

RENESAS TECHNICAL UPDATE

TOYOSU FORESIA, 3-2-24, Toyosu, Koto-ku, Tokyo 135-0061, Japan
Renesas Electronics Corporation

Product Category	MPU/MCU		Document No.	TN-RL*-A0120A/E	Rev.	1.00
Title	Correction for Incorrect Description Notice RL78/I1C (512KB) Descriptions in the User's Manual: Hardware Rev. 1.01 Changed		Information Category	Technical Notification		
Applicable Product	RL78/I1C Group	Lot No.	Reference Document	RL78/I1C (512KB) User's Manual: Hardware Rev. 1.01 R01UH0889EJ0101 (Nov. 2022)		
		All lots				

This document describes misstatements found in the RL78/I1C (512KB) User's Manual: Hardware Rev. 1.01 (R01UH0889EJ0211).

Corrections

Applicable Item	Applicable Page	Contents
43.3.2 Supply current characteristics	Page 1228 to Page 1233	Incorrect descriptions revised

Document Improvement

The above corrections will be made for the next revision of the User's Manual: Hardware.

Corrections in the User's Manual: Hardware

No.	Corrections and Applicable Items			Pages in this document for corrections
	Document No.	English	R01UH0889EJ0101	
1	43.3.2 Supply current characteristics		Page 1228 to Page 1233	Page 3 to Page 7

Incorrect: Bold with underline; Correct: Gray hatched

Revision History

RL78/I1C Correction for incorrect description notice

Document Number	Issue Date	Description
TN-RL*-A0120A/E	Jan. 20, 2023	First edition issued Corrections No.1 revised (this document)

1. **43.3.2 Supply current characteristics (Page 1228 to Page 1233)**

Incorrect:

43.3.2 Supply current characteristics

(T_A = -40 to +85° C, 1.6 V ≤ AV_{DD} = EV_{DD} = V_{DD} ≤ 5.5 V, AV_{SS} = V_{SS} = EV_{SS} = 0V) (1/6)

Parameter	Symbol	Conditions				MIN.	TYP.	MAX.	Unit	
Supply current ^{Note 1}	I _{DD1}	Operating mode	HS (high-speed main) mode ^{Note 5}	f _{ih} = 32 MHz ^{Note 3}	Basic operation	V _{DD} = 5.0 V		2.5		mA
						V _{DD} = 3.0 V		2.5		mA
					Normal operation	V _{DD} = 5.0 V		5.6	9.1	mA
						V _{DD} = 3.0 V		5.6	9.1	mA
				f _{il} = 15 kHz, T _A = +85°C ^{Note 7}	Normal operation		5.0	13	μA	

- Notes**
- Total current flowing into V_{DD}, EV_{DD}, and V_{RTC} including the input leakage current flowing when the level of the input pin is fixed to V_{DD}, EV_{DD}, V_{RTC} or V_{SS}, EV_{SS}. ~~The values below the MAX. column include the peripheral operation current. However, not including the current flowing into the LCD controller/driver, 12-bit A/D converter, ΔΣA/D converter, LVD circuit, battery backup circuit, I/O port, and on-chip pull-up/pull-down resistors.~~
 - When high-speed on-chip oscillator, middle-speed on-chip oscillator, low-speed on-chip oscillator, and subsystem clock are stopped.
 - When high-speed system clock, middle-speed on-chip oscillator, low-speed on-chip oscillator, and subsystem clock are stopped.
 - When high-speed on-chip oscillator, middle-speed on-chip oscillator, and high-speed system clock are stopped. When setting ultra-low current consumption (AMP_{HS1} = 1), ~~However, not including the current flowing into independent power supply RTC, 12-bit interval timer.~~
 - Relationship between operation voltage width, operation frequency of CPU and operation mode is as below.
 - HS (high-speed main) mode: 2.8 V ≤ V_{DD} ≤ 5.5 V@1 MHz to 32 MHz
2.4 V ≤ V_{DD} ≤ 5.5 V@1 MHz to 16 MHz
2.1 V ≤ V_{DD} ≤ 5.5 V@1 MHz to 6 MHz
 - LS (low-speed main) mode: 1.8 V ≤ V_{DD} ≤ 5.5 V@1 MHz to 8 MHz
 - LP (low-power main) mode: 1.8 V ≤ V_{DD} ≤ 5.5 V@1 MHz
 - LV (low-voltage main) mode: 1.6 V ≤ V_{DD} ≤ 5.5 V@1 MHz to 4 MHz
 - When high-speed on-chip oscillator, low-speed on-chip oscillator, high-speed system clock, and subsystem clock are stopped.
 - When high-speed on-chip oscillator, middle-speed on-chip oscillator, high-speed system clock, and subsystem clock are stopped.

Correct:

43.3.2 Supply current characteristics

(T_A = -40 to +85° C, 1.6 V ≤ AV_{DD} = EV_{DD} = V_{DD} ≤ 5.5 V, AV_{SS} = V_{SS} = EV_{SS} = 0V) (1/6)

Parameter	Symbol	Conditions				MIN.	TYP.	MAX.	Unit	
Supply current ^{Note 1}	I _{DD1}	Operating mode	HS (high-speed main) mode ^{Note 5}	f _{ih} = 32 MHz ^{Note 3}	Basic operation	V _{DD} = 5.0 V		2.5		mA
						V _{DD} = 3.0 V		2.5		mA
					Normal operation	V _{DD} = 5.0 V		5.6	9.1	mA
						V _{DD} = 3.0 V		5.6	9.1	mA
				f _{il} = 15 kHz, T _A = +85°C ^{Note 7}	Normal operation		5.0	13	μA	

- Notes**
- Total current flowing into V_{DD}, EV_{DD}, and V_{RTC} including the input leakage current flowing when the level of the input pin is fixed to V_{DD}, EV_{DD}, V_{RTC} or V_{SS}, EV_{SS}. The following points apply in the HS (high-speed main), LS (low-speed main), LV (low-voltage main), and LP (low-power main) modes.
 - The currents in the "TYP." column do not include the operating currents of the peripheral modules.
 - The currents in the "MAX." column include the operating currents of the peripheral modules, except for those flowing into the LCD controller/driver, 12-bit A/D converter, ΔΣA/D converter, LVD circuit, battery backup circuit, I/O port, and on-chip pull-up/pull-down resistors, and those flowing while the data flash memory is being rewritten.

In the subsystem clock operation, the currents in both the "TYP." and "MAX." columns do not include the operating currents of the peripheral modules. However, in HALT mode, including the current flowing into the independent power supply RTC.
 - When high-speed on-chip oscillator, middle-speed on-chip oscillator, low-speed on-chip oscillator, and subsystem clock are stopped.
 - When high-speed system clock, middle-speed on-chip oscillator, low-speed on-chip oscillator, and subsystem clock are stopped.
 - When high-speed on-chip oscillator, middle-speed on-chip oscillator, and high-speed system clock are stopped. When setting ultra-low current consumption (AMP_{HS1} = 1).

6. When high-speed on-chip oscillator, low-speed on-chip oscillator, high-speed system clock, and subsystem clock are stopped.
7. When high-speed on-chip oscillator, middle-speed on-chip oscillator, high-speed system clock, and subsystem clock are stopped.

- Remarks**
1. f_{MX} : High-speed system clock frequency (X1 clock oscillation frequency or external main system clock frequency)
 2. f_{IH} : High-speed on-chip oscillator clock frequency
 3. f_{IM} : Middle-speed on-chip oscillator clock frequency
 4. f_{IL} : Low-speed on-chip oscillator clock frequency
 5. f_{SUB} : Subsystem clock frequency (XT1 clock oscillation frequency)
 6. Except subsystem clock operation, temperature condition of the TYP. value is $T_A = 25^\circ\text{C}$

5. Relationship between operation voltage width, operation frequency of CPU and operation mode is as below.

HS (high-speed main) mode: $2.8\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }32\text{ MHz}$
 $2.4\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }16\text{ MHz}$
 $2.1\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }6\text{ MHz}$

LS (low-speed main) mode: $1.8\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }8\text{ MHz}$

LP (low-power main) mode: $1.8\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz}$

LV (low-voltage main) mode: $1.6\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }4\text{ MHz}$

6. When high-speed on-chip oscillator, low-speed on-chip oscillator, high-speed system clock, and subsystem clock are stopped.
7. When high-speed on-chip oscillator, middle-speed on-chip oscillator, high-speed system clock, and subsystem clock are stopped.

- Remarks**
1. f_{MX} : High-speed system clock frequency (X1 clock oscillation frequency or external main system clock frequency)
 2. f_{IH} : High-speed on-chip oscillator clock frequency
 3. f_{IM} : Middle-speed on-chip oscillator clock frequency
 4. f_{IL} : Low-speed on-chip oscillator clock frequency
 5. f_{SUB} : Subsystem clock frequency (XT1 clock oscillation frequency)
 6. Except subsystem clock operation, temperature condition of the TYP. value is $T_A = 25^\circ\text{C}$

(TA = -40 to +85° C, 1.6 V ≤ AVDD = EVDD = VDD ≤ 5.5 V, AVSS = VSS = EVSS = 0V) (3/6)

(TA = -40 to +85° C, 1.6 V ≤ AVDD = EVDD = VDD ≤ 5.5 V, AVSS = VSS = EVSS = 0V) (3/6)

Parameter	Symbol	Conditions		MIN.	TYP.	MAX.	Unit		
Supply current ^{Note 1}	I _{DD2} ^{Note 2}	HALT mode	HS (high-speed main) mode ^{Note 7}	f _{HI} = 32 MHz ^{Note 4}	V _{DD} = 5.0 V	0.69	1.9	mA	
					V _{DD} = 3.0 V	0.68	1.9	mA	
				f _{CLK} = 32 MHz ^{Note 4} , PLL operation	V _{DD} = 5.0 V	1.2	2.2	mA	
					V _{DD} = 3.0 V	1.2	2.2	mA	
				f _{HI} = 24 MHz ^{Note 4}	V _{DD} = 5.0 V	0.56	1.5	mA	
					V _{DD} = 3.0 V	0.56	1.5	mA	
				f _{HI} = 16 MHz ^{Note 4}	V _{DD} = 5.0 V	0.49	1.2	mA	
					V _{DD} = 3.0 V	0.49	1.2	mA	
				f _{HI} = 12 MHz ^{Note 4}	V _{DD} = 5.0 V	0.41	1.0	mA	
					V _{DD} = 3.0 V	0.41	1.0	mA	
				f _{HI} = 6 MHz ^{Note 4}	V _{DD} = 5.0 V	0.36	0.8	mA	
					V _{DD} = 3.0 V	0.36	0.8	mA	
				f _{HI} = 3 MHz ^{Note 4}	V _{DD} = 5.0 V	0.33	0.7	mA	
					V _{DD} = 3.0 V	0.33	0.7	mA	
				LS (low-speed main) mode ^{Note 7} (MCSEL = 0)	f _{HI} = 8 MHz ^{Note 4}	V _{DD} = 3.0 V	290	755	μA
						V _{DD} = 2.0 V	290	755	μA
					f _{HI} = 6 MHz ^{Note 4}	V _{DD} = 3.0 V	240	655	μA
						V _{DD} = 2.0 V	240	655	μA
			f _{HI} = 3 MHz ^{Note 4}		V _{DD} = 3.0 V	210	556	μA	
					V _{DD} = 2.0 V	210	556	μA	
			LS (low-speed main) mode ^{Note 7} (MCSEL = 1)	f _{HI} = 4 MHz ^{Note 4}	V _{DD} = 3.0 V	220	450	μA	
					V _{DD} = 2.0 V	220	450	μA	
				f _{IM} = 4 MHz ^{Note 5}	V _{DD} = 3.0 V	60	350	μA	
					V _{DD} = 2.0 V	60	350	μA	
			LV (low-voltage main) mode ^{Note 7}	f _{HI} = 4 MHz ^{Note 4}	V _{DD} = 3.0 V	625	1200	μA	
					V _{DD} = 2.0 V	625	1200	μA	
			LP (low-power main) mode ^{Note 7} (MCSEL = 1)	f _{HI} = 1 MHz ^{Note 4}	V _{DD} = 3.0 V	200	410	μA	
					V _{DD} = 2.0 V	200	410	μA	
f _{IM} = 1 MHz ^{Note 5}	V _{DD} = 3.0 V	35		150	μA				
	V _{DD} = 2.0 V	35		150	μA				
HS (high-speed main) mode ^{Note 7}	f _{MAX} = 20 MHz ^{Note 3} , V _{DD} = 5.0 V	Square wave input	0.31	1.15	mA				
		Resonator connection	0.53	1.35	mA				

Parameter	Symbol	Conditions		MIN.	TYP.	MAX.	Unit		
Supply current ^{Note 1}	I _{DD2} ^{Note 2}	HALT mode	HS (high-speed main) mode ^{Note 7}	f _{HI} = 32 MHz ^{Note 4}	V _{DD} = 5.0 V	0.69	1.9	mA	
					V _{DD} = 3.0 V	0.68	1.9	mA	
				f _{CLK} = 32 MHz ^{Note 4} , PLL operation	V _{DD} = 5.0 V	1.2	2.2	mA	
					V _{DD} = 3.0 V	1.2	2.2	mA	
				f _{HI} = 24 MHz ^{Note 4}	V _{DD} = 5.0 V	0.56	1.5	mA	
					V _{DD} = 3.0 V	0.56	1.5	mA	
				f _{HI} = 16 MHz ^{Note 4}	V _{DD} = 5.0 V	0.49	1.2	mA	
					V _{DD} = 3.0 V	0.49	1.2	mA	
				f _{HI} = 12 MHz ^{Note 4}	V _{DD} = 5.0 V	0.41	1.0	mA	
					V _{DD} = 3.0 V	0.41	1.0	mA	
				f _{HI} = 6 MHz ^{Note 4}	V _{DD} = 5.0 V	0.36	0.8	mA	
					V _{DD} = 3.0 V	0.36	0.8	mA	
				f _{HI} = 3 MHz ^{Note 4}	V _{DD} = 5.0 V	0.33	0.7	mA	
					V _{DD} = 3.0 V	0.33	0.7	mA	
				LS (low-speed main) mode ^{Note 7} (MCSEL = 0)	f _{HI} = 8 MHz ^{Note 4}	V _{DD} = 3.0 V	290	755	μA
						V _{DD} = 2.0 V	290	755	μA
					f _{HI} = 6 MHz ^{Note 4}	V _{DD} = 3.0 V	240	655	μA
						V _{DD} = 2.0 V	240	655	μA
			f _{HI} = 3 MHz ^{Note 4}		V _{DD} = 3.0 V	210	556	μA	
					V _{DD} = 2.0 V	210	556	μA	
			LS (low-speed main) mode ^{Note 7} (MCSEL = 1)	f _{HI} = 4 MHz ^{Note 4}	V _{DD} = 3.0 V	220	450	μA	
					V _{DD} = 2.0 V	220	450	μA	
				f _{IM} = 4 MHz ^{Note 5}	V _{DD} = 3.0 V	60	350	μA	
					V _{DD} = 2.0 V	60	350	μA	
			LV (low-voltage main) mode ^{Note 7}	f _{HI} = 4 MHz ^{Note 4}	V _{DD} = 3.0 V	625	1200	μA	
					V _{DD} = 2.0 V	625	1200	μA	
			LP (low-power main) mode ^{Note 7} (MCSEL = 1)	f _{HI} = 1 MHz ^{Note 4}	V _{DD} = 3.0 V	200	410	μA	
					V _{DD} = 2.0 V	200	410	μA	
f _{IM} = 1 MHz ^{Note 5}	V _{DD} = 3.0 V	35		150	μA				
	V _{DD} = 2.0 V	35		150	μA				
HS (high-speed main) mode ^{Note 7}	f _{MAX} = 20 MHz ^{Note 3} , V _{DD} = 5.0 V	Square wave input	0.31	1.15	mA				
		Resonator connection	0.53	1.35	mA				

(T_A = -40 to +85° C, 1.6 V ≤ AV_{DD} = EV_{DD} = V_{DD} ≤ 5.5 V, AV_{SS} = V_{SS} = EV_{SS} = 0V) (4/6)

Parameter	Symbol	Conditions		MIN.	TYP.	MAX.	Unit	
Supply current ^{Note 1}	I _{DD2} ^{Note 2}	HALT mode	LS (low-speed main)	f _{MAX} = 8 MHz ^{Note 3} , V _{DD} = 3.0 V	Square wave input	113	420	μA
					Resonator connection	176	485	μA
		mode ^{Note 7} (MCSEL = 0)		f _{MAX} = 8 MHz ^{Note 3} , V _{DD} = 2.0 V	Square wave input	113	420	μA

Sub clock operation	f _{SUB} = 32.768 kHz ^{Note 5}	T _A = -40°C	Square wave input	0.80	6.6	μA	
			Resonator connection	1.00	6.8	μA	
			T _A = +25°C	Square wave input	1.0	4.1	μA
				Resonator connection	1.4	4.3	μA
			T _A = +50°C	Square wave input	1.2	5.6	μA
				Resonator connection	1.6	5.7	μA
			T _A = +70°C	Square wave input	1.6	9.0	μA
				Resonator connection	2.0	10.6	μA
			T _A = +85°C	Square wave input	2.80	16.2	μA
				Resonator connection	3.00	19.6	μA
			f _L = 15 kHz ^{Note 9} , T _A = -40°C		0.83	1.85	μA
							μA
			f _L = 15 kHz ^{Note 9} , T _A = +25°C		1.07	2.25	μA
							μA
			f _L = 15 kHz ^{Note 9} , T _A = +85°C		2.68	28.1	μA
							μA
I _{DD3} ^{Note 6}	STOP mode ^{Note 8}	T _A = -40°C	0.47	0.95	μA		
		T _A = +25°C	0.66	1.60	μA		
		T _A = +50°C	0.84	4.80	μA		
		T _A = +70°C	1.22	10.60	μA		
		T _A = +85°C	1.94	13	μA		

- Notes 1.** Total current flowing into V_{DD}, EV_{DD}, and V_{RTC} including the input leakage current flowing when the level of the input pin is fixed to V_{DD}, EV_{DD} or V_{SS}, EV_{SS}. The values below the MAX. column include the peripheral operation current. However, not including the current flowing into the LCD controller/driver, 12-bit A/D converter, ΔΣA/D converter, LVD circuit, battery backup circuit, I/O port, and on-chip pull-up/pull-down resistors.
- During HALT instruction execution by flash memory.
 - When high-speed on-chip oscillator, middle-speed on-chip oscillator, low-speed on-chip oscillator, and subsystem clock are stopped.
 - When high-speed system clock, middle-speed on-chip oscillator, low-speed on-chip oscillator, and Subsystem clock are stopped.

(T_A = -40 to +85° C, 1.6 V ≤ AV_{DD} = EV_{DD} = V_{DD} ≤ 5.5 V, AV_{SS} = V_{SS} = EV_{SS} = 0V) (4/6)

Parameter	Symbol	Conditions		MIN.	TYP.	MAX.	Unit	
Supply current ^{Note 1}	I _{DD2} ^{Note 2}	HALT mode	LS (low-speed main)	f _{MAX} = 8 MHz ^{Note 3} , V _{DD} = 3.0 V	Square wave input	113	420	μA
					Resonator connection	176	485	μA
		mode ^{Note 7} (MCSEL = 0)		f _{MAX} = 8 MHz ^{Note 3} , V _{DD} = 2.0 V	Square wave input	113	420	μA

Sub clock operation	f _{SUB} = 32.768 kHz ^{Note 6}	T _A = -40°C	Square wave input	0.80	6.6	μA	
			Resonator connection	1.00	6.8	μA	
			T _A = +25°C	Square wave input	1.0	4.1	μA
				Resonator connection	1.4	4.3	μA
			T _A = +50°C	Square wave input	1.2	5.6	μA
				Resonator connection	1.6	5.7	μA
			T _A = +70°C	Square wave input	1.6	9.0	μA
				Resonator connection	2.0	10.6	μA
			T _A = +85°C	Square wave input	2.80	16.2	μA
				Resonator connection	3.00	19.6	μA
			f _L = 15 kHz ^{Note 9} , T _A = -40°C		0.83	1.85	μA
							μA
			f _L = 15 kHz ^{Note 9} , T _A = +25°C		1.07	2.25	μA
							μA
			f _L = 15 kHz ^{Note 9} , T _A = +85°C		2.68	28.1	μA
							μA
I _{DD3}	STOP mode ^{Note 8}	T _A = -40°C	0.47	0.95	μA		
		T _A = +25°C	0.66	1.60	μA		
		T _A = +50°C	0.84	4.80	μA		
		T _A = +70°C	1.22	10.60	μA		
		T _A = +85°C	1.94	13	μA		

- Notes 1.** Total current flowing into V_{DD}, EV_{DD}, and V_{RTC} including the input leakage current flowing when the level of the input pin is fixed to V_{DD}, EV_{DD} or V_{RTC} or V_{SS}, EV_{SS}.
The following points apply in the HS (high-speed main), LS (low-speed main), LV (low-voltage main), and LP (low-power main) modes.
- The currents in the "TYP." column do not include the operating currents of the peripheral modules.
 - The currents in the "MAX." column include the operating currents of the peripheral modules, except for those flowing into LCD controller/driver, the 12-bit A/D converter, ΔΣA/D converter, LVD circuit, battery backup circuit, I/O port, and on-chip pull-up/pull-down resistors, and those flowing while the data flash memory is being rewritten.
- In the subsystem clock operation, the currents in both the "TYP." and "MAX." columns do not include the operating currents of the peripheral modules. However, in HALT mode, including the current flowing into the independent power supply RTC.
- In the STOP mode, the currents in both the "TYP." and "MAX." columns do not include the operating currents of the peripheral modules.

5. When operating independent power supply RTC and setting ultra-low current consumption (AMPHS1 = 1). When high-speed on-chip oscillator, middle-speed on-chip oscillator, and high-speed system clock are stopped. ~~However, not including the current flowing into the 12-bit interval timer and watchdog timer. When high-speed on-chip oscillator and high-speed system clock are stopped.~~
6. ~~When high-speed on-chip oscillator, high-speed system clock, and subsystem clock are stopped. However, not including the current flowing into independent power supply RTC, 12-bit interval timer, and watchdog timer.~~
7. Relationship between operation voltage width, operation frequency of CPU and operation mode is as below.
 - HS (high-speed main) mode: $2.8\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }32\text{ MHz}$
 $2.7\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }24\text{ MHz}$
 $2.5\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }16\text{ MHz}$
 $2.4\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }12\text{ MHz}$
 $2.1\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }6\text{ MHz}$
 - LS (low-speed main) mode: $1.9\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }8\text{ MHz}$
 - LP (low-power main) mode: $1.9\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz}$
 - LV (low-voltage main) mode: $1.7\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }4\text{ MHz}$
8. If operation of the subsystem clock when STOP mode, same as when HALT mode of subsystem clock operation.
9. When high-speed on-chip oscillator, middle-speed on-chip oscillator, and high-speed system clock are stopped.

- Remarks**
1. f_{MX} : High-speed system clock frequency (X1 clock oscillation frequency or external main system clock frequency)
 2. f_{IH} : High-speed on-chip oscillator clock frequency
 3. f_{IM} : Middle-speed on-chip oscillator clock frequency
 4. f_{IL} : Low-speed on-chip oscillator clock frequency
 5. f_{SUB} : Subsystem clock frequency (XT1 clock oscillation frequency)
 6. Except subsystem clock operation, temperature condition of the TYP. value is $T_A = 25^\circ\text{C}$

2. During HALT instruction execution by flash memory.
3. When high-speed on-chip oscillator, middle-speed on-chip oscillator, low-speed on-chip oscillator, and subsystem clock are stopped.
4. When high-speed system clock, middle-speed on-chip oscillator, low-speed on-chip oscillator, and Subsystem clock are stopped.
5. When high-speed on-chip oscillator system clock, low-speed on-chip oscillator, high-speed system clock, and Subsystem clock are stopped.
6. When operating independent power supply RTC and setting ultra-low current consumption (AMPHS1 = 1). When high-speed on-chip oscillator, middle-speed on-chip oscillator, and high-speed system clock are stopped.
7. Relationship between operation voltage width, operation frequency of CPU and operation mode is as below.
 - HS (high-speed main) mode: $2.8\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }32\text{ MHz}$
 $2.7\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }24\text{ MHz}$
 $2.5\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }16\text{ MHz}$
 $2.4\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }12\text{ MHz}$
 $2.1\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }6\text{ MHz}$
 - LS (low-speed main) mode: $1.9\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }8\text{ MHz}$
 - LP (low-power main) mode: $1.9\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz}$
 - LV (low-voltage main) mode: $1.7\text{ V} \leq V_{DD} \leq 5.5\text{ V}@1\text{ MHz to }4\text{ MHz}$
8. If operation of the subsystem clock when STOP mode, same as when HALT mode of subsystem clock operation.
9. When high-speed on-chip oscillator, middle-speed on-chip oscillator, and high-speed system clock are stopped.

- Remarks**
1. f_{MX} : High-speed system clock frequency (X1 clock oscillation frequency or external main system clock frequency)
 2. f_{IH} : High-speed on-chip oscillator clock frequency
 3. f_{IM} : Middle-speed on-chip oscillator clock frequency
 4. f_{IL} : Low-speed on-chip oscillator clock frequency
 5. f_{SUB} : Subsystem clock frequency (XT1 clock oscillation frequency)
 6. Except subsystem clock operation, temperature condition of the TYP. value is $T_A = 25^\circ\text{C}$