GigaDevice Semiconductor Inc.

Differences between GD32E235 and GD32E230 products

Application Note
AN145

Revision 1.0

(Nov. 2023)

Table of Contents

List of Table

1. Introduction

This application note introduces the characteristic differences between GD32E235 and GD32E230 product series, mainly for electric characteristics and peripheral function characteristics. The differences are described in the following paragraphs.

2. Electric characteristic differences

2.1. Start-up timings of operating conditions

Start-up timings difference refers to ***Table 2-1. Differences of start-up timings of operating conditions***.

Table 2-1. Differences of start-up timings of operating conditions

Part Numbers	Symbol	Parameter	Conditions	Typ	Unit
GD32E230xx	tstart-up	Start-up time	Clock source from IRC8M	76	μs
GD32E235xx				87	

Note:

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

(2) After power-up, the start-up time is the time between the rising edge of NRST high and the first I/O instruction conversion in SystemInit function.

(3) PLL is off.

2.2. Power saving mode wakeup timings

The power saving mode wakeup timings differences are reflected in wakeup timings from sleep mode, deep-sleep mode and standby mode, which refers to ***Table 2-2. Differences of power saving mode wakeup timings characteristics***.

Table 2-2. Differences of power saving mode wakeup timings characteristics

Part Numbers	Symbol	Parameter	Typ	Unit
GD32E230xx	t_{Sleep}	Wakeup from Sleep mode	3.5	μs
	$t_{Deep-sleep}$	Wakeup from Deep-sleep mode (LDO On)	17.1	
		Wakeup from Deep-sleep mode (LDO in low power mode)	17.1	
	$t_{Standby}$	Wakeup from Standby mode	77.5	
GD32E235xx	t_{Sleep}	Wakeup from Sleep mode	2.5	
	$t_{Deep-sleep}$	Wakeup from Deep-sleep mode (LDO On)	31.6	
		Wakeup from Deep-sleep mode (LDO in low power mode)	31.6	
	$t_{Standby}$	Wakeup from Standby mode	87.4	

Note:

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

(2) The wakeup time is measured from the wakeup event to the point at which the application code reads the first instruction under the below conditions: V_{DD} = V_{DDA} = 3.3 V, IRC8M = System clock = 8 MHz.

2.3. Power consumption

The power consumption differences are reflected in supply current in deep-sleep mode and standby mode, which refers to ***Table 2-3. Differences of power consumption characteristics in deep-sleep mode*** and ***Table 2-4. Differences of Power consumption characteristics in standby mode***.

Table 2-3. Differences of power consumption characteristics in deep-sleep mode

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GD32E230xx	$I_{DD}+I_{DDA}$	Supply current (Deep-sleep mode)	V_{DD} = V_{DDA} = 3.3 V, LDO in normal power and normal driver mode, IRC40K off, RTC off	—	25.5	58	μA
			V_{DD} = V_{DDA} = 3.3 V, LDO in normal power and low driver mode, IRC40K off, RTC off	—	12.3	58	μA
GD32E235xx			V_{DD} = V_{DDA} = 3.3 V, LDO in normal power and normal driver mode, IRC40K off, RTC off	—	32.3	-	μA
			V_{DD} = V_{DDA} = 3.3 V, LDO in normal power and low driver mode, IRC40K off, RTC off	—	20.4	66	μA

Note: Based on characterization, not tested in production.

Table 2-4. Differences of Power consumption characteristics in standby mode

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GD32E230xx	$I_{DD}+I_{DDA}$	Supply current (Standby mode)	V_{DD} = V_{DDA} = 3.3 V, LXTAL off, IRC40K on, RTC on	—	3.8	5.5	μA
			V_{DD} = V_{DDA} = 3.3 V, LXTAL off, IRC40K on, RTC off	—	3.6	5.5	
			V_{DD} = V_{DDA} = 3.3 V, LXTAL off, IRC40K off, RTC off, VDDA Monitor on	—	3.1	5.5	
			V_{DD} = V_{DDA} = 3.3 V, LXTAL off, IRC40K off, RTC off, VDDA Monitor off	—	1.6	5.5	
GD32E235xx			V_{DD} = V_{DDA} = 3.3 V, LXTAL off, IRC40K on, RTC on	—	4.7	—	μA
			V_{DD} = V_{DDA} = 3.3 V, LXTAL off, IRC40K on, RTC off	—	4.5	—	
			V_{DD} = V_{DDA} = 3.3 V, LXTAL off, IRC40K off, RTC off, VDDA Monitor on	—	4.0	11	
			V_{DD} = V_{DDA} = 3.3 V, LXTAL off,	—	2.5	—	

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
			IRC40K off, RTC off, VDDA Monitor off				

Note: Based on characterization, not tested in production.

2.4. External clock

The external clock difference is reflected in LXTAL startup time, which refers to ***Table 2-5. Differences of LXTAL startup time***.

Table 2-5. Differences of LXTAL startup time

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GD32E230xx	$t_{SULXTAL}$	Crystal or ceramic startup time	V_{DD} = 3.3 V	—	1.8 (1)	—	s
GD32E235xx				—	0.6 (2)	—	

Note:

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

(2) Guaranteed by design, not tested in production.

2.5. Internal clock

The internal clock difference is reflected in IRC40K startup time, which refers to ***Table 2-6. Differences of IRC40K startup time***.

Table 2-6. Differences of IRC40K startup time

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GD32E230xx	$t_{SUIRC40K}$	IRC40K oscillator startup time	V_{DD} = 3.3 V	—	33	—	μs
GD32E235xx				—	24	—	

Note: Based on characterization, not tested in production.

2.6. PLL

The PLL difference is reflected in I_{DDA} and $Jitter_{PLL}$, which refers to ***Table 2-7. Differences of IDDA and JitterPLL of PLL***.

Table 2-7. Differences of I_{DDA} and $Jitter_{PLL}$ of PLL

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GD32E230xx	I_{DDA} (1)	Current consumption on V_{DDA}	VCO freq = 72 MHz	—	260	—	μA
	$Jitter_{PLL}$ (2)	Cycle to cycle Jitter（rms）	System clock	—	50	—	ps
GD32E235xx	I_{DDA} (1)	Current consumption on V_{DDA}	VCO freq = 72 MHz	—	370	—	μA
	$Jitter_{PLL}$ (2)	Cycle to cycle Jitter（rms）	System clock	—	159	—	ps

Note:

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

(2) Value given with main PLL running.

2.7. Flash memory

The flash memory characteristics differences are reflected in word programming, page erasing and mass erasing time, which refers to ***Table 2-8. Differences of flash operating time***.

Table 2-8. Differences of flash operating time

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GD32E230xx	t_{PROG}	Word programming time	T_A = -40 °C ~ +85 °C	37	—	42	μs
	t_{ERASE}	Page erase time		3.2	—	4	ms
	t_{MERASE}	Mass erase time		8	—	10	ms
GD32E235xx	t_{PROG}	Word programming time		—	197	—	μs
	t_{ERASE}	Page erase time		—	5	—	ms
	t_{MERASE}	Mass erase time		—	35	—	ms

Note: Guaranteed by design, not tested in production.

2.8. Analog-to-digital converter (ADC)

The ADC characteristics differences are reflected in operating voltage, external input impedance and input sampling capacitance, which refers to ***Table 2-9. Electric characteristic differences of ADC***.

Table 2-9. Electric characteristic differences of ADC

Part Numbers	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
GD32E230xx	V_{DDA}(1)	Operating voltage	—	2.4	3.3	3.6	V
	R_{AIN}(2)	External input impedance	—	—	—	219.86	kΩ
	C_{ADC}(2)	Input sampling capacitance	No pin/pad capacitance included	—	—	4	pF
GD32E235xx	V_{DDA}(1)	Operating voltage	—	1.8	3.3	3.6	V
	R_{AIN}(2)	External input impedance	—	—	—	127.24	kΩ
	C_{ADC}(2)	Input sampling capacitance	No pin/pad capacitance included	—	—	6.9	pF

Note:

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

(2) Guaranteed by design, not tested in production.

3. Peripheral function differences

3.1. Interrupt / event controller (EXTI)

The EXTI differences are reflected in SWIEVx bit function of software interrupt event register, which refers to ***Table 3-1. Differences of SWIEVx bit function of EXTI***.

Table 3-1. Differences of SWIEVx bit function of EXTI

Part Numbers	SWIEVx bit function
GD32E230xx	0: Deactivate the EXTIx software interrupt / event request 1: Activate the EXTIx software interrupt / event request
GD32E235xx	0: Writing 0 has no effect. 1: Writing '1' to this bit when it is at “0” will trigger the EXTI linex software interrupt / event request. This bit is cleared by clearing the corresponding PDx bit in the EXTI_PD register

4. Other differences

4.1. Memory

Memory size difference refers to ***Table 4-1. Differences of memory size***.

Table 4-1. Differences of memory size

Part Numbers	FLASH	SRAM
GD32E230xx	Up to 64KB	Up to 8KB
GD32E235xx	Up to 128KB	Up to 16KB

4.2. ADC with FLASH

GD32E230xx product: when DMA reads ADC data to SRAM, if the CPU performs a flash erase operation at this time, the DMA task will be blocked until the flash erase operation is complete. The GD32E235xx does not have the above problem.

4.3. I2C Arbitration

GD32E230xx product: I2C is interrupted by another interruption during data reception, and if BTC is set at this time, the program will read back one more data. The GD32E235xx does not have the above problem.

5. Revision history

Table 5-1. Revision history

Revision No.	Description	Date
1.0	Initial Release	Nov.8, 2023

Important Notice

This document is the property of GigaDevice Semiconductor Inc. and its subsidiaries (the "Company"). This document, including any product of the Company described in this document (the “Product”), is owned by the Company under the intellectual property laws and treaties of the People’s Republic of China and other jurisdictions worldwide. The Company reserves all rights under such laws and treaties and does not grant any license under its patents, copyrights, trademarks, or other intellectual property rights. The names and brands of third party referred thereto (if any) are the property of their respective owner and referred to for identification purposes only.

The Company makes no warranty of any kind, express or implied, with regard to this document or any Product, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The Company does not assume any liability arising out of the application or use of any Product described in this document. Any information provided in this document is provided only for reference purposes. It is the responsibility of the user of this document to properly design, program, and test the functionality and safety of any application made of this information and any resulting product. Except for customized products which has been expressly identified in the applicable agreement, the Products are designed, developed, and/or manufactured for ordinary business, industrial, personal, and/or household applications only. The Products are not designed, intended, or authorized for use as components in systems designed or intended for the operation of weapons, weapons systems, nuclear installations, atomic energy control instruments, combustion control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, life-support devices or systems, other medical devices or systems (including resuscitation equipment and surgical implants), pollution control or hazardous substances management, or other uses where the failure of the device or Product could cause personal injury, death, property or environmental damage ("Unintended Uses"). Customers shall take any and all actions to ensure using and selling the Products in accordance with the applicable laws and regulations. The Company is not liable, in whole or in part, and customers shall and hereby do release the Company as well as it’s suppliers and/or distributors from any claim, damage, or other liability arising from or related to all Unintended Uses of the Products. Customers shall indemnify and hold the Company as well as it’s suppliers and/or distributors harmless from and against all claims, costs, damages, and other liabilities, including claims for personal injury or death, arising from or related to any Unintended Uses of the Products.

Information in this document is provided solely in connection with the Products. The Company reserves the right to make changes, corrections, modifications or improvements to this document and Products and services described herein at any time, without notice.