# OKI Semiconductor

1A

# MR27V801D

## 1,048,576-Word x 8-Bit One Time PROM

### DESCRIPTION

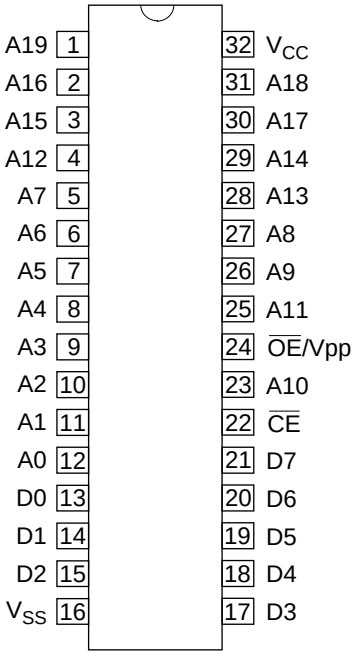
The MR27V801D is a 8Mbit electrically Programmable Read-Only Memory organized as 1,048,576 word x 8bit. The MR27V801D operates on a single +3V-3.3V power supply and is TTL compatible. Since the MR27V801D operates asynchronously , external clocks are not required , making this device easy-to-use. The MR27V801D is suitable as large-capacity fixed memory for microcomputers and data terminals. It is manufactured using a CMOS double silicon gate technology and is offered in 32-pin DIP, 32-pin SOP or 32-pin TSOP packages.

### FEATURES

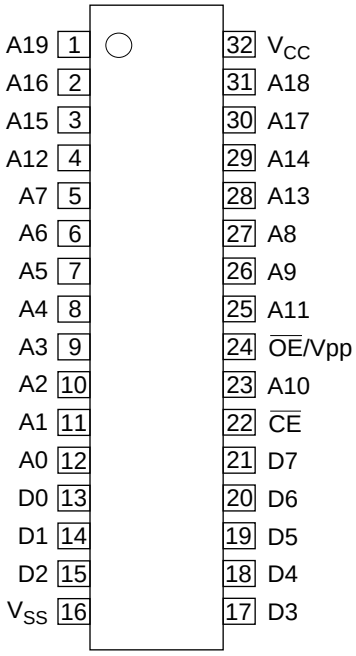
- 1,048,576 word x 8bit
- Single +3V-3.3V power supply
- Access time 100ns access time (Vcc=+3V)
  80ns access time (Vcc=+3.3V)
- Input / Output TTL compatible
- Three-state output
- Packages

| | |
|---|---|
| 32-pin plastic DIP (DIP32-P-600-2.54) | (Product name : MR27V801DRA) |
| 32-pin plastic SOP (SOP32-P-525-1.27-K) | (Product name : MR27V801DMA) |
| 32-pin plastic TSOP (TSOP I 32-P-814-0.50-K) | (Product name : MR27V801DTA) |

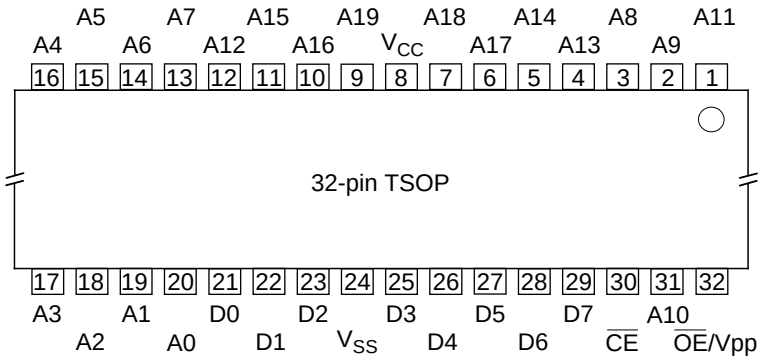
## PIN CONFIGURATION (TOP VIEW)




32-pin DIP

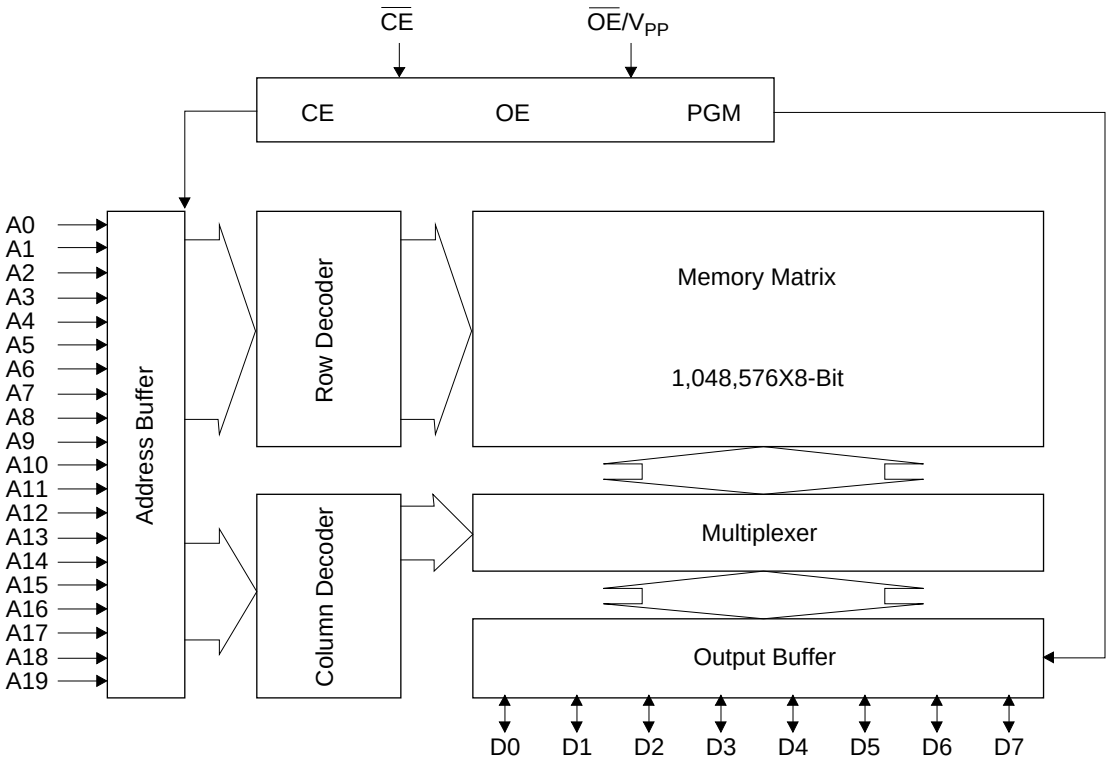



32-pin SOP




| PIN NAMES | FUNCTIONS |
|---|---|
| A0 - A19 | Address input |
| D0 - D7 | Data output |
| $\overline{CE}$ | Chip enable |
| $\overline{OE}/V_{PP}$ | Output enable / Program power supply voltage |
| $V_{CC}$ | Power supply voltage |
| $V_{SS}$ | GND |

## BLOCK DIAGRAM




## FUNCTION TABLE

| MODE | $\overline{CE}$ | $\overline{OE}/V_{PP}$ | $V_{CC}$ | D0 - D7 |
|---|---|---|---|---|
| READ | L | L | 3.0V to 3.3V | $D_{OUT}$ |
| OUTPUT DISABLE | L | H | | Hi-Z |
| STAND-BY | H | * | | Hi-Z |
| PROGRAM | L | 9.75V | 4.0V | $D_{IN}$ |
| PROGRAM INHIBIT | H | | | Hi-Z |
| PROGRAM VERIFY | L | L | | $D_{OUT}$ |

*: Don't Care

## ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | Condition | Value | Unit |
|---|---|---|---|---|
| Operating temperature under bias | Topr | - | 0 to 70 | °C |
| Storage temperature | $T_{stg}$ | | -55 to 125 | °C |
| Input voltage | $V_I$ | relative to $V_{SS}$ | -0.5 to $V_{CC}$ + 0.5 | V |
| Output voltage | $V_O$ | | -0.5 to $V_{CC}$ + 0.5 | V |
| Power supply voltage | $V_{CC}$ | | -0.5 to 5 | V |
| Program power supply voltage | $V_{PP}$ | | -0.5 to 11.5 | V |
| Power dissipation per package | $P_D$ | - | 1.0 | W |

## RECOMMENDED OPERATING CONDITIONS

(Ta=0 to 70°C)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ power supply voltage | $V_{CC}$ | $V_{CC}$=2.7V - 3.6V | 2.7 | - | 3.6 | V |
| $V_{PP}$ power supply voltage | $\overline{OE}/V_{PP}$ | | -0.5 | - | $V_{CC}$+0.5 | V |
| Input "H" level | $V_{IH}$ | | 2.2 | - | $V_{CC}$+0.5* | V |
| Input "L" level | $V_{IL}$ | | -0.5** | - | 0.6 | V |

Voltage is relative to Vss

* : Vcc+1.5V (Max.) when pulse width of overshoot is less than 10nS.

** : -1.5V (Min.) when pulse width of undershoot is less than 10nS.

## ELECTRICAL CHARACTERISTICS (Read operation)

### DC Characteristics 1

($V_{CC}$=3V±0.3V, Ta=0 to 70°C)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input leakage current | $I_{LI}$ | $V_I$=0 to Vcc | - | - | 10 | µA |
| Output leakage current | $I_{LO}$ | $V_O$=0 to Vcc | - | - | 10 | µA |
| $V_{CC}$ power supply current (Standby) | $I_{CCSC}$ | $\overline{CE}$=$V_{CC}$ | - | - | 50 | µA |
| | $I_{CCST}$ | $\overline{CE}$=$V_{IH}$ | - | - | 1 | mA |
| $V_{CC}$ power supply current (Read) | $I_{CCA}$ | $\overline{CE}$=$V_{IL}$, $\overline{OE}$/$V_{PP}$=$V_{IH}$ tc=100ns | - | - | 25 | mA |
| $V_{PP}$ power supply current | $I_{PP}$ | $\overline{OE}$/$V_{PP}$=$V_{CC}$ | - | - | 10 | µA |
| Input "H" level | $V_{IH}$ | - | 2.2 | - | $V_{CC}$+0.5* | V |
| Input "L" level | $V_{IL}$ | - | -0.5** | - | 0.6 | V |
| Output "H" level | $V_{OH}$ | $I_{OH}$=-400µA | 2.4 | - | - | V |
| Output "L" level | $V_{OL}$ | $I_{OL}$=2.1mA | - | - | 0.4 | V |

Voltage is relative to Vss

* : Vcc+1.5V (Max.) when pulse width of overshoot is less than 10nS.

** : -1.5V (Min.) when pulse width of undershoot is less than 10nS.

### DC Characteristics 2

($V_{CC}$=3.3V±0.3V, Ta=0 to 70°C)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input leakage current | $I_{LI}$ | $V_I$=0 to Vcc | - | - | 10 | µA |
| Output leakage current | $I_{LO}$ | $V_O$=0 to Vcc | - | - | 10 | µA |
| $V_{CC}$ power supply current (Standby) | $I_{CCSC}$ | $\overline{CE}$=$V_{CC}$ | - | - | 50 | µA |
| | $I_{CCST}$ | $\overline{CE}$=$V_{IH}$ | - | - | 1 | mA |
| $V_{CC}$ power supply current (Read) | $I_{CCA}$ | $\overline{CE}$=$V_{IL}$, $\overline{OE}$/$V_{PP}$=$V_{IH}$ tc=80ns | - | - | 30 | mA |
| $V_{PP}$ power supply current | $I_{PP}$ | $\overline{OE}$/$V_{PP}$=$V_{CC}$ | - | - | 10 | µA |
| Input "H" level | $V_{IH}$ | - | 2.2 | - | $V_{CC}$+0.5* | V |
| Input "L" level | $V_{IL}$ | - | -0.5** | - | 0.6 | V |
| Output "H" level | $V_{OH}$ | $I_{OH}$=-400µA | 2.4 | - | - | V |
| Output "L" level | $V_{OL}$ | $I_{OL}$=2.1mA | - | - | 0.4 | V |

Voltage is relative to Vss

* : Vcc+1.5V (Max.) when pulse width of overshoot is less than 10nS.

** : -1.5V (Min.) when pulse width of undershoot is less than 10nS.

**AC Characteristics 1**

($V_{CC}$=3V±0.3V, Ta=0 to 70°C)

| Parameter | Symbol | Condition | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Address cycle time | $T_C$ | - | 100 | - | ns |
| Address access time | $T_{ACC}$ | $\overline{CE}$=$\overline{OE}$/$V_{PP}$=$V_{IL}$ | - | 100 | ns |
| $\overline{CE}$ access time | $T_{CE}$ | $\overline{OE}$/$V_{PP}$=$V_{IL}$ | - | 100 | ns |
| $\overline{OE}$ access time | $T_{OE}$ | $\overline{CE}$=$V_{IL}$ | - | 50 | ns |
| Output disable time | $T_{CHZ}$ | $\overline{OE}$/$V_{PP}$=$V_{IL}$ | 0 | 30 | ns |
| | $T_{OHZ}$ | $\overline{CE}$=$V_{IL}$ | 0 | 25 | ns |
| Output hold time | $T_{OH}$ | $\overline{CE}$=$\overline{OE}$/$V_{PP}$=$V_{IL}$ | 0 | - | ns |

Measurement conditions

Input signal level ---------- 0V/3V
Input timing reference level ---------- 0.8V/2.0V
Output load ---------- 100pF
Output timing reference level ---------- 0.8V/2.0V

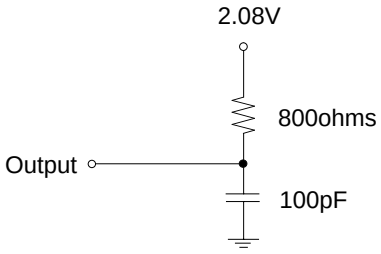
**AC Characteristics 2**

($V_{CC}$=3.3V±0.3V, Ta=0 to 70°C)

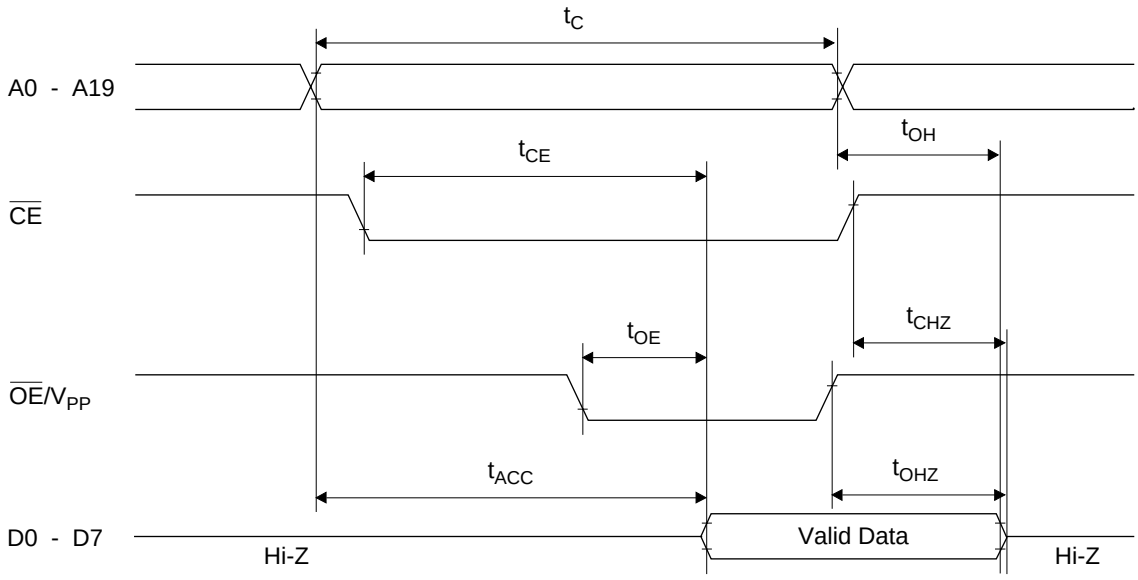
| Parameter | Symbol | Condition | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Address cycle time | $T_C$ | - | 80 | - | ns |
| Address access time | $T_{ACC}$ | $\overline{CE}$=$\overline{OE}$/$V_{PP}$=$V_{IL}$ | - | 80 | ns |
| $\overline{CE}$ access time | $T_{CE}$ | $\overline{OE}$/$V_{PP}$=$V_{IL}$ | - | 80 | ns |
| $\overline{OE}$ access time | $T_{OE}$ | $\overline{CE}$=$V_{IL}$ | - | 40 | ns |
| Output disable time | $T_{CHZ}$ | $\overline{OE}$/$V_{PP}$=$V_{IL}$ | 0 | 30 | ns |
| | $T_{OHZ}$ | $\overline{CE}$=$V_{IL}$ | 0 | 25 | ns |
| Output hold time | $T_{OH}$ | $\overline{CE}$=$\overline{OE}$/$V_{PP}$=$V_{IL}$ | 0 | - | ns |

Measurement conditions

Input signal level ---------- 0V/3V
Input timing reference level ---------- 0.8V/2.0V
Output load ---------- 100pF
Output timing reference level ---------- 0.8V/2.0V



**TIMING CHART (READ CYCLE)**




**PIN Capacitance**

($V_{CC}$=3.3V, Ta=25°C, f=1MHz)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input | $C_{IN1}$ | $V_I$=0V | - | - | 8 (10) | pF |
| $\overline{OE}/V_{PP}$ | $C_{IN2}$ | | - | - | 60 | |
| Output | $C_{OUT}$ | $V_O$=0V | - | - | 10 (12) | |

( ) : DIP only

## ELECTRICAL CHARACTERISTICS (Programming operation)

### DC Characteristics

(Ta=25°C±5°C)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input leakage current | $I_{LI}$ | $V_I=V_{CC}+0.5V$ | - | - | 10 | µA |
| $V_{PP}$ power supply current (Program) | $I_{PP2}$ | $\overline{CE}=V_{IL}$ | - | - | 50 | mA |
| $V_{CC}$ power supply current | $I_{CC}$ | - | - | - | 50 | mA |
| Input "H" level | $V_{IH}$ | - | 3.0 | - | $V_{CC}+0.5$ | V |
| Input "L" level | $V_{IL}$ | - | -0.5 | - | 0.8 | V |
| Output "H" level | $V_{OH}$ | $I_{OH}=-400µA$ | 2.4 | - | - | V |
| Output "L" level | $V_{OL}$ | $I_{OL}=2.1mA$ | - | - | 0.45 | V |
| Program voltage | $V_{PP}$ | - | 9.5 | 9.75 | 10.0 | V |
| $V_{CC}$ power supply voltage | $V_{CC}$ | - | 3.9 | 4.0 | 4.1 | V |

Voltage is relative to Vss

### AC Characteristics

($V_{cc}$=4.0V±0.1V,$V_{pp}$=9.75V±0.25V,Ta=25°C±5°C)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Address set-up time | $T_{AS}$ | - | 100 | - | - | ns |
| Data set-up time | $T_{DS}$ | - | 100 | - | - | ns |
| Address hold time | $T_{AH}$ | - | 2 | - | - | µs |
| Data hold time | $T_{DH}$ | - | 100 | - | - | ns |
| Output float delay from $\overline{CE}$ | $T_{CHZ}$ | - | 0 | - | 100 | ns |
| $V_{PP}$ voltage set-up time | $T_{VS}$ | - | 2 | - | - | µs |
| Program pulse width | $T_{PW}$ | - | 9 | 10 | 11 | µs |
| Data valid from $\overline{CE}$ | $T_{CE}$ | - | - | - | 100 | ns |
| Address hold from $\overline{CE}$ high | $T_{AHC}$ | - | 0 | - | - | ns |
| $V_{PP}$ voltage recovery time | $T_{VR}$ | - | 2 | - | - | µs |

### Pin Check Function

Pin Check Function is to check contact between each device-pin and each socket-lead with EPROM programmer.

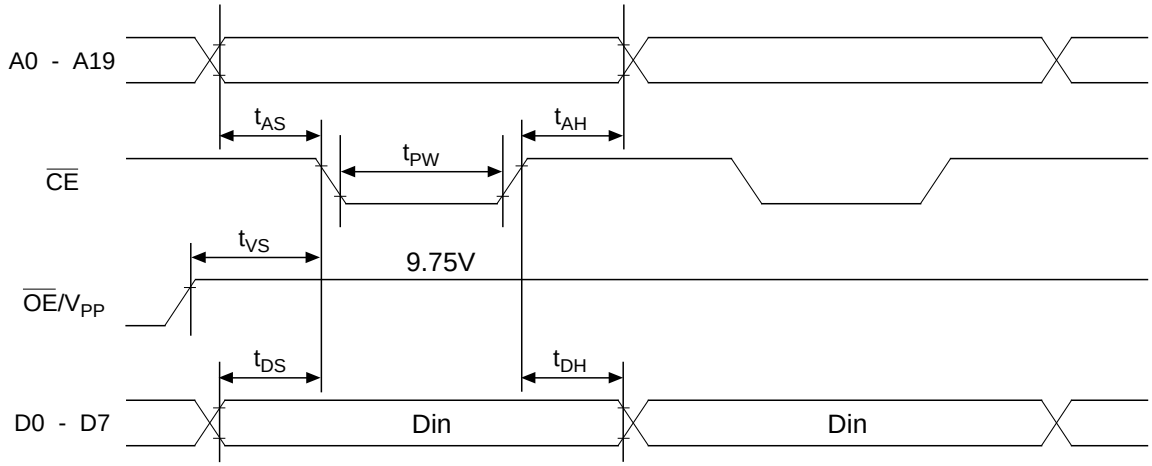
Setting up address as the following condition call the preprogrammed codes on device outputs.

($V_{cc}$=3.3V±0.3V,$\overline{CE}=V_{IL}$,$\overline{OE}/V_{pp}=V_{IL}$,Ta=25°C±5°C)

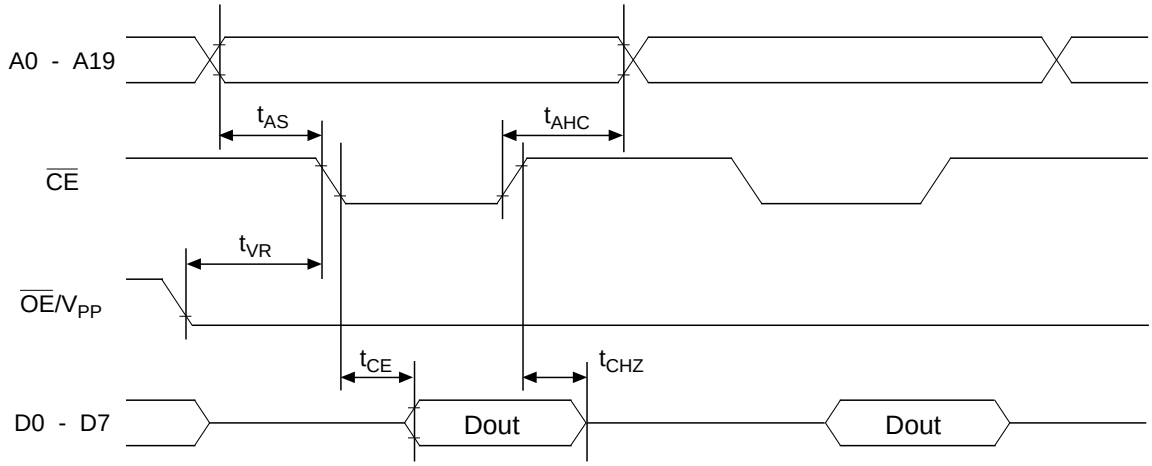
| A0 | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | A11 | A12 | A13 | A14 | A15 | A16 | A17 | A18 | A19 | DATA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | VH* | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | AA |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | VH* | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 55 |
| Other conditions | | | | | | | | | | | | | | | | | | | | FF |

* :VH=8V±0.25V

**Consecutive Programming Waveforms**




**Consecutive Program Verify Waveforms**



**Programming / Verify Flow Chart**