PROFET™ + 48V - Daughterboard description

User guide

About this document

Scope and purpose

This document explains the latest evaluation boards (Daughterboards ordering information) for the PROFET™+ 48V family. It focuses on the *daughterboard (DB)*s, which are part of a kit that includes a *motherboard (MB)*. The DB requires a MB (Motherboards ordering information) to function, as they are not functional as standalone components. For information on the MB, visit the company website.

Intended audience

This user guide is intended for automotive electronics engineers, designers, and technicians who are responsible for the development, testing, and implementation of high side switch solutions using the PROFET™+ 48V family of devices. The target audience includes individuals who require a detailed understanding of the DB's features, functionality, and operation, as well as those who need to integrate the device into their automotive systems. This document is also relevant for application engineers, system designers, and quality assurance personnel who are involved in the development and validation of automotive ECUs that utilize high-side switch technology. Additionally, the guide may be useful for students and researchers in the field of automotive electronics who are interested in learning about the application and implementation of high side switch devices in automotive systems. The intended audience is assumed to have a basic understanding of automotive electronics, electrical engineering principles, and microcontroller-based systems.

About this product group

Target applications

These boards are optimized for 48 V loads in 48 V systems, capable of handling currents up to 5 A.

Product family

PROFET™+ 48V

***Note**: printed circuit board (PCB) and auxiliary circuits are not optimized for final customer designs.*

Safety precautions

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

Table 1 Safety precautions

	**Warning:** *The DC-link potential of this board is up to 1000 VDC. When measuring voltage waveforms by oscilloscope, high voltage differential probes must be used. Failure to do so may result in personal injury or death.*
	**Warning:** *The evaluation or reference board contains DC bus capacitors which take time to discharge after removal of the main supply. Before working on the drive system, wait five minutes for capacitors to discharge to safe voltage levels. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.*
	**Warning:** *The evaluation or reference board is connected to the grid input during testing. Hence, high-voltage differential probes must be used when measuring voltage waveforms by oscilloscope. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.*
	**Warning:** *Remove or disconnect power from the drive before you disconnect or reconnect wires, or perform maintenance work. Wait five minutes after removing power to discharge the bus capacitors. Do not attempt to service the drive until the bus capacitors have discharged to zero. Failure to do so may result in personal injury or death.*
	**Caution:** *The heat sink and device surfaces of the evaluation or reference board may become hot during testing. Hence, necessary precautions are required while handling the board. Failure to comply may cause injury.*
	**Caution:** *Only personnel familiar with the drive, power electronics and associated machinery should plan, install, commission and subsequently service the system. Failure to comply may result in personal injury and/or equipment damage.*
	**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.*
	**Caution:** *A drive that is incorrectly applied or installed can lead to component damage or reduction in product lifetime. Wiring or application errors such as undersizing the motor, supplying an incorrect or inadequate AC supply, or excessive ambient temperatures may result in system malfunction.*
	**Caution:** *The evaluation or reference board is shipped with packing materials that need to be removed prior to installation. Failure to remove all packing materials that are unnecessary for system installation may result in overheating or abnormal operating conditions.*

Table of contents

1 General information

The smart power switches (SPS) evaluation kit consists of a *MB* and a *DB*. Depending on the device's features, the DB provides additional functionalities. It is essential to note that the setup and operation of the DB are contingent upon its combination with a MB. The two components are designed to work in tandem, and the DB's functionality is optimized when used with a MB. For users requiring information regarding the MB, including its specifications, setup, and operation, Infineon recommends consulting the relevant documentation available on the homepage. This will provide a more comprehensive understanding of the entire evaluation kit and its capabilities.

The usage of a ground resistor RGND is recommended. Therefore, it is suggested to close the jumper XGND. Depending on which DB is plugged onto the MB, a different number of banana jacks OUT0 to OUT7 are in use. For the best current capability, it is recommended to use the maximum available banana jacks. This is described in each DB chapter.

***Note**: Usually in the device's datasheet, it is recommended to use an RIS of 1.2 kΩ. This refers to a 5 V logic system. Since the* MB *and the microcontroller provides a 3.3 V logic system, the resistor value RIS was reduced accordingly.*

2 2-channel daughterboard

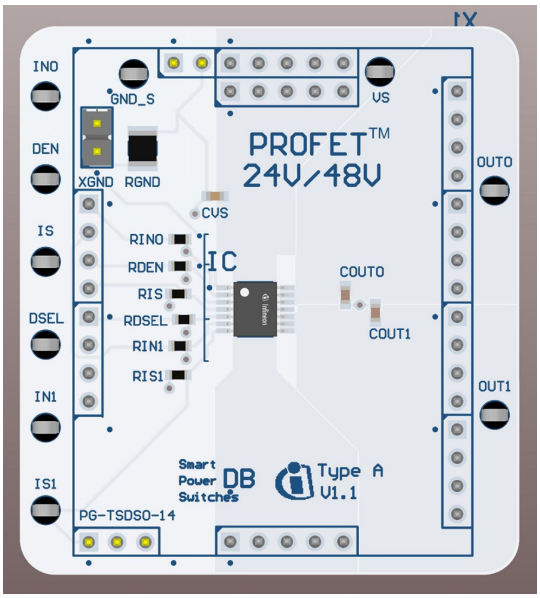

Figure 1 2-channel daughterboard

The OUT0 current is provided via banana sockets OUT0 to OUT3.
The OUT1 current is provided via banana sockets OUT4 to OUT7.

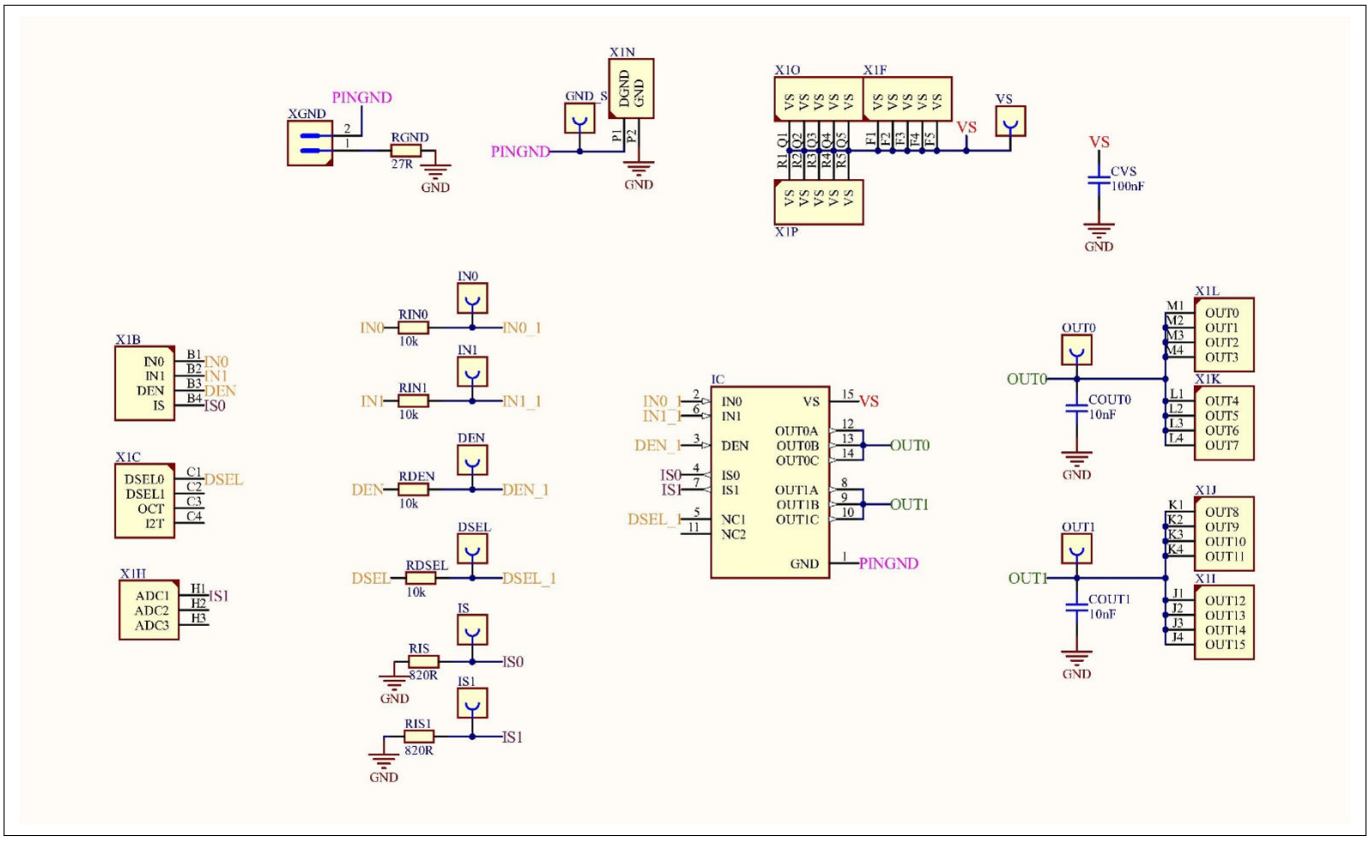

Figure 2 2-channel daughterboard - schematic

Table 2 Product list of compatible devices for this DB

Device name	Channels	$I_{L(NOM)}$ [A]
BTH6070-2EPV	2	2.17
BTH6100-2EPA	2	2.03

2.1 Bill of materials

Table 3 Bill of materials

Designator	Qty	Fitted	Description
COUT0, COUT1	2	Fitted	CAP/CERA/10 nF/0603(1608)/SMD
CVS	1	Fitted	CAP/CERA/100 nF/100 V/0603(1608)/SMD
DEN, DSEL, GND_S, IN0, IN1, IS, IS1, OUT0, OUT1, VS	10	Fitted	Black bead terminal assembly 1.02 mm hole
RDEN, RDSEL, RIN0, RIN1	4	Fitted	RES/STD/10 k/100 mW/1%/0603(1608)/SMD
RGND	1	Fitted	RES/STD/27R/500 mW/1%/1210(3225)/SMD
RIS, RIS1	2	Fitted	RES/STD/820R/100 mW/1%/0603(1608)/SMD
XGND	1	Fitted	Through hole .025 SQ Post Header, 2.54 mm pitch, 2 pin, vertical, single row

3 4-channel daughterboard

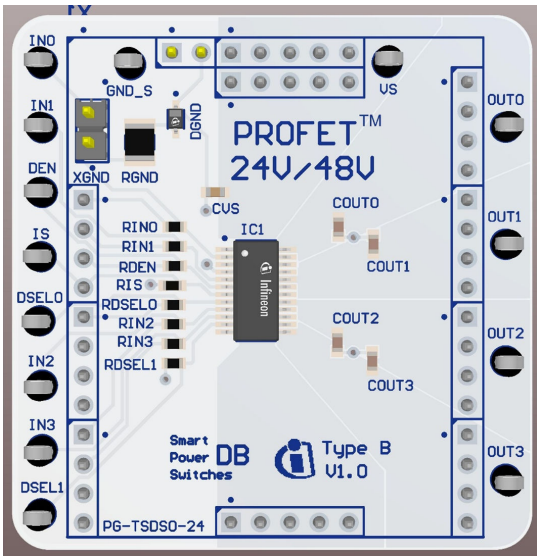

Figure 3 4-channel daughterboard

The OUT0 current is provided via banana sockets OUT0 and OUT1.
The OUT1 current is provided via banana sockets OUT2 and OUT3.
The OUT2 current is provided via banana sockets OUT4 and OUT5.
The OUT3 current is provided via banana sockets OUT6 and OUT7.

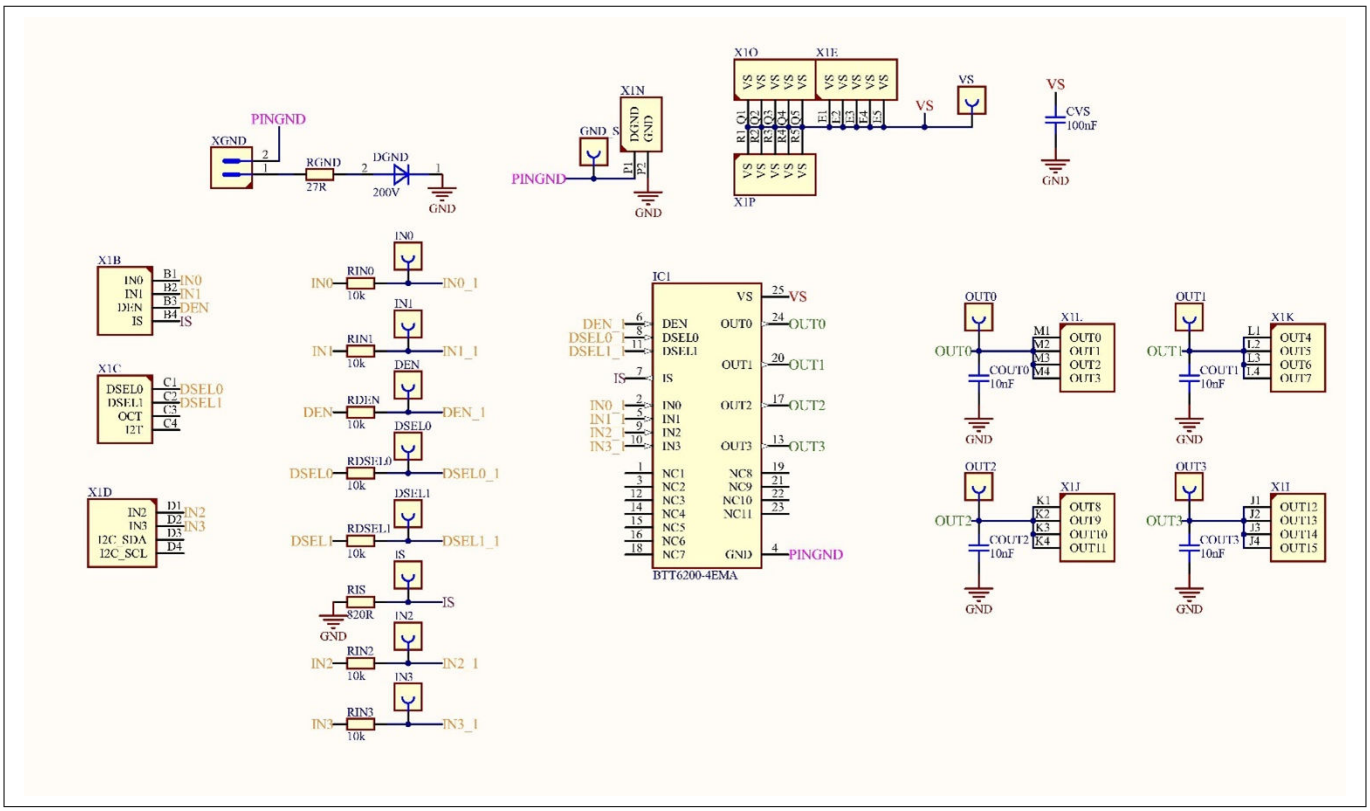

Figure 4 4-channel daughterboard - schematic

Table 4 Product list of compatible devices for this DB

Device name	$I_{L(NOM)}$ [A]
BTH6200-4ESA	1

3.1 Bill of materials

Table 5 Bill of materials

Designator	Qty	Fitted	Description
COUT0, COUT1, COUT2, COUT3	4	Fitted	CAP/CERA/10 nF/100 V/5%/0603(1608)/SMD
CVS	1	Fitted	CAP/CERA/100 nF/100 V/10%/0603(1608)/SMD
DEN, DSEL0, DSEL1, GND_S, IN0, IN1, IN2, IN3, IS, OUT0, OUT1, OUT2, OUT3, VS	14	Fitted	Black bead terminal assembly 1.02 mm hole
DGND	1	Fitted	Silicon Switching Diode, BAS21-03W
IC1	1	Fitted	BTT6200-4ESA
RDEN, RDSEL0, RDSEL1, RIN0, RIN1, RIN2, RIN3	7	Fitted	RES/STD/10 k/100 mW/1%/0603(1608)/SMD
RGND	1	Fitted	RES/STD/27R/500 mW/1%/1210(3225)/SMD
RIS	1	Fitted	RES/STD/820R/100 mW/1%/0603(1608)/SMD
XGND	1	Fitted	Through hole .025 SQ Post Header, 2.54 mm pitch, 2 pin, vertical, single row

4 ENA daughterboard

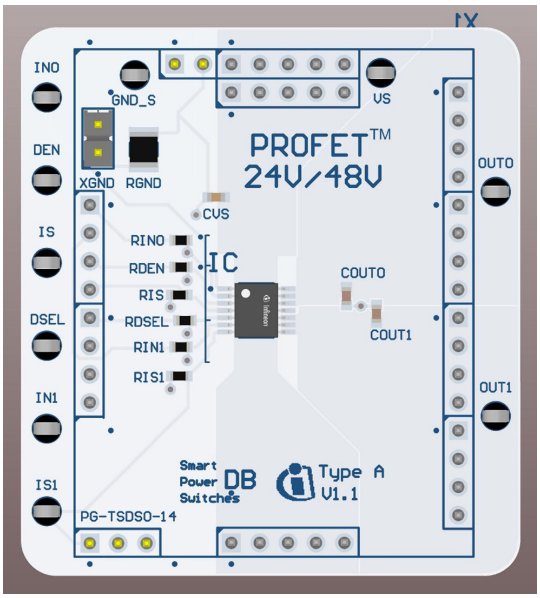

Figure 5 ENA daughterboard

The OUT0 current is provided via banana sockets OUT0 to OUT3.
The OUT1 current is provided via banana sockets OUT4 to OUT7.

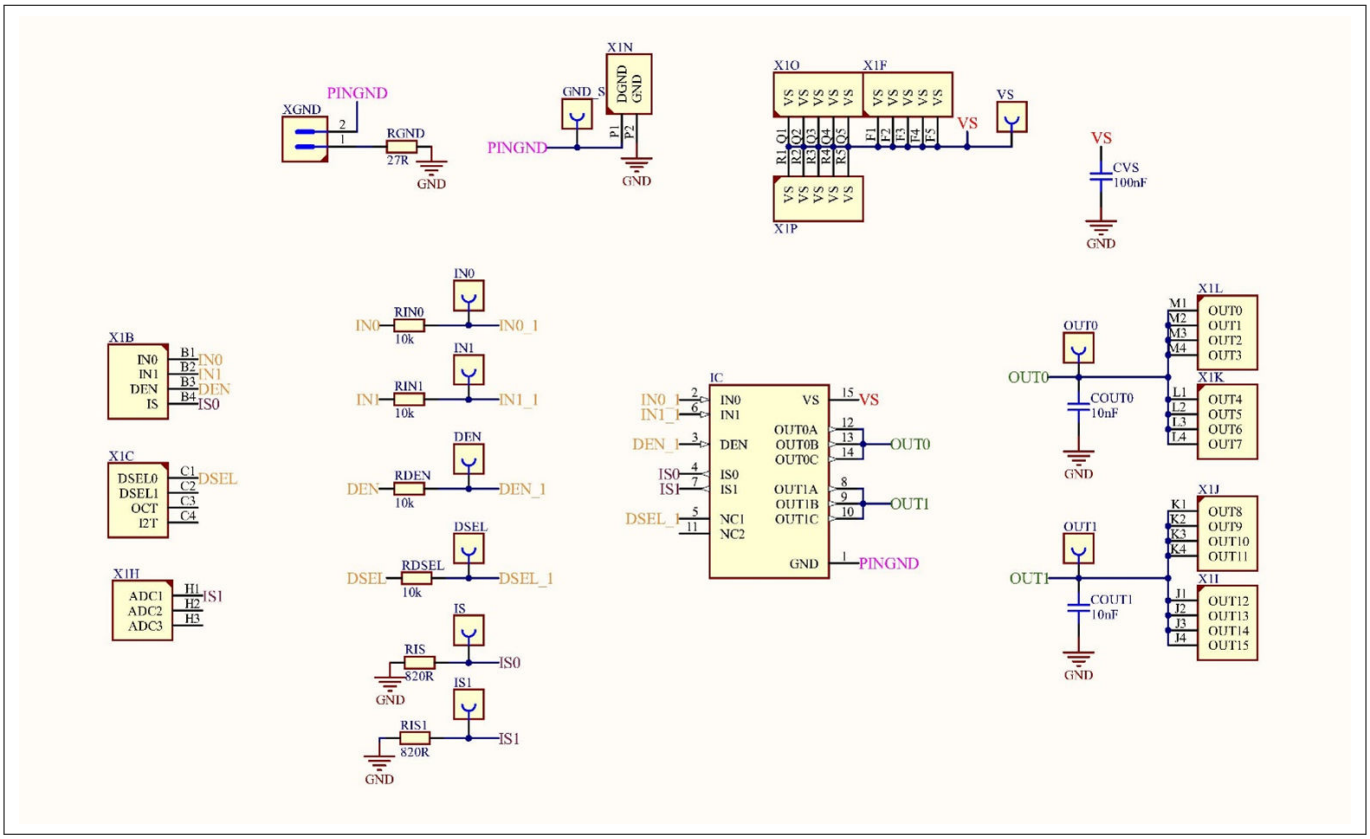

Figure 6 ENA daughterboard - schematic

Table 6 Product list of compatible devices for this DB

Device name	Channels	$I_{L(NOM)}$ [A]
BTH6200-1ENA	1	1.74

4.1 Bill of materials

Table 7 Bill of materials

Designator	Qty	Fitted	Description
COUT0, COUT1	2	Fitted	CAP/CERA/10 nF/0603(1608)/SMD
CVS	1	Fitted	CAP/CERA/100 nF/100 V/0603(1608)/SMD
DEN, DSEL, GND_S, IN0, IN1, IS, IS1, OUT0, OUT1, VS	10	Fitted	Black bead terminal assembly 1.02 mm hole
DGND	1	Fitted	Silicon Switching Diode, BAS21-03W
RDEN, RDSEL, RIN0, RIN1	4	Fitted	RES/STD/10 k/100 mW/1%/0603(1608)/SMD
RGND	1	Fitted	RES/STD/27R/500 mW/1%/1210(3225)/SMD
RIS, RIS1	2	Fitted	RES/STD/820R/100 mW/1%/0603(1608)/SMD
XGND	1	Fitted	Through hole .025 SQ Post Header, 2.54 mm pitch, 2 pin, vertical, single row

5 EPL daughterboard

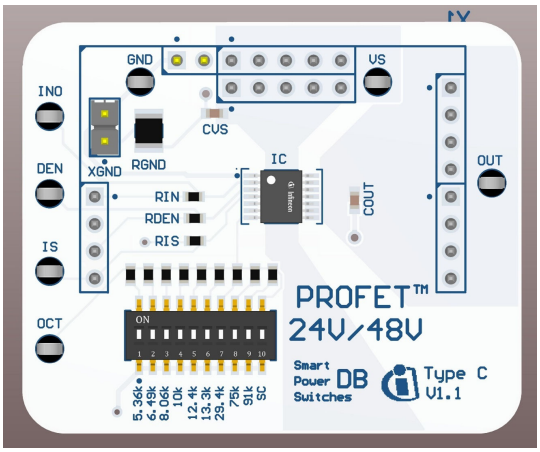

Figure 7 EPL daughterboard

The OUT current is provided via banana sockets OUT0 to OUT3.

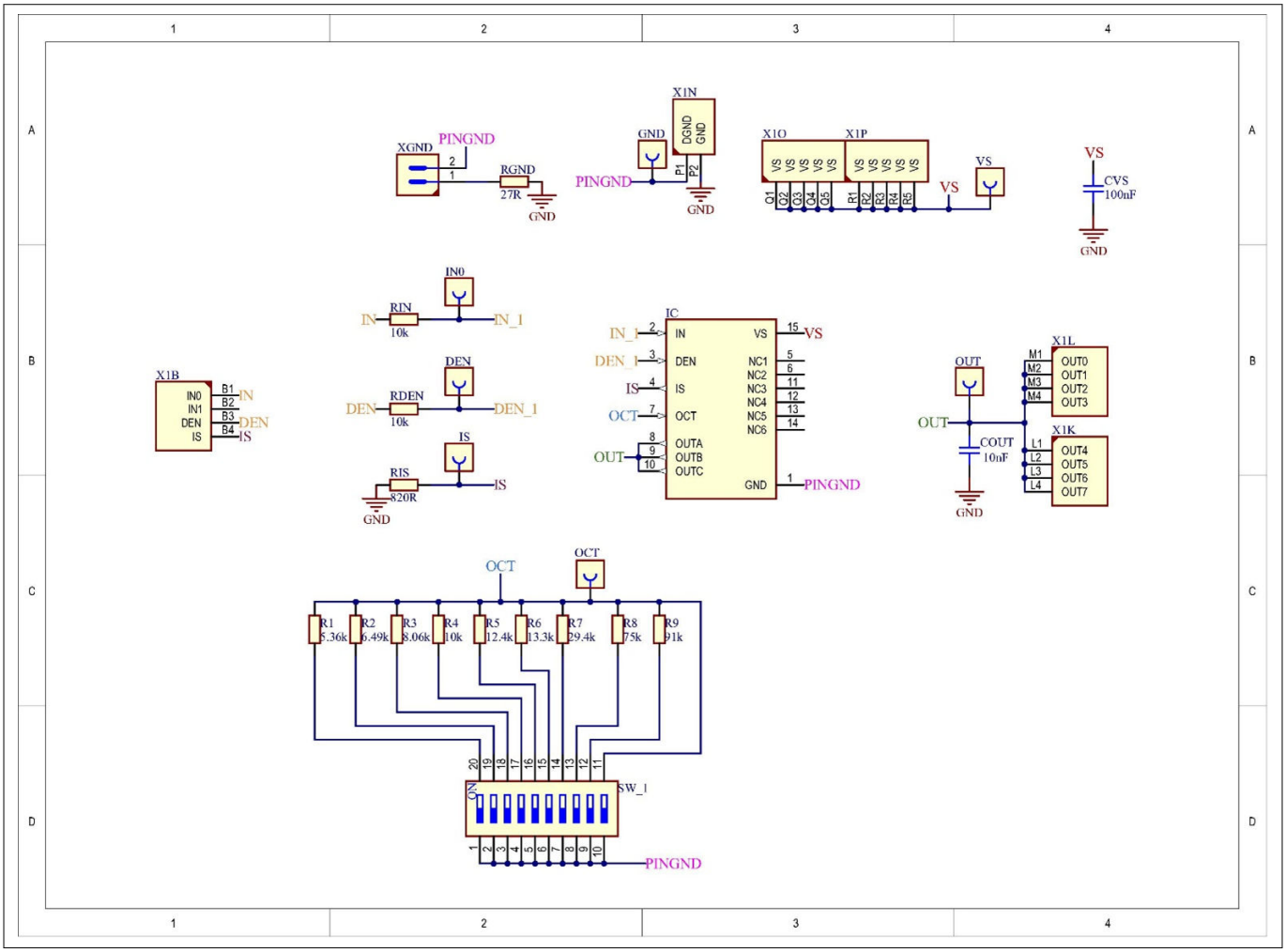

Figure 8 EPL daughterboard - schematic

Table 8 Product list of compatible devices for this DB

Device name	$I_{L(NOM)}$ [A]
BTH6035-1EPL	5
BTH6080-1EPL	2.5

On the *DB*, there is a dip switch with different values provided for evaluation. The numbering of the resistor values are numbered according to the dip switch from left to right. It is recommended to pick an R_{OCT} before using the device.

5.1 Bill of materials

Table 9 Bill of materials

Designator	Qty	Fitted	Description
COUT	1	Fitted	10 nF
CVS	1	Fitted	100 nF
DEN, GND, IN0, IS, OCT, VS	6	Fitted	Black bead terminal assembly 1.02 mm hole
DGND	1	Fitted	Silicon Switching Diode, BAS21-03W
IC	1	Fitted	Infineon Technologies
OUT	1	Fitted	Black bead terminal assembly 1.02 mm hole
R1	1	Fitted	RES/STD/5.36 k/100 mW/1%/0603(1608)/SMD
R2	1	Fitted	RES/STD/6.49 k/100 mW/1%/0603(1608)/SMD
R3	1	Fitted	RES/STD/8.06 k/100 mW/1%/0603(1608)/SMD
R4, RDEN, RIN	3	Fitted	RES/STD/10 k/100 mW/1%/0603(1608)/SMD
R5	1	Fitted	RES/STD/12.4 k/100 mW/1%/0603(1608)/SMD
R6	1	Fitted	RES/STD/13.3 k/100 mW/1%/0603(1608)/SMD
R7	1	Fitted	RES/STD/29.4 k/100 mW/1%/0603(1608)/SMD
R8	1	Fitted	RES/STD/75 k/100 mW/1%/0603(1608)/SMD
R9	1	Fitted	RES/STD/91 k/100 mW/1%/0603(1608)/SMD
RGND	1	Fitted	RES/STD/27R/500 mW/1%/1210(3225)/SMD
RIS	1	Fitted	RES/STD/820R/100 mW/1%/0603(1608)/SMD
SW_1	1	Fitted	Surface Mount DIP Switches, 97 Series Half-Pitch, 10 Positions, 97C10ST
XGND	1	Fitted	Through hole .025 SQ Post Header, 2.54 mm pitch, 2 pin, vertical, single row

6 Appendices

6.1 Daughterboards ordering information

Table 10 Daughterboards ordering information

Sales part name	Sales product number
D-BTH6035-1EPL-4	SP006149044
D-BTH6070-2EPV-4	SP006149046
D-BTH6080-1EPL-4	SP006149048
D-BTH6100-2EPA-4	SP006149050
D-BTH6200-1ENA-4	SP006149052
D-BTH6200-4ESA-4	SP006149054

6.2 Motherboards ordering information

Table 11 Motherboards ordering information

Board name	Sales part name	Sales product number
SPS Motherboard Lite	M-SMART-POWER-LITE-5	SP006136123
SPS Motherboard	M-SMART-POWER-SWT-5	SP006041408

Glossary

DB

daughterboard (DB)
An expansion circuit card connected to a motherboard.

MB

motherboard (MB)
The main printed circuit board (PCB) in general-purpose computers and other expandable systems. It holds and allows communication between many of the crucial electronic components of a system, such as the central processing unit (CPU) and memory, and provides connectors for other peripherals.

microcontroller

microcontroller
A small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals.

PCB

printed circuit board (PCB)

A board that mechanically supports and electrically connects electronic components using conductive tracks, pads, and other features etched from copper sheets laminated onto a non-conductive substrate.

Revision history

Document version	Date of release	Description of changes
Rev. 1.00	2025-12-12	Initial release

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Edition 2025-12-12

Published by

Infineon Technologies AG

81726 Munich, Germany

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Document reference
IFX-nqo1746428093485

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