

User Manual DA9217/DA9121 and DA9220/DA9122 EVB Kits

UM-PM-041

Abstract

This document is a user manual for DA9217/DA9121 and DA9220/DA9122 EVB and GUI (SmartCanvas[™] software). It provides the basic information for configuring the EVB, installing and using the GUI software.



DA9217/DA9121 and DA9220/DA9122 EVB Kits

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1 Terms and Definitions

EVB	Evaluation board
GUI	Graphical user interface
PMIC	Power management integrated circuit

2 References

- [1] DA9217, Datasheet, Dialog Semiconductor.
- [2] DA9220, Datasheet, Dialog Semiconductor.
- [3] DA9121, Datasheet, Dialog Semiconductor.
- [4] DA9122, Datasheet, Dialog Semiconductor.

3 Introduction

Dialog Semiconductor's DA9217/DA9121 and DA9220/DA9122 devices are power management ICs with integrated power FETs, see datasheets [1][2][3][4]. The DA9217/DA9121 is configured as a single-channel dual-phase buck converter, while the DA9220/DA9122 is configured as a two channel, one-phase buck converter.

The input voltage range of 2.5 V to 5.5 V makes DA9217/DA9121 and DA9220/DA9122 suitable for a wide variety of low-voltage systems, including, but not limited to, all Li-Ion battery supplied applications. The output voltage is configurable in the range of 0.3 V to 1.57 V.

Key functions for power applications, such as soft-start, selectable output voltage, flexible power-up and power-down sequences are provided on chip and are programmable via the I²C interface with non-volatile memory defaults.

The evaluation kit includes:

- Dialog EVB 368-01, which is designed for DA9217/DA9121 evaluation
- Dialog EVB 368-03, which is designed for DA9220/DA9122 evaluation
- USB-I²C interface module with USB cable (162-09), which is used for I²C communication between the device and PC
- GUI software: Dialog Semiconductor's SmartCanvas

The software can be used to configure the device through write and read operations to all control registers and provides monitoring of the device status.

3.1 PC Requirements

The PC requirements are:

- Windows 7 operating system
- USB1.1 or USB2.0 interface

For any questions or further clarification please refer to your local Dialog support team.

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4 Evaluation Board Hardware

The DA9217/DA9121 and DA9220/DA9122 evaluation boards enable the measurement and evaluation of the DA9217/DA9121 and DA9220/DA9122 respectively, see Figure 1 and Figure 2.

Figure 3 shows how the USB-I²C Module should be connected to the evaluation board.

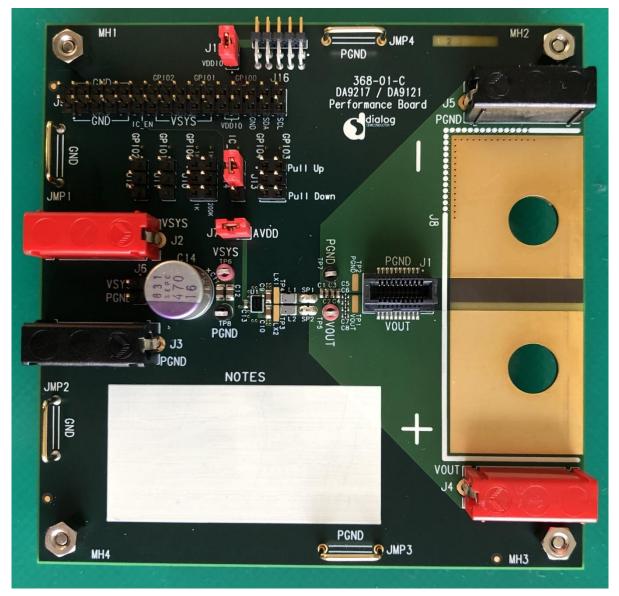


Figure 1: 368-01 DA9217/DA9121 EVB

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DA9217/DA9121 and DA9220/DA9122 EVB Kits

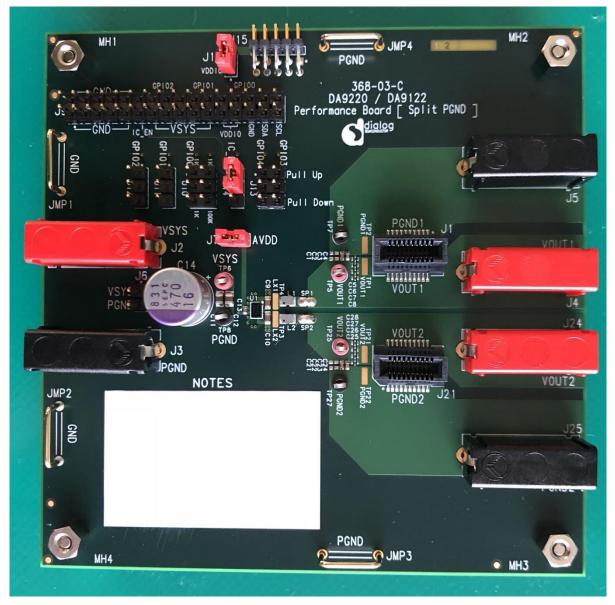


Figure 2: 368-03 DA9220/DA9122 EVB



DA9217/DA9121 and DA9220/DA9122 EVB Kits

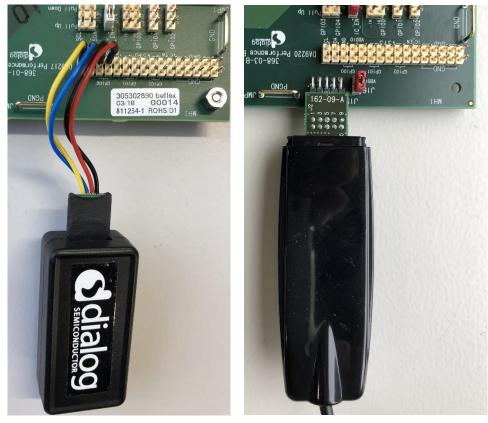


Figure 3: Connection between EVB and USB-I²C Module

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4.1 Links Description

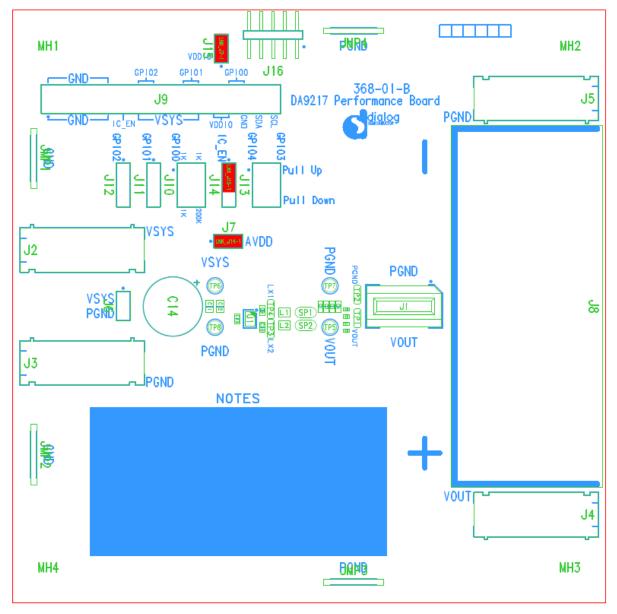


Figure 4: 368-01 EVB Links Location

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DA9217/DA9121 and DA9220/DA9122 EVB Kits

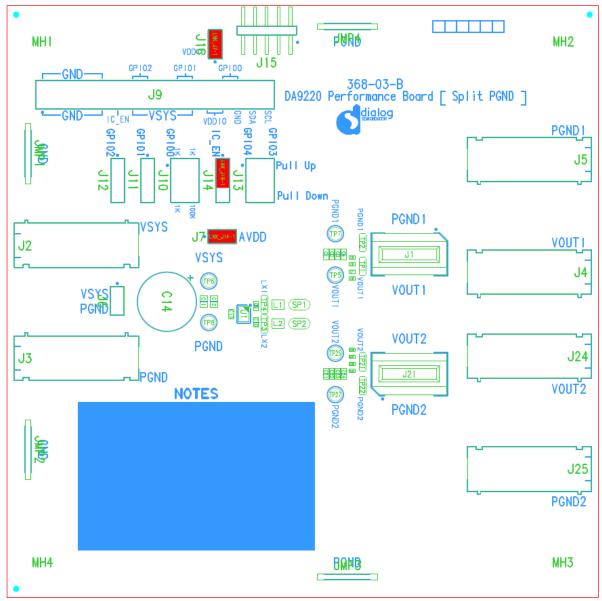


Figure 5: 368-03 EVB Links Location

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Table 1: 368-01 EVB and 368-03 EVB Links Description

Link	Position 1	Position 2	Function
J7 Link 7	Connect to VSYS (pin 1-2)	-	Connect AVDD to VSYS
J10 Link 10	Connect to VDDIO (pin 1-3)	Connect to VSYS (pin 2-4)	Pull up GPIO0 to VDDIO or VSYS
J10 Link 10	Connect to GND (pin 3-5)	Connect to GND (pin 4-6)	Pull down GPIO0 to GND
J11 Link 11	Connect to VDDIO (pin 1-2)	-	Pull up GPIO1 to VDDIO
J11 Link 11	Connect to GND (pin 2-3)	-	Pull down GPIO1 to GND
J12 Link 12	Connect to VDDIO (pin 1-2)	-	Pull up GPIO2 to VDDIO
J12 Link 12	Connect to GND (pin 2-3)	-	Pull down GPIO2 to GND
J13 Link 13	Connect to VDDIO (pin 1-3)	Connect to VDDIO (pin 2-4)	Pull up SDA and SCL to VDDIO
J13 Link 13	Connect to GND (pin 3-5)	Connect to GND (pin 4-6)	Pull down SDA and SCL to GND
J14 Link 14	Connect to VDDIO (pin 1-2)	-	Pull up IC_EN to VDDIO
J14 Link 14	Connect to GND (pin 2-3)	-	Pull down IC_EN to GND
J15 Link 15 (on 368-01) J16 Link 16 (on 368-03)	Connect to USB-I ² C module 3.3 V output (pin 1-2)	-	Connect VDDIO to USB-I ² C module 3.3 V output

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5 Software Installation

5.1 SmartCanvas GUI Software Installation

Use the following steps to install the SmartCanvas GUI:

1. Run the SmartCanvas software file setup_DA9217_DA9220_DA9121_DA9122_GUI.exe (Application).

🐻 Setup - DA9217_DA9220_DA9121_DA9122 GUI AC.101.0.11 🦳 🗌	\times
License Agreement Please read the following important information before continuing.	ð
Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.	
Dialog Smart Canvas Software Package Licensing Agreement	^
======	
THIS LICENSING AGREEMENT REGULATES YOUR USE OF THE SCFTWARE PRODUCTS DESCRIBED HEREIN AND PROVIDED BY DIALOG SEMICONDUCTOR (UK) LTD ("DIALOG").	
IF YOU (INDIVIDUAL OR LEGAL ENTITY, ALSO REFERRED TO AS "LICENSEE" HEREIN) HAVE ALREADY SIGNED OR ASSENTED TO BE BOUND BY ANOTHER SOFTWARE LICENSING AGREEMENT WITH RESPECT TO THE	~
 I accept the agreement 	
○ I do not accept the agreement	
Next > C	ancel

Figure 6: SmartCanvas License Agreement

NOTE
Administrator credentials are required for installation on a new Windows machine.

2. Select I accept the agreement and click Next.





🔀 Setup - DA9217_DA9220_DA9121_DA9122 GUI AC.101	.0.11 —		\times
Select Additional Tasks Which additional tasks should be performed?			Ð
Select the additional tasks you would like Setup to perfor DA9217_DA9220_DA9121_DA9122 GUI, then dick Nex			
Additional shortcuts:			
Create a desktop shortcut			
< Back	k Next >	Ca	ancel

Figure 7: Optional Create a Desktop Shortcut

3. Optionally, select to Create a desktop shortcut and then click Next.



🔀 Setup - DA9217_DA9220_DA9121_DA9122 GUI AC.101.0.11			\times
Ready to Install Setup is now ready to begin installing DA9217_DA9220_DA91 your computer.	121_DA9122 GL	II on	Ð
Click Install to continue with the installation.			
< Back	Install	Ca	incel

Figure 8: Install SmartCanvas

- 4. Click **Install**, which creates the directory:
 - C:\Dialog Semiconductor\Power Management\DA9217_DA9220_DA9121_DA9122 GUI.
- Once the installation is completed, the SmartCanvas GUI for DA9217/DA9121 and DA9220/DA9122 can be launched from the directory created in step 4 or from the optional shortcut.

5.2 USB-IO Driver Installation

Follow the following steps to install the Dialog USB driver:

- 1. Plug the USB cable of USB-I²C Module into a free USB port of your PC and wait for a few minutes to complete the driver software installation.
- 2. Check that the Dialog USB driver has been properly installed using the **Windows Device Manager**, see Figure 9.

🚔 Device Manager
File Action View Help
▲ 🛁 TK-ENG-LT-KH2
Batteries
Bluetooth Radios
⊳ di 🖉 Computer
Disk drives
Display adapters
Im Human Interface Devices
De TELATA/ATAPI controllers
> Traging devices
Intel(R) Dynamic Platform and Thermal Framework
▶ <u> </u>
Dialog USB-Lab IO
Memory technology driver
Mice and other pointing devices
Monitors
Network adapters
Ports (COM & LPT)
Processors
Security Devices
Sound, video and game controllers
🦻 🚛 System devices
🦕 🏺 Universal Serial Bus controllers

Figure 9: Windows Device Manager

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6 SmartCanvas GUI

💽 DA9217/	DA9220/DA9121/DA912	22								- 🗆 ×
File Optio	ns Tools Search	View Help								
DA9217_9	220_9121_9122								- E	Control ×
buck	otp sys Table Vie	w								Classical conversion
5	Buck1									Smart canvas
puck	BUCK_BUCK1_0 CH1_SR_DVC_DWN CH1_SR_DVC_UP CH1_EN	20mV/us v 20mV/us v Low	BUCK_BUCK1_1 CH1_SR_SHDN CH1_SR_STARTUP CH1_PD_DIS	20mV/us v 20mV/us v Low	BUCK_BUCK1_2 CH1_ILIM	7.5 🔍	BUCK_BUCK1_3 CH1_VMAX	[<u>1.9</u> v]		Raw I/O Advanced 0xD0 Dev Addr Batch Mode 0x00 Reg Addr
	0x20	0x48 🛨	0x21	0x48 🛨	0x22	0x09 🕂	0x23	0xBE		Send 0x00 🕂 Send Data
	BUCK_BUCK1_4 CH1_VSEL CH1_B_MODE	Low Auto mode	BUCK_BUCK1_5 CH1_A_VOUT	[1 v]	BUCK_BUCK1_6 CH1_B_VOUT	1	BUCK_BUCK1_7 CH1_RIPPLE_CAN	Small ripple		Read 0x00 Read Data Communication
	CH1_A_MODE 0x24	Auto mode v 0x0F	0x25	0x64 +	0x26	0x64 +	0x27	0x01 ÷		USB connection
	Buck2]		USB device A>dev0 v
	BUCK_BUCK2_0 CH2_SR_DVC_DWN	20mV/us 🗸	BUCK_BUCK2_1 CH2_SR_SHDN	20mV/us 🗸	BUCK_BUCK2_2 CH2_ILIM	7.5 🔍	BUCK_BUCK2_3 CH2_VMAX	1.9 🗸		Reconnect to device
	CH2_SR_DVC_UP	20mV/us 🗸	CH2_SR_STARTUP	20mV/us 🗸						Enable/Disable Polling
	CH2_EN 0x28	Ox48	CH2_PD_DIS 0x29	Ux48	0x2A	0x09	0x2B	0xBE		Disabled
	BUCK_BUCK2_4 CH2_VSEL CH2_B_MODE	Low Auto mode	BUCK_BUCK2_5 CH2_A_VOUT	[1 v]	BUCK_BUCK2_6 CH2_B_VOUT	[1 v]	BUCK_BUCK2_7 CH2_RIPPLE_CAN	Small ripple		Read all registers (excluding event) Read Event/Status/Fault regs Save Register Dump
	CH2_A_MODE 0x2C	Auto mode V 0x0F +	0x2D	0x64 +	0x2E	0x64 +	0x2F	0x01 ÷		Load Register Dump
										USB Interface Info Interface: Dialog USB-IO
(Status			×	Info			USB device: 0 Firmware version: 1.11
Console	Log		Status			Register Info				Firmware Dev. version: 69888
						Bitfield: CH1				
Clear Mark Save to file Filter (reg expr): Log level: Info							K_BUCK1_3 (0x23)			
2019-10-02, 16:30:46 [INFO] (2cChannel 0 2019-10-02, 16:30:48 [INFO] GPIO configuration is called. 2019-10-02, 16:30:48 [INFO] SAM3U firmware version 1.11 does not support GPIO get mode							/Write 0xBE) : 1.9 = 190 (0xbe or 0b1	10111110)		
2019-10-02, 16:30:48 [INFO] ready 2019-10-02, 16:30:48 [INFO] get_freq 100173								,		
2019-10-02, 16:30:46 [DWPO] Starup tool: 3.10 sec							Description: VOUT mass setting (V): From 0.30V (0x 1E) to 1.90V (0x8E) in steps of 10 mV This is a read-only register. 0: Reserved 1: 1 - n.a. 2: 2 - n.a.			

Figure 10: SmartCanvas GUI

Click Reconnect to device to connect to the device via the I²C interface.

The default I²C address of the GUI is 0xD0 (8-bit mapping, 1101 000xb).

To change the I²C address of the GUI:

- 1. Select **Options > Settings** to displays the **Settings** window, see Figure 11.
- 2. Change the **Bus Interface** to the intended I²C address (in 8-bit).
- 3. Click Enable Interface to start the communication.

Once communication is established, the **Bus communication** and **USB connection** lights turn green to indicate normal operation.

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💽 Settings 🛛 🗙
Numerical Base
Hexadecimal
Polling
Enabled 🝚 Poll Indicator
250 milliseconds
Poll Visible Only 🔿 Poll All Registers
Bus Interface
DA9217_9220_9121_9122 0x00 on bus 0 : Bus_0 v
Interface Disabled
I ² C Frequency (ch 0) 100kHz
Device Connect Error Settings
Show popup on I ² C error
Comms Server
Z Local Only
Stop Comms Server 31646 +

Figure 11: SmartCanvas GUI Settings Window

6.1 SmartCanvas Tabs

There are four tabs in the DA9217/DA9220/DA9121/DA9122 SmartCanvas GUI. They are:

- **buck** address range from 0x20 to 0x2F which contains CH1 and CH2 settings.
- **otp** address range from 0x48 to 0x4B which contains information of the chip ID and OTP variant.
- **sys** address range from 0x01 to 0x15 which contains event and status registers, and GPIOs settings.
- **Table View** table of registers data.

S DA9217/DA9220/DA9121/DA9122

e Option	ns Tools Search	View Help						
A9217_92	220_9121_9122							
uck o	otp sys Table Vie	w						
buck	Buck1]
	BUCK_BUCK1_0 CH1_SR_DVC_DWN	20mV/us V	BUCK_BUCK1_1 CH1_SR_SHDN	20mV/us 🗸	BUCK_BUCK1_2 CH1_ILIM	7.5 🗸	BUCK_BUCK1_3 CH1_VMAX	1.9 🗸
	CH1_SR_DVC_UP	20mV/us V	CH1 SR STARTUP	20mV/us V				
	CH1 EN	Low	CH1 PD DIS	Low				
	0x20	0x48 ÷	0x21	0x48	0x22	0x09	0x23	OxBE
	0.20						0.20	
	BUCK_BUCK1_4		BUCK_BUCK1_5		BUCK_BUCK1_6		BUCK_BUCK1_7	
	CH1_VSEL	Low	CH1_A_VOUT	1 🗸	CH1_B_VOUT	1 🗸	CH1_RIPPLE_CAN	Small ripple
	CH1_B_MODE	Auto mode 🗸						
	CH1_A_MODE	Auto mode 🗸						
	0x24	0x0F 🕂	0x25	0x64 🕂	0x26	0x64 ÷	0x27	0x01 ÷
	Buck2							
	BUCK_BUCK2_0		BUCK_BUCK2_1		BUCK_BUCK2_2		BUCK_BUCK2_3	
	CH2_SR_DVC_DWN	20mV/us 🗸	CH2_SR_SHDN	20mV/us 🗸	CH2_ILIM	7.5 🗸	CH2_VMAX	1.9 🗸
	CH2_SR_DVC_UP	20mV/us 🗸	CH2_SR_STARTUP	20mV/us 🗸				
	CH2_EN	Low	CH2_PD_DIS	Low				
	0x28	0x48 ÷	0x29	0x48 ÷	0x2A	0x09	0x2B	0xBE 🗧
	BUCK_BUCK2_4		BUCK_BUCK2_5		BUCK_BUCK2_6		BUCK_BUCK2_7	
	CH2_VSEL	Low	CH2_A_VOUT	1 v	CH2_B_VOUT	1 ~	CH2_RIPPLE_CAN	Small ripple
	CH2_B_MODE	Auto mode 🔍						
	CH2_A_MODE	Auto mode 🔍						
	0x2C	0x0F	0x2D	0x64	0x2E	0x64 ÷	0x2F	0x01 ÷

Figure 12: SmartCanvas GUI buck Tab

💽 DA9	217/DA	9220/DA	9121/DA91	22				
File O	ptions	Tools	Search	View	Help			
DA921	17_9220_	9121_91	22					
buck	otp	sys	Table Vie	ew				
ਉ		OTP						
		TP_DEV	ICE_ID			OTP_VARIAN	т_10	
	[DEV_ID		5	\vee	MRC	2	<u></u>
						VRC	1	<u></u>
	0	x48		0x05	5	0x49	0x21	
		TP_CUS	TOMER_IC)		OTP_CONFIG	_ID	
		CUST_ID		0	\sim	CONFIG_REV	176	
	0	x4A		0x00) 1	0x4B	0xB0	÷
				_				

Figure 13: SmartCanvas GUI otp Tab





SI DA9217/DA9220/DA9121/DA9122

File Options Tools Search View Help		
DA9217_9220_9121_9122		
buck otp sys Table View		
	Event SYS_EVENT_0	
CH1_DIS_DLY 0	E_SG Low	
CH1_EN_DLY 0	E_TEMP_CRIT Low	
0x0B 0x00	E_TEMP_WARN Low	
SYS_CONFIG_1	0x04 0x00 ÷	
CH2_DIS_DLY 0	SYS_EVENT_1	
CH2_EN_DLY 0	E_PG2 Low	
0x0C	E_OV2	
SYS_CONFIG_2	E_UV2 Low	
OC_LATCHOFF Latch off dit V	E_OC2	
OC_DVC_MASK Low	E_PG1	
PG_DVC_MASK No mask		
PH2_DIS Low	E_UV1 Low E OC1 Low	
CHMODE 1 channel, 2		
0x0D 0x01 +		
	SYS_EVENT_2	
	E_GPIO2 Low	
	E_GPI01 Low E_GPI00 Low	
GPIO		
	SYS_GPI00_1 SYS_GPI01_0	

Figure 14: SmartCanvas GUI sys Tab

Options Tools Sear	ch View Help							
9217_9220_9121_9122								
ck otp sys Tab	le View							
	Data	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2 SG_[2]:	
0x01: SYS_STATUS_0	0x00 +			unused	- <u>-</u>		0x00	
0x02: SYS_STATUS_1	0x00	PG2_[7]: 0x00	OV2_[6]: 0x00	UV2_[5]: 0x00	OC2_[4]: 0x00	PG1_[3]: 0x00	OV1_[2]: 0x00	
0x03: SYS_STATUS_2	0x00			unused			GPIO2_[2]: 0x00	
0x04: SYS_EVENT_0	0x00 +			unused			E_SG_[2]: 0x00	
0x05: SYS_EVENT_1	0x00	E_PG2_[7]: 0x00	E_OV2_[8]: 0x00	E_UV2_[5]: 0x00	E_OC2_[4]: 0x00	E_PG1_[3]: 0x00	E_OV1_[2]: 0x00	
0x06: SYS_EVENT_2	0x00			unused			E_GPIO2_[2]: 0x00	
0x07: SYS_MASK_0	0x07 ÷			unused			M_SG_[2]: 0x01	
0x08: SYS_MASK_1	0xFF	M_PG2_[7]: 0x01	M_OV2_[6]: 0x01	M_UV2_[5]: 0x01	M_OC2_[4]: 0x01	M_PG1_[3]: 0x01	M_OV1_[2]: 0x01	
0x09: SYS_MASK_2	0x07			unused			M_GPIO2_[2]: 0x01	
0x0A: SYS_MASK_3	0x0F		un	used		M_VR_HOT_[3]: 0x01	M_SG_STAT_[2]: 0x01	
0x0B: SYS_CONFIG_0	0x00			3_DLY_[4]: x00			CH1_EN_ 0x	
0x0C: SYS_CONFIG_1	0x00			6_DLY_[4]: x00			CH2_EN_ 0x	
0x0D: SYS_CONFIG_2	0x01	Unused OC_LATCHOFF_[5]: OC_DVC_MASK_[4]: PG_DVC_MASK 0x00 0x00 0x00 0x00					_MASK_[2]: x00	
0x0E: SYS_CONFIG_3	0x02	unused	OSC TUNE (4)					
0x10: SYS_GPIO0_0	0x00 ÷		unused GPIOD_N					

Figure 15: SmartCanvas GUI Table View Tab

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6.2 Control Window

The **Control** window is used to connect to the device, to update the registers, and to save and/or load a Register Dump file.

Control ×
Smart canvas
Raw I/O
Advanced 0xD0 🕂 Dev Addr
Batch Mode 0x00 🗧 Reg Addr
Send 0x00 🗧 Send Data
Read 0x00 Read Data
Communication
Bus communication
USB connection
USB device A>dev0 v
Reconnect to device
Enable/Disable Polling
Disabled
Read all registers (excluding event)
Read Event/Status/Fault regs
Save Register Dump
Load Register Dump
USB Interface Info
Interface: Dialog USB-IO USB device: 0
Firmware version: 1.11 Firmware Dev. version: 69888

Figure 16: SmartCanvas GUI Control Window



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6.2.1 Raw I/O

Data of each register address can be directly read by using the **Raw I/O** function.

Control ×	
Smart canvas	
Raw I/O	
Advanced 0xD0 🕂 Dev Addr	
Batch Mode 0x20 Reg Addr	
Send 0x00 Send Data	
Read 0x48 Read Data	
Communication	
Bus communication	
USB connection	
USB device A>dev0 v	
Reconnect to device	
Enable/Disable Polling	
Disabled	
Read all registers (excluding event)	
Read Event/Status/Fault regs	
Save Register Dump	
Load Register Dump	
USB Interface Info	
Interface: Dialog USB-IO USB device: 0	
Firmware version: 1.11 Firmware Dev. version: 69888	
Timware Dev. version, 09000	

Figure 17: Read addr 0x20 Example

Control
Smart canvas
Raw I/O
Advanced 0xD0 🕂 Dev Addr
Batch Mode 0x08 🗧 Reg Addr
Send 0x00 🗧 Send Data
Read 0xFF Read Data
Communication
Bus communication
USB connection
USB device A>dev0 v
Reconnect to device
Enable/Disable Polling
Disabled
Read all registers (excluding event)
Read Event/Status/Fault regs
Save Register Dump
Load Register Dump
USB Interface Info
Interface: Dialog USB-IO USB device: 0
Firmware version: 1.11 Firmware Dev. version: 69888

Figure 18: Read addr 0x08 Example

It is also possible to write data directly to each register address by using the $\ensuremath{\textit{Raw I/O}}$ function.

Figure 19 shows an example of writing 0x49 to Addr 0x20 register and then reading register data in Addr 0x20.

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NOTE

Ensure that the I²C address in **Dev Addr** is set correctly.

Control	<
Smart canvas	
Raw I/O	
Advanced OxD0 🕂 Dev Addr	
Batch Mode 0x20 Reg Addr	
Send 0x49 🕂 Send Data	
Read 0x49 Read Data	
Communication	
Bus communication	
USB connection	
USB device A>dev0 🗸	
Reconnect to device	
Enable/Disable Polling	
Disabled	
Read all registers (excluding event)	
Read Event/Status/Fault regs	
Save Register Dump	Buck1
Load Register Dump	BUCK_BUCK1_0
USB Interface Info	CH1_SR_DVC_DWN
Interface: Dialog USB-IO	CH1_SR_DVC_UP
USB device: 0 Firmware version: 1,11	CH1_EN
Firmware Dev. version: 69888	0x20
	0.20

Figure 19: GUI SmartCanvas Raw I/O Window and BUCK_BUCK1_0 Register in the buck Tab

6.2.2 Enable/Disable Polling

When **Enable/Disable Polling** is set to **Enabled**, the GUI repeatedly reads access via I²C and updates all registers data.

Select **Disabled** to disable the polling operation.

6.2.3 Registers Update

The **Read all registers** and **Read Event/Status/Fault regs** buttons can be used to update the registers data.

6.2.4 Save and Load Register Dump

Users can save the device registers data in .txt and/or .csv format by using **Save Register Dump** and load data in .txt and/or .csv format to the device registers by using **Load Register Dump**.

User Manual



Revision History

Revision	Date	Description
0.1	25-May-2018	Initial version (draft).
1.0	18-Oct-2019	Released version.
1.1	16-Feb-2022	Rebranded to Renesas.



Status Definitions

Status	Definition
DRAFT	The content of this document is under review and subject to formal approval, which may result in modifications or additions.
APPROVED or unmarked	The content of this document has been approved for publication.

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Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu

Koto-ku, Tokyo 135-0061, Japan

www.renesas.com

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