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"[Embedded - Microcontrollers](#)" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "[Embedded - Microcontrollers](#)"

Details

Product Status	Not For New Designs
Core Processor	M16C/60
Core Size	16-Bit
Speed	24MHz
Connectivity	I ² C, IEBus, UART/USART
Peripherals	DMA, WDT
Number of I/O	85
Program Memory Size	384KB (384K x 8)
Program Memory Type	FLASH
EEPROM Size	4K x 8
RAM Size	31K x 8
Voltage - Supply (Vcc/Vdd)	2.7V ~ 5.5V
Data Converters	A/D 26x10b; D/A 2x8b
Oscillator Type	Internal
Operating Temperature	-20°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	100-BQFP
Supplier Device Package	100-QFP (14x20)
Purchase URL	https://www.e-xfl.com/product-detail/renesas-electronics-america/m30626fhfp-u9c

1.3 Block Diagram

Figure 1.1 is a M16C/62P Group (M16C/62P, M16C/62PT) 128-pin and 100-pin version Block Diagram,
Figure 1.2 is a M16C/62P Group (M16C/62P, M16C/62PT) 80-pin version Block Diagram.

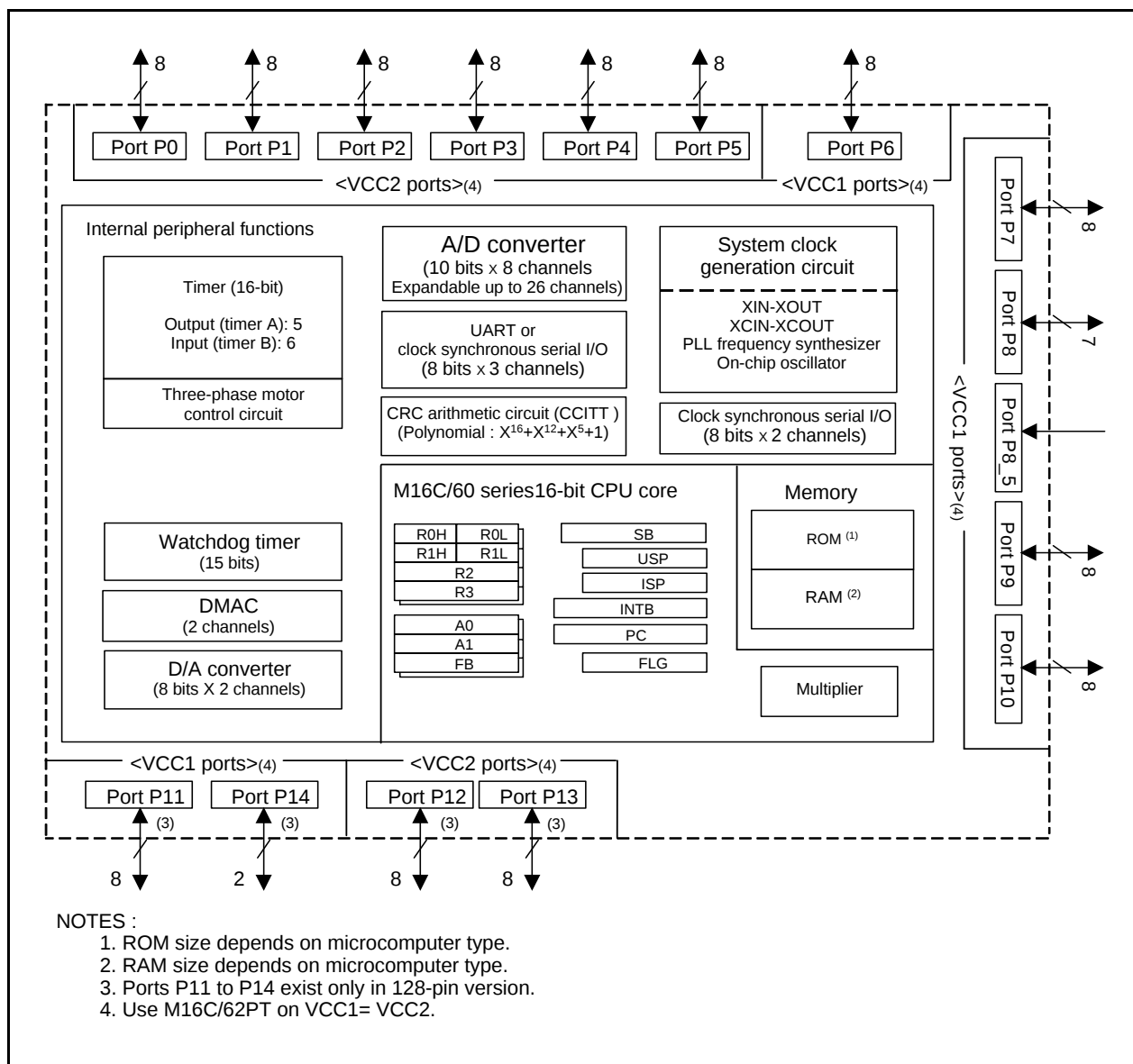


Figure 1.1 M16C/62P Group (M16C/62P, M16C/62PT) 128-pin and 100-pin version Block Diagram

Table 1.5 Product List (2) (M16C/62P)

As of Dec. 2005

Type No.	ROM Capacity	RAM Capacity	Package Type ⁽¹⁾	Remarks
M30622MHP-XXXFP	384 Kbytes	16 Kbytes	PRQP0100JB-A	Mask ROM version
M30622MHP-XXXGP			PLQP0100KB-A	
M30623MHP-XXXGP			PLQP0128KB-A	
M30624MHP-XXXFP		24 Kbytes	PRQP0100JB-A	
M30624MHP-XXXGP			PLQP0100KB-A	
M30625MHP-XXXGP			PLQP0128KB-A	
M30626MHP-XXXFP		31 Kbytes	PRQP0100JB-A	
M30626MHP-XXXGP			PLQP0100KB-A	
M30627MHP-XXXGP			PLQP0128KB-A	
M30626MJP-XXXFP (D)	512 Kbytes	31 Kbytes	PRQP0100JB-A	Flash memory version ⁽²⁾
M30626MJP-XXXGP (D)			PLQP0100KB-A	
M30627MJP-XXXGP (D)			PLQP0128KB-A	
M30622F8PFP	64K+4 Kbytes	4 Kbytes	PRQP0100JB-A	
M30622F8PGP			PLQP0100KB-A	
M30623F8PGP			PRQP0080JA-A	
M30620FCPFP	128K+4 Kbytes	10 Kbytes	PRQP0100JB-A	
M30620FCPGP			PLQP0100KB-A	
M30621FCPGP			PRQP0080JA-A	
M3062LFGPFP ⁽³⁾ (D)	256K+4 Kbytes	20 Kbytes	PRQP0100JB-A	
M3062LFGPGP ⁽³⁾ (D)			PLQP0100KB-A	
M30625FGPGP			PLQP0128KB-A	
M30626FHPFP	384K+4 Kbytes	31 Kbytes	PRQP0100JB-A	ROM-less version
M30626FHPPGP			PLQP0100KB-A	
M30627FHPPGP			PLQP0128KB-A	
M30626FJPFP	512K+4 Kbytes	31 Kbytes	PRQP0100JB-A	
M30626FJPGP			PLQP0100KB-A	
M30627FJPGP			PLQP0128KB-A	
M30622SPFP	–	4 Kbytes	PRQP0100JB-A	
M30622SPGP			PLQP0100KB-A	
M30620SPFP		10 Kbytes	PRQP0100JB-A	
M30620SPGP			PLQP0100KB-A	
M30624SPFP (D)	–	20 Kbytes	PRQP0100JB-A	
M30624SPGP (D)			PLQP0100KB-A	
M30626SPFP (D)		31 Kbytes	PRQP0100JB-A	
M30626SPGP (D)			PLQP0100KB-A	

(D): Under development

NOTES:

1. The old package type numbers of each package type are as follows.

PLQP0128KB-A : 128P6Q-A,

PRQP0100JB-A : 100P6S-A,

PLQP0100KB-A : 100P6Q-A,

PRQP0080JA-A : 80P6S-A

2. In the flash memory version, there is 4K bytes area (block A).

3. Please use M3062LFGPFP and M3062LFGPGP for your new system instead of M30624FGPFP and M30624FGPGP. The M16C/62P Group (M16C/62P, M16C/62PT) hardware manual is still good for M30624FGPFP and M30624FGPGP.

M30624FGPFP	256K+4 Kbytes	20 Kbytes	PRQP0100JB-A	Flash memory version
M30624FGPGP			PLQP0100KB-A	

Table 1.10 Pin Characteristics for 128-Pin Package (1)

Pin No.	Control Pin	Port	Interrupt Pin	Timer Pin	UART Pin	Analog Pin	Bus Control Pin
1	VREF						
2	AVCC						
3		P9_7			SIN4	ADTRG	
4		P9_6			SOUT4	ANEX1	
5		P9_5			CLK4	ANEX0	
6		P9_4		TB4IN		DA1	
7		P9_3		TB3IN		DA0	
8		P9_2		TB2IN	SOUT3		
9		P9_1		TB1IN	SIN3		
10		P9_0		TB0IN	CLK3		
11		P14_1					
12		P14_0					
13	BYTE						
14	CNVSS						
15	XCIN	P8_7					
16	XCOUT	P8_6					
17	RESET						
18	XOUT						
19	VSS						
20	XIN						
21	VCC1						
22		P8_5	NMI				
23		P8_4	INT2	ZP			
24		P8_3	INT1				
25		P8_2	INT0				
26		P8_1		TA4IN/U			
27		P8_0		TA4OUT/U			
28		P7_7		TA3IN			
29		P7_6		TA3OUT			
30		P7_5		TA2IN/W			
31		P7_4		TA2OUT/W			
32		P7_3		TA1IN/V	CTS2/RTS2		
33		P7_2		TA1OUT/V	CLK2		
34		P7_1		TA0IN/TB5IN	RXD2/SCL2		
35		P7_0		TA0OUT	TXD2/SDA2		
36		P6_7			TXD1/SDA1		
37	VCC1						
38		P6_6			RXD1/SCL1		
39	VSS						
40		P6_5			CLK1		
41		P6_4			CTS1/RTS1/CTS0/CLKS1		
42		P6_3			TXD0/SDA0		
43		P6_2			RXD0/SCL0		
44		P6_1			CLK0		
45		P6_0			CTS0/RTS0		
46		P13_7					
47		P13_6					
48		P13_5					
49		P13_4					
50		P5_7					RDY/CLKOUT

Table 1.11 Pin Characteristics for 128-Pin Package (2)

Pin No.	Control Pin	Port	Interrupt Pin	Timer Pin	UART Pin	Analog Pin	Bus Control Pin
51		P5_6					ALE
52		P5_5					$\overline{\text{HOLD}}$
53		P5_4					$\overline{\text{HLDA}}$
54		P13_3					
55		P13_2					
56		P13_1					
57		P13_0					
58		P5_3					BCLK
59		P5_2					$\overline{\text{RD}}$
60		P5_1					$\overline{\text{WRH/BHE}}$
61		P5_0					$\overline{\text{WRL/WR}}$
62		P12_7					
63		P12_6					
64		P12_5					
65		P4_7					$\overline{\text{CS3}}$
66		P4_6					$\overline{\text{CS2}}$
67		P4_5					$\overline{\text{CS1}}$
68		P4_4					$\overline{\text{CS0}}$
69		P4_3					A19
70		P4_2					A18
71		P4_1					A17
72		P4_0					A16
73		P3_7					A15
74		P3_6					A14
75		P3_5					A13
76		P3_4					A12
77		P3_3					A11
78		P3_2					A10
79		P3_1					A9
80		P12_4					
81		P12_3					
82		P12_2					
83		P12_1					
84		P12_0					
85	VCC2						
86		P3_0					A8(/D7)
87	VSS						
88		P2_7				AN2_7	A7(/D7/D6)
89		P2_6				AN2_6	A6(/D6/D5)
90		P2_5				AN2_5	A5(/D5/D4)
91		P2_4				AN2_4	A4(/D4/D3)
92		P2_3				AN2_3	A3(/D3/D2)
93		P2_2				AN2_2	A2(/D2/D1)
94		P2_1				AN2_1	A1(/D1/D0)
95		P2_0				AN2_0	A0(/D0/-)
96		P1_7	$\overline{\text{INT5}}$				D15
97		P1_6	$\overline{\text{INT4}}$				D14
98		P1_5	$\overline{\text{INT3}}$				D13
99		P1_4					D12
100		P1_3					D11

2.8.8 Stack Pointer Select Flag (U Flag)

ISP is selected when the U flag is “0”; USP is selected when the U flag is “1”.

The U flag is cleared to “0” when a hardware interrupt request is accepted or an INT instruction for software interrupt Nos. 0 to 31 is executed.

2.8.9 Processor Interrupt Priority Level (IPL)

IPL is configured with three bits, for specification of up to eight processor interrupt priority levels from level 0 to level 7.

If a requested interrupt has priority greater than IPL, the interrupt is enabled.

2.8.10 Reserved Area

When write to this bit, write “0”. When read, its content is indeterminate.

4. Special Function Register (SFR)

SFR(Special Function Register) is the control register of peripheral functions. Tables 4.1 to 4.6 list the SFR information.

Table 4.1 SFR Information (1) (1)

Address	Register	Symbol	After Reset
0000h			
0001h			
0002h			
0003h			
0004h	Processor Mode Register 0 ⁽²⁾	PM0	0000000b(CNVSS pin is "L") 0000011b(CNVSS pin is "H")
0005h	Processor Mode Register 1	PM1	00001000b
0006h	System Clock Control Register 0	CM0	01001000b
0007h	System Clock Control Register 1	CM1	00100000b
0008h	Chip Select Control Register ⁽⁶⁾	CSR	00000001b
0009h	Address Match Interrupt Enable Register	AIER	XXXXXX00b
000Ah	Protect Register	PRCR	XX000000b
000Bh	Data Bank Register ⁽⁶⁾	DBR	00h
000Ch	Oscillation Stop Detection Register ⁽³⁾	CM2	0X000000b
000Dh			
000Eh	Watchdog Timer Start Register	WDTS	XXh
000Fh	Watchdog Timer Control Register	WDC	00XXXXXXb ⁽⁴⁾
0010h	Address Match Interrupt Register 0	RMAD0	00h
0011h			00h
0012h			X0h
0013h			
0014h	Address Match Interrupt Register 1	RMAD1	00h
0015h			00h
0016h			X0h
0017h			
0018h			
0019h	Voltage Detection Register 1 ^(5, 6)	VCR1	00001000b
001Ah	Voltage Detection Register 2 ^(5, 6)	VCR2	00h
001Bh	Chip Select Expansion Control Register ⁽⁶⁾	CSE	00h
001Ch	PLL Control Register 0	PLC0	0001X010b
001Dh			
001Eh	Processor Mode Register 2	PM2	XXX00000b
001Fh	Low Voltage Detection Interrupt Register ⁽⁶⁾	D4INT	00h
0020h	DMA0 Source Pointer	SAR0	XXh
0021h			XXh
0022h			XXh
0023h			
0024h	DMA0 Destination Pointer	DAR0	XXh
0025h			XXh
0026h			XXh
0027h			
0028h	DMA0 Transfer Counter	TCR0	XXh
0029h			XXh
002Ah			
002Bh			
002Ch	DMA0 Control Register	DM0CON	00000X00b
002Dh			
002Eh			
002Fh			
0030h	DMA1 Source Pointer	SAR1	XXh
0031h			XXh
0032h			XXh
0033h			
0034h	DMA1 Destination Pointer	DAR1	XXh
0035h			XXh
0036h			XXh
0037h			
0038h	DMA1 Transfer Counter	TCR1	XXh
0039h			XXh
003Ah			
003Bh			
003Ch	DMA1 Control Register	DM1CON	00000X00b
003Dh			
003Eh			
003Fh			

NOTES:

1. The blank areas are reserved and cannot be accessed by users.
2. The PM00 and PM01 bits do not change at software reset, watchdog timer reset and oscillation stop detection reset.
3. The CM20, CM21, and CM27 bits do not change at oscillation stop detection reset.
4. The WDC5 bit is "0" (cold start) immediately after power-on. It can only be set to "1" in a program.
5. This register does not change at software reset, watchdog timer reset and oscillation stop detection reset.
6. This register in M16C/62PT cannot be used.

X : Nothing is mapped to this bit

Table 4.3 SFR Information (3) ⁽¹⁾

Address	Register	Symbol	After Reset
0080h			
0081h			
0082h			
0083h			
0084h			
0085h			
0086h			
0087h to 01AFh			
01B0h			
01B1h			
01B2h			
01B3h			
01B4h	Flash Identification Register ⁽²⁾	FIDR	XXXXXX00b
01B5h	Flash Memory Control Register 1 ⁽²⁾	FMR1	0X00XX0Xb
01B6h			
01B7h	Flash Memory Control Register 0 ⁽²⁾	FMR0	00000001b
01B8h	Address Match Interrupt Register 2	RMAD2	00h
01B9h			00h
01BAh			XXh
01BBh			XXXXXX00b
01BCh	Address Match Interrupt Register 3	RMAD3	00h
01BDh			00h
01BEh			XXh
01C0h to 024Fh			
0250h			
0251h			
0252h			
0253h			
0254h			
0255h			
0256h			
0257h			
0258h			
0259h			
025Ah			
025Bh			
025Ch			
025Dh			
025Eh	Peripheral Clock Select Register	PCLKR	00000011b
025Fh			
0260h to 032Fh			
0330h			
0331h			
0332h			
0333h			
0334h			
0335h			
0336h			
0337h			
0338h			
0339h			
033Ah			
033Bh			
033Ch			
033Dh			
033Eh			
033Fh			

NOTES:

1. The blank areas are reserved and cannot be accessed by users.
2. This register is included in the flash memory version.

X : Nothing is mapped to this bit

Table 5.4 A/D Conversion Characteristics (1)

Symbol	Parameter		Measuring Condition		Standard			Unit
					Min.	Typ.	Max.	
–	Resolution		VREF=VCC1				10	Bits
INL	Integral Non-Linearity Error	10bit	VREF=VCC1=5V	AN0 to AN7 input, AN0_0 to AN0_7 input, AN2_0 to AN2_7 input, ANEX0, ANEX1 input			±3	LSB
				External operation amp connection mode			±7	LSB
			VREF=VCC1=3.3V	AN0 to AN7 input, AN0_0 to AN0_7 input, AN2_0 to AN2_7 input, ANEX0, ANEX1 input			±5	LSB
				External operation amp connection mode			±7	LSB
		8bit	VREF=VCC1=5V, 3.3V				±2	LSB
		–	Absolute Accuracy	10bit	VREF=VCC1=5V	AN0 to AN7 input, AN0_0 to AN0_7 input, AN2_0 to AN2_7 input, ANEX0, ANEX1 input		
External operation amp connection mode						±7	LSB	
VREF=VCC1=3.3V	AN0 to AN7 input, AN0_0 to AN0_7 input, AN2_0 to AN2_7 input, ANEX0, ANEX1 input					±5	LSB	
	External operation amp connection mode					±7	LSB	
8bit	VREF=VCC1=5V, 3.3V					±2	LSB	
–	Tolerance Level Impedance						3	
DNL	Differential Non-Linearity Error						±1	LSB
–	Offset Error						±3	LSB
–	Gain Error						±3	LSB
RLADDER	Ladder Resistance		VREF=VCC1		10		40	kΩ
tCONV	10-bit Conversion Time, Sample & Hold Available		VREF=VCC1=5V, φAD=12MHz		2.75			μs
tCONV	8-bit Conversion Time, Sample & Hold Available		VREF=VCC1=5V, φAD=12MHz		2.33			μs
tsAMP	Sampling Time				0.25			μs
VREF	Reference Voltage				2.0		VCC1	V
VIA	Analog Input Voltage				0		VREF	V

NOTES:

1. Referenced to $V_{CC1}=AV_{CC}=V_{REF}=3.3$ to $5.5V$, $V_{SS}=AV_{SS}=0V$ at $T_{opr} = -20$ to $85^{\circ}C$ / -40 to $85^{\circ}C$ unless otherwise specified.
2. If $V_{CC1} > V_{CC2}$, do not use AN0_0 to AN0_7 and AN2_0 to AN2_7 as analog input pins.
3. ϕ_{AD} frequency must be 12 MHz or less. And divide the fAD if V_{CC1} is less than 4.0V, and ϕ_{AD} frequency into 10 MHz or less.
4. When sample & hold is disabled, ϕ_{AD} frequency must be 250 kHz or more, in addition to the limitation in Note 3.
When sample & hold is enabled, ϕ_{AD} frequency must be 1MHz or more, in addition to the limitation in Note 3.

Table 5.5 D/A Conversion Characteristics ⁽¹⁾

Symbol	Parameter	Measuring Condition	Standard			Unit
			Min.	Typ.	Max.	
–	Resolution				8	Bits
–	Absolute Accuracy				1.0	%
t _{su}	Setup Time				3	μs
R _o	Output Resistance		4	10	20	kΩ
I _{VREF}	Reference Power Supply Input Current	(NOTE 2)			1.5	mA

NOTES:

1. Referenced to V_{CC1}=V_{REF}=3.3 to 5.5V, V_{SS}=AV_{SS}=0V at T_{opr} = –20 to 85°C / –40 to 85°C unless otherwise specified.
2. This applies when using one D/A converter, with the D/A register for the unused D/A converter set to “00h”. The resistor ladder of the A/D converter is not included. Also, when D/A register contents are not “00h”, the I_{VREF} will flow even if V_{ref} is disconnected by the A/D control register.

$$V_{CC1}=V_{CC2}=5V$$

Switching Characteristics

($V_{CC1} = V_{CC2} = 5V$, $V_{SS} = 0V$, at $T_{opr} = -20$ to $85^{\circ}C$ / -40 to $85^{\circ}C$ unless otherwise specified)

Table 5.29 Memory Expansion and Microprocessor Modes (for 2- to 3-wait setting, external area access and multiplex bus selection)

Symbol	Parameter		Standard		Unit
			Min.	Max.	
$t_d(BCLK-AD)$	Address Output Delay Time	See Figure 5.2		25	ns
$t_h(BCLK-AD)$	Address Output Hold Time (in relation to BCLK)		4		ns
$t_h(RD-AD)$	Address Output Hold Time (in relation to RD)		(NOTE 1)		ns
$t_h(WR-AD)$	Address Output Hold Time (in relation to WR)		(NOTE 1)		ns
$t_d(BCLK-CS)$	Chip Select Output Delay Time			25	ns
$t_h(BCLK-CS)$	Chip Select Output Hold Time (in relation to BCLK)		4		ns
$t_h(RD-CS)$	Chip Select Output Hold Time (in relation to RD)		(NOTE 1)		ns
$t_h(WR-CS)$	Chip Select Output Hold Time (in relation to WR)		(NOTE 1)		ns
$t_d(BCLK-RD)$	RD Signal Output Delay Time			25	ns
$t_h(BCLK-RD)$	RD Signal Output Hold Time		0		ns
$t_d(BCLK-WR)$	WR Signal Output Delay Time			25	ns
$t_h(BCLK-WR)$	WR Signal Output Hold Time		0		ns
$t_d(BCLK-DB)$	Data Output Delay Time (in relation to BCLK)			40	ns
$t_h(BCLK-DB)$	Data Output Hold Time (in relation to BCLK)		4		ns
$t_d(DB-WR)$	Data Output Delay Time (in relation to WR)		(NOTE 2)		ns
$t_h(WR-DB)$	Data Output Hold Time (in relation to WR)		(NOTE 1)		ns
$t_d(BCLK-HLDA)$	HLDA Output Delay Time			40	ns
$t_d(BCLK-ALE)$	ALE Signal Output Delay Time (in relation to BCLK)			15	ns
$t_h(BCLK-ALE)$	ALE Signal Output Hold Time (in relation to BCLK)		-4		ns
$t_d(AD-ALE)$	ALE Signal Output Delay Time (in relation to Address)		(NOTE 3)		ns
$t_h(AD-ALE)$	ALE Signal Output Hold Time (in relation to Address)		(NOTE 4)		ns
$t_d(AD-RD)$	RD Signal Output Delay From the End of Address		0		ns
$t_d(AD-WR)$	WR Signal Output Delay From the End of Address		0		ns
$t_{dz}(RD-AD)$	Address Output Floating Start Time			8	ns

NOTES:

1. Calculated according to the BCLK frequency as follows:

$$\frac{0.5 \times 10^9}{f(BCLK)} - 10 [ns]$$

2. Calculated according to the BCLK frequency as follows:

$$\frac{(n - 0.5) \times 10^9}{f(BCLK)} - 40 [ns] \quad n \text{ is "2" for 2-wait setting, "3" for 3-wait setting.}$$

3. Calculated according to the BCLK frequency as follows:

$$\frac{0.5 \times 10^9}{f(BCLK)} - 25 [ns]$$

4. Calculated according to the BCLK frequency as follows:

$$\frac{0.5 \times 10^9}{f(BCLK)} - 15 [ns]$$

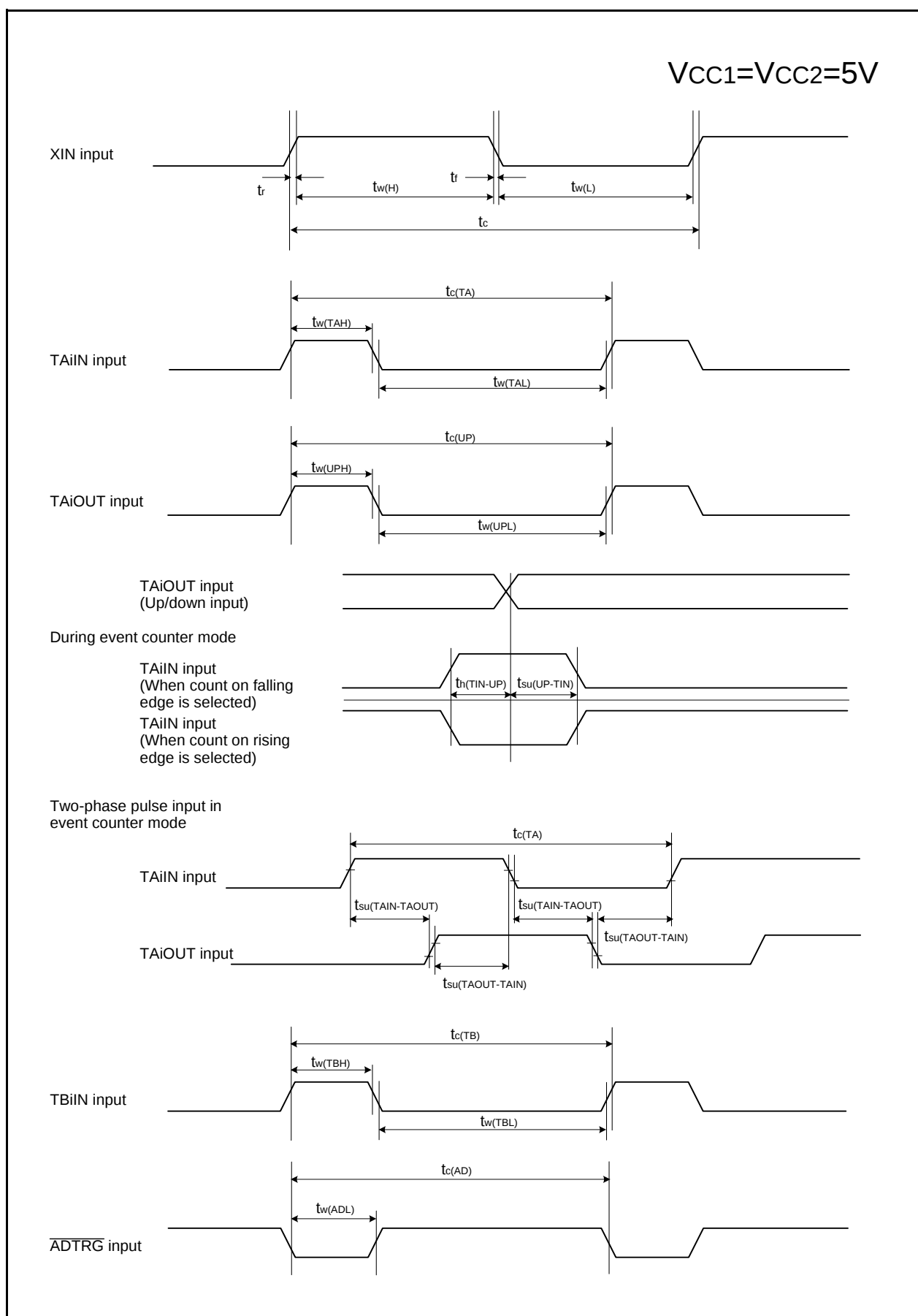


Figure 5.3 Timing Diagram (1)

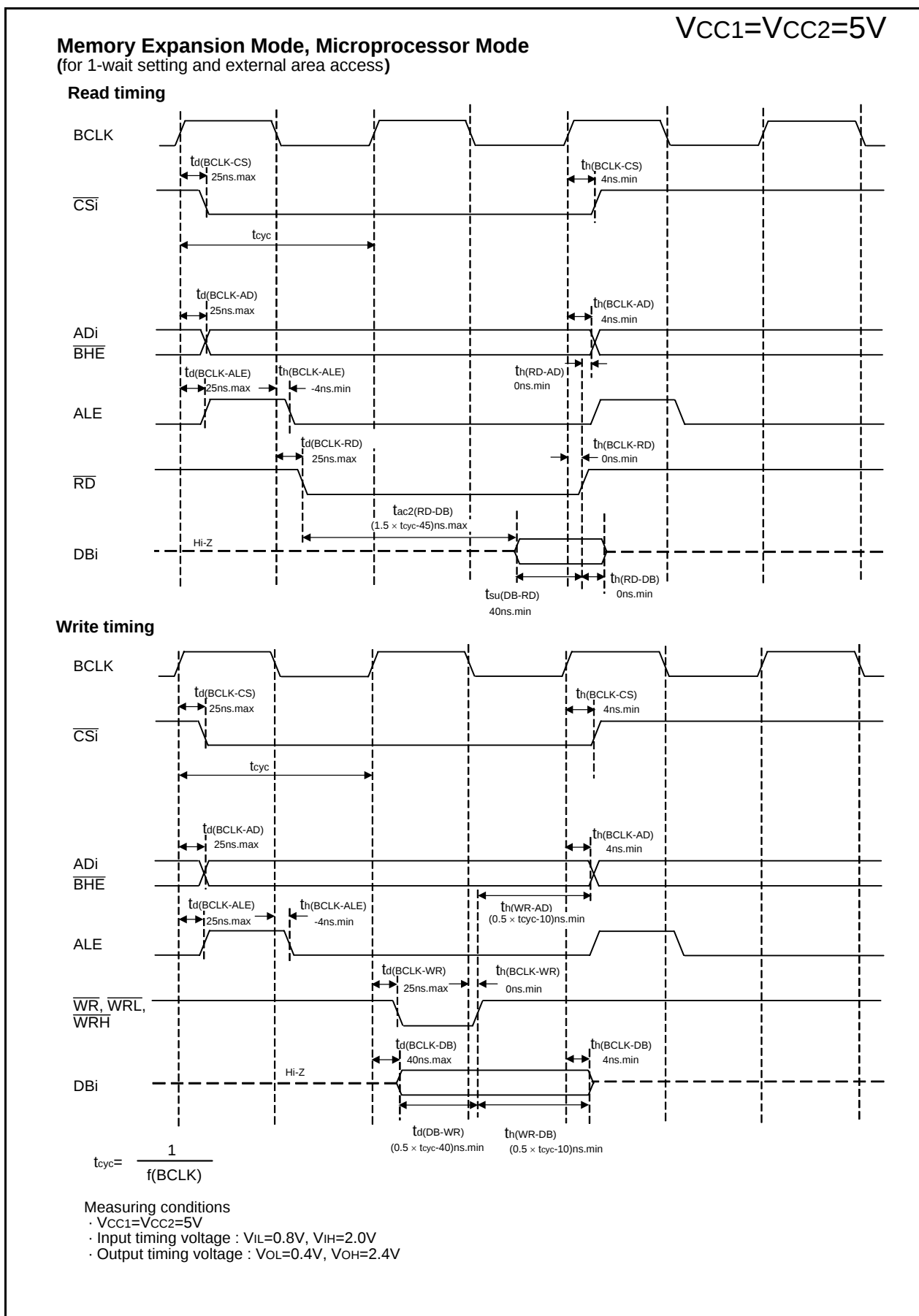


Figure 5.7 Timing Diagram (5)

$$V_{CC1}=V_{CC2}=3V$$

Timing Requirements

($V_{CC1} = V_{CC2} = 3V$, $V_{SS} = 0V$, at $T_{opr} = -20$ to $85^{\circ}C$ / -40 to $85^{\circ}C$ unless otherwise specified)

Table 5.34 Timer A Input (Counter Input in Event Counter Mode)

Symbol	Parameter	Standard		Unit
		Min.	Max.	
$t_{c(TA)}$	TAiIN Input Cycle Time	150		ns
$t_{w(TAH)}$	TAiIN Input HIGH Pulse Width	60		ns
$t_{w(TAL)}$	TAiIN Input LOW Pulse Width	60		ns

Table 5.35 Timer A Input (Gating Input in Timer Mode)

Symbol	Parameter	Standard		Unit
		Min.	Max.	
$t_{c(TA)}$	TAiIN Input Cycle Time	600		ns
$t_{w(TAH)}$	TAiIN Input HIGH Pulse Width	300		ns
$t_{w(TAL)}$	TAiIN Input LOW Pulse Width	300		ns

Table 5.36 Timer A Input (External Trigger Input in One-shot Timer Mode)

Symbol	Parameter	Standard		Unit
		Min.	Max.	
$t_{c(TA)}$	TAiIN Input Cycle Time	300		ns
$t_{w(TAH)}$	TAiIN Input HIGH Pulse Width	150		ns
$t_{w(TAL)}$	TAiIN Input LOW Pulse Width	150		ns

Table 5.37 Timer A Input (External Trigger Input in Pulse Width Modulation Mode)

Symbol	Parameter	Standard		Unit
		Min.	Max.	
$t_{w(TAH)}$	TAiIN Input HIGH Pulse Width	150		ns
$t_{w(TAL)}$	TAiIN Input LOW Pulse Width	150		ns

Table 5.38 Timer A Input (Counter Increment/Decrement Input in Event Counter Mode)

Symbol	Parameter	Standard		Unit
		Min.	Max.	
$t_{c(UP)}$	TAiOUT Input Cycle Time	3000		ns
$t_{w(UPH)}$	TAiOUT Input HIGH Pulse Width	1500		ns
$t_{w(UPL)}$	TAiOUT Input LOW Pulse Width	1500		ns
$t_{su(UP-TIN)}$	TAiOUT Input Setup Time	600		ns
$t_{h(TIN-UP)}$	TAiOUT Input Hold Time	600		ns

Table 5.39 Timer A Input (Two-phase Pulse Input in Event Counter Mode)

Symbol	Parameter	Standard		Unit
		Min.	Max.	
$t_{c(TA)}$	TAiIN Input Cycle Time	2		μs
$t_{su(TAIN-TAOUT)}$	TAiOUT Input Setup Time	500		ns
$t_{su(TAOUT-TAIN)}$	TAiIN Input Setup Time	500		ns

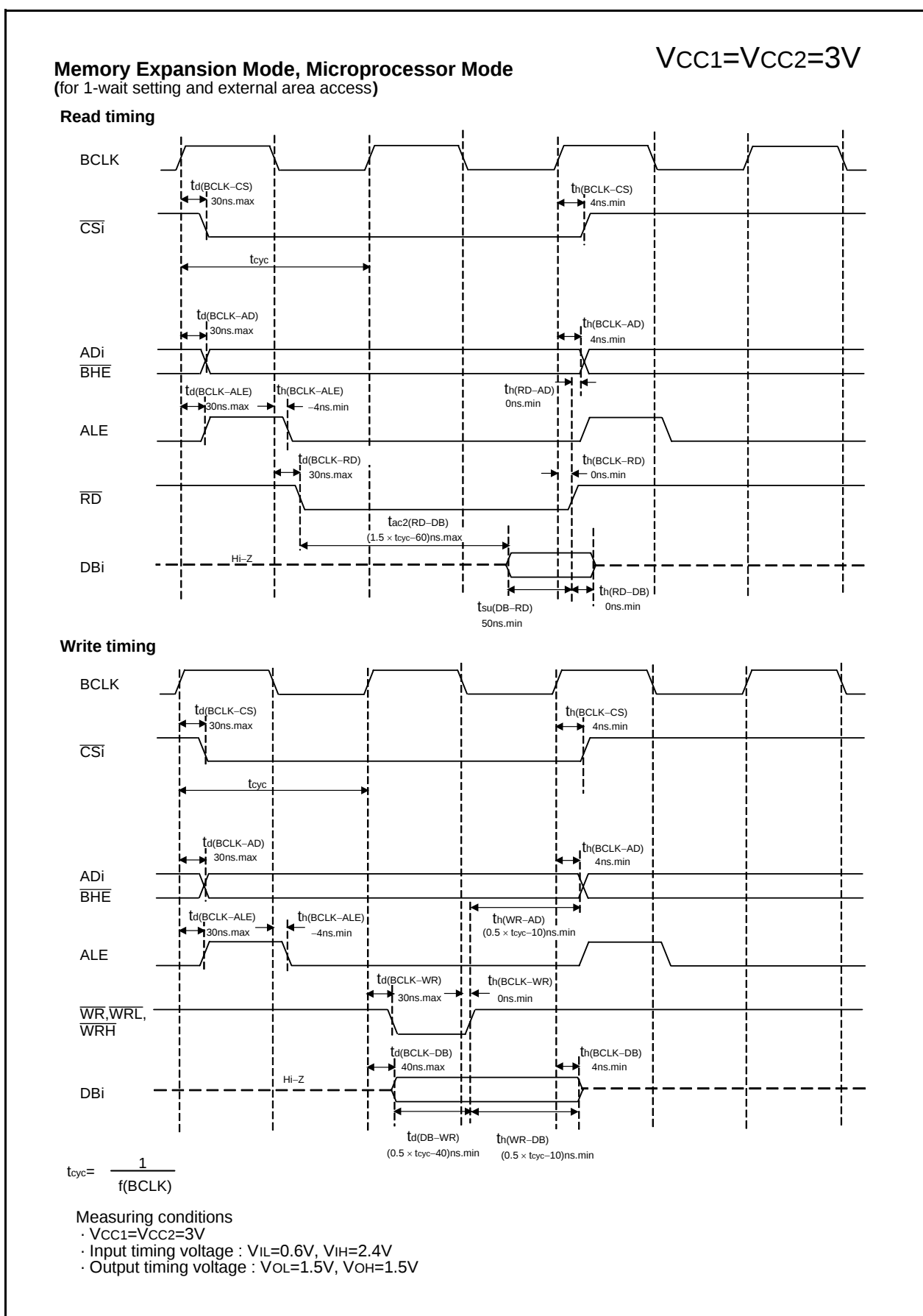


Figure 5.17 Timing Diagram (5)

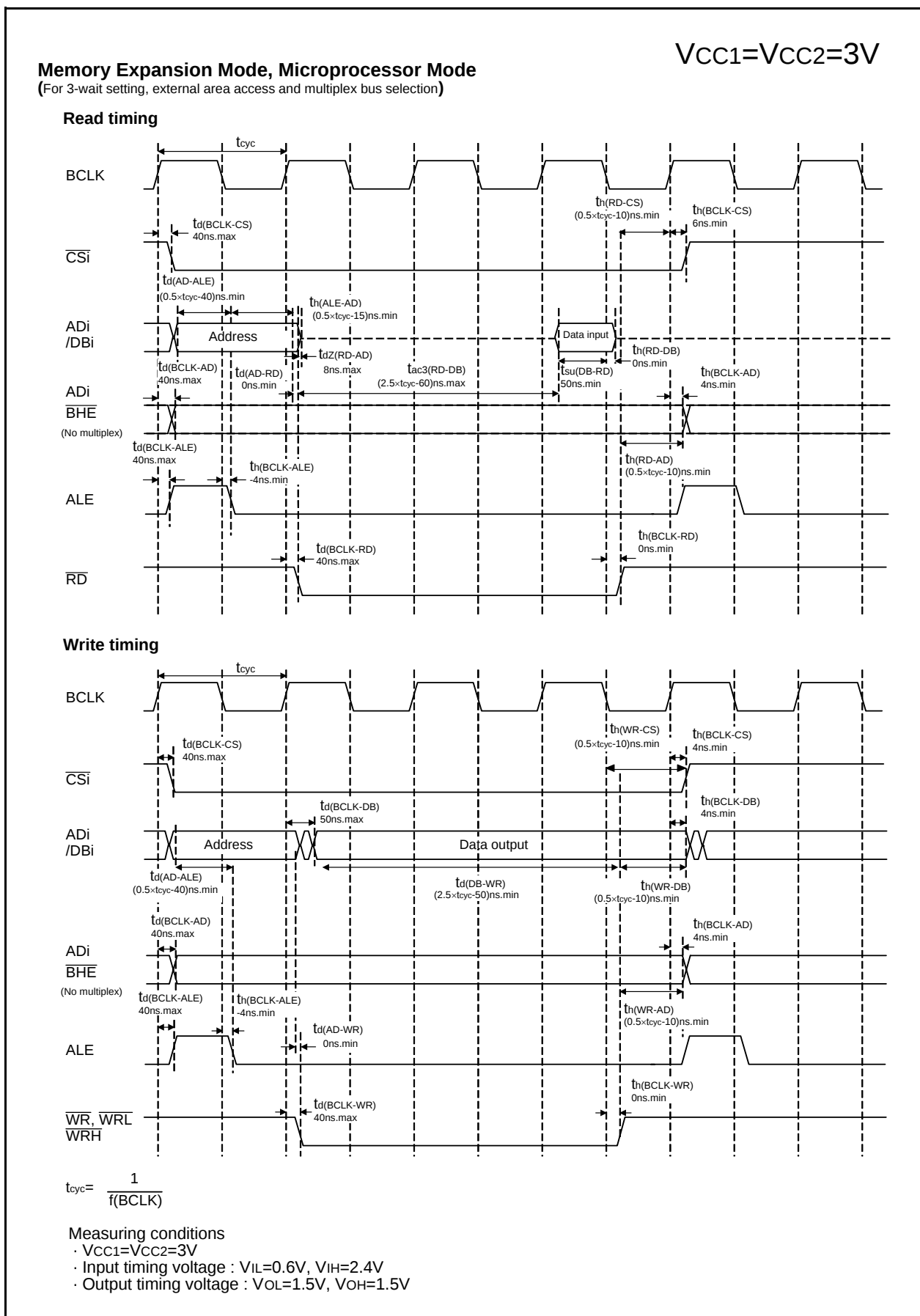


Figure 5.21 Timing Diagram (9)

5.2 Electrical Characteristics (M16C/62PT)

Table 5.49 Absolute Maximum Ratings

Symbol	Parameter		Condition	Rated Value	Unit
V _{CC1} , V _{CC2}	Supply Voltage		V _{CC1} =V _{CC2} =AV _{CC}	−0.3 to 6.5	V
AV _{CC}	Analog Supply Voltage		V _{CC1} =V _{CC2} =AV _{CC}	−0.3 to 6.5	V
V _I	Input Voltage	RESET, CNVSS, BYTE, P6_0 to P6_7, P7_2 to P7_7, P8_0 to P8_7, P9_0 to P9_7, P10_0 to P10_7, P11_0 to P11_7, P14_0, P14_1, VREF, XIN		−0.3 to V _{CC1} +0.3 ⁽¹⁾	V
		P0_0 to P0_7, P1_0 to P1_7, P2_0 to P2_7, P3_0 to P3_7, P4_0 to P4_7, P5_0 to P5_7, P12_0 to P12_7, P13_0 to P13_7		−0.3 to V _{CC2} +0.3 ⁽¹⁾	V
		P7_0, P7_1		−0.3 to 6.5	V
V _O	Output Voltage	P6_0 to P6_7, P7_2 to P7_7, P8_0 to P8_4, P8_6, P8_7, P9_0 to P9_7, P10_0 to P10_7, P11_0 to P11_7, P14_0, P14_1, XOUT		−0.3 to V _{CC1} +0.3 ⁽¹⁾	V
		P0_0 to P0_7, P1_0 to P1_7, P2_0 to P2_7, P3_0 to P3_7, P4_0 to P4_7, P5_0 to P5_7, P12_0 to P12_7, P13_0 to P13_7		−0.3 to V _{CC2} +0.3 ⁽¹⁾	V
		P7_0, P7_1		−0.3 to 6.5	V
P _d	Power Dissipation		−40°C<T _{opr} ≤85°C	300	mW
			85°C<T _{opr} ≤125°C	200	
T _{opr}	Operating Ambient Temperature	When the Microcomputer is Operating		−40 to 85 / −40 to 125 ⁽²⁾	°C
		Flash Program Erase		0 to 60	
T _{stg}	Storage Temperature			−65 to 150	°C

NOTES:

1. There is no external connections for port P1_0 to P1_7, P4_4 to P4_7, P7_2 to P7_5 and P9_1 in 80-pin version.
2. T version = −40 to 85 °C, V version= −40 to 125 °C.

Table 5.53 Flash Memory Version Electrical Characteristics ⁽¹⁾ for 100 cycle products (B, U)

Symbol	Parameter		Standard			Unit
			Min.	Typ.	Max.	
–	Program and Erase Endurance ⁽³⁾		100			cycle
–	Word Program Time (V _{CC1} =5.0V)			25	200	μs
–	Lock Bit Program Time			25	200	μs
–	Block Erase Time (V _{CC1} =5.0V)	4-Kbyte block	4	0.3	4	s
–		8-Kbyte block		0.3	4	s
–		32-Kbyte block		0.5	4	s
–		64-Kbyte block		0.8	4	s
–	Erase All Unlocked Blocks Time ⁽²⁾				4×n	s
tps	Flash Memory Circuit Stabilization Wait Time				15	μs
–	Data Hold Time ⁽⁵⁾		20			year

Table 5.54 Flash Memory Version Electrical Characteristics ⁽⁶⁾ for 10,000 cycle products (B7, U7) (Block A and Block 1 ⁽⁷⁾)

Symbol	Parameter		Standard			Unit
			Min.	Typ.	Max.	
–	Program and Erase Endurance ^(3, 8, 9)		10,000 ⁽⁴⁾			cycle
–	Word Program Time (V _{CC1} =5.0V)			25		μs
–	Lock Bit Program Time			25		μs
–	Block Erase Time (V _{CC1} =5.0V)	4-Kbyte block	4	0.3		s
tps	Flash Memory Circuit Stabilization Wait Time				15	μs
–	Data Hold Time ⁽⁵⁾		20			year

NOTES:

1. Referenced to V_{CC1}=4.5 to 5.5V at T_{opr} = 0 to 60 °C unless otherwise specified.
2. n denotes the number of block erases.
3. Program and Erase Endurance refers to the number of times a block erase can be performed.
If the program and erase endurance is n (n=100, 1,000, or 10,000), each block can be erased n times.
For example, if a 4 Kbytes block A is erased after writing 1 word data 2,048 times, each to a different address, this counts as one program and erase endurance. Data cannot be written to the same address more than once without erasing the block.
(Rewrite prohibited)
4. Maximum number of E/W cycles for which operation is guaranteed.
5. T_a (ambient temperature)=55 °C. As to the data hold time except T_a=55 °C, please contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor.
6. Referenced to V_{CC1} = 4.5 to 5.5V at T_{opr} = –40 to 85 °C (B7, U7 (T version)) / –40 to 125 °C (B7, U7 (V version)) unless otherwise specified.
7. Table 5.54 applies for block A or block 1 program and erase endurance > 1,000. Otherwise, use Table 5.53.
8. To reduce the number of program and erase endurance when working with systems requiring numerous rewrites, write to unused word addresses within the block instead of rewrite. Erase block only after all possible addresses are used. For example, an 8-word program can be written 256 times maximum before erase becomes necessary.
Maintaining an equal number of erasure between block A and block 1 will also improve efficiency. It is important to track the total number of times erasure is used.
9. Should erase error occur during block erase, attempt to execute clear status register command, then block erase command at least three times until erase error disappears.
10. Set the PM17 bit in the PM1 register to “1” (wait state) when executing more than 100 times rewrites (B7 and U7).
11. Customers desiring E/W failure rate information should contact their Renesas technical support representative.

Table 5.55 Flash Memory Version Program/Erase Voltage and Read Operation Voltage Characteristics (at T_{opr} = 0 to 60 °C (B, U), T_{opr} = –40 to 85 °C (B7, U7 (T version)) / –40 to 125 °C (B7, U7 (V version))

Flash Program, Erase Voltage	Flash Read Operation Voltage
V _{CC1} = 5.0 V ± 0.5 V	V _{CC1} =4.0 to 5.5 V

$$V_{CC1}=V_{CC2}=5V$$

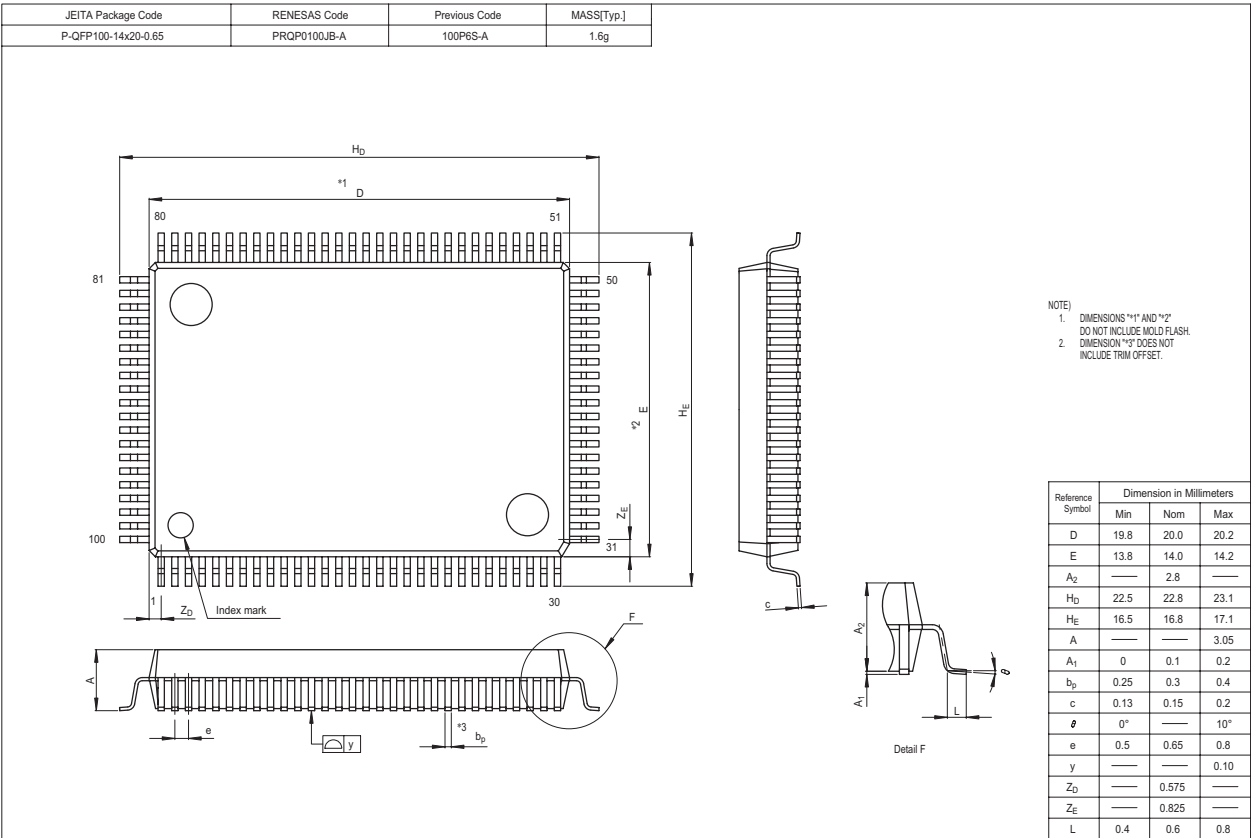
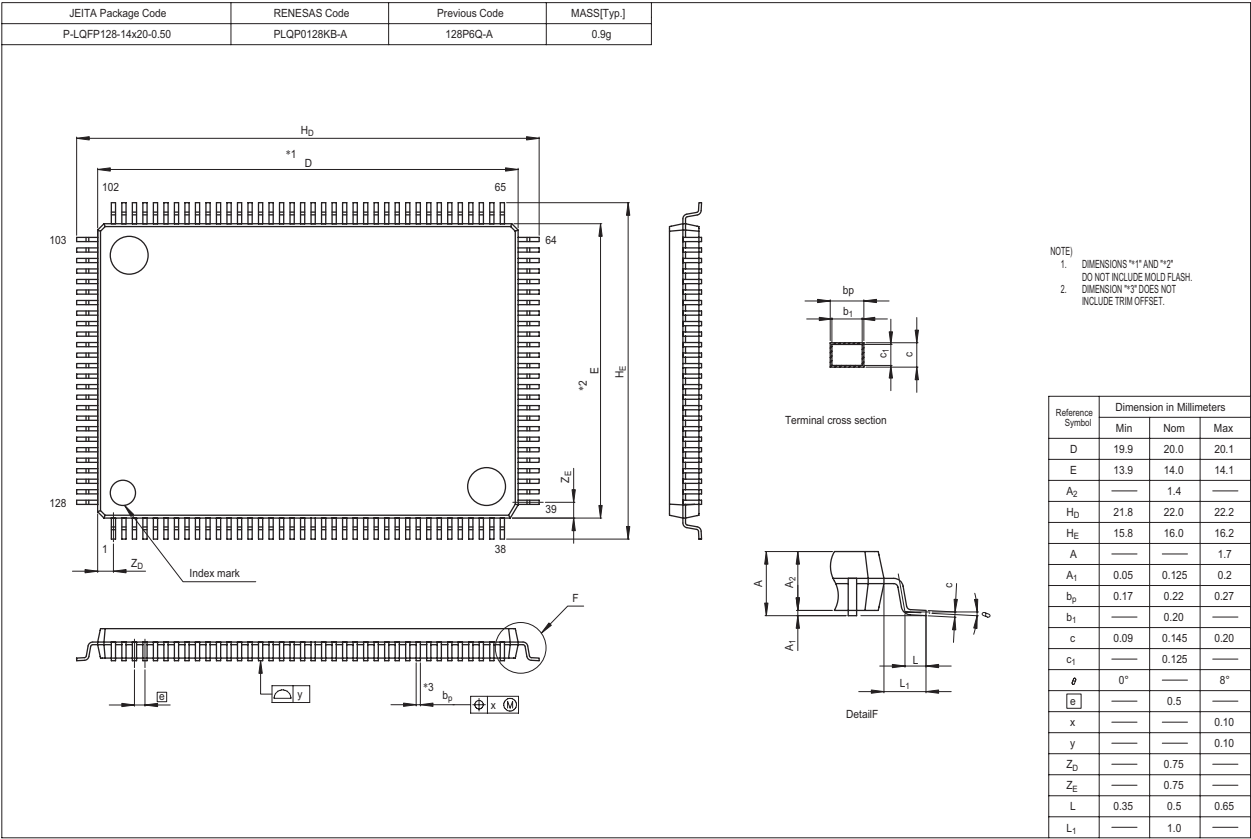
Table 5.57 Electrical Characteristics (1) ⁽¹⁾

Symbol	Parameter		Measuring Condition	Standard			Unit
				Min.	Typ.	Max.	
VOH	HIGH Output Voltage ⁽²⁾	P6_0 to P6_7, P7_2 to P7_7, P8_0 to P8_4, P8_6, P8_7, P9_0 to P9_7, P10_0 to P10_7, P11_0 to P11_7, P14_0, P14_1	IOH=-5mA	VCC1-2.0		VCC1	V
		P0_0 to P0_7, P1_0 to P1_7, P2_0 to P2_7, P3_0 to P3_7, P4_0 to P4_7, P5_0 to P5_7, P12_0 to P12_7, P13_0 to P13_7	IOH=-5mA	VCC2-2.0		VCC2	
VOH	HIGH Output Voltage ⁽²⁾	P6_0 to P6_7, P7_2 to P7_7, P8_0 to P8_4, P8_6, P8_7, P9_0 to P9_7, P10_0 to P10_7, P11_0 to P11_7, P14_0, P14_1	OH=-200μA	VCC1-0.3		VCC1	V
		P0_0 to P0_7, P1_0 to P1_7, P2_0 to P2_7, P3_0 to P3_7, P4_0 to P4_7, P5_0 to P5_7, P12_0 to P12_7, P13_0 to P13_7	IOH=-200μA	VCC2-0.3		VCC2	
VOH	HIGH Output Voltage XOUT	HIGHPOWER	IOH=-1mA	VCC1-2.0		VCC1	V
		LOWPOWER	IOH=-0.5mA	VCC1-2.0		VCC1	
	HIGH Output Voltage XCOUT	HIGHPOWER	With no load applied		2.5		V
		LOWPOWER	With no load applied		1.6		
VOL	LOW Output Voltage ⁽²⁾	P6_0 to P6_7, P7_0 to P7_7, P8_0 to P8_4, P8_6, P8_7, P9_0 to P9_7, P10_0 to P10_7, P11_0 to P11_7, P14_0, P14_1	IOL=5mA			2.0	V
		P0_0 to P0_7, P1_0 to P1_7, P2_0 to P2_7, P3_0 to P3_7, P4_0 to P4_7, P5_0 to P5_7, P12_0 to P12_7, P13_0 to P13_7	IOL=5mA			2.0	
VOL	LOW Output Voltage ⁽²⁾	P6_0 to P6_7, P7_0 to P7_7, P8_0 to P8_4, P8_6, P8_7, P9_0 to P9_7, P10_0 to P10_7, P11_0 to P11_7, P14_0, P14_1	IOL=200μA			0.45	V
		P0_0 to P0_7, P1_0 to P1_7, P2_0 to P2_7, P3_0 to P3_7, P4_0 to P4_7, P5_0 to P5_7, P12_0 to P12_7, P13_0 to P13_7	IOL=200μA			0.45	
VOL	LOW Output Voltage XOUT	HIGHPOWER	IOL=1mA			2.0	V
		LOWPOWER	IOL=0.5mA			2.0	
	LOW Output Voltage XCOUT	HIGHPOWER	With no load applied		0		V
		LOWPOWER	With no load applied		0		
VT+-VT-	Hysteresis	HOLD, RDY, TA0IN to TA4IN, TB0IN to TB5IN, INT0 to INT5, NMI, ADTRG, CTS0 to CTS2, CLK0 to CLK4, TA0OUT to TA4OUT, KI0 to KI3, RXD0 to RXD2, SCL0 to SCL2, SDA0 to SDA2, SIN3, SIN4		0.2		1.0	V
VT+-VT-	Hysteresis	RESET		0.2		2.5	V
I _{IH}	HIGH Input Current ⁽²⁾	P0_0 to P0_7, P1_0 to P1_7, P2_0 to P2_7, P3_0 to P3_7, P4_0 to P4_7, P5_0 to P5_7, P6_0 to P6_7, P7_0 to P7_7, P8_0 to P8_7, P9_0 to P9_7, P10_0 to P10_7, P11_0 to P11_7, P12_0 to P12_7, P13_0 to P13_7, P14_0, P14_1, XIN, RESET, CNVSS, BYTE	Vi=5V			5.0	μA
I _{IL}	LOW Input Current ⁽²⁾	P0_0 to P0_7, P1_0 to P1_7, P2_0 to P2_7, P3_0 to P3_7, P4_0 to P4_7, P5_0 to P5_7, P6_0 to P6_7, P7_0 to P7_7, P8_0 to P8_7, P9_0 to P9_7, P10_0 to P10_7, P11_0 to P11_7, P12_0 to P12_7, P13_0 to P13_7, P14_0, P14_1, XIN, RESET, CNVSS, BYTE	Vi=0V			-5.0	μA
RPULLUP	Pull-Up Resistance ⁽²⁾	P0_0 to P0_7, P1_0 to P1_7, P2_0 to P2_7, P3_0 to P3_7, P4_0 to P4_7, P5_0 to P5_7, P6_0 to P6_7, P7_2 to P7_7, P8_0 to P8_4, P8_6, P8_7, P9_0 to P9_7, P10_0 to P10_7, P11_0 to P11_7, P12_0 to P12_7, P13_0 to P13_7, P14_0, P14_1	Vi=0V	30	50	170	kΩ
R _{IXIN}	Feedback Resistance XIN				1.5		MΩ
R _{IXCIN}	Feedback Resistance XCIN				15		MΩ
V _{RAM}	RAM Retention Voltage		At stop mode	2.0			V

NOTES:

1. Referenced to VCC1=VCC2=4.0 to 5.5V, VSS = 0V at T_{opr} = -40 to 85°C / -40 to 125°C, f(BCLK)=24MHz unless otherwise specified. T version = -40 to 85°C, V version = -40 to 125°C.
2. There is no external connections for port P1_0 to P1_7, P4_4 to P4_7, P7_2 to P7_5 and P9_1 in 80-pin version.

Appendix 1.Package Dimensions



REVISION HISTORY		M16C/62P Group (M16C/62P, M16C/62PT) Hardware Manual	
Rev.	Date	Description	
		Page	Summary
		47	Figure 5.1 Power Supply Circuit Timing Diagram is partly revised.
		48	Table 5.11 Electrical Characteristics (1) is partly deleted.
		49	Table 5.12 Electrical Characteristics (2) is partly revised.
		50	Note 1 of Table 5.13 External Clock Input (XIN input) is added.
		67	Notes 1 to 4 of Table 5.32 External Clock Input (XIN input) are added.
		85	Table 5.53 Flash Memory Version Electrical Characteristics for 100 cycle products is partly revised. Standard (Min.) is partly revised. Table 5.54 Flash Memory Version Electrical Characteristics for 10,000 cycle products is partly revised. Standard (Min.) is partly revised. Note 5 is revised. Table 23.55 Flash Memory Version Program / Erase Voltage and Read Operation Voltage Characteristics is partly revised.
		87	Table 5.57 Electrical Characteristics (1) is partly deleted.
		88	Table 5.58 Electrical Characteristics is partly revised.