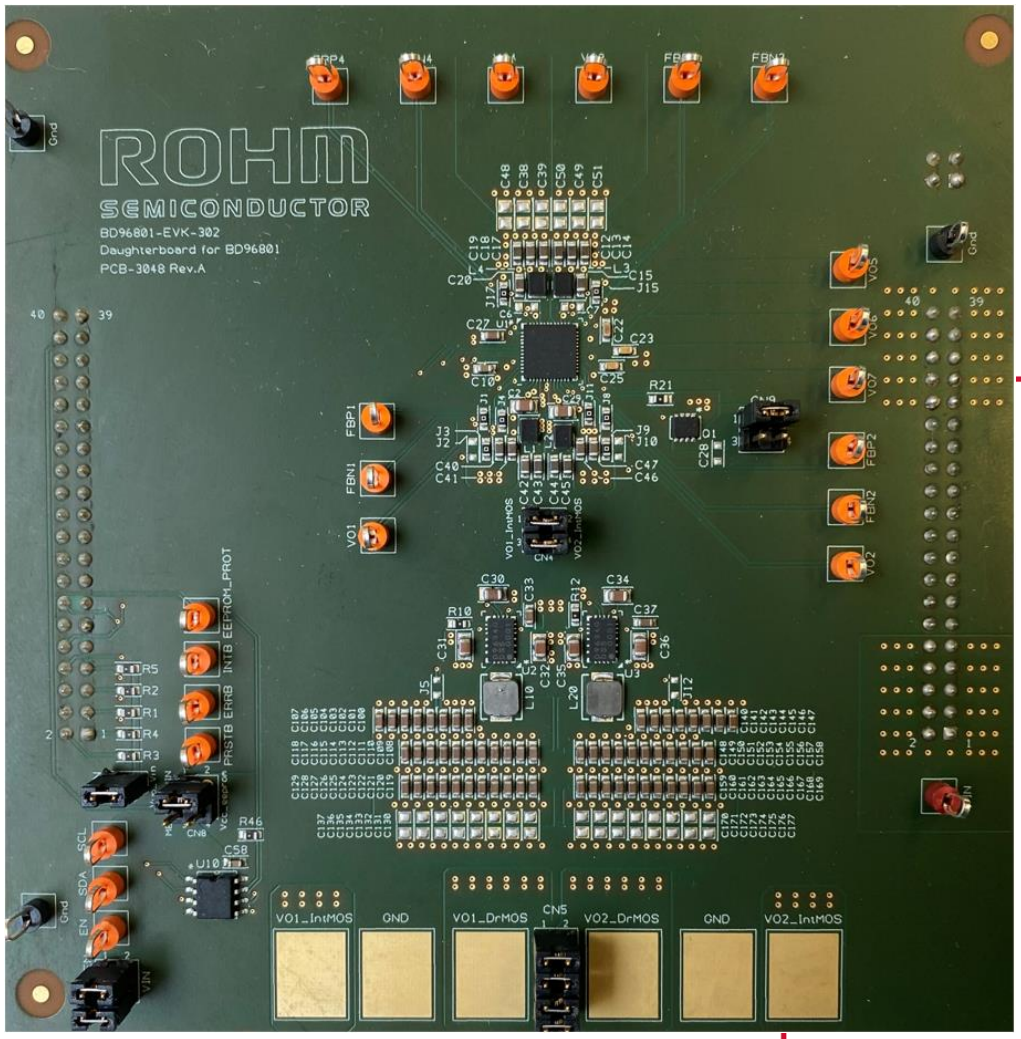
BD96801QXX-C

Scalable PMIC EVK User's Guide



User's Guide

CONTENTS

List of Figures 3
List of Tables 4
1. Revision History 5
Safety Precautions 7
2. Overview 8
2.1. Purpose 8
2.2. Acronyms & Abbreviations 8
2.3. EVK Part List 8
3. Start Up 8
3.1. Board Connection Overview 9
3.2. GUI Software Installation 9
3.3. PC Connection 10
4. MB Description 10
4.1. Input Jumper Selection and Protection Circuit 11
4.2. MCU interface 12
4.3. DB Interface 12
4.4. Level shifters 12
4.5. Reference Voltage for I/O signals and I^2C signals 12
4.6. Output Acquisition Block 12
5. DB Descripton 12
5.1. DB Plug-in 13
5.2. Boards Powering 13
5.3. Load Connection 14
5.4. Board Access Points 14
5.5. Board Settings 15
5.5.1. VO1 & VO2 built-in / External driver MOS 16
5.5.2. Single / Multiphase Operation 16
5.5.3. Local or Remote sense 17
5.5.3.1. Output VO1 18
5.5.3.2. Output VO2 18
5.5.3.3. Output VO3 19
5.5.3.4. Output VO4 20
5.5.4. Load switch / LDO for output VO7 20
5.6. External EEPROM 21

© 2022 ROHM Co., Ltd.

5.7. Stand-alone functioning 22
5.7.1. EN / STBY pin 22
6. Use of the GUI 23
6.1. DB Selection 23
6.2. I²C communication confirmation 24
6.2.1. Board Lost of Communication 25
6.3. GUI Menus 25
6.3.1. Data / Connection tabs 27
6.3.2. Registers tab 27
6.3.3. Settings tab 27
6.4. GUI main area 28
6.4.1. Read Register 29
6.4.2. Write Register 30
7. MB Schematic and BOM 31
8. DB Schematic and BOM 37

LIST OF FIGURES

Figure 1: Board connection overview 9
Figure 2: Executable file 10
Figure 3: EVK connection confirmation 10
Figure 4: MB Functional Blocks 11
Figure 5: BD96801-DB plugged into MB 13
Figure 6: Input Voltage Reference Selection via J3 14
Figure 7: Example of electronic load connected to VO2 14
Figure 8: Connectors for output shortening in case of Multiphase Operation 17
Figure 9: VO1 jumper selection (TOP side) 18
Figure 10: VO1 jumper selection (BOTTOM side) 18
Figure 11: VO2 jumper selection (TOP side) 19
Figure 12: VO2 jumper selection (BOTTOM side) 19
Figure 13: VO3 jumpers' selection (TOP side) 20
Figure 14: VO3 jumpers' selection (BOTTOM side) 20
Figure 15: VO4 jumper selection (TOP side) 20
Figure 16: VO4 jumper selection (BOTTOM side) 20
Figure 17: VO7 configuration selection 21
Figure 18: Resistors for EEPROM address setting 21
Figure 19: pull-up resistors for stand-alone DB use 22
Figure 20: Board selection 23
Figure 21: Confirm board 23
Figure 22: GUI "DB BD96801-EVK-302 Connection" tab 24
Figure 23: Communication information in main page of GUI tool 24

© 2022 ROHM Co., Ltd.

Figure 24: GUI Lost of communication 25
Figure 25: Right side menus 26
Figure 26: Settings tab → Reconfigure product family 28
Figure 27: Read/write register buttons 29
Figure 28: Register value visualization 29
Figure 29: "Error" status read 30
Figure 30: Choose to remove write-protection bits 30
Figure 31: Edit write-protection bit 30
Figure 32: Write protection bit 30
Figure 33: "Write Fail" status when write bit not enabled 30
Figure 34: "Error" status when no I^2C communication is present 31
Figure 35: BD96801-EVK-302 schematics part 1 of 3 40
Figure 36: BD96801-EVK-302 schematics part 2 of 3 41
Figure 37: BD96801-EVK-302 schematics part 3 of 3 42

LIST OF TABLES

Table 1: Acronyms & Abbreviations 8
Table 2: List of access points 15
Table 3: Built-in / External Driver MOS 16
Table 4: Single- / Multiphase operation for output 1+2, feedback jumpers 17
Table 5: Single- / Multiphase operation for outputs 3+4, feedback jumpers 17
Table 6: VO1 jumper configuration 18
Table 7: VO2 jumper configuration 19
Table 8: VO3 jumper configuration 19
Table 9: VO4 jumper configuration 20
Table 10: VO7 configuration selection 21
Table 11: CN8 jumper setting explanation 22
Table 12: CN7 jumper setting explanation 23
Table 13: PMIC-MB-EVK-302 BOM 32
Table 14: BD96801-EVK-302 BOM 39

© 2022 ROHM Co., Ltd.

1. REVISION HISTORY

Revision	Date	Description
001	13 July 2022	First Edition

© 2022 ROHM Co., Ltd.

Important Notice

This evaluation board is intended for **product evaluation in a research and development context only** and is not intended for resale to end consumers and it is not authorized for end customer or household use. This board may not comply with CE or similar standards (including, but not limited to the EMC directive) and may not fulfil other requirements of the country it will be operated in by the user. The user shall ensure that the evaluation board will be handled in a way that is compliant with all the standards and regulations in the country it will be operated in.

The evaluation board provided here has only been subjected to functional testing under typical load conditions. The design of this evaluation board is tested by ROHM only as described in the user guide for this board. The design is not qualified in terms of safety requirements, manufacturing and operation over the entire operating temperature range or lifetime.

This evaluation board may only be used by authorized personnel that is properly trained in recognizing and dealing with the dangers of testing powered on equipment and generally experimenting with powered on circuits. Ensure you review this user guide as it contains important safety warnings. Take care that capacitors on the board have discharged fully before touching any part of the board. Always place the evaluation board under appropriate covers, such as in a Perspex box, to protect against accidental touching of high voltage parts BEFORE applying a voltage supply to the board.

To ensure safe operation, please carefully read all precautions before handling the evaluation board

Before Use

[1] Verify that the parts/components are not damaged or missing (i.e. due to the drops).
[2] Check that there are no conductive foreign objects on the board.
[3] Be careful when performing soldering on the module and/or evaluation board to ensure that solder splash does not occur.
[4] Check that there is no condensation or water droplets on the circuit board.

During Use

[5] Be careful to not allow conductive objects to come into contact with the board.
[6] Please exercise extreme caution when using conductive tools such as tweezers and screwdrivers.
[7] If used under conditions beyond its rated voltage, it may cause defects such as short-circuit or, depending on the circumstances, permanent damages.

After Use

[8] The ROHM Evaluation Board contains the circuits which store the high voltage. Since it stores the charges even after the connected power circuits are cut, please discharge the electricity after using it, and please deal with it after confirming such electric discharge.
[9] Protect against electric shocks by wearing insulated gloves when handling.

This evaluation board is intended for use only in research and development facilities and should by handled **only by qualified personnel familiar with all safety and operating procedures.**

© 2022 ROHM Co., Ltd.

SAFETY PRECAUTIONS

Caution: This evaluation board may only be used by authorized personnel that is properly trained in recognizing and dealing with the dangers of testing high voltage equipment and generally experimenting with high voltage circuits. This board should only be used in a lab facility properly equipped for the safe testing of power electronic systems at the relevant voltage levels. Failure to comply may result in damage to equipment, personal injury or death.

Warning: This evaluation board contains DC bus capacitors which take time to discharge after removal of the power supplies. Before working on the evaluation board wait after deactivating all connected power supplies to ensure that the capacitors have discharged.

Warning: Before disconnecting, connecting or reconnecting wires or measurement probes to the board or before touching the board or performing any manipulations on the board ensure that all external power is removed or disconnected from the board and ensure the capacitors have discharged. Failure to do so may result in damage to equipment, personal injury or death.

Caution: Some component surfaces on the evaluation board may become hot during testing and remain hot for a certain time after turn-off. Take appropriate measures while handling the board after use. Failure to do so may cause personal injury.

Caution: Incorrect connection of power supplies or loads can damage the board. Carefully review the information in this document.

© 2022 ROHM Co., Ltd.

2. OVERVIEW

2.1. Purpose

The Scalable PMIC EVK has the purpose to explore the functionality of the new scalable PMIC BD96801QXX-C.

This user's guide describes the content of the scalable PMIC EVK kit, that consists of:

- 1 x Daughter Board (DB) *BD96801-EVK-302 (PCB3048)*, in the future abbreviated as BD96801-DB, that is the board under test (DUT)
- 1 x Mother Board *PMIC-MB-EVK-302 Revision B (PCB3046)*, in the future abbreviated as PMIC-MB-EVK, that has an MCU plug-in board (CY8CKIT-059) onboard
- 1x ROHM PMIC EVK GUI interface

2.2. Acronyms & Abbreviations

Acronym	Description
DB	Daughter Board
MB	Mother Board
GUI	Graphical User Interface
PMIC	Power Management Integrated Circuit
EVK	Evaluation Kit
DUT	Device Under Test
PMIC-MB-EVK	Mother board EVK
BD96801-DB	Daughter board
BOM	Bill of Material

Table 1: Acronyms & Abbreviations

2.3. EVK Part List

The EVK box consist of:

- 1x PMIC-MB-EVK
- 1x BD96801-DB
- 1x USB – Micro-USB cable
- 1x USB memory stick (containing GUI software)

3. START UP

Some external hardware is needed for the evaluation of the BD96801-DB. In particular:

- A power supply with an output voltage range of 2.5V to 6V and a power capability of at least 75W

© 2022 ROHM Co., Ltd.

- An electronic load, able to sink more current than 20A

3.1. Board Connection Overview

Figure 1 shows an overview of the board connection, highlighting how to connect external hardware for evaluation of our Scalable PMIC EVK. Note that buck1 and buck2 can be configured to either use internal FET (solid blue and green connection lines) or external FET (dashed blue and green connection lines).

For detailed steps, please refer to the next paragraphs.

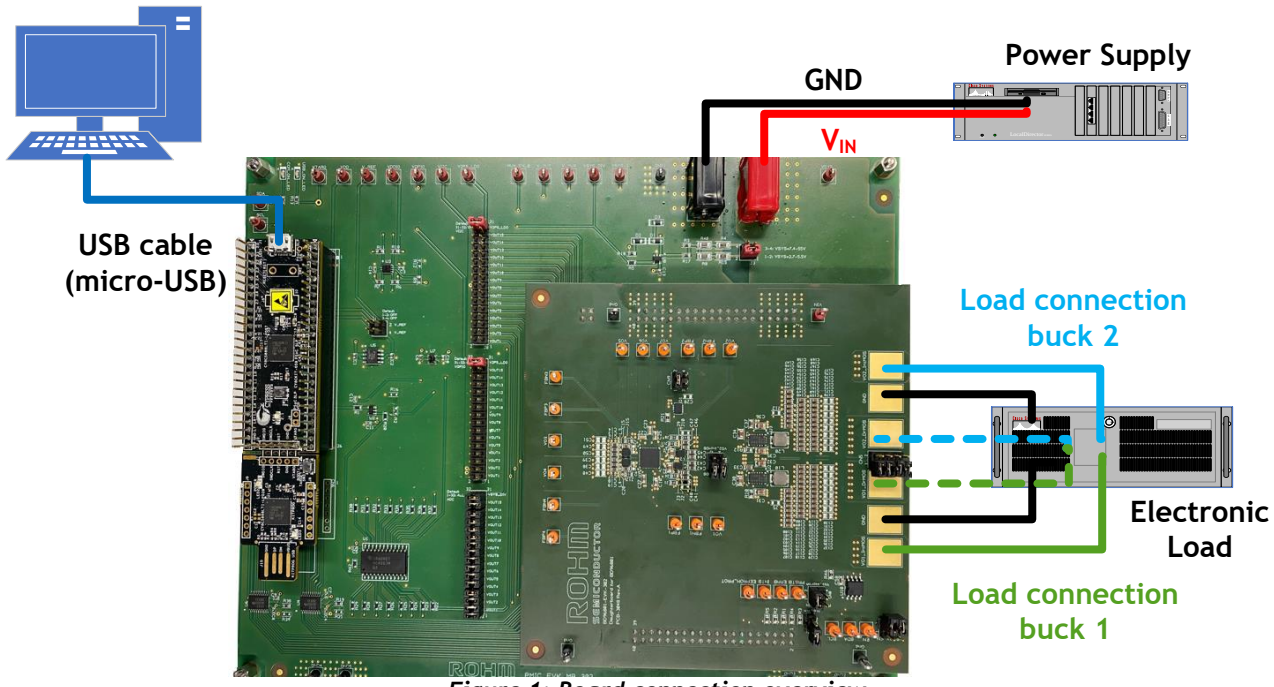


Figure 1: Board connection overview

3.2. GUI Software Installation

To run and test the functionality of BD96801-DB via a computer, the dedicated GUI needs to be installed.

Download the latest version from our website or use the USB stick provided with the EVK kit and extract the .zip file in your own computer folder. Then run the executable file ROHM_EVK.exe to start the GUI.

© 2022 ROHM Co., Ltd.

Figure 2: Executable file

3.3. PC Connection

Communication between GUI software and EVK hardware is achieved by inserting a micro-USB cable into the CY8CKIT-059 plug-in board that is mounted on the MB (see Figure 1 and Figure 4).

Once the communication between GUI and CY8CKIT-059 plug-in board is established, the "EVK connection" box of the GUI software will turn to yellow. The initialization steps are also shown in the "Log" tab at the bottom (see figure below).

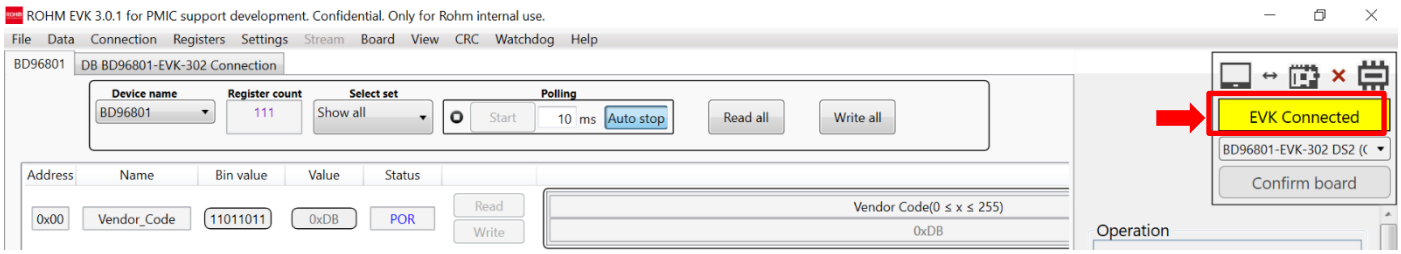


Figure 3: EVK connection confirmation

4. MB DESCRIPTION

The Mother board can be used with a variety of different DBs that are developed for different ROHM ICs. It acts as an interface between the DBs, PC and external equipment.

The functional blocks of the board are shown below:

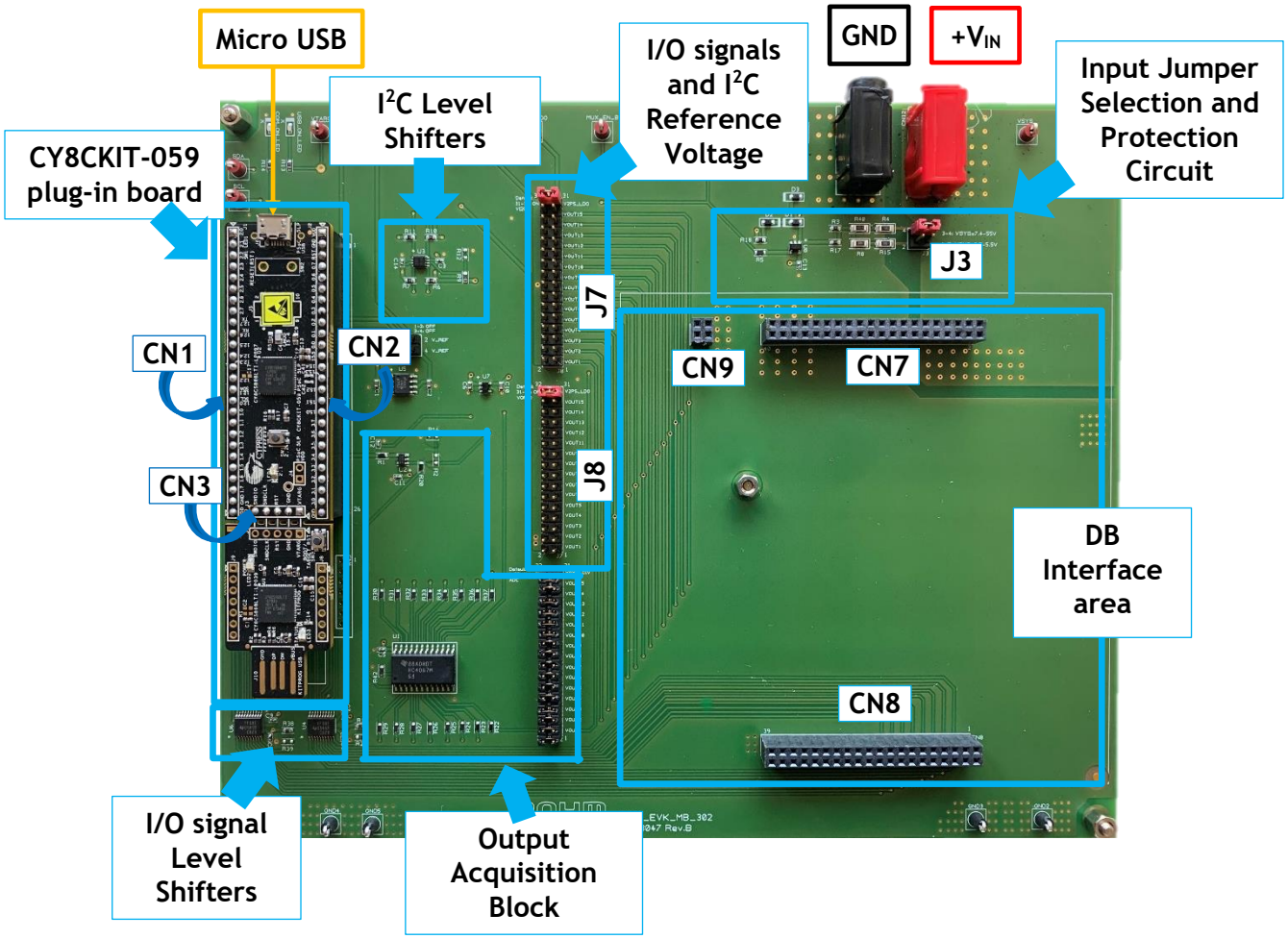


Figure 4: MB Functional Blocks

For schematic details and BOM please refer to paragraph 7.

4.1. Input Jumper Selection and Protection Circuit

Different DBs can have different input voltage ranges. The input voltage is digitized and displayed in the GUI. To get a better accuracy of the displayed input voltage jumper J3 must be set appropriately according to the current input voltage range:

- 2.7 – 5.5V
- 7.4 – 55V

These two paths have different voltage divider circuits. They divide the value of the sensed input voltage such that it remains below the maximum admissible value for the buffered sense circuit.

To avoid destruction of the sense circuit in case the input voltage is beyond the selected range, a circuit protection is onboard to clamp the scaled-down input buffer voltage to a maximum of 4V.

Please note that if J3 is placed in the wrong position the input voltage value shown by the GUI will be incorrect.

© 2022 ROHM Co., Ltd.

4.2. MCU interface

A CY8CKIT-059 plug-in board is included in the MB set. It connects via 3 connectors CN1, CN2 and CN3 (Figure 4 – under CY8CKIT-059 plug-in board) to the MB. Its purpose is to manage the communication between the GUI, MB and DB.

4.3. DB Interface

The DB is plugged into three connectors (CN7, CN8 and CN9).

CN7 carries all power signals (V_{IN} and VOx), CN8 contains all the PMIC signal lines, whereas CN9 is only a fool proof connector to prevent an erroneous DB plug-in orientation.

4.4. Level shifters

The logic signals of the CY8CKIT-059 plug-in board and the MB could have different voltage levels. To adapt the levels three level shifters are foreseen. Two of them, U4 and U6, take care of the I/O signals while U3 handles I^2C signals.

4.5. Reference Voltage for I/O signals and I^2C signals

Different DBs could lead to different required reference levels for I/O signals (V_{GPIO}) or I^2C (V_{I2C}). For this reason, the jumper connectors J7 and J8 (Figure 4) set the voltage reference of V_{GPIO} and V_{I2C} to any chosen output voltage VOx that is provided by the DB or by the local LDO 1.8V reference.

The default setting for both jumpers J7 and J8 is between pin #31 and #32, so the local LDO 1.8V is set for both V_{GPIO} and V_{I2O}. For any additional information on the details of other pin lines, please refer to the schematic in paragraph 7.

4.6. Output Acquisition Block

The MB input voltage (that is also the DB input voltage) and all outputs of the DB are sensed and transferred to the CY8CKIT-059 plug-in board by a multiplexer followed by a buffer stage.

5. DB DESCRIPTON

The BD96801-DB has been designed to provide an easy tool to test the functionality of the new scalable PMIC BD96801.

Multiple test points on the DB make measurements easy.

The BD96801 has 4 buck regulators and 3 LDOs. Buck1 and buck2 can be configured to control either the internal FET or an external driver MOS IC. The other 2 bucks operate with internal FETs. The outputs of buck1 and buck2 can be configured to run either in single phase or multi-phase mode. The same option is available for buck3 and buck4. LDO7 can be configured as an LDO or as a load switch. For details, please refer to the datasheet.

The schematics and the layout are designed with some unmounted capacitors both at the input and at the outputs. This provides more flexibility for the input- and output buffering.

© 2022 ROHM Co., Ltd.

5.1. DB Plug-in

Unless already put in place, before starting the board evaluation, BD96801-DB needs to be plugged-in into MB. Please take care to plug-in correctly in order not to destroy the board itself.

Board orientation is given by connector CN3 (see Figure 5).

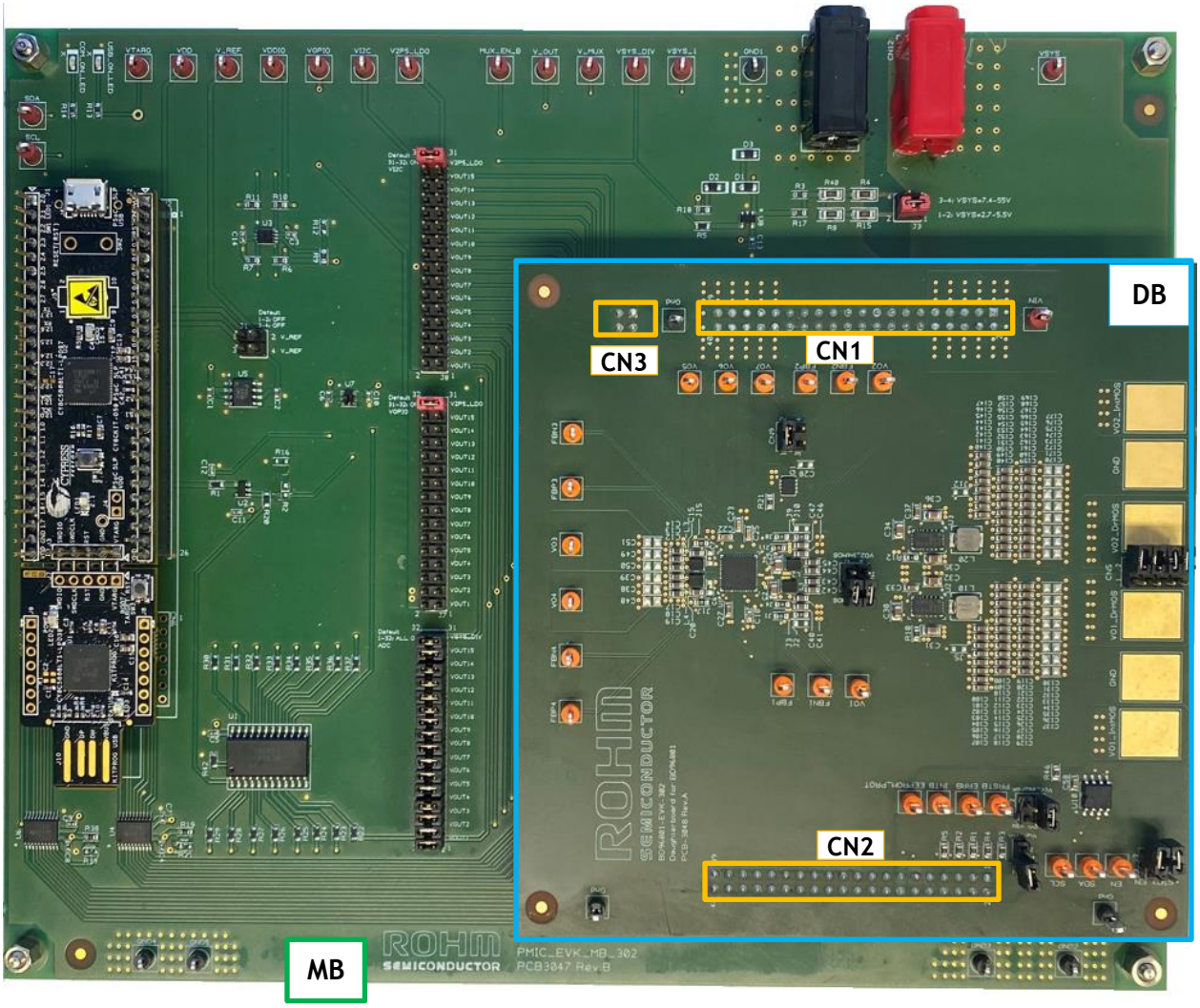


Figure 5: BD96801-DB plugged into MB

5.2. Boards Powering

BD96801-DB is powered via MB banana jacks through CN1 (see Figure 5).

IMPORTANT NOTE:

Before applying power to the MB, please select the current input voltage range according to the plugged-in DB. In case of BD96801-DB, please set jumper J3 on MB (see Figure 6) between pin #1 and #2 for range 2.7 – 5.5V.

© 2022 ROHM Co., Ltd.

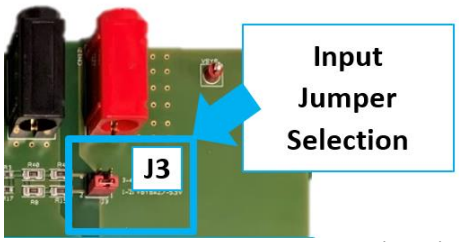


Figure 6: Input Voltage Reference Selection via J3

To power ON the EVK set, an external power supply needs to be connected to the banana jacks (see Figure 1 and Figure 4) that are mounted on the MB. Check that the input voltage is in accordance with the range reported in the BD96801QXX-C datasheet (please take care of the correct orientation of the inputs since no reverse protection is foreseen on the MB yet).

5.3. Load Connection

Each output can be tested in light load or in full load.

An external load can be connected to the access points listed in Table 2 according to the maximum value, as indicated in the datasheet. However, considering the high current that can flow out of the outputs, especially in case of external Driver MOS configuration, copper pads are foreseen where load can be connected for VO1&2. The solid red line in the below picture is used for internal-MOS configuration of VO2 whereas the dashed red line is used for external MOS configuration of VO2.

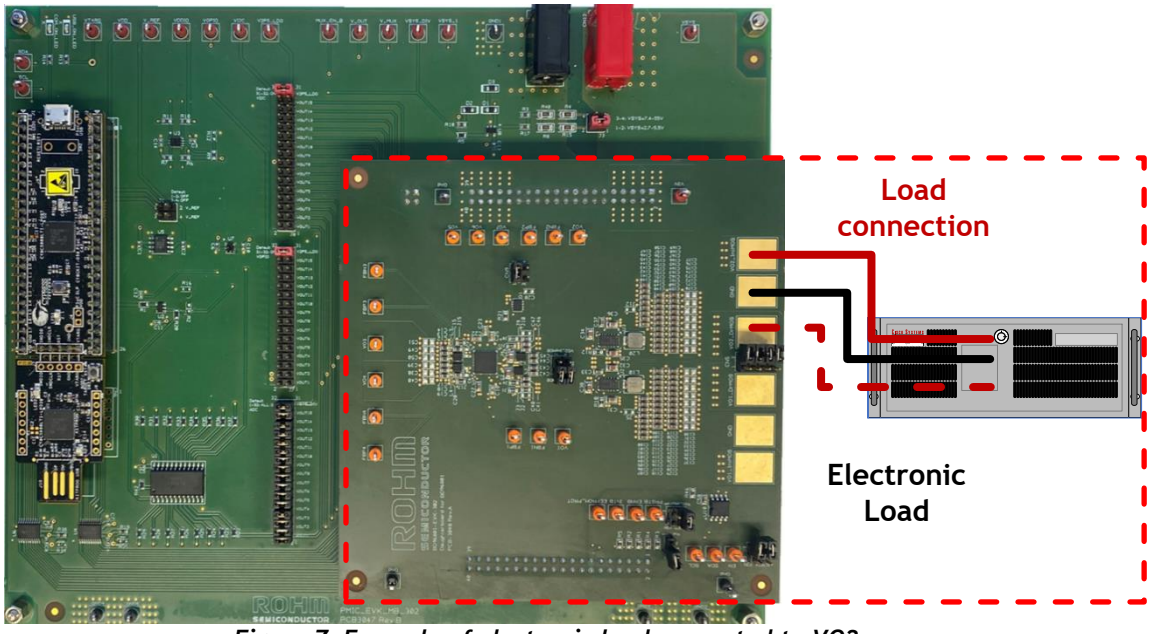


Figure 7: Example of electronic load connected to VO2

5.4. Board Access Points

The EVK board has many access points to ease measurements of PMIC outputs and other signals.

below is a table that summarizes them:

© 2022 ROHM Co., Ltd.

Access point	Description
VO1_IntMOS	Test point for Output 1 configured with built-in MOSFET; solder PAD is present to allow thick cable soldering
VO1_DrMOS	Test point for Output 1 configured with external driver MOSFET; solder PAD is present to allow thick cable soldering
VO1	Test point for Output 1
FBP1	Test point for positive feedback of Output 1
FBN1	Test point for negative feedback of Output 1
VO2_IntMOS	Test point for Output 2 configured with built-in MOSFET; solder PAD is present to allow thick cable soldering
VO2_DrMOS	Test point for Output 2 configured with external driver MOSFET; solder PAD is present to allow thick cable soldering
VO2	Test point for Output 2
FBP2	Test point for positive feedback of Output 2
FBN2	Test point for negative feedback of Output 2
VO3	Test point for Output 3
FBP3	Test point for positive feedback of Output 3
FBN3	Test point for negative feedback of Output 3
VO4	Test point for Output 4
FBP4	Test point for positive feedback of Output 4
FBN4	Test point for negative feedback of Output 4
VO5	Test point for Output 5
VO6	Test point for Output 6
VO7	Test point for Output 7
INTB	Interrupt signal pin.
ERRB	Open-drain Error signal pin
PRSTB	Reset signal output pin
EN	Test point for Enable pin
SDA	Test point for serial interface data (I2C)
SCL	Test point for serial interface clock (I2C)
VIN	Test point for board Input Voltage
GND	Test point for Ground

Table 2: List of access points

5.5. Board Settings

The BD96801-DB has been developed allowing to apply all possible configurations that are supported by the BD96801, meaning:

- Built-in / external MOS for outputs VO1 & 2
- Single / Multiphase for outputs VO1 & VO2
- Single / Multiphase for outputs VO3 & VO4
- Local / Remote feedback for outputs VO1 to VO4
- Load switch / LDO for output VO7

© 2022 ROHM Co., Ltd.

A detailed description about the settings of the board to obtain these different modes is explained more detailed from paragraph 5.5.1 to paragraph 5.5.3.4.

The default settings for each output are:

- VO1 with built-in MOS and local sense
- VO2 with built-in MOS and local sense
- VO3 with local sense
- VO4 with local sense
- LDO for output VO7

5.5.1. VO1 & VO2 built-in / External driver MOS

To generate the output voltages VO1 and VO2 the BD96901XXX-C can be configured to either use the built-in MOSFET or to control an external driver MOS DB96340 for higher current capability.

To select one of the 2 options some 0 Ω jumper resistors need to be added or removed.

The default setting for VO1 and VO2 is to use the built-in MOS with local sense. The table indicates which jumpers need to be soldered or removed to set up the desired option. However, for a complete configuration overview, including local/remote sense preference, see Table 6 and Table 7.

Output	Built-in / Driver MOS	J2	J3	J4	J5	J6	J7
VO1	Built-in MOS	✓	✗	✓	✗	✓	✗
	External Driver MOS	✗	✓	✗	✓	✗	✓
		J9	J10	J11	J12	J13	J14
VO2	Built-in MOS	✓	✗	✓	✗	✓	✗
	External Driver MOS	✗	✓	✗	✓	✗	✓

Table 3: Built-in / External Driver MOS

For the location of the jumper resistors in the PCB refer to Figure 9 to Figure 12.

5.5.2. Single / Multiphase Operation

VO1 and VO2 can be configured to operate in single or multiphase mode. For multi-phase mode the two outputs need to be shorted with each other. This can be applied by either using jumpers to short the pins of connector CN4 (in case of built-in MOS) or CN5 (in case of external driver MOS), or shorting externally the outputs with proper cables, according to the requested current capability.

Additionally, the return signal FBP2 need to be left open. Unmount J8 for this. FBN2 needs to remain tied to GND. Mount J11 if the built-in MOS is used, or J12 if external MOS driver is used. Refer to Table 4 for details.

Make sure that both output voltages are set to the same value (PMIC registers 0x21h and 0x22h).

© 2022 ROHM Co., Ltd.

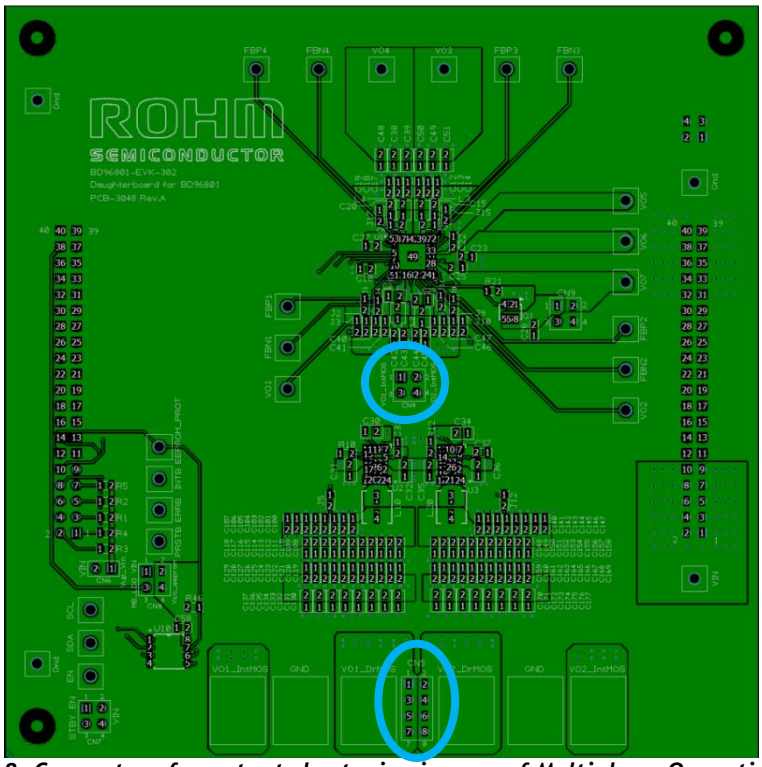


Figure 8: Connectors for output shortening in case of Multiphase Operation

Similarly, VO3 and VO4 can also be configured in single or multiphase mode. For multi-phase mode short outputs VO3 and VO4 with each other. FBP4 needs to be left open and FBN4 needs to remain connected to GND. That can be achieved by leaving J17 unmounted and by mounting J18. See Table 5 for details.

Make sure that both output voltages VO3 and VO4 are set to the same value (PMIC registers 0x23h and 0x24h).

Output	Phase	Built-in / Driver MOS	J8	J11	J12
VO1+V2 (short)	Single	Built-in MOS	✔	✔	✘
		Dr MOS	✔	✘	✔
	Multi	Built-in MOS	✘	✔	✘
		Dr MOS	✘	✘	✔

Table 4: Single- / Multiphase operation for output 1+2, feedback jumpers

Output	Phase	J17	J18
VO3+V4 (short)	Single	✔	✔
	Multi	✘	✔

Table 5: Single- / Multiphase operation for outputs 3+4, feedback jumpers

5.5.3. Local or Remote sense

The BD96801-DB allows local and remote sensing options. At high loads remote sensing should be the preferred option.

© 2022 ROHM Co., Ltd.

To configure them, some 0 Ω resistors must be soldered/unsoldered according to Table 6 to Table 9.

5.5.3.1. Output VO1

Output 1 of BD96801QXX-C can be set to either use a built-in MOSFET or an external Driver MOS. In both cases, remote/local sense can be chosen according to the jumper selection depicted in Table 6 (green cells with thick boundary indicate the default setting). Additionally, the test pins FBP1 and FBN1 need to be connected close to the load.

Output	Feedback	Built-in / Driver MOS	J1	J2	J3	J4	J5	J6	J7
VO1	Local	**Built-in MOS**	✔	✔	✘	✔	✘	✔	✘
		Dr MOS	✔	✘	✔	✘	✔	✘	✔
	Remote	Built-in MOS	✘	✔	✘	✘	✘	✔	✘
		Dr MOS	✘	✘	✔	✘	✘	✘	✔

Table 6: VO1 jumper configuration

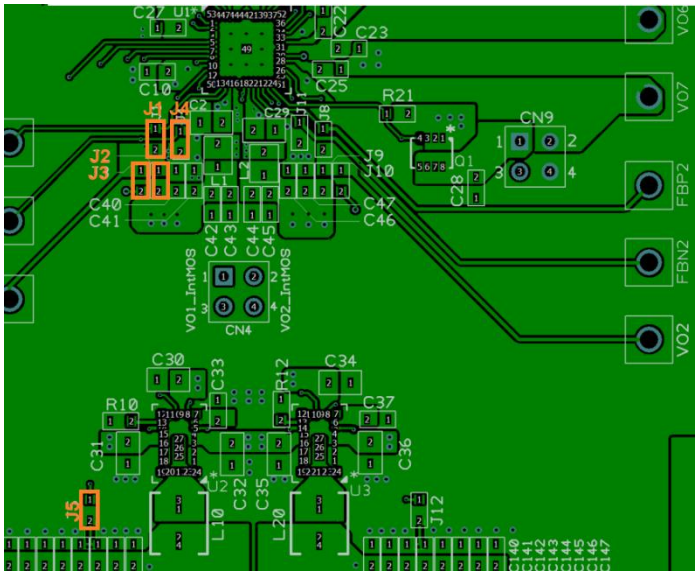


Figure 9: VO1 jumper selection (TOP side)

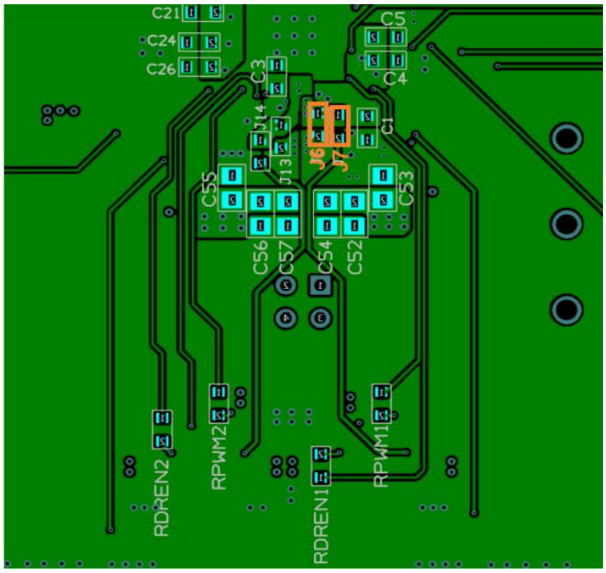


Figure 10: VO1 jumper selection (BOTTOM side)

5.5.3.2. Output VO2

Also, Output 2 of the BD96801QXX-C can be configured to either use a built-in MOSFET or an external Driver MOS. In both cases, remote/local sense can be chosen according to the jumper selection depicted in Table 7 (green cells with thick boundary indicate the default setting). Additionally, the test pins FBP2 and FBN2 need to be connected close to the load.

Output	Feedback	Built-in / Driver MOS	J8	J9	J10	J11	J12	J13	J14
VO2	Local	**Built-in MOS**	✔	✔	✘	✔	✘	✔	✘
		Dr MOS	✔	✘	✔	✘	✔	✘	✔
	Remote	Built-in MOS	✘	✔	✘	✘	✘	✔	✘

© 2022 ROHM Co., Ltd.

		Dr MOS	✗	✗	✓	✗	✗	✗	✓

Table 7: VO2 jumper configuration

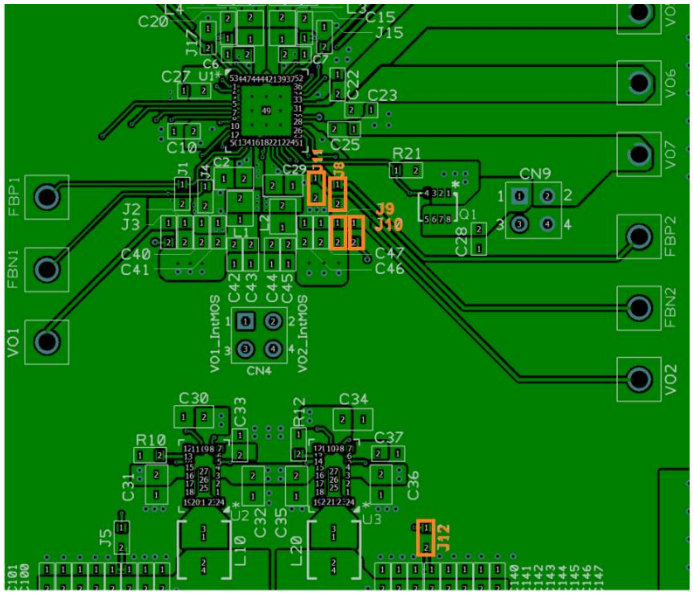


Figure 11: VO2 jumper selection (TOP side)

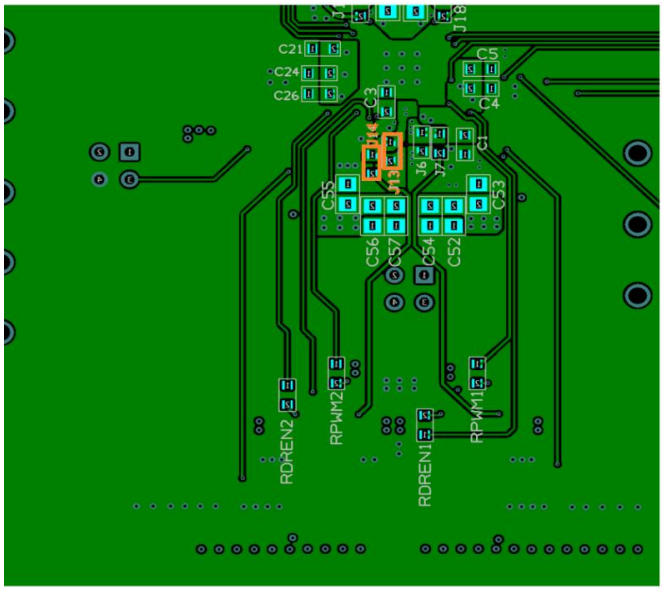


Figure 12: VO2 jumper selection (BOTTOM side)

5.5.3.3. Output VO3

Output 3 remote/local sense is possible according to jumper selection of Table 8. Additionally, the test pins FBP3 and FBN3 need to be connected close to the load.

Output	Feedback	J15	J16
VO3	Local	✓	✓
	Remote	✗	✗

Table 8: VO3 jumper configuration

© 2022 ROHM Co., Ltd.

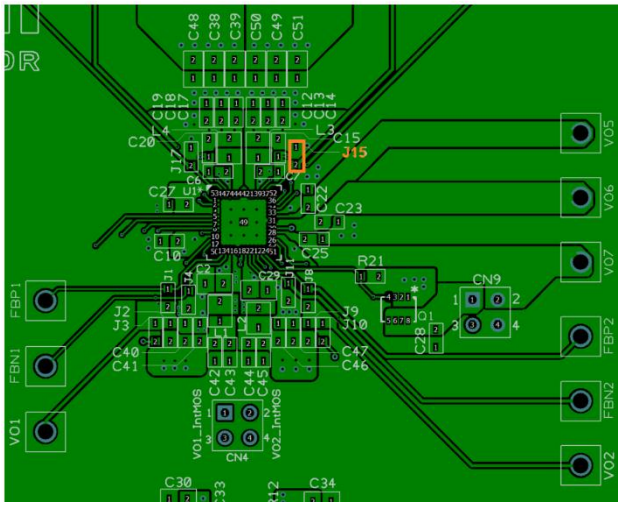


Figure 13: VO3 jumpers' selection (TOP side)

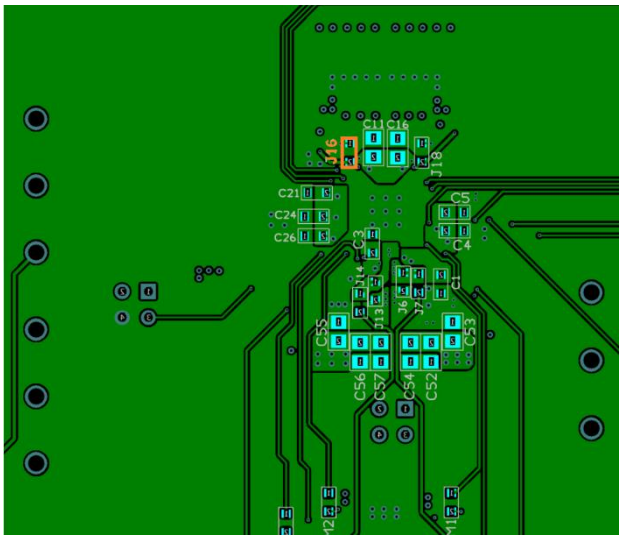


Figure 14: VO3 jumpers' selection (BOTTOM side)

5.5.3.4. Output VO4

Output 4 remote/local sense is possible according to jumper selection of Table 9. Additionally, the test pins FBP4 and FBN4 need to be connected close to the load.

Output	Feedback	J17	J18
VO4	Local	✔	✔
	Remote	✘	✘

Table 9: VO4 jumper configuration

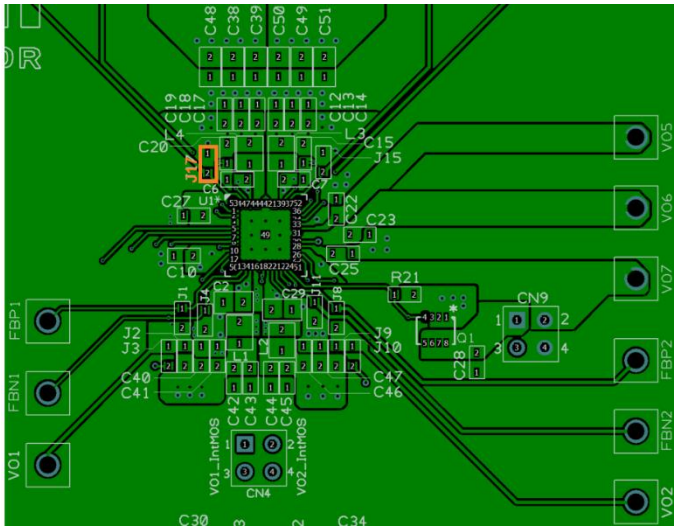


Figure 15: VO4 jumper selection (TOP side)

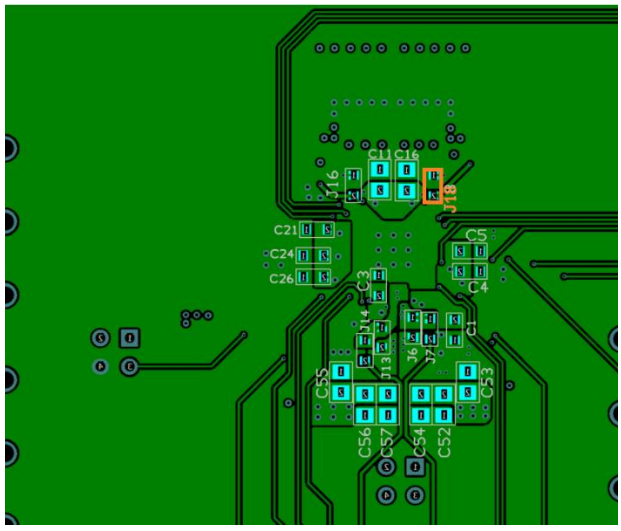


Figure 16: VO4 jumper selection (BOTTOM side)

5.5.4. Load switch / LDO for output VO7

Output 7 of the BD96801QXX-C can be configured as LDO or Load Switch. Components for both options are onboard. It is possible to easily switch between the configurations by simply moving the jumper on connector CN9.

© 2022 ROHM Co., Ltd.

The table below indicates the location of jumper on CN9 as well as some other component settings for each option. Note that Q1, R21 and C28 could also be kept onboard in LDO mode though they are not needed.

Output	VO7 option	External PMOS Q1	R21	C28	CN9
VO7	LDO control	✗	✗	✗	**Pins # 3 and #4**
	Load Switch	✓	✓	✓	**Pins # 1 and #2**

Table 10: VO7 configuration selection

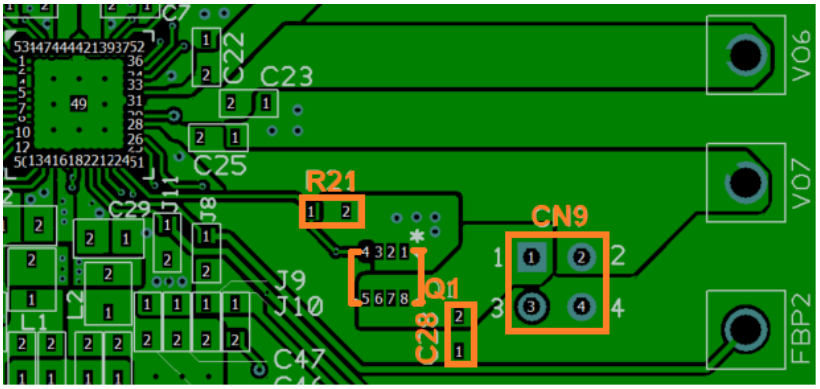


Figure 17: VO7 configuration selection

5.6. External EEPROM

The default settings of the BD96801QXX-C are stored in its OTP memory. However, the IC can also read settings during start-up that are provided by an external EEPROM. In the register map of the data sheet these settings are listed in column “EEP”.

The EEPROM slave address has been initially set to 0x000, but it can be changed (see EPPROM datasheet for address details) by soldering or removing resistors R40 to R45. The default board settings are: R40 to R42 are 0 Ω resistors and R43 to R45 are not mounted.

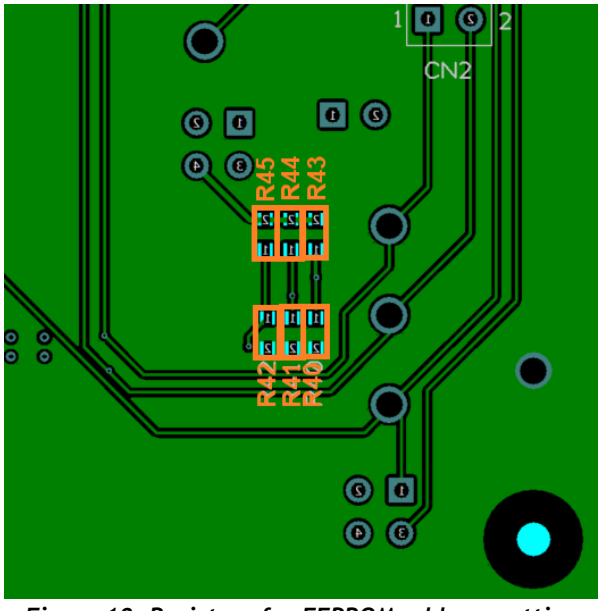


Figure 18: Resistors for EEPROM address setting

© 2022 ROHM Co., Ltd.

Connector CN8 (see Figure 19) provides the power supply to the memory. If the DB is plugged into the MB a jumper needs to be placed between pins #3 and #4. In this case the EEPROM gets its supply voltage from a 1.8V LDO of the MB. See the table below for a short description about the jumper positions of CN8:

CN8 jumper position	Meaning
Pins #1 and #2	EEPROM supply voltage from V_{IN}. Configuration needed when DB is used “stand-alone”
Pins #3 and #4	EEPROM supply voltage from 1.8V MB LDO. Configuration needed when DB is plugged into MB

Table 11: CN8 jumper setting explanation

5.7. Stand-alone functioning

BD96801-DB has been designed to be used in combination with the PMIC-MB-EVK and the GUI interface. However, the DB can also be operated in stand-alone mode without the GUI software.

To do so, a jumper must be placed between pins #1 and #2 of CN6 so that 10kΩ pull-up resistors provide a pull-up voltage for INTB, PRSTB, ERRB and I^2C signals.

If an external EEPROM is used, the jumper on connector CN8 must be placed between pins #1 and #2 (see Table 11 for details).

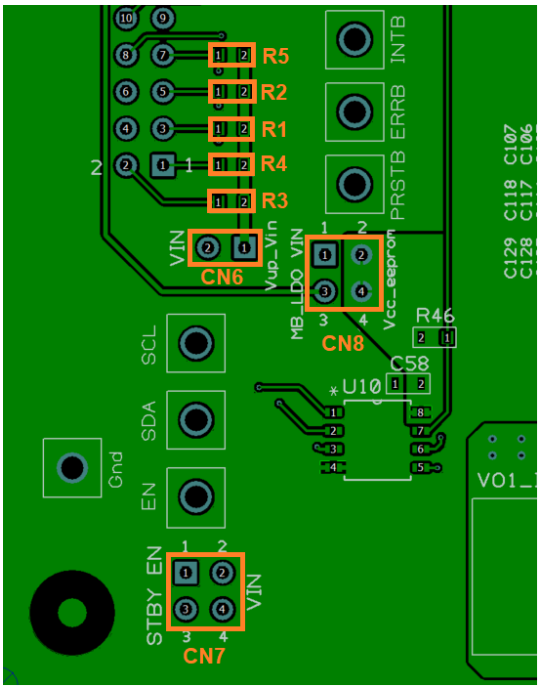


Figure 19: pull-up resistors for stand-alone DB use

5.7.1. EN / STBY pin

In stand-alone mode there is no GUI to control the level of EN and STBY. Hence, these pins must be set to high level for the proper functioning of the PMIC.

This is done by placing 2 jumpers onto connector CN7 (see figure above). In particular:

© 2022 ROHM Co., Ltd.

- Use jumper between pins #1 and #2 to set EN high
- and jumper between pins #3 and #4 to set STBY high.

The table below shows the meaning of the 2 jumper positions:

CN7 jumper position	Meaning
Pins #1 and #2	EN pin is pulled-up to V_{IN}
Pins #3 and #4	STBY pin is pulled-up to V_{IN}

Table 12: CN7 jumper setting explanation

If the DB is plugged into the MB, no CN7 jumpers must be placed.

6. USE OF THE GUI

6.1. DB Selection

After applying the power, as described in the previous paragraphs, select the board name "*BD96801-EVK-302 (CRC OFF, RnD)*" in the drop-down menu on the top right side of the GUI. Alternatively, you could also choose the board in the tab "Board" on the top-left side of the GUI.

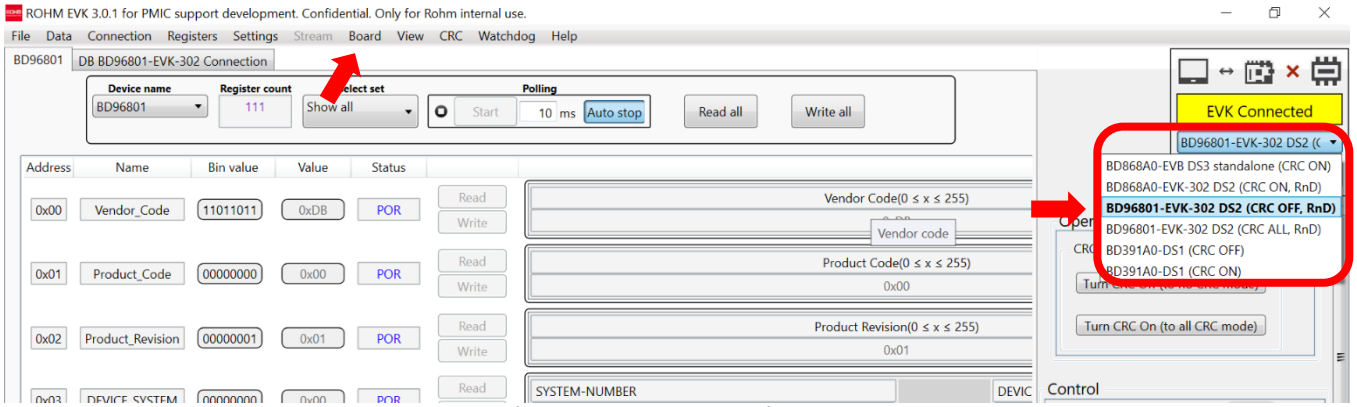


Figure 20: Board selection

Once done, you need to press the "Confirm board" button. Now the field "EVK connection" turns green.

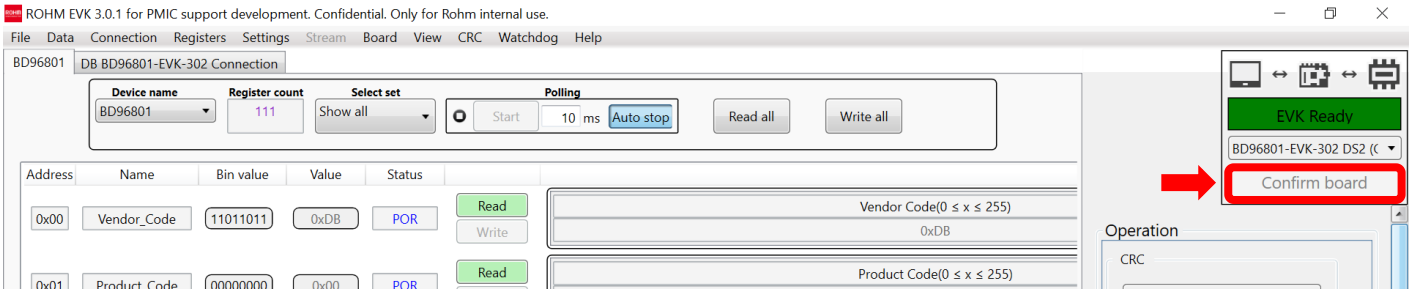
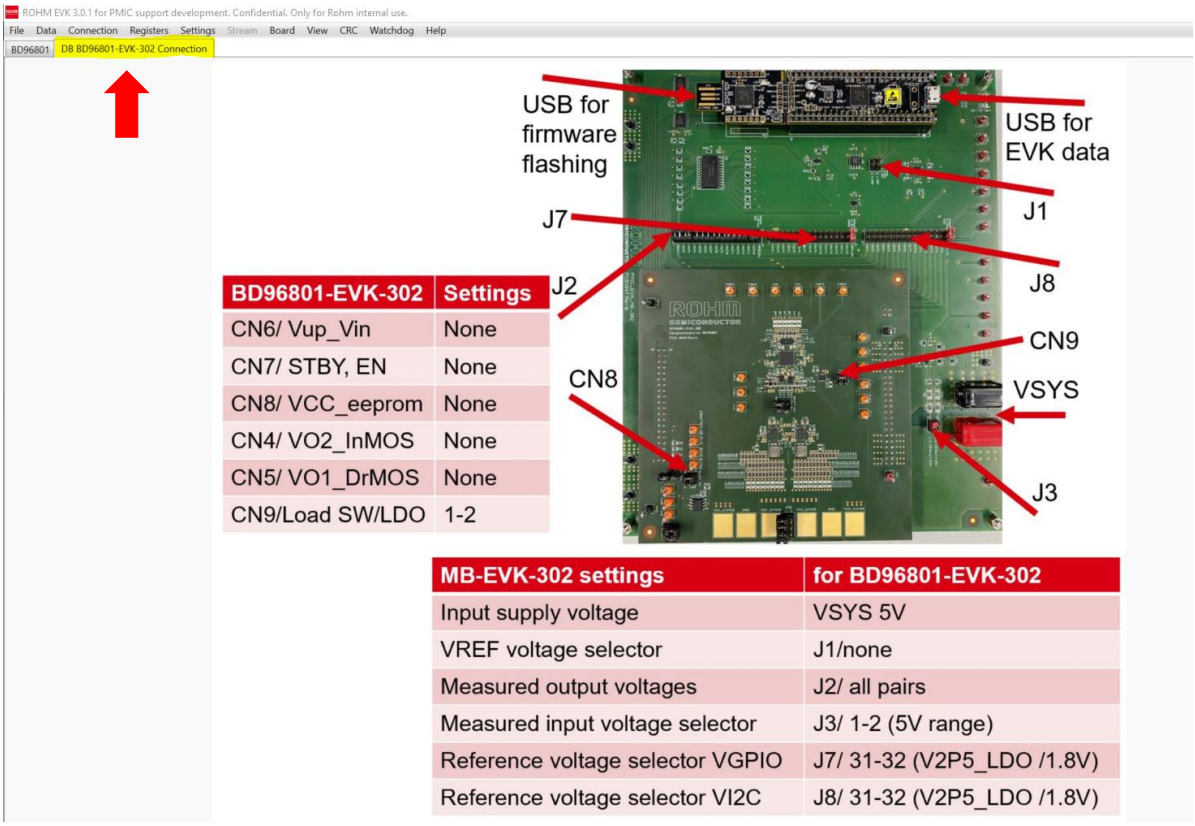


Figure 21: Confirm board

Board matching can also be verified in the "DB BD96801-EVK-302 Connection" tab:

© 2022 ROHM Co., Ltd.



BD96801-EVK-302	Settings
CN6/ Vup_Vin	None
CN7/ STBY, EN	None
CN8/ VCC_eeprom	None
CN4/ VO2_InMOS	None
CN5/ VO1_DrMOS	None
CN9/Load SW/LDO	1-2

MB-EVK-302 settings	for BD96801-EVK-302
Input supply voltage	VSYS 5V
VREF voltage selector	J1/none
Measured output voltages	J2/ all pairs
Measured input voltage selector	J3/ 1-2 (5V range)
Reference voltage selector VGPIO	J7/ 31-32 (V2P5_LDO /1.8V)
Reference voltage selector VI2C	J8/ 31-32 (V2P5_LDO /1.8V)

Figure 22: GUI "DB BD96801-EVK-302 Connection" tab

6.2. I²C communication confirmation

After selection of the board name and pressing of the "Confirm board" button, the confirmation of the correct functioning of the board is given in the "Connection status" box on the top right side of the GUI.

A green "EVK Ready" will appear as depicted in Figure 23.

Input & output voltages are also simultaneously displayed in the related cells.

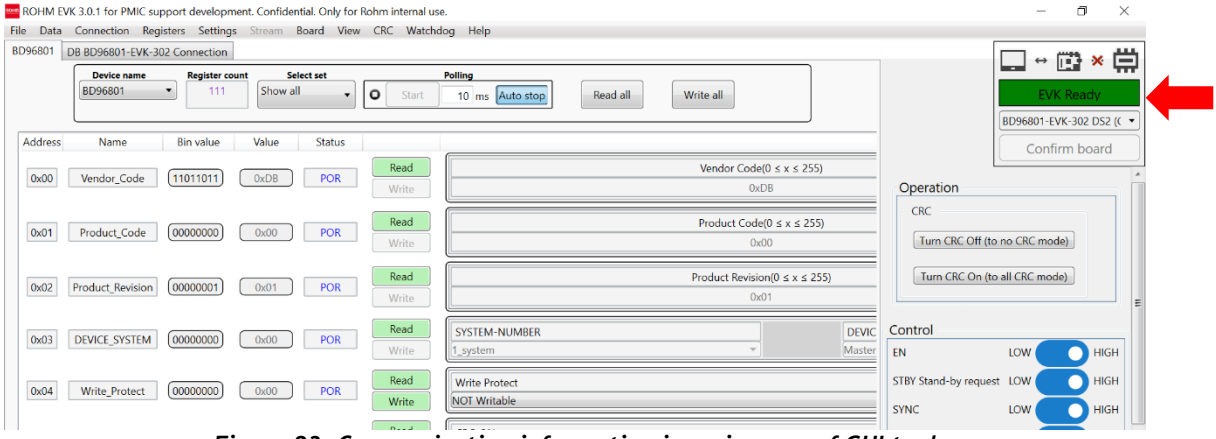


Figure 23: Communication information in main page of GUI tool

6.2.1. Board Lost of Communication

Problems with I²C communication during testing operation will not generate an automatic failure message. However, the status turns to “Error” after pressing any read/write button.

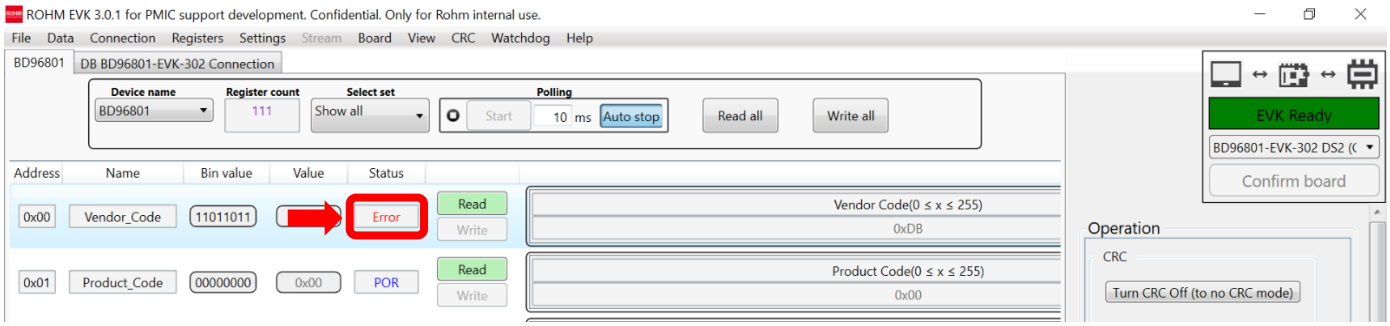


Figure 24: GUI Lost of communication

In this state the voltage values will not be updated even if the voltage box keeps showing the last value before the loss of communication.

Also, no access to PMIC registers is possible.

6.3. GUI Menus

In the top left corner of the GUI menu a “Help” menu provides information regarding revision, version and configuration of the CY8CKIT-059 plug-in board and the GUI software.

On the right side is an area containing the following elements:

- “EVK connection” box that indicates the status of the communication between GUI and CY8CKIT-059 plug-in board that is plugged-in into the MB
- Drop down menu for EVK selection
- “Confirm board” button that needs to be pressed, once the appropriate EVK is selected from the drop-down menu
- “Control” & “Status” boxes, where CRC, *EN*, *STBY*, *SYNC* and EEPROM protection buttons are available. Below them are status flags for *INTB*, *ERRB and PRSTB*, followed by a box “ADC” indicating the input voltage as well as all output voltages.

© 2022 ROHM Co., Ltd.

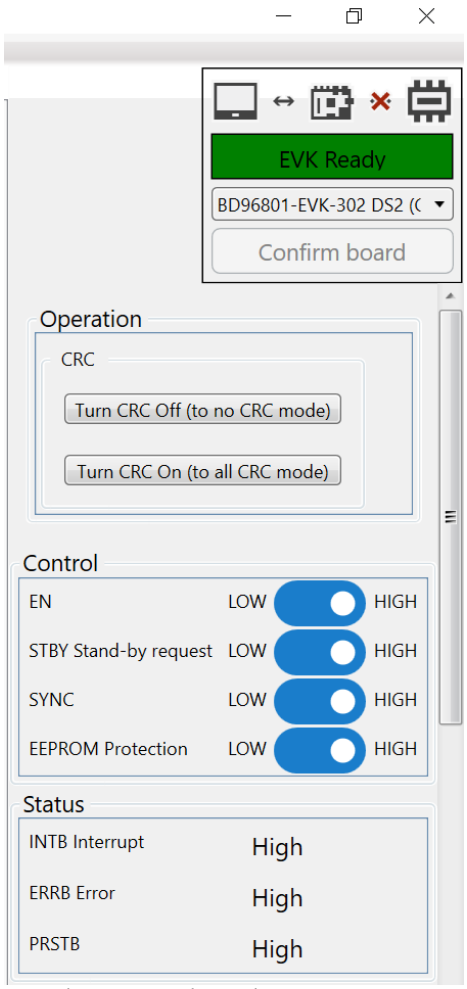


Figure 25: Right side menus

The GUI contains 11 main tabs:

- File (allows to exit GUI software)
- Data
- Connection
- Registers
- Settings
- Stream (disabled for BD96801 GUI)
- Board (see chapter 6.1)
- View (enables/disables additional views)
- CRC (turns CRC mode on/off)

© 2022 ROHM Co., Ltd.

- Watchdog (enables disables watchdog reset signals via I2C)
- Help

The following sub-chapters describe some of them.

6.3.1. Data / Connection tabs

The Data tab offers the possibility to log the data.

The Connection tabs offers choices to connect the EVK via USB cable or BLE (Bluetooth Low Energy) connection. However, BLE is not supported for the BD96801-EVK-302.

6.3.2. Registers tab

Register contents can be saved into a file or into the IC. It is also possible to read registers from a file or from the IC.

6.3.3. Settings tab

The most important drop-down item is probably “Reconfigure product family”. The correct product family needs to be assigned to the GUI software tool to make it work correctly. As a preparation the appropriate json software key that needs to be requested at a Rohm representative, needs to be copied into the folder ROHM-EVK-GUI→ConfigurationKeys.

© 2022 ROHM Co., Ltd.

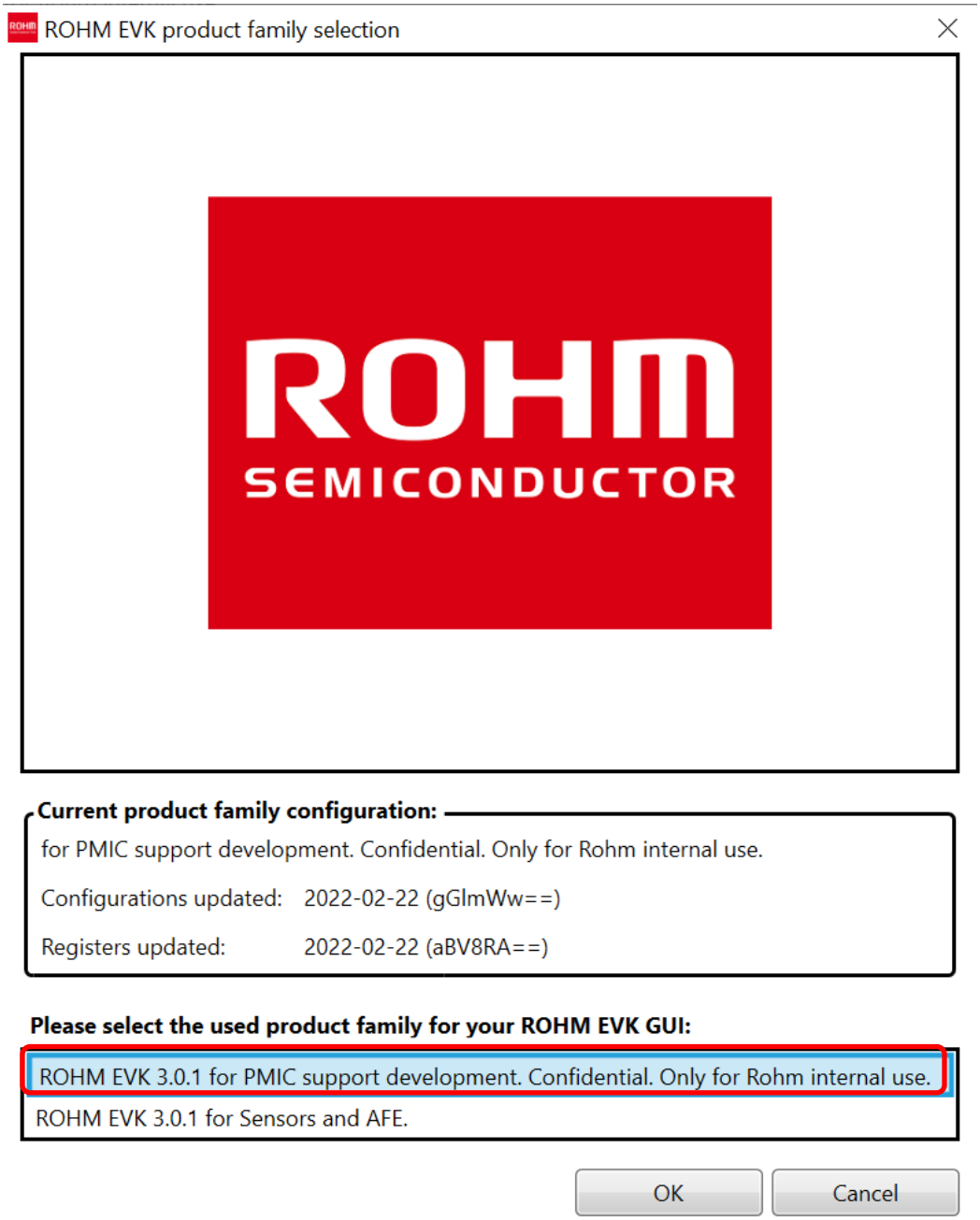


Figure 26: Settings tab → Reconfigure product family

6.4. GUI main area

For each register address, name, binary value, hexadecimal value and status values are shown. “Read” & “Write” buttons are also present to read out a register or to write into a register.

© 2022 ROHM Co., Ltd.

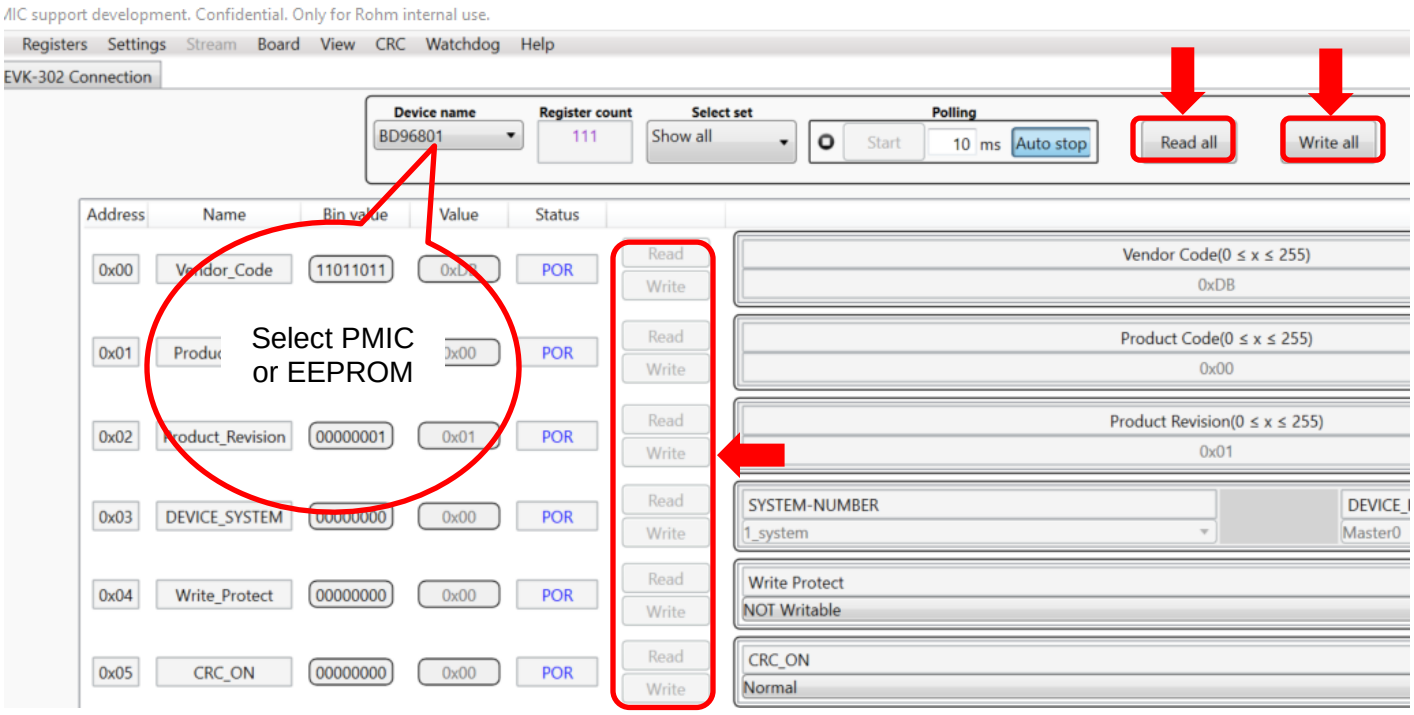


Figure 27: Read/write register buttons

6.4.1. Read Register

Any register can be read by pressing the “Read all” button highlighted in the figure above or by using the “Read” button that is part of each register row in the GUI.

The hexadecimal value will be displayed in the “Value” box. The single bit indication will be updated in the register map area as well.

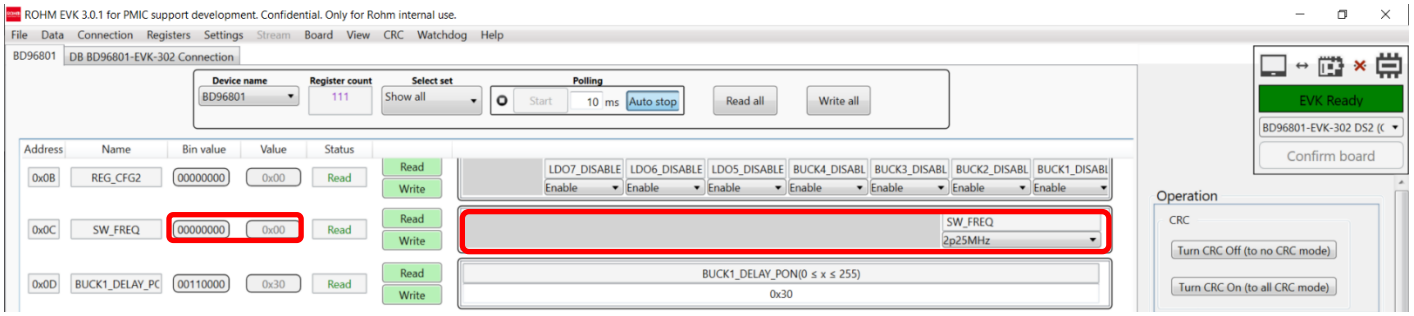


Figure 28: Register value visualization

If a read action fails, the status next to the address will show the message “Error”.

© 2022 ROHM Co., Ltd.

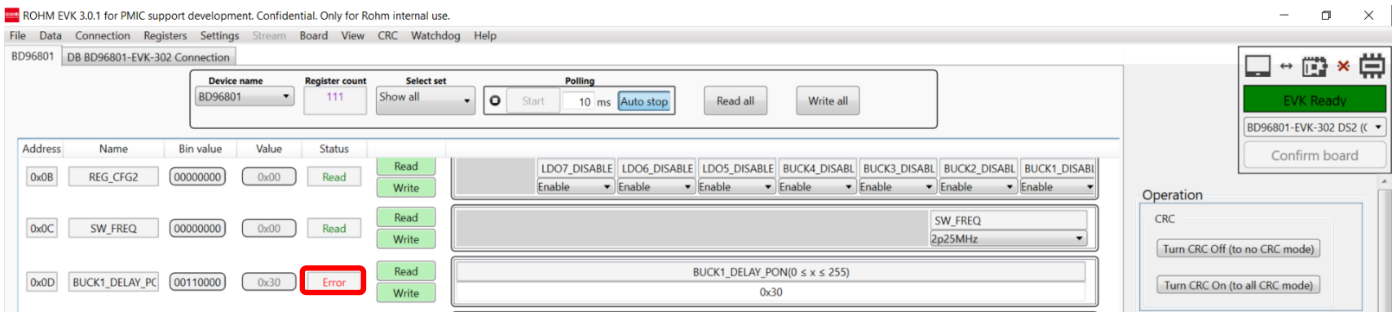


Figure 29: "Error" status read

6.4.2. Write Register

To write any of the writable registers, the user must first enable the write-operation. This is done by changing the content of register 0x04:

1. Choose "Writable" from the drop-down menu (register 0x04).

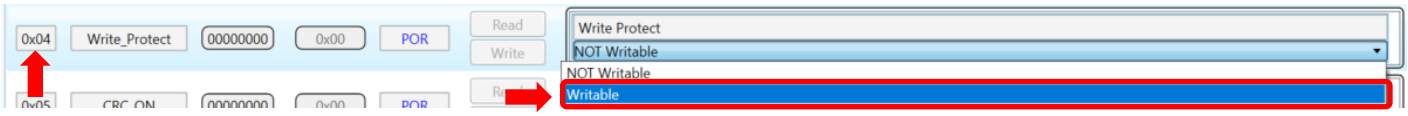


Figure 30: Choose to remove write-protection bits

2. Now the binary value and the hexadecimal value change and "Edited" appears in the "Status" box.

Figure 31: Edit write-protection bit

3. Press "Write" button and the status box will change to "Stored".

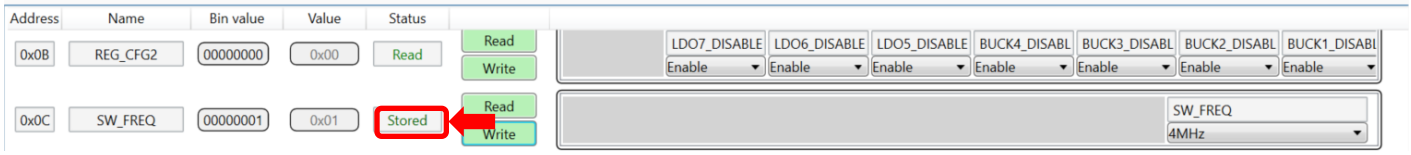


Figure 32: Write protection bit

If the write-protection bit is not enabled first, no register can be written, and the indication "W*rite Fail*" will appear in the status box next to the register.

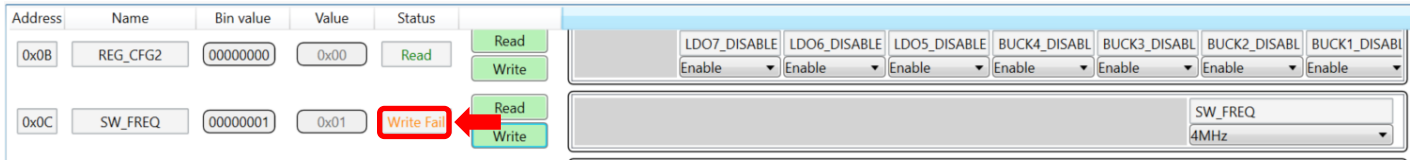


Figure 33: "Write Fail" status when write bit not enabled

© 2022 ROHM Co., Ltd.

If a user tries to write a register while no I²C communication is present, “Error” will be displayed in the status box:

Figure 34: "Error" status when no I²C communication is present

7. MB SCHEMATIC AND BOM

Schematic and BOM of PMIC-MB-EVK are reported hereafter.

Reference	Characteristic	Parts Number	Manufacturer
CN1, CN2	2.54mm connector 1x26 female	TSW-126-07-G-S	Samtec
CN3, CN4	2.54mm connector 1x5 female	TSW-105-07-G-S	Samtec
CN5, CN6	2.54mm connector 1x7 female	TSW-107-07-G-S	Samtec
CN7, CN8	2.54mm connector 2x20 female	SSQ-120-03-G-D	Samtec
CN9	2.54mm connector 2x2 female	SSQ-102-03-G-D	Samtec
CN12	4mm Female Red	24.243.1	Multicomp
CN13	4mm Female Black	24.243.2	Multicomp
J1, J3	2.54mm header 2x2 male	TSW-102-07-G-D	Samtec
J2, J7, J8	2.54mm header 2x16 male	TSW-116-07-G-D	Samtec
U1	16-Channel	CD74HC4067M	TI
U2, U8	Ultra-Low Noise Ground Sense	LMR1802G-LB	ROHM
U4, U6	8-Bit Bi-directional	TXS0108EPW	TI
U3	I2C and SMBus	TXS0102DCT	TI
U5	LDO 1.024V	LM4140ACM-1.0/NOPB	TI
U7	LDO 2.5V	BU25TD3WG	ROHM
USB_ON_LED, COM_ON_LED	LED 0603 Green	SML-D12P8W	ROHM
D1, D2	Schottky diode VF=0.37V	RB751VM-40	ROHM
D3	Zener diode 3.6V-3.845V	UDZVTE-173.6B	ROHM
C1, C2, C6, C10	1uF, 16V, 10%, X7R, 0603	EMK107B7105KA-T	Taiyo Yuden
C3, C4, C5, C7, cn8 , C9, C11, C13, C14	100nF, 16V, 10%, X7R, 0402	EMK105B7104KV-F	Taiyo Yuden
C12	10pF, 50V, 5%, U2J, 0402	UMK105UJ100DV-F	Taiyo Yuden
R1, R5, R20, R42, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32,	0R, 0603, 1/4W	PMR03EZPJ000	ROHM

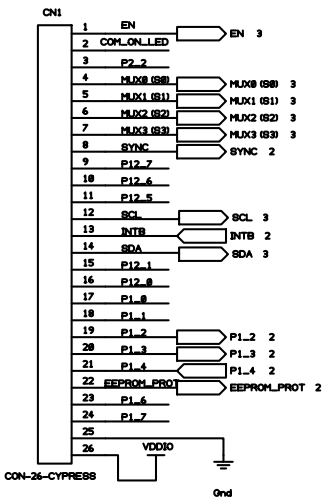
© 2022 ROHM Co., Ltd.

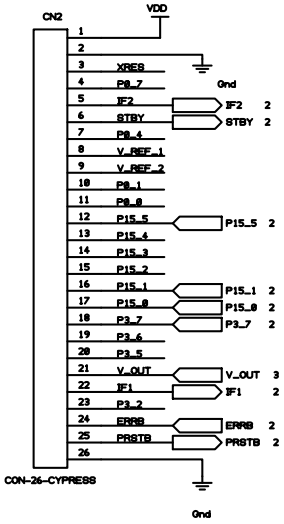
R33, R34, R35, R36, R37			
R13, R14	220R, 0603, 5%, TC200, 1/10W	MCR03EZPJ221	ROHM
R2	100k, 0603, 5%, TC200, 1/10W	MCR03EZPJ104	ROHM
R16	5.1k, 0603, 5%, TC200, 1/10W	MCR03EZPJ512	ROHM
R4, R8	3k, 1206, 5%, TC100, 1/4W	MCR18EZPF302	ROHM
R6, R7	2.2k, 0603, 1%, TC100, 1/10W	MCR03EZPJ222	ROHM
R10, R11	510, 0603, 1%, TC100, 1/10W	MCR03EZPJ511	ROHM
R3, R9, R17, R19, R38, R12, R21, R39	10k, 0603, 1%, TC100, 1/10W	MCR03EZPF103	ROHM
R15, R40	75k, 1206, 5%, TC100, 1/4W	MCR18EZPF753	ROHM
R18	360R, 0603, 5%, TC200, 1/10W	MCR03EZPJ361	ROHM
VTARG, VDD, VDDIO, V_REF, VGPIO, VI2C, V2P5_LDO, VSYS, VSYS_1, VSYS_DIV, V_OUT, V_MUX, MUX_EN_B, SDA, SCL	Test Point Red	5005	Keystone
GND1, GND2, GND3, GND4, GND5	Test Point Black	5006	Keystone

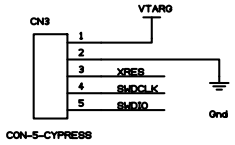
Table 13: PMIC-MB-EVK-302 BOM

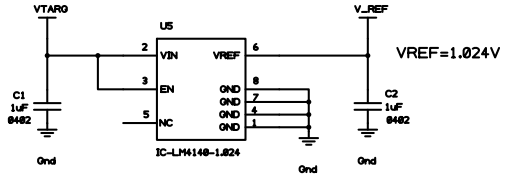
© 2022 ROHM Co., Ltd.

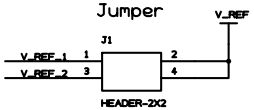
PSOC® 5LP







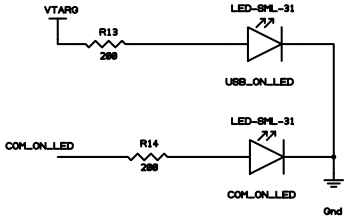




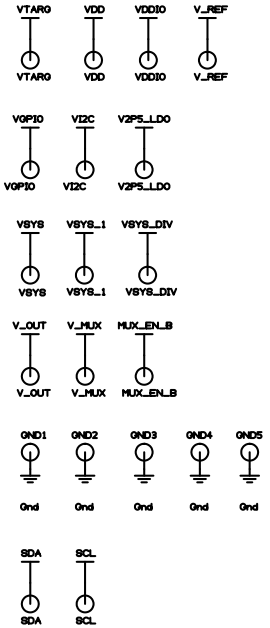
Initial setting is unsed.

USB_ON_LED: indicates Power-On state

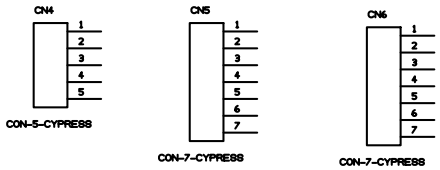
COM_ON_LED: indicates communication



Test Points

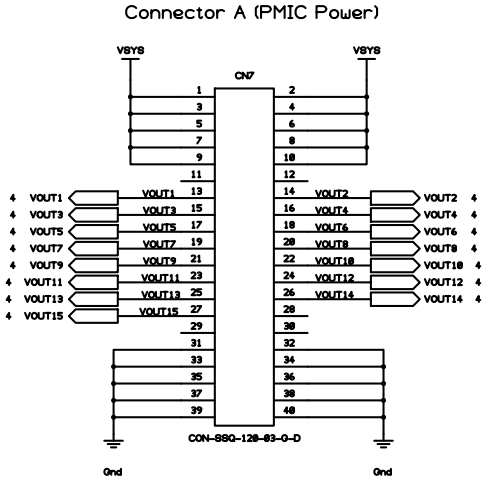


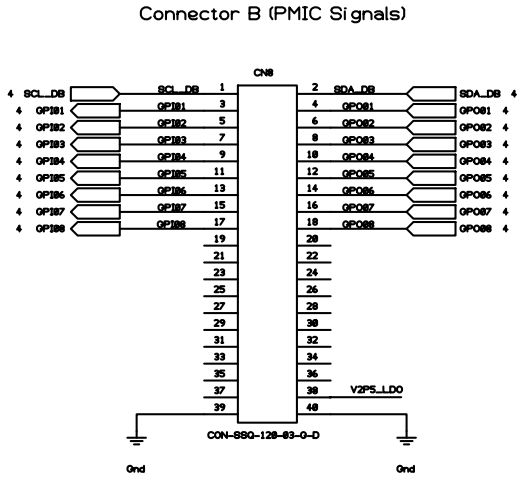
KitProg

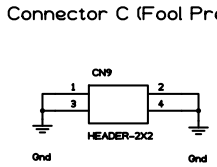


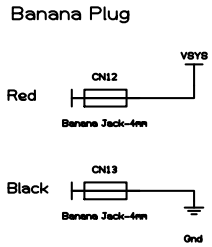
COMPANY NAME: ROHM Semiconductor GmbH			
DESIGN TITLE: PMIC EVK MB			
PAGE: Page1 Cypress I2C Connector	DRAWING NO.	REVISION: B	
SCALE:	SIZE: A4	SHEET 1 OF 5	

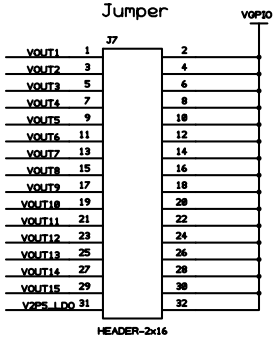
© 2022 ROHM Co., Ltd.



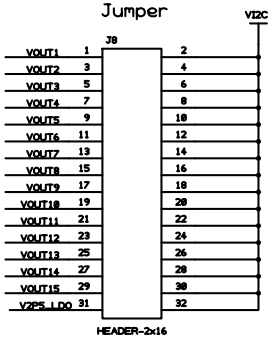




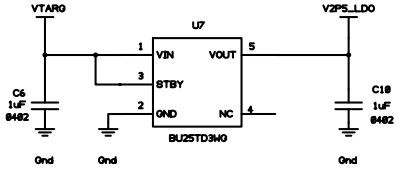




Initial setting: 31-32 ON

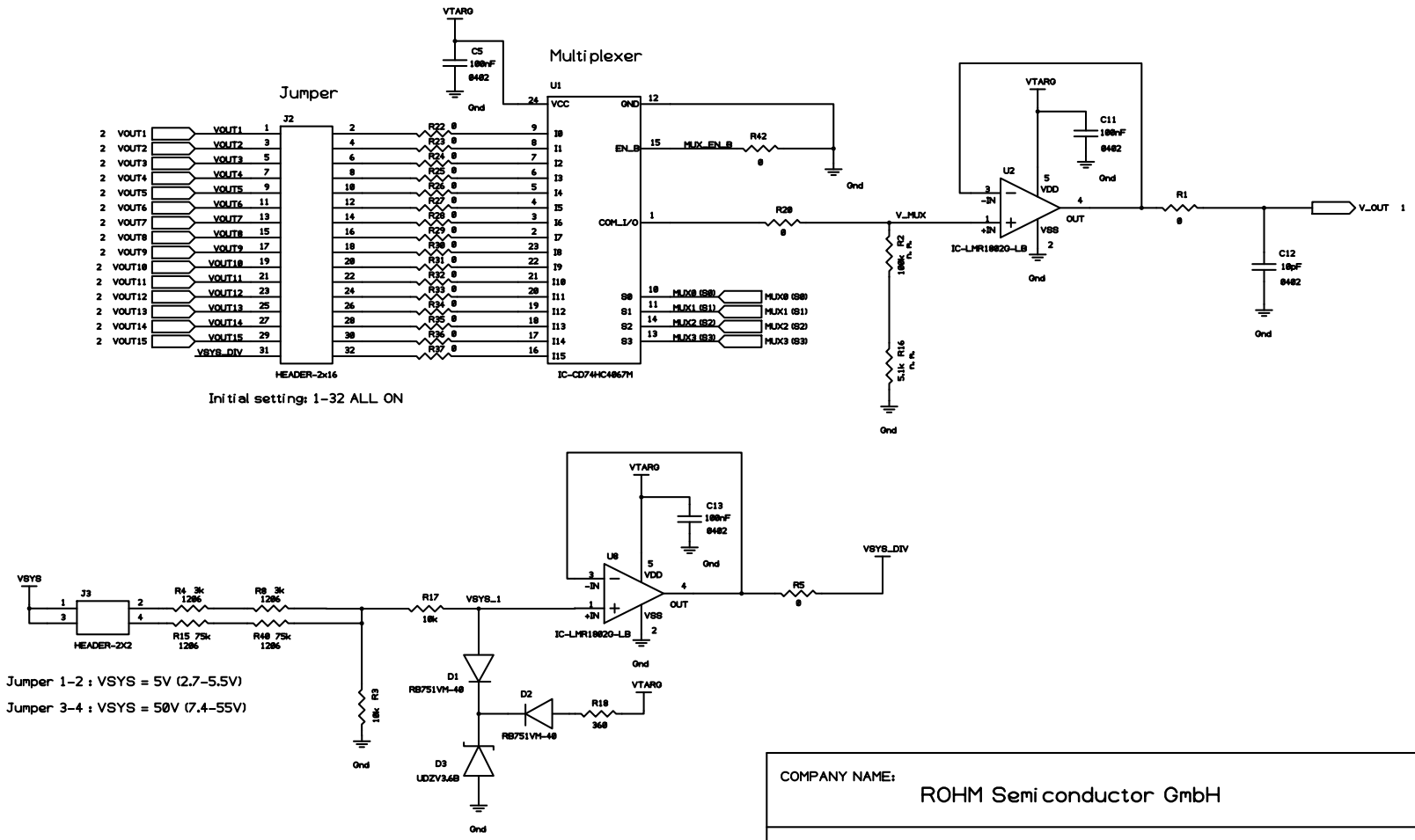


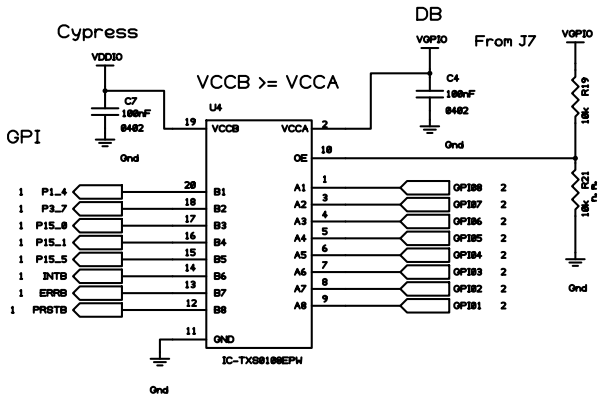
Initial setting: 31-32 ON

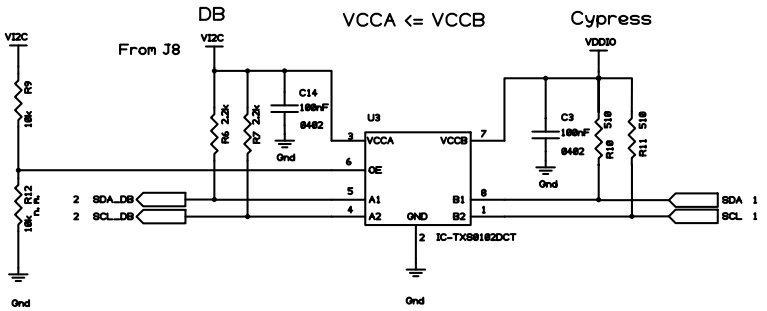


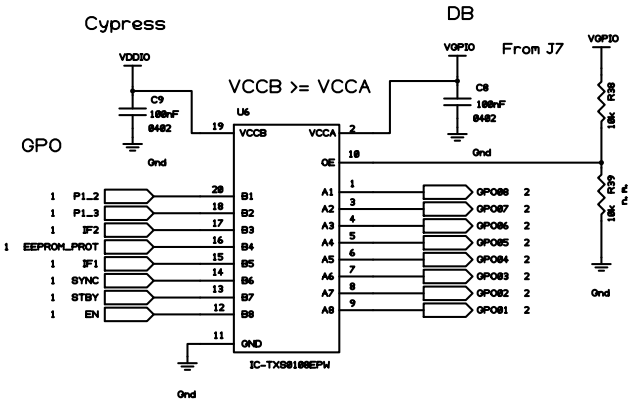
COMPANY NAME: ROHM Semiconductor GmbH			
DESIGN TITLE: PMIC EVK MB			
PAGE: Page2 MB/DB Connector	DRAWING NO.	REVISION: B	
SCALE:	SIZE: A4	SHEET 2 OF 5	

© 2022 ROHM Co., Ltd.


Jumper
Multiplexer
Initial setting: 1-32 ALL ON
HEADER-2x16
IC-CD74HC4067M
IC-LMR10020-LB
HEADER-2X2
Jumper 1-2 : VSYS = 5V (2.7-5.5V)
Jumper 3-4 : VSYS = 50V (7.4-55V)
RB751VM-40
UDZV3.6B
V_MUX
V_OUT
VSYS_DIV
VSYS_1
COMPANY NAME: ROHM Semiconductor GmbH
DESIGN TITLE: PMIC EVK MB
PAGE: Page3
VSYS Protection & Multiplexer
DRAWING NO.
REVISION: B
SCALE:
SIZE: A4
SHEET 3 OF 5







COMPANY NAME: ROHM Semiconductor GmbH			
DESIGN TITLE: PMIC EVK MB			
PAGE: Page4 Level Shifter	DRAWING NO.	REVISION: B	
SCALE:	SIZE: A4	SHEET 4 OF 5	

© 2022 ROHM Co., Ltd.

8. DB SCHEMATIC AND BOM

Schematic and BOM of BD96801-EVK-302 are reported hereafter.

Reference	Characteristic	Parts Number	Manufacturer
C1, C3, C4, C5, C6, C7	not mounted	CGA3E1X7T0J106M	TDK
C2, C11, C16, C29, C30, C31, C32, C34, C35, C36	10uF, 16V, 10%, X7S, 0805, AEC-Q200	CGA4J1X7S1C106K125AC	TDK
C10, C21, C28	1uF, 16V, 10%, X7R, 0603, AEC-Q200	CGA3E1X7R1C105K	TDK
C12, C13, C14, C15, C17, C18, C19, C20, C40, C41, C42, C43, C44, C45, C46, C47	10uF, 4V, 20%, X7T, 0603, AEC-Q200	CGA3E1X7T0G106M080AC	TDK
C22, C23, C24, C25, C26	1uF, 10V, 10%, 0603, AEC-Q200	CGJ3E2X7R1A105K080AA	TDK
C27, C33, C37, C100, C101, C102, C103, C104, C105, C106, C107, C108, C109, C110, C111, C112, C113, C114, C115, C116, C117, C118, C119, C120, C121, C122, C123, C124, C125, C126, C127, C128, C129, C140, C141, C142, C143, C144, C145, C146, C147, C148, C149, C150, C151, C152, C153, C154, C155, C156, C157, C158, C159, C160, C161, C162, C163, C164, C165, C166, C167, C168, C169	10uF, 6.3V, 20%, X7T, 0603, AEC-Q200	CGA3E1X7T0J106M	TDK

© 2022 ROHM Co., Ltd.

C38, C39, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C134, C135, C136, C137, C174, C175, C176, C177	not mounted	CGA4J1X7T0J226M125AC	TDK
C58	100nF, 16V, 10%, X7R, 0603, AEC-Q200	CGJ3E2X7R1C104K080AA	TDK
C130, C131, C132, C133, C170, C171, C172, C173	not mounted	GRT21BR60G476ME13L	Murata
CN1, CN2, CN3, CN4, CN5, CN6, CN7, CN8, CN9	Connector	TSW-120-07-G-D	Samtec
J1, J2, J4, J6, J8, J9, J11, J13, J15, J16, J17, J18, R2, R33, R34, R40, R41, R42, RDREN1, RDREN2, RPWM1, RPWM2	0R, 1/10W, 0603	RC0603JR-070RL	Yageo
J3, J5, J7, J10, J12, J14, R30, R31, R32, R43, R44, R45	not mounted	RC0603JR-070RL	Yageo
L1, L2, L3, L4	0.22uH, 6.7A, 20%, 1008	SRP2510A-R22M	Bourns
L10, L20	100nH, 25.8A/11.5A, 20%, 4x4	IHLP1616ABERR10M01	Vishay Dale
Q1	12V, 7A, TSMT8	RQ1A070ZPHZGTR	ROHM
R1	10k, 5%, TC200, 1/10W, 0603	RC0603JR-0710KP	Yageo
R3, R4, R5, R10, R12, R21, R46	10k, 5%, TC200, 1/10W, 0603	KTR03EZPJ103	ROHM
R100, R101, R102, R103, R104, R105, R106, R107, R108, R115	100k, 5%, TC200, 1/10W, 0603	KTR03EZPJ104	ROHM

© 2022 ROHM Co., Ltd.

TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP11, TP12, TP13, TP14, TP15, TP16, TP21, TP22, TP25, TP26, TP27, TP28, TP29, TP30	Test Point Orange	5013	Keystone
TP17	Test Point Red	5010	Keystone
TP20, TP23, TP24	Test Point Black	5011	Keystone
U1	IC	BD96801	ROHM
U2, U3	MOSFET	BD96340	ROHM
U10	EEPROM	BR24T01F-WGE2	ROHM

Table 14: BD96801-EVK-302 BOM

Redundant capacitor components have also been foreseen and not mounted to give maximum freedom and easy test access to the customer to change the value of the input/output capacitor bank blocks.

© 2022 ROHM Co., Ltd.

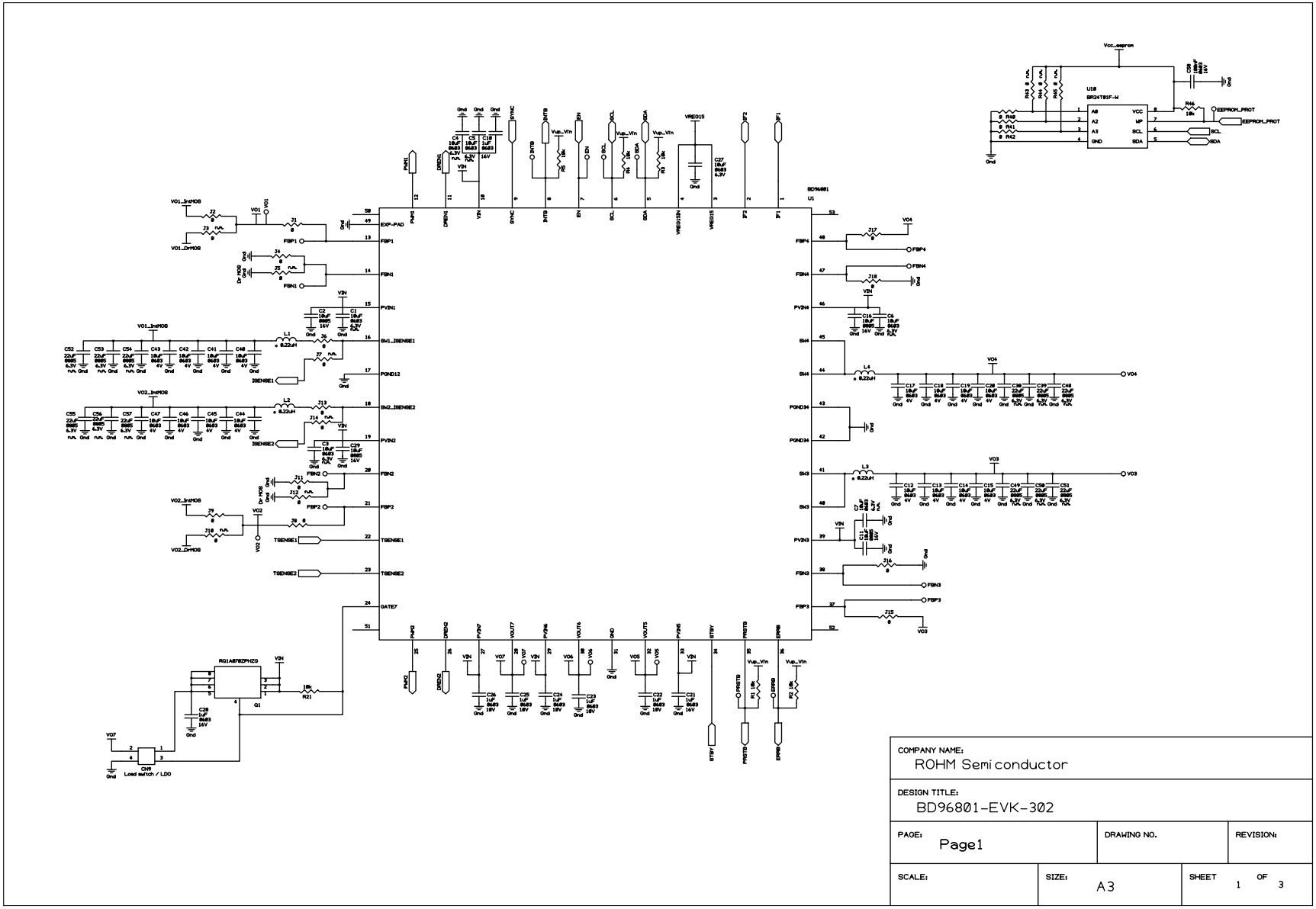


Figure 35: BD96801-EVK-302 schematics part 1 of 3

© 2022 ROHM Co., Ltd.

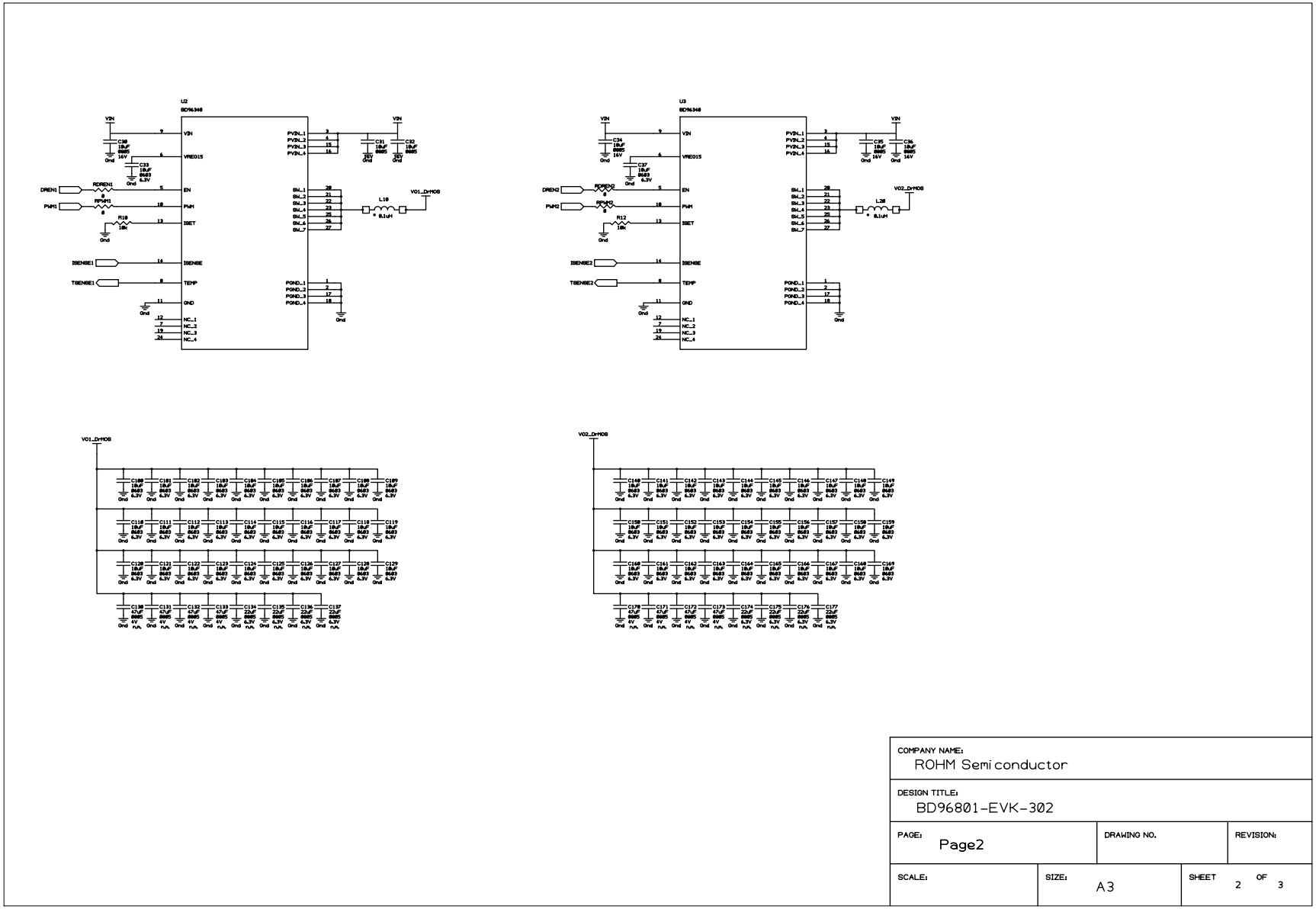


Figure 36: BD96801-EVK-302 schematics part 2 of 3

© 2022 ROHM Co., Ltd.

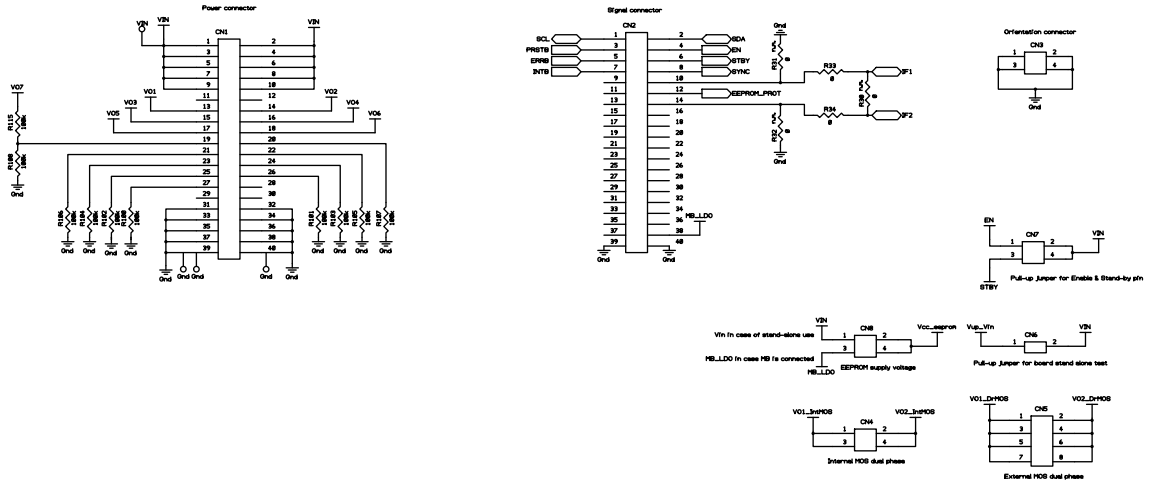


Figure 37: BD96801-EVK-302 schematics part 3 of 3

© 2022 ROHM Co., Ltd.

Notes

1) The information contained herein is subject to change without notice

2) Before you use our Products, please contact our sales representative and verify the latest specifications:

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Products beyond the rating specified by ROHM.

4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.

6) The Products specified in this document are not designed to be radiation tolerant.

7) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative: transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems.

8) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.

9) ROHM shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.

10) ROHM has used reasonable care to ensure the accuracy of the information contained in this document. However, ROHM does not warrants that such information is error-free, and ROHM shall have no responsibility for any damages arising from any inaccuracy or misprint of such information.

11) Please use the Products in accordance with any applicable environmental laws and regulations, such as the RoHS Directive. For more details, including RoHS compatibility, please contact a ROHM sales office. ROHM shall have no responsibility for any damages or losses resulting non-compliance with any applicable laws or regulations.

12) When providing our Products and technologies contained in this document to other countries, you must abide by the procedures and provisions stipulated in all applicable export laws and regulations, including without limitation the US Export Administration Regulations and the Foreign Exchange and Foreign Trade Act.

13) This document, in part or in whole, may not be reprinted or reproduced without prior consent of ROHM.

Thank you for your accessing to ROHM product informations.
More detail product informations and catalogs are available, please contact us.

ROHM Customer Support System

http://www.rohm.com/contact/

© 2022 ROHM Co., Ltd.

No. 65UG014E Rev.001
July 2022