GigaDevice Semiconductor Inc.

Differences between GD32F47x/F42x and GD32F45x/F40x products

Application Note
AN030

Revision 1.3

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1. Introduction

This application note introduces the characteristic differences between GD32F47x/F42x and GD32F45x/F40x product series, mainly for electric characteristics and peripheral function characteristics. The differences are described in the following paragraphs.

2. Electric characteristic differences

2.1. General-purpose IOs (GPIO)

The GPIO differences is reflected in I/O port DC characteristics when IO speed is configured to level 0. The difference refers to ***Table 2-1. Differences of VOL in speed level 0*** and ***Table 2-2. Differences of VOH in speed level 0***.

Table 2-1. Differences of V_{OL} in speed level 0

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GD32F450xx GD32F407xx GD32F405xx	V_{OL}	Low level output voltage for an IO Pin (I_{IO} = +4 mA)	V_{DD}=V_{DDA}=2.6V	—	—	0.45	V
			V_{DD}=V_{DDA}=3.3V	—	—	0.38	
			V_{DD}=V_{DDA}=3.6V	—	—	0.36	
GD32F470xx GD32F427xx GD32F425xx			V_{DD}=V_{DDA}=2.6V	—	—	0.80	V
			V_{DD}=V_{DDA}=3.3V	—	—	0.63	
			V_{DD}=V_{DDA}=3.6V	—	—	0.60	

Table 2-2. Differences of V_{OH} in speed level 0

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GD32F450xx GD32F407xx GD32F405xx	V_{OH}	High level output voltage for an IO Pin (I_{IO} = +4 mA)	V_{DD}=V_{DDA}=2.6V	2.08	—	—	V
			V_{DD}=V_{DDA}=3.3V	2.87	—	—	
			V_{DD}=V_{DDA}=3.6V	3.19	—	—	
GD32F470xx GD32F427xx GD32F425xx			V_{DD}=V_{DDA}=2.6V	1.45	—	—	V
			V_{DD}=V_{DDA}=3.3V	2.48	—	—	
			V_{DD}=V_{DDA}=3.6V	2.83	—	—	

Note:

(1) Based on characterization, not tested in production.

(2) All pins except PC13 / PC14 / PC15 / PI8. Since PC13 to PC15 and PI8 are supplied through the Power Switch, which can only be obtained by a small current, the speed of GPIOs PC13 to PC15 and PI8 should not exceed 2 MHz when they are in output mode (maximum load: 30 pF).

2.2. Analog-to-digital converter (ADC)

The ADC differences are reflected in the value of input sampling capacitance and ADC dynamic accuracy. The differences refer to ***Table 2-3. Electric characteristic difference of ADC*** and ***Table 2-4. Electric characteristic difference of ADC dynamic accuracy***.

Table 2-3. Electric characteristic difference of ADC

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GD32F450xx GD32F407xx GD32F405xx	C_{ADC}	Input sampling capacitance	No pin/pad capacitance included	—	—	5.5	pF
GD32F470xx GD32F427xx GD32F425xx				—	—	4.0	pF

Note: Guaranteed by design, not tested in production.

Table 2-4. Electric characteristic difference of ADC dynamic accuracy

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GD32F450xx GD32F407xx GD32F405xx	ENOB	Effective number of bits	f_{ADC} = 40 MHz V_{DDA} = V_{REF+} = 3.3 V Input Frequency = 110 kHz Temperature = 25 ℃	—	10.0	—	bits
	SNDR	Signal-to-noise and distortion ratio		—	62	—	dB
	SNR	Signal-to-noise ratio		—	62.4	—	
	THD	Total harmonic distortion		—	-70	—	
GD32F470xx GD32F427xx GD32F425xx	ENOB	Effective number of bits		—	10.9	—	bits
	SNDR	Signal-to-noise and distortion ratio		—	67.3	—	dB
	SNR	Signal-to-noise ratio		—	67.7	—	
	THD	Total harmonic distortion		—	-75	—	

Note: Based on characterization, not tested in production.

2.3. Digital-to-analog converter (DAC)

The DAC difference refers to***Table 2-5. Electric characteristic difference of DAC***.

Table 2-5. Electric characteristic difference of DAC

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GD32F450xx GD32F407xx GD32F405xx	DNL	Differential non-linearity	10-bit configuration	—	—	±0.5	LSB
			12-bit configuration	—	—	±2	
	INL	Integral non linearity	10-bit configuration	—	—	±1	LSB
			12-bit configuration	—	—	±4	
	Offset	Offset error	DAC in 12-bit mode	—	—	±12	LSB
GD32F470xx GD32F427xx GD32F425xx	DNL	Differential non-linearity	10-bit configuration	—	—	±0.75	LSB
			12-bit configuration	—	—	±3	
	INL	Integral non linearity	10-bit configuration	—	—	±1.25	LSB
			12-bit configuration	—	—	±5	
	Offset	Offset error	DAC in 12-bit mode	—	—	±24	LSB

Note: Based on characterization, not tested in production.

2.4. Electrostatic discharge (ESD)

The ESD difference refers to ***Table 2-6. Difference of ESD level***.

Table 2-6. Difference of ESD level

Part Numbers	Model	ESD level (V)
GD32F450xx GD32F407xx GD32F405xx	HBM JS-001-2014	7000V
	CDM JS-002-2014	800V
GD32F470xx GD32F427xx GD32F425xx	HBM JS-001-2017	5000V
	CDM JS-002-2018	1000V

3. Peripheral function differences

3.1. Flash memory controller (FMC)

Compared with GD32F450/F407/F405xx, GD32F470/F427/F425xx supports the 4KB erase function. The GD32F470/F427/F425xx has page erase configuration register (FMC_PECFG) and unlock page erase key register (FMC_PEKEY). The FMC difference refers to ***Table 3-1. Difference of FMC registers***.

Table 3-1. Difference of FMC registers

Part Numbers	FMC_PECFG	FMC_PEKEY
GD32F450xx GD32F407xx GD32F405xx	Not supported	
GD32F470xx GD32F427xx GD32F425xx	Supported	

4. Other differences

4.1. Clock

Maximum operating clock frequency difference of processor core refer to ***Table 4-1. Difference of system maximum operating clock frequency***.

Table 4-1. Difference of system maximum operating clock frequency

Part Numbers	Maximum operating frequency
GD32F450xx	Up to 200MHz
GD32F407/F405xx	Up to 168MHz
GD32F470xx	Up to 240MHz
GD32F427/F425xx	Up to 200MHz

4.2. Memory

Memory size difference refer to ***Table 4-2. Difference of memory size***.

Table 4-2. Difference of memory size

Part Numbers	Code-Flash	ADDSRAM
GD32F450xx	Up to 512KB	Up to 256KB
GD32F407/F405xx	Up to 512KB	0KB
GD32F470xx	Up to 1024KB	Up to 512KB
GD32F427/F425xx	Up to 512KB	0KB

5. Revision history

Table 5-1. Revision history

Revision No.	Description	Date
1.0	Initial Release	May.11, 2022
1.1	Add DAC difference and update ESD difference	May.23, 2022
1.2	Add GPIO port DC difference	Dec.9, 2022
1.3	Delete the flash memory difference	Aug.22, 2023

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