

## CMOS 4-BIT MICROCONTROLLER

# TMP47P800N TMP47P800F

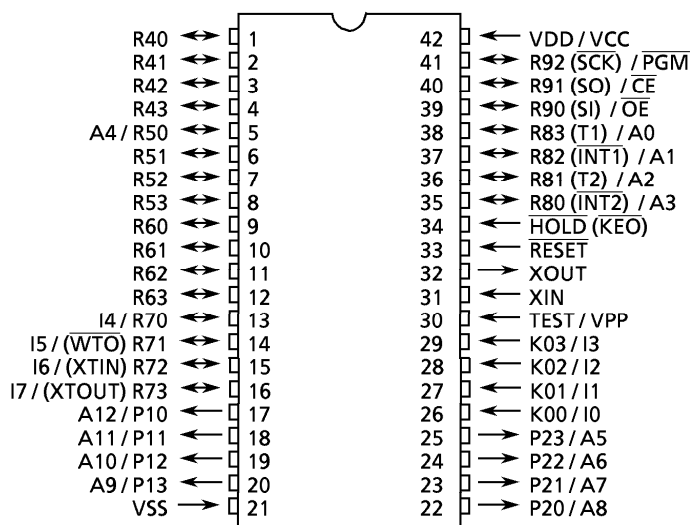
The 47P800 is the system evaluation LSI of 47C800 with 64K bits one-time PROM. The 47P800 programs / verifies using an adapter socket to connect with PROM programmer, as it is in TMM2764D.

In addition, the 47P800 and the 47C800 are pin compatible. The 47P800 operates as the same as the 47C800 by programming to the internal PROM.

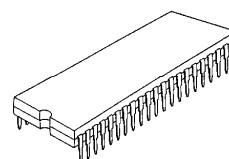
| PART No.   | ROM          | RAM         | PACKAGE            | ADAPTER SOCKET |
|------------|--------------|-------------|--------------------|----------------|
| TMP47P800N | OTP          | 512 × 4-bit | SDIP42-P-600-1.78  | BM1108         |
| TMP47P800F | 8192 × 8-bit |             | QFP44-P-1414-0.80D | BM1111         |

## PIN ASSIGNMENT (TOP VIEW)

SDIP42-P-600-1.78



SDIP42-P-600-1.78



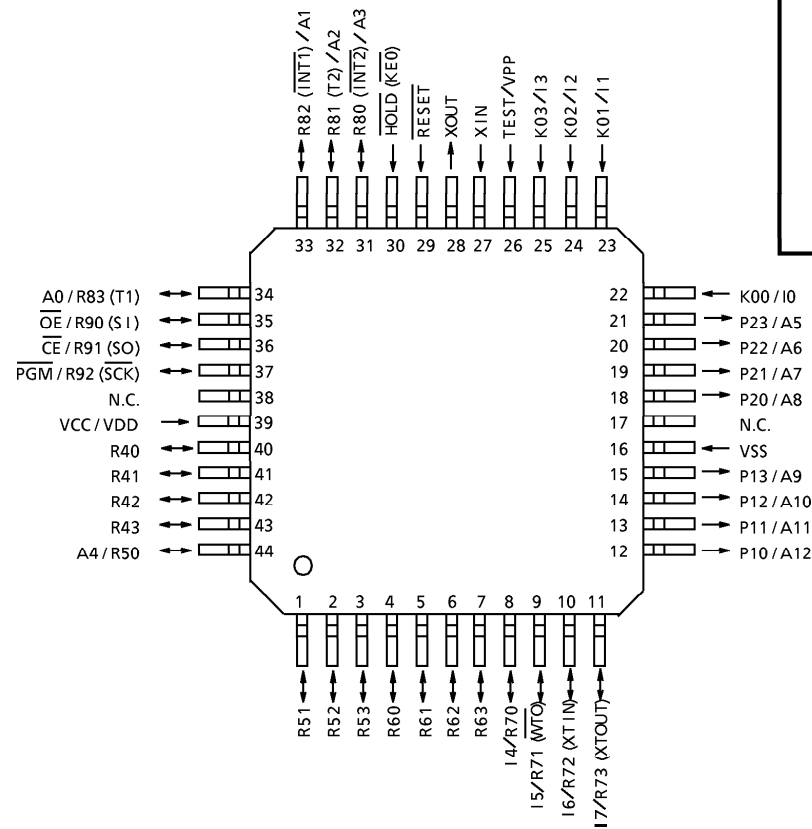
TMP47P800N

980901EBP1

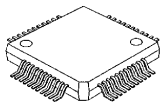
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PIN ASSIGNMENT (TOP VIEW)

QFP44-P-1414-0.80D



QFP44-P-1414-0.80D



TMP47P800F

## PIN FUNCTION

The 47P800 has MCU mode and PROM mode.

(1) MCU mode

The 47C800 and the 47P800 are pin compatible (TEST pin for out-going test. Be fixed to low level).

(2) PROM mode

| PIN NAME                  | Input/Output | FUNCTIONS                                      | PIN NAME (MCU MODE) |
|---------------------------|--------------|------------------------------------------------|---------------------|
| A12 to A9                 | Input        | Address inputs                                 | P10 to P13          |
| A8 to A5                  |              |                                                | P20 to P23          |
| A4                        |              |                                                | R50                 |
| A3 to A0                  |              |                                                | R80 to R83          |
| I7 to I4                  | I/O          | Data inputs / outputs                          | R73 to R70          |
| I3 to I0                  |              |                                                | K03 to K00          |
| $\overline{\text{PGM}}$   | Input        | Program control input                          | R92                 |
| $\overline{\text{CE}}$    |              | Chip Enable input                              | R91                 |
| $\overline{\text{OE}}$    |              | Output Enable input                            | R90                 |
| VPP                       | Power supply | + 21V / 5V (Program supply voltage)            | TEST                |
| VCC                       |              | + 5V                                           | VDD                 |
| VSS                       |              | 0V                                             | VSS                 |
| R53 to R51                | I/O          | Be fixed to low level.                         |                     |
| R63 to R60                |              |                                                |                     |
| R43, R42                  |              |                                                |                     |
| R41, R40                  |              |                                                |                     |
| $\overline{\text{RESET}}$ | Input        | PROM mode setting pins. Be fixed to low level. |                     |
| $\overline{\text{HOLD}}$  | Input        |                                                |                     |
| XIN                       | Input        | Resonator connecting pins                      |                     |
| XOUT                      | Output       |                                                |                     |

## OPERATIONAL DESCRIPTION

The following is an explanation of hardware configuration and operation in relation to the 47P800. The 47P800 is the same as the 47C800 except that an OTP is used instead of a built-in Mask ROM.

### 1. OPERATION MODE

The 47P800 has an MCU mode and PROM mode.

#### 1.1 MCU mode

The MCU mode is set by fixing the TEST / VPP pin at the "L" level. Operation in the MCU Mode is the same as for the 47C800 except that the TEST / VPP pin does not have pull-down resistor and can not be used open.

##### 1.1.1 Program memory

The program storage area is the same as for the 47C800.

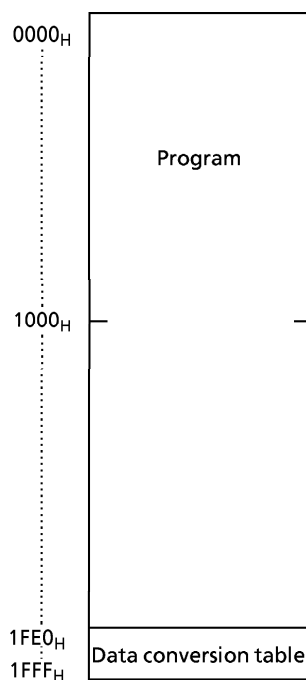


Figure 1-1. Program area

##### 1.1.2 Data memory

The 47P800 has 256X4 bits data memory bank (RAM).

### 1.1.3 Input /Output Circuitry

(1) Control pins

This is the same as for the 47C800 except that there is no pull-down resistor for the TEST pin.

(2) I/O ports

The input / output circuit of the 47C800 is the same as I/O code RA of the 47C800 external resistor, for example, is required when using as evaluator of other I/O codes (RB to RF) (Refer to Figure 1-2).

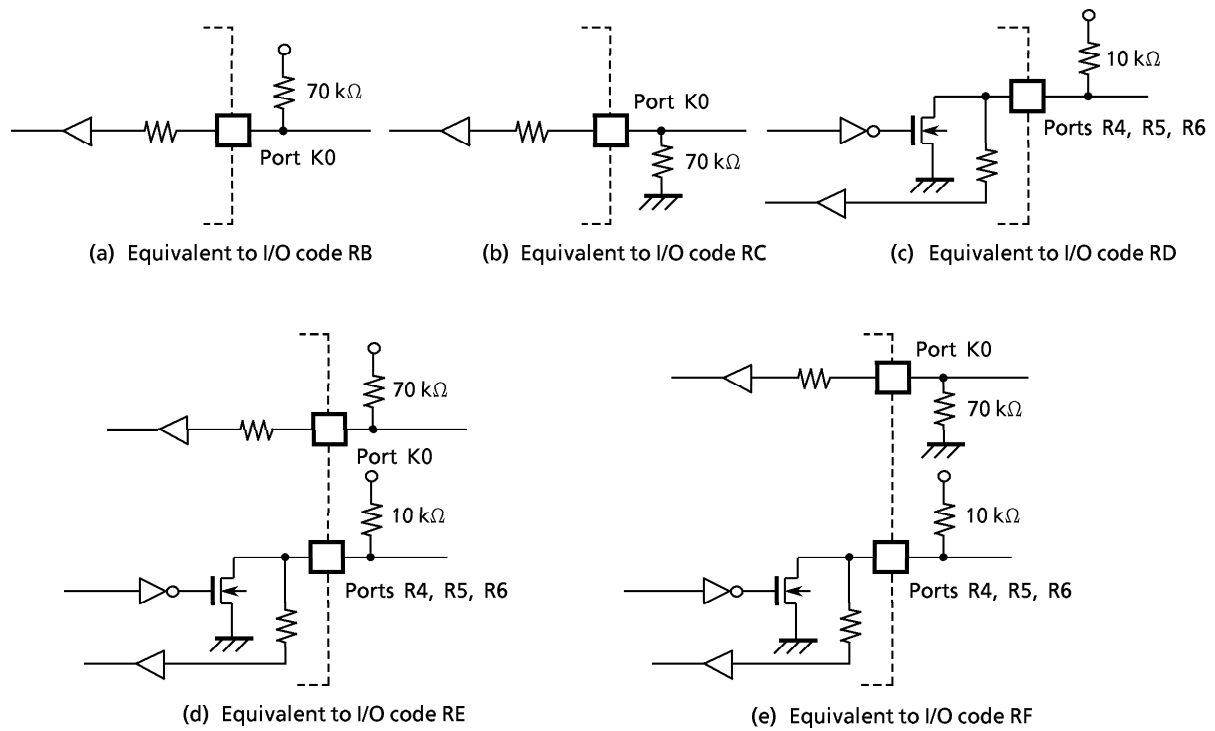
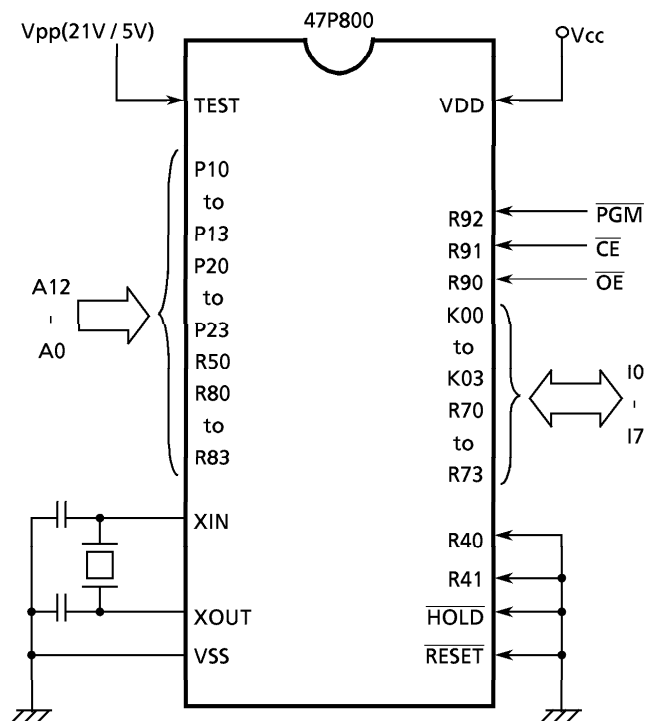


Figure 1-2. I/O code and external circuitry

## 1.2 PROM mode

The PROM mode is set by setting the  $\overline{\text{RESET}}$ ,  $\overline{\text{HOLD}}$ , K00 and K01 pins to the "L" level. The PROM mode can be used as a general-purpose PROM writer for program writing and verification (A high-speed program mode is used set the ROM type the same as for the TMM2764D).



For more information on pins refer to the section on pin function.

Figure 1-3. Setting for PROM mode

### 1.2.1 High Speed Programming Mode

The device is set up in the high speed programming mode when the programming voltage (21.0V) is applied to the VPP pin with  $V_{CC} = 6V$  and  $\overline{PGM} = V_{IH4}$ . The programming is achieved by applying a single TTL low level 1 msec pulse the  $\overline{PGM}$  input after addresses and data are stable. Then the programmed data is verified by using program Verify Mode. If the programmed data is not correct, another program pulse of 1 msec is applied and then programmed data is verified. This should be repeated until the program operates correctly (max. 15 times). After correctly programming the selected address, one additional program pulse with pulse width 4 times that needed for programming is applied. When programming has been completed, the data in all addresses should be verified with  $V_{CC} = V_{pp} = 5V$ .

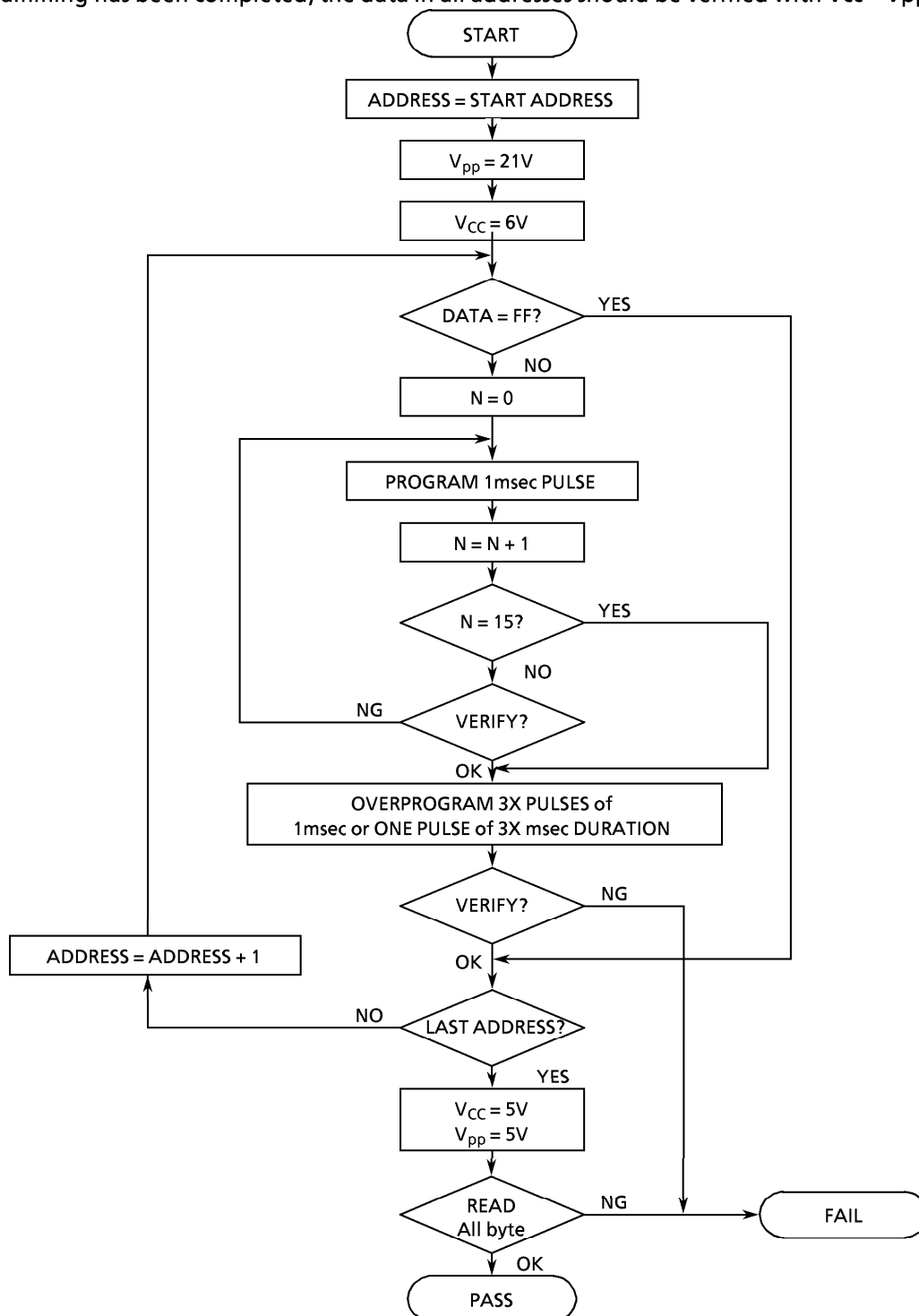


Figure1-4. FLOW CHART

## ELECTRICAL CHARACTERISTICS

## ABSOLUTE MAXIMUM RATINGS

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

| PARAMETER                                   | SYMBOL             | PINS                                           | RATINGS                        | UNIT |
|---------------------------------------------|--------------------|------------------------------------------------|--------------------------------|------|
| Supply Voltage                              | V <sub>DD</sub>    |                                                | – 0.3 to 7                     | V    |
| Input Voltage                               | V <sub>IN</sub>    |                                                | – 0.3 to V <sub>DD</sub> + 0.3 | V    |
| Output Voltage                              | V <sub>OUT1</sub>  | Except the sink open drain pin, but include R7 | – 0.3 to V <sub>DD</sub> + 0.3 | V    |
|                                             | V <sub>OUT2</sub>  | The sink open drain pin except R7              | – 0.3 to 10                    |      |
| Output Current (Per 1 pin)                  | I <sub>OUT1</sub>  | Ports R                                        | 3.2                            | mA   |
|                                             | I <sub>OUT2</sub>  | Ports P1, P2                                   | 30                             |      |
| Output Current (Total)                      | ΣI <sub>OUT1</sub> | Ports P1, P2                                   | 120                            | mA   |
| Power Dissipation [T <sub>opr</sub> = 70°C] | PD                 |                                                | 600                            | mW   |
| 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>   |                                                | – 40 to 70                     | °C   |

## RECOMMENDED OPERATING CONDITIONS

(V<sub>SS</sub> = 0V, T<sub>opr</sub> = – 40 to 70°C)

| PARAMETER          | SYMBOL           | PINS                    | CONDITIONS                   | Min.                   | Max.                   | UNIT |
|--------------------|------------------|-------------------------|------------------------------|------------------------|------------------------|------|
| Supply Voltage     | V <sub>DD</sub>  |                         | in the Normal operating mode | 4.5                    | 6.0                    | V    |
|                    |                  |                         | in the SLOW operating mode   | 2.7                    |                        |      |
|                    |                  |                         | in the HOLD operating mode   | 2.0                    |                        |      |
| High Input Voltage | V <sub>IH1</sub> | Except Hysteresis Input | V <sub>DD</sub> ≥ 4.5V       | V <sub>DD</sub> × 0.7  | V <sub>DD</sub>        | V    |
|                    | V <sub>IH2</sub> | Hysteresis Input        |                              | V <sub>DD</sub> × 0.75 |                        |      |
|                    | V <sub>IH3</sub> |                         | V <sub>DD</sub> < 4.5V       | V <sub>DD</sub> × 0.9  |                        |      |
| Low Input Voltage  | V <sub>IL1</sub> | Except Hysteresis Input | V <sub>DD</sub> ≥ 4.5V       | 0                      | V <sub>DD</sub> × 0.3  | V    |
|                    | V <sub>IL2</sub> | Hysteresis Input        |                              |                        | V <sub>DD</sub> × 0.25 |      |
|                    | V <sub>IL3</sub> |                         | V <sub>DD</sub> < 4.5V       |                        | V <sub>DD</sub> × 0.1  |      |
| Clock Frequency    | f <sub>c</sub>   | XIN, XOUT               |                              | 0.4                    | 6.0                    | MHz  |
|                    | f <sub>s</sub>   | XTIN, XTOUT             |                              | 30.0                   | 34.0                   | kHz  |

Note. Input voltage V<sub>IH3</sub>, V<sub>IL3</sub> : in the SLOW or HOLD operation.

## D.C. CHARACTERISTICS

(V<sub>SS</sub> = 0V, T<sub>opr</sub> = -40 to 70°C)

| PARAMETER                             | SYMBOL           | PINS                            | CONDITIONS                                            | Min. | Typ. | Max. | UNIT |
|---------------------------------------|------------------|---------------------------------|-------------------------------------------------------|------|------|------|------|
| Hysteresis Voltage                    | V <sub>HS</sub>  | Hysteresis input                |                                                       | —    | 0.7  | —    | V    |
| Input Current                         | I <sub>IN1</sub> | Port K0, TEST, RESET, HOLD      | V <sub>DD</sub> = 5.5V                                | —    | —    | ± 2  | μA   |
|                                       | I <sub>IN2</sub> | Ports R (open-drain)            | V <sub>IN</sub> = 5.5V / 0V                           |      |      |      |      |
| Input Resistance                      | R <sub>IN2</sub> | RESET                           |                                                       | 100  | 220  | 450  | kΩ   |
| Output Leakage Current                | I <sub>LO</sub>  | Ports R, P (open drain)         | V <sub>DD</sub> = 5.5V, V <sub>OUT</sub> = 5.5V       | —    | —    | 2    | μA   |
| Output Low Voltage                    | V <sub>OL2</sub> | Except XOUT XTOUT, Ports P1, P2 | V <sub>DD</sub> = 4.5V, I <sub>OL</sub> = 1.6 mA      | —    | —    | 0.4  | V    |
| Low Level Output Current              | I <sub>OL1</sub> | Ports P1, P2                    | V <sub>DD</sub> = 4.5V, V <sub>OL</sub> = 1.0V        | —    | 20   | —    | mA   |
| Supply Current<br>(in the Nomal mode) | I <sub>DD</sub>  |                                 | V <sub>DD</sub> = 5.5V<br>f <sub>c</sub> = 4 MHz      | —    | 5    | 10   | mA   |
| Supply Current<br>(in the SLOW mode)  | I <sub>DDS</sub> |                                 | V <sub>DD</sub> = 5.0V<br>f <sub>s</sub> = 32.768 kHz | —    | 5    | 8    | mA   |
| Supply Current<br>(in the HOLD mode)  | I <sub>DDH</sub> |                                 | V <sub>DD</sub> = 5.5V                                | —    | 0.5  | 10   | μA   |

Note 1. Typ. values show those at T<sub>opr</sub> = 25°C, V<sub>DD</sub> = 5V.

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

Note 3. Supply Current I<sub>DD</sub>, I<sub>DDH</sub> ; V<sub>IN</sub> = 5.3V/0.2V

The K0 port is opened when the input resistor is contained. The voltage applied to the R port is within the valid range.

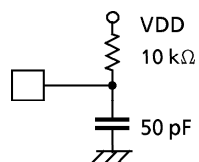
Supply Current I<sub>DDS</sub> ; V<sub>IN</sub> = 2.8V/0.2V, low frequency clock is only oscillated (connecting XTIN, XTOUT).

**A.C. CHARACTERISTICS** ( $V_{SS} = 0V$ ,  $V_{DD} = 4.5$  to  $6.0V$ ,  $T_{opr} = -40$  to  $70^{\circ}C$ )

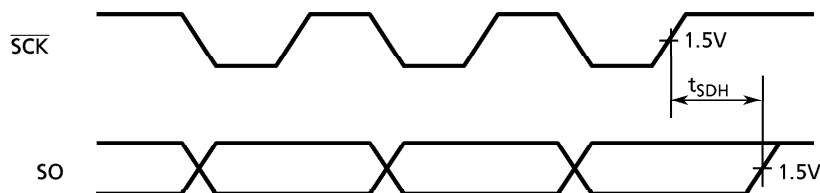
| PARAMETER                    | SYMBOL    | CONDITION                    | Min.              | Typ. | Max. | UNIT    |
|------------------------------|-----------|------------------------------|-------------------|------|------|---------|
| Instruction Cycle Time       | $t_{cy}$  | in the Normal mode           | 1.33              | —    | 20   | $\mu s$ |
|                              |           | in the SLOW mode             | 235               | —    | 267  |         |
| High level Clock Pulse Width | $t_{WCH}$ | For external clock operation | 80                | —    | —    | ns      |
| Low level Clock Pulse Width  | $t_{WCL}$ |                              |                   |      |      |         |
| Shift Data Hold Time         | $t_{SDH}$ |                              | $0.5t_{cy} - 300$ | —    | —    | ns      |

Note. Shift Data Hold Time:

External circuit for  $\overline{SCK}$  pin and SO pin



Serial port (completion of transmission)

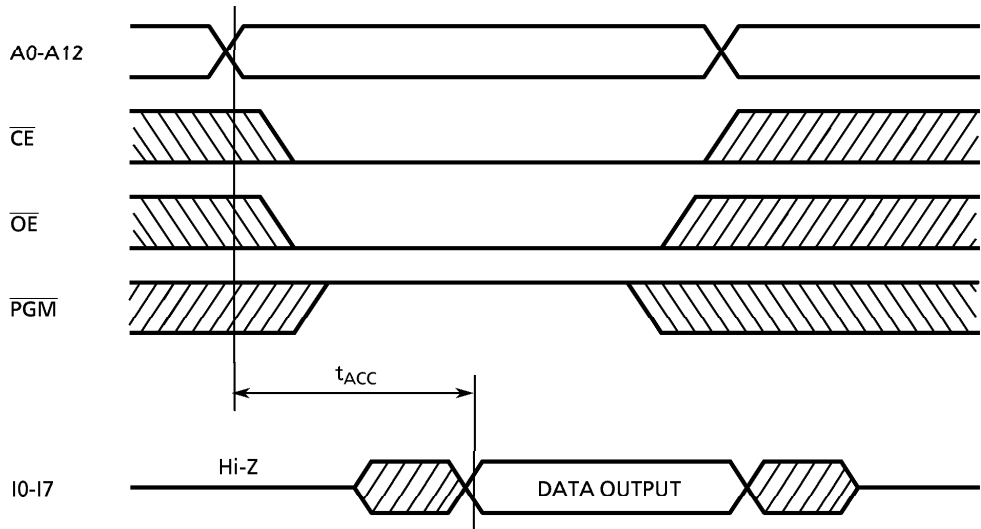

**RECOMMENDED OSCILLATING CONDITIONS** ( $V_{SS} = 0V$ ,  $V_{DD} = 4.5$  to  $6.0V$ ,  $T_{opr} = -40$  to  $70^{\circ}C$ )

Recommended oscillating conditions of the 47P800 are equal to the 47C800's.

**D.C. / A.C. CHARACTERISTICS (PROM mode)** ( $V_{SS} = 0V$ )

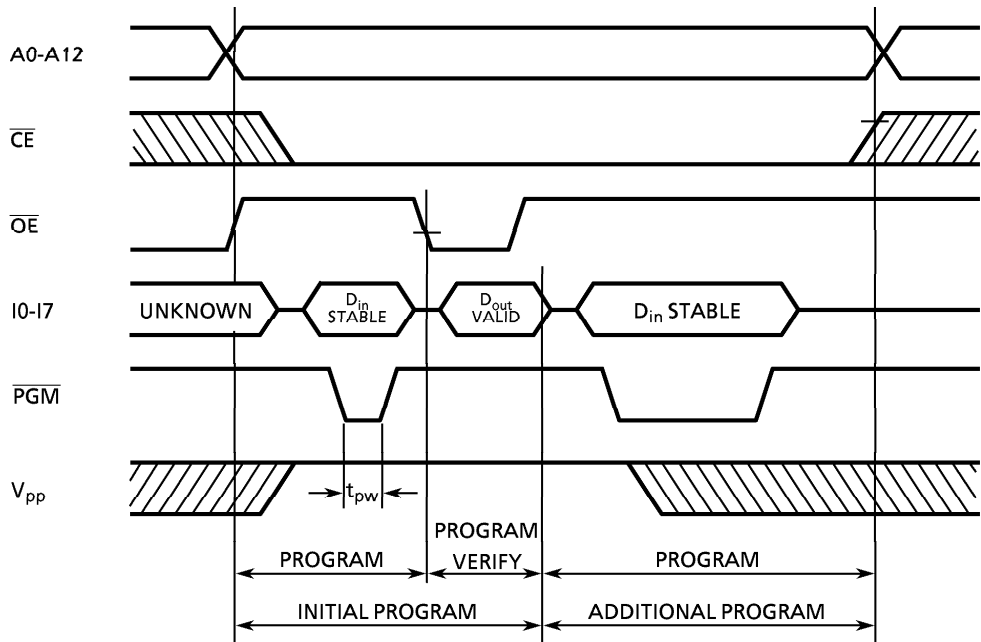
**(1) Read Operation**

| PARAMETER                 | SYMBOL    | CONDITION                | Min.                | Typ. | Max.                 | UNIT |
|---------------------------|-----------|--------------------------|---------------------|------|----------------------|------|
| Output Level High Voltage | $V_{IH4}$ |                          | $V_{CC} \times 0.7$ | —    | $V_{CC}$             | V    |
| Output Level Low Voltage  | $V_{IL4}$ |                          | 0                   | —    | $V_{CC} \times 0.12$ | V    |
| Supply Voltage            | $V_{CC}$  |                          | 4.75                | —    | 6.0                  | V    |
| Programming Voltage       | $V_{PP}$  |                          |                     |      |                      |      |
| Address Access Time       | $t_{ACC}$ | $V_{CC} = 5.0 \pm 0.25V$ | 0                   | —    | 350                  | ns   |



(2) High Speed Programming Operation

| PARAMETER                     | SYMBOL    | CONDITION                | 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                | $V_{CC}$  |                          | 4.75                | –    | 6.0                  | V    |
| $V_{PP}$ Power Supply Voltage | $V_{PP}$  |                          | 20.5                | 21.0 | 21.5                 | V    |
| Programming Pulse Width       | $t_{PW}$  | $V_{CC} = 6.0 \pm 0.25V$ | 0.95                | 1.0  | 1.05                 | ms   |



※ Difference compared with the 47C800  
The 47P800 is different from the 47C800 with respect to the following spec points.

| PARAMETER      | SYMBOL    | CONDITION               | 47C800 |                              |      | 47P800 |                          |      | UNIT |
|----------------|-----------|-------------------------|--------|------------------------------|------|--------|--------------------------|------|------|
|                |           |                         | Min.   | Typ.                         | Max. | Min.   | Typ.                     | Max. |      |
| Supply Voltage | $V_{DD}$  | in the NORMAL operation | 4.5    | —                            | 6.0  | 4.5    | —                        | 6.0  | V    |
|                |           | in the SLOW operation   | 2.7    | —                            |      |        |                          |      |      |
| Supply Current | $I_{DD}$  | in the NORMAL operation | —      | 3                            | 6    | —      | 5                        | 10   | mA   |
|                | $I_{DDS}$ | in the SLOW operation   | —      | $30\mu A$<br>$(V_{DD} = 3V)$ |      | —      | $5mA$<br>$(V_{DD} = 5V)$ |      | —    |

Note. Be fixed low level at MCU mode because of TEST pin does not have pull-down resistor.

TYPICAL CHARACTERISTICS

