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## MSM27V1655CZ

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524,288-Double Word x 32-Bit or 1,048,576-Word x 16-Bit

4-Double Word x 32-Bit or 8-Word x 16-Bit Page Mode One Time PROM

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### DESCRIPTION

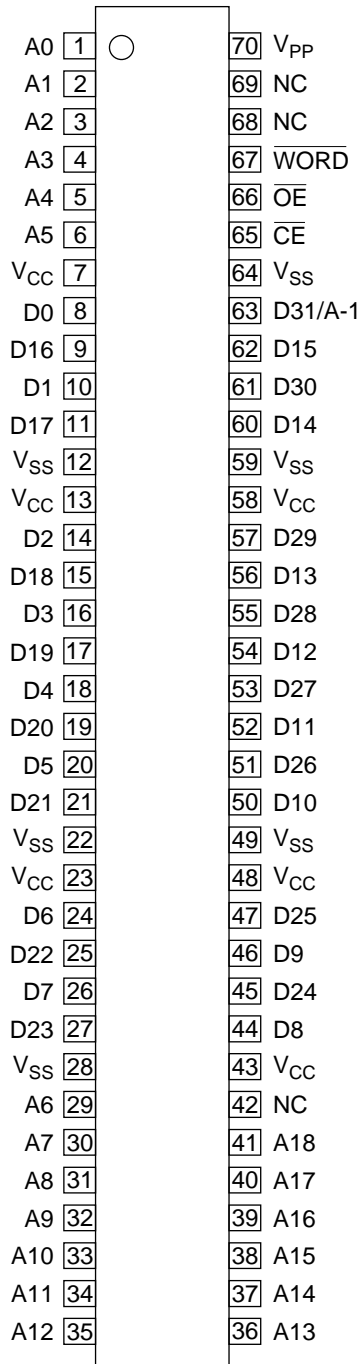
The MSM27V1655CZ is a 16Mbit electrically Programmable Read-Only Memory with page mode. Its configuration can be electrically switched between 524,288 double word x 32bit and 1,048,576word x 16bit. The MSM27V1655CZ operates on a single +3.3V power supply and is TTL compatible. The MSM27V1655CZ provides Page mode which can greatly reduce the read access time. Since the MSM27V1655CZ operates asynchronously , external clocks are not required , making this device easy-to-use. The MSM27V1655CZ 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 70-pin SSOP , 70-pin TSOP packages.

### FEATURES

- 524,288 double word x 32bit / 1,048,576 word x 16bit electrically switchable configuration
- Single +3.3V power supply
- Access time 100ns
  - Page mode access time 30ns
- Input / Output TTL compatible
- Three-state output
- Packages

70-pin plastic SSOP (SSOP70-P-500-0.80-K)  
70-pin plastic TSOP (TSOP1170-P-400-0.65-K)

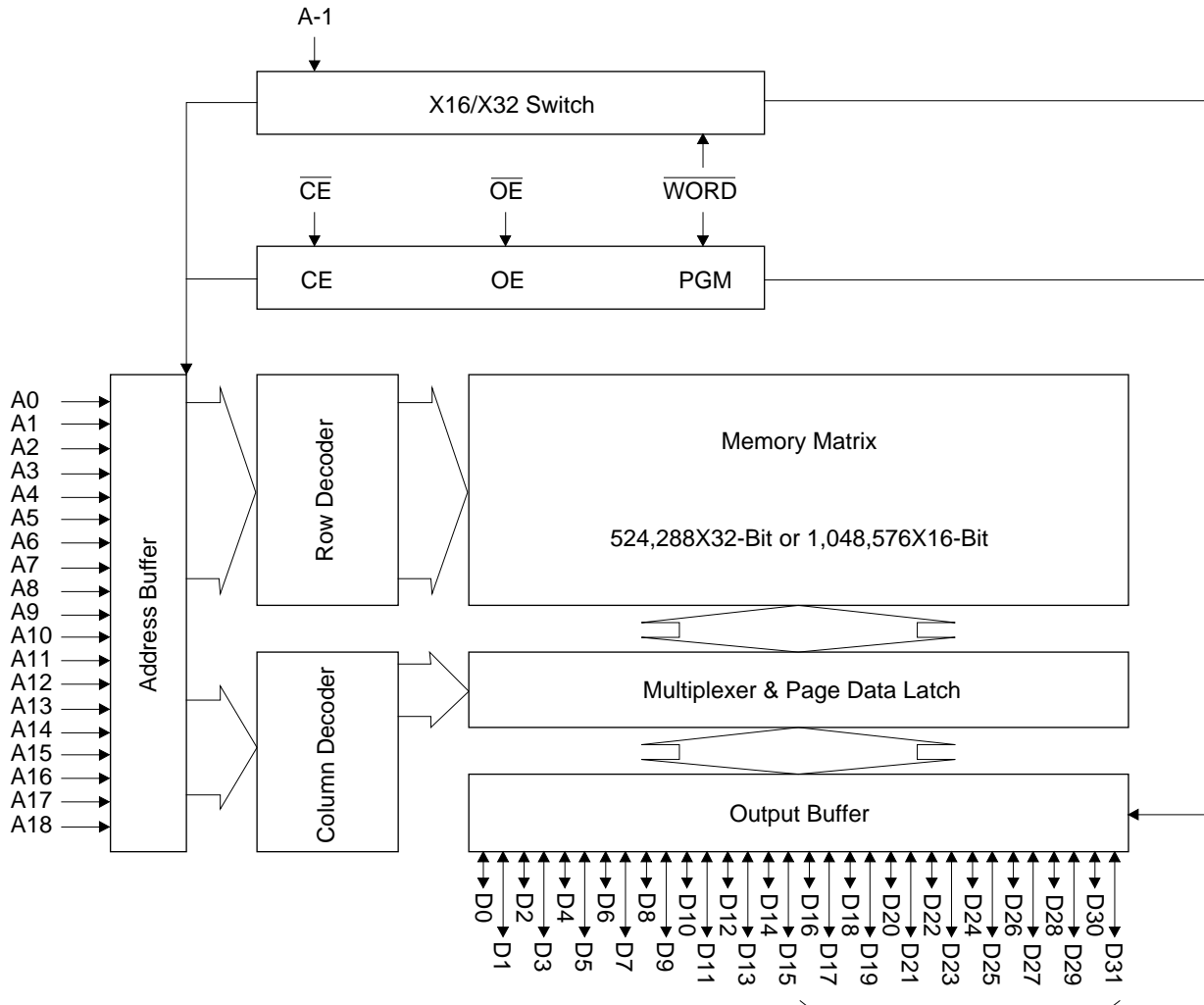
## PIN CONFIGURATION (TOP VIEW)



PIN NAMES	FUNCTIONS
D31/A-1	Data output / Address input
A0 - A18	Address input
D0 - D30	Data output
CE	Chip enable
OE	Output enable
V <sub>CC</sub>	Power supply voltage
V <sub>SS</sub>	GND
WORD	Mode switch
V <sub>PP</sub>	Program power supply voltage
NC	Non connection

70-pin SSOP , TSOP

**BLOCK DIAGRAM**



In 16-bit output mode, these pins are three-stated and pin D31 functions as the A-1 address pin.

**FUNCTION TABLE**

MODE	CE	OE	WORD	V <sub>PP</sub>	V <sub>CC</sub>	D0 - D15	D16 - D30	D31/A-1
READ (32-Bit)	L	L	H	*	3.0V to 3.6V	D <sub>OUT</sub>		
READ (16-Bit)	L	L	L			D <sub>OUT</sub>	Hi-Z	L/H
OUTPUT DISABLE	L	H	H			Hi-Z		*
			L			Hi-Z		*
STAND-BY	H	*	H	Hi-Z		*		
			L	Hi-Z		*		
PROGRAM	L	H	L	11.0V	5.0V	D <sub>IN</sub>	Hi-Z	L/H
PROGRAM INHIBIT	H	H				Hi-Z		
PROGRAM VERIFY	H	L				D <sub>OUT</sub>	Hi-Z	L/H

\*: Don't Care

**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 7	V
Program power supply voltage	$V_{PP}$		-0.5 to 12.5	V
Power dissipation per package	$P_D$	-	1.0	W

**RECOMMENDED OPERATING CONDITIONS FOR READ**

(Ta=0 to 70°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
$V_{CC}$ power supply voltage	$V_{CC}$	$V_{CC}=3.0V-3.6V$	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  $V_{SS}$

**ELECTRICAL CHARACTERISTICS (Read operation)****DC Characteristics** $(V_{CC}=3.3V\pm 0.3V, T_a=0 \text{ to } 70^\circ\text{C})$ 

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input leakage current	$I_{LI}$	$V_I=0 \text{ to } V_{CC}$	-	-	10	$\mu\text{A}$
Output leakage current	$I_{LO}$	$V_O=0 \text{ to } V_{CC}$	-	-	10	$\mu\text{A}$
$V_{CC}$ power supply current (Standby)	$I_{CS1}$	$\overline{CE}=V_{CC}$	-	-	50	$\mu\text{A}$
	$I_{CS2}$	$\overline{CE}=V_{IH}$	-	-	1	$\text{mA}$
$V_{CC}$ power supply current (Read)	$I_{CCA}$	$\overline{CE}=V_{IL}, \overline{OE}=V_{IH}$ $t_c=100\text{ns}$	-	-	80	$\text{mA}$
$V_{PP}$ power supply current	$I_{PP}$	$V_{PP}=V_{CC}$	-	-	10	$\mu\text{A}$
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	$V_{OH}$	$I_{OH}=-400\mu\text{A}$	2.4	-	-	V
Output "L" level	$V_{OL}$	$I_{OL}=2.1\text{mA}$	-	-	0.45	V

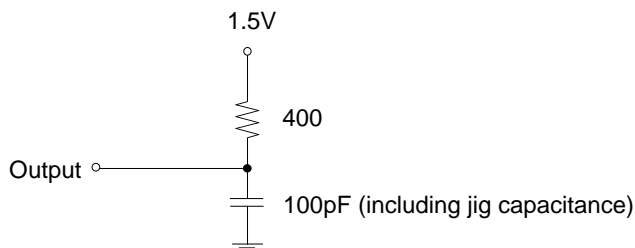
Voltage is relative to  $V_{SS}$ **AC Characteristics** $(V_{CC}=3.3V\pm 0.3V, T_a=0 \text{ to } 70^\circ\text{C})$ 

Parameter	Symbol	Condition	Min.	Max.	Unit
Address access cycle time	$T_C$	-	100	-	ns
Address access time	$T_{ACC}$	$\overline{CE}=\overline{OE}=V_{IL}$	-	100	ns
Page set up time	$T_{PSET}$	NOTE(1)	120	-	ns
Page access cycle time	$T_{PC}$	-	30	-	ns
Page access time	$T_{PAC}$	-	-	30	ns
$\overline{CE}$ access time	$T_{CE}$	$\overline{OE}=V_{IL}$	-	100	ns
$\overline{OE}$ access time	$T_{OE}$	$\overline{CE}=V_{IL}$	-	30	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

NOTE(1)  $T_{PSET}$  is defined as the end of either  $\overline{CE}$  trailing edge or address transition in random access term until the first page address transition.

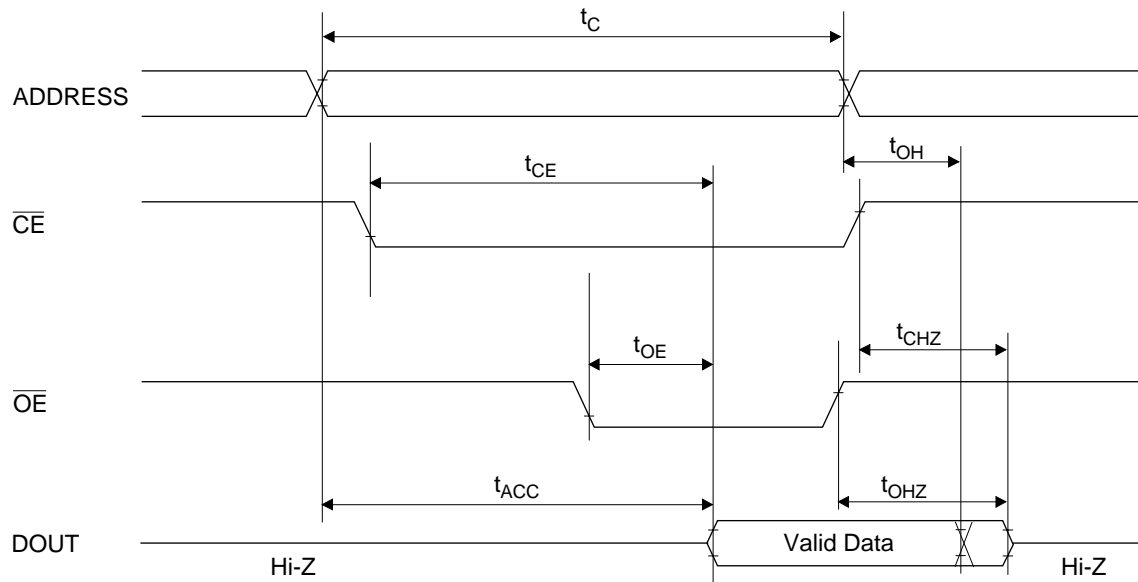
## Measurement conditions

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

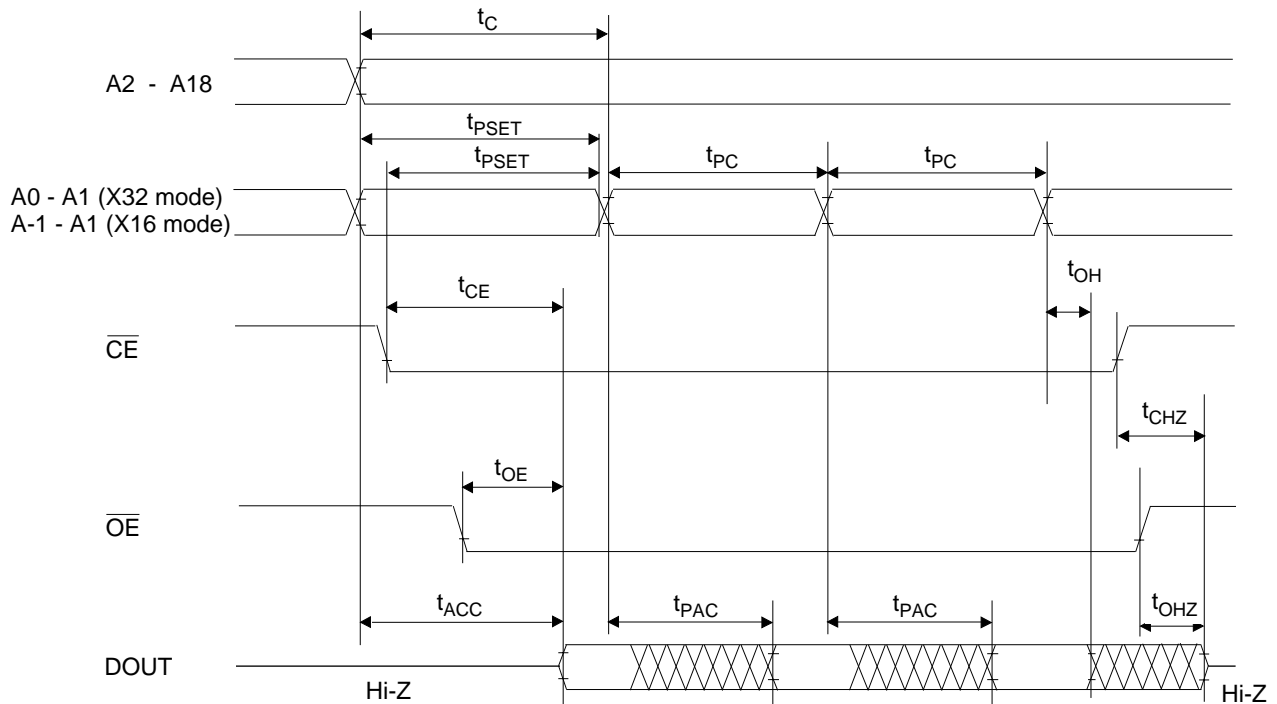


## TIMING CHART

## NORMAL MODE READ CYCLE



## PAGE MODE READ CYCLE



**ELECTRICAL CHARACTERISTICS (Programming operation)****DC Characteristics**

(Ta=25°C±5°C)

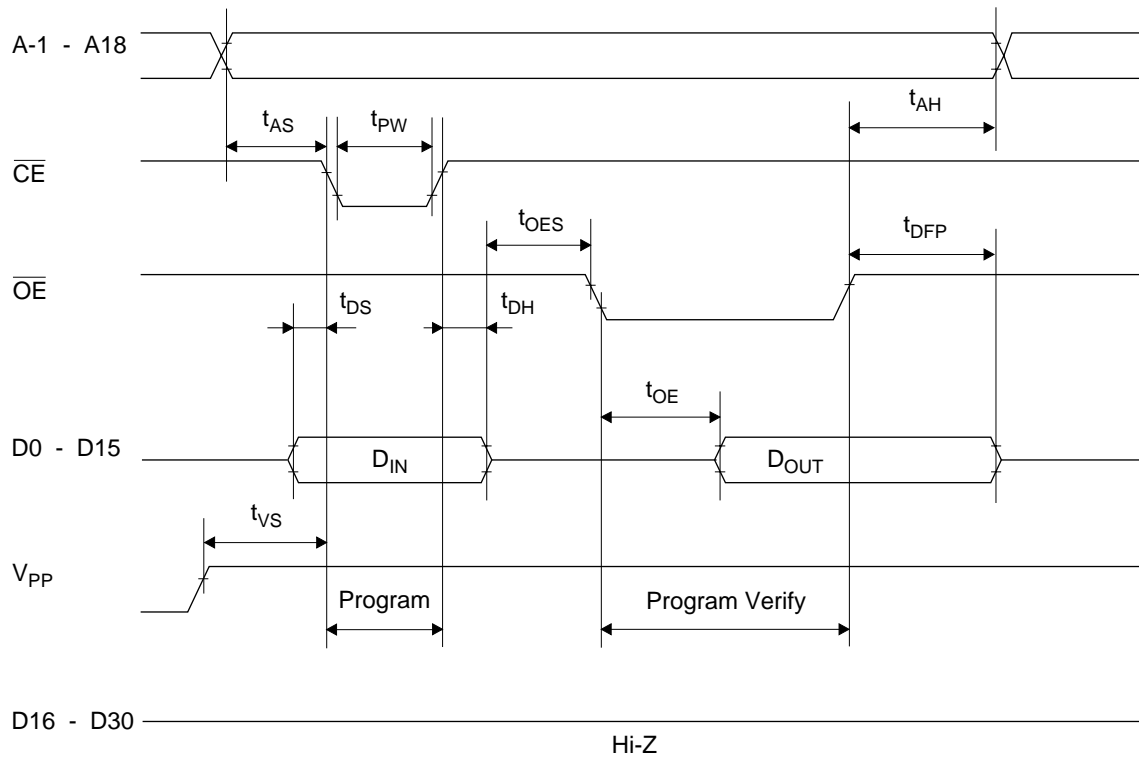
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input leakage current	I <sub>LI</sub>	V <sub>I</sub> =V <sub>CC</sub> +0.5V	-	-	10	μA
V <sub>PP</sub> power supply current (Program)	I <sub>PP2</sub>	$\overline{CE}=V_{IL}$	-	-	50	mA
V <sub>CC</sub> power supply current	I <sub>CC</sub>	-	-	-	100	mA
Input "H" level	V <sub>IH</sub>	-	2.2	-	V <sub>CC</sub> +0.5	V
Input "L" level	V <sub>IL</sub>	-	-0.5	-	0.8	V
Output "H" level	V <sub>OH</sub>	I <sub>OH</sub> =-400μA	2.4	-	-	V
Output "L" level	V <sub>OL</sub>	I <sub>OL</sub> =2.1mA	-	-	0.45	V
Program voltage	V <sub>PP</sub>	-	10.75	11.0	11.25	V
V <sub>CC</sub> power supply voltage	V <sub>CC</sub>	-	4.75	5.0	5.25	V

Voltage is relative to Vss

**AC Characteristics**(V<sub>CC</sub>=5.0V±0.25V, V<sub>pp</sub>=11.0V±0.25V, Ta=25°C±5°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Address set-up time	T <sub>AS</sub>	-	2	-	-	μs
$\overline{OE}$ set-up time	T <sub>OES</sub>	-	2	-	-	μs
Data set-up time	T <sub>DS</sub>	-	2	-	-	μs
Address hold time	T <sub>AH</sub>	-	0	-	-	μs
Data hold time	T <sub>DH</sub>	-	2	-	-	μs
Output float delay from $\overline{OE}$	T <sub>DFP</sub>	-	0	-	130	ns
V <sub>PP</sub> voltage set-up time	T <sub>VS</sub>	-	2	-	-	μs
Program pulse width	T <sub>PW</sub>	-	23	25	27	μs
Data valid from $\overline{OE}$	T <sub>OE</sub>	-	-	-	150	ns

### Programming Waveform



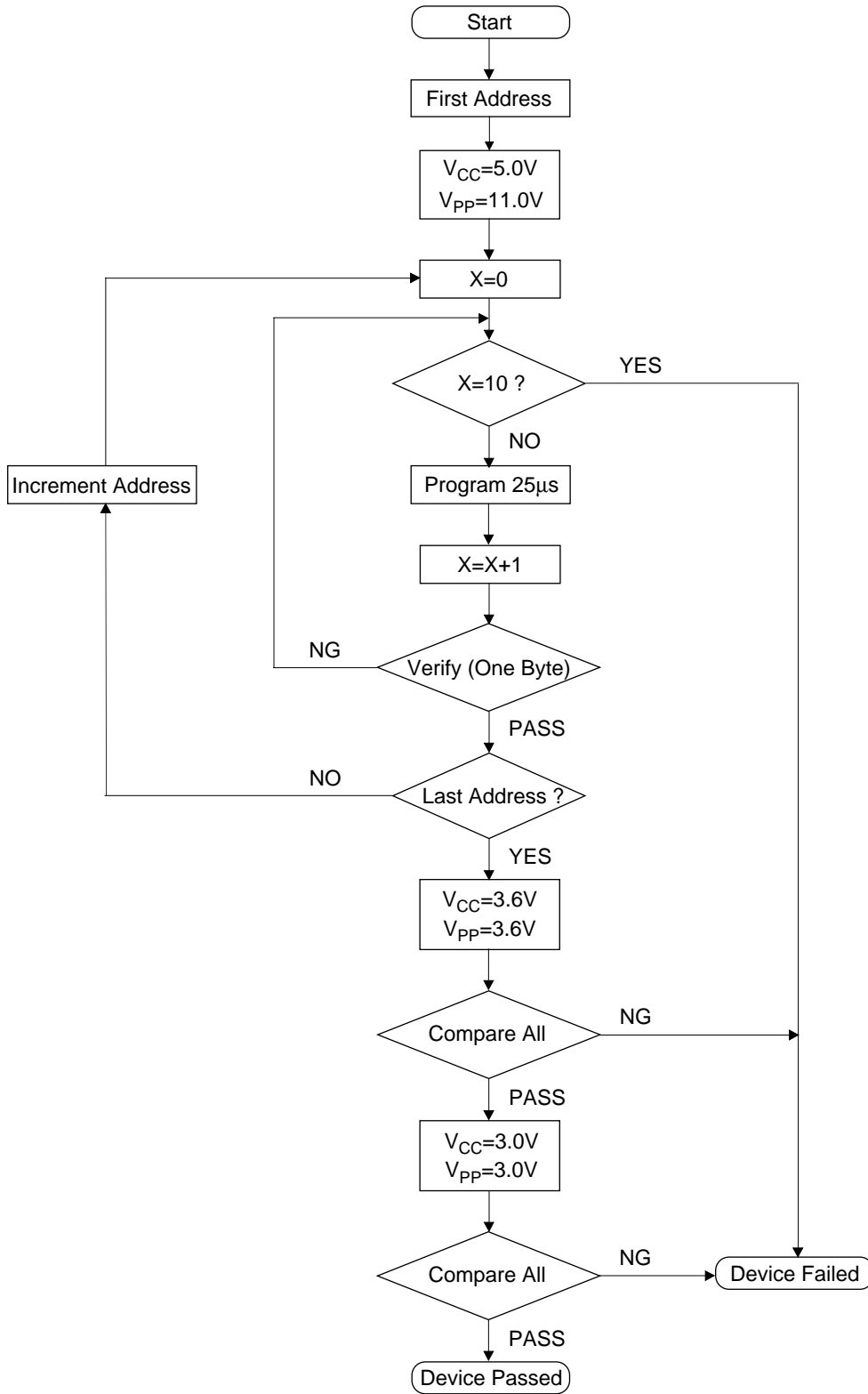
### PIN Capacitance

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

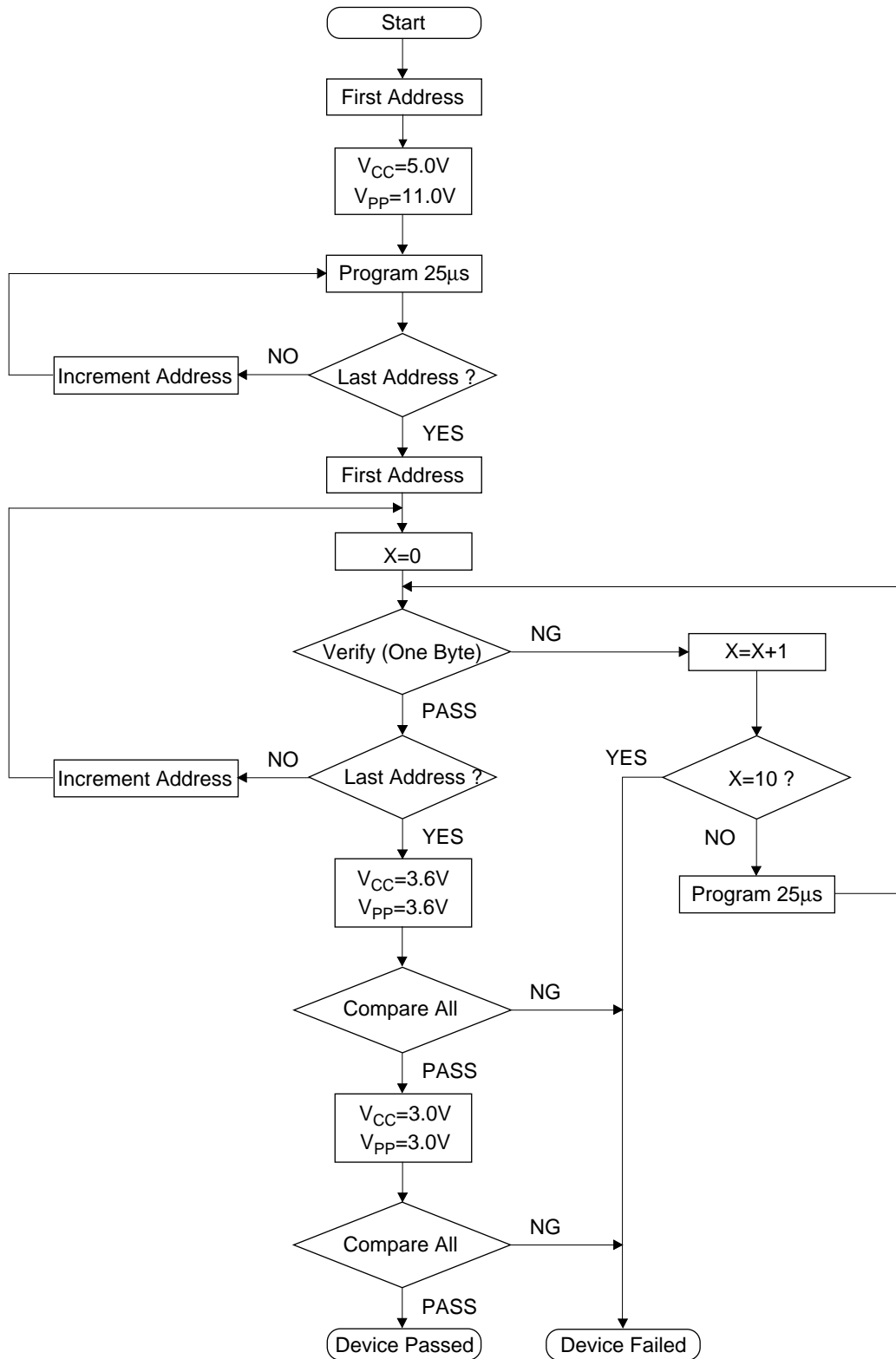
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input	$C_{IN1}$	$V_I=0V$	-	-	12	pF
$V_{PP}$	$C_{IN2}$		-	-	60	
Output	$C_{OUT}$	$V_O=0V$	-	-	15	



High Speed Programming Algorithm ( I )



## High Speed Programming Algorithm ( II )



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