

MR27V401D

524,288-Word x 8-Bit One Time PROM

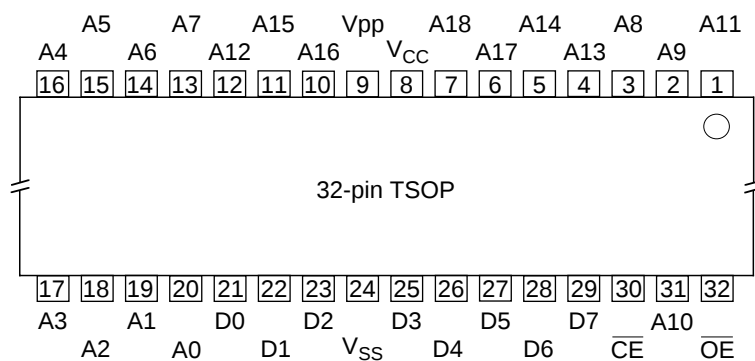
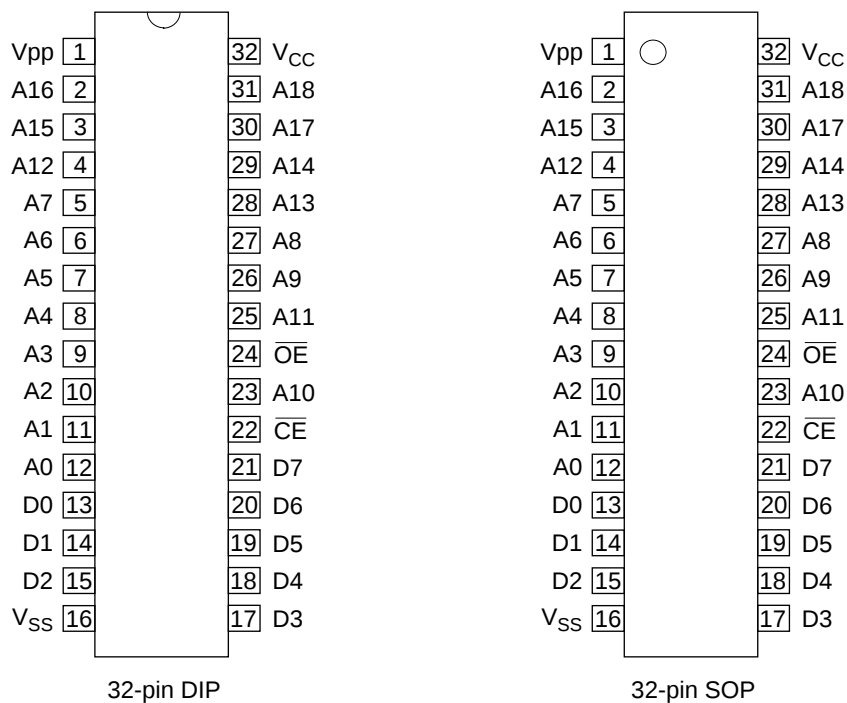
DESCRIPTION

The MR27V401D is a 4Mbit electrically Programmable Read-Only Memory organized as 524,288 word x 8bit. The MR27V401D operates on a single +3V-3.3V power supply and is TTL compatible. Since the MR27V401D operates asynchronously, external clocks are not required, making this device easy-to-use. The MR27V401D 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

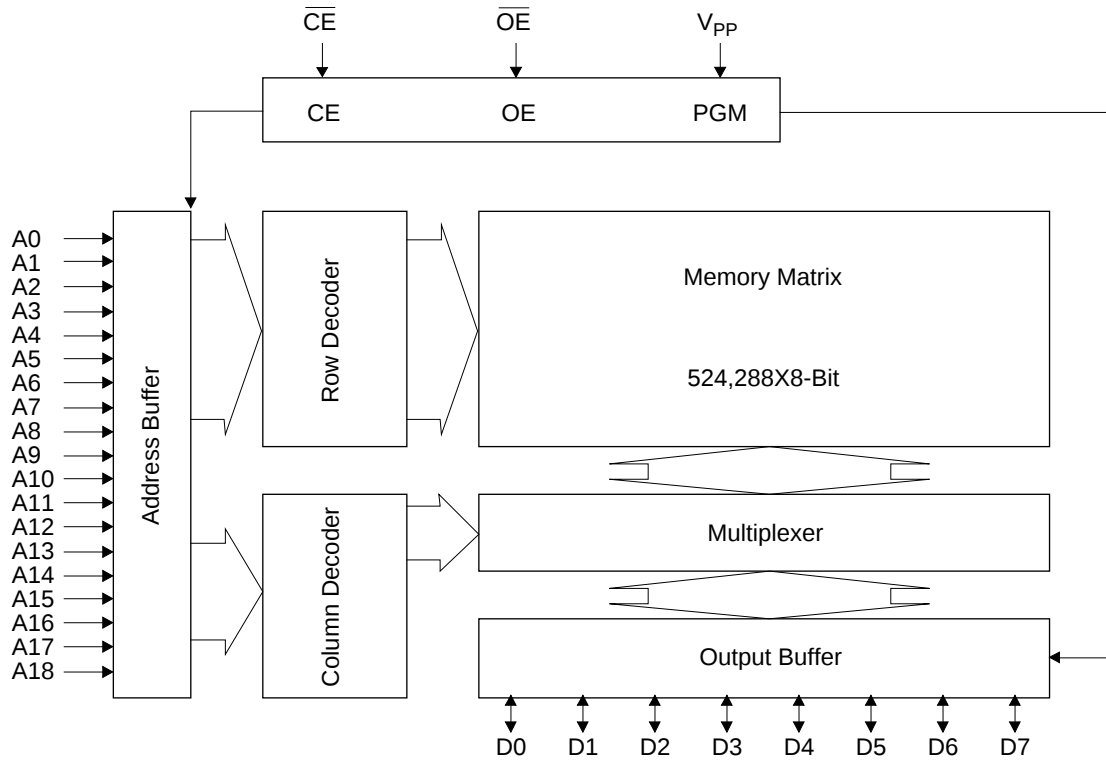
- 524,288 word x 8bit
- Single +3V-3.3V power supply
- Access time 80ns access time (Vcc=+3V)
 70ns access time (Vcc=+3.3V)
- Input / Output TTL compatible
- Three-state output
- Packages
 - 32-pin plastic DIP (DIP32-P-600-2.54) (Product name : MR27V401DRA)
 - 32-pin plastic SOP (SOP32-P-525-1.27-K) (Product name : MR27V401DMA)
 - 32-pin plastic TSOP (TSOP I 32-P-814-0.50-K) (Product name : MR27V401DTA)

PIN CONFIGURATION (TOP VIEW)



PIN NAMES	FUNCTIONS
A0 - A18	Address input
D0 - D7	Data output
C _E	Chip enable
O _E	Output enable
V _{CC}	Power supply voltage
V _{SS}	GND
V _{PP}	Program Power supply voltage

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	H	9.75V	4.0V	D_{IN}
PROGRAM INHIBIT	H	H			Hi-Z
PROGRAM VERIFY	H	L			D_{OUT}

* : Don't Care (H or L)

** : Don't Care (H or L or Open)

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Value	Unit
Operating temperature under bias	T_{opr}	-	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	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 V_{SS} * : $V_{CC}+1.5V$ (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

($V_{CC}=3V\pm0.3V$, $T_a=0$ to $70^{\circ}C$)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input leakage current	I_{LI}	$V_I=0$ to V_{CC}	-	-	10	μA
Output leakage current	I_{LO}	$V_O=0$ to V_{CC}	-	-	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}	$\overline{CE}=V_{IL}$, $\overline{OE}=V_{IH}$ $t_c=80ns$	-	-	20	mA
V_{PP} power supply current	I_{PP}	$V_{PP}=V_{CC}$	-	-	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}	$I_{OH}=-400\mu A$	2.4	-	-	V
Output "L" level	V_{OL}	$I_{OL}=2.1mA$	-	-	0.4	V

Voltage is relative to V_{SS}

* : $V_{CC}+1.5V$ (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

($V_{CC}=3.3V\pm0.3V$, $T_a=0$ to $70^{\circ}C$)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input leakage current	I_{LI}	$V_I=0$ to V_{CC}	-	-	10	μA
Output leakage current	I_{LO}	$V_O=0$ to V_{CC}	-	-	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}	$\overline{CE}=V_{IL}$, $\overline{OE}=V_{IH}$ $t_c=70ns$	-	-	25	mA
V_{PP} power supply current	I_{PP}	$V_{PP}=V_{CC}$	-	-	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}	$I_{OH}=-400\mu A$	2.4	-	-	V
Output "L" level	V_{OL}	$I_{OL}=2.1mA$	-	-	0.4	V

Voltage is relative to V_{SS}

* : $V_{CC}+1.5V$ (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	-	80	-	ns
Address access time	T _{ACC}	$\overline{CE}=\overline{OE}=V_{IL}$	-	80	ns
$\overline{CE}$ access time	T _{CE}	$\overline{OE}=V_{IL}$	-	80	ns
$\overline{OE}$ access time	T _{OE}	$\overline{CE}=V_{IL}$	-	40	ns
Output disable time	T _{CHZ}	$\overline{OE}=V_{IL}$	0	30	ns
	T _{OHZ}	$\overline{CE}=V_{IL}$	0	25	ns
Output hold time	T _{OH}	$\overline{CE}=\overline{OE}=V_{IL}$	0	-	ns

Measurement conditions

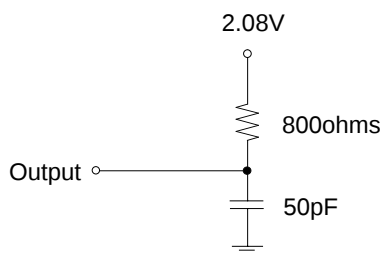
Input signal level	-----	0V/3V
Input timing reference level	-----	0.8V/2.0V
Output load	-----	50pF
Output timing reference level	-----	0.8V/2.0V

AC Characteristics 2(V_{CC}=3.3V±0.3V, Ta=0 to 70°C)

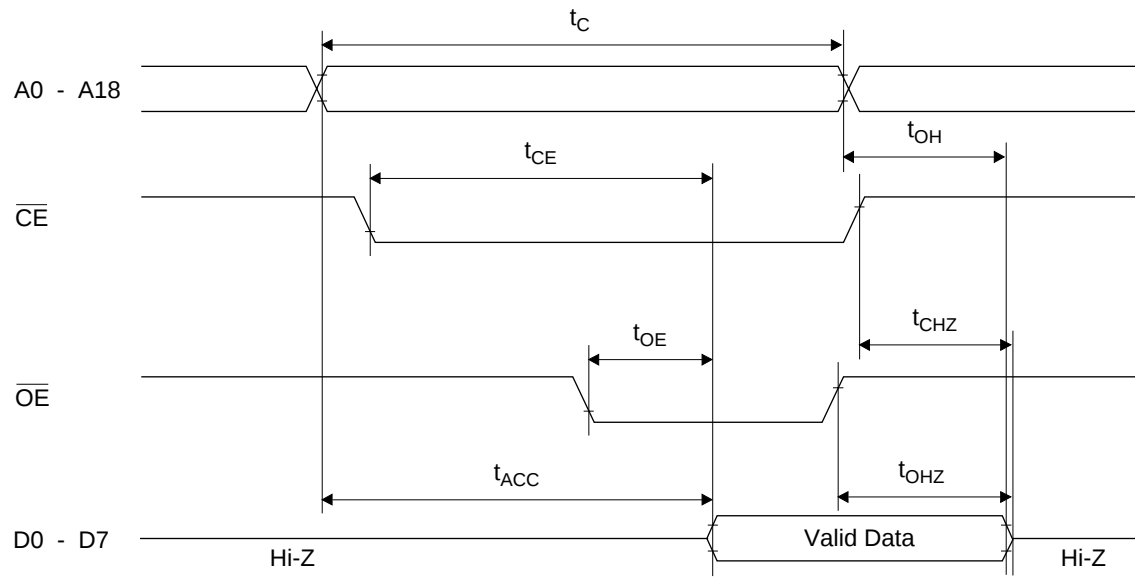
Parameter	Symbol	Condition	Min.	Max.	Unit
Address cycle time	T _C	-	70	-	ns
Address access time	T _{ACC}	$\overline{CE}=\overline{OE}=V_{IL}$	-	70	ns
$\overline{CE}$ access time	T _{CE}	$\overline{OE}=V_{IL}$	-	70	ns
$\overline{OE}$ access time	T _{OE}	$\overline{CE}=V_{IL}$	-	35	ns
Output disable time	T _{CHZ}	$\overline{OE}=V_{IL}$	0	30	ns
	T _{OHZ}	$\overline{CE}=V_{IL}$	0	25	ns
Output hold time	T _{OH}	$\overline{CE}=\overline{OE}=V_{IL}$	0	-	ns

Measurement conditions

Input signal level	-----	0V/3V
Input timing reference level	-----	0.8V/2.0V
Output load	-----	50pF
Output timing reference level	-----	0.8V/2.0V



TIMING CHART (READ CYCLE)



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}	$I_{OH} = -400\mu A$	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
$\overline{OE}$ set-up time	T_{OES}	-	2	-	-	μs
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 $\overline{OE}$	T_{OHZ}	-	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 $\overline{OE}$	T_{OE}	-	-	-	100	ns
Address hold from $\overline{OE}$ high	T_{AHO}	-	0	-	-	ns

Pin Check Function

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

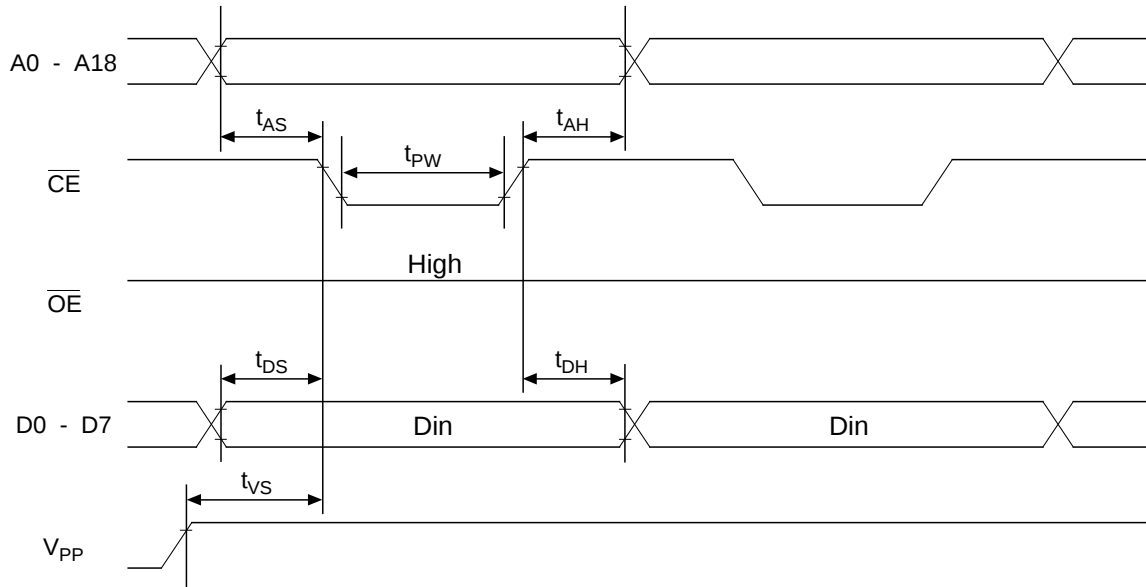
Setting up address as the following condition call the preprogrammed codes on device outputs.

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

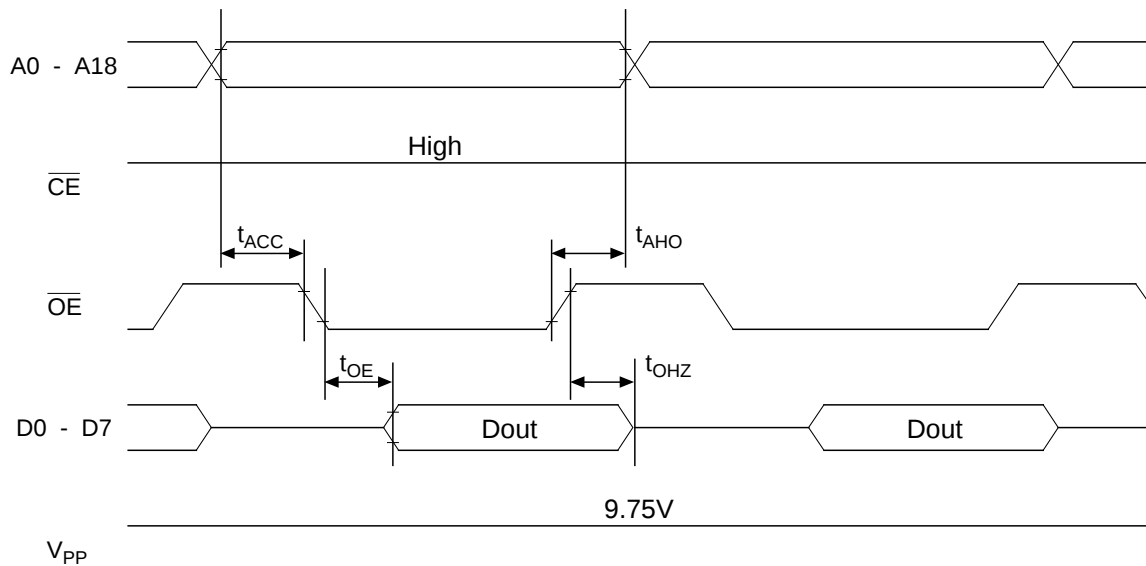
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	DATA
0	1	0	1	0	1	0	1	0	VH*	1	1	0	1	0	1	0	1	0	AA
1	0	1	0	1	0	1	0	1	VH*	0	0	1	0	1	0	1	0	1	55
Other conditions																			FF

*: VH=8V±0.25V

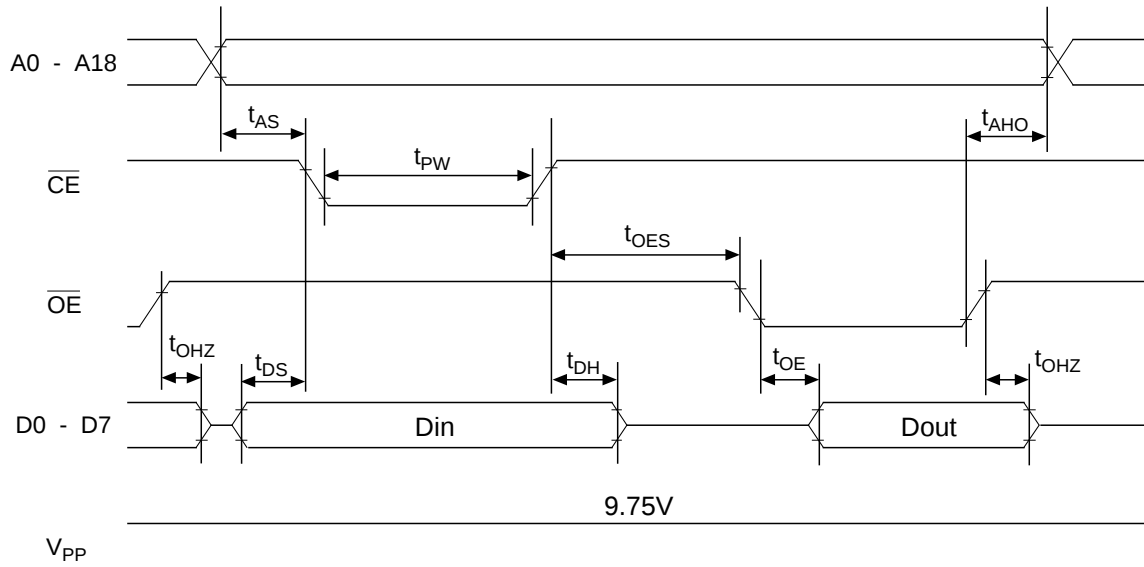
Consecutive Programming Waveforms



Consecutive Program Verify Waveforms



Program and Program Verify Cycle Waveforms



PIN Capacitance

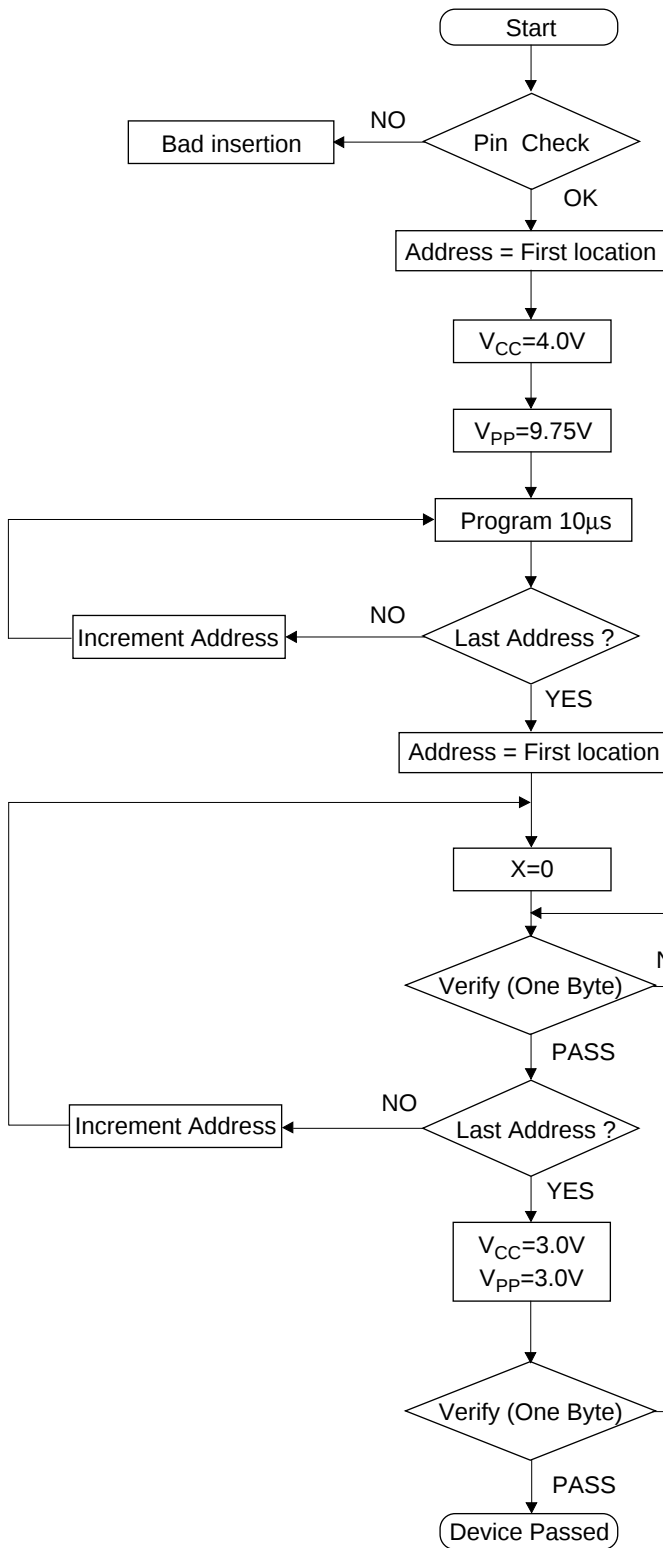
($V_{CC}=3.3V$, $T_a=25^{\circ}C$, $f=1MHz$)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input	C_{IN}	$V_I=0V$	-	-	8 (10)	pF
Output	C_{OUT}	$V_O=0V$	-	-	10 (12)	

() : DIP only

Programming / Verify Flow Chart

Programming



Verify

