ESD). Electrostatic control precautions are required when installing, testing, servicing or repairing the assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with electrostatic control procedures, refer to the applicable ESD protection handbooks and guidelines.*

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1 Introduction

The EVAL_XDPP1188_DB is a versatile daughterboard designed to facilitate the evaluation of the XDPP1188 controller in a 40-pin VQFN 5 mm×5 mm package. This evaluation board provides a platform for testing and configuring both the hardware and software of the controller, enabling users to assess its performance in DC-DC converter applications.

Key features of the EVAL_XDPP1188_DB include the ability to debug the controller, develop custom firmware patches, simulate various power stage conditions, and establish communication through multiple protocols, such as I2C, SPI, UART, and SWD. This board is designed to streamline the evaluation process, offering convenience, speed, and compatibility with DC-DC power modules and other evaluation power boards.

Additionally, the board provides easy access to all special-purpose analog, digital, and general-purpose pins of the XDPP1188, including communication and debug pins. This accessibility enables users to configure and test the controller's various functions with ease.

1.1 Features and applications

The EVAL_XDPP1188_DB evaluation board offers a wide range of features that support the evaluation and development of the XDPP1188 controller. Key features include:

- Support for XDPP1188 controller evaluation
- Configuration jumpers that allow an easy switch between different modes and applications
- Dedicated I2C communication ports for PMBus® communication
- A 10-pin JTAG SWD connector port for firmware debugging
- LED indicators
- Test points for oscilloscope probes and clipper cables
- Male header test points for all the pins of the microcontroller
- An auxiliary 1.8 V supply on board
- Option to use DIP switch to customize I2C and PMBus® address offset
- High-speed mezzanine connectors for power boards interface

2 Hardware requirements

2.1 Board overview

Figure 1 provides a virtual rendering of the EVAL_XDPP1188_DB. As illustrated, the board is populated with various jumpers, test points, debugger port, and switch. This board is powered by a 3.3 V input.

The EVAL_XDPP1188_DB is designed to facilitate easy evaluation of the IC, with pins and test points spread across the sides. The top and bottom edges of the board consist of various test points for all analog and digital pins, such as voltage sense, current sense, and GPIOs. The left edge consists of communication ports, such as I2C, SPI, and JTAG. The right edge of the board features power supply and address-offset settings. At the center of the board lies the XDPP1188 controller. The bottom side of the board features high-speed mezzanine connectors for connection to evaluation power boards.

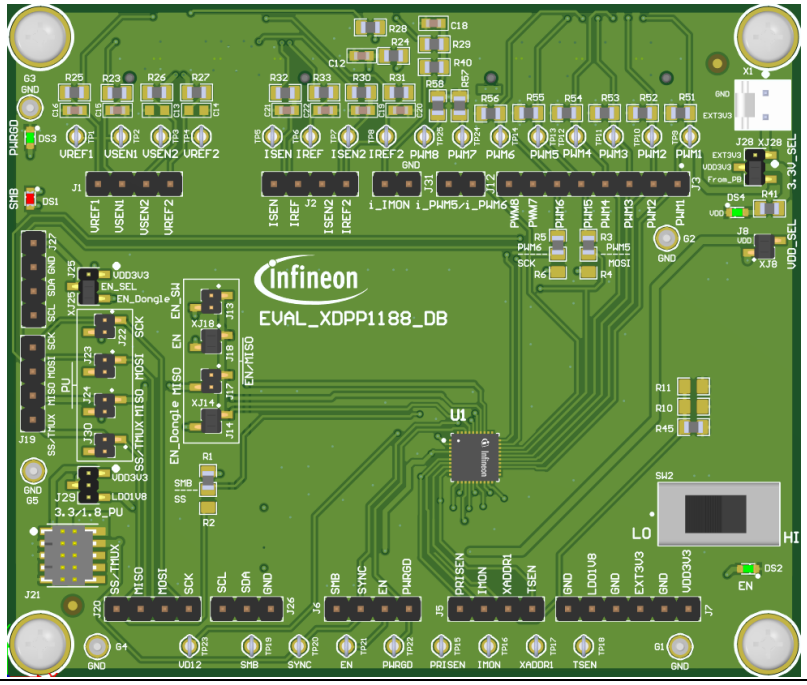


Figure 1 EVAL_XDPP1188_DB evaluation board

There are two types of test points on the top and the bottom edges:

- Regular male headers
- Loop-style test points for connecting oscilloscope probes

In addition to the test points, the board features multiple small jumper connectors located between the IC and the test points. These jumpers play a crucial role in configuring the controller for various applications and modifying the functions of the GPIOs. For example, the jumpers can be used to configure analog and digital GPIOs or multi-purpose pins on the controller for a specific application. This can involve using a PWM pin as a high-speed digital PWM, a fast-fault input pin, or an SPI communication pin. For more details on configuring the jumpers and GPIOs, see Section 2.3.

2.2 Pinout

Figure 2 shows a simplified version of the board, where only the header pins are shown. Table 2 lists the detailed description of each pin. For multipurpose pins, only the primary function is listed. Refer to the device datasheet [1] for alternative pin functions.

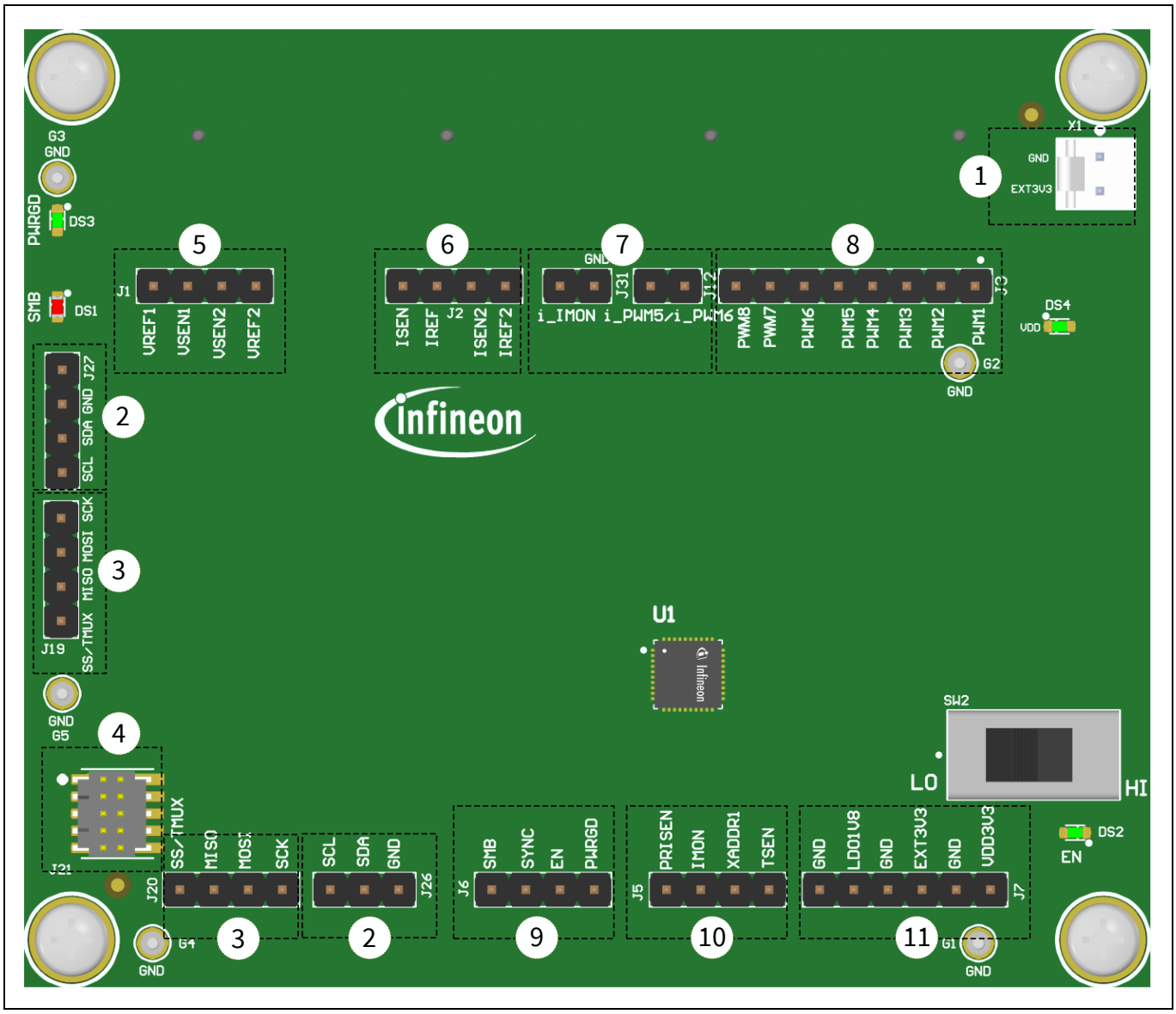


Figure 2 Board diagram highlighting header pins

Table 2 Primary header pin table for EVAL_XDPP1188_DB

Number	Designators	Pins	Purpose/description
1	X1 Power connector	EXT3v3	External DC power positive
		GND	External DC power ground
2	J26-J27 I2C/PMBus® connector	SCL	Serial clock for I2C/PMBus®
		SDA	Serial data for I2C/PMBus®
		GND	Ground connection

Hardware requirements

Number	Designators	Pins	Purpose/description
		EN	EN pin input from dongle/3.3 V power supply for isolated dongle
3	J19-J20 SPI connector	SCK	Serial clock for SPI
		MOSI	Master-out/data-out, slave-in pin for SPI
		MISO	Master-in/data-in, slave-out pin for SPI
		SS/TMUX	Slave select pin for SPI
4	J21 debugger port	10-pin JTAG	Port to connect JTAG or Lauterbach debugger
5	J1 Voltage sensing port	VREF1	Analog voltage sense 1 reference voltage pin
		VSEN1	Analog voltage sense 1 input voltage pin
		VREF2	Analog voltage sense 2 reference voltage pin
		VSEN2	Analog voltage sense 2 input voltage pin
6	J2 Current sensing port	ISEN	Analog current sense 1 input pin for ISEN1
		IREF	Analog current sense 1 reference voltage pin
		ISEN2	Analog current sense 2 input pin for ISEN2
		IREF2	Analog current sense 2 reference voltage pin
7	J12	i_PWM5	To use PWM5 as an IMON disconnect pin for current sharing
		i_PWM6	To use PWM6 as an IMON disconnect pin for current sharing
	J31	i_IMON-GND	Short these two pins to connect 2.21 kΩ to IMON pin
8	J3 Digital PWM output port	PWM1	Digital PWM1 output pin
		PWM2	Digital PWM2 output pin
		PWM3	Digital PWM3 output pin
		PWM4	Digital PWM4 output pin
		PWM5	Digital PWM5 output pin
		PWM6	Digital PWM6 output pin
		PWM7	Digital PWM7 output pin
		PWM8	Digital PWM8 output pin
9	J6 General-purpose digital port	SMB	SMBALERT# pin
		SYNC	Sync input/output pin
		EN	Enable pin
		PWRGD	Power good pin
10	J5 General-purpose analog port	PRISEN	Primary voltage sensing input
		IMON	Output current monitor pin
		XADDR1	Address offset pin
		TSEN	External temperature sensing pin
11	J7 Power output port	LDO1V8	1.8 V output from onboard LDO
		VDD3V3	3.3 V IC VDD voltage supply, selected by J28 - either from X1 or from power board

Number	Designators	Pins	Purpose/description
		EXT3V3	External 3.3 V from X1
		GND	Ground

2.3 Jumper configuration

Figure 3 illustrates the jumpers on the EVAL_XDPP1188_DB. These jumpers are used to select power supply options, as well as assign different functions for multipurpose pins.

To ensure easy identification and accessibility, all major function jumpers are placed within the perimeter of the main testing points. To further distinguish them visually, small jumpers with a pitch mating of 1.27 mm are used. In addition, a few jumpers related to SPI function are implemented with resistors (R1 through R6).

Table 3 explains the function of each jumper and its corresponding effect on the application and configuration.

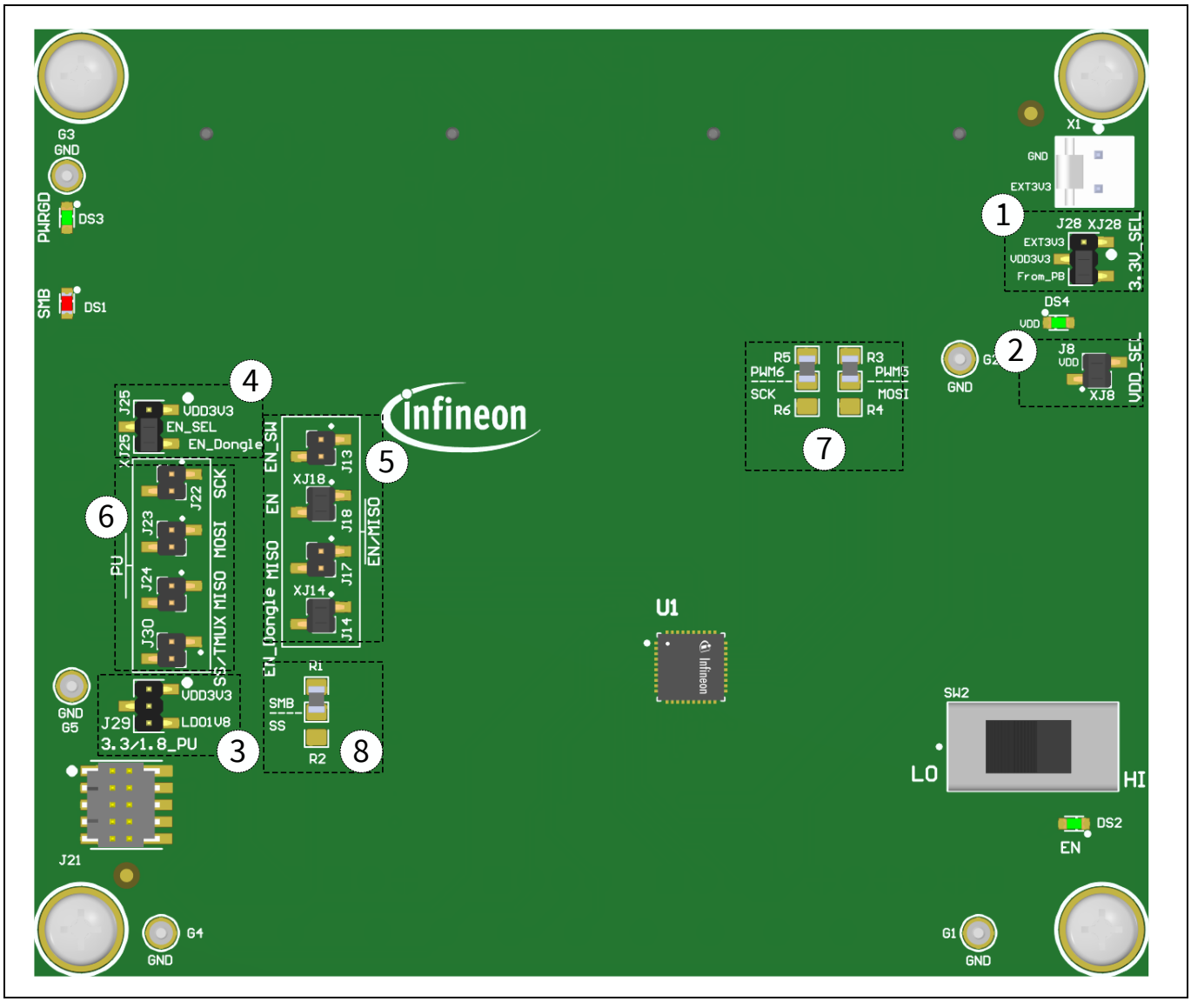


Figure 3 Board diagram highlighting jumpers

Table 3 Jumper configuration table

No.	Jumper	Connection (pin position)		Application/result
1	J28 3.3V_SEL	VDD3V3 (2)	EXT3V3 (1)	VDD3V3 connected to external 3.3 V
			From_PB (3)	VDD3V3 connected to power board 3.3 V
2	J8 VDD_SEL	VDD (2)	VDD3V3 (1)	Shorted for normal operation Optional ammeter connection to measure current draw on VDD3V3
3	J29 3.3/1.8_PU	3.3/1.8_PU (2)	VDD3V3 (1)	3.3 V selected for SPI pins pulled-up
			LDO1V8 (3)	1.8 V selected for SPI pins pulled-up
4	J25 EN_SEL	EN_SEL (2)	VDD3V3 (1)	3.3 V connected to J27 pin 4
			EN_Dongle (3)	EN pin connected to J27 pin 4
5	J13	EN_MISO (2)	EN_SW (1)	The onboard switch is used to control EN pin
	J14		EN_Dongle (1)	J27 pin 4 is used to control EN pin (EN_Dongle in No. 6 needs to be connected)
	J17		MISO (1)	EN pin assigned to MISO for SPI
	J18		EN (1)	Enable LED2 indicator for EN pin
6	J22	SPI_PU (2)	SCK	Pull-up connector for SPI clock
	J23		MOSI_PU	Pull-up connector for master_out slave_in (data out)
	J24		MISO_PU	Pull-up connector for master_in slave_out (data in)
	J30		SS	Pull-up connector for SPI Slave Select
7	R5/R6 P6_SEL	R5 installed, R6 empty		PWM6 pin assigned to PWM6 output
		R6 installed, R5 empty		PWM6 pin assigned to SCK for SPI
	R3/R4 P5_SEL	R3 installed, R4 empty		PWM5 pin assigned to PWM5 output
		R4 installed, R3 empty		PWM5 pin assigned to MOSI for SPI
8	R1/R2 SMB_SEL	R1 installed, R2 empty		SMBALERT# pin used as normal SMBALERT#
		R2 installed, R1 empty		SMBALERT# pin assigned as SS for SPI or TMUX

2.4 Test points

Test points provide convenient access points for probing signals using various testing and measurement equipment, such as oscilloscopes, logic analyzers, digital multimeters, or waveform generators.

The EVAL_XDPP1188_DB offers two types of test points: male header pins and loop-style test points. While Section 2.2 provides a detailed description of the header pins, this section focuses on the loop-style test points. The board offers five ground pins at multiple locations for easy ground pin connection. Figure 4 highlights the location of these test points. The detailed description of the loop-style test points is provided in Table 4.

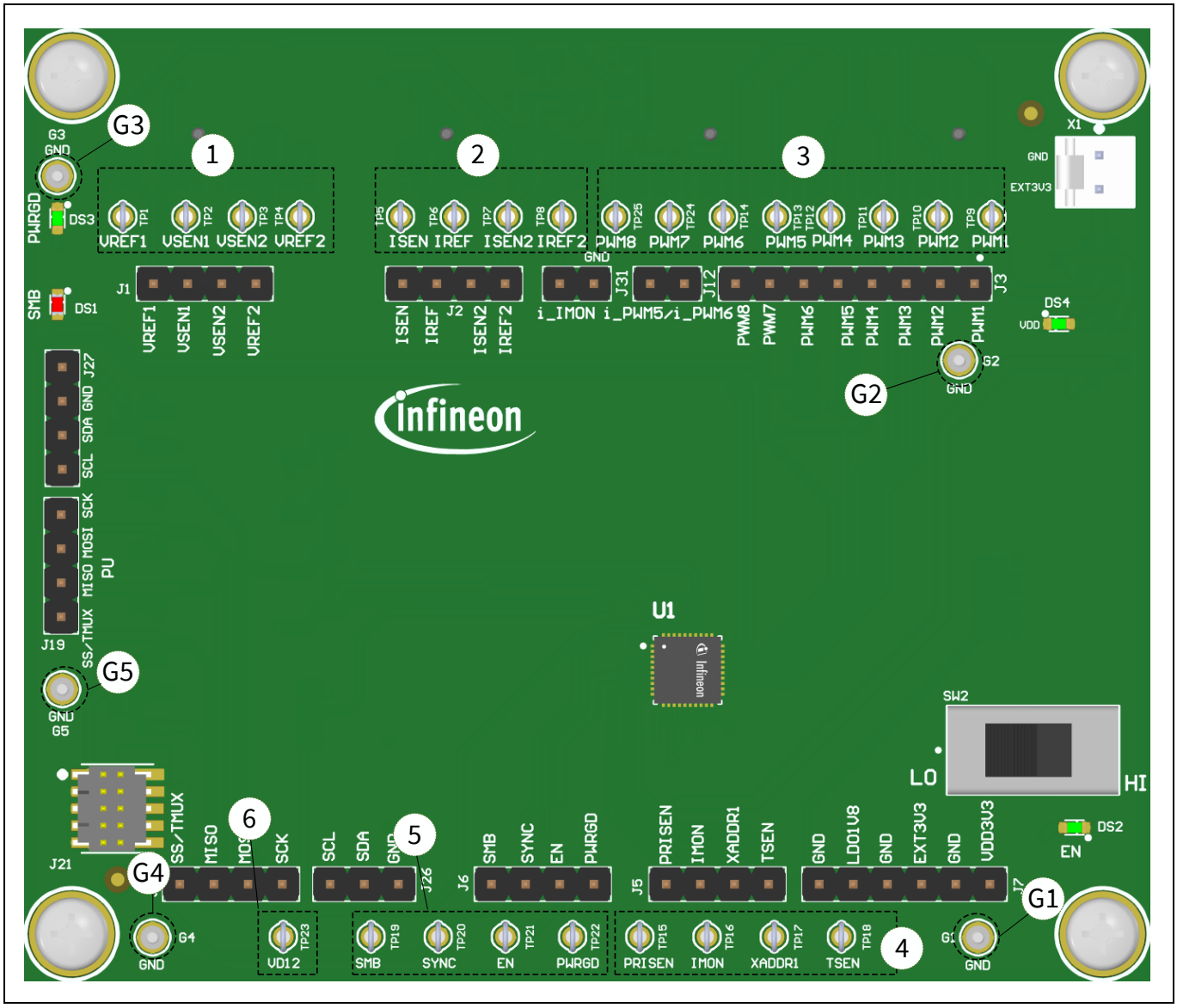


Figure 4 Board diagram highlighting loop-style test points

Table 4 Test point connection

No.	Test point group	Designator	XDPP1188 pin name	Male header connector
1	Analog voltage sensing	TP1	VREF1	J1 – VREF1
		TP2	VSEN1	J1 – VSEN1
		TP3	VSEN2	J1 – VSEN2
		TP4	VREF2	J1 – VREF2
2	Analog current sensing	TP5	ISEN1	J2 – ISEN
		TP6	IREF1	J2 – IREF
		TP7	ISEN2	J2 – ISEN2
		TP8	IREF2	J2 – ISEN2
3	Digital PWM output	TP9	PMW1	J3 – PWM1
		TP10	PWM2	J3 – PWM2

No.	Test point group	Designator	XDPP1188 pin name	Male header connector
		TP11	PWM3	J3 – PWM3
		TP12	PWM4	J3 – PWM4
		TP13	PWM5	J3 – PWM5
		TP14	PWM6	J3 – PWM6
		TP24	PWM7	J3 – PWM7
		TP25	PWM8	J3 – PWM8
4	General purpose analog pin	TP15	PRISEN	J5 – PRISEN
		TP16	IMON	J5 – IMON
		TP17	XADDR1	J5 – XADDR1
		TP18	TSEN	J5 – TSEN
5	General purpose digital pin	TP19	SMB	J6 – SMB
		TP20	SYNC	J6 – SYNC
		TP21	EN	J6 – EN
		TP22	PWRGD	J6 – PWRGD
6	Microcontroller bias test pin	TP23	VD12	N/A
7	Ground pins	G1	Ground	N/A
		G2	Ground	N/A
		G3	Ground	N/A
		G4	Ground	N/A
		G5	Ground	N/A

2.5 LED indicators

The EVAL_XDPP1188_DB offers four LEDs to indicate system status, as shown in Figure 5. For a detailed description of each LED, refer to Table 5.

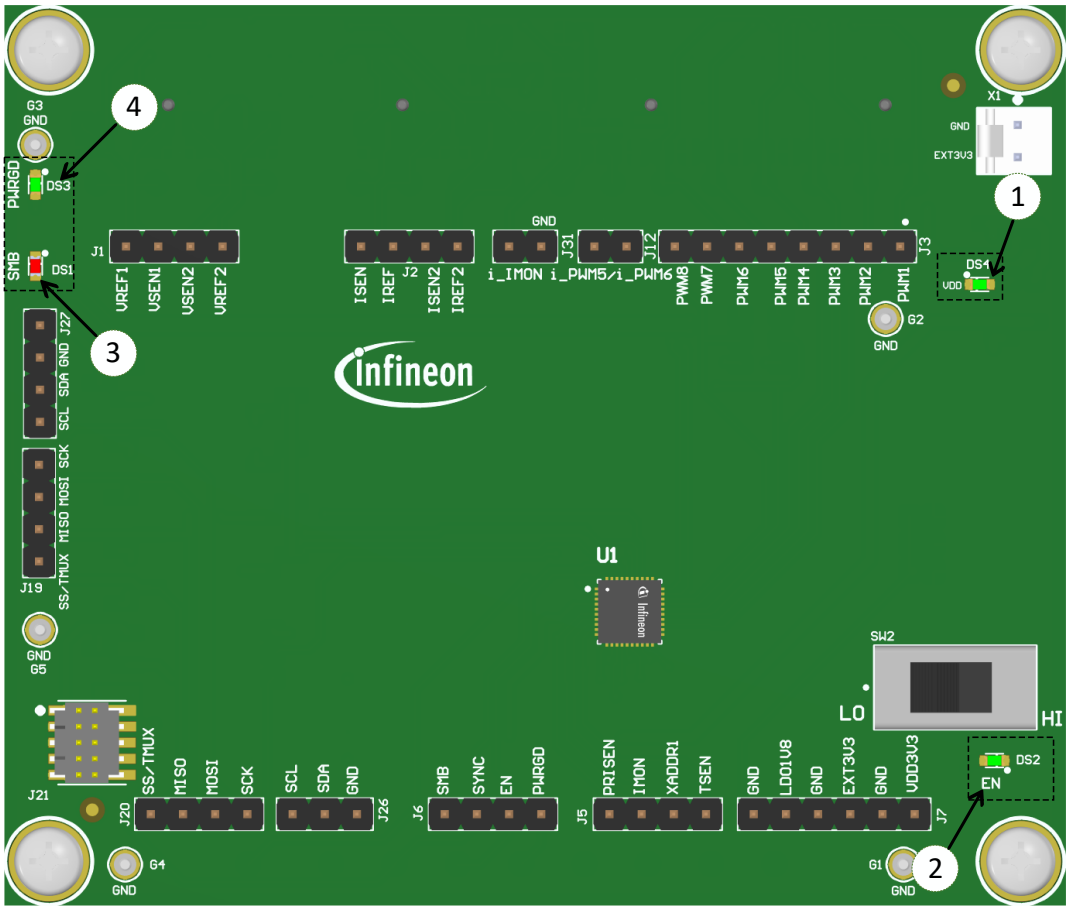


Figure 5 LED indicators

Table 5 LED configuration table

No.	LED	Color	Signals	Light	Description
1	DS4	Green	3.3 V input power	ON	Ext 3.3 V input power supply is present
				OFF	Ext 3.3 V input power supply is not present
2	DS2	Green	EN	ON	EN is high
				OFF	EN is low
3	DS1	Red	SMBALERT#	ON	SMBALERT# signal is low
				OFF	SMBALERT# signal is high
4	DS3	Green	PWRGD	ON	Power good signal is high
				OFF	Power good signal is low

2.6 Address offset

Up to three address resistors (R10, R11 and R45) can be installed to modify the I2C/PMBus® address offset. By default, only R45 is installed with a 22 kΩ resistor. If using 16-segment decode, the default address offset is 0x09. With 0x40 as the base address, the default address of the XDPP1188 is 0x49.

3 Getting started

3.1 Requirements

- Infineon XDP™ Designer GUI
- Infineon USB0010(A), USB007A1, or USB007B USB to I2C translator dongle

3.2 Hardware setup

- Connect the USB dongle to the I2C port (J27) as shown in Figure 6

The dongle has a standard USB-A port on one end and three or four wires for I2C/PMBus® output on the other end. As shown in the figure, it includes **SCL**, **SDA**, **GND,** and an optional **EN** or **VDD** wire. The colors of these wires are yellow, red, black, and blue, respectively.

The SCL and SDA are standard clock and data pins for the I2C/PMBus® protocol. The EN wire can be used as a control pin. It can be set to either of the following:

- 0 V representing logic low to the device
- 3.3 V representing logic High

If using an isolated dongle, the VDD wire needs to be connected to 3.3 V.

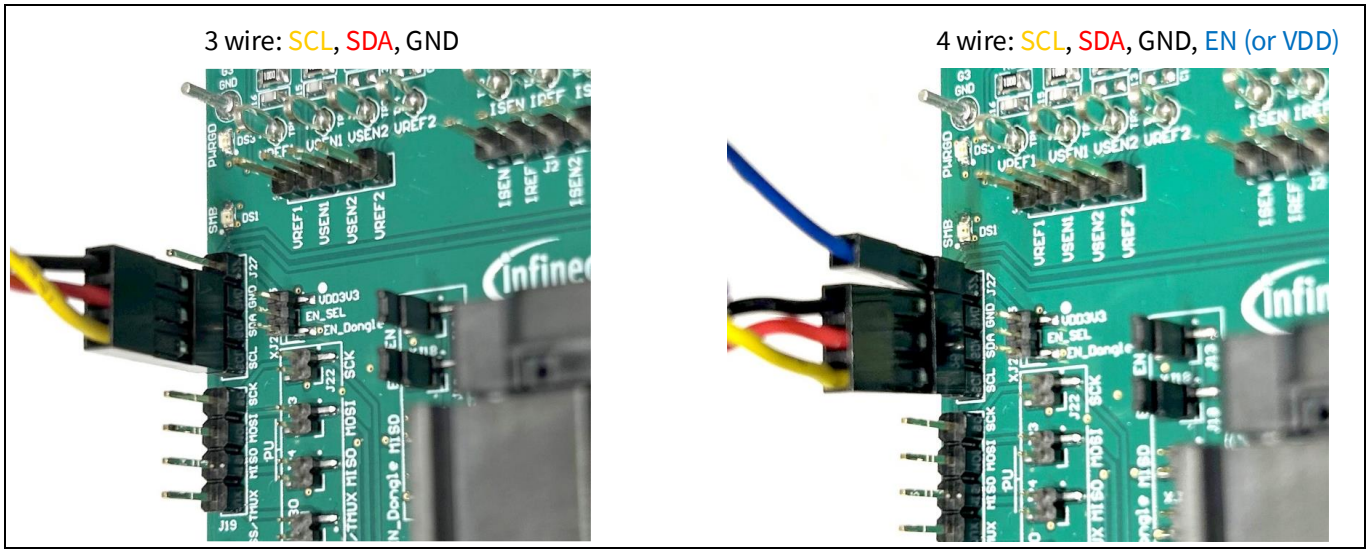


Figure 6 Dongle connection to the EVAL_XDPP1188_DB

3.3 Software setup

As described in Section 3.1, the XDP™ Designer GUI, and the drivers for the dongle can be downloaded from the Infineon Development Center. To install the XDP™ Designer GUI and install the drivers from the Infineon development center, do the following:

1. Search for **XDP™ Designer** in the search bar or use the alphabet shortcut to jump to letter "**X**"
2. Select the latest version from the **Version** drop-down and click **Install**
   This downloads the GUI and installs it. It will automatically select the path for installation. It is recommended to use the default path.

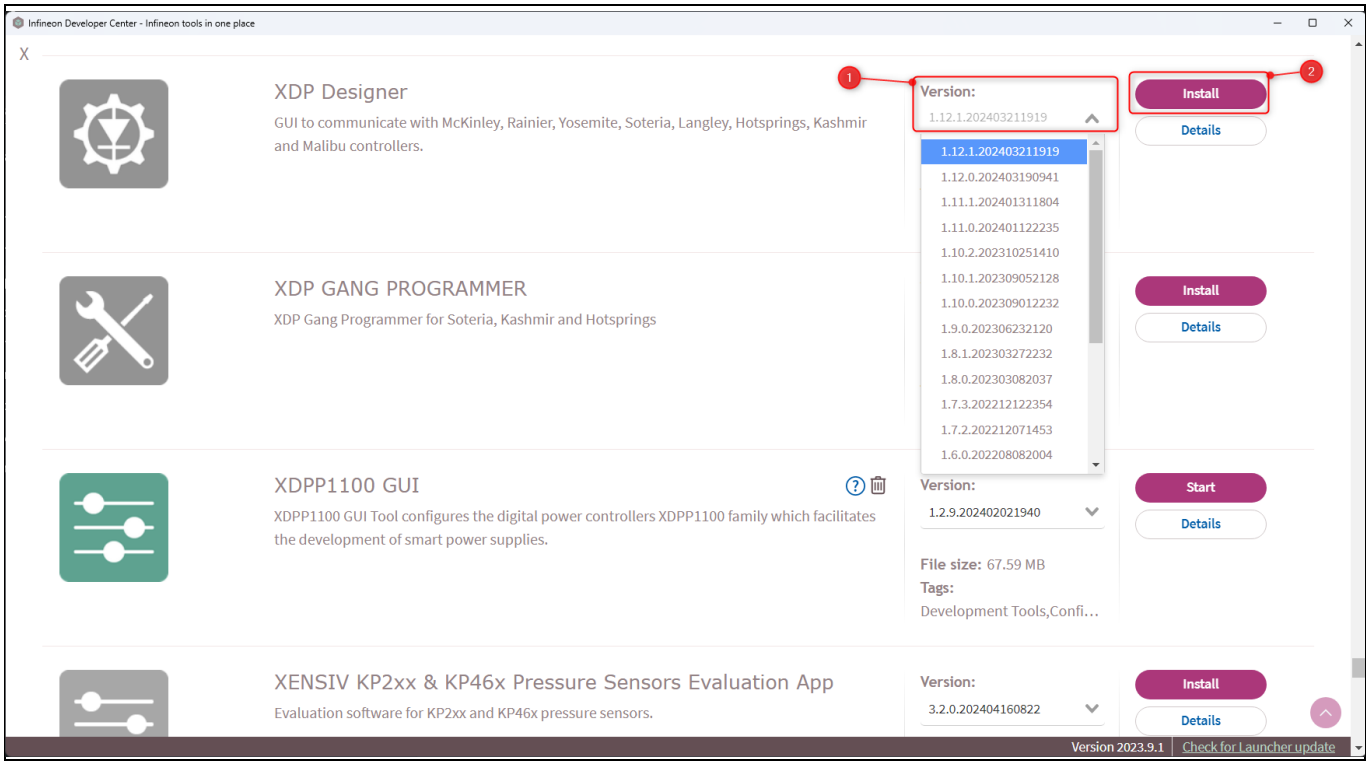


Figure 7 Download XDP™ Designer GUI

Once the installation is complete, the installation of the drivers for the dongle begins, as shown in Figure 8.

3. Click **Next** to install the required files and drivers for the dongle

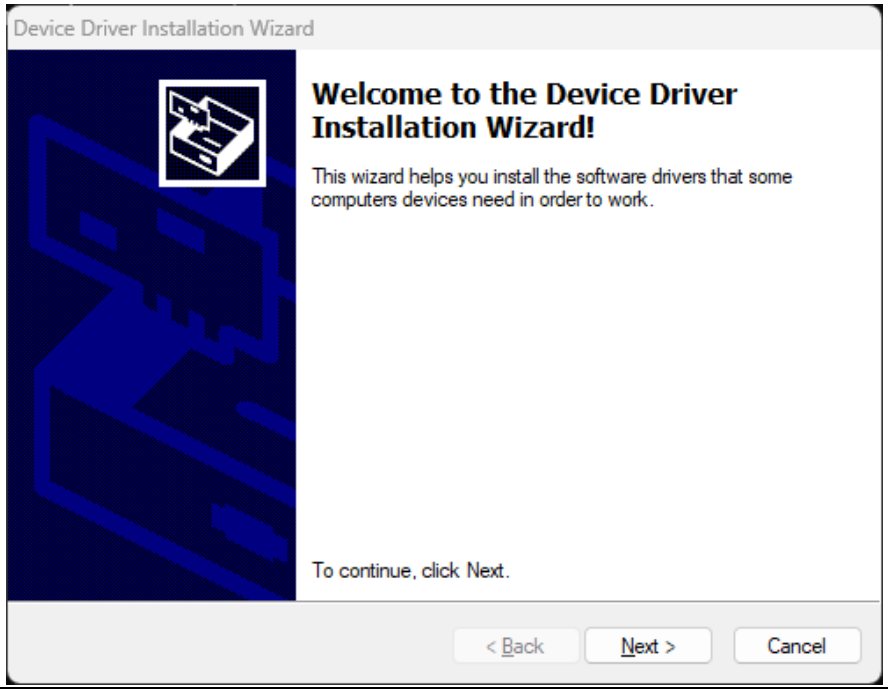


Figure 8 Driver installation

Once installation is complete for both the GUI and driver, a pop-up message confirms the completion. Under the **My Tools**, the **XDP Designer GUI** appears (as well as any other installed GUI).

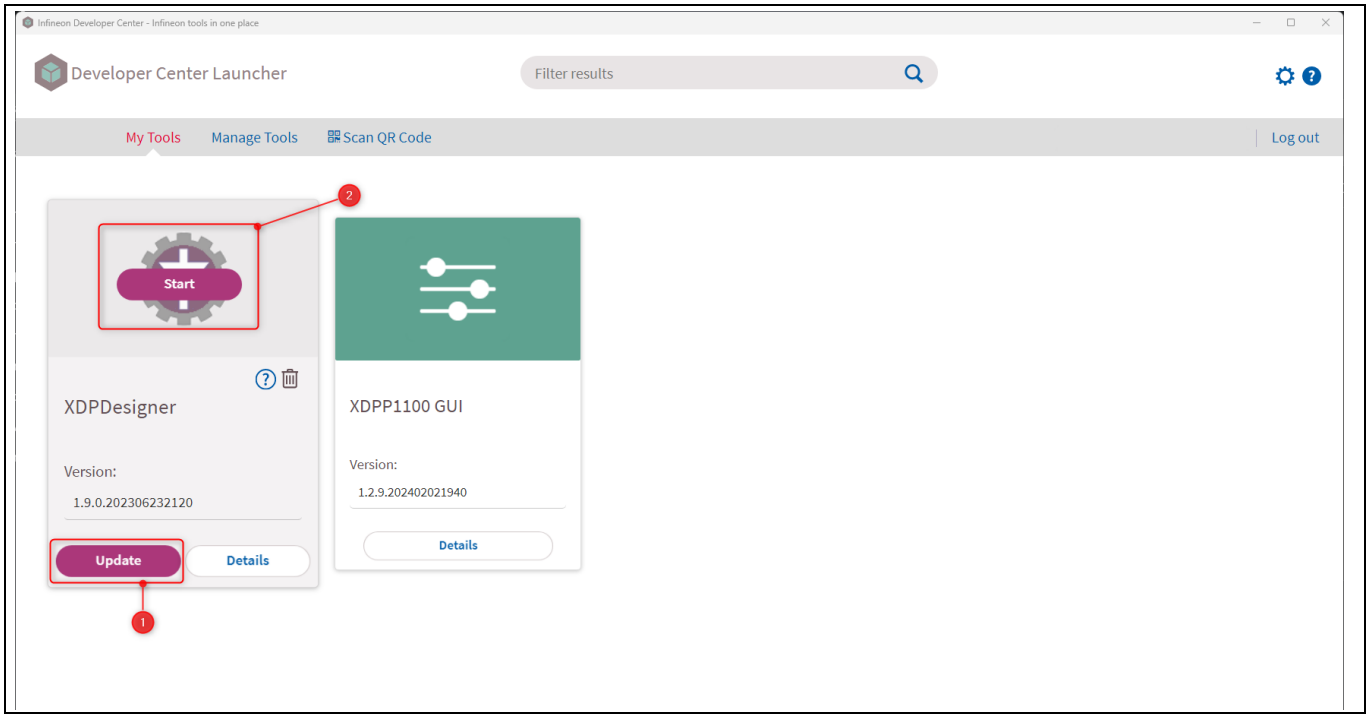


Figure 9 Update and open XDP Designer

*Note: As shown in Figure 9, when a new **update(1)** for the GUI is available, it shows an option to update it. Updating the version will not uninstall the older version. Both versions will be available after updating.*

4. Once the latest version is installed, hover the mouse on the GUI icon and click **Start(2)**

Once GUI is open, it will automatically try to detect the dongle first, and then scan for the connected device.

3.4 Testing

3.4.1 Testing without a power board

When operating the EVAL_XDPP1188_DB without a power board, the 3.3 V power supply is typically provided through connector X1 (Table 2). In this configuration, it is essential to connect jumper J28 to link VDD to EXT3V3 (Table 3).

It is possible to apply voltage source directly to the sensing pins to emulate power board signals. However, it is crucial to note that in this case, the analog input pins, including VREF1 and VREF2, are left floating by default. To prevent potential issues such as ADC common mode input out of range, it is recommended to connect VREF1 and VREF2 to GND. Similarly, for current sensing, it is recommended to connect IREF1 and IREF2 to 1.2 V or other acceptable reference voltages specified by the XDPP1188 datasheet.

3.4.2 Testing with a power board

This board is designed to operate with power boards, such as FBFB or LLC power board. The hardware connections are described below.

- High-speed mezzanine connectors are used for connection with the power board
- 3.3 V can be supplied by the board power by changing the J28 jumper to 'From_PB' location

The recommended jumper configurations for this example are listed in Table 6.

Table 6 Jumper configuration for example test with power board

Jumper	Connection	Purpose
J28	VDD – From_PB	Power board provides 3.3 V
J8	VDD – IC_3V3	Supply 3.3 V to the IC
R5/R6	R5 installed, R6 empty	To use PWM6 as a PWM6
R3/R4	R3 installed, R4 empty	To use PWM5 as a PWM5
R1/R2	R1 installed, R2 empty	To use SMBALERT# pin as SMBALERT#
J25	EN_SEL – EN_Dongle	To use EN pin from dongle to control operation ON/OFF
J14	EN_Dongle	Connect EN pin to EN_Dongle on J27
J18	EN	Connect EN_Dongle to LED indicator

4 System design details

4.1 Schematics

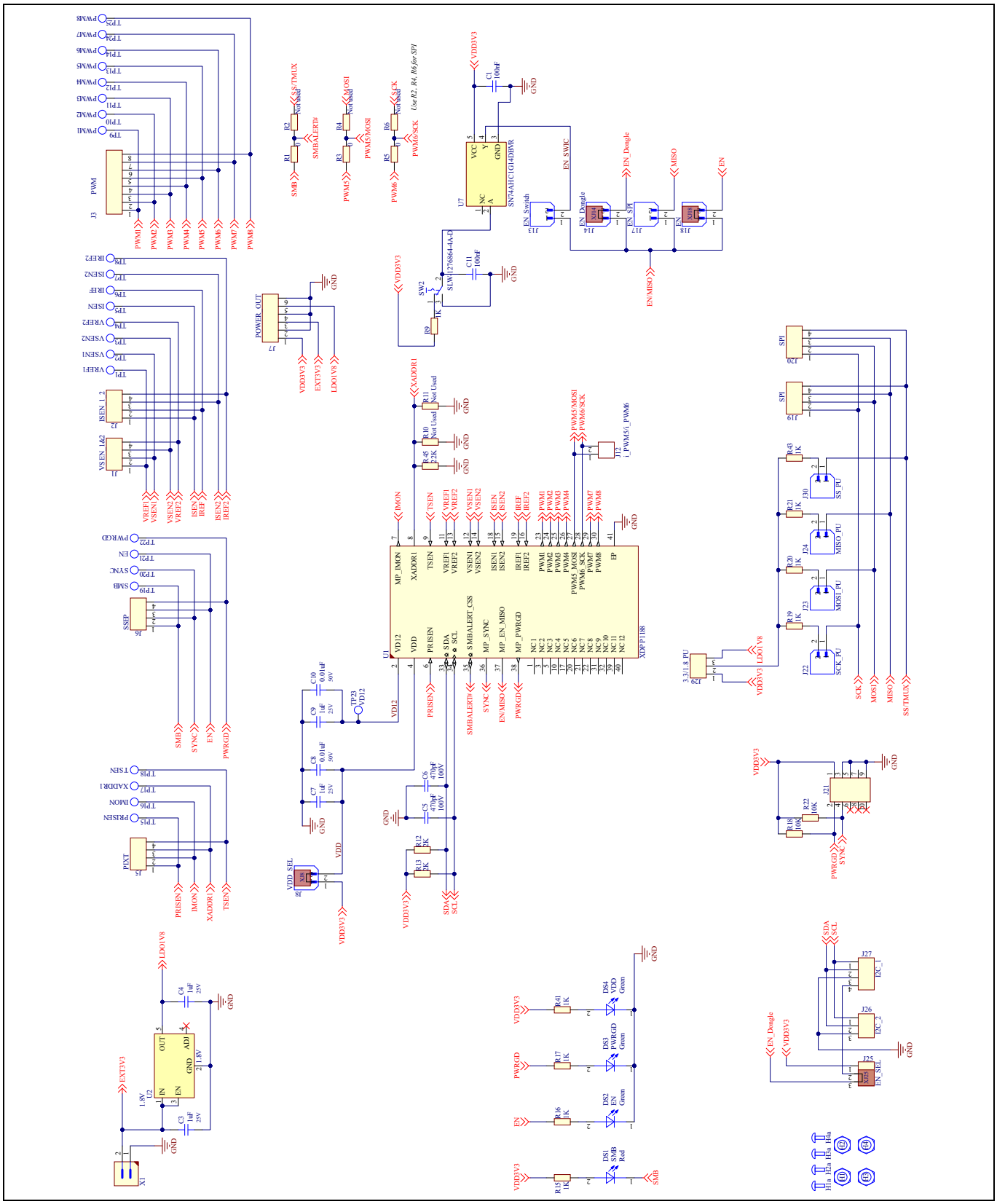


Figure 10 EVAL_XDPP1188_DB schematics page 1

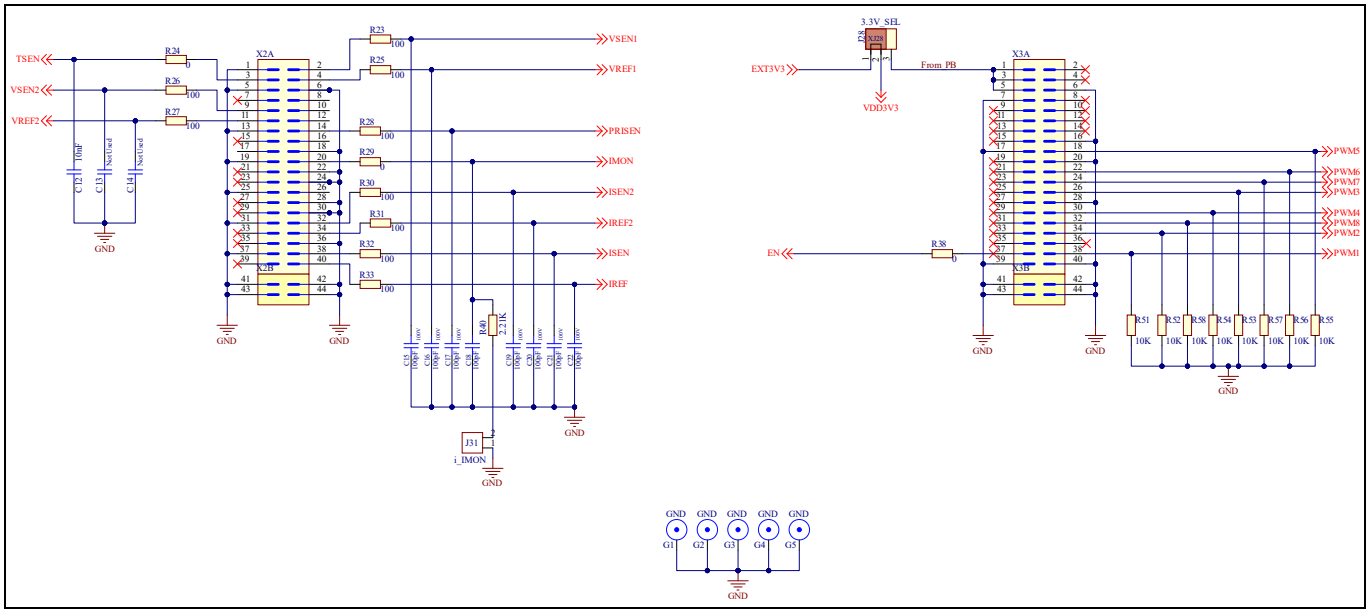


Figure 11 EVAL_XDPP1188_DB schematics page 2

4.2 Bill of materials

Table 7 BOM of the most important/critical parts of the evaluation board

Designator	Quantity	Value	Manufacturer	Part number
C1, C11	2	100 nF	Kyocera	KAE15AR71H104KT24
C12	1	10 nF	TDK	C1608C0G2A103J080AC
C15, C16, C17, C18, C19, C20, C21, C22	8	100 pF	TDK	C1608C0G2A101K080AA
C3, C4, C7, C9	4	1 uF	TDK	C1608X7R1E105K080AB
C5, C6	2	470 pF	TDK	C1608C0G2A471K080AA
C8, C10	2	0.01 uF	TDK	C1608X7R1H103K080AA
DS1	1	Red	Würth Elektronik	150060RS75000
DS2, DS3, DS4	3	Green	Würth Elektronik	150060GS75000
G1, G2, G3, G4, G5	5	PIN42	Vector	K31C/M
J1, J2, J5, J6, J19, J20, J27	7	CON4	Würth Elektronik	61300411121
J12, J31	2	CON2	Würth Elektronik	61300211121
J21	1	SMD_CON10	Samtec	FTSH-105-01-L-DV-007-K
J25, J28, J29	3	CON3	Sullins	GRPB031VWTC-RC
J26	1	CON3	Würth Elektronik	61300311121
J3	1	CON8	Würth Elektronik	61300811121
J7	1	POWER_OUT	Würth Elektronik	61300611121
J8, J13, J14, J17, J18, J22, J23, J24, J30	9	CON2	Sullins	GRPB021VWTC-RC
R1, R3, R5, R24, R29, R38	9	0	Panasonic	ERJ-6GEY0R00V
R12, R13	2	2 K	Panasonic	ERJ-6ENF2001V

System design details

Designator	Quantity	Value	Manufacturer	Part number
R18, R22, R51, R52, R53, R54, R55, R56, R57, R58	10	10 K	Panasonic	ERJ-6ENF1002V
R23, R25, R26, R27, R28, R30, R31, R32, R33	9	100	Panasonic	ERJ-6ENF1000V
R40	1	2.21 K	Panasonic	ERJ-6ENF2211V
R45	1	22 K	Panasonic	ERJ-6ENF2202V
R9, R15, R16, R17, R19, R20, R21, R41, R43	9	1K	Panasonic	ERJ-6ENF1001V
SW2	1	SLW-1276864-4A-D	Same Sky	SLW-1276864-4A-D
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14, TP15, TP16, TP17, TP18, TP19, TP20, TP21, TP22, TP23, TP24, TP25	25	loop	Keystone	5020
U1	1	XDPP1188-200C	Infineon Technologies	
U2	1	1.8 V	TI	TLV70018DDCR
U7	1	1 bit inverter	TI	SN74AHC1G14DBVR
X1	1	640456-2	TE Connectivity	640456-2
X2, X3	2	QTE-020-01-L-D-A	Samtec	QTE-020-01-L-D-A
XJ8, XJ14, XJ18, XJ25, XJ28	5	Con Jumper	Sullins	NPB02SVFN-RC

References

Note: Contact Infineon support to obtain these documents.

[1] Infineon technologies AG: *XDPP1188 datasheet;*

Glossary

DB
Daughterboard

GUI
Graphical user interface

PCB
Printed circuit board

PMBus®
Power management bus protocol

I2C
Inter-integrated circuit

SWD
Serial wire debug

JTAG
Joint test action group protocol

Revision history

Document revision	Date	Description of changes
V 1.0	2025-05-28	Initial release
V 2.0	2026-03-04	Updated device to XDPP1188-200C Updated all tables and figures to reflect changes to RevB PCB Added Section 2.6 Address offset

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