

MR27V1602E**Preliminary****1,048,576-Word × 16-Bit or 2,097,152-Word × 8-Bit One Time PROM****GENERAL DESCRIPTION**

The MR27V1602E is a 16 Mbit electrically Programmable Read-Only Memory that can be electrically switched between 1,048,576-word × 16-bit and 2,097,152-word × 8-bit configurations. This device operates on a single +3.3V power supply, and all inputs and outputs are TTL compatible. Because of its asynchronous operation, it requires no external clocks, making this device easy-to-use.

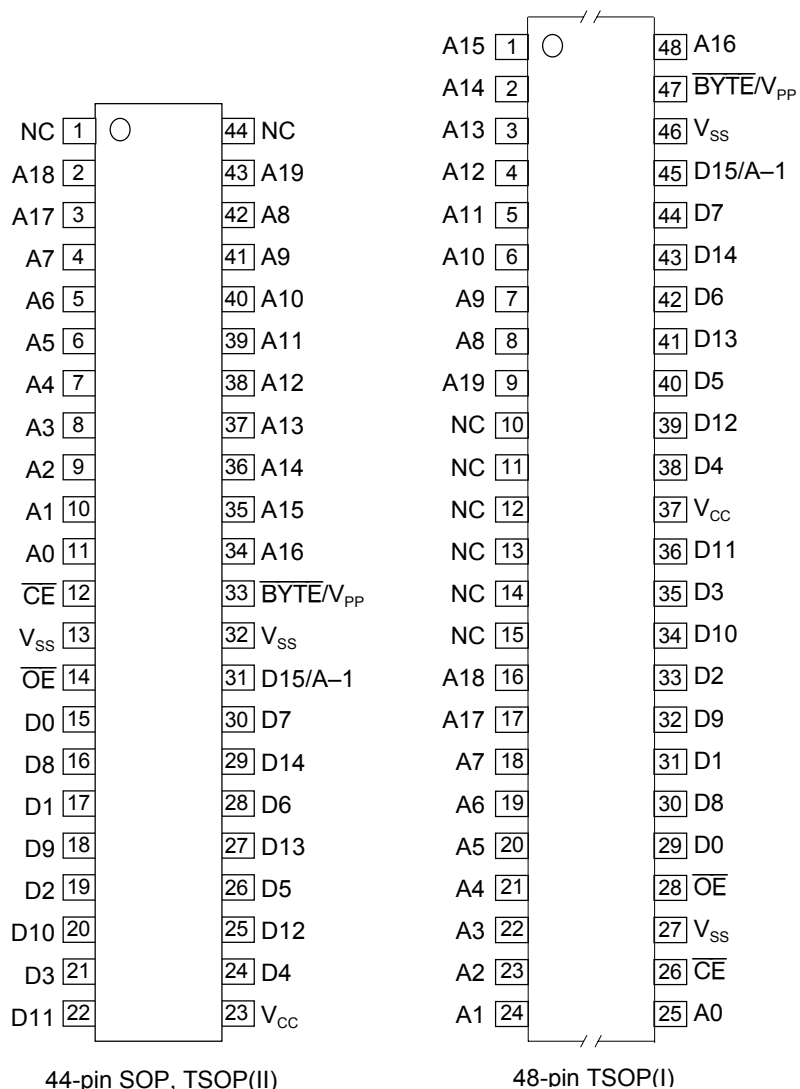
The MR27V1602E is suitable as large-capacity fixed memory for microcomputers and data terminals. It is manufactured using a CMOS double silicon gate technology and is offered in 44-pin SOP, 44-pin TSOP(II) or 48-pin TSOP(I) packages.

FEATURES

- 1,048,576-word × 16-bit/2,097,152-word × 8-bit electrically switchable configuration
- +3.3 V power supply
- Access time 90 nS MAX
- Operating current 30 mA MAX
- Standby current 50 μA MAX
- Input/Output TTL compatible
- Three-state output
- Packages:

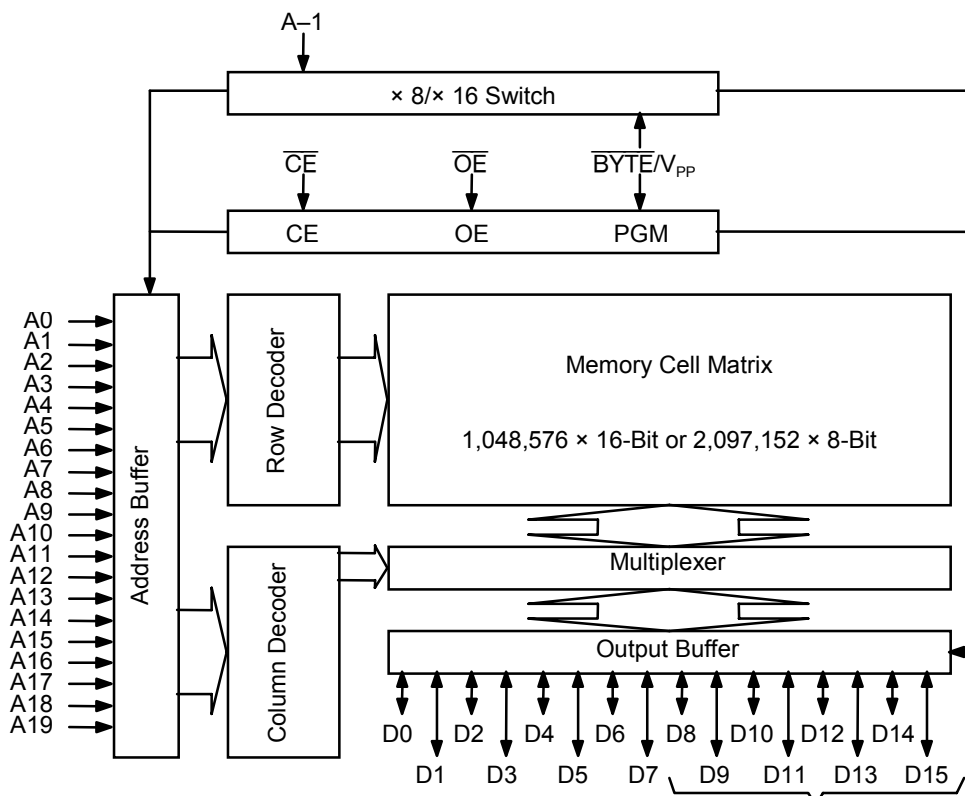
44-pin plastic SOP (SOP44-P-600-1.27-K)	(Product Name : MR27V1602EMA)
44-pin plastic TSOP (TSOP II 44-P-400-0.80-K)	(Product Name : MR27V1602ETP)
48-pin plastic TSOP (TSOP I 48-P-1220-0.50-K)	(Product Name : MR27V1602ETN)

PIN CONFIGURATION (TOP VIEW)



Pin name	Functions
D15/A-1	Data output/Address input
A0 to A19	Address input
D0 to D14	Data output
\overline{CE}	Chip enable
\overline{OE}	Output enable
BYTE/ V_{PP}	Mode switch/Program power supply voltage
V_{CC}	Power supply voltage
V_{SS}	GND
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 to D7	D8 to D14	D15/A-1
Read (16-Bit)	L	L	H	3.3 V	D_{OUT}		
Read (8-Bit)	L	L	L		D_{OUT}	Hi-Z	L/H
Output disable	L	H	H		Hi-Z		*
			L		Hi-Z		*
Standby	H	*	H	Hi-Z		*	
			L	Hi-Z		*	
Program	L	H	9.75 V	D_{IN}			
Program inhibit	H	H		Hi-Z			
Program verify	H	L		D_{OUT}			

*: Don't Care (H or L)

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Value	Unit
Operating temperature under bias	Ta	—	0 to 70	°C
Storage temperature	Tstg		-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} = 3.0 to 3.6 V	3.0	—	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

DC Characteristics

 $(V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}, T_a = 0 \text{ to } 70^\circ\text{C})$

parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input leakage current	I_{LI}	$V_I = 0 \text{ to } V_{CC}$	—	—	10	μA
Output leakage current	I_{LO}	$V_O = 0 \text{ to } V_{CC}$	—	—	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}	$\overline{CE} = V_{IL}, \overline{OE} = V_{IH}$ $t_c = 90 \text{ ns}$	—	—	30	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}	$I_{OH} = -2 \text{ mA}$	2.4	—	—	V
Output "L" level	V_{OL}	$I_{OL} = 4 \text{ mA}$	—	—	0.4	V

Voltage is relative to V_{SS} .* : $V_{CC} + 1.5\text{V}$ (Max.) when pulse width of overshoot is less than 10ns.** : -1.5V (Min.) when pulse width of undershoot is less than 10ns.

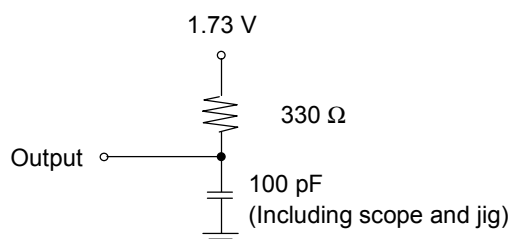
AC Characteristics

 $(V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}, T_a = 0 \text{ to } 70^\circ\text{C})$

Parameter	Symbol	Condition	Min.	Max.	Unit
Address cycle time	t_C	—	90	—	ns
Address access time	t_{ACC}	$\overline{CE} = \overline{OE} = V_{IL}$	—	90	ns
\overline{CE} access time	t_{CE}	$\overline{OE} = V_{IL}$	—	90	ns
\overline{OE} access time	t_{OE}	$\overline{CE} = V_{IL}$	—	45	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

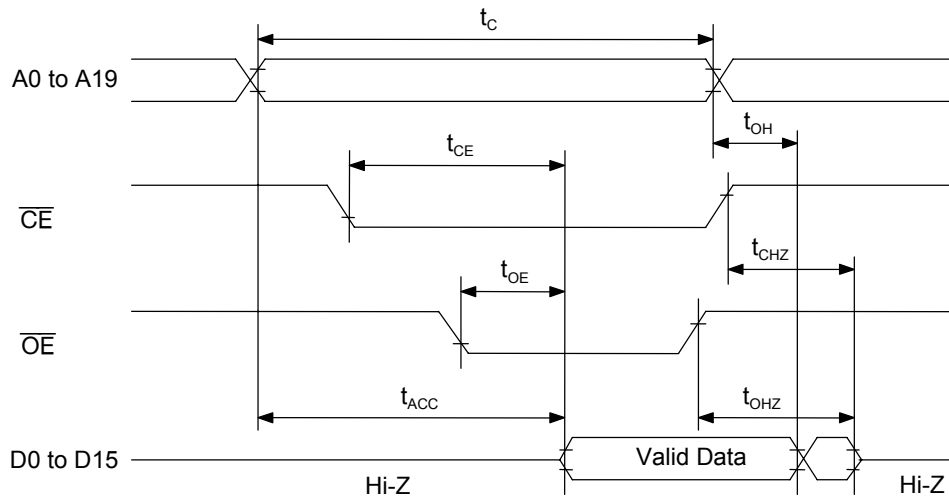
Measurement conditions

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

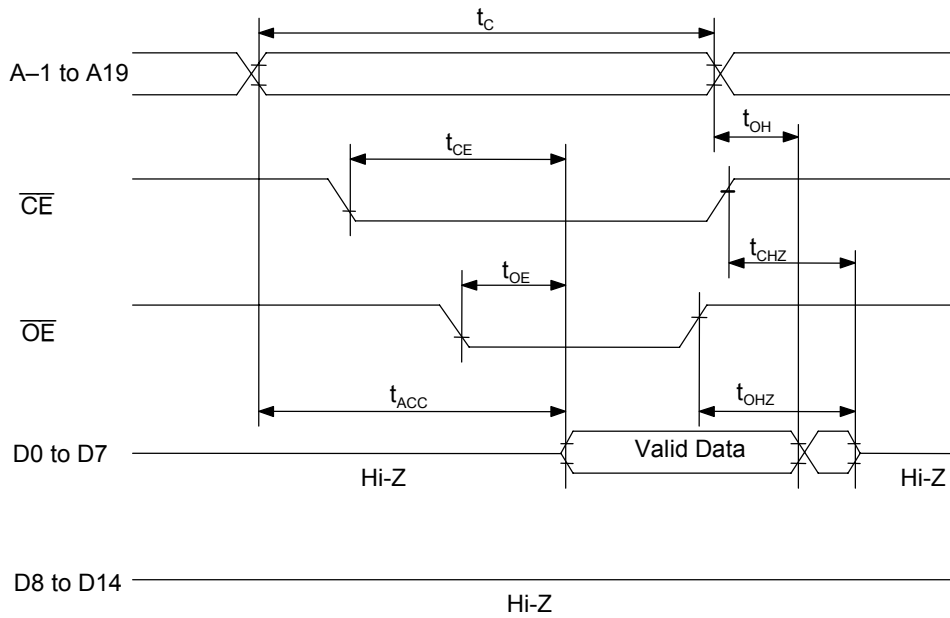


TIMING CHART (READ CYCLE)

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} +0.5 V	—	—	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 μA	2.4	—	—	V
Output "L" level	V _{OL}	I _{OL} = 2.1 mA	—	—	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 V_{SS}.**AC Characteristics**(V_{CC} = 4.0 V ± 0.1 V, $\overline{BYTE}/V_{PP} = 9.75 V \pm 0.25 V$, 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 time 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 _{AOH}	—	0	—	—	ns

Pin Check Function

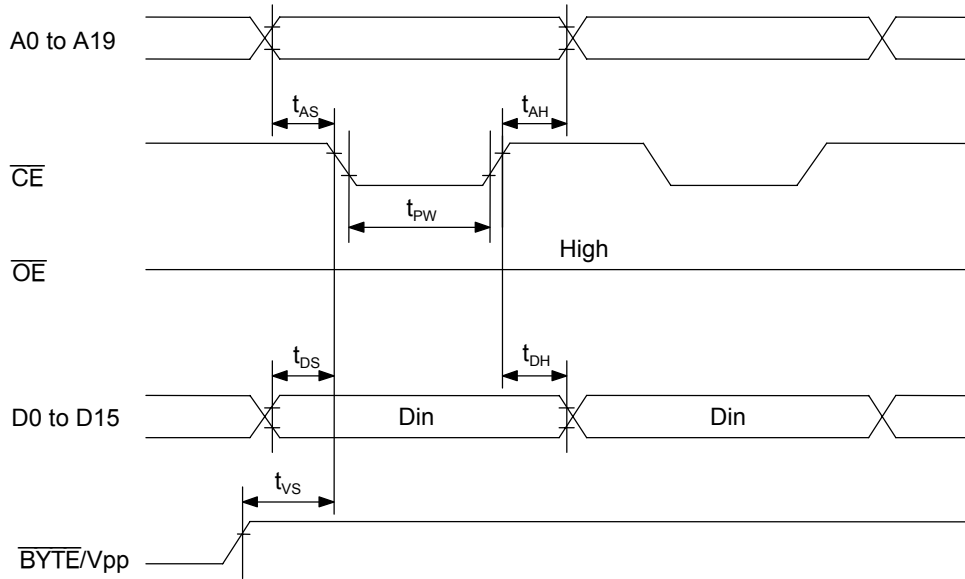
Pin Check Function is to check contact between each device-pin and each socket-lead with EPROM programmer. Setting up address as following condition call the preprogrammed codes on device outputs.

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

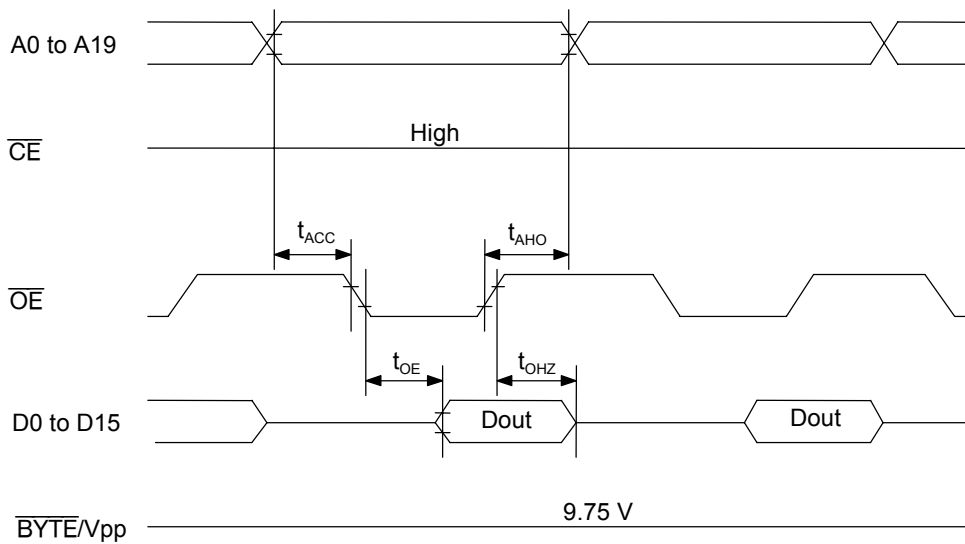
A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	DATA
0	1	0	1	0	1	0	1	0	VH*	0	1	0	1	0	1	0	0	1	1	FF00
1	0	1	0	1	0	1	0	1	VH*	1	0	1	0	1	0	1	1	0	0	00FF
Other conditions																				FFFF

*: VH = 8 V ± 0.25 V

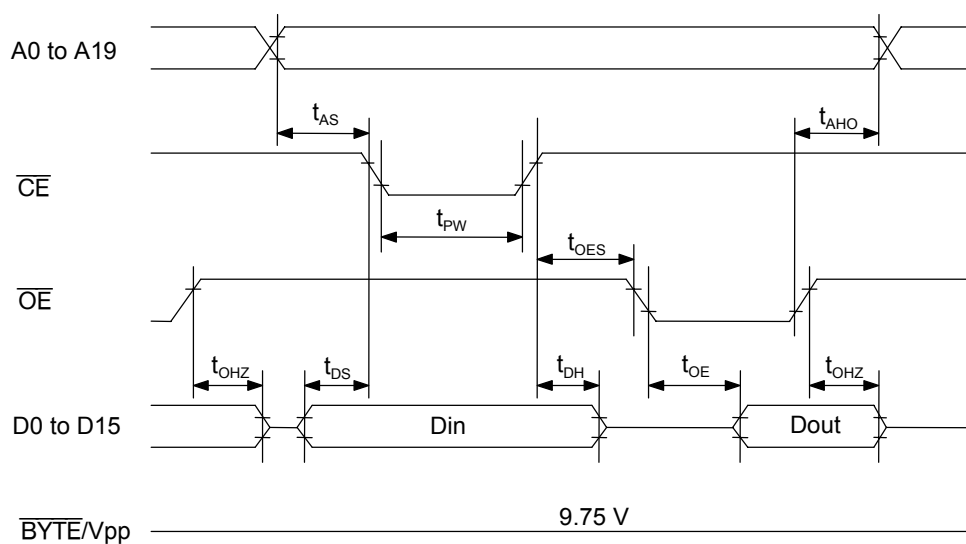
Consecutive Programming Waveforms



Consecutive Program Verify Waveforms



Program and Program Verify Cycle Waveforms

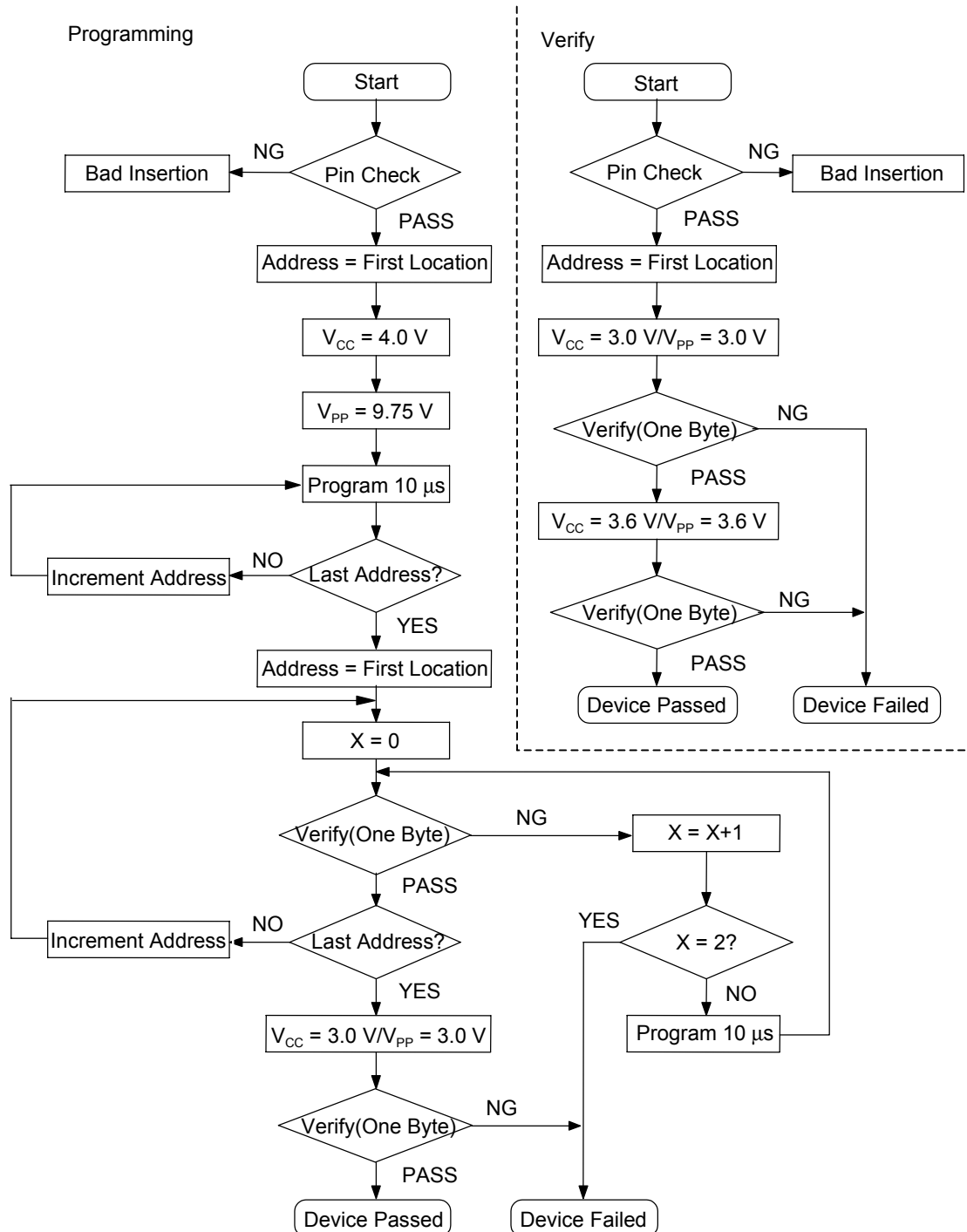


Pin Capacitance

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

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input	C_{IN1}	$V_i = 0\text{ V}$	—	—	8	pF
\overline{BYTE}/V_{PP}	C_{IN2}		—	—	120	
Output	C_{OUT}	$V_o = 0\text{ V}$	—	—	10	

Programming/Verify Flow Chart



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