

## CMOS 8-Bit Microcontroller

# **TMP87P808M, TMP87P808N** **TMP87P808LM, TMP87P808LN**

The 87P808/808L is a high-speed, high-performance 8-bit single chip microcomputer, which has 64K bits One-Time PROM. The 87P808/808L is pin compatible with the 87C408/808/408L/808L. The operations possible with the 87C408/808/408L/808L can be performed by writing programs to PROM. The 87P808/808L can write and verify in the same way as the TC57256AD using an adapter socket and a general-purpose PROM programmer.

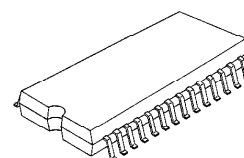
| Part No.    | ROM         | RAM         | Package           | Adapter socket | Operation Voltage Range   |
|-------------|-------------|-------------|-------------------|----------------|---------------------------|
| TMP87P808M  | 8 K × 8-bit | 256 × 8-bit | P-SOP28-450-1.27  | BM11116        | 2.7 V to 5.5 V at 4.2 MHz |
| TMP87P808N  |             |             | P-SDIP28-400-1.78 | BM11122        | 4.5 V to 5.5 V at 8 MHz   |
| TMP87P808LM |             |             | P-SOP28-450-1.27  | BM11116        | 1.8 V to 4.0 V at 4.2 MHz |
| TMP87P808LN |             |             | P-SDIP28-400-1.78 | BM11122        |                           |

## Pin Assignments (Top View)

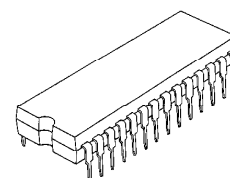
P-SOP28-400-1.78 / P-SDIP28-450-1.27

|                           |    |    |                                  |
|---------------------------|----|----|----------------------------------|
| DIDS / XOUT               | 1  | 28 | VDD / VCC                        |
| CLOCK / XIN               | 2  | 27 | RESET                            |
| VPP / TEST                | 3  | 26 | P10 (INT0) / A7 / D7             |
| OE / P67                  | 4  | 25 | P11 (INT1) / A14 / A6 / D6       |
| CE / P66                  | 5  | 24 | P12 (INT2 / TC1) / A13 / A5 / D5 |
| D0 / A0 / A8 / (AIN5) P65 | 6  | 23 | P13 (DV0) / A12 / A4 / D4        |
| D1 / A1 / A9 / (AIN4) P64 | 7  | 22 | P14 (PPG) / A11 / A3 / D3        |
| (AIN3) P63                | 8  | 21 | P15 (TC2) / A10 / A2 / D2        |
| (AIN2) P62                | 9  | 20 | P16                              |
| (AIN1) P61                | 10 | 19 | P17                              |
| (AIN0) P60                | 11 | 18 | P72                              |
| (VAREF) P77               | 12 | 17 | P73 (SCK)                        |
| (STOP / INT5) P76         | 13 | 16 | P74 (SI)                         |
| (VASS) VSS                | 14 | 15 | P75 (SO)                         |

P-SOP28-450-1.27


**TMP87P808M**  
**TMP87P808LM**

P-SDIP28-400-1.78


**TMP87P808N**  
**TMP87P808LN**

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## Pin Function

The 87P808/808L has two modes: MCU and PROM.

### (1) MCU mode

In this mode, the 87P808/808L is pin compatible with the 87C408/808/408L/808L (fix the TEST pin at low level).

### (2) PROM mode

| Pin Name (PROM mode) | Input / Output | Functions                                                    | Pin name (MCU mode)  |
|----------------------|----------------|--------------------------------------------------------------|----------------------|
| A14 to A8            | Input          | Program memory address inputs                                | P10 to P15, P64, P65 |
| A7 to A0             |                |                                                              | P10 to P15, P64, P65 |
| D7 to D0             | I/O            | Program memory data input/outputs                            | P10 to P15, P64, P65 |
| $\overline{CE}$      | Input          | Chip enable signal input                                     | P66                  |
| $\overline{OE}$      |                | Output enable signal input                                   | P67                  |
| VPP                  | Power supply   | + 12.5 V / 5 V (Program supply voltage)                      | TEST                 |
| VCC                  |                | + 5 V                                                        | VDD                  |
| GND                  |                | 0 V                                                          | VSS                  |
| P17 to P16           | I/O            | PROM mode setting pins. Be fixed at low level.               |                      |
| P63 to P60           |                |                                                              |                      |
| P77 to P72           |                |                                                              |                      |
| $\overline{RESET}$   |                |                                                              |                      |
| XIN                  | Input          | Connect an 8 MHz oscillator to stabilize the internal state. |                      |
| XOUT                 | Output         |                                                              |                      |
| VAREF                | Power supply   | 0 V (GND)                                                    |                      |
| VASS                 |                |                                                              |                      |

## Operational Description

The configuration and function of the 87P808/808L are the same as those of the 87C408/808/408L/808L, except in that a one-time PROM is used instead of an on-chip mask ROM.

### 1. Operating Mode

The 87P808/808L has two modes: MCU and PROM.

#### 1.1 MCU Mode

The MCU mode is activated by fixing the TEST/VPP pin at low level.

In the MCU mode, operation is the same as with the 87C408/808/408L/808L (TEST/VPP pin cannot be used open because it has no built in pull-down resistance.)

##### 1.1.1 Program Memory

The 87P808/808L have an 8 Kbytes (addresses E000 to FFFF<sub>H</sub> in the MCU mode, addresses 6000 to 7FFF<sub>H</sub> in the PROM mode) one-time PROM.

When the 87P808/808L is used as a system evaluation of the 87C408/808/408L/808L, the data is written to the program storage area shown in Figure 1-1.

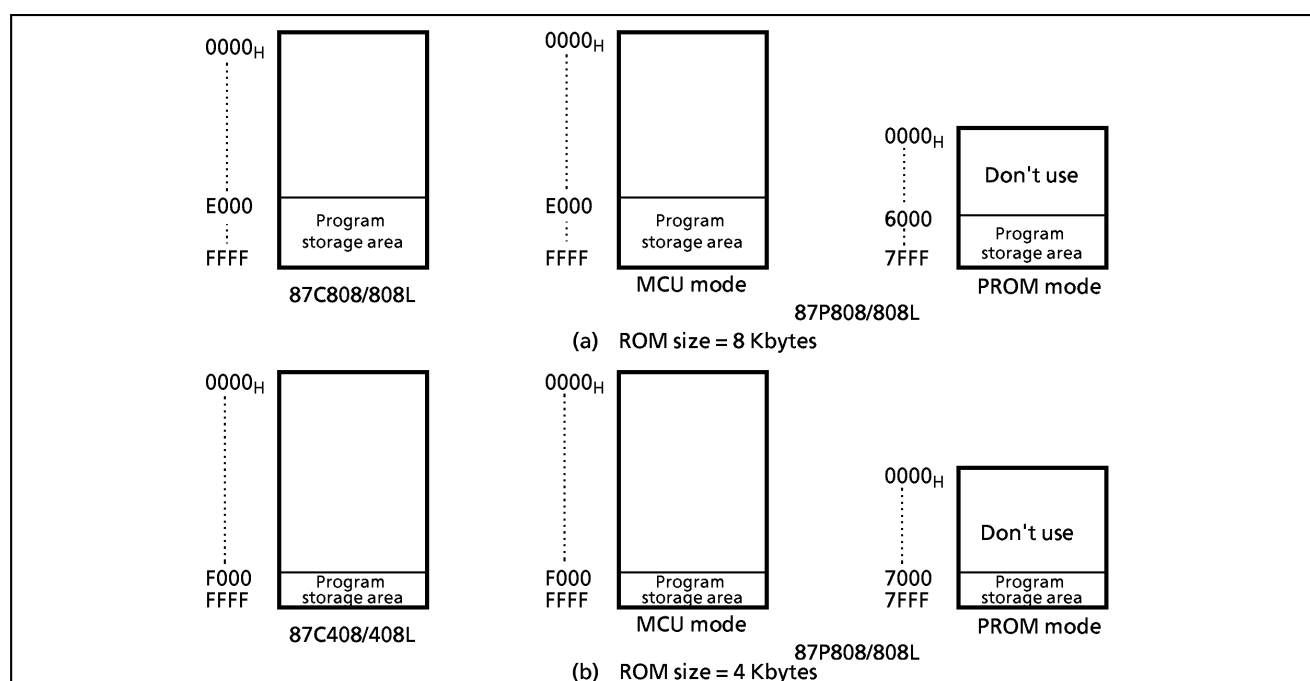


Figure 1-1. Program Memory Area

**Note:** Either write the data FFH to the unused area or set the general-purpose PROM programmer to access only the program storage area

##### 1.1.2 Data Memory

The 87P808/808L has an 256 bytes data memory (static RAM).

## Electrical Characteristics

(1) 87P808

## Absolute Maximum Ratings

(V<sub>SS</sub> = 0 V)

| Parameter                                   |     | Symbol              | Conditions                | Ratings                        | Unit |
|---------------------------------------------|-----|---------------------|---------------------------|--------------------------------|------|
| Supply Voltage                              |     | V <sub>DD</sub>     |                           | – 0.3 to 6.5                   | V    |
| Program Voltage                             |     | V <sub>PP</sub>     | TEST /V <sub>PP</sub> pin | – 0.3 to 13.0                  | V    |
| Input Voltage                               |     | V <sub>IN</sub>     |                           | – 0.3 to V <sub>DD</sub> + 0.3 | V    |
| Output Voltage                              |     | V <sub>OUT</sub>    |                           | – 0.3 to V <sub>DD</sub> + 0.3 | V    |
| Output Current (Per 1 pin)                  | IOL | I <sub>OUT1</sub>   | P1, P6                    | 3.2                            | mA   |
|                                             |     | I <sub>OUT2</sub>   | P7 (Middle current port)  | 15                             | mA   |
|                                             | IOH | I <sub>OUT3</sub>   | P1, P6, P7                | – 1.8                          | mA   |
| Output Current (Total)                      | IOL | Σ I <sub>OUT1</sub> | P1, P6                    | 50                             | mA   |
|                                             |     | Σ I <sub>OUT2</sub> | P7 (Middle current port)  | 60                             | mA   |
|                                             | IOH | Σ I <sub>OUT3</sub> | P1, P6, P7                | 30                             | mA   |
| Power Dissipation [T <sub>opr</sub> = 70°C] |     | PD                  | SDIP                      | 300                            | mW   |
|                                             |     |                     | SOP                       | 180                            |      |
| Soldering Temperature (time)                |     | T <sub>sld</sub>    |                           | 260 (10 s)                     | °C   |
| Storage Temperature                         |     | T <sub>stg</sub>    |                           | – 55 to 125                    | °C   |
| Operating Temperature                       |     | T <sub>opr</sub>    |                           | – 30 to 70                     | °C   |

**Note:** The absolute maximum ratings are rated values which must not be exceeded during operation, even for an instant. Any one of the ratings must not be exceeded. If any absolute maximum rating is exceeded, a device may break down or its performance may be degraded, causing it to catch fire or explode resulting in injury to the user. Thus, when designing products which include this device, ensure that no absolute maximum rating value will ever be exceeded.

## Recommended Operating Conditions

(V<sub>SS</sub> = 0 V, T<sub>opr</sub> = –30 to 70°C)

| Parameter          | Symbol           | Pins                    | Conditions                      |                        | Min                    | Max                    | Unit |
|--------------------|------------------|-------------------------|---------------------------------|------------------------|------------------------|------------------------|------|
| Supply Voltage     | V <sub>DD</sub>  |                         | fc = 8 MHz                      | NORMAL mode            | 4.5                    | 5.5                    | V    |
|                    |                  |                         |                                 | IDLE mode              |                        |                        |      |
|                    |                  |                         | fc = 4.2 MHz                    | NORMAL mode            | 2.7                    |                        |      |
|                    |                  |                         |                                 | IDLE mode              |                        |                        |      |
|                    |                  |                         |                                 | STOP mode              | 2.0                    |                        |      |
| Input High Voltage | V <sub>IH1</sub> | Except hysteresis input | V <sub>DD</sub> ≥ 4.5 V         |                        | V <sub>DD</sub> × 0.70 | V <sub>DD</sub>        | V    |
|                    | V <sub>IH2</sub> | Hysteresis input        |                                 |                        | V <sub>DD</sub> × 0.75 |                        |      |
|                    | V <sub>IH3</sub> |                         | 2.7 V ≤ V <sub>D</sub> < 4.5 V  | V <sub>DD</sub> × 0.90 |                        |                        |      |
|                    | V <sub>IH4</sub> |                         | V <sub>DD</sub> < 2.7 V         | V <sub>DD</sub> × 0.95 |                        |                        |      |
| Input Low Voltage  | V <sub>IL1</sub> | Except hysteresis input | V <sub>DD</sub> ≥ 4.5 V         |                        | 0                      | V <sub>DD</sub> × 0.30 | V    |
|                    | V <sub>IL2</sub> | Hysteresis input        |                                 |                        |                        | V <sub>DD</sub> × 0.25 |      |
|                    | V <sub>IL3</sub> |                         | 2.7 V ≤ V <sub>DD</sub> < 4.5 V | V <sub>DD</sub> × 0.10 |                        |                        |      |
| Clock Frequency    | fc               | XIN, XOUT               | V <sub>DD</sub> = 4.5 to 5.5 V  |                        | 1.0                    | 8.0                    | MHz  |
|                    |                  |                         | V <sub>DD</sub> = 2.7 to 5.5 V  |                        |                        | 4.2                    |      |

**Note 1:** The recommended operating conditions for a device are operating conditions under which it can be guaranteed that the device will operate as specified. If the device is used under operating conditions other than the recommended operating conditions (supply voltage, operating temperature range, specified AC/DC values etc.), malfunction may occur. Thus, when designing products which include this device, ensure that the recommended operating conditions for the device are always adhered to.

**Note 2:** Clock frequency f<sub>c</sub>: Supply voltage range is specified in NORMAL mode and IDLE mode.

**Note 3:** Minimum of clock frequency: 1 MHz ≤ f<sub>c</sub>gck

## D.C. Characteristics

(V<sub>SS</sub> = 0 V, Topr = -30 to 70°C)

| Parameter                     | Symbol           | PINS                            | Conditions                                                                          | Min                           | Typ.  | Max   | Unit |     |    |     |
|-------------------------------|------------------|---------------------------------|-------------------------------------------------------------------------------------|-------------------------------|-------|-------|------|-----|----|-----|
| Hysteresis Voltage            | V <sub>HS</sub>  | Hysteresis inputs               |                                                                                     | –                             | 0.9   | –     | V    |     |    |     |
| Input Current                 | I <sub>IN1</sub> | TEST                            | V <sub>DD</sub> = 5.5 V<br>V <sub>IN</sub> = 5.5 V / 0 V                            | –2                            | –     | 2     | μA   |     |    |     |
|                               | I <sub>IN2</sub> | Tri-state ports                 |                                                                                     |                               |       |       |      |     |    |     |
|                               | I <sub>IN3</sub> | RESET, STOP                     |                                                                                     |                               |       |       |      |     |    |     |
| Input Resistance              | R <sub>IN1</sub> | TEST                            |                                                                                     | 30                            | 70    | 150   | kΩ   |     |    |     |
|                               | R <sub>IN2</sub> | RESET                           |                                                                                     | 100                           | 220   | 450   |      |     |    |     |
|                               | R <sub>IN3</sub> | STOPi                           | i = 2 to 5                                                                          | 30                            | 130   | 250   |      |     |    |     |
| Output Leak Current           | I <sub>LO</sub>  | Tri-state ports                 | V <sub>DD</sub> = 5.5 V, V <sub>OUT</sub> = 5.5 V / 0V                              | –2                            | –     | 2     | μA   |     |    |     |
| Output High Voltage           | V <sub>OH2</sub> | Tri-state ports    Ports P1, P6 | V <sub>DD</sub> = 4.5 V, I <sub>OH</sub> = – 0.7 mA                                 | 4.1                           | –     | –     | V    |     |    |     |
| Low Output Voltage            | V <sub>OL</sub>  | Except XOUT and P7              | V <sub>DD</sub> = 4.5V, I <sub>OL</sub> = 1.6 mA                                    | –                             | –     | 0.4   | V    |     |    |     |
| Low Output Current            | I <sub>OL3</sub> | P7                              | V <sub>DD</sub> = 4.5 V, V <sub>OL</sub> = 1.0 V                                    | –                             | 7     | –     | mA   |     |    |     |
| Supply Current in NORMAL mode | I <sub>DD</sub>  |                                 | V <sub>DD</sub> = 5.5 V<br>f <sub>c</sub> = 8 MHz<br>V <sub>IN</sub> = 5.3 V / 0.2V | fcgck                         | fc    | –     | 7.0  | 11  | mA |     |
| Supply Current in IDLE mode   |                  |                                 |                                                                                     |                               | fcgck | fc/2  | –    | 4.4 |    | 7.0 |
|                               |                  |                                 |                                                                                     |                               |       | fc/4  | –    | 2.8 |    | 5.1 |
|                               |                  |                                 |                                                                                     |                               |       | fc/8  | –    | 2.2 |    | 4.5 |
|                               |                  |                                 |                                                                                     | Supply Current in NORMAL mode |       | fcgck | fc   | –   |    | 3.6 |
| fc/2                          |                  |                                 |                                                                                     |                               | –     |       | 2.6  | 4.2 |    |     |
| fc/4                          |                  |                                 |                                                                                     |                               | –     |       | 2.0  | 3.7 |    |     |
| fc/8                          |                  |                                 |                                                                                     |                               | –     |       | 1.7  | 3.5 |    |     |
| Supply Current in IDLE mode   |                  |                                 | fcgck                                                                               | fc                            | –     | 1.7   | 2.8  |     |    |     |
|                               |                  |                                 |                                                                                     | fc/2                          | –     | 1.1   | 2.0  |     |    |     |
|                               |                  |                                 |                                                                                     | fc/4                          | –     | 0.7   | 1.4  |     |    |     |
|                               |                  |                                 |                                                                                     | Supply Current in STOP mode   | fcgck | fc    | –    | 0.9 |    | 1.6 |
| fc/2                          |                  |                                 | –                                                                                   |                               |       | 0.7   | 1.4  |     |    |     |
| fc/4                          |                  |                                 | –                                                                                   |                               |       | 0.5   | 1.0  |     |    |     |
|                               |                  |                                 | V <sub>DD</sub> = 5.5 V<br>V <sub>IN</sub> = 5.3 V / 0.2 V                          |                               |       | –     | 0.5  | 10  | μA |     |

Note 1: Typical values show those at Topr = 25°C, V<sub>DD</sub> = 5 V.Note 2: Input Current I<sub>IN1</sub>, I<sub>IN3</sub>: The current through resistor is not included, when the input resistor (pull-up or pull-down) is contained.Note 3: I<sub>DD</sub>; Except for I<sub>REF</sub>

## A/D Conversion Characteristics

(V<sub>SS</sub> = 0 V, V<sub>DD</sub> = 2.7 to 5.5 V, Topr = -30 to 70°C)

| Parameter                  | Symbol            | Conditions                                                             | Min              | Typ. | Max               | Unit |
|----------------------------|-------------------|------------------------------------------------------------------------|------------------|------|-------------------|------|
| Analog Reference Voltage   | V <sub>AREF</sub> |                                                                        | 2.7              | –    | V <sub>DD</sub>   | V    |
|                            | V <sub>ASS</sub>  |                                                                        | V <sub>SS</sub>  |      |                   |      |
| Analog Input Voltage Range | V <sub>AIN</sub>  |                                                                        | V <sub>ASS</sub> | –    | V <sub>AREF</sub> | V    |
| Analog Reference Current   | I <sub>REF</sub>  | V <sub>AREF</sub> = 5.5 V, V <sub>ASS</sub> (V <sub>SS</sub> ) = 0.0 V | –                | 0.8  | 1.0               | mA   |
| Nonlinearity Error         |                   | V <sub>DD</sub> = 5.0 V, V <sub>AREF</sub> = 5.000 V                   | –                | –    | ± 1               | LSB  |
| Zero Point Error           |                   | V <sub>ASS</sub> (V <sub>SS</sub> ) = 0.000 V                          | –                | –    | ± 1               |      |
| Full Scale Error           |                   | or<br>V <sub>DD</sub> = 2.7 V, V <sub>AREF</sub> = 2.700 V             | –                | –    | ± 1               |      |
| Total Error                |                   | V <sub>ASS</sub> (V <sub>SS</sub> ) = 0.000 V                          | –                | –    | ± 2               |      |

Note: Quantizing error is not contained in those errors.

## A.C. Characteristics ( I )

(V<sub>SS</sub> = 0 V, V<sub>DD</sub> = 4.5 to 5.5 V, T<sub>opr</sub> = -30 to 70°C)

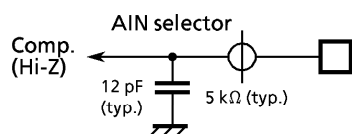
| Parameter                    | Symbol           | Conditions                   | Min | Typ. | Max | Unit            |
|------------------------------|------------------|------------------------------|-----|------|-----|-----------------|
| Machine Cycle Timer          | t <sub>cy</sub>  | In NORMAL mode               | 0.5 | -    | 4   | μs              |
|                              |                  | In IDLE mode                 |     |      |     |                 |
| High Level Clock Pulse Width | t <sub>WCH</sub> | For external clock operation | 50  | -    | -   | ns              |
| Low Level Clock Pulse Width  | t <sub>WCL</sub> | f <sub>c</sub> = 8 MHz       |     |      |     |                 |
| A/D Conversion Time          | t <sub>ADC</sub> | ACK = 0                      | -   | 46   | -   | t <sub>cy</sub> |
|                              |                  | ACK = 1                      |     | 184  |     |                 |
| A/D Sampling Time            | t <sub>AIN</sub> |                              | -   | 4    | -   |                 |

## A.C. Characteristics ( II )

(V<sub>SS</sub> = 0 V, V<sub>DD</sub> = 2.7 to 5.5 V, T<sub>opr</sub> = -30 to 70°C)

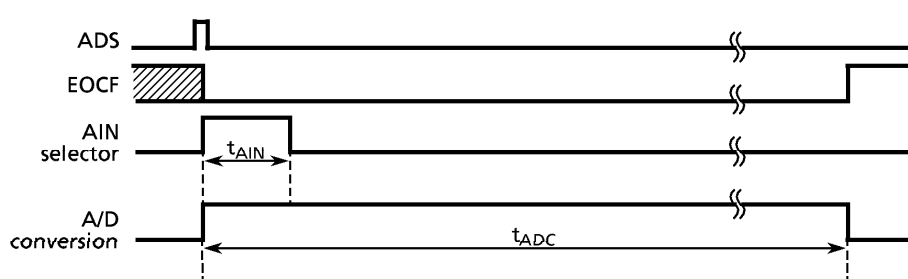
| Parameter                    | Symbol           | Conditions                   | Min  | Typ. | Max | Unit            |
|------------------------------|------------------|------------------------------|------|------|-----|-----------------|
| Machine Cycle Time           | t <sub>cy</sub>  | In NORMAL mode               | 0.95 | -    | 4   | μs              |
|                              |                  | In IDLE mode                 |      |      |     |                 |
| High Level Clock Pulse Width | t <sub>WCH</sub> | For external clock operation | 110  | -    | -   | ns              |
| Low Level Clock Pulse Width  | t <sub>WCL</sub> | f <sub>c</sub> = 4.2 MHz     |      |      |     |                 |
| A/D Conversion Time          | t <sub>ADC</sub> | ACK = 0                      | -    | 46   | -   | t <sub>cy</sub> |
|                              |                  | ACK = 1                      |      | 184  |     |                 |
| A/D Sampling Time            | t <sub>AIN</sub> |                              | -    | 4    | -   |                 |

**Note:** A/D conversion timing:  
Internal circuit for AIN0 to 5



※ To maintain a precision of A/D conversion, internal condenser must be charged until t<sub>AIN</sub> is over.

A/D conversion timing



Recommended Oscillating Conditions ( I )

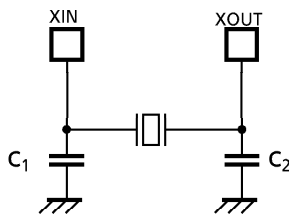
(V<sub>SS</sub> = 0 V, V<sub>DD</sub> = 4.5 to 5.5 V, Topr = – 30 to 70°C)

| Parameter                  | Oscillator         | Oscillation Frequency            | Recommended Oscillator                        | Recommended Conditions |                |
|----------------------------|--------------------|----------------------------------|-----------------------------------------------|------------------------|----------------|
|                            |                    |                                  |                                               | C <sub>1</sub>         | C <sub>2</sub> |
| High-frequency Oscillation | Ceramic Resonator  | 8 MHz<br>(VDD = 4.5 to 5.5 V)    | KYOCERA KBR8.0M                               | 30 pF                  | 30 pF          |
|                            |                    |                                  | MURATA CSAC8.00MT                             | 30 pF                  | 30 pF          |
|                            |                    |                                  | MURATA CSA8.00MTZ<br>CST8.00MTW<br>CST58.00MT | —                      | —              |
|                            |                    | 4.19 MHz<br>(VDD = 2.7 to 5.5 V) | MURATA CSA4.19MG                              | 30 pF                  | 30 pF          |
|                            |                    |                                  | MURATA CST4.19MGW                             | —                      | —              |
|                            |                    | 4 MHz<br>(VDD = 2.7 to 5.5 V)    | KYOCERA KBR4.0MS                              | 30 pF                  | 30 pF          |
|                            | Crystal Oscillator | 8 MHz<br>(VDD = 4.5 to 5.5 V)    | TOYOCOM 210B 8.0000                           | 20 pF                  | 20 pF          |
|                            |                    | 4 MHz<br>(VDD = 2.7 to 5.5 V)    | TOYOCOM 204B 4.000                            |                        |                |

Recommended Oscillating Conditions ( II )

(V<sub>SS</sub> = 0 V, V<sub>DD</sub> = 2.7 to 5.5 V, Topr = – 30 to 70°C)

| Parameter                  | Oscillator        | Oscillation Frequency            | Recommended Oscillator | Recommended Conditions |                |
|----------------------------|-------------------|----------------------------------|------------------------|------------------------|----------------|
|                            |                   |                                  |                        | C <sub>1</sub>         | C <sub>2</sub> |
| High-frequency Oscillation | Ceramic Resonator | 4.19 MHz<br>(VDD = 2.7 to 5.5 V) | MURATA CSA4.19MG       | 30 pF                  | 30 pF          |
|                            |                   |                                  | MURATA CST4.19MGW      | —                      | —              |
|                            |                   | 4 MHz<br>(VDD = 2.7 to 5.5 V)    | MURATA CSA4.00MG       | 30 pF                  | 30 pF          |
|                            |                   |                                  | CSA4.00MGC             | —                      | —              |
|                            |                   |                                  | MURATA CST4.00MGW      | —                      | —              |
|                            |                   |                                  | CSTC4.00MG             | —                      | —              |
|                            |                   |                                  | MURATA CSTCS4.00MG     | —                      | —              |



(1) High-frequency Oscillation

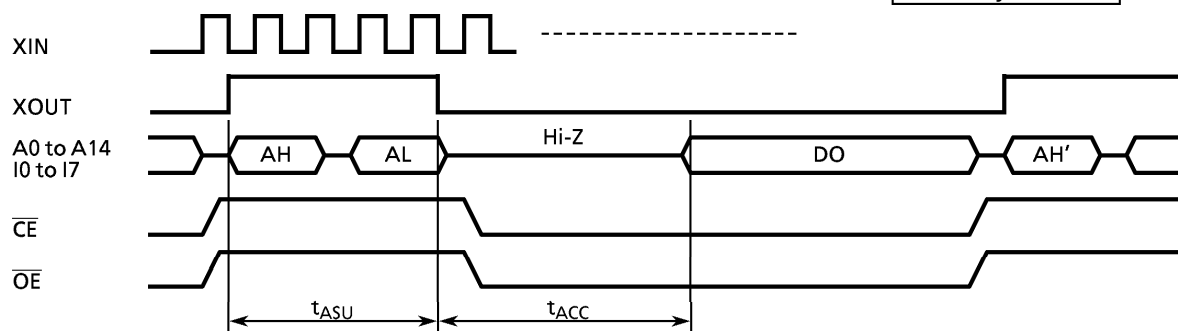
*Note: When used in high electric field such as a picture tube, the package is recommended to be electrically shielded to maintain a regular operation.*

## D.C. Characteristics, A.C. Characteristics

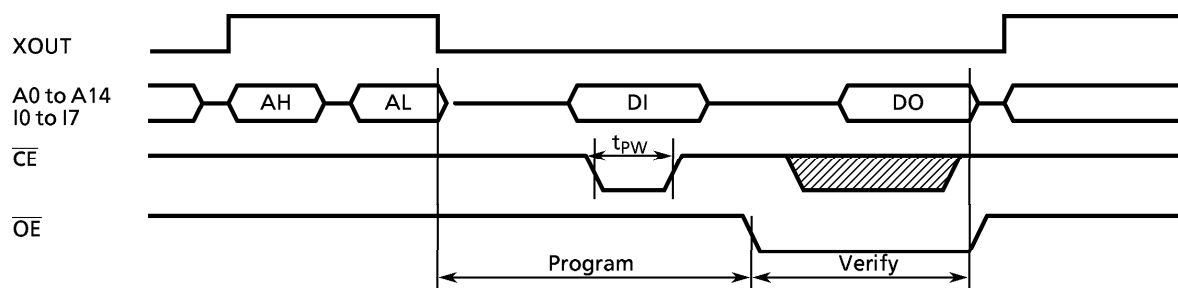
(V<sub>SS</sub> = 0 V)(1) Read Operation (T<sub>opr</sub> = 0 to 70°C)

| Parameter              | Symbol           | Conditions                     | Min                    | Typ.            | Max                   | Unit |
|------------------------|------------------|--------------------------------|------------------------|-----------------|-----------------------|------|
| Input High Voltage     | V <sub>IH4</sub> |                                | V <sub>CC</sub> × 0.67 | –               | V <sub>CC</sub>       | V    |
| Input Low Voltage      | V <sub>IL4</sub> |                                | 0                      | –               | V <sub>CC</sub> × 0.3 | V    |
| Supply Voltage         | V <sub>CC</sub>  |                                | 4.75                   | 5.00            | 5.25                  | V    |
| Program Supply Voltage | V <sub>PP</sub>  |                                | V <sub>CC</sub> – 0.6  | V <sub>CC</sub> | V <sub>CC</sub> + 0.6 |      |
| Address Set-up Time    | t <sub>ASU</sub> |                                | 400                    | –               | –                     | ns   |
| Address Access Time    | t <sub>ACC</sub> | V <sub>CC</sub> = 5.0 ± 0.25 V | –                      | 5tcyc           | –                     | ns   |

Note: tcyc = 400 ns

(2) Program Operation (High speed write mode - I ) (T<sub>opr</sub> = 25 ± 5°C)

| Parameter                   | Symbol           | Conditions                                                             | Min                   | Typ. | Max                    | Unit |
|-----------------------------|------------------|------------------------------------------------------------------------|-----------------------|------|------------------------|------|
| Input High Voltage          | V <sub>IH4</sub> |                                                                        | V <sub>CC</sub> × 0.7 | –    | V <sub>CC</sub>        | V    |
| Input Low Voltage           | V <sub>IL4</sub> |                                                                        | 0                     | –    | V <sub>CC</sub> × 0.12 | V    |
| Supply Voltage              | V <sub>CC</sub>  |                                                                        | 5.75                  | 6.0  | 6.25                   | V    |
| Program Supply Voltage      | V <sub>PP</sub>  |                                                                        | 12.0                  | 12.5 | 13.0                   | V    |
| Initial Program Pulse Width | t <sub>PW</sub>  | V <sub>CC</sub> = 6.0 V ± 0.25 V,<br>V <sub>PP</sub> = 12.5 V ± 0.25 V | 0.95                  | 1.0  | 1.05                   | ms   |



Note: DO ; Data output (I0 to I7) AL ; Address input (A0 to A7)  
DI ; Data input (I0 to I7) AH ; Address input (A8 to A14)

Note 1: When V<sub>CC</sub> power supply is turned on or after, V<sub>PP</sub> must be increased.

When V<sub>CC</sub> power supply is turned off or before, V<sub>PP</sub> must be decreased.

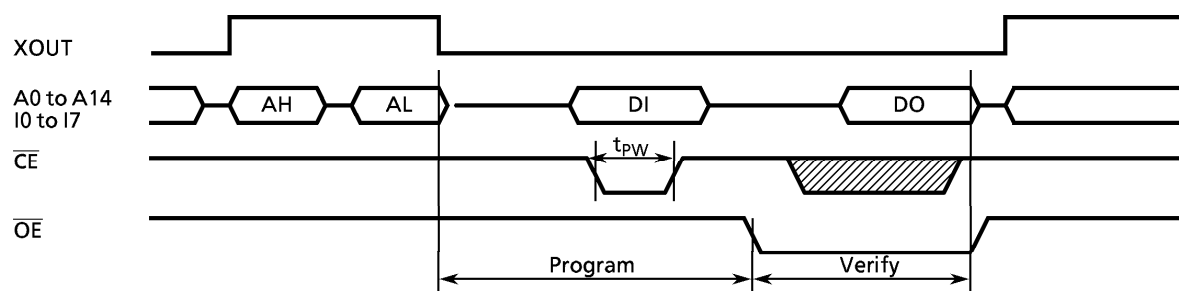
Note 2: The device must not be set to the EPROM programmer or picked up from it under applying the program voltage (12.5 V ± 0.5 V) to the V<sub>PP</sub> pin as the device is damaged.

Note 3: Be sure to execute the recommended programming mode with the recommended programming adaptor. If a mode or an adaptor except the above, the misoperation sometimes occurs.



(3) Program Operation (High speed write mode -II) ( $T_{opr} = 25 \pm 5^{\circ}\text{C}$ )

| Parameter                   | Symbol    | Conditions                                                                                      | Min                 | Typ.  | Max                  | Unit |
|-----------------------------|-----------|-------------------------------------------------------------------------------------------------|---------------------|-------|----------------------|------|
| Input High Voltage          | $V_{IH4}$ |                                                                                                 | $V_{CC} \times 0.7$ | –     | $V_{CC}$             | V    |
| Input Low Voltage           | $V_{IL4}$ |                                                                                                 | 0                   | –     | $V_{CC} \times 0.12$ | V    |
| Supply Voltage              | $V_{CC}$  |                                                                                                 | 6.00                | 6.25  | 6.50                 | V    |
| Program Supply Voltage      | $V_{PP}$  |                                                                                                 | 12.50               | 12.75 | 13.0                 | V    |
| Initial Program Pulse Width | $t_{PW}$  | $V_{CC} = 6.25 \text{ V} \pm 0.25 \text{ V}$ ,<br>$V_{PP} = 12.75 \text{ V} \pm 0.25 \text{ V}$ | 0.095               | 0.1   | 0.105                | ms   |



Note: DO ; Data output (I0 to I7)    AL ; Address input (A0 to A7)  
DI ; Data input (I0 to I7)    AH ; Address input (A8 to A14)

Note 1: When  $V_{CC}$  power supply is turned on or after,  $V_{PP}$  must be increased.

When  $V_{CC}$  power supply is turned off or before,  $V_{PP}$  must be decreased.

Note 2: The device must not be set to the EPROM programmer or picked up from it under applying the program voltage ( $12.5 \text{ V} \pm 0.5 \text{ V}$ ) to the  $V_{PP}$  pin as the device is damaged.

Note 3: Be sure to execute the recommended programming mode with the recommended programming adaptor. If a mode or an adaptor except the above, the misoperation sometimes occurs.

## Recommended EPROM Programmer

|           |                                |
|-----------|--------------------------------|
| DATA I/O  | UNISTTE (SITE40)               |
| ADVANTEST | R4945A                         |
| AVAL DATA | PECKER11 MARK-II (version 5.5) |

## Electrical Characteristics

(1) 87P808L

## Absolute Maximum Ratings

(V<sub>SS</sub> = 0 V)

| Parameter                                   |     | Symbol              | Conditions                | Ratings                        | Unit |
|---------------------------------------------|-----|---------------------|---------------------------|--------------------------------|------|
| Supply Voltage                              |     | V <sub>DD</sub>     |                           | – 0.3 to 6.5                   | V    |
| Program Voltage                             |     | V <sub>PP</sub>     | TEST /V <sub>PP</sub> pin | – 0.3 to 13.0                  | V    |
| Input Voltage                               |     | V <sub>IN</sub>     |                           | – 0.3 to V <sub>DD</sub> + 0.3 | V    |
| Output Voltage                              |     | V <sub>OUT</sub>    |                           | – 0.3 to V <sub>DD</sub> + 0.3 | V    |
| Output Current (Per 1 pin)                  | IOL | I <sub>OUT1</sub>   | P1, P6                    | 3.2                            | mA   |
|                                             |     | I <sub>OUT2</sub>   | P7 (Middle current port)  | 15                             | mA   |
|                                             | IOL | I <sub>OUT3</sub>   | P1, P6, P7                | – 1.8                          | mA   |
| Output Current (Total)                      | IOL | Σ I <sub>OUT1</sub> | P1, P6                    | 50                             | mA   |
|                                             |     | Σ I <sub>OUT2</sub> | P7 (Middle current port)  | 60                             | mA   |
|                                             | IOL | Σ I <sub>OUT3</sub> | P1, P6, P7                | 30                             | mA   |
| Power Dissipation [T <sub>opr</sub> = 70°C] |     | PD                  | SDIP                      | 300                            | mW   |
|                                             |     |                     | SOP                       | 180                            |      |
| Soldering Temperature (time)                |     | T <sub>sld</sub>    |                           | 260 (10 s)                     | °C   |
| Storage Temperature                         |     | T <sub>stg</sub>    |                           | – 55 to 125                    | °C   |
| Operating Temperature                       |     | T <sub>opr</sub>    |                           | – 30 to 70                     | °C   |

**Note:** The absolute maximum ratings are rated values which must not be exceeded during operation, even for an instant. Any one of the ratings must not be exceeded. If any absolute maximum rating is exceeded, a device may break down or its performance may be degraded, causing it to catch fire or explode resulting in injury to the user. Thus, when designing products which include this device, ensure that no absolute maximum rating value will ever be exceeded.

## Recommended Operating Conditions

(V<sub>SS</sub> = 0 V, T<sub>opr</sub> = –30 to 70°C)

| Parameter          | Symbol          | Pins      | Conditions                     |             | Min                    | Max                    | Unit |
|--------------------|-----------------|-----------|--------------------------------|-------------|------------------------|------------------------|------|
| Supply Voltage     | V <sub>DD</sub> |           | fc = 4.2 MHz                   | NORMAL mode | 1.8                    | 4.0                    | V    |
|                    |                 |           |                                | IDLE mode   |                        |                        |      |
|                    |                 |           | STOP mode                      |             |                        |                        |      |
| Input High Voltage | V <sub>IH</sub> |           |                                |             | V <sub>DD</sub> × 0.90 | V <sub>DD</sub>        | V    |
| Input Low Voltage  | V <sub>IL</sub> |           |                                |             | 0                      | V <sub>DD</sub> × 0.10 | V    |
| Clock Frequency    | fc              | XIN, XOUT | V <sub>DD</sub> = 1.8 to 4.0 V |             | 1.0                    | 4.2                    | MHz  |

**Note 1:** The recommended operating conditions for a device are operating conditions under which it can be guaranteed that the device will operate as specified. If the device is used under operating conditions other than the recommended operating conditions (supply voltage, operating temperature range, specified AC/DC values etc.), malfunction may occur. Thus, when designing products which include this device, ensure that the recommended operating conditions for the device are always adhered to.

**Note 2:** Clock frequency f<sub>c</sub>: Supply voltage range is specified in NORMAL mode and IDLE mode.

**Note 3:** Minimum of clock frequency: 1 MHz ≤ f<sub>c</sub>gck

## D.C. Characteristics

(V<sub>SS</sub> = 0 V, T<sub>opr</sub> = -30 to 70°C)

| Parameter                     | Symbol           | PINS               | Conditions                                                                 |                                                            |      | Min | Typ. | Max  | Unit |     |    |    |  |
|-------------------------------|------------------|--------------------|----------------------------------------------------------------------------|------------------------------------------------------------|------|-----|------|------|------|-----|----|----|--|
| Hysteresis Voltage            | V <sub>HS</sub>  | Hysteresis inputs  |                                                                            |                                                            |      | –   | 0.9  | –    | V    |     |    |    |  |
| Input Current                 | I <sub>IN1</sub> | TEST               | V <sub>DD</sub> = 4.0 V<br>V <sub>IN</sub> = 4.0 V / 0 V                   |                                                            |      | –2  | –    | 2    | μA   |     |    |    |  |
|                               | I <sub>IN2</sub> | Tri-state ports    |                                                                            |                                                            |      |     |      |      |      |     |    |    |  |
|                               | I <sub>IN3</sub> | RESET, STOP        |                                                                            |                                                            |      |     |      |      |      |     |    |    |  |
| Input Resistance              | R <sub>IN1</sub> | TEST               |                                                                            |                                                            |      | 30  | 70   | 150  | kΩ   |     |    |    |  |
|                               | R <sub>IN2</sub> | RESET              |                                                                            |                                                            |      | 100 | 220  | 450  |      |     |    |    |  |
|                               | R <sub>IN3</sub> | STOPi              | i = 2 to 5                                                                 |                                                            |      | 30  | 130  | 250  |      |     |    |    |  |
| Output Leakl Current          | I <sub>LO</sub>  | Tri-state ports    | V <sub>DD</sub> = 4.0 V, V <sub>OUT</sub> = 4.0 V / 0V                     |                                                            |      | –2  | –    | 2    | μA   |     |    |    |  |
| Output High Voltage           | V <sub>OH2</sub> | Tri-state ports    | V <sub>DD</sub> = 4.0 V, I <sub>OH</sub> = – 0.5 mA                        |                                                            |      | 3.6 | –    | –    | V    |     |    |    |  |
| Output Low Voltage            | V <sub>OL</sub>  | Except XOUT and P7 | V <sub>DD</sub> = 4.0V, I <sub>OL</sub> = 1.3 mA                           |                                                            |      | –   | –    | 0.4  | V    |     |    |    |  |
| Output Low Current            | I <sub>OL3</sub> | P7                 | V <sub>DD</sub> = 4.0 V, V <sub>OL</sub> = 1.0 V                           |                                                            |      | –   | 6    | –    | mA   |     |    |    |  |
| Supply Current in NORMAL mode | I <sub>DD</sub>  |                    | V <sub>DD</sub> = 4 V<br>fc = 4.19 MHz<br>V <sub>IN</sub> = 3.8 V / 0.2V   | fcgck                                                      | fc   | –   | 2.25 | 3.6  | mA   |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/2 | –   | 1.35 | 2.5  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/4 | –   | 0.9  | 1.9  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/8 | –   | 0.7  | 1.65 |      |     |    |    |  |
| Supply Current in IDLE mode   |                  |                    |                                                                            | fcgck                                                      | fc   | –   | 1.2  | 1.9  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/2 | –   | 0.9  | 1.7  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/4 | –   | 0.7  | 1.5  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/8 | –   | 0.6  | 1.4  |      |     |    |    |  |
| Supply Current in NORMAL mode |                  |                    | V <sub>DD</sub> = 3.0 V<br>fc = 4.19 MHz<br>V <sub>IN</sub> = 2.8 V / 0.2V | fcgck                                                      | fc   | –   | 1.5  | 2.5  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/2 | –   | 0.85 | 1.6  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/4 | –   | 0.6  | 1.2  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/8 | –   | 0.4  | 1.0  |      |     |    |    |  |
| Supply Current in IDLE mode   |                  |                    |                                                                            | fcgck                                                      | fc   | –   | 0.8  | 1.4  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/2 | –   | 0.55 | 1.1  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/4 | –   | 0.45 | 0.9  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/8 | –   | 0.35 | 0.85 |      |     |    |    |  |
| Supply Current in NORMAL mode |                  |                    | V <sub>DD</sub> = 1.8 V<br>fc = 4.19 MHz<br>V <sub>IN</sub> = 1.6 V / 0.2V | fcgck                                                      | fc   | –   | 0.9  | 1.3  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/2 | –   | 0.5  | 0.8  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/4 | –   | 0.3  | 0.45 |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/8 | –   | 0.2  | 0.35 |      |     |    |    |  |
| Supply Current in IDLE mode   |                  |                    |                                                                            | fcgck                                                      | fc   | –   | 0.35 | 0.5  |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/2 | –   | 0.23 | 0.35 |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/4 | –   | 0.17 | 0.26 |      |     |    |    |  |
|                               |                  |                    |                                                                            |                                                            | fc/8 | –   | 0.14 | 0.24 |      |     |    |    |  |
| Supply Current in STOP mode   |                  |                    |                                                                            | V <sub>DD</sub> = 4.0 V<br>V <sub>IN</sub> = 3.8 V / 0.2 V |      |     |      | –    |      | 0.5 | 10 | μA |  |

Note 1: Typical values show those at T<sub>opr</sub> = 25°C, V<sub>DD</sub> = 4 V.

Note 2: Input Current I<sub>IN1</sub>, I<sub>IN3</sub>: The current through resistor is not included, when the input resistor (pull-up or pull-down) is contained.

Note3: I<sub>DD</sub> ; Except for I<sub>REF</sub>

## A/D Conversion Characteristics ( I )

(V<sub>DD</sub> = 1.8 to 4.0 V, T<sub>opr</sub> = -30 to 70°C, V<sub>SS</sub> = 0V)

| Parameter                  | Symbol            | Conditions                                                                                                                                        | Min              | Typ. | Max               | Unit |
|----------------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------|-------------------|------|
| Analog Reference Voltage   | V <sub>AREF</sub> |                                                                                                                                                   | 1.8              | –    | V <sub>DD</sub>   | V    |
|                            | V <sub>ASS</sub>  |                                                                                                                                                   | V <sub>SS</sub>  |      |                   |      |
| Analog Input Voltage Range | V <sub>AIN</sub>  |                                                                                                                                                   | V <sub>ASS</sub> | –    | V <sub>AREF</sub> | V    |
| Nonlinearity Error         |                   | 1.8 V ≤ V <sub>AREF</sub> < 2.7 V<br>V <sub>AREF</sub> ≤ V <sub>DD</sub> ≤ 4.0<br>V <sub>ASS</sub> (V <sub>SS</sub> ) = 0.000V<br>ACK = 1 (Note2) | –                | –    | ± 2               | LSB  |
| Zero Point Error           |                   |                                                                                                                                                   | –                | –    | ± 2               |      |
| Full Scale Error           |                   |                                                                                                                                                   | –                | –    | ± 2               |      |
| Total Error                |                   |                                                                                                                                                   | –                | –    | ± 4               |      |

Note1: Quantizing error is not contained in those errors.

Note2: ACK ; bit5 of ADCCR (#000E<sub>H</sub>). conversion time = 184 tcy (175.6 μs / at f<sub>cgck</sub> = 4.19 MHz)

## A/D Conversion Characteristics ( II )

(V<sub>SS</sub> = 0V, V<sub>DD</sub> = 2.7 to 4.0 V, T<sub>opr</sub> = -30 to 70°C)

| Parameter                  | Symbol            | Conditions                                                                                                                                                                                                           | Min              | Typ. | Max               | Unit |
|----------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------|-------------------|------|
| Analog Reference Voltage   | V <sub>AREF</sub> |                                                                                                                                                                                                                      | 2.7              | –    | V <sub>DD</sub>   | V    |
|                            | V <sub>ASS</sub>  |                                                                                                                                                                                                                      | V <sub>SS</sub>  |      |                   |      |
| Analog Input Voltage Range | V <sub>AIN</sub>  |                                                                                                                                                                                                                      | V <sub>ASS</sub> | –    | V <sub>AREF</sub> | V    |
| Analog Reference Current   | I <sub>REF</sub>  | V <sub>AREF</sub> = 4.0V, V <sub>ASS</sub> (V <sub>SS</sub> ) = 0.0V                                                                                                                                                 | –                | 0.5  | 1.0               | mA   |
| Nonlinearity Error         |                   | V <sub>DD</sub> = 4.0 V<br>V <sub>AREF</sub> = 4.000V<br>V <sub>ASS</sub> (V <sub>SS</sub> ) = 0.000V<br>or<br>V <sub>DD</sub> = 2.7 V<br>V <sub>AREF</sub> = 2.700V<br>V <sub>ASS</sub> (V <sub>SS</sub> ) = 0.000V | –                | –    | ± 1               | LSB  |
| Zero Point Error           |                   | –                                                                                                                                                                                                                    | –                | ± 1  |                   |      |
| Full Scale Error           |                   | –                                                                                                                                                                                                                    | –                | ± 1  |                   |      |
| Total Error                |                   | –                                                                                                                                                                                                                    | –                | ± 2  |                   |      |

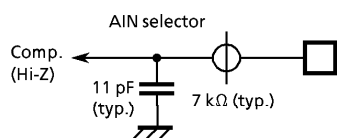
Note: Quantizing error is not contained in those errors.

## A.C. Characteristics

(V<sub>SS</sub> = 0 V, V<sub>DD</sub> = 1.8 to 4.0 V, T<sub>opr</sub> = –30 to 70°C)

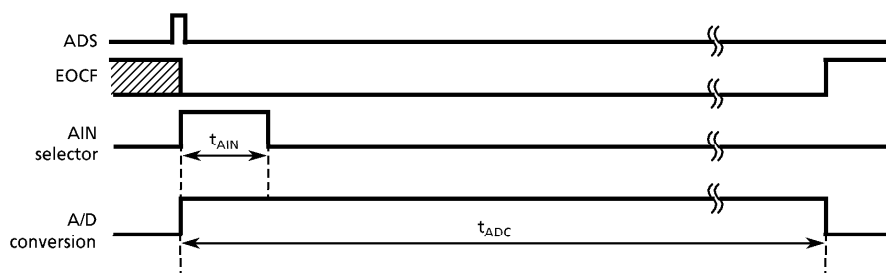
| Parameter                    | Symbol           | Conditions                                               | Min  | Typ. | Max | Unit            |
|------------------------------|------------------|----------------------------------------------------------|------|------|-----|-----------------|
| Machine Cycle Time           | t <sub>cy</sub>  | In NORMAL mode                                           | 0.95 | –    | 4   | μs              |
|                              |                  | In IDLE mode                                             |      |      |     |                 |
| High Level Clock Pulse Width | t <sub>WCH</sub> | For external clock operation<br>f <sub>c</sub> = 4.2 MHz | 110  | –    | –   | ns              |
| Low Level Clock Pulse Width  | t <sub>WCL</sub> |                                                          |      |      |     |                 |
| A/D Conversion Time          | t <sub>ADC</sub> | ACK = 0                                                  | –    | 46   | –   | t <sub>cy</sub> |
|                              |                  | ACK = 1                                                  |      | 184  |     |                 |
| A/D Sampling Time            | t <sub>AIN</sub> |                                                          | –    | 4    |     |                 |

**Note:** A/D conversion timing:  
Internal circuit for AIN 0 to 5



※ To maintain a precision of A/D conversion, internal condenser must be charged until t<sub>AIN</sub> is over.

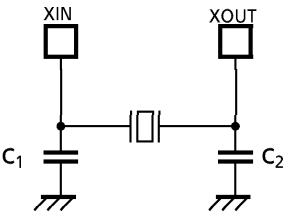
A/D conversion timing



Recommended Oscillating Conditions

(V<sub>SS</sub> = 0 V, Topr = – 30 to 70°C)

| Parameter                  | Oscillator        | Oscillation Frequency            | Recommended Oscillator |             | Recommended Conditions |                |
|----------------------------|-------------------|----------------------------------|------------------------|-------------|------------------------|----------------|
|                            |                   |                                  |                        |             | C <sub>1</sub>         | C <sub>2</sub> |
| High-frequency Oscillation | Ceramic Resonator | 4.19 MHz<br>(VDD = 2.7 to 5.5 V) | MURATA                 | CSA4.19MG   | 30 pF                  | 30 pF          |
|                            |                   |                                  | MURATA                 | CST4.19MGW  | —                      | —              |
|                            |                   | 4 MHz<br>(VDD = 2.7 to 5.5 V)    | MURATA                 | CSA4.00MG   | 30 pF                  | 30 pF          |
|                            |                   |                                  |                        | CSA4.00MGC  | —                      | —              |
|                            |                   |                                  | MURATA                 | CST4.00MGW  | —                      | —              |
|                            |                   |                                  |                        | CSTC4.00MG  | —                      | —              |
|                            |                   |                                  | MURATA                 | CSTCS4.00MG | —                      | —              |



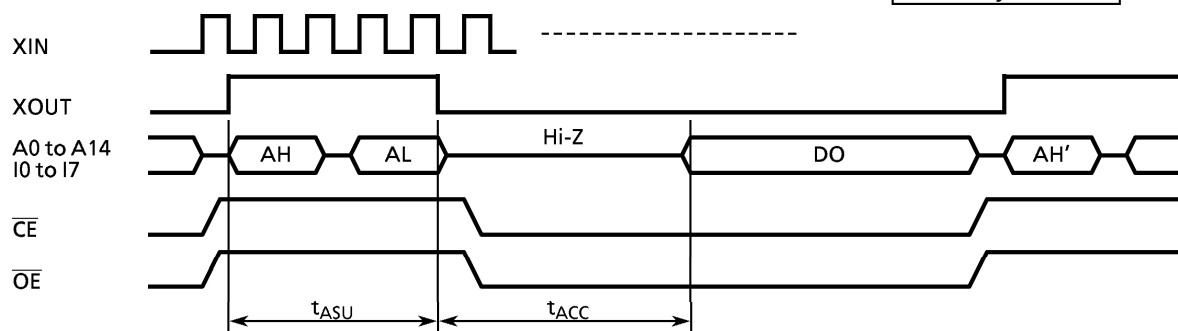
(1) High-frequency Oscillation

*Note: When used in high electric field such as a picture tube, the package is recommended to be electrically shielded to maintain a regular operation.*

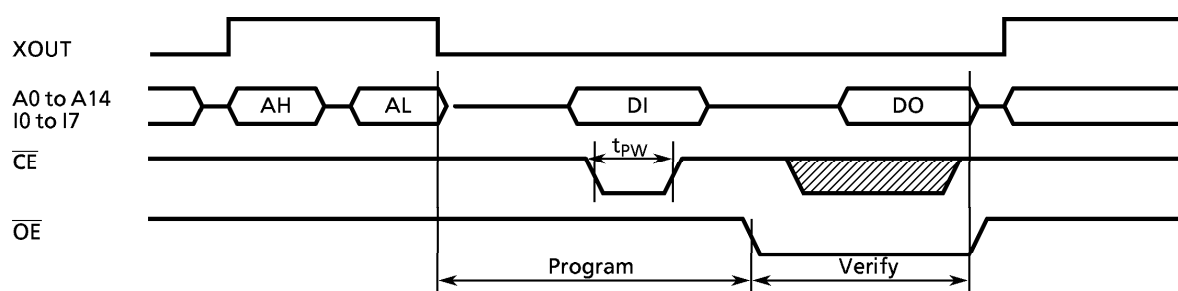
## D.C. Characteristics, A.C. Characteristics

(V<sub>SS</sub> = 0 V)(1) Read Operation (T<sub>opr</sub> = 0 to 70°C)

| Parameter              | Symbol           | Conditions                     | Min                    | Typ.             | Max                   | Unit |
|------------------------|------------------|--------------------------------|------------------------|------------------|-----------------------|------|
| Input High Voltage     | V <sub>IH4</sub> |                                | V <sub>CC</sub> × 0.67 | –                | V <sub>CC</sub>       | V    |
| Input Low Voltage      | V <sub>IL4</sub> |                                | 0                      | –                | V <sub>CC</sub> × 0.3 | V    |
| Supply Voltage         | V <sub>CC</sub>  |                                | 4.75                   | 5.00             | 5.25                  | V    |
| Program Supply Voltage | V <sub>PP</sub>  |                                | V <sub>CC</sub> – 0.6  | V <sub>CC</sub>  | V <sub>CC</sub> + 0.6 |      |
| Address Set-up Time    | t <sub>ASU</sub> |                                | 400                    | –                | –                     | ns   |
| Address Access Time    | t <sub>ACC</sub> | V <sub>CC</sub> = 5.0 ± 0.25 V | –                      | 5t <sub>cy</sub> | –                     | ns   |

Note: t<sub>cy</sub> = 400 ns(2) Program Operation (High speed write mode - I ) (T<sub>opr</sub> = 25 ± 5°C)

| Parameter                   | Symbol           | Conditions                                                             | Min                   | Typ. | Max                    | Unit |
|-----------------------------|------------------|------------------------------------------------------------------------|-----------------------|------|------------------------|------|
| Input High Voltage          | V <sub>IH4</sub> |                                                                        | V <sub>CC</sub> × 0.7 | –    | V <sub>CC</sub>        | V    |
| Input Low Voltage           | V <sub>IL4</sub> |                                                                        | 0                     | –    | V <sub>CC</sub> × 0.12 | V    |
| Supply Voltage              | V <sub>CC</sub>  |                                                                        | 5.75                  | 6.0  | 6.25                   | V    |
| Program Supply Voltage      | V <sub>PP</sub>  |                                                                        | 12.0                  | 12.5 | 13.0                   | V    |
| Initial Program Pulse Width | t <sub>PW</sub>  | V <sub>CC</sub> = 6.0 V ± 0.25 V,<br>V <sub>PP</sub> = 12.5 V ± 0.25 V | 0.95                  | 1.0  | 1.05                   | ms   |



Note: DO ; Data output (I0 to I7) AL ; Address input (A0 to A7)  
DI ; Data input (I0 to I7) AH ; Address input (A8 to A14)

Note 1: When V<sub>CC</sub> power supply is turned on or after, V<sub>PP</sub> must be increased.

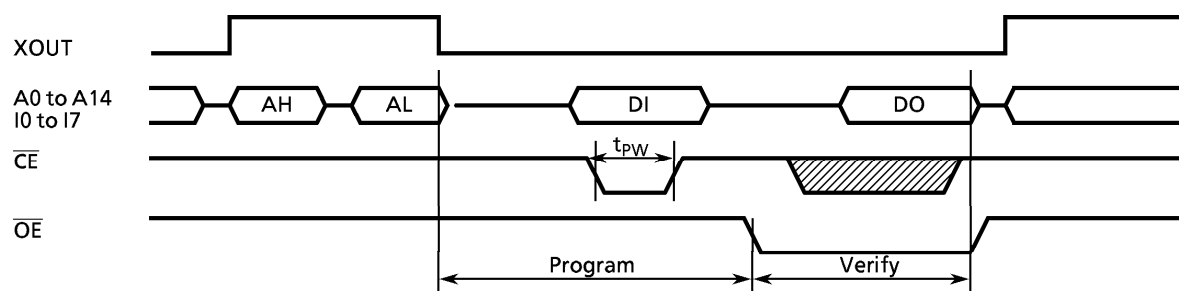
When V<sub>CC</sub> power supply is turned off or before, V<sub>PP</sub> must be decreased.

Note2: The device must not be set to the EPROM programmer or picked up from it under applying the program voltage (12.5 V ± 0.5 V) to the V<sub>PP</sub> pin as the device is damaged.

Note3: Be sure to execute the recommended programing mode with the recommended programing adaptor. If a mode or an adaptor except the above, the misoperation sometimes occurs.

(3) Program Operation (High speed write mode - II) ( $T_{opr} = 25 \pm 5^{\circ}\text{C}$ )

| Parameter                   | Symbol    | Conditions                                                                                      | Min                 | Typ.  | Max                  | Unit |
|-----------------------------|-----------|-------------------------------------------------------------------------------------------------|---------------------|-------|----------------------|------|
| Input High Voltage          | $V_{IH4}$ |                                                                                                 | $V_{CC} \times 0.7$ | –     | $V_{CC}$             | V    |
| Input Low Voltage           | $V_{IL4}$ |                                                                                                 | 0                   | –     | $V_{CC} \times 0.12$ | V    |
| Supply Voltage              | $V_{CC}$  |                                                                                                 | 6.00                | 6.25  | 6.50                 | V    |
| Program Supply Voltage      | $V_{PP}$  |                                                                                                 | 12.50               | 12.75 | 13.0                 | V    |
| Initial Program Pulse Width | $t_{PW}$  | $V_{CC} = 6.25 \text{ V} \pm 0.25 \text{ V}$ ,<br>$V_{PP} = 12.75 \text{ V} \pm 0.25 \text{ V}$ | 0.095               | 0.1   | 0.105                | ms   |



Note: DO ; Data output (I0 to I7)    AL ; Address input (A0 to A7)  
DI ; Data input (I0 to I7)    AH ; Address input (A8 to A14)

**Note1:** When  $V_{CC}$  power supply is turned on or after,  $V_{PP}$  must be increased.

When  $V_{CC}$  power supply is turned off or before,  $V_{PP}$  must be decreased.

**Note2:** The device must not be set to the EPROM programmer or picked up from it under applying the program voltage ( $12.5 \text{ V} \pm 0.5 \text{ V}$ ) to the  $V_{PP}$  pin as the device is damaged.

**Note3:** Be sure to execute the recommended programing mode with the recommended programing adaptor. If a mode or an adaptor except the above, the misoperation sometimes occurs.

## Recommended EPROM Programmer

|           |                                |
|-----------|--------------------------------|
| DATA I/O  | UNISTTE (SITE40)               |
| ADVANTEST | R4945A                         |
| AVAL DATA | PECKER11 MARK-II (version 5.5) |