

TOSHIBA

TMP47P800

CMOS 4-BIT MICROCONTROLLER

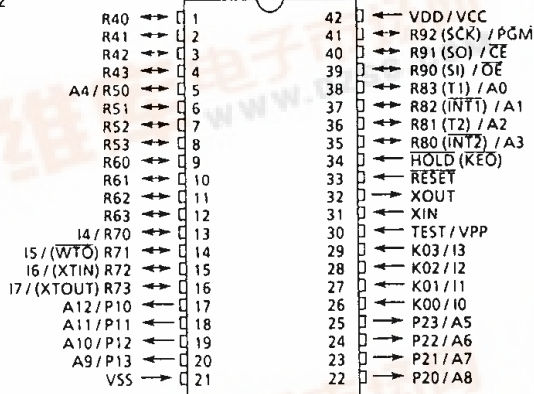
TMP47P800N
TMP47P800F

The 47P800 is the OTP microcontroller with 64kbits EPROM. For program operation, the programming is achieved by using with EPROM programmer (TMM2764D type) and adapter socket (BM1108). The function of this device is exactly same as the 47C800.

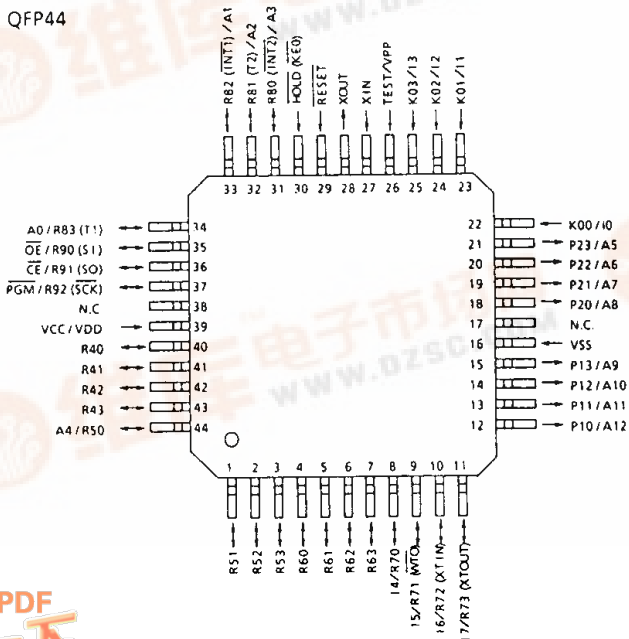
| PART No. | ROM | RAM | PACKAGE |
|------------|--------------|-------------|---------|
| TMP47P800N | OTP | 512 x 4-bit | SDIP42 |
| TMP47P800F | 8192 x 8-bit | | QFP44 |

PIN ASSIGNMENT (TOP VIEW)

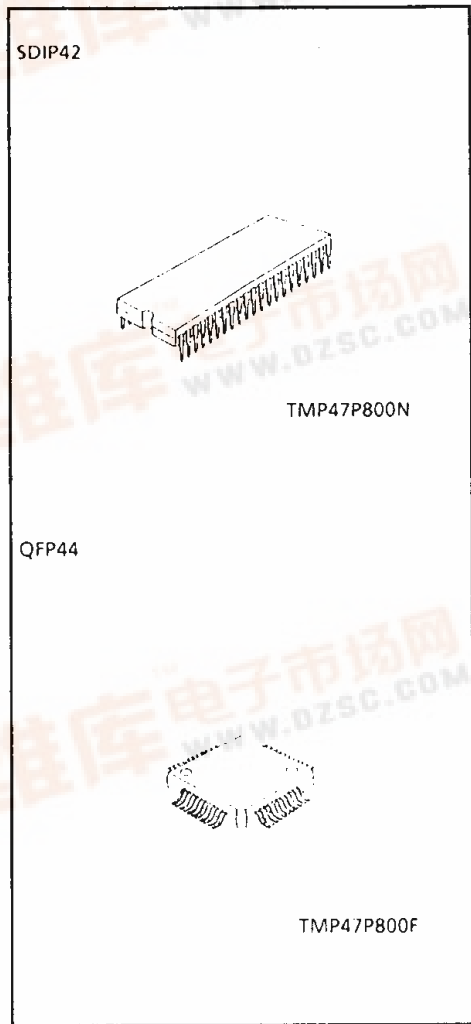
SDIP42



QFP44



SDIP42



TMP47P800N

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 - A9 | Input | Address inputs | P10 - P13 |
| A8 - A5 | | | P20 - P23 |
| A4 | | | R50 |
| A3 - A0 | | | R80 - R83 |
| I7 - I4 | I/O | Data inputs/ outputs | R73 - R70 |
| I3 - I0 | | | K03 - K00 |
| $\overline{\text{PGM}}$ | Input | Program control input | R92 |
| $\overline{\text{CE}}$ | | Chip Enable input | R91 |
| OE | | Output Enable input | R90 |
| VPP | Power supply | + 21V / 5V (Program supply voltage) | TEST |
| VCC | | + 5V | VDD |
| VSS | | 0V | VSS |
| R53 - R51 | I/O | Be fixed to low level. | |
| R63 - 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 EPROM or 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.

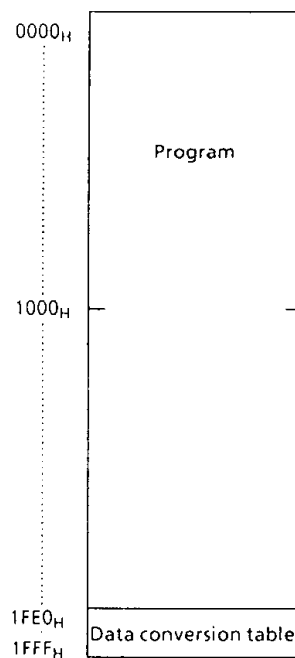


Figure 1-1. Program area

1.1.2 Data memory

The 47P800 has two built in 256X4 bits data memory banks (DMB0, DMB1).

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, RC) (Refer to Figure 1-2).

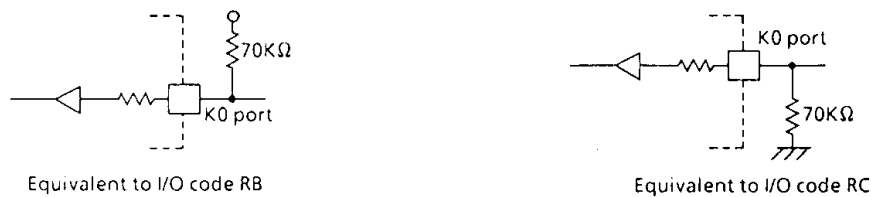


Figure 1-2. I/O code and external circuitry

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).

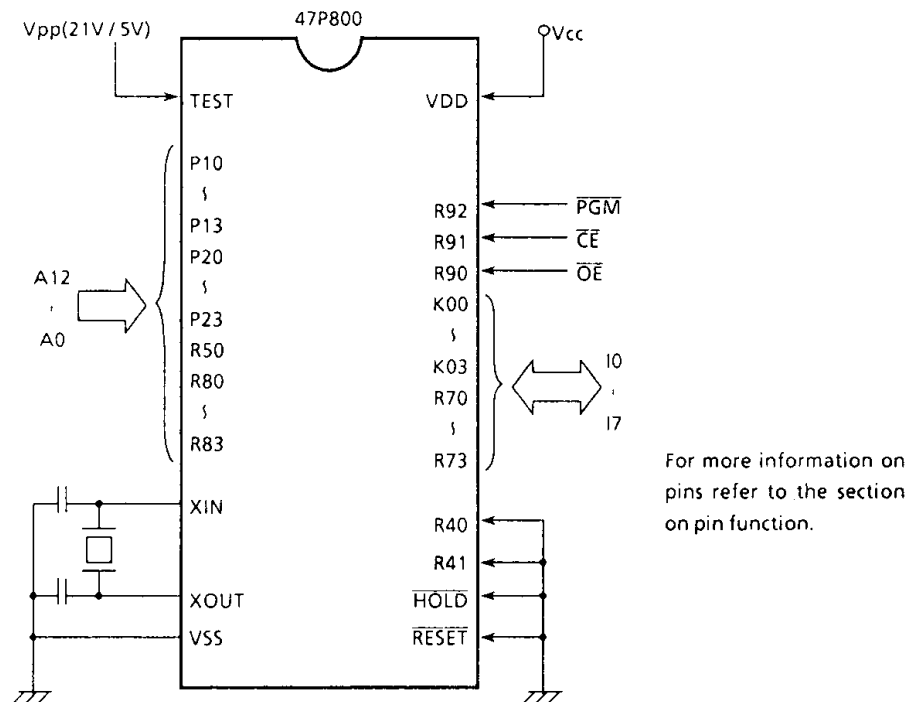


Figure 1-3. Setting for PROM mode

An adapter socket is available for connecting a PROM writer.

- BM1108 : TMP47P800N
- BM1111 : TMP47P800F

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 Vcc = 6V and PGM = VIH4. The programming is achieved by applying a single TTL low level 1 msec,pulse the 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 Vcc = Vpp = 5V.

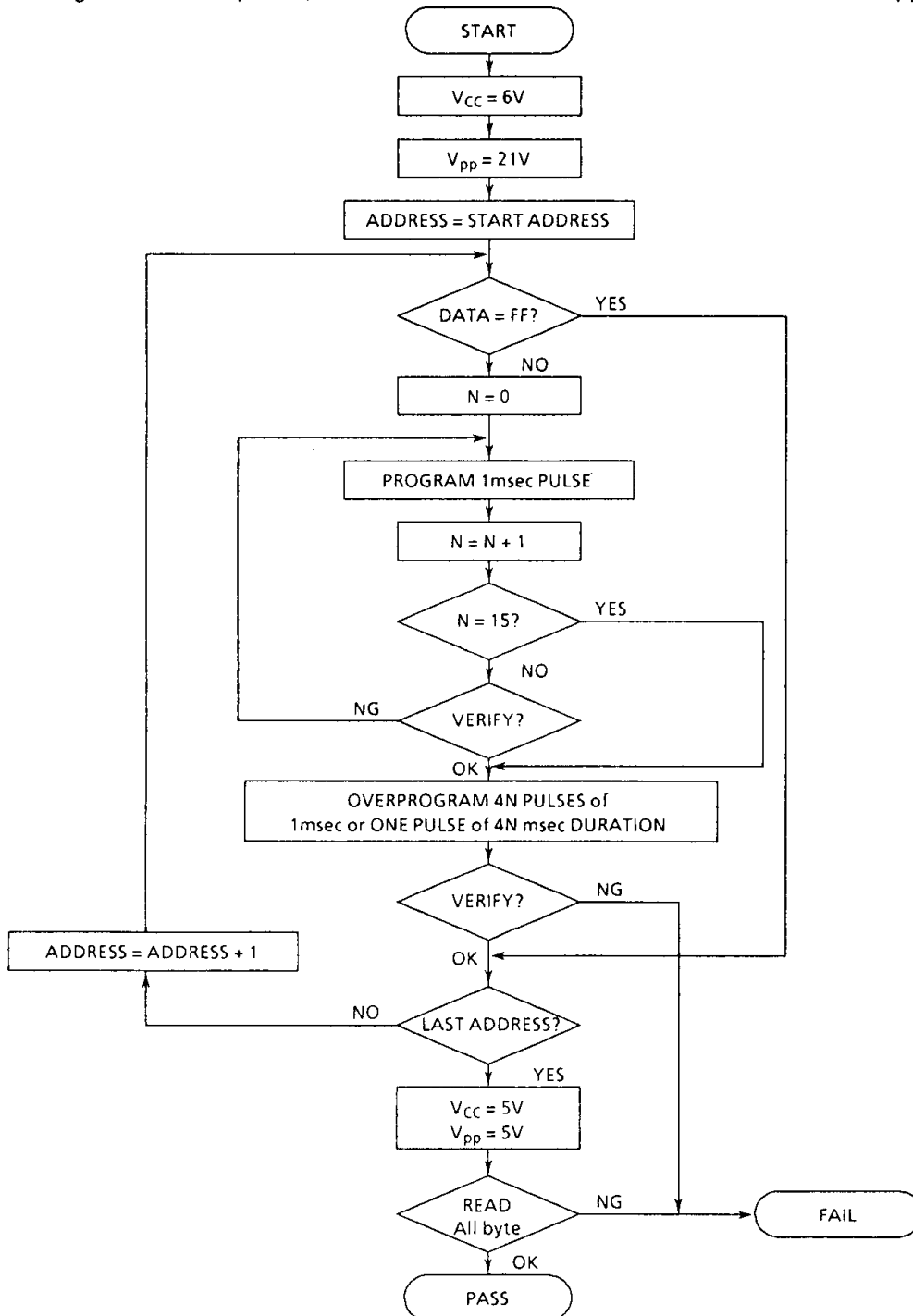


Figure1-4. FLOW CHART

ELECTRICAL CHARACTERISTICS

ABSOLUTE MAXIMUM RATINGS (V_{SS} = 0V)

| PARAMETER | SYMBOL | PINS | RATING | UNIT |
|------------------------------|--------------------|----------------------------------|--------------------------------|------|
| Supply Voltage | V _{DD} | | - 0.3 to 7 | V |
| Program Voltage | V _{PP} | TEST / VPP pin | - 0.3 to 22.0 | V |
| Input Voltage | V _{IN} | | - 0.3 to V _{DD} + 0.3 | V |
| Output Voltage | V _{OUT1} | R7, | - 0.3 to V _{DD} + 0.3 | V |
| | V _{OUT2} | Ports P1, P2, R4, R5, R6, R8, R9 | - 0.3 to 10 | |
| Output (per 1 pin) | I _{OUT2} | Port R | 3.2 | mA |
| Output Current (total) | ΣI _{OUT1} | Ports P1, P2 | 120 | mA |
| Power Dissipation | PD | | 600 | mW |
| Soldering Temperature (time) | T _{sld} | | 260 (10sec) | °C |
| Storage Temperature | T _{stg} | | - 55 to 125 | °C |
| Operating Temperature | T _{opr} | | - 40 to 70 | °C |

RECOMMENDED OPERATING CONDITIONS (V_{SS} = 0V, T_{opr} = - 40 to 70°C)

| PARAMETER | SYMBOL | PINS | CONDITIONS | Min. | Max. | UNIT |
|--------------------|------------------|-------------------------|------------------------|------------------------|------------------------|------|
| Supply Voltage | V _{DD} | | In the Normal mode | 4.5 | 6.0 | V |
| | | | In the SLOW mode | | | |
| | | | In the HOLD mode | | | |
| Input High Voltage | V _{IH1} | Except Hysteresis Input | V _{DD} ≥ 4.5V | V _{DD} × 0.7 | V _{DD} | V |
| | V _{IH2} | Hysteresis Input | | V _{DD} × 0.75 | | |
| | V _{IH3} | | | V _{DD} < 4.5V | | |
| Input Low Voltage | V _{IL1} | Hysteresis Input | V _{DD} ≥ 4.5V | 0 | V _{DD} × 0.3 | V |
| | V _{IL2} | Hysteresis Input | | | V _{DD} × 0.25 | |
| | V _{IL3} | | | | V _{DD} < 4.5V | |
| Clock Frequency | f _c | XIN, XOUT | | 0.4 | 6.0 | MHz |
| | f _s | XTIN, XTOUT | | 30 | 34 | KHz |

Note. Input Voltage V_{IH3}, V_{IL3}: in the SLOW operation or HOLD operation.

| | |
|----------------------|--|
| D.C. CHARACTERISTICS | ($V_{SS} = 0V$, $T_{opr} = -40$ to $70^{\circ}C$) |
|----------------------|--|

| PARAMETER | SYMBOL | PINS | CONDITIONS | Min. | Typ. | Max. | UNIT |
|--|-----------|----------------------------|--------------------------------------|------|------|---------|-----------|
| Hysteresis Voltage | V_{HS} | Hysteresis input | | — | 0.7 | — | V |
| Input Current | I_{IN1} | Port K0, TEST, RESET, HOLD | $V_{DD} = 5.5V$ | — | — | ± 2 | μA |
| | I_{IN2} | Ports R (open-drain) | $V_{IN} = 5.5V / 0V$ | | | | |
| Input Resistance | R_{IN2} | RESET | | 100 | 220 | 450 | $K\Omega$ |
| Output Leakage Current | I_{LO} | Ports R (open drain) | $V_{DD} = 5.5V$, $V_{OUT} = 5.5V$ | — | — | 2 | μA |
| Output Low Voltage | V_{OL2} | Except XOUT XTOUT, Ports P | $V_{DD} = 4.5V$, $I_{OL} = 1.6mA$ | — | — | 0.4 | V |
| Low Level Output Current | I_{OL1} | Ports P1, P2 | $V_{DD} = 4.5V$, $V_{OL} = 1.0V$ | — | 20 | — | mA |
| Supply Current (in the Normal mode) | I_{DD} | | $V_{DD} = 5.5V$ $f_c = 4MHz$ | — | 5 | 10 | mA |
| Supply Current (in the SLOW mode) | I_{DDs} | | $V_{DD} = 5.0V$ $f_s = 32.768KHz$ | — | 5 | 8 | mA |
| Supply Current (in the HOLD mode) | I_{DDH} | | $V_{DD} = 5.5V$ | — | 0.5 | 10 | μA |

Note 1. Typ. values show those at $T_{opr} = 25^{\circ}C$, $V_{DD} = 5V$.

Note 2. Input Current I_{IN1} ; The current through resistor is not included, when the input resistor (pull-up/pull-down) is contained.

Note 3. Supply Current I_{DD} , I_{DDH} ; $V_{IN} = 5.3V/0.2V$
The K0 port is opened when the input resistor is contained. The voltage applied to the R port is within the valid range.

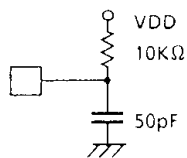
Note 4. Supply Current I_{DDs} ; $V_{IN} = 2.8V/0.2V$, low frequency clock is only oscillated (connecting XTIN, XTOUT).

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

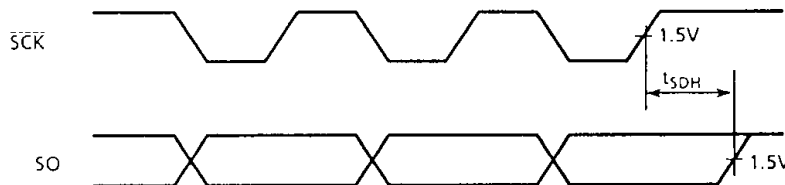
| PARAMETER | SYMBOL | CONDITION | Min. | Typ. | Max. | UNIT |
|------------------------------|-----------|------------------------------|-------------------|------|------|---------|
| Instruction Cycle Time | t_{cy} | in the Normal mode | 1.33 | - | 20 | μs |
| | | in the SLOW mode | 235 | - | 267 | |
| 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)



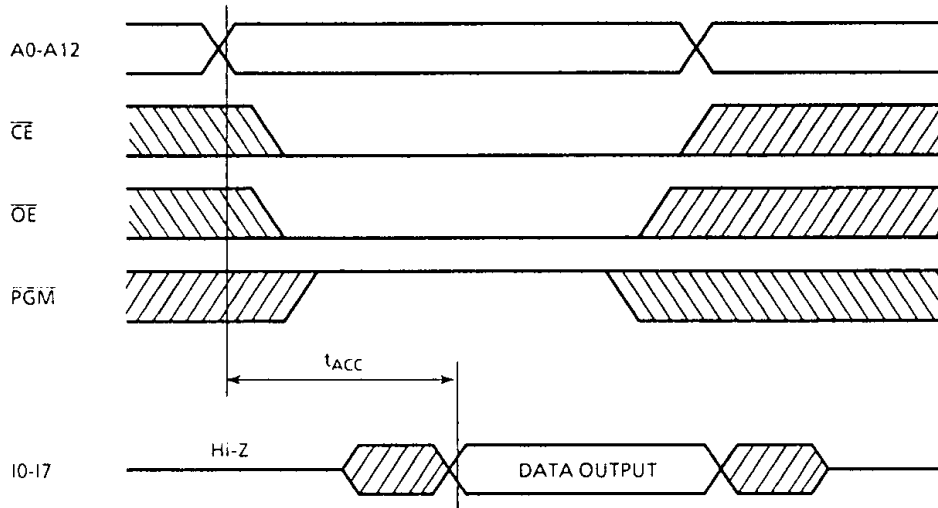
RECOMMENDED OSCILLATING CONDITIONS ($V_{SS} = 0V$, $V_{DD} = 4.5$ to $6.0V$, $T_{opr} = -40$ to $70^{\circ}C$)

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

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

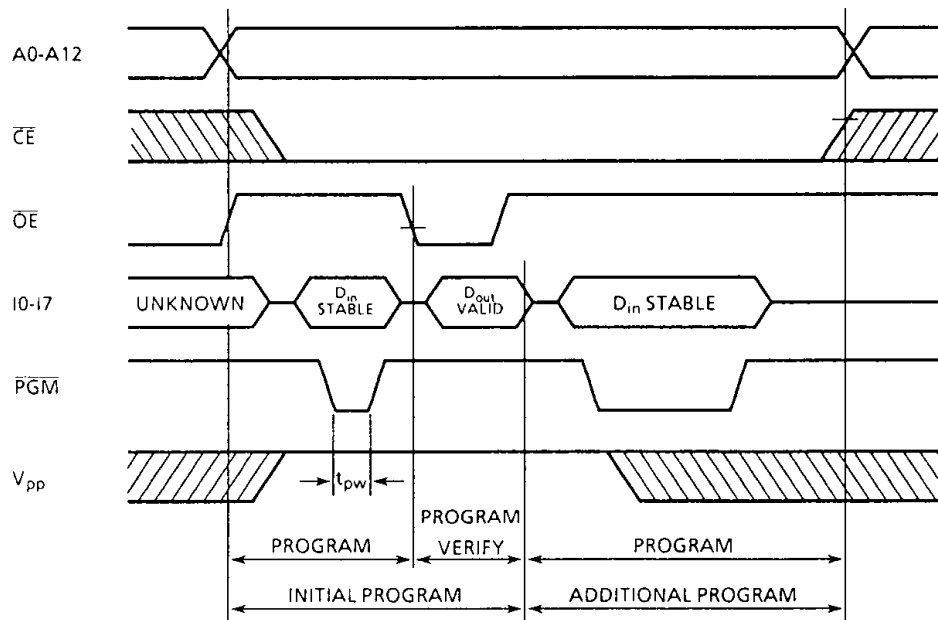
(1) Read Operation

| 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 | - | $V_{CC} \times 0.1$ | 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 | - | $V_{CC} \times 0.1$ | 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 μ A ($V_{DD} = 3V$) | T.B.D | — | 5mA ($V_{DD} = 5V$) | 8mA ($V_{DD} = 5V$) | — |

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

TYPICAL CHARACTERISTICS

