MR27V1602D

1,048,576-Word x 16-Bit or 2,097,152-Word x 8-Bit One Time PROM

DESCRIPTION

The MR27V1602D is a 16Mbit electrically Programmable Read-Only Memory whose configuration can be electrically switched between 1,048,576 word x 16bit and 2,097,152 word x 8bit. The MR27V1602D operates on a single +3V-3.3V power supply and is TTL compatible. Since the MR27V1602D operates asynchronously , external clocks are not required , making this device easy-to-use. The MR27V1602D 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 42-pin DIP, 44-pin SOP, 44-pin TSOP or 48-pin TSOP packages.

FEATURES

- 1,048,576 word x 16bit / 2,097,152 word x 8bit electrically switchable configuration
- Single +3V-3.3V power supply
- Access time   100ns access time (Vcc=+3V)
                           80ns access time (Vcc=+3.3V)
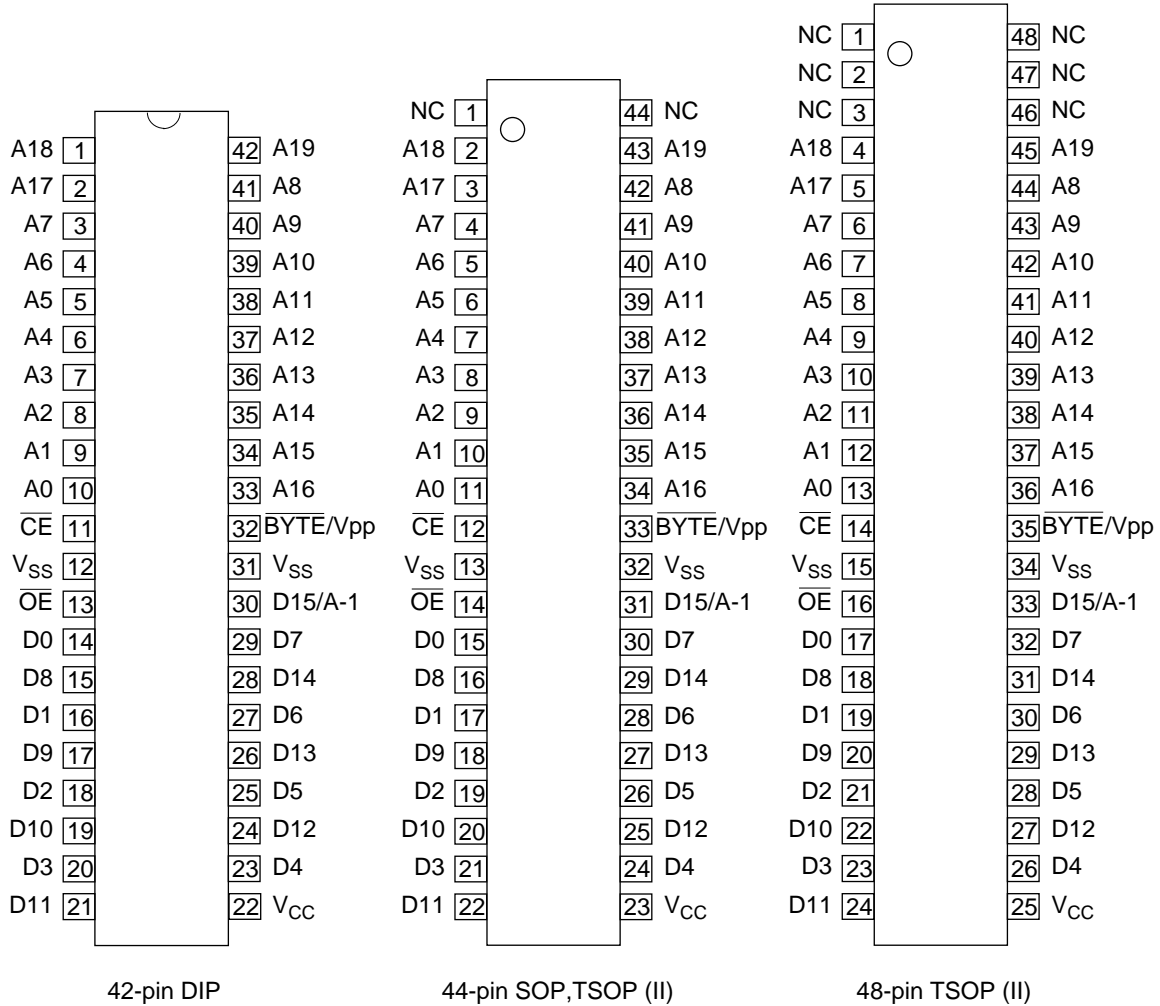- Input / Output TTL compatible
- Three-state output
- Packages

|		
42-pin plastic DIP (DIP42-P-600-2.54)	(Product name : MR27V1602DRA)	
44-pin plastic SOP (SOP44-P-600-1.27-K)	(Product name : MR27V1602DMA)	
44-pin plastic TSOP (TSOP II 44-P-400-0.80-K)	(Product name : MR27V1602DTP)	
48-pin plastic TSOP (TSOP II 48-P-550-0.80-K)	(Product name : MR27V1602DTA)	

PIN CONFIGURATION (TOP VIEW)

42-pin DIP

A18	1	42	A19
A17	2	41	A8
A7	3	40	A9
A6	4	39	A10
A5	5	38	A11
A4	6	37	A12
A3	7	36	A13
A2	8	35	A14
A1	9	34	A15
A0	10	33	A16
$\overline{CE}$	11	32	$\overline{BYTE}$/Vpp
V_{SS}	12	31	V_{SS}
$\overline{OE}$	13	30	D15/A-1
D0	14	29	D7
D8	15	28	D14
D1	16	27	D6
D9	17	26	D13
D2	18	25	D5
D10	19	24	D12
D3	20	23	D4
D11	21	22	V_{CC}

44-pin SOP,TSOP (II)

NC	1	44	NC
A18	2	43	A19
A17	3	42	A8
A7	4	41	A9
A6	5	40	A10
A5	6	39	A11
A4	7	38	A12
A3	8	37	A13
A2	9	36	A14
A1	10	35	A15
A0	11	34	A16
$\overline{CE}$	12	33	$\overline{BYTE}$/Vpp
V_{SS}	13	32	V_{SS}
$\overline{OE}$	14	31	D15/A-1
D0	15	30	D7
D8	16	29	D14
D1	17	28	D6
D9	18	27	D13
D2	19	26	D5
D10	20	25	D12
D3	21	24	D4
D11	22	23	V_{CC}

48-pin TSOP (II)

NC	1	48	NC
NC	2	47	NC
NC	3	46	NC
A18	4	45	A19
A17	5	44	A8
A7	6	43	A9
A6	7	42	A10
A5	8	41	A11
A4	9	40	A12
A3	10	39	A13
A2	11	38	A14
A1	12	37	A15
A0	13	36	A16
$\overline{CE}$	14	35	$\overline{BYTE}$/Vpp
V_{SS}	15	34	V_{SS}
$\overline{OE}$	16	33	D15/A-1
D0	17	32	D7
D8	18	31	D14
D1	19	30	D6
D9	20	29	D13
D2	21	28	D5
D10	22	27	D12
D3	23	26	D4
D11	24	25	V_{CC}

PIN NAMES	FUNCTIONS
D15/A-1	Data output / Address input
A0-A19	Address input
D0-D14	Data output
$\overline{CE}$	Chip enable
$\overline{OE}$	Output enable
V_{CC}	Power supply voltage
V_{SS}	GND
$\overline{BYTE}$/V_{PP}	Mode switch / Program power supply voltage
NC	Non connection

BLOCK DIAGRAM
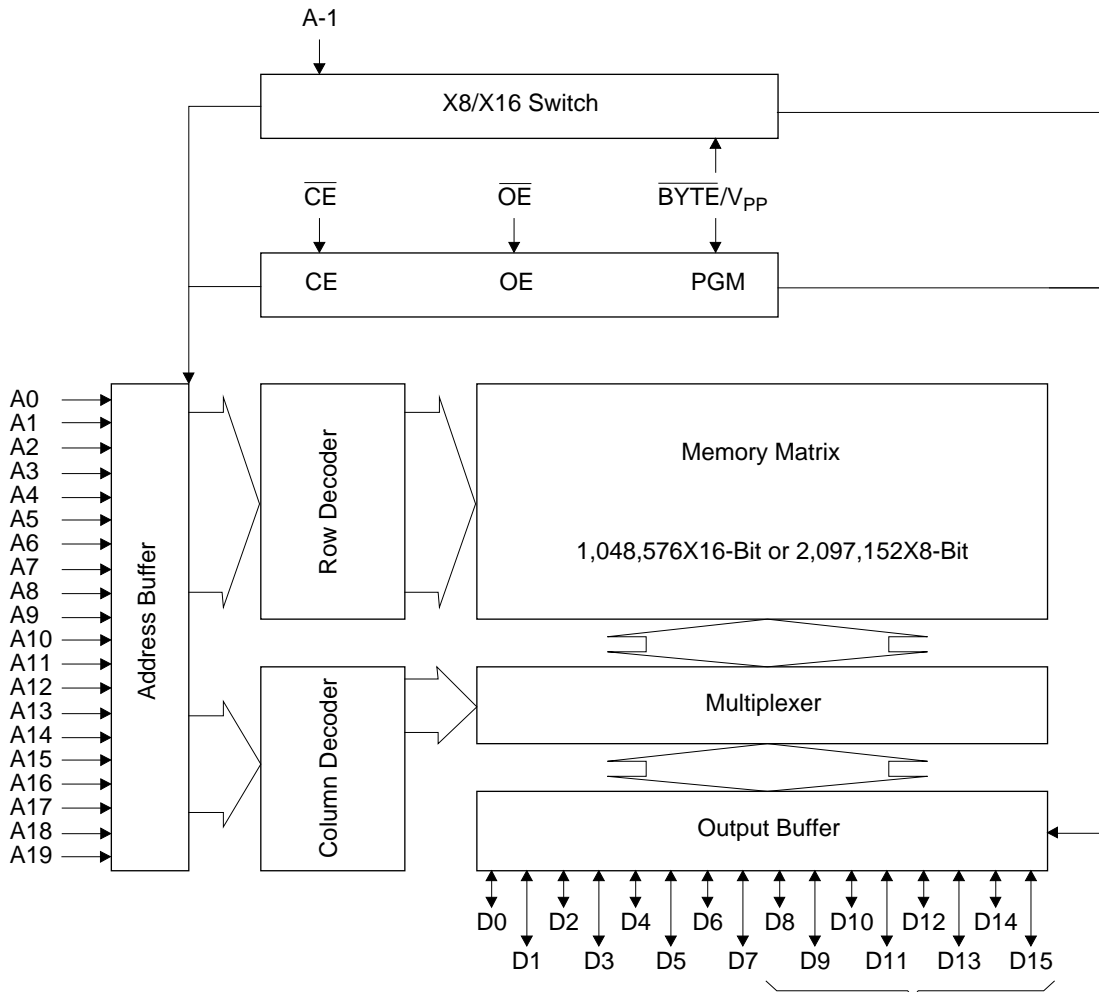
In 8-bit output mode, these pins are three-stated and pin D15 functions as the A-1 address pin.

FUNCTION TABLE

MODE	$\overline{CE}$	$\overline{OE}$	$\overline{BYTE}$/V_{PP}	V_{CC}	D0 - D7	D8 - D14	D15/A-1
READ (16-Bit)	L	L	H	3.0V to 3.3V	D_{OUT}		
READ (8-Bit)	L	L	L		D_{OUT}	Hi-Z	L/H
OUTPUT DISABLE	L	H	H			Hi-Z	
			L				*
STAND-BY	H	*	H			Hi-Z	
			L				*
PROGRAM	L	H	9.75V	4.0V	D_{IN}		
PROGRAM INHIBIT	H	H			Hi-Z		
PROGRAM VERIFY	H	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		-0.5 to V_{CC}+ 0.5	V
Output voltage	V_O	relative to V_{SS}	-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}		2.7	-	3.6	V
V_{PP} power supply voltage	V_{PP}	V_{CC}=2.7V-3.6V	-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_{IH} tc=100ns	-	-	35	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}=-400uA	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_{IH} tc=80ns	-	-	40	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}=-400uA	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)

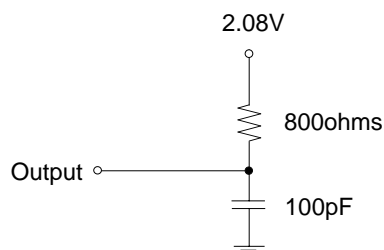| Parameter	Symbol	Condition	Min.	Max.	Unit
Address cycle time	T_C	-	100	-	ns
Address access time	T_{ACC}	$\overline{CE}=\overline{OE}=V_{IL}$	-	100	ns
$\overline{CE}$ access time	T_{CE}	$\overline{OE}=V_{IL}$	-	100	ns
$\overline{OE}$ access time	T_{OE}	$\overline{CE}=V_{IL}$	-	50	ns
Output disable time	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 - 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}	$\overline{CE}=\overline{OE}=V_{IL}$	-	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 - 100pF
Output timing reference level - - - - - - - - - - 0.8V/2.0V

2.08V

800ohms

Output

100pF

TIMING CHART (READ CYCLE)

16-Bit Read Mode ($\overline{\text{BYTE}}=V_{IH}$)
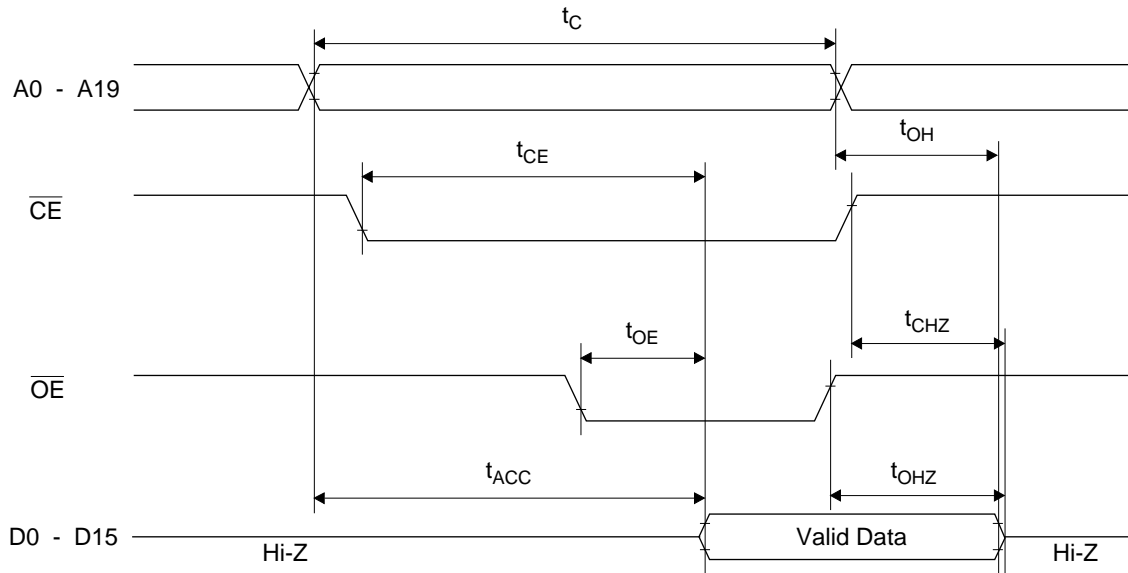
8-Bit Read Mode ($\overline{\text{BYTE}}=V_{IL}$)
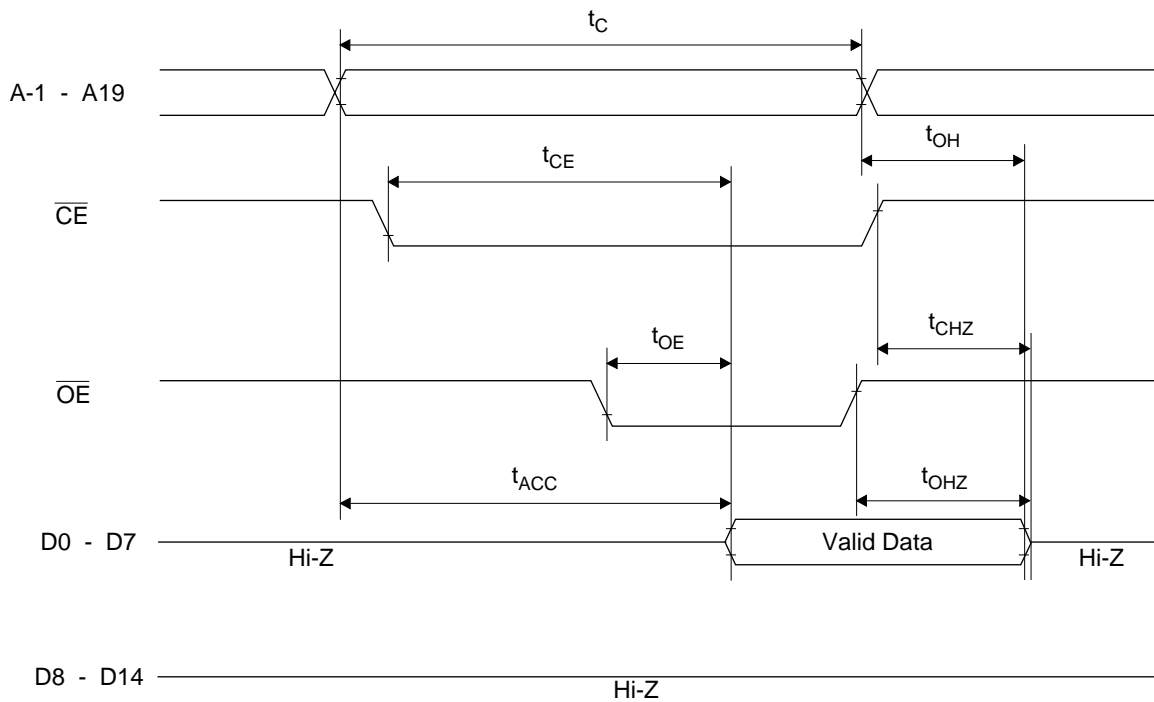
ELECTRICAL CHARACTERISTICS (Programming operation)

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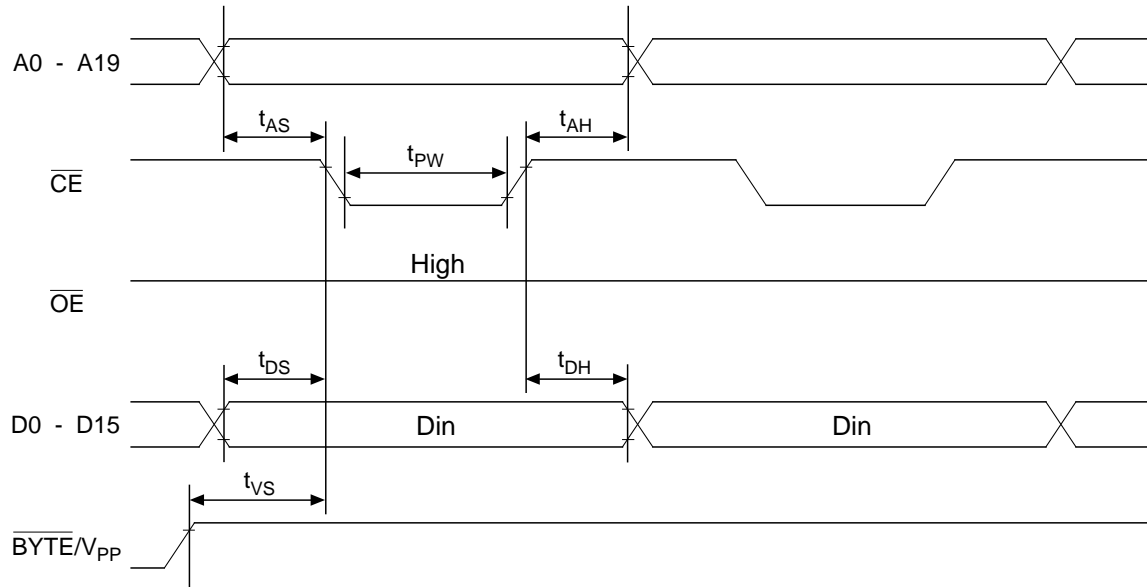
(V_{CC}=3.3V±0.3V,$\overline{CE}$=$\overline{OE}$=V_{IL},$\overline{BYTE}$/V_{pp}=V_{IH},Ta=25°C±5°C)

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*	0	1	0	1	0	1	0	0	1	1	FF00
1	0	1	0	1	0	1	0	1	VH*	1	0	1	0	1	0	1	1	0	0	00FF
Other conditions																				FFFF

* :VH=8V±0.25V

Consecutive Programming Waveforms

A0 - A19

t_{AS} t_{PW} t_{AH}

$\overline{CE}$

High

$\overline{OE}$

t_{DS} t_{DH}

D0 - D15   Din   Din

t_{VS}

$\overline{BYTE}/V_{PP}$

Consecutive Program Verify Waveforms

A0 - A19

High

$\overline{CE}$

t_{ACC} t_{AHO}

$\overline{OE}$

t_{OE} t_{OHZ}

D0 - D15   Dout   Dout

9.75V
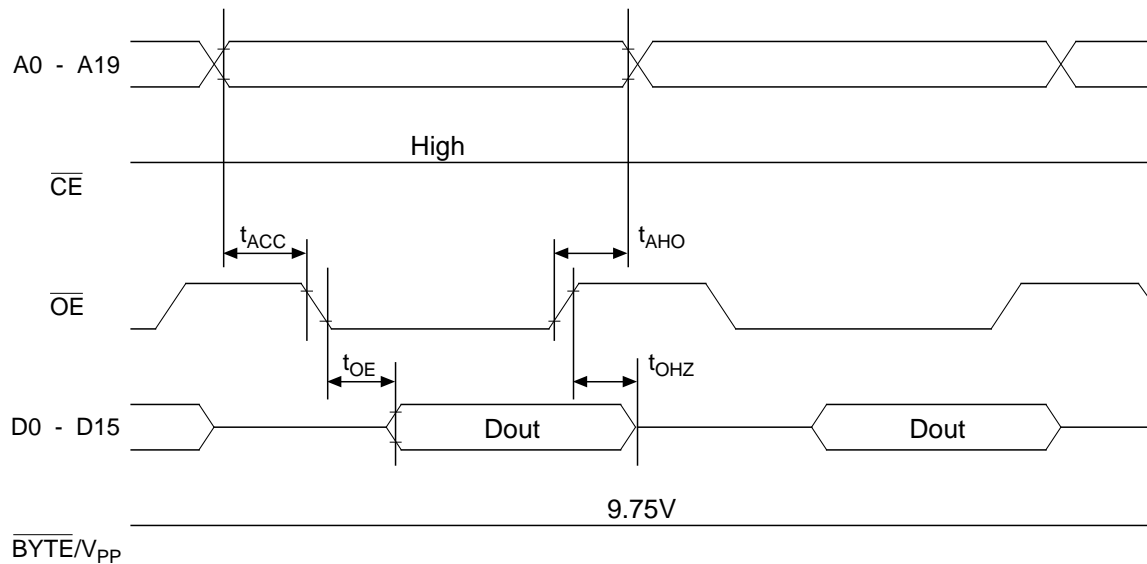
$\overline{BYTE}/V_{PP}$

Program and Program Verify Cycle Waveforms
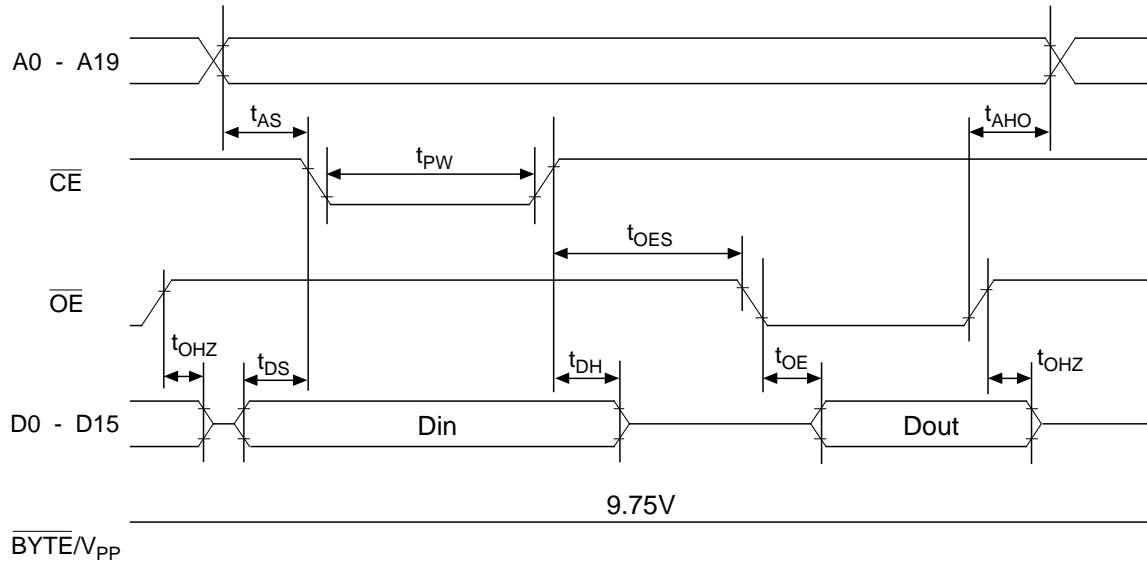
PIN Capacitance

$(V_{CC}=3.3V, Ta=25°C, f=1MHz)$

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input	C_{IN1}	$V_I=0V$	-	-	8 (10)	
$\overline{BYTE}/V_{PP}$	C_{IN2}		-	-	120	pF
Output	C_{OUT}	$V_O=0V$	-	-	10 (12)	

( ) : DIP only

Programming / Verify Flow Chart

Programming

Verify

Start → Pin Check

- NO → Bad insertion
- OK → Address = First location

V_{CC}=4.0V

V_{PP}=9.75V

Program 10μs

Last Address ?
- NO → Increment Address
- YES → Address = First location

X=0

Verify (One Byte)
- NG → X=X+1 → X=2?
  - YES → Device Failed
  - NO → Program 10μs
- PASS → Last Address ?
  - NO → Increment Address
  - YES → V_{CC}=3.0V, V_{PP}=3.0V

Verify (One Byte)
- NG → Device Failed
- PASS → Device Passed

Verify

Start → Pin Check
- NO → Bad insertion
- OK → Address = First location

V_{CC}=3.0V
V_{PP}=3.0V

Verify (One Byte)
- NG → Device Failed
- PASS → V_{CC}=3.6V, V_{PP}=3.6V

Verify (One Byte)
- NG → Device Failed
- PASS → Device Passed

11/11