

New product

16-BIT CMOS MICROCOMPUTER

DESCRIPTION

The M37735S4LHP is a microcomputer using the 7700 Family core. This microcomputer has a CPU and a bus interface unit. The CPU is a 16-bit parallel processor that can be an 8-bit parallel processor, and the bus interface unit enhances the memory access efficiency to execute instructions fast. This microcomputer also includes a 32 kHz oscillation circuit, in addition to the RAM, multiple-function timers, serial I/O, A-D converter, and so on. Its strong points are the low power dissipation, the low supply voltage, and the small package.

FEATURES

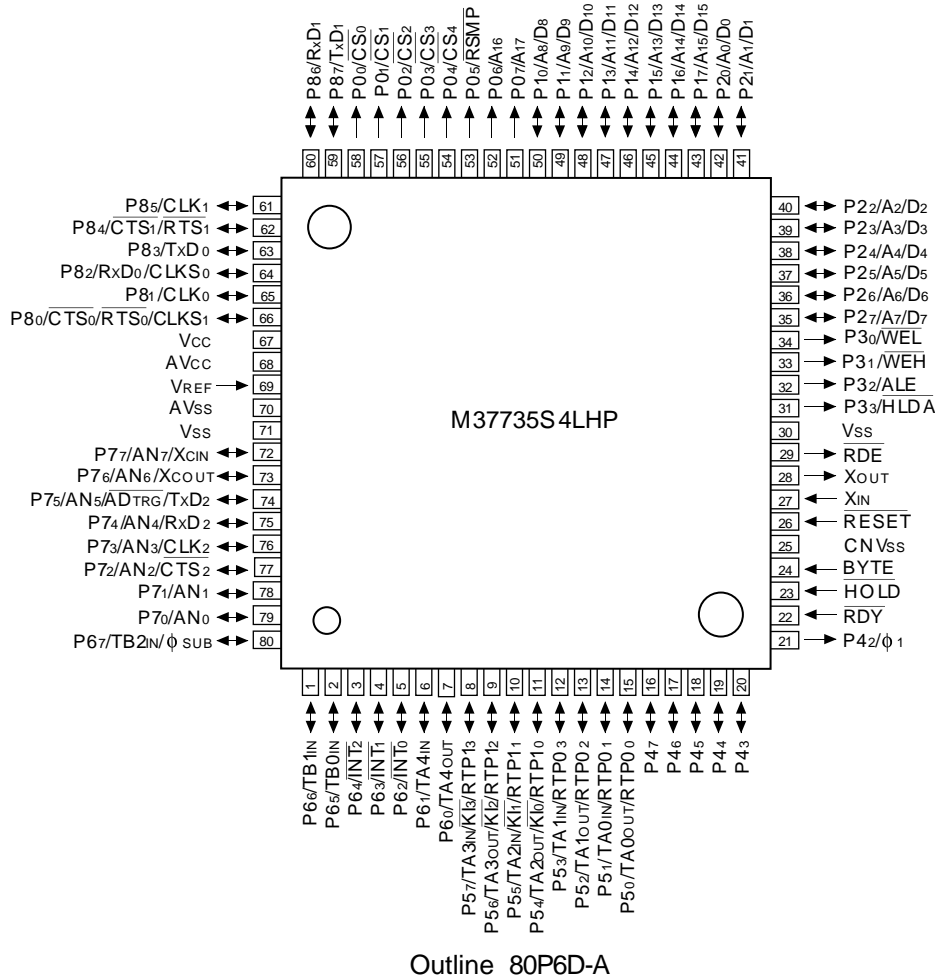
- Number of basic instructions 103
- Memory size RAM 2048 bytes
- Instruction execution time
The fastest instruction at 12 MHz frequency333 ns
- Single power supply 2.7 – 5.5 V
- Low power dissipation (At 3 V supply voltage, 12 MHz frequency)
..... 10.8 mW (Typ.)

- Interrupts 19 types, 7 levels
- Multiple-function 16-bit timer 5 + 3
- Serial I/O (UART or clock synchronous).....3
- 10-bit A-D converter8-channel inputs
- 12-bit watchdog timer
- Programmable input/output
(ports P4, P5, P6, P7, P8)37
- Clock generating circuit 2 circuits built-in
- Small package.....80-pin plastic molded fine-pitch QFP
(80P6D-A; 0.5 mm lead pitch)

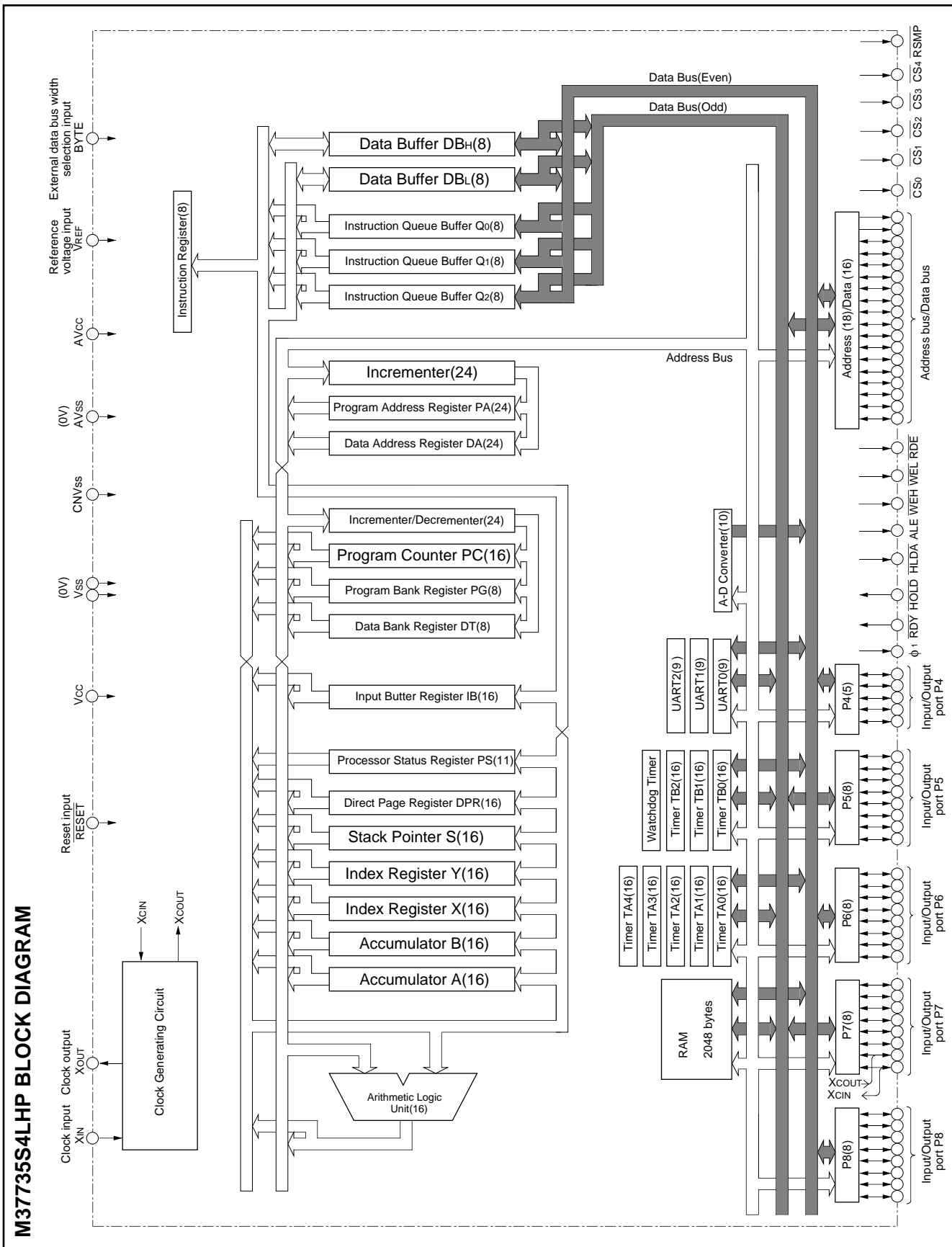
APPLICATION

Control devices for general commercial equipment such as office automation, office equipment, and so on.
Control devices for general industrial equipment such as communication equipment, and so on.

PIN CONFIGURATION (TOP VIEW)



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FUNCTIONS OF M37735S4LHP

| Parameter | | Functions |
|------------------------------|-------------------------|--|
| Number of basic instructions | | 103 |
| Instruction execution time | | 333 ns (the fastest instruction at external clock 12 MHz frequency) |
| Memory size | RAM | 2048 bytes |
| Input/Output ports | P5 – P8 | 8-bit X 4 |
| | P4 | 5-bit X 1 |
| Multi-function timers | TA0, TA1, TA2, TA3, TA4 | 16-bit X 5 |
| | TB0, TB1, TB2 | 16-bit X 3 |
| Serial I/O | | (UART or clock synchronous serial I/O) X 3 |
| A-D converter | | 10-bit X 1 (8 channels) |
| Watchdog timer | | 12-bit X 1 |
| Interrupts | | 3 external types, 16 internal types Each interrupt can be set to the priority level (0 – 7.) |
| Clock generating circuit | | 2 circuits built-in (externally connected to a ceramic resonator or a quartz-crystal oscillator) |
| Supply voltage | | 2.7 – 5.5 V |
| Power dissipation | | 10.8 mW (at 3 V supply voltage, external clock 12 MHz frequency) 27 mW (at 5 V supply voltage, external clock 12 MHz frequency) |
| Input/Output characteristic | Input/Output voltage | 5 V |
| | Output current | 5 mA |
| Memory expansion | | Maximum 1 Mbytes |
| Operating temperature range | | –40 to 85 °C |
| Device structure | | CMOS high-performance silicon gate process |
| Package | | 80-pin plastic molded fine-pitch QFP (80P6D-A; 0.5 mm lead pitch) |

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PIN DESCRIPTION

| Pin | Name | Input/Output | Functions |
|-------------------------|---------------------------------------|--------------|--|
| Vcc, Vss | Power source | | Apply 2.7 – 5.5 V to Vcc and 0 V to Vss. |
| CNVss | CNVss input | Input | Connect to Vcc. |
| RESET | Reset input | Input | When “L” level is applied to this pin, the microcomputer enters the reset state. |
| XIN | Clock input | Input | These are pins of main-clock generating circuit. Connect a ceramic resonator or a quartz-crystal oscillator between XIN and XOUT. When an external clock is used, the clock source should be connected to the XIN pin, and the XOUT pin should be left open. |
| XOUT | Clock output | Output | |
| RDE | Read enable output | Output | When data/instruction read is performed, output level of RDE signal is “L”. |
| BYTE | Bus width selection input | Input | This pin determines whether the external data bus has an 8-bit width or a 16-bit width. The data bus has a 16-bit width when “L” signal is input and an 8-bit width when “H” signal is input. |
| AVcc, AVss | Analog power source input | | Power source input pin for the A-D converter. Externally connect AVcc to Vcc and AVss to Vss. |
| VREF | Reference voltage input | Input | This is reference voltage input pin for the A-D converter. |
| P00/CS0 – P04/CS4 | Chip selection output | Output | When the specified external memory area is accessed, CS0 – CS4 signals are “L”. |
| P05/RSMP | Ready sampling output | Output | The timing signal to be input to the RDY pin is output. |
| P06/A16, P07/A17 | Address output | Output | An address (A16, A17) is output. |
| P10/A8/D8 – P17/A15/D15 | Address output /data (high-order) I/O | I/O | When the BYTE pin is set to “L” and external data bus has a 16-bit width, high-order data (D8 – D15) is input/output or an address (A8 – A15) is output. When the BYTE pin is “H” and an external data bus has an 8-bit width, only address (A8 – A15) is output. |
| P20/A0/D0 – P27/A7/D7 | Address output /data (low-order) I/O | I/O | Low-order data (D0 – D7) is input/output or an address (A0 – A7) is output. |
| P30/WEL | Write enable output | Output | When the BYTE pin is “L” and writing to an even address is performed, output level of WEL signal is “L”. When the BYTE pin is “H” and writing to an even address or an odd address is performed, output level of WEL signal is “L”. |
| P31/WEH | Write enable high output | Output | When the BYTE pin is “L” and writing to an odd address is performed, output level of WEH signal is “L”. When the BYTE pin is “H”, WEH signal is always “H”. |
| P32/ALE | Address latch enable output | Output | This is used to retrieve only the address from the multiplex signal which consists of address and data. |
| P33/HLDA | Hold acknowledge output | Output | This outputs “L” level when the microcomputer enters hold state after a hold request is accepted. |
| HOLD | Hold request input | Input | This is an input pin for HOLD request signal. The microcomputer enters hold state while this signal is “L”. |
| RDY | Ready input | Input | This is an input pin for RDY signal. The microcomputer enters ready state while this signal is “L”. |
| P42/ φ 1 | Clock output | Output | This pin outputs the clock φ 1. |
| P43 – P47 | I/O port P4 | I/O | These pins become a 5-bit I/O port. An I/O direction register is available so that each pin can be programmed for input or output. These ports are in the input mode when reset. |
| P50 – P57 | I/O port P5 | I/O | In addition to having the same functions as port P4, these pins also function as I/O pins for timers A0 to A3 and input pins for key input interrupt input (KI0 – KI3). |
| P60 – P67 | I/O port P6 | I/O | In addition to having the same functions as port P4, these pins also function as I/O pins for timer A4, input pins for external interrupt input (INT0 – INT2) and input pins for timers B0 to B2. P67 also functions as sub-clock φ SUB output pin. |
| P70 – P77 | I/O port P7 | I/O | In addition to having the same functions as port P4, these pins function as input pins for A-D converter. P72 to P75 also function as I/O pins for UART2. Additionally, P76 and P77 have the function as the output pin (XCOUT) and the input pin (XCIN) of the sub-clock (32 kHz) oscillation circuit, respectively. When P76 and P77 are used as the XCOUT and XCIN pins, connect a resonator or an oscillator between the both. |
| P80 – P87 | I/O port P8 | I/O | In addition to having the same functions as port P4, these pins also function as I/O pins for UART 0 and UART 1. |

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BASIC FUNCTION BLOCKS

The M37735S4LHP has the same functions as the M37735MHBXXXFP except for the following:

- (1) The memory map is different.
- (2) The processor mode is different.
- (3) The reset circuit is different.
- (4) Pulse output port mode of timer A is available.
- (5) The function of ROM area modification is not available.

Refer to the section on the M37735MHBXXXFP, except for above (1)–(5).

MEMORY

The memory map is shown in Figure 1. The address space has a capacity of 16 Mbytes and is allocated to addresses from 0₁₆ to FFFFFFF₁₆. The address space is divided by 64-Kbyte unit called bank. The banks are numbered from 0₁₆ to FF₁₆. However, banks 10₁₆–FF₁₆ of the M37735S4LHP cannot be accessed.

Built-in RAM and control registers for internal peripheral devices are assigned to bank 0₁₆.

Addresses FFD6₁₆ to FFFF₁₆ are the RESET and interrupt vector addresses and contain the interrupt vectors. Use ROM for memory of this address.

The 2048-byte area allocated to addresses from 80₁₆ to 87F₁₆ is the built-in RAM. In addition to storing data, the RAM is used as stack during a subroutine call or interrupts.

Peripheral devices such as I/O ports, A-D converter, serial I/O, timer, and interrupt control registers are allocated to addresses from 0₁₆ to 7F₁₆.

A 256-byte direct page area can be allocated anywhere in bank 0₁₆ by using the direct page register (DPR). In the direct page addressing mode, the memory in the direct page area can be accessed with two words. Hence program steps can be reduced.

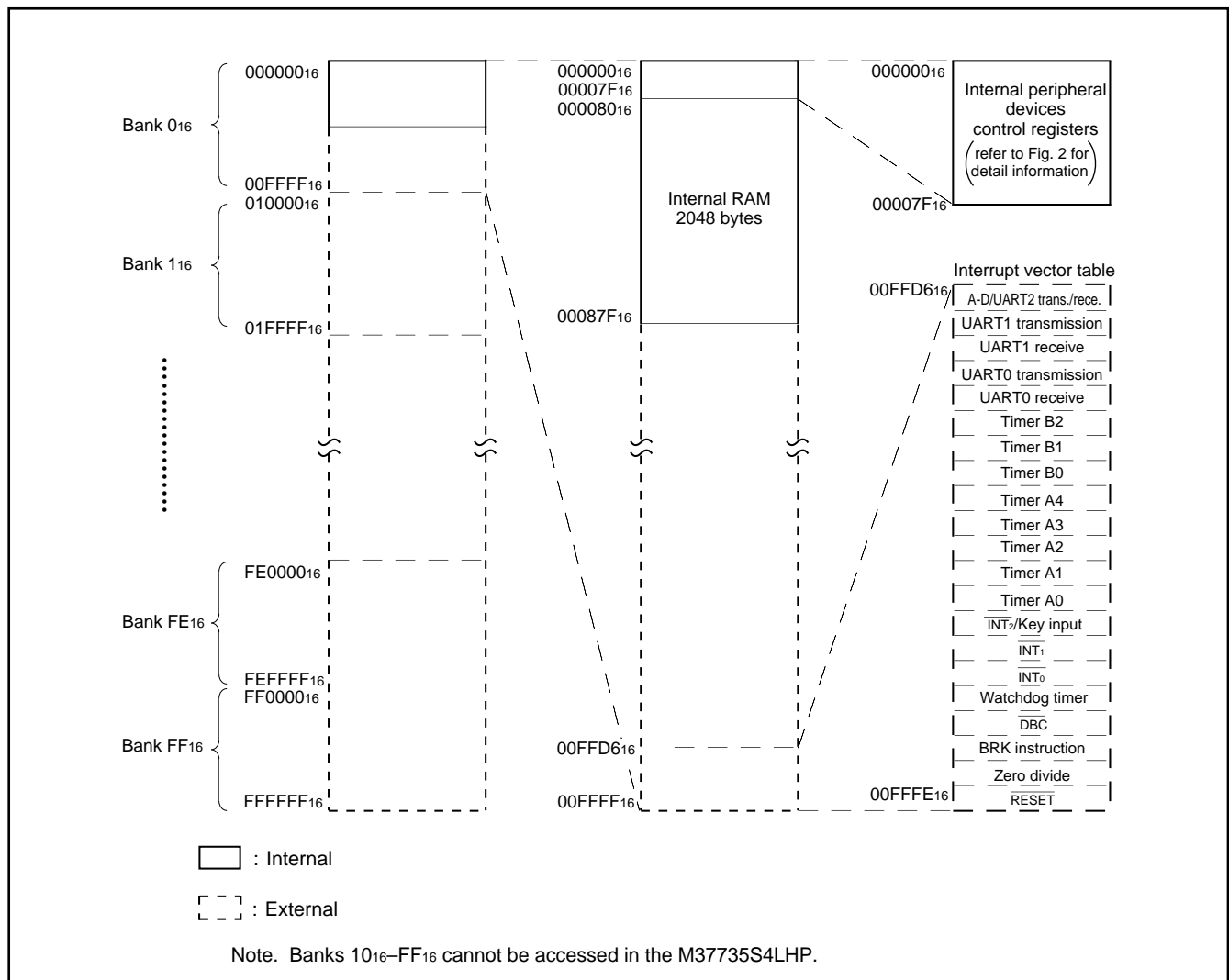


Fig. 1 Memory map

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| Address (Hexadecimal notation) | | Address (Hexadecimal notation) | |
|--------------------------------|--|--------------------------------|--|
| 000000 | | 000040 | Count start flag |
| 000001 | | 000041 | |
| 000002 | Port P0 register | 000042 | One-shot start flag |
| 000003 | Port P1 register | 000043 | |
| 000004 | Port P0 direction register | 000044 | Up-down flag |
| 000005 | Port P1 direction register | 000045 | |
| 000006 | Port P2 register | 000046 | Timer A0 register |
| 000007 | Port P3 register | 000047 | |
| 000008 | Port P2 direction register | 000048 | Timer A1 register |
| 000009 | Port P3 direction register | 000049 | |
| 00000A | Port P4 register | 00004A | Timer A2 register |
| 00000B | Port P5 register | 00004B | |
| 00000C | Port P4 direction register | 00004C | Timer A3 register |
| 00000D | Port P5 direction register | 00004D | |
| 00000E | Port P6 register | 00004E | Timer A4 register |
| 00000F | Port P7 register | 00004F | |
| 000010 | Port P6 direction register | 000050 | Timer B0 register |
| 000011 | Port P7 direction register | 000051 | |
| 000012 | Port P8 register | 000052 | Timer B1 register |
| 000013 | | 000053 | |
| 000014 | Port P8 direction register | 000054 | Timer B2 register |
| 000015 | | 000055 | |
| 000016 | | 000056 | Timer A0 mode register |
| 000017 | | 000057 | Timer A1 mode register |
| 000018 | | 000058 | Timer A2 mode register |
| 000019 | | 000059 | Timer A3 mode register |
| 00001A | | 00005A | Timer A4 mode register |
| 00001B | | 00005B | Timer B0 mode register |
| 00001C | Pulse output data register 1 | 00005C | Timer B1 mode register |
| 00001D | Pulse output data register 0 | 00005D | Timer B2 mode register |
| 00001E | A-D control register 0 | 00005E | Processor mode register 0 |
| 00001F | A-D control register 1 | 00005F | Processor mode register 1 |
| 000020 | | 000060 | Watchdog timer register |
| 000021 | A-D register 0 | 000061 | Watchdog timer frequency selection flag |
| 000022 | | 000062 | Waveform output mode register |
| 000023 | A-D register 1 | 000063 | Reserved area (Note) |
| 000024 | | 000064 | UART2 transmit/receive mode register |
| 000025 | A-D register 2 | 000065 | UART2 baud rate register (BRG2) |
| 000026 | | 000066 | UART2 transmission buffer register |
| 000027 | A-D register 3 | 000067 | |
| 000028 | | 000068 | UART2 transmit/receive control register 0 |
| 000029 | A-D register 4 | 000069 | UART2 transmit/receive control register 1 |
| 00002A | | 00006A | |
| 00002B | A-D register 5 | 00006B | UART2 receive buffer register |
| 00002C | | 00006C | Oscillation circuit control register 0 |
| 00002D | A-D register 6 | 00006D | Port function control register |
| 00002E | | 00006E | Serial transmit control register |
| 00002F | A-D register 7 | 00006F | Oscillation circuit control register 1 |
| 000030 | UART 0 transmit/receive mode register | 000070 | A-D/UART2 trans./rece. interrupt control register |
| 000031 | UART 0 baud rate register (BRG0) | 000071 | UART 0 transmission interrupt control register |
| 000032 | | 000072 | UART 0 receive interrupt control register |
| 000033 | UART 0 transmission buffer register | 000073 | UART 1 transmission interrupt control register |
| 000034 | UART 0 transmit/receive control register 0 | 000074 | UART 1 receive interrupt control register |
| 000035 | UART 0 transmit/receive control register 1 | 000075 | Timer A0 interrupt control register |
| 000036 | | 000076 | Timer A1 interrupt control register |
| 000037 | UART 0 receive buffer register | 000077 | Timer A2 interrupt control register |
| 000038 | UART 1 transmit/receive mode register | 000078 | Timer A3 interrupt control register |
| 000039 | UART 1 baud rate register (BRG1) | 000079 | Timer A4 interrupt control register |
| 00003A | | 00007A | Timer B0 interrupt control register |
| 00003B | UART 1 transmission buffer register | 00007B | Timer B1 interrupt control register |
| 00003C | UART 1 transmit/receive control register 0 | 00007C | Timer B2 interrupt control register |
| 00003D | UART 1 transmit/receive control register 1 | 00007D | INT ₀ interrupt control register |
| 00003E | | 00007E | INT ₁ interrupt control register |
| 00003F | UART 1 receive buffer register | 00007F | INT ₂ /Key input interrupt control register |

Note. Writing to reserved area is disabled.

Fig. 2 Location of internal peripheral devices and interrupt control registers

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Pulse output port mode

The pulse motor drive waveform can be output by using plural internal timer A.

Figure 3 shows a block diagram for pulse output port mode. In the pulse output port mode, two pairs of four-bit pulse output ports are used. Whether using pulse output port or not can be selected by waveform output selection bit (bit 0, bit 1) of waveform output mode register (62₁₆ address) shown in Figure 4. When bit 0 of waveform output selection bit is set to "1", RTP1₀, RTP1₁, RTP1₂, and RTP1₃ are used as pulse output ports, and when bit 1 of waveform output selection bit is set to "1", RTP0₀, RTP0₁, RTP0₂, and RTP0₃ are used as pulse output ports. When bits 1 and 0 of waveform output selection bit are set to "1", RTP1₀, RTP1₁, RTP1₂, and RTP1₃, and RTP0₀, RTP0₁, RTP0₂, and RTP0₃ are used as pulse output ports. The ports not used as pulse output ports can be used as normal parallel ports, timer input/output or key input interrupt input.

In the pulse output port mode, set timers A0 and A2 to timer mode as timers A0 and A2 are used. Figure 5 shows the bit configuration of timer A0, A2 mode registers in pulse output port mode.

Data can be set in each bit of the pulse output data register corresponding to four ports selected as pulse output ports. Figure 6

shows the bit configuration of the pulse output data register. The contents of the pulse output data register 1 (low-order four bits of 1C₁₆ address) corresponding to RTP1₀, RTP1₁, RTP1₂, and RTP1₃ is output to the ports each time the counter of timer A2 becomes 0000₁₆. The contents of the pulse output data register 0 (low-order four bits of 1D₁₆ address) corresponding to RTP0₀, RTP0₁, RTP0₂, and RTP0₃ is output to the ports each time the counter of timer A0 becomes 0000₁₆.

Figure 7 shows example of waveforms in pulse output port mode. When "0" is written to a specified bit of the pulse output data register, "L" level is output to the corresponding pulse output port when the counter of corresponding timer becomes 0000₁₆, and when "1" is written, "H" level is output to the pulse output port.

Pulse width modulation can be applied to each pulse output port. Since pulse width modulation involves the use of timers A1 and A3, activate these timers in pulse width modulation mode.

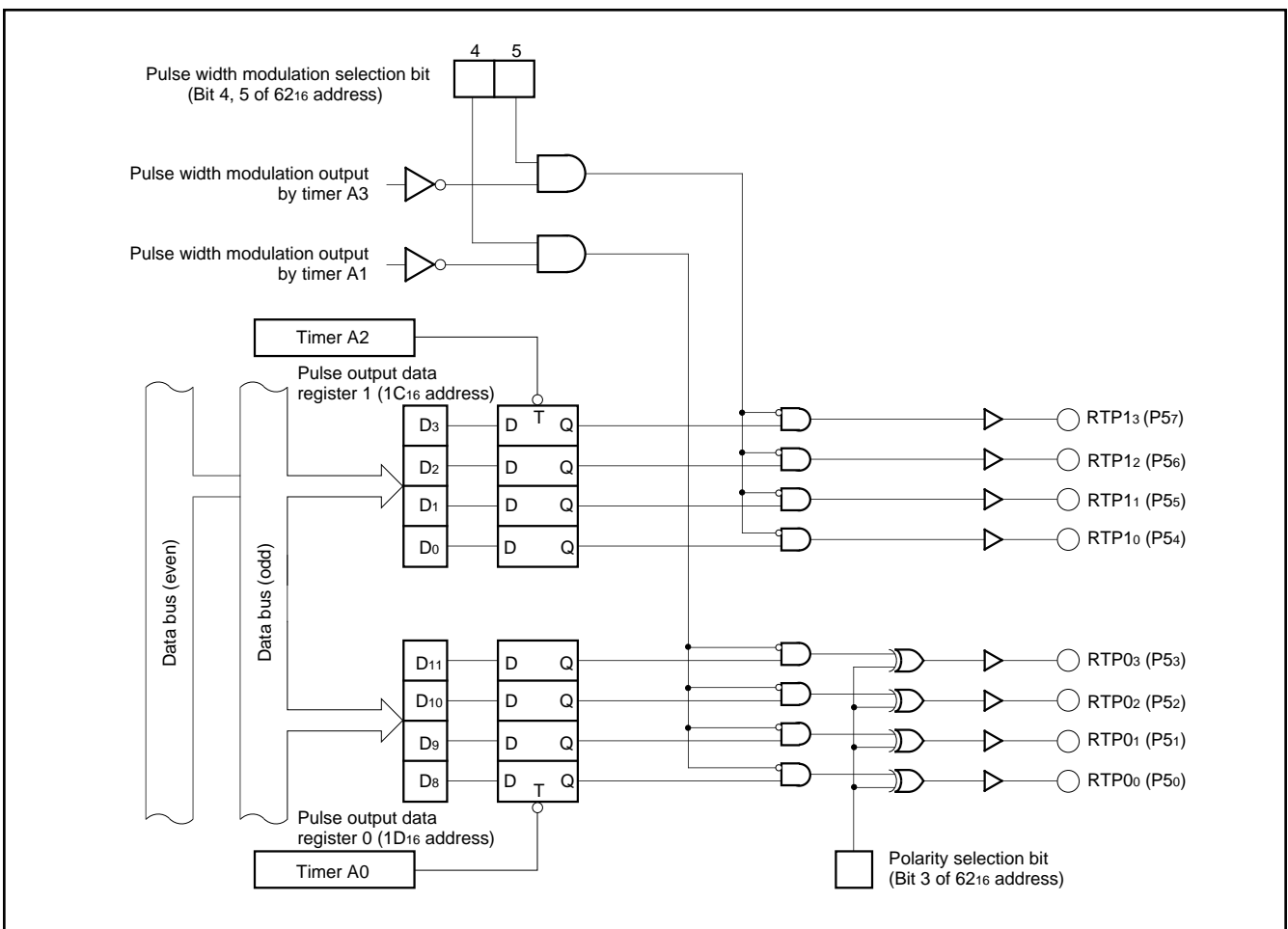


Fig. 3 Block diagram for pulse output port mode

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RTP10, RTP11, RTP12, and RTP13 are applied pulse width modulation by timer A3 by setting the pulse width modulation selection bit by timer A3 (bit 5) of the waveform output mode register to "1".

RTP00, RTP01, RTP02, and RTP03 are applied pulse width modulation by timer A1 by setting the pulse width modulation selection bit by timer A1 (bit 4) of the waveform output mode register to "1".

The contents of the pulse output data register 0 can be reversed and output to pulse output ports RTP00, RTP01, RTP02, and RTP03 by the polarity selection bit (bit 3) of the waveform output mode register. When the polarity selection bit is "0", the contents of the pulse output data register 0 is output unchangeably, and when "1", the contents of the pulse output data register 0 is reversed and output. When pulse width modulation is applied, likewise the polarity reverse to pulse width modulation can be selected by the polarity selection bit.

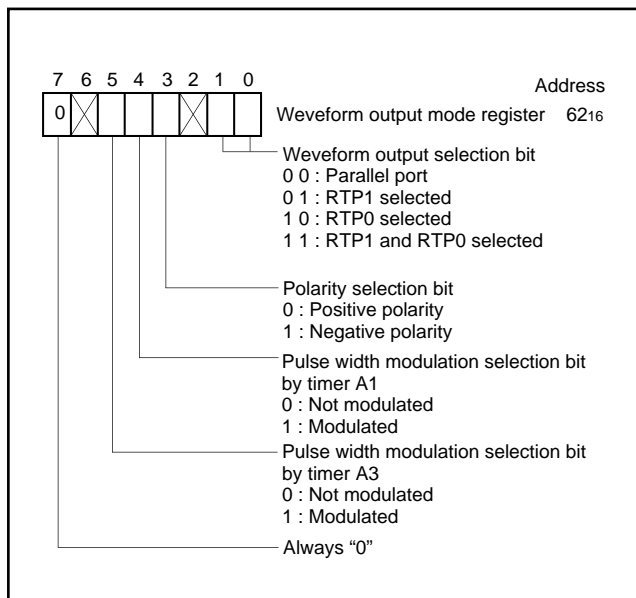


Fig. 4 Waveform output mode register bit configuration

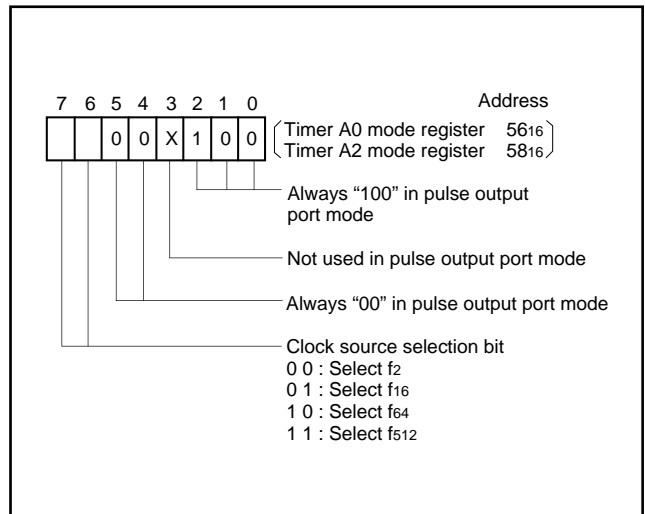


Fig. 5 Timer A0, A2 mode register bit configuration in pulse output port mode

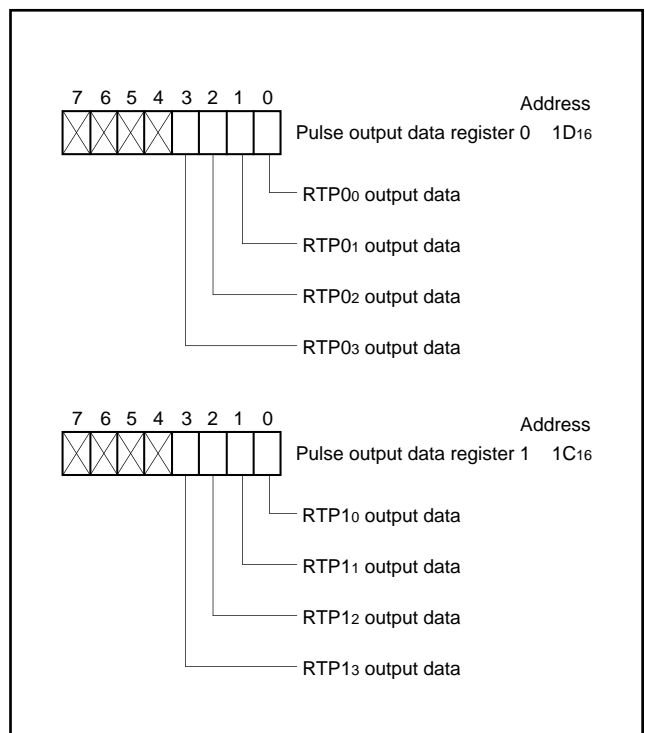


Fig. 6 Pulse output data register bit configuration

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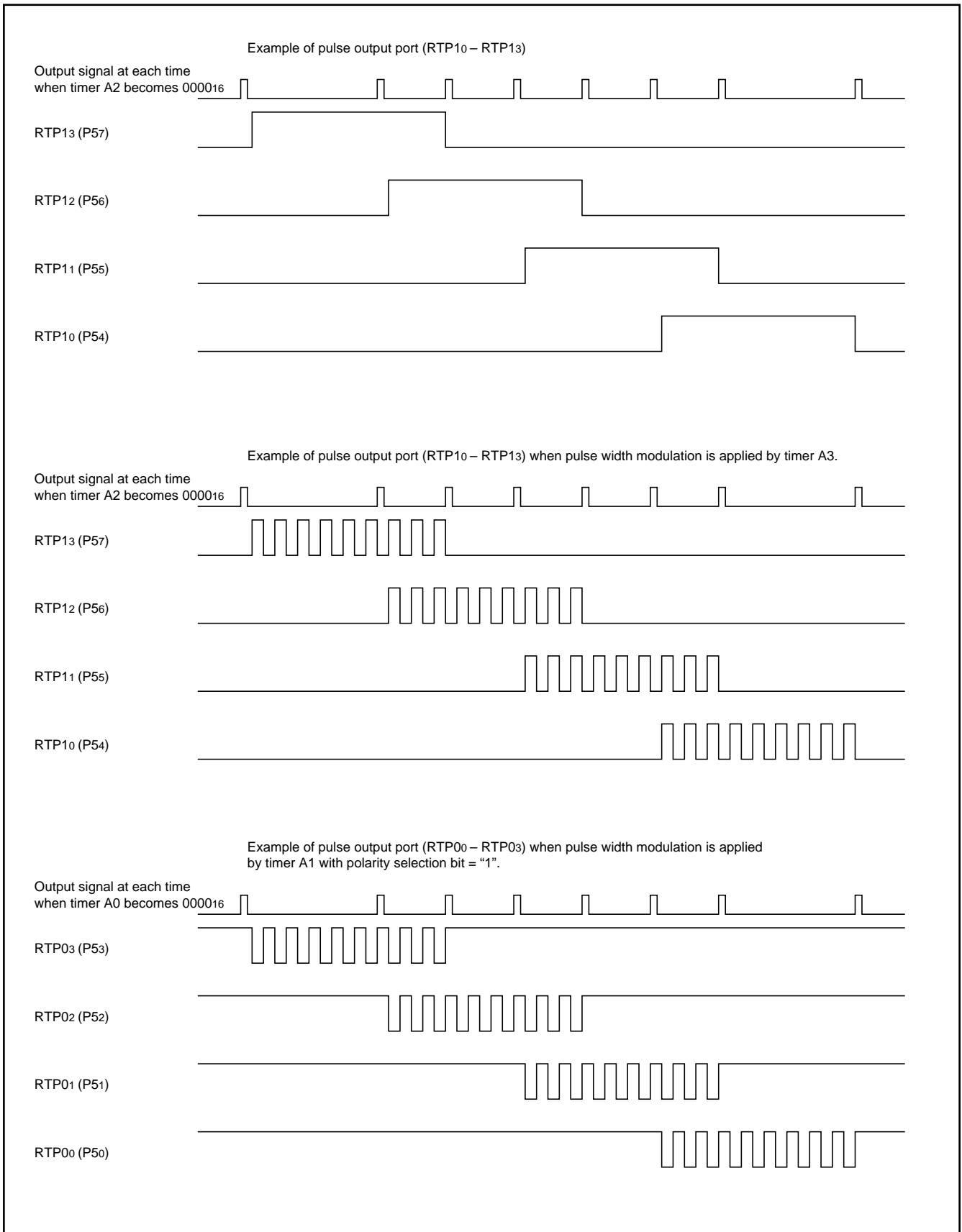


Fig. 7 Example of waveforms in pulse output port mode

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PROCESSOR MODE

Only the microprocessor mode can be selected.

Figure 9 shows the functions of pins P00/ \overline{CS}_0 – P47 in the microprocessor mode.

Figure 10 shows external memory area for the microprocessor mode. Access to the external memory is affected by the BYTE pin, the wait bit (bit 2 of the processor mode register 0 at address 5E16), and the wait selection bit (bit 0 of the processor mode register 1 at address 5F16).

• BYTE pin

When accessing the external memory, the level of the BYTE pin is used to determine whether to use the data bus as 8-bit width or 16-bit width.

The data bus has a width of 8 bits when level of the BYTE pin is "H", and pins P20/A0/D0 – P27/A7/D7 are the data I/O pins.

The data bus has a width of 16 bits when the level of the BYTE pin is "L", and pins P20/A0/D0 – P27/A7/D7 and pins P10/A8/D8 – P17/A15/D15 are the data I/O pins.

When accessing the internal memory, the data bus always has a width of 16 bits regardless of the BYTE pin level.

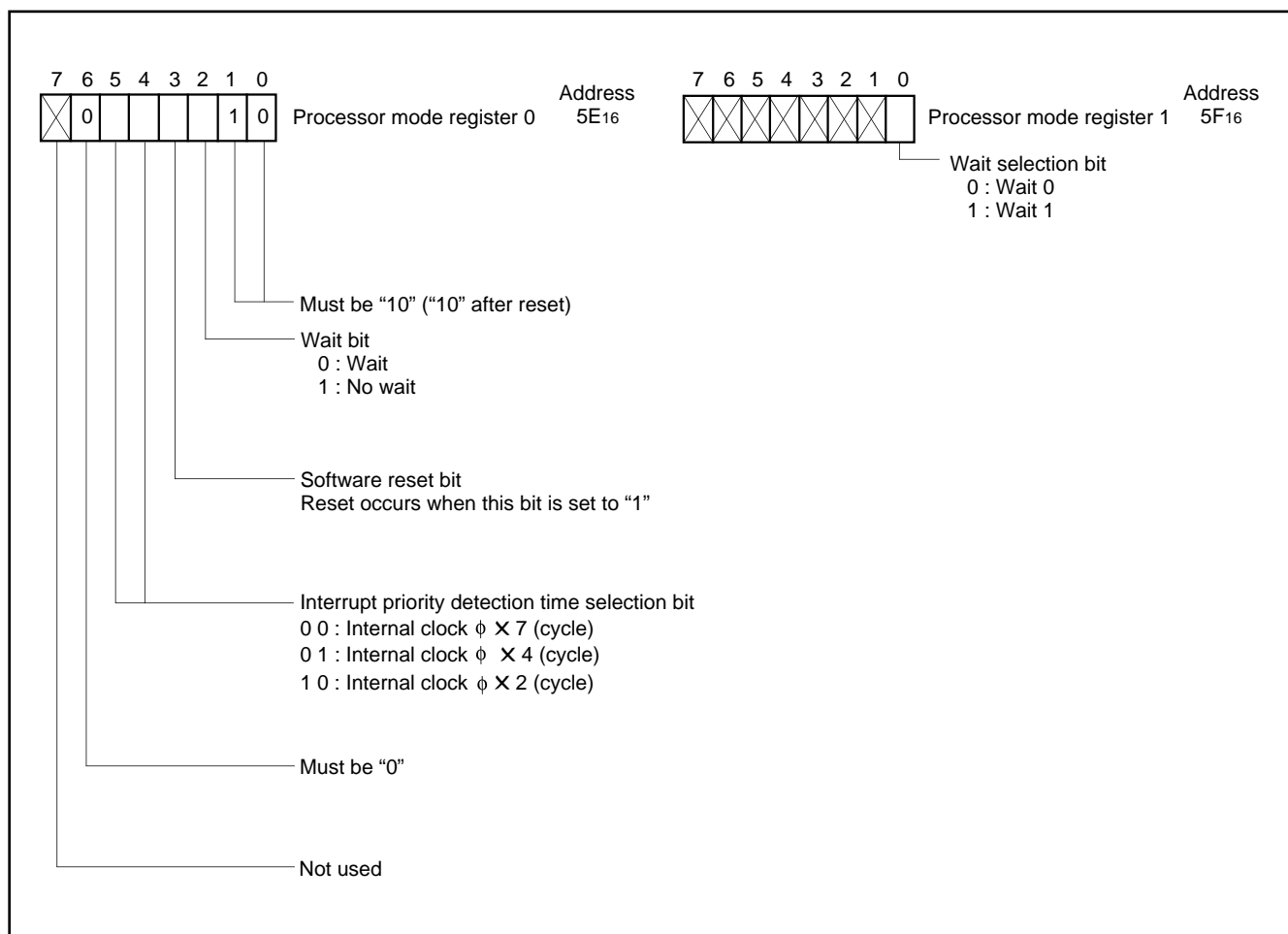


Fig. 8 Processor mode register bit configuration

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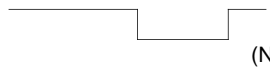
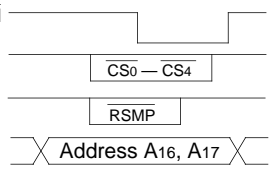
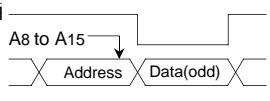
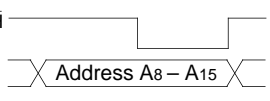
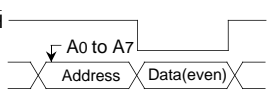
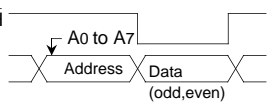
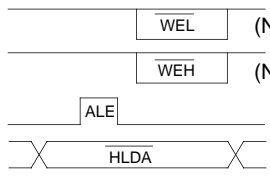
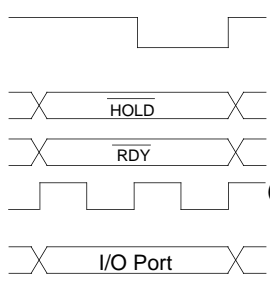
| | | | |
|--|------------|---|--|
| Pin | | PM ₁ | 1 |
| | | PM ₀ | 0 |
| | | Mode | Microprocessor mode |
| $\overline{\text{RDE}}$ | | $\overline{\text{RDE}}$ |  (Note) |
| $\overline{\text{CS}}_0$ to $\overline{\text{CS}}_4$ $\overline{\text{RSMP}}$, A ₁₆ , A ₁₇ | | ($\overline{\text{RDE}}, \overline{\text{WEL}}, \overline{\text{WEH}}$) P ₀₀ / $\overline{\text{CS}}_0$ to P ₀₄ / $\overline{\text{CS}}_4$ P ₀₅ / $\overline{\text{RSMP}}$ P ₀₆ /A ₁₆ P ₀₇ /A ₁₇ |  |
| P ₁₀ /A ₈ /D ₈ to P ₁₇ /A ₁₅ /D ₁₅ | BYTE = "L" | ($\overline{\text{RDE}}, \overline{\text{WEL}}, \overline{\text{WEH}}$) P ₁₀ /A ₈ /D ₈ to P ₁₇ /A ₁₅ /D ₁₅ |  |
| | BYTE = "H" | ($\overline{\text{RDE}}, \overline{\text{WEL}}, \overline{\text{WEH}}$) P ₁₀ /A ₈ /D ₈ to P ₁₇ /A ₁₅ /D ₁₅ |  |
| P ₂₀ /A ₀ /D ₀ to P ₂₇ /A ₇ /D ₇ | BYTE = "L" | ($\overline{\text{RDE}}, \overline{\text{WEL}}, \overline{\text{WEH}}$) P ₂₀ /A ₀ /D ₀ to P ₂₇ /A ₇ /D ₇ |  |
| | BYTE = "H" | ($\overline{\text{RDE}}, \overline{\text{WEL}}, \overline{\text{WEH}}$) P ₂₀ /A ₀ /D ₀ to P ₂₇ /A ₇ /D ₇ |  |
| P ₃₀ / $\overline{\text{WEL}}$, P ₃₁ / $\overline{\text{WEH}}$, P ₃₂ /ALE, P ₃₃ /HLDA | | P ₃₀ / $\overline{\text{WEL}}$ P ₃₁ / $\overline{\text{WEH}}$ P ₃₂ /ALE P ₃₃ /HLDA |  |
| $\overline{\text{HOLD}}$, RDY, P ₄₂ /φ ₁ , Ports P ₄₃ to P ₄₇ | | $\overline{\text{HOLD}}$ RDY P ₄₂ /φ ₁ P ₄₃ to P ₄₇ | ($\overline{\text{RDE}}, \overline{\text{WEL}}, \overline{\text{WEH}}$)  |

Fig. 9 Functions of pins P₀₀/ $\overline{\text{CS}}_0$ to P₄₇ in microprocessor mode

Note. The signal output disable selection bit (bit 6 of the oscillation circuit control register 0) can stop the φ₁ output in the microprocessor mode. In this mode, signals $\overline{\text{RDE}}$, $\overline{\text{WEL}}$, $\overline{\text{WEH}}$ can also be fixed to "H" when the internal memory area is accessed.

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• Wait bit

As shown in Figure 11, when the external memory area is accessed with the wait bit (bit 2 of the processor mode register 0 at address 5E₁₆) cleared to "0", the access time can be extended compared with no wait (the wait bit is "1").

The access time is extended in two ways and this is selected with the wait selection bit (bit 0 of the processor mode register 1 at address 5F₁₆).

When this bit is "1", the access time is 1.5 times compared to that for no wait. When this bit is "0", the access time is twice compared to that for no wait.

At reset, the wait bit and the wait selection bit are "0".

Access to internal memory area is always performed in the no wait mode regardless of the wait bit.

The processor modes are described below.

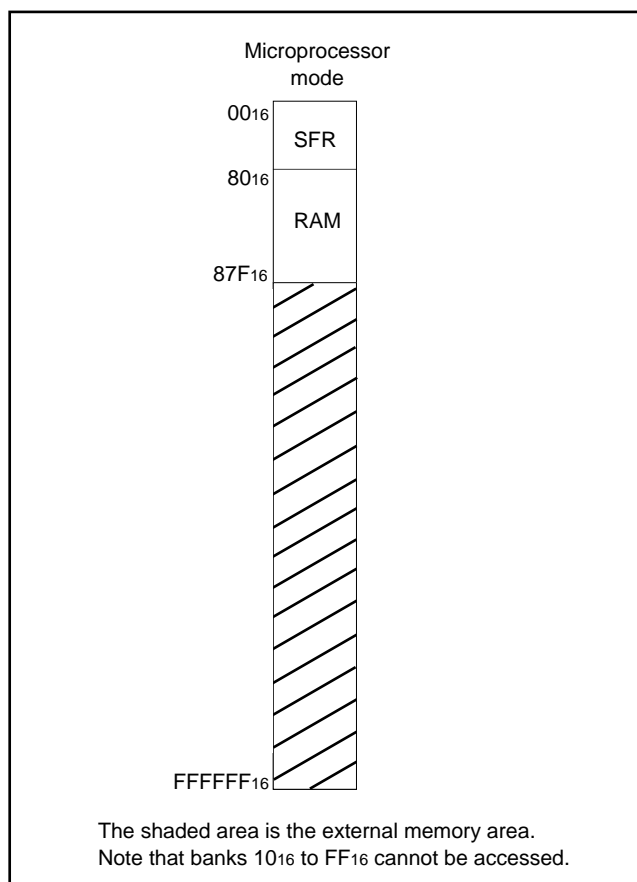


Fig. 10 External memory area for microprocessor mode

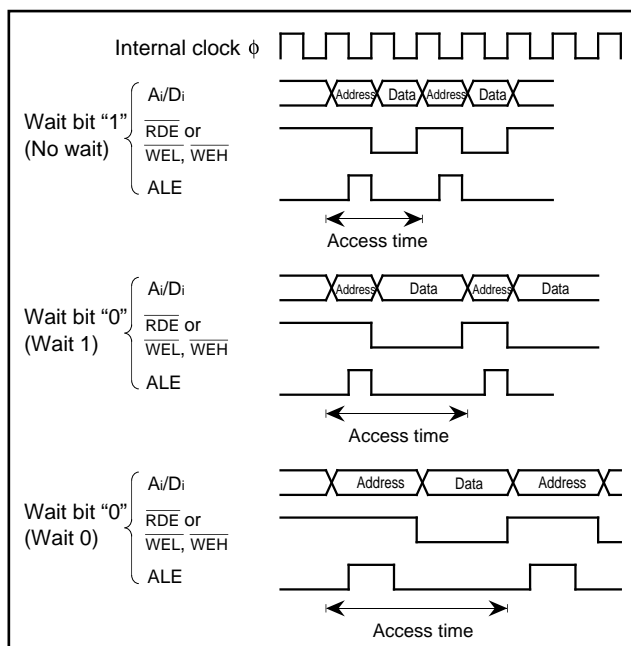


Fig. 11 Relationship between wait bit, wait selection bit, and access time

(1) Microprocessor mode [10]

The microcomputer enters the microprocessor mode after connecting the CNVss pin to Vcc and starting from reset.

Pin RDE is the output pin for the read enable signal (RDE).

RDE is "L" during the data read term in the read cycle. When the internal memory area is read, RDE can be fixed to "H" by setting the signal output disable selection bit (bit 6 of the oscillation circuit control register 0) to "1".

New product

\overline{CS}_0 to \overline{CS}_4 are the chip select signals and are "L" when the address shown in Table 2 is accessed. \overline{RSMP} is the ready-sampling signal which is output for the \overline{RDY} input described later when the external memory area is accessed. By inputting logical AND of \overline{RSMP} and \overline{CS}_n ($n = 0$ to 4) to the \overline{RDY} pin, read/write term for any address areas can be extended by 1 cycle of clock ϕ_1 . In addition, the read/write term can also be extended by 2 cycles of clock ϕ_1 if the above function and wait 0/1 function specified with the wait bit are used together.

Pins P10/A8/D8 — P17/A15/D15 have two functions depending on the level of the BYTE pin.

When the BYTE pin level is "L", pins P10/A8/D8 — P17/A15/D15 function as address (A8 to A15) output pins while \overline{RDE} or \overline{WEL} , \overline{WEH} are "H" and as odd address data I/O pins while these signals are "L". However, if an internal memory is read, external data is ignored while \overline{RDE} is "L".

When the BYTE pin level is "H", pins P10/A8/D8 — P17/A15/D15 function as address (A8 to A15) output pins.

Pins P20/A0/D0 — P27/A7/D7 have two functions depending on the level of the BYTE pin.

When the BYTE pin level is "L", pins P20/A0/D0 — P27/A7/D7 function as address (A0 to A7) output pins while \overline{RDE} or \overline{WEL} , \overline{WEH} are "H" and as even address data I/O pins while these signals are "L". However, if an internal memory is read, external data is ignored while \overline{RDE} is "L".

When the BYTE pin level is "H", pins P20/A0/D0 — P27/A7/D7 function as address (A0 to A7) output pins while \overline{RDE} or \overline{WEL} , \overline{WEH} are "H" and as even and odd address data I/O pins while these signals are "L". However, if an internal memory is read, external data is ignored while \overline{RDE} is "L".

\overline{WEL} , \overline{WEH} are the write-enable low signal and the write-enable high signal, respectively. These signals are "L" during the data write term of the write cycle, but their operations differ depending on the BYTE pin level.

In the case the BYTE pin level is "L", \overline{WEL} is "L" when writing to an even address, \overline{WEH} is "L" when writing to an odd address, and both \overline{WEL} and \overline{WEH} are "L" when writing to even and odd addresses. In the case the BYTE pin level is "H", regardless of address, only \overline{WEL} is "L", and \overline{WEH} retains "H". \overline{WEL} and \overline{WEH} can also be fixed to "H" when the internal memory is accessed, same as \overline{RDE} , by writing "1" to the signal output disable selection bit.

ALE is an address latch enable signal used to latch the address signal from a multiplexed signal of address and data. The latch is transparent while ALE is "H" to let the address signal pass through and held while ALE is "L".

\overline{HLDA} is a hold acknowledge signal and is used to notify externally when the microcomputer receives HOLD input and enters into hold state.

HOLD is a hold request signal. It is an input signal used to put the microcomputer in hold state. \overline{HOLD} input is accepted when the internal clock ϕ falls from "H" level to "L" level while the bus is not used.

Pins P00/ \overline{CS}_0 — P31/ \overline{WEH} and \overline{RDE} are floating while the microcomputer stays in hold state. After \overline{HLDA} signal changes to "L" level and one cycle of internal clock ϕ passed, these ports become floating. After \overline{HLDA} signal changes to "H" level and one cycle of internal clock ϕ passed, these ports are released from floating state.

\overline{RDY} is a ready signal. If this signal goes "L", the internal clock ϕ stops at "L". \overline{RDY} is used when slow external memory is attached. P42/ ϕ_1 pin is an output pin for clock ϕ_1 . The ϕ_1 output is independent of \overline{RDY} and does not stop even when internal clock ϕ stops because of "L" input to the \overline{RDY} pin.

New product

As shown in Table 3, ϕ_1 output can be stopped with the signal output disable selection bit = "1". In this case, write "1" to the port P42 direction register.

Table 1 shows the relationship between the CNVss pin input level and the processor mode.

Table 1. Relationship between CNVss pin input levels and processor mode

| CNVss | Mode | Description |
|-------|------------------|--|
| Vcc | • Microprocessor | Microprocessor mode upon starting after reset. |

Table 2. Relationship between access addresses and chip-select signals \overline{CS}_0 to \overline{CS}_4

| Chip-select signal | Area | Access address |
|--------------------|---|--|
| | | Microprocessor mode |
| \overline{CS}_0 | The first half of bank 00 ₁₆ except internal memory area | 00 0880 ₁₆ to 00 7FFF ₁₆ |
| \overline{CS}_1 | The latter half of bank 00 ₁₆ except internal memory area and banks 01 ₁₆ to 03 ₁₆ . | 00 8000 ₁₆ to 03 FFFF ₁₆ |
| \overline{CS}_2 | Banks 04 ₁₆ to 07 ₁₆ | 04 0000 ₁₆ to 07 FFFF ₁₆ |
| \overline{CS}_3 | Banks 08 ₁₆ to 0B ₁₆ | 08 0000 ₁₆ to 0B FFFF ₁₆ |
| \overline{CS}_4 | Banks 0C ₁₆ to 0F ₁₆ | 0C 0000 ₁₆ to 0F FFFF ₁₆ |

Table 3. Function of signal output disable selection bit CM₆ (bit 6 of oscillation circuit control register 0)

| Processor mode | Pin | Function | |
|---------------------|---|--|--|
| | | CM ₆ = "0" | CM ₆ = "1" |
| Microprocessor mode | \overline{RDE} , \overline{WEL} , \overline{WEH} | RDE, WEL, WEH are output when the internal/external memory area is accessed. | RDE, WEL, WEH are output only when the external memory area is accessed. |
| | \overline{RDE} | After WIT/STP instruction is executed, "H" is output. | "L" is output after WIT/STP instruction is executed * Standby state selection bit (bit 0 of port function control register) must be set to "1". |
| | ϕ_1 | Clock ϕ_1 is output independent of ϕ_1 output selection bit. | "H" or "L" is output. (Contents of P42 port latch is output.) * Port P42 direction register must be set to "1". |

Note. Functions shown in Table 3 cannot be emulated with a debugger. For the oscillation circuit control register 0 and port function control register, refer to Figures 64 and 11 in data sheet "M37735MHBXXXFP", respectively.

New product

RESET CIRCUIT

The microcomputer is released from the reset state when the RESET pin is returned to "H" level after holding it at "L" level with the power source voltage at 2.7 to 5.5 V. Program execution starts at the address formed by setting address A₂₃ – A₁₆ to 00₁₆, A₁₅ – A₈ to the contents of address FFFF₁₆, and A₇ – A₀ to the contents of address FFFE₁₆. Figure 13 shows an example of a reset circuit. If the stabilized clock is input from the external to the main-clock oscillation circuit, the reset

input voltage must be 0.55 V or less when the power source voltage reaches 2.7 V. If a resonator/oscillator is connected to the main-clock oscillation circuit, change the reset input voltage from "L" to "H" after the main-clock oscillation is fully stabilized.

Figure 12 shows the status of the internal registers during reset.

| Register Name | Address | Value | Register Name | Address | Value |
|--|---------------------|-------------------|--|---------------------|-------------------------------|
| Port P0 direction register | (04 ₁₆) | 00 ₁₆ | Watchdog timer frequency selection flag | (61 ₁₆) | XXXXXXXXXX0 |
| Port P1 direction register | (05 ₁₆) | 00 ₁₆ | Waveform output mode register | (62 ₁₆) | 0X000X00 |
| Port P2 direction register | (08 ₁₆) | 00 ₁₆ | UART2 transmit/receive mode register | (64 ₁₆) | X0000000 |
| Port P3 direction register | (09 ₁₆) | XXXXXXXX0000 | UART2 transmit/receive control register 0 | (68 ₁₆) | XXXXXXXX1000 |
| Port P4 direction register | (0C ₁₆) | 00 ₁₆ | UART2 transmit/receive control register 1 | (69 ₁₆) | 000000010 |
| Port P5 direction register | (0D ₁₆) | 00 ₁₆ | Oscillation circuit control register 0 | (6C ₁₆) | X00000X1 |
| Port P6 direction register | (10 ₁₆) | 00 ₁₆ | Port function control register | (6D ₁₆) | 00 ₁₆ |
| Port P7 direction register | (11 ₁₆) | 00 ₁₆ | Serial transmit control register | (6E ₁₆) | XXXXXXXXXX |
| Port P8 direction register | (14 ₁₆) | 00 ₁₆ | Oscillation circuit control register 1 | (6F ₁₆) | 0XXXX00000 |
| A-D control register 0 | (1E ₁₆) | 00000??? | A-D/UART2 trans./rece. interrupt control register | (70 ₁₆) | XXXXXXXX0000 |
| A-D control register 1 | (1F ₁₆) | XXXX000X11 | UART 0 transmission interrupt control register | (71 ₁₆) | XXXXXXXX0000 |
| UART 0 transmit/receive mode register | (30 ₁₆) | 00 ₁₆ | UART 0 receive interrupt control register | (72 ₁₆) | XXXXXXXX0000 |
| UART 1 transmit/receive mode register | (38 ₁₆) | 00 ₁₆ | UART 1 transmission interrupt control register | (73 ₁₆) | XXXXXXXX0000 |
| UART 0 transmit/receive control register 0 | (34 ₁₆) | 0000010000 | UART 1 receive interrupt control register | (74 ₁₆) | XXXXXXXX0000 |
| UART 1 transmit/receive control register 0 | (3C ₁₆) | 0000010000 | Timer A0 interrupt control register | (75 ₁₆) | XXXXXXXX0000 |
| UART 0 transmit/receive control register 1 | (35 ₁₆) | 0000000010 | Timer A1 interrupt control register | (76 ₁₆) | XXXXXXXX0000 |
| UART 1 transmit/receive control register 1 | (3D ₁₆) | 0000000010 | Timer A2 interrupt control register | (77 ₁₆) | XXXXXXXX0000 |
| Count start flag | (40 ₁₆) | 00 ₁₆ | Timer A3 interrupt control register | (78 ₁₆) | XXXXXXXX0000 |
| One-shot start flag | (42 ₁₆) | XXXX000000 | Timer A4 interrupt control register | (79 ₁₆) | XXXXXXXX0000 |
| Up-down flag | (44 ₁₆) | 00 ₁₆ | Timer B0 interrupt control register | (7A ₁₆) | XXXXXXXX0000 |
| Timer A0 mode register | (56 ₁₆) | 00 ₁₆ | Timer B1 interrupt control register | (7B ₁₆) | XXXXXXXX0000 |
| Timer A1 mode register | (57 ₁₆) | 00 ₁₆ | Timer B2 interrupt control register | (7C ₁₆) | XXXXXXXX0000 |
| Timer A2 mode register | (58 ₁₆) | 00 ₁₆ | INT ₀ interrupt control register | (7D ₁₆) | XXXX000000 |
| Timer A3 mode register | (59 ₁₆) | 00 ₁₆ | INT ₁ interrupt control register | (7E ₁₆) | XXXX000000 |
| Timer A4 mode register | (5A ₁₆) | 00 ₁₆ | INT ₂ /key input interrupt control register | (7F ₁₆) | XXXX000000 |
| Timer B0 mode register | (5B ₁₆) | 0001000000 | Processor status register (PS) | | 000??0001?? |
| Timer B1 mode register | (5C ₁₆) | 0001X00000 | Program bank register (PG) | | 00 ₁₆ |
| Timer B2 mode register | (5D ₁₆) | 0001X00000 | Program counter (PC _H) | | Content of FFFF ₁₆ |
| Processor mode register 0 | (5E ₁₆) | 00 ₁₆ | Program counter (PC _L) | | Content of FFFE ₁₆ |
| Processor mode register 1 | (5F ₁₆) | XXXXXXXXXX0 | Direct page register (DPR) | | 0000 ₁₆ |
| Watchdog timer register | (60 ₁₆) | FFF ₁₆ | Data bank register (DT) | | 00 ₁₆ |

Contents of other registers and RAM are undefined during reset. Initialize them by software.

Fig. 12 Microcomputer internal status during reset

New product

16-BIT CMOS MICROCOMPUTER

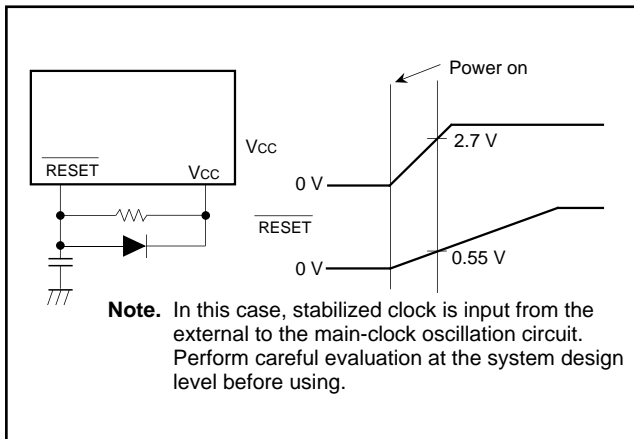


Fig. 13 Example of a reset circuit

ADDRESSING MODES

The M37735S4LHP has 28 powerful addressing modes. Refer to the MITSUBISHI SEMICONDUCTORS DATA BOOK SINGLE-CHIP 16-BIT MICROCOMPUTERS for the details of each addressing mode.

MACHINE INSTRUCTION LIST

The M37735S4LHP has 103 machine instructions. Refer to the MITSUBISHI SEMICONDUCTORS DATA BOOK SINGLE-CHIP 16-BIT MICROCOMPUTERS for details.

New product

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Conditions | Ratings | Unit |
|------------------|--|------------------------|-------------------------------|------|
| V _{cc} | Power source voltage | | -0.3 to +7 | V |
| AV _{cc} | Analog power source voltage | | -0.3 to +7 | V |
| V _i | Input voltage RESET, CNV _{ss} , BYTE | | -0.3 to +12 | V |
| V _i | Input voltage P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P43 – P47, P50 – P57, P60 – P67, P70 – P77, P80 – P87, V _{REF} , X _{IN} , HOLD, RDY | | -0.3 to V _{cc} + 0.3 | V |
| V _o | Output voltage P00/CS ₀ – P07/A17, P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P30/WEL – P33/HLDA, P42/φ 1, P43 – P47, P50 – P57, P60 – P67, P70 – P77, P80 – P87, X _{OUT} , RDE | | -0.3 to V _{cc} + 0.3 | V |
| P _d | Power dissipation | T _a = 25 °C | 200 | mW |
| T _{opr} | Operating temperature | | -40 to +85 | °C |
| T _{stg} | Storage temperature | | -65 to +150 | °C |

RECOMMENDED OPERATING CONDITIONS (V_{cc} = 2.7 – 5.5 V, T_a = -40 to +85 °C, unless otherwise noted)

| Symbol | Parameter | Limits | | | Unit | |
|-----------------------|---|--|-----------------|---------------------|------|---|
| | | Min. | Typ. | Max. | | |
| V _{cc} | Power source voltage | f(X _{IN}) : Operating | 2.7 | | 5.5 | V |
| | | f(X _{IN}) : Stopped, f(X _{CIN}) = 32.768 kHz | 2.7 | | 5.5 | |
| AV _{cc} | Analog power source voltage | | V _{cc} | | V | |
| V _{ss} | Power source voltage | | 0 | | V | |
| AV _{ss} | Analog power source voltage | | 0 | | V | |
| V _{IH} | High-level input voltage HOLD, RDY, P43 – P47, P50 – P57, P60 – P67, P70 – P77, P80 – P87, X _{IN} , RESET, CNV _{ss} , BYTE, X _{CIN} (Note 3) | 0.8 V _{cc} | | V _{cc} | V | |
| V _{IH} | High-level input voltage P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7 | 0.5 V _{cc} | | V _{cc} | V | |
| V _{IL} | Low-level input voltage HOLD, RDY, P43 – P47, P50 – P57, P60 – P67, P70 – P77, P80 – P87, X _{IN} , RESET, CNV _{ss} , BYTE, X _{CIN} (Note 3) | 0 | | 0.2V _{cc} | V | |
| V _{IL} | Low-level input voltage P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7 | 0 | | 0.16V _{cc} | V | |
| I _{OH(peak)} | High-level peak output current P00/CS ₀ – P07/A17, P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P30/WEL – P33/HLDA, P42/φ 1, P43 – P47, P50 – P57, P60 – P67, P70 – P77, P80 – P87 | | | -10 | mA | |
| I _{OH(avg)} | High-level average output current P00/CS ₀ – P07/A17, P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P30/WEL – P33/HLDA, P42/φ 1, P43 – P47, P50 – P57, P60 – P67, P70 – P77, P80 – P87 | | | -5 | mA | |
| I _{OL(peak)} | Low-level peak output current P00/CS ₀ – P07/A17, P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P30/WEL – P33/HLDA, P42/φ 1, P43, P54 – P57, P60 – P67, P70 – P77, P80 – P87 | | | 10 | mA | |
| I _{OL(peak)} | Low-level peak output current P44 – P47, P50 – P53 | | | 16 | mA | |
| I _{OL(avg)} | Low-level average output current P00/CS ₀ – P07/A17, P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P30/WEL – P33/HLDA, P42/φ 1, P43, P54 – P57, P60 – P67, P70 – P77, P80 – P87 | | | 5 | mA | |
| I _{OL(avg)} | Low-level average output current P44 – P47, P50 – P53 | | | 12 | mA | |
| f(X _{IN}) | Main-clock oscillation frequency (Note 4) | | | 12 | MHz | |
| f(X _{CIN}) | Sub-clock oscillation frequency | | 32.768 | 50 | kHz | |

- Notes**
1. Average output current is the average value of a 100 ms interval.
 2. The sum of I_{OL(peak)} for ports P00/CS₀ – P07/A17, P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P30/WEL – P33/HLDA and P8 must be 80 mA or less, the sum of I_{OH(peak)} for ports P00/CS₀ – P07/A17, P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P30/WEL – P33/HLDA and P8 must be 80 mA or less, the sum of I_{OL(peak)} for ports P4, P5, P6, and P7 must be 100 mA or less, and the sum of I_{OH(peak)} for ports P4, P5, P6, and P7 must be 80 mA or less.
 3. Limits V_{IH} and V_{IL} for X_{CIN} are applied when the sub clock external input selection bit = "1".
 4. The maximum value of f(X_{IN}) = 6 MHz when the main clock division selection bit = "1".

New product

ELECTRICAL CHARACTERISTICS ($V_{CC} = 5\text{ V}$, $V_{SS} = 0\text{ V}$, $T_a = -40\text{ to }+85\text{ }^\circ\text{C}$, $f(X_{IN}) = 12\text{ MHz}$, unless otherwise noted)

| Symbol | Parameter | Test conditions | Limits | | | Unit | |
|-----------------------------------|--|--|-----------------------|-------|-------|---------------|---------------|
| | | | Min. | Typ. | Max. | | |
| V _{OH} | High-level output voltage P00/ $\overline{CS_0}$ – P07/A17, P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P33/ \overline{HLDA} , P42/ ϕ_1 , P43 – P47, P50 – P57, P60 – P67, P70 – P77, P80 – P87 | $V_{CC} = 5\text{ V}$, $I_{OH} = -10\text{ mA}$ | 3 | | | V | |
| | | $V_{CC} = 3\text{ V}$, $I_{OH} = -1\text{ mA}$ | 2.5 | | | | |
| V _{OH} | High-level output voltage P00/ $\overline{CS_0}$ – P07/A17, P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P33/ \overline{HLDA} , P42/ ϕ_1 | $V_{CC} = 5\text{ V}$, $I_{OH} = -400\text{ }\mu\text{A}$ | 4.7 | | | V | |
| V _{OH} | High-level output voltage P30/ \overline{WEL} , P31/ \overline{WEH} , P32/ALE | $V_{CC} = 5\text{ V}$, $I_{OH} = -10\text{ mA}$ | 3.1 | | | V | |
| | | $V_{CC} = 5\text{ V}$, $I_{OH} = -400\text{ }\mu\text{A}$ | 4.8 | | | | |
| | | $V_{CC} = 3\text{ V}$, $I_{OH} = -1\text{ mA}$ | 2.6 | | | | |
| V _{OH} | High-level output voltage \overline{RDE} | $V_{CC} = 5\text{ V}$, $I_{OH} = -10\text{ mA}$ | 3.4 | | | V | |
| | | $V_{CC} = 5\text{ V}$, $I_{OH} = -400\text{ }\mu\text{A}$ | 4.8 | | | | |
| | | $V_{CC} = 3\text{ V}$, $I_{OH} = -1\text{ mA}$ | 2.6 | | | | |
| V _{OL} | Low-level output voltage P00/ $\overline{CS_0}$ – P07/A17, P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P33/ \overline{HLDA} , P42/ ϕ_1 , P43, P54 – P57, P60 – P67, P70 – P77, P80 – P87 | $V_{CC} = 5\text{ V}$, $I_{OL} = 10\text{ mA}$ | | | 2 | V | |
| | | $V_{CC} = 3\text{ V}$, $I_{OL} = 1\text{ mA}$ | | | 0.5 | | |
| V _{OL} | Low-level output voltage P44 – P47, P50 – P53 | $V_{CC} = 5\text{ V}$, $I_{OL} = 16\text{ mA}$ | | | 1.8 | V | |
| | | $V_{CC} = 3\text{ V}$, $I_{OL} = 10\text{ mA}$ | | | 1.5 | | |
| V _{OL} | Low-level output voltage P00/ $\overline{CS_0}$ – P07/A17, P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P33/ \overline{HLDA} , P42/ ϕ_1 | $V_{CC} = 5\text{ V}$, $I_{OL} = 2\text{ mA}$ | | | 0.45 | V | |
| V _{OL} | Low-level output voltage P30/ \overline{WEL} , P31/ \overline{WEH} , P32/ALE | $V_{CC} = 5\text{ V}$, $I_{OL} = 10\text{ mA}$ | | | 1.9 | V | |
| | | $V_{CC} = 5\text{ V}$, $I_{OL} = 2\text{ mA}$ | | | 0.43 | | |
| | | $V_{CC} = 3\text{ V}$, $I_{OL} = 1\text{ mA}$ | | | 0.4 | | |
| V _{OL} | Low-level output voltage \overline{RDE} | $V_{CC} = 5\text{ V}$, $I_{OL} = 10\text{ mA}$ | | | 1.6 | V | |
| | | $V_{CC} = 5\text{ V}$, $I_{OL} = 2\text{ mA}$ | | | 0.4 | | |
| | | $V_{CC} = 3\text{ V}$, $I_{OL} = 1\text{ mA}$ | | | 0.4 | | |
| V _{T+} – V _{T-} | Hysteresis \overline{HOLD} , \overline{RDY} , $\overline{TA0IN}$ – $\overline{TA4IN}$, $\overline{TB0IN}$ – $\overline{TB2IN}$, $\overline{INT_0}$ – $\overline{INT_2}$, \overline{ADTRG} , $\overline{CTS_0}$, $\overline{CTS_1}$, $\overline{CTS_2}$, $\overline{CLK_0}$, $\overline{CLK_1}$, $\overline{CLK_2}$, $\overline{Kl_0}$ – $\overline{Kl_3}$ | $V_{CC} = 5\text{ V}$ | 0.4 | | 1 | V | |
| | | $V_{CC} = 3\text{ V}$ | 0.1 | | 0.7 | | |
| V _{T+} – V _{T-} | Hysteresis \overline{RESET} | $V_{CC} = 5\text{ V}$ | 0.2 | | 0.5 | V | |
| | | $V_{CC} = 3\text{ V}$ | 0.1 | | 0.4 | | |
| V _{T+} – V _{T-} | Hysteresis X _{IN} | $V_{CC} = 5\text{ V}$ | 0.1 | | 0.4 | V | |
| | | $V_{CC} = 3\text{ V}$ | 0.06 | | 0.26 | | |
| V _{T+} – V _{T-} | Hysteresis X _{CIN} (When external clock is input) | $V_{CC} = 5\text{ V}$ | 0.1 | | 0.4 | V | |
| | | $V_{CC} = 3\text{ V}$ | 0.06 | | 0.26 | | |
| I _{IH} | High-level input current P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P43 – P47, P50 – P57, P60 – P67, P70 – P77, P80 – P87, X _{IN} , \overline{RESET} , \overline{CNVss} , \overline{BYTE} | $V_{CC} = 5\text{ V}$, $V_I = 5\text{ V}$ | | | 5 | μA | |
| | | $V_{CC} = 3\text{ V}$, $V_I = 3\text{ V}$ | | | 4 | | |
| I _{IL} | Low-level input current P10/A8/D8 – P17/A15/D15, P20/A0/D0 – P27/A7/D7, P43 – P47, P50 – P53, P60, P61, P65 – P67, P70 – P77, P80 – P87, X _{IN} , \overline{RESET} , \overline{CNVss} , \overline{BYTE} | $V_{CC} = 5\text{ V}$, $V_I = 0\text{ V}$ | | | -5 | μA | |
| | | $V_{CC} = 3\text{ V}$, $V_I = 0\text{ V}$ | | | -4 | | |
| I _{IL} | Low-level input current P54 – P57, P62 – P64 | $V_I = 0\text{ V}$, without a pull-up transistor | $V_{CC} = 5\text{ V}$ | | | -5 | μA |
| | | | $V_{CC} = 3\text{ V}$ | | | -4 | |
| | | $V_I = 0\text{ V}$, with a pull-up transistor | $V_{CC} = 5\text{ V}$ | -0.25 | -0.5 | -1.0 | mA |
| | | | $V_{CC} = 3\text{ V}$ | -0.08 | -0.18 | -0.35 | |
| V _{RAM} | RAM hold voltage | When clock is stopped. | 2 | | | V | |

New product

ELECTRICAL CHARACTERISTICS ($V_{CC} = 5\text{ V}$, $V_{SS} = 0\text{ V}$, $T_a = -40\text{ to }+85\text{ }^\circ\text{C}$, unless otherwise noted)

| Symbol | Parameter | Test conditions | Limits | | | Unit | |
|-----------------|----------------------|---|---|------|------|------|-----|
| | | | Min. | Typ. | Max. | | |
| I _{CC} | Power source current | When external bus is in use, output pins are open, and other pins are V _{SS} . | V _{CC} = 5 V, f(X _{IN}) = 12 MHz (square waveform), f(f ₂) = 6 MHz, f(X _{CIN}) = 32.768 kHz, in operating (Note 1) | | 5.4 | 10.8 | mA |
| | | | V _{CC} = 3 V, f(X _{IN}) = 12 MHz (square waveform), f(f ₂) = 6 MHz, f(X _{CIN}) = 32.768 kHz, in operating (Note 1) | | 3.6 | 7.2 | mA |
| | | | V _{CC} = 3 V, f(X _{IN}) = 12 MHz (square waveform), f(f ₂) = 0.75 MHz, f(X _{CIN}) : Stopped, in operating | | 0.5 | 1.0 | mA |
| | | | V _{CC} = 3 V, f(X _{IN}) = 12 MHz (square waveform), f(X _{CIN}) = 32.768 kHz, when a WIT instruction is executed (Note 2) | | 6 | 12 | μ A |
| | | | V _{CC} = 3 V, f(X _{IN}) : Stopped, f(X _{CIN}) = 32.768 kHz, in operating (Note 3) | | 40 | 80 | μ A |
| | | | V _{CC} = 3 V, f(X _{IN}) : Stopped, f(X _{CIN}) = 32.768 kHz, when a WIT instruction is executed (Note 4) | | 3 | 6 | μ A |
| | | | T _a = 25 °C, when clock is stopped | | | 1 | μ A |
| | | | T _a = 85 °C, when clock is stopped | | | 20 | μ A |

- Notes**
1. This applies when the main clock external input selection bit = "1", the main clock division selection bit = "0", and the signal output stop bit = "1".
 2. This applies when the main clock external input selection bit = "1" and the system clock stop bit at wait state = "1".
 3. This applies when CPU and the clock timer are operating with the sub clock (32.768 kHz) selected as the system clock.
 4. This applies when the X_{cout} drivability selection bit = "0" and the system clock stop bit at wait state = "1".

A-D CONVERTER CHARACTERISTICS

($V_{CC} = AV_{CC} = 5\text{ V}$, $V_{SS} = AV_{SS} = 0\text{ V}$, $T_a = -40\text{ to }+85\text{ }^\circ\text{C}$, f(X_{IN}) = 12 MHz, unless otherwise noted (Note))

| Symbol | Parameter | Test conditions | Limits | | | Unit |
|-------------------|----------------------|------------------------------------|--------|------|------------------|------|
| | | | Min. | Typ. | Max. | |
| — | Resolution | V _{REF} = V _{CC} | | | 10 | Bits |
| — | Absolute accuracy | V _{REF} = V _{CC} | | | ± 3 | LSB |
| RLADDER | Ladder resistance | V _{REF} = V _{CC} | 10 | | 25 | kΩ |
| t _{CONV} | Conversion time | | 19.6 | | | μ s |
| V _{REF} | Reference voltage | | 2.7 | | V _{CC} | V |
| V _{IA} | Analog input voltage | | 0 | | V _{REF} | V |

Note. This applies when the main clock division selection bit = "0" and f(f₂) = 6 MHz.

New product

TIMING REQUIREMENTS ($V_{CC} = 2.7 - 5.5$ V, $V_{SS} = 0$ V, $T_a = -40$ to $+85$ °C, $f(X_{IN}) = 12$ MHz, unless otherwise noted (Note 1))

Notes 1. This applies when the main clock division selection bit = "0" and $f(f_2) = 6$ MHz.

2. Input signal's rise/fall time must be 100 ns or less, unless otherwise noted.

External clock input

| Symbol | Parameter | Limits | | Unit |
|------------|--|--------|------|------|
| | | Min. | Max. | |
| t_c | External clock input cycle time (Note 1) | 83 | | ns |
| $t_{w(H)}$ | External clock input high-level pulse width (Note 2) | 33 | | ns |
| $t_{w(L)}$ | External clock input low-level pulse width (Note 2) | 33 | | ns |
| t_r | External clock rise time | | 15 | ns |
| t_f | External clock fall time | | 15 | ns |

Notes 1. When the main clock division selection bit = "1", the minimum value of $t_c = 166$ ns.

2. When the main clock division selection bit = "1", values of $t_{w(H)} / t_c$ and $t_{w(L)} / t_c$ must be set to values from 0.45 through 0.55.

Microprocessor mode

| Symbol | Parameter | Limits | | Unit |
|------------------------|--------------------------|--------|------|------|
| | | Min. | Max. | |
| $t_{su}(P4D-RDE)$ | Port P4 input setup time | 200 | | ns |
| $t_{su}(P5D-RDE)$ | Port P5 input setup time | 200 | | ns |
| $t_{su}(P6D-RDE)$ | Port P6 input setup time | 200 | | ns |
| $t_{su}(P7D-RDE)$ | Port P7 input setup time | 200 | | ns |
| $t_{su}(P8D-RDE)$ | Port P8 input setup time | 200 | | ns |
| $t_h(RDE-P4D)$ | Port P4 input hold time | 0 | | ns |
| $t_h(RDE-P5D)$ | Port P5 input hold time | 0 | | ns |
| $t_h(RDE-P6D)$ | Port P6 input hold time | 0 | | ns |
| $t_h(RDE-P7D)$ | Port P7 input hold time | 0 | | ns |
| $t_h(RDE-P8D)$ | Port P8 input hold time | 0 | | ns |
| $t_{su}(D-RDE)$ | Data input setup time | 80 | | ns |
| $t_{su}(RDY- \phi 1)$ | RDY input setup time | 80 | | ns |
| $t_{su}(HOLD- \phi 1)$ | HOLD input setup time | 80 | | ns |
| $t_h(RDE-D)$ | Data input hold time | 0 | | ns |
| $t_h(\phi 1-RDY)$ | RDY input hold time | 0 | | ns |
| $t_h(\phi 1-HOLD)$ | HOLD input hold time | 0 | | ns |

New product

Timer A input (Count input in event counter mode)

| Symbol | Parameter | Limits | | Unit |
|--------------|-----------------------------------|--------|------|------|
| | | Min. | Max. | |
| $t_{c(TA)}$ | TAiN input cycle time | 250 | | ns |
| $t_{w(TAH)}$ | TAiN input high-level pulse width | 125 | | ns |
| $t_{w(TAL)}$ | TAiN input low-level pulse width | 125 | | ns |

Timer A input (Gating input in timer mode)

| Symbol | Parameter | Limits | | Unit |
|--------------|--|--------|------|------|
| | | Min. | Max. | |
| $t_{c(TA)}$ | TAiN input cycle time (Note) | 666 | | ns |
| $t_{w(TAH)}$ | TAiN input high-level pulse width (Note) | 333 | | ns |
| $t_{w(TAL)}$ | TAiN input low-level pulse width (Note) | 333 | | ns |

Note. Limits change depending on $f(X_{IN})$. Refer to "DATA FORMULAS".

Timer A input (External trigger input in one-shot pulse mode)

| Symbol | Parameter | Limits | | Unit |
|--------------|-----------------------------------|--------|------|------|
| | | Min. | Max. | |
| $t_{c(TA)}$ | TAiN input cycle time (Note) | 333 | | ns |
| $t_{w(TAH)}$ | TAiN input high-level pulse width | 166 | | ns |
| $t_{w(TAL)}$ | TAiN input low-level pulse width | 166 | | ns |

Note. Limits change depending on $f(X_{IN})$. Refer to "DATA FORMULAS".

Timer A input (External trigger input in pulse width modulation mode)

| Symbol | Parameter | Limits | | Unit |
|--------------|-----------------------------------|--------|------|------|
| | | Min. | Max. | |
| $t_{w(TAH)}$ | TAiN input high-level pulse width | 166 | | ns |
| $t_{w(TAL)}$ | TAiN input low-level pulse width | 166 | | ns |

Timer A input (Up-down input in event counter mode)

| Symbol | Parameter | Limits | | Unit |
|---------------------|-------------------------------------|--------|------|------|
| | | Min. | Max. | |
| $t_{c(UP)}$ | TAiOUT input cycle time | 3333 | | ns |
| $t_{w(UPH)}$ | TAiOUT input high-level pulse width | 1666 | | ns |
| $t_{w(UPL)}$ | TAiOUT input low-level pulse width | 1666 | | ns |
| $t_{su(UP-T_{IN})}$ | TAiOUT input setup time | 666 | | ns |
| $t_{h(T_{IN}-UP)}$ | TAiOUT input hold time | 666 | | ns |

Timer A input (Two-phase pulse input in event counter mode)

| Symbol | Parameter | Limits | | Unit |
|------------------------|-------------------------|--------|------|------|
| | | Min. | Max. | |
| $t_{c(TA)}$ | TAjIN input cycle time | 2000 | | ns |
| $t_{su(TAjIN-TAjOUT)}$ | TAjIN input setup time | 500 | | ns |
| $t_{su(TAjOUT-TAjIN)}$ | TAjOUT input setup time | 500 | | ns |

New product

Timer B input (Count input in event counter mode)

| Symbol | Parameter | Limits | | Unit |
|--------------|---|--------|------|------|
| | | Min. | Max. | |
| $t_{c(TB)}$ | TBiIN input cycle time (one edge count) | 250 | | ns |
| $t_{w(TBH)}$ | TBiIN input high-level pulse width (one edge count) | 125 | | ns |
| $t_{w(TBL)}$ | TBiIN input low-level pulse width (one edge count) | 125 | | ns |
| $t_{c(TB)}$ | TBiIN input cycle time (both edges count) | 500 | | ns |
| $t_{w(TBH)}$ | TBiIN input high-level pulse width (both edges count) | 250 | | ns |
| $t_{w(TBL)}$ | TBiIN input low-level pulse width (both edges count) | 250 | | ns |

Timer B input (Pulse period measurement mode)

| Symbol | Parameter | Limits | | Unit |
|--------------|---|--------|------|------|
| | | Min. | Max. | |
| $t_{c(TB)}$ | TBiIN input cycle time (Note) | 666 | | ns |
| $t_{w(TBH)}$ | TBiIN input high-level pulse width (Note) | 333 | | ns |
| $t_{w(TBL)}$ | TBiIN input low-level pulse width (Note) | 333 | | ns |

Note. Limits change depending on $f(X_{IN})$. Refer to "DATA FORMULAS".

Timer B input (Pulse width measurement mode)

| Symbol | Parameter | Limits | | Unit |
|--------------|---|--------|------|------|
| | | Min. | Max. | |
| $t_{c(TB)}$ | TBiIN input cycle time (Note) | 666 | | ns |
| $t_{w(TBH)}$ | TBiIN input high-level pulse width (Note) | 333 | | ns |
| $t_{w(TBL)}$ | TBiIN input low-level pulse width (Note) | 333 | | ns |

Note. Limits change depending on $f(X_{IN})$. Refer to "DATA FORMULAS".

A-D trigger input

| Symbol | Parameter | Limits | | Unit |
|--------------|--|--------|------|------|
| | | Min. | Max. | |
| $t_{c(AD)}$ | ADTRG input cycle time (minimum allowable trigger) | 1333 | | ns |
| $t_{w(ADL)}$ | ADTRG input low-level pulse width | 166 | | ns |

Serial I/O

| Symbol | Parameter | Limits | | Unit |
|---------------|-----------------------------------|--------|------|------|
| | | Min. | Max. | |
| $t_{c(CK)}$ | CLKi input cycle time | 333 | | ns |
| $t_{w(CKH)}$ | CLKi input high-level pulse width | 166 | | ns |
| $t_{w(CKL)}$ | CLKi input low-level pulse width | 166 | | ns |
| $t_{d(C-Q)}$ | TxDi output delay time | | 100 | ns |
| $t_{h(C-Q)}$ | TxDi hold time | 0 | | ns |
| $t_{su(D-C)}$ | RxDi input setup time | 65 | | ns |
| $t_{h(C-D)}$ | RxDi input hold time | 75 | | ns |

External interrupt INTi input, key input interrupt KIi input

| Symbol | Parameter | Limits | | Unit |
|--------------|-----------------------------------|--------|------|------|
| | | Min. | Max. | |
| $t_{w(INH)}$ | INTi input high-level pulse width | 250 | | ns |
| $t_{w(INL)}$ | INTi input low-level pulse width | 250 | | ns |
| $t_{w(KIL)}$ | KIi input low-level pulse width | 250 | | ns |

New product

DATA FORMULAS

Timer A input (Gating input in timer mode)

| Symbol | Parameter | Limits | | Unit |
|-------------|------------------------------------|--|------|------|
| | | Min. | Max. | |
| $t_{c(TA)}$ | TAiIN input cycle time | $\frac{8 \times 10^9}{2 \cdot f(f_2)}$ | | ns |
| $t_w(TAH)$ | TAiIN input high-level pulse width | $\frac{4 \times 10^9}{2 \cdot f(f_2)}$ | | ns |
| $t_w(TAL)$ | TAiIN input low-level pulse width | $\frac{4 \times 10^9}{2 \cdot f(f_2)}$ | | ns |

Timer A input (External trigger input in one-shot pulse mode)

| Symbol | Parameter | Limits | | Unit |
|-------------|------------------------|--|------|------|
| | | Min. | Max. | |
| $t_{c(TA)}$ | TAiIN input cycle time | $\frac{8 \times 10^9}{2 \cdot f(f_2)}$ | | ns |

Timer B input (In pulse period measurement mode or pulse width measurement mode)

| Symbol | Parameter | Limits | | Unit |
|-------------|------------------------------------|--|------|------|
| | | Min. | Max. | |
| $t_{c(TB)}$ | TBiIN input cycle time | $\frac{8 \times 10^9}{2 \cdot f(f_2)}$ | | ns |
| $t_w(TBH)$ | TBiIN input high-level pulse width | $\frac{4 \times 10^9}{2 \cdot f(f_2)}$ | | ns |
| $t_w(TBL)$ | TBiIN input low-level pulse width | $\frac{4 \times 10^9}{2 \cdot f(f_2)}$ | | ns |

Note. $f(f_2)$ represents the clock f_2 frequency.

For the relation to the main clock and sub clock, refer to Table 10 in data sheet "M37735MHBXXXFP".

New product

SWITCHING CHARACTERISTICS

(V_{CC} = 2.7 – 5.5 V, V_{SS} = 0 V, T_a = –40 to +85°C, f(X_{IN}) = 12 MHz, unless otherwise noted (Note))

Microprocessor mode

| Symbol | Parameter | Test conditions | Limits | | Unit |
|-------------------------|--------------------------------|-----------------|--------|------|------|
| | | | Min. | Max. | |
| t _d (WE–P4Q) | Port P4 data output delay time | Fig. 14 | | 300 | ns |
| t _d (WE–P5Q) | Port P5 data output delay time | | | 300 | ns |
| t _d (WE–P6Q) | Port P6 data output delay time | | | 300 | ns |
| t _d (WE–P7Q) | Port P7 data output delay time | | | 300 | ns |
| t _d (WE–P8Q) | Port P8 data output delay time | | | 300 | ns |
| t _d (WE–P8Q) | Port P8 data output delay time | | | 300 | ns |

Note. This applies when the main clock division selection bit = "0" and f(f₂) = 6 MHz.

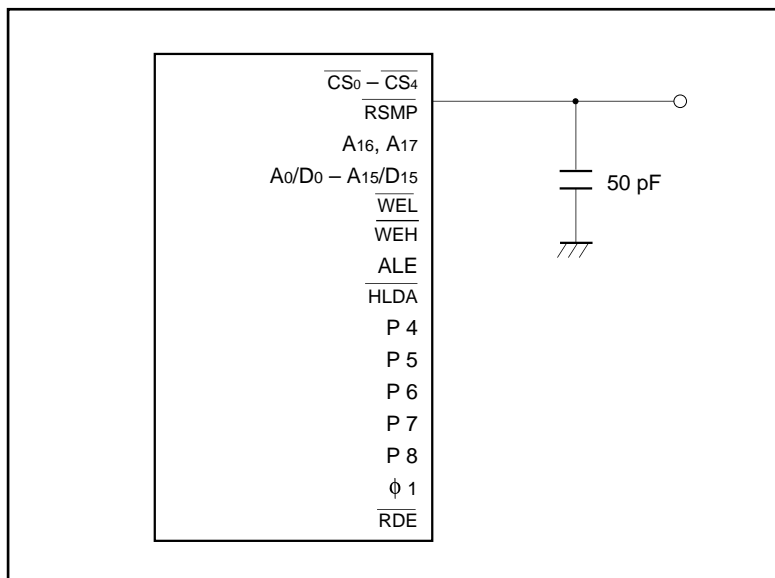


Fig. 14 Measuring circuit for each pin

New product

Microprocessor mode

(V_{CC} = 2.7 – 5.5 V, V_{SS} = 0 V, T_a = –40 to +85 °C, f(XIN) = 12 MHz, unless otherwise noted (Note 1))

| Symbol | Parameter | (Note 2) Wait mode | Test conditions | Limits | | Unit | |
|---|--|---|-----------------|---------------------------|---------|------|----|
| | | | | Min. | Max. | | |
| t _d (CS–WE) t _d (CS–RDE) | Chip-select output delay time | No wait | Fig. 14 | 20 | | ns | |
| | | Wait 1 | | 182 | | ns | |
| | | Wait 0 | | | | | |
| t _h (WE–CS) t _h (RDE–CS) | Chip-select hold time | | | 4 | | ns | |
| | | t _d (A _n –WE) t _d (A _n –RDE) | | Address output delay time | No wait | 20 | ns |
| | | | | | Wait 1 | 182 | ns |
| Wait 0 | | | | | | | |
| t _d (A–WE) t _d (A–RDE) | Address output delay time | No wait | | 20 | ns | | |
| | | Wait 1 | | 162 | ns | | |
| | | Wait 0 | | | | | |
| t _h (WE–A _n) t _h (RDE–A _n) | Address hold time | | 40 | ns | | | |
| | | t _w (ALE) | ALE pulse width | No wait | 40 | ns | |
| | | | | Wait 1 | 123 | ns | |
| Wait 0 | | | | | | | |
| t _{su} (A–ALE) | Address output setup time | No wait | 10 | ns | | | |
| | | Wait 1 | 93 | ns | | | |
| | | Wait 0 | | | | | |
| t _h (ALE–A) | Address hold time | No wait | 9 | ns | | | |
| | | Wait 1 | 40 | ns | | | |
| | | Wait 0 | | | | | |
| t _d (ALE–WE) t _d (ALE–RDE) | ALE output delay time | No wait | 4 | ns | | | |
| | | Wait 1 | 40 | ns | | | |
| | | Wait 0 | | | | | |
| t _d (WE–DQ) | Data output delay time | | | 90 | ns | | |
| t _h (WE–DQ) | Data hold time | | | 40 | ns | | |
| t _w (WE) | WE _L /WE _H pulse width | No wait | 131 | ns | | | |
| | | Wait 1 | 298 | ns | | | |
| | | Wait 0 | | | | | |
| t _{pxz} (RDE–DZ) | Floating start delay time | | | 10 | ns | | |
| t _{pzx} (RDE–DZ) | Floating release delay time | | | 53 | ns | | |
| t _w (RDE) | RDE pulse width | No wait | 128 | ns | | | |
| | | Wait 1 | 295 | ns | | | |
| | | Wait 0 | | | | | |
| t _d (RSMP–WE) t _d (RSMP–RDE) | RSMP output delay time | | 25 | ns | | | |
| | | | 0 | ns | | | |
| t _h (φ ₁ –RSMP) | RSMP hold time | | 0 | ns | | | |
| t _d (WE–φ ₁) t _d (RDE–φ ₁) | φ ₁ output delay time | | 0 | 30 | ns | | |
| | | | | 120 | ns | | |
| t _d (φ ₁ –HLDA) | HLDA output delay time | | | | ns | | |

Notes 1. This applies when the main clock division selection bit = "0" and f(f₂) = 6 MHz.

2. No wait : Wait bit = "1".

Wait 1 : The external memory area is accessed with wait bit = "0" and wait selection bit = "1".

Wait 0 : The external memory area is accessed with wait bit = "0" and wait selection bit = "0".

New product

Bus timing data formulas ($V_{CC} = 2.7 - 5.5V$, $V_{SS} = 0V$, $T_a = -40$ to $+85^\circ C$, $f(XIN) = 12$ MHz (Max.), unless otherwise noted (Note1))

| Symbol | Parameter | Wait mode | Limits | | Unit |
|---|---|-----------|---|------|------|
| | | | Min. | Max. | |
| $t_{d(CS-WE)}$ $t_{d(CS-RDE)}$ | Chip-select output delay time | No wait | $\frac{1 \times 10^9}{2 \cdot f(f_2)} - 63$ | | ns |
| | | Wait 1 | $\frac{3 \times 10^9}{2 \cdot f(f_2)} - 68$ | | |
| $t_{th(WE-CS)}$ $t_{th(RDE-CS)}$ | Chip-select hold time | | 4 | | ns |
| | | | | | |
| $t_{d(A_n-WE)}$ $t_{d(A_n-RDE)}$ | Address output delay time | No wait | $\frac{1 \times 10^9}{2 \cdot f(f_2)} - 63$ | | ns |
| | | Wait 1 | $\frac{3 \times 10^9}{2 \cdot f(f_2)} - 68$ | | |
| $t_{d(A-WE)}$ $t_{d(A-RDE)}$ | Address output delay time | No wait | $\frac{1 \times 10^9}{2 \cdot f(f_2)} - 63$ | | ns |
| | | Wait 1 | $\frac{3 \times 10^9}{2 \cdot f(f_2)} - 88$ | | |
| $t_{th(WE-A_n)}$ $t_{th(RDE-A_n)}$ | Address hold time | | $\frac{1 \times 10^9}{2 \cdot f(f_2)} - 43$ | | ns |
| | | | | | |
| $t_{w(ALE)}$ | ALE pulse width | No wait | $\frac{1 \times 10^9}{2 \cdot f(f_2)} - 43$ | | ns |
| | | Wait 1 | $\frac{2 \times 10^9}{2 \cdot f(f_2)} - 43$ | | |
| $t_{su(A-ALE)}$ | Address output setup time | No wait | $\frac{1 \times 10^9}{2 \cdot f(f_2)} - 73$ | | ns |
| | | Wait 1 | $\frac{2 \times 10^9}{2 \cdot f(f_2)} - 73$ | | |
| $t_{th(ALE-A)}$ | Address hold time | No wait | 9 | | ns |
| | | Wait 1 | $\frac{1 \times 10^9}{2 \cdot f(f_2)} - 43$ | | |
| $t_{d(ALE-WE)}$ $t_{d(ALE-RDE)}$ | ALE output delay time | No wait | 4 | | ns |
| | | Wait 1 | $\frac{1 \times 10^9}{2 \cdot f(f_2)} - 43$ | | |
| $t_{d(WE-DQ)}$ | Data output delay time | | | 90 | ns |
| $t_{th(WE-DQ)}$ | Data hold time | | $\frac{1 \times 10^9}{2 \cdot f(f_2)} - 43$ | | ns |
| $t_{w(WE)}$ | $\overline{WEL}/\overline{WEH}$ pulse width | No wait | $\frac{2 \times 10^9}{2 \cdot f(f_2)} - 35$ | | ns |
| | | Wait 1 | $\frac{4 \times 10^9}{2 \cdot f(f_2)} - 35$ | | |
| $t_{pxz(RDE-DZ)}$ | Floating start delay time | | | 10 | ns |
| $t_{pzx(RDE-DZ)}$ | Floating release delay time | | $\frac{1 \times 10^9}{2 \cdot f(f_2)} - 30$ | | ns |
| $t_{w(RDE)}$ | \overline{RDE} pulse width | No wait | $\frac{2 \times 10^9}{2 \cdot f(f_2)} - 38$ | | ns |
| | | Wait 1 | $\frac{4 \times 10^9}{2 \cdot f(f_2)} - 38$ | | |
| $t_{d(RSMP-WE)}$ $t_{d(RSMP-RDE)}$ | RSMP output delay time | | $\frac{1 \times 10^9}{2 \cdot f(f_2)} - 58$ | | ns |
| $t_{th}(\phi_1-RSMP)$ | RSMP hold time | | 0 | | ns |
| $t_{d(WE-\phi_1)}$ $t_{d(RDE-\phi_1)}$ | ϕ_1 output delay time | | 0 | 30 | ns |

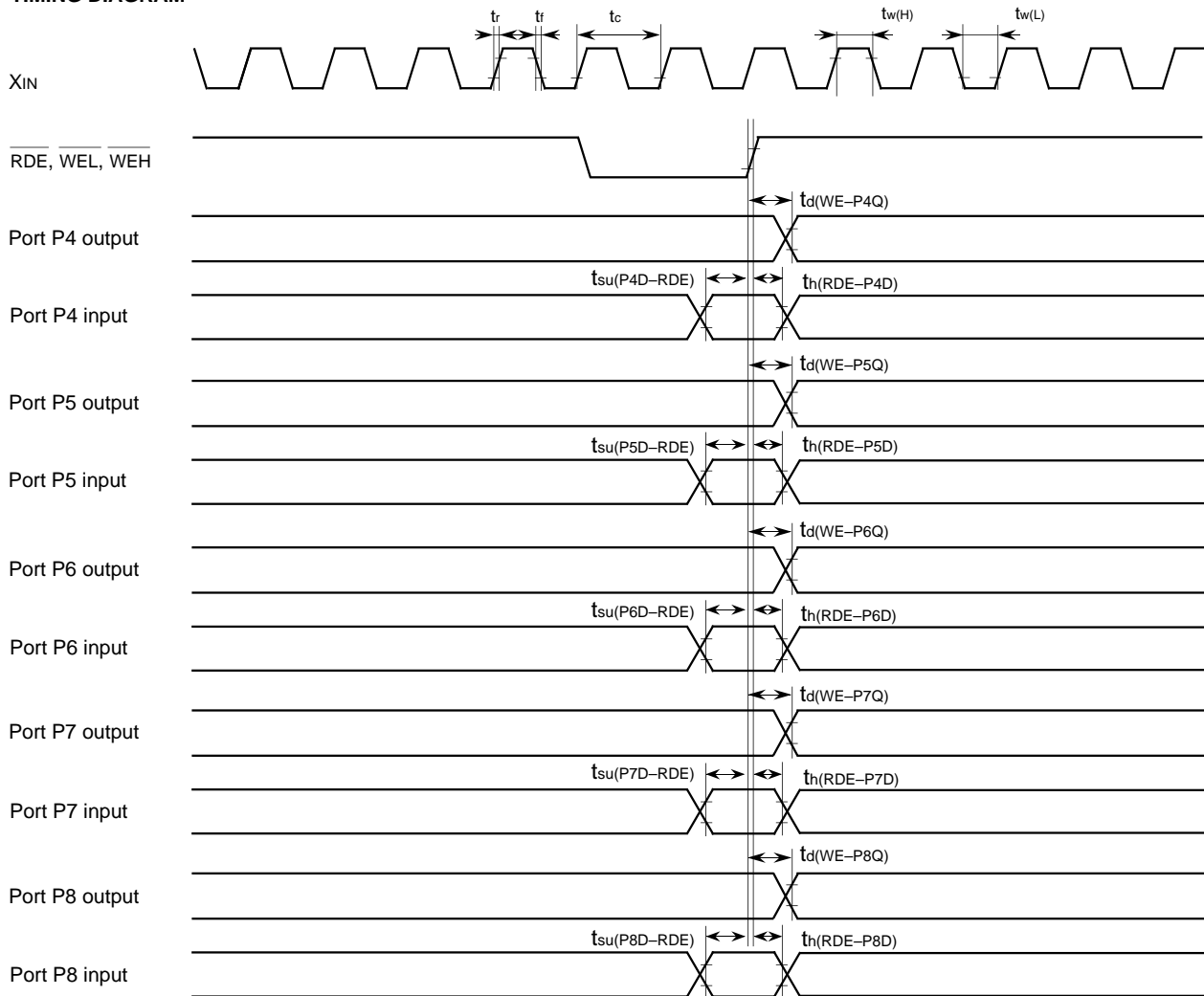
Notes 1. This applies when the main clock division selection bit = "0".

2. $f(f_2)$ represents the clock f_2 frequency.

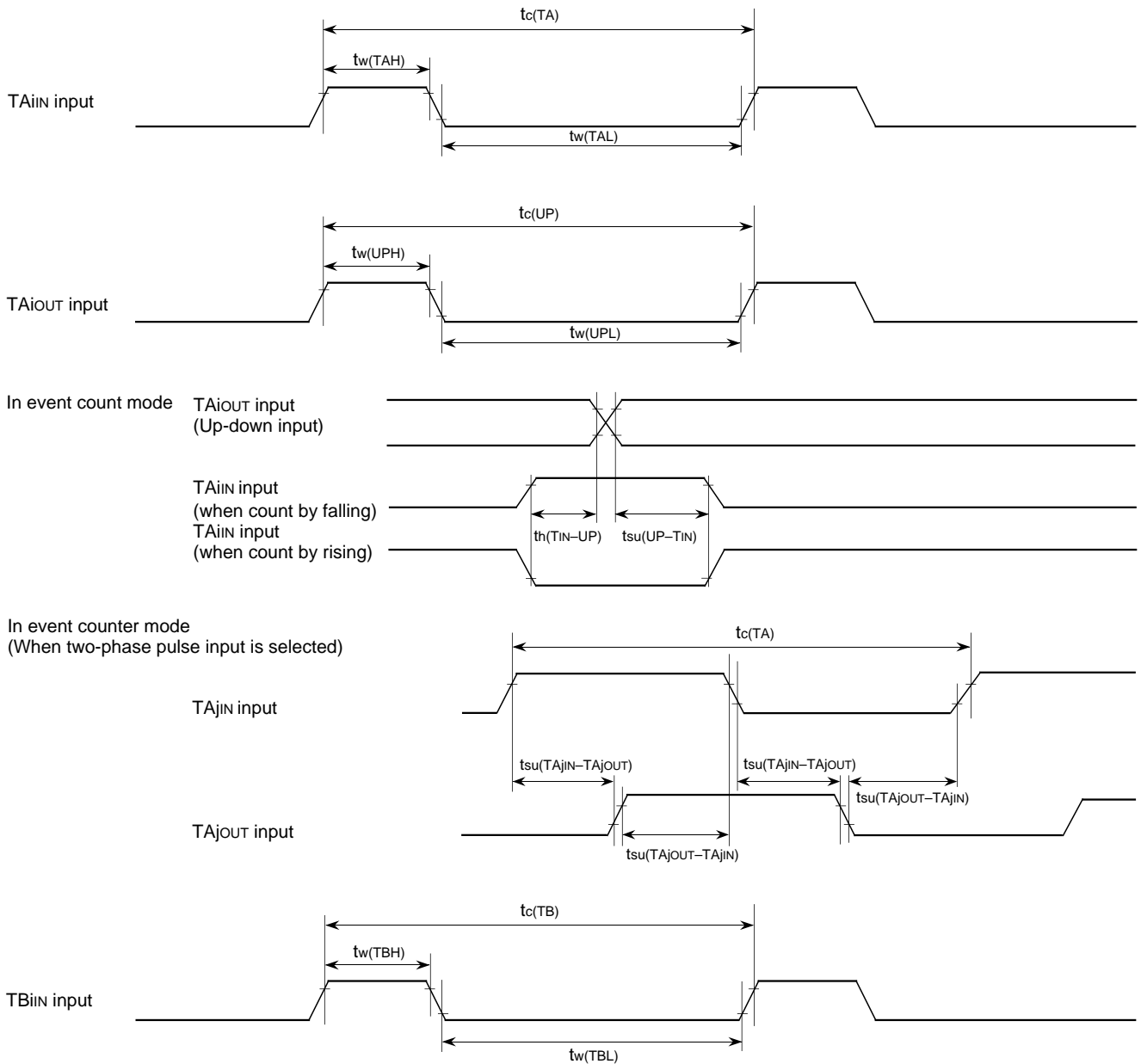
For the relation to the main clock and sub clock, refer to Table 10 in data sheet "M37735MHBXXXFP".

New product

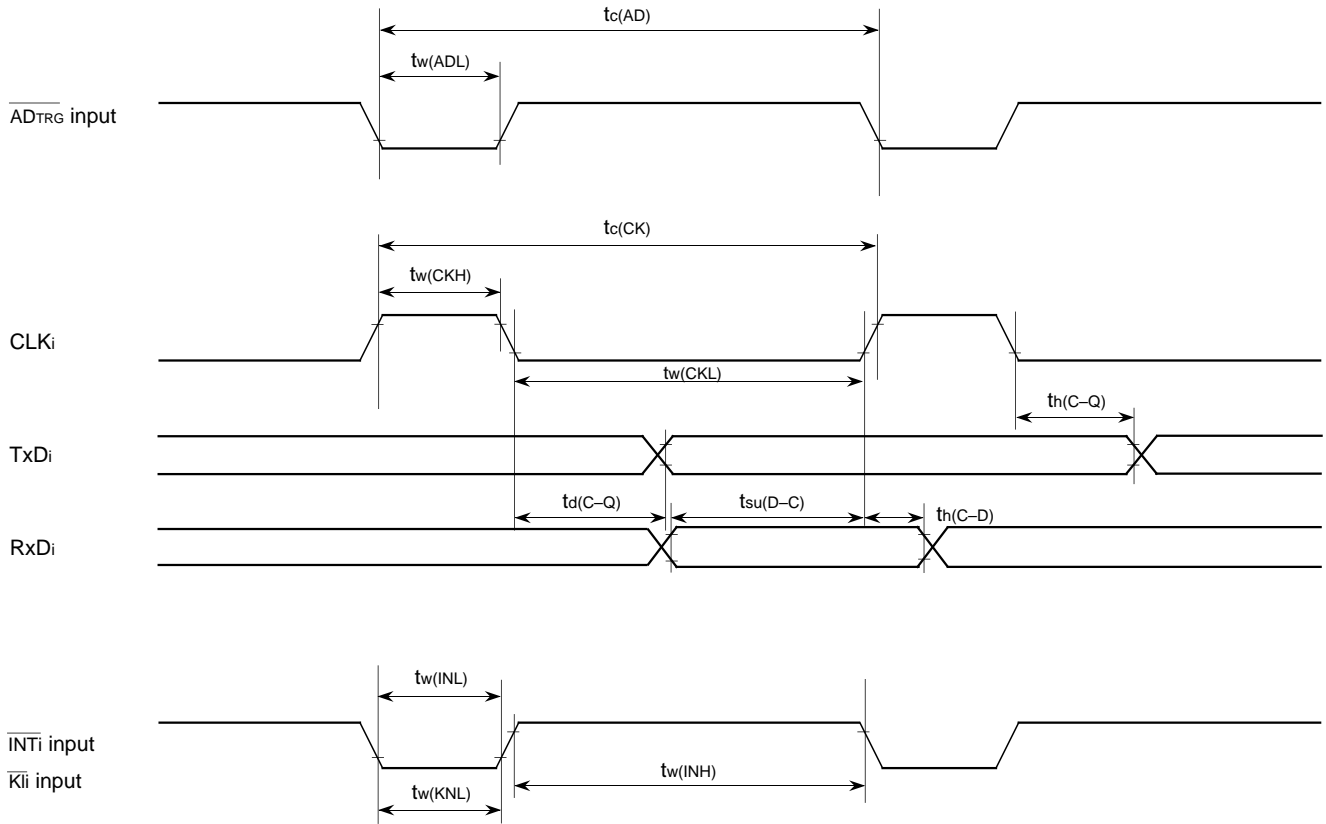
TIMING DIAGRAM



New product

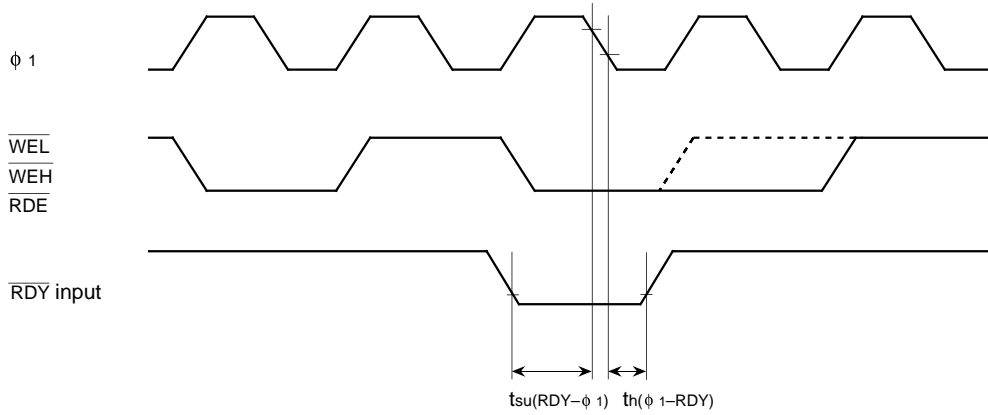


New product

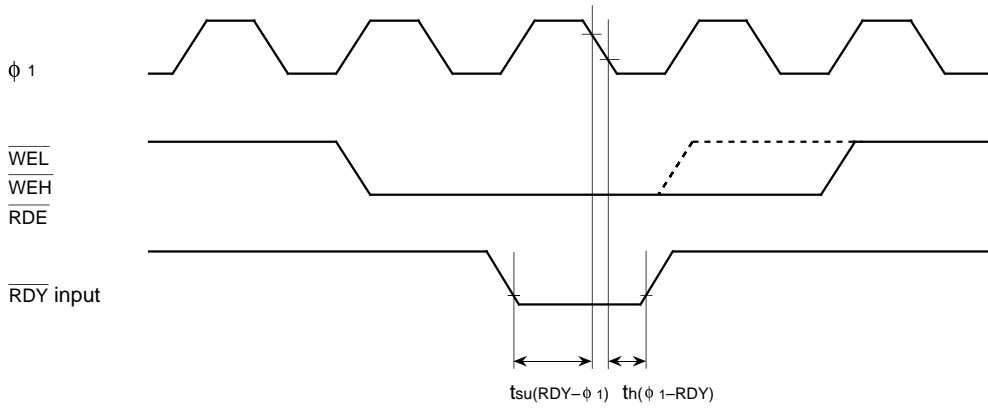


New product

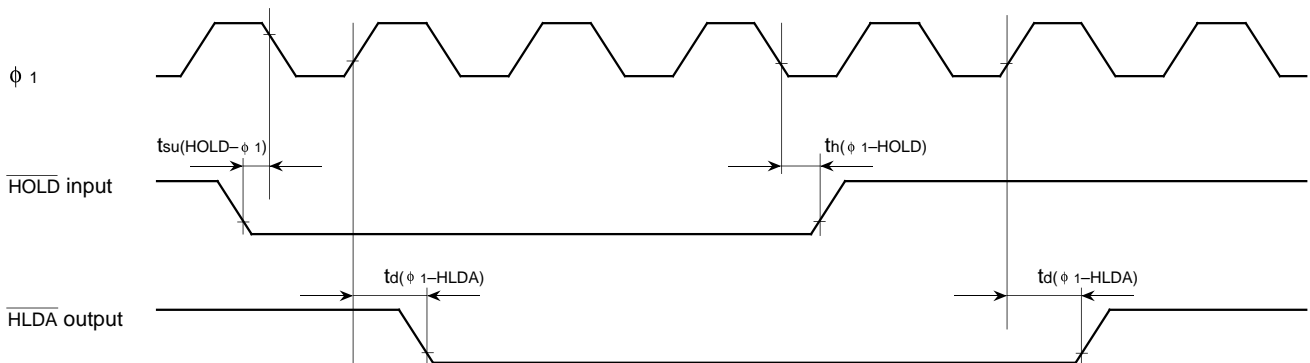
Microprocessor mode
(When wait bit = "1")



(When wait bit = "0")



(When wait bit = "1" or "0" in common)

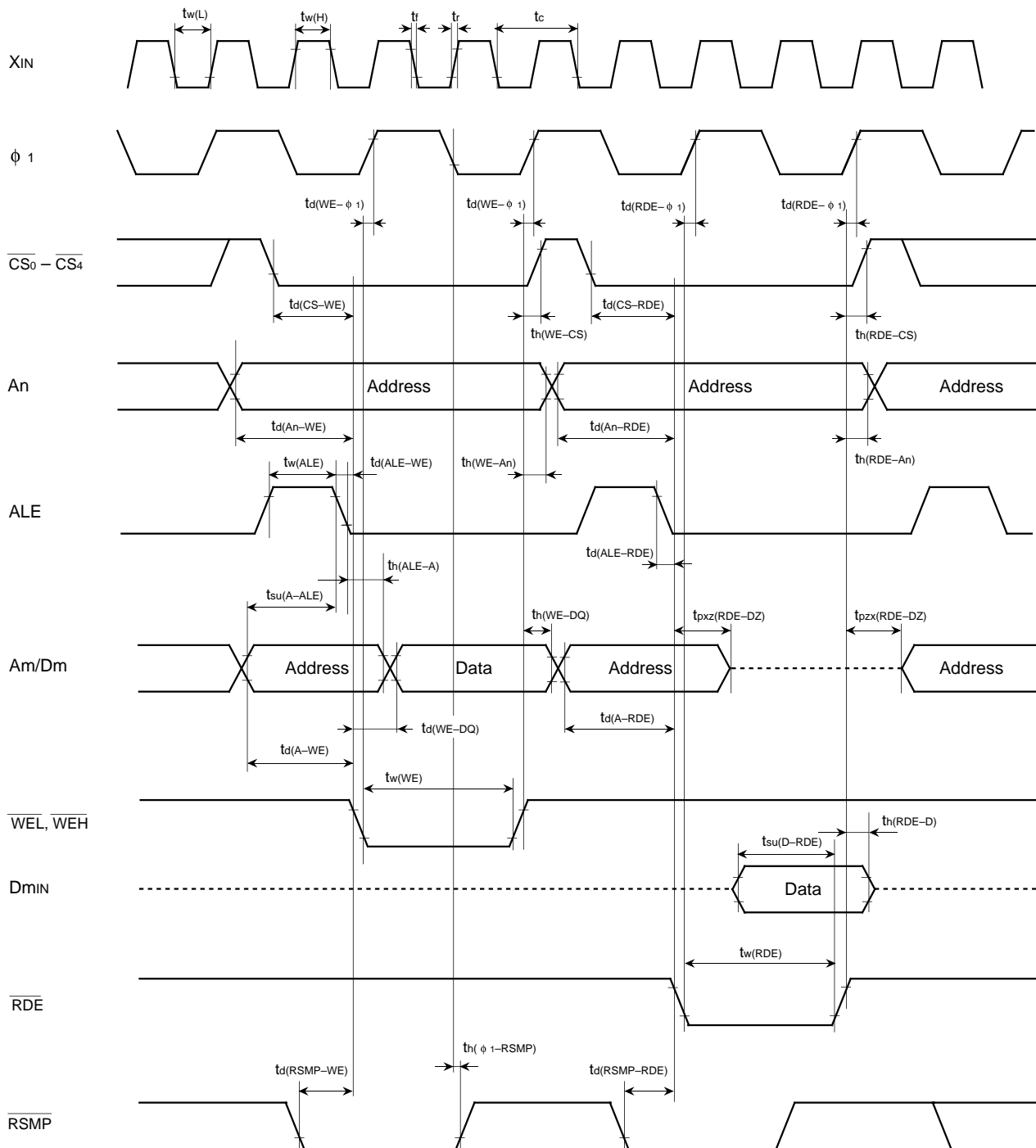


Test conditions

- $V_{CC} = 2.7 - 5.5$ V
- Input timing voltage : $V_{IL} = 0.2V_{CC}$, $V_{IH} = 0.8V_{CC}$
- Output timing voltage : $V_{OL} = 0.8$ V, $V_{OH} = 2.0$ V

New product

Microprocessor mode
(No wait : When wait bit = "1")

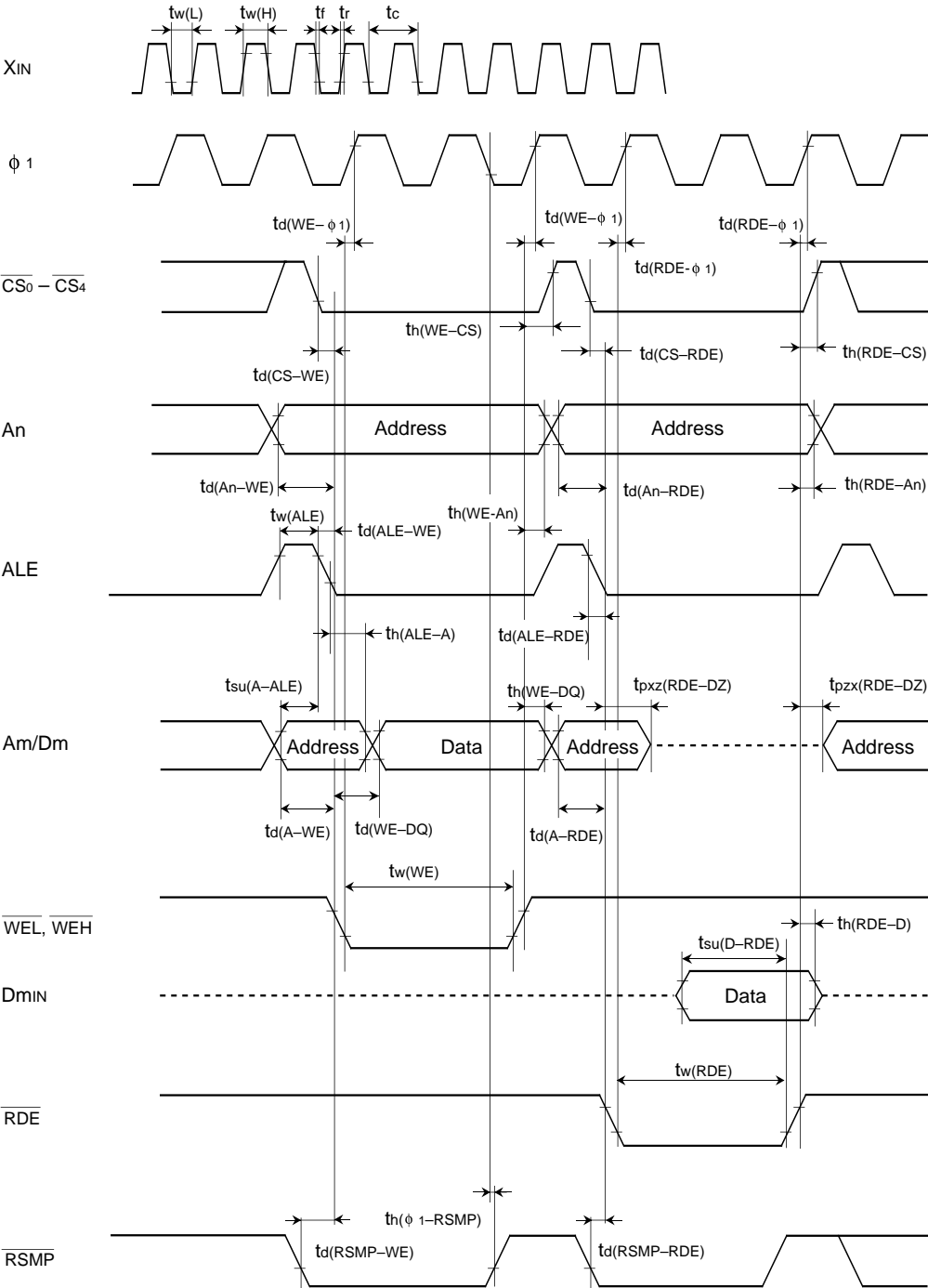


Test conditions

- $V_{CC} = 2.7 - 5.5 V$
- Output timing voltage : $V_{OL} = 0.8 V$, $V_{OH} = 2.0 V$
- Data input D_{MIN} : $V_{IL} = 0.16 V_{CC}$, $V_{IH} = 0.5 V_{CC}$

New product

Microprocessor mode
(Wait 1 : The external area is accessed when wait bit = "0" and wait selection bit = "1".)

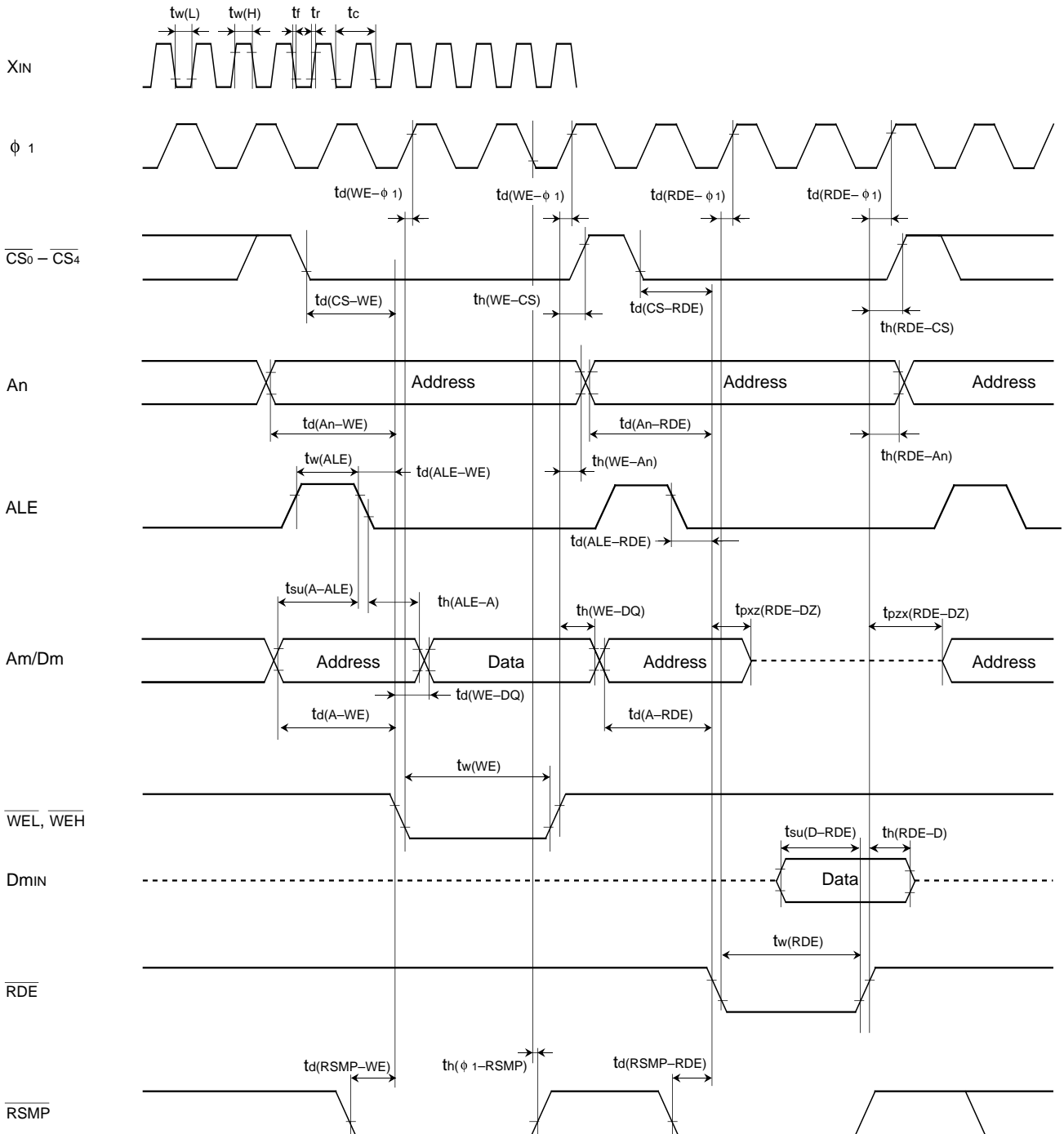


- Test conditions
- $V_{CC} = 2.7 - 5.5 V$
 - Output timing voltage : $V_{OL} = 0.8 V, V_{OH} = 2.0 V$
 - Data input D_{min} : $V_{IL} = 0.16 V_{CC}, V_{IH} = 0.5 V_{CC}$

New product

Microprocessor mode

(Wait 0 : The external memory area is accessed when wait bit = "0" and wait selection bit = "0".)



Test conditions

- $V_{CC} = 2.7 - 5.5 V$
- Output timing voltage : $V_{OL} = 0.8 V, V_{OH} = 2.0 V$
- Data input Dmin : $V_{IL} = 0.16 V_{CC}, V_{IH} = 0.5 V_{CC}$

New product

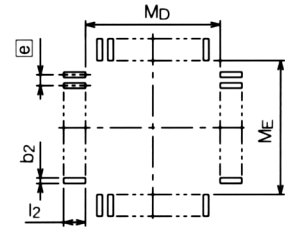
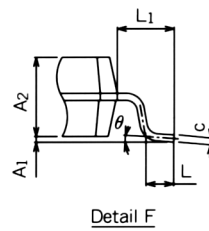
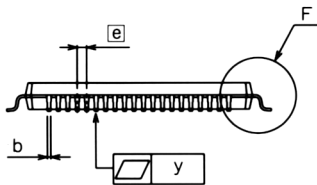
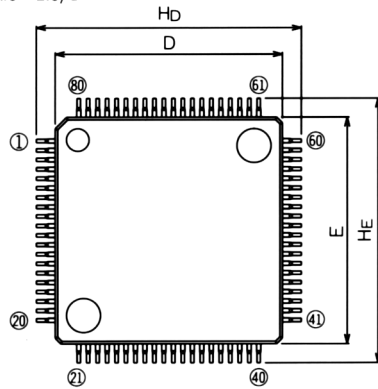
PACKAGE OUTLINE

80P6D-A

Plastic 80pin 12x12mm body LQFP

| | | | |
|--------------------|------------|------------|---------------|
| EIAJ Package Code | JEDEC Code | Weight (g) | Lead Material |
| LQFP80-P-1212-0.50 | - | 0.44 | Alloy 42 |

Scale : 2.5/1



Recommended Mount Pad

| Symbol | Dimension in Millimeters | | |
|--------|--------------------------|-------|-------|
| | Min | Nom | Max |
| A | - | - | 1.7 |
| A1 | 0 | 0.1 | 0.2 |
| A2 | - | 1.4 | - |
| b | 0.13 | 0.18 | 0.28 |
| c | 0.105 | 0.125 | 0.175 |
| D | 11.9 | 12.0 | 12.1 |
| E | 11.9 | 12.0 | 12.1 |
| e | - | 0.5 | - |
| Hd | 13.8 | 14.0 | 14.2 |
| HE | 13.8 | 14.0 | 14.2 |
| L | 0.3 | 0.5 | 0.7 |
| L1 | - | 1.0 | - |
| y | - | - | 0.1 |
| theta | 0° | - | 10° |
| b2 | - | 0.225 | - |
| l2 | 1.0 | - | - |
| MD | - | 12.4 | - |
| ME | - | 12.4 | - |

New product

MEMO

New product

Keep safety first in your circuit designs!

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