

# Application Note

## DA9213 Standard Variants Overview

### AN-PM-121

#### **Abstract**

*This application note describes the default register settings of the DA9213 standard variants.*

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**DA9213 Standard Variants Overview**

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## DA9213 Standard Variants Overview

### 1 Terms and Definitions

CPU	Central Processing Unit
GPIO	General Purpose Input/Output
GPU	Graphic Processing Unit
OTP	One Time Programmable (Memory)
PMU	Power Management Unit
PWM	Pulse-Width Modulation

### 2 References

- [1] DA9213, Datasheet, Dialog Semiconductor.

## DA9213 Standard Variants Overview

### 3 Introduction

The DA9213 is a PMU optimized for the supply of CPUs, GPUs, and DDR memory rails in smartphones, tablets and other portable applications. The fast transient response and load regulation are optimized for the latest generation of multi-core application processors. The DA9213 operates as a single four-phase buck converter delivering up to 20 A output current.

This application note intended to help a hardware designer understand the configurations of the DA9213 standard variants.

#### 3.1 System Diagram

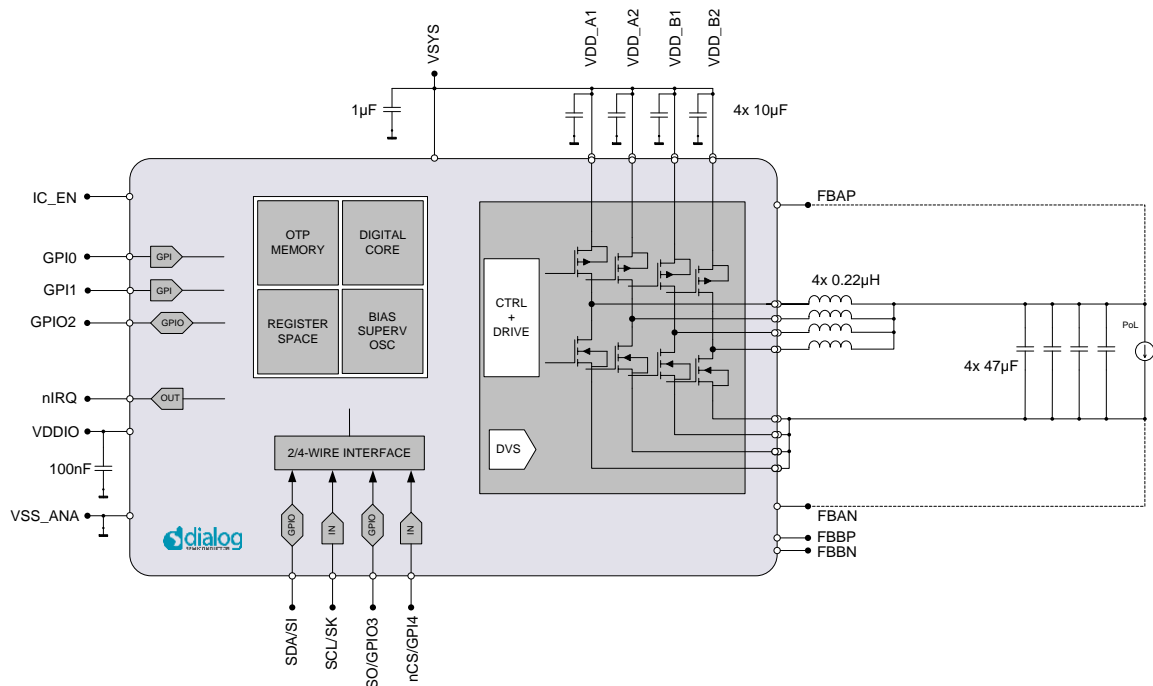


Figure 1: DA9213 System Diagram

#### 3.2 Variant Table and Ordering Information

Table 1: Ordering Information

Part Number	Package	Shipment Form	Pack Quantity
DA9213-xxUP2	66 WL-CSP	Tape and Reel	4500pcs
DA9213-xxUP6	66 WL-CSP	Waffle	
DA9213-JEUP2	66 WL-CSP	Tape and Reel	4500pcs
DA9213-JEUP6	66 WL-CSP	Tray	
DA9213-88UP2	66 WL-CSP	Tape and Reel	4500pcs
DA9213-88UP2	66 WL-CSP	Waffle	

## DA9213 Standard Variants Overview

### 4 DA9213-JEUP Detailed Description

Key settings:

- Default output voltage is set to 1.0 V.
- Buck is set to operate in SYNC (forced PWM) mode.
- Maximum allowed output voltage is set to 1.57 V.
- GPIO, GPI1, GPIO2, GPIO3 and GPI4 are assigned as active-high digital input.

**Table 2: DA9213-JEUP Register Settings**

Register Address	Function	Default Value	Description
0x054	MASK_A	0x5F	nIRQ interrupt at GPIO0 to GPI4 and UVLO_IO caused nIRQ are masked.
0x055	MASK_B	0x3F	PWRGOOD Buck A and Buck B, TEMP_WARN, TEMP_CRIT, OV_CURR Buck A and OV_CURR Buck B caused event are masked.
0x056	CONTROL_A	0x53	GPIO debounce time = 10 ms DVC slew rate A = 10 mV/μs DVC slew rate B = 10 mV/μs V_LOCK = 0: Allows host writes into registers 0xD0 to 0x14F.
0x058	GPI0-1	0x44	GPI0: input, active high, debouncing off. GPI1: input, active high, debouncing off.
0x059	GPIO2-3	0x44	GPIO2: input, active high, debouncing off. GPIO3: input, active high, debouncing off.
0x05A	GPI4	0x04	GPI4: input, active high, debouncing off.
0x05D	BUCKA_CONT	0x00	Buck is default OFF. Pull down resistor is enabled. Buck output voltage is selected from VBUCKA_A.
0x0D0	BUCK_ILIM	0x99	Current limit per phase BUCKA_ILIM = 5800 mA (peak inductor current)
0x0D1	BUCKA_CONF	0x92	Operation mode is set to SYNC (forced PWM) mode. Start-up control = 20 mV/μs Down control = 20 mV/μs
0x0D3	VBUCK_CONF	0x1F	Maximum 4-phase is selected. Phase-shedding is enabled.
0x0D5	VBUCKA_MAX	0x7F	Max output voltage VBUCKA_MAX = 1.57 V
0x0D7	VBUCKA_A	0x46	Output voltage VBUCKA_A = 1.00 V
0x0D8	VBUCKA_B	0x46	Output voltage VBUCKA_B = 1.00 V
0x105	INTERFACE	0xD9	Primary 2-wire interface slave address = 0xD0
0x106	INTERFACE2	0x80	Communication interface is 2-wire, standard speed, PM_IF_V=VDDCORE.
0x143	CONFIG_A	0x12	Enabled automatic reset of 2-WIRE interface in case of clock stays low for >35 ms. nIRQ output port is open drain, active low. GPIs are supplied from VDDCORE.
0x144	CONFIG_B	0xE0	UVLO_IO is disabled. Power good signal masked during DVC transitions (keep previous status). Reload function is disabled.

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**DA9213 Standard Variants Overview**

Register Address	Function	Default Value	Description
0x145	CONFIG_C	0x00	GPIO, GPI1, GPIO2, GPIO3 and GPI4 pull-down resistors are disabled.
0x146	CONFIG_D	0x00	Buck Power Good (PG) and READY are not assigned to any GPIOs.
0x147	CONFIG_E	0x80	DA9213 is set as standalone device. No tune of oscillator frequency.
0x148	CONFIG_F	0xD0	Secondary 2-wire interface slave address = 0xD0

## DA9213 Standard Variants Overview

### 5 DA9213-88UP Detailed Description

Key settings:

- Default output voltage is set to 0.85 V.
- Secondary voltage is set to 0.90 V and can be triggered via GPIO1.
- Buck is set to operate in AUTO mode.
- Maximum allowed output voltage is set to 1.57 V.
- GPIO0 is assigned as active-high digital input and serves as buck enable/disable pin.
- GPI1 is assigned as active- high digital input and serves as buck output voltage switch pin.
- GPIO2 is assigned active-high open-drain output and serves as a ready signal output pin.
- GPIO3 is assigned as active-high open-drain output and serves as a power good signal output pin
- GPI4 is not used.

**Table 3: DA9213-88UP Register Settings**

Register Address	Function	Default Value	Description
0x054	MASK_A	0x5F	nIRQ interrupt at GPIO0 to GPI4 and UVLO_IO caused nIRQ are masked.
0x055	MASK_B	0x3F	PWRGOOD Buck A and Buck B, TEMP_WARN, TEMP_CRIT, OV_CURR Buck A and OV_CURR Buck B caused event are masked.
0x056	CONTROL_A	0x51	GPIO debounce time = 0.1 ms DVC slew rate A = 10 mV/μs DVC slew rate B = 10 mV/μs V_LOCK = 0: Allows host writes into registers 0xD0 to 0x14F.
0x058	GPIO-1	0x44	GPIO0: input, active high, debouncing off. GPI1: input, active high, debouncing off.
0x059	GPIO2-3	0xEE	GPIO2: output open-drain, active high, debouncing on. GPIO3: output open-drain, active high, debouncing on.
0x05A	GPI4	0x0C	GPI4: input, active high, debouncing on.
0x05D	BUCKA_CONT	0x22	Buck is default OFF. Pull down resistor is enabled. Buck is controlled by GPIO0 (enable on passive to active, disable on active to passive). VBUCK is controlled by GPI1 (VBUCK_A on active to passive, VBUCK_B on passive to active).
0x0D0	BUCK_ILIM	0xFF	Current limit per phase BUCKA_ILIM = 7000 mA. (peak inductor current)
0x0D1	BUCKA_CONF	0x0F	Operation mode is set to AUTO mode. Start-up control = 10 mV/μs Down control = 1.25 mV/μs
0x0D3	VBUCK_CONF	0x1F	Maximum 4-phase is selected. Phase-shedding is enabled.
0x0D5	VBUCKA_MAX	0x7F	Max output voltage VBUCKA_MAX = 1.57 V
0x0D7	VBUCKA_A	0x37	Output voltage VBUCKA_A = 0.85 V
0x0D8	VBUCKA_B	0x3C	Output voltage VBUCKA_B = 0.9 V
0x105	INTERFACE	0xD9	Primary 2-wire interface slave address = 0xD0
0x106	INTERFACE2	0x90	Communication interface is 2-wire, standard speed,

## DA9213 Standard Variants Overview

Register Address	Function	Default Value	Description
			PM_IF_V=VDDIO.
0x143	CONFIG_A	0x1A	Enabled automatic reset of 2-WIRE interface in case of clock stays low for > 35 ms. nIRQ output port is open drain, active low. GPIs are supplied from VDDIO.
0x144	CONFIG_B	0xE0	UVLO_IO is disabled. Power good signal masked during DVC transitions (keep previous status). Reload function is disabled.
0x145	CONFIG_C	0x1F	GPI0, GPI1, and GPI4 pull-down resistors are enabled. GPO2 and GPO3 pull-up resistors are enabled.
0x146	CONFIG_D	0x21	GPO3 is assigned as Power Good (PG), GPO2 is assigned as READY.
0x147	CONFIG_E	0x80	DA9213 is set as standalone device. No tune of oscillator frequency.
0x148	CONFIG_F	0xD0	Secondary 2-wire interface slave address = 0xD0



## DA9213 Standard Variants Overview

### 6 DA9213 Standard Variants Overview

Table 4: DA9213 Standard Variants Overview

Register Address	Function	Standard Variant DA9213-					
		JEUP	88UP				
0x054	MASK_A	0x5F	0x5F				
0x055	MASK_B	0x3F	0x3F				
0x056	CONTROL_A	0x53	0x51				
0x058	GPI0-1	0x44	0x44				
0x059	GPI02-3	0x44	0xEE				
0x05A	GPI4	0x04	0x0C				
0x05D	BUCKA_CONT	0x00	0x22				
0x0D0	BUCK_ILIM	0x99	0xFF				
0x0D1	BUCKA_CONF	0x92	0x0F				
0x0D3	VBUCK_CONF	0x1F	0x1F				
0x0D5	VBUCKA_MAX	0x7F	0x7F				
0x0D7	VBUCKA_A	0x46	0x37				
0x0D8	VBUCKA_B	0x46	0x3C				
0x105	INTERFACE	0xD9	0xD9				
0x106	INTERFACE2	0x80	0x90				
0x143	CONFIG_A	0x12	0x1A				
0x144	CONFIG_B	0xE0	0xE0				
0x145	CONFIG_C	0x00	0x1F				
0x146	CONFIG_D	0x00	0x21				
0x147	CONFIG_E	0x80	0x80				
0x148	CONFIG_F	0xD0	0xD0				

## 7 Conclusions

Understanding the configuration of the OTP described in this document can help minimize system issues such as incorrect hardware configuration. For further information please refer to the datasheets [1], on the Dialog website (<https://www.dialog-semiconductor.com/pmics>) or contact Dialog via either your sales representative or the support forum (<https://support.dialog-semiconductor.com/forums/pmic-audio>).

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**DA9213 Standard Variants Overview****Revision History**

Revision	Date	Description
1.0	06-Aug-2018	Initial version.
1.1	24-Feb-2022	File was rebranded with new logo, copyright and disclaimer

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## DA9213 Standard Variants Overview

### 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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