

OKI Semiconductor

1A

MSM27C401CZ

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

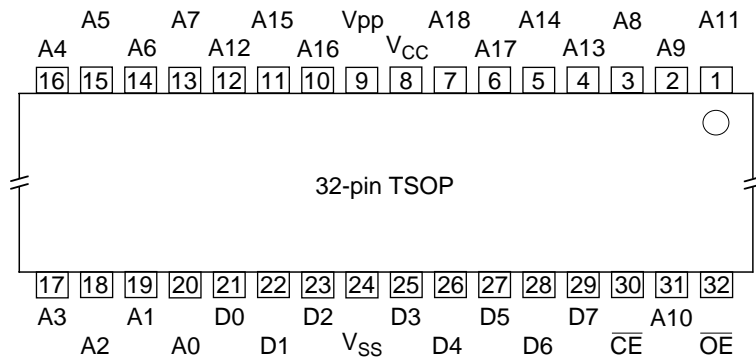
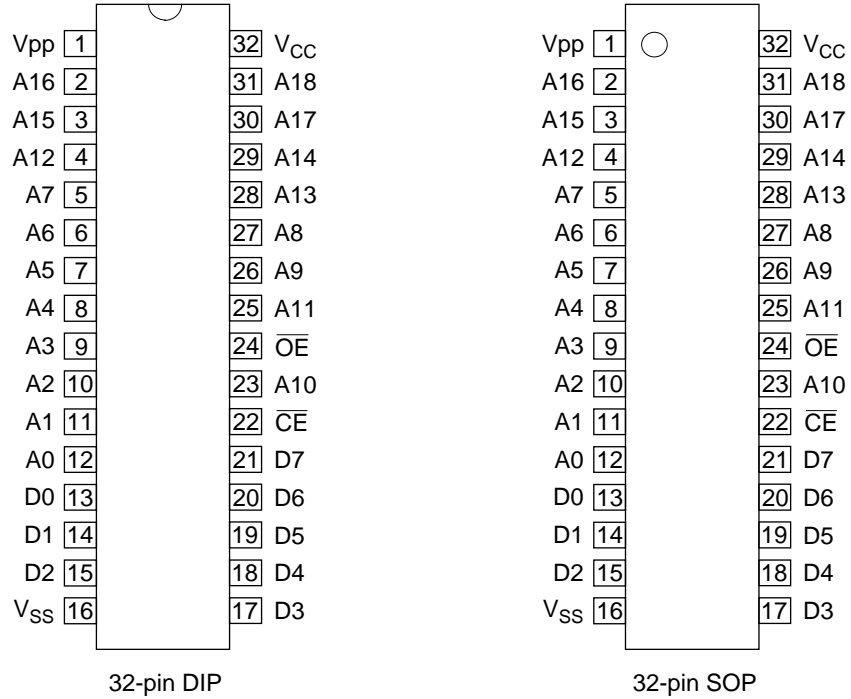
DESCRIPTION

The MSM27C401CZ is a 4Mbit electrically Programmable Read-Only Memory organized as 524,288 word x 8bit. The MSM27C401CZ operates on a single +3V-5V power supply and is TTL compatible. Since the MSM27C401CZ operates asynchronously, external clocks are not required, making this device easy-to-use. The MSM27C401CZ 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

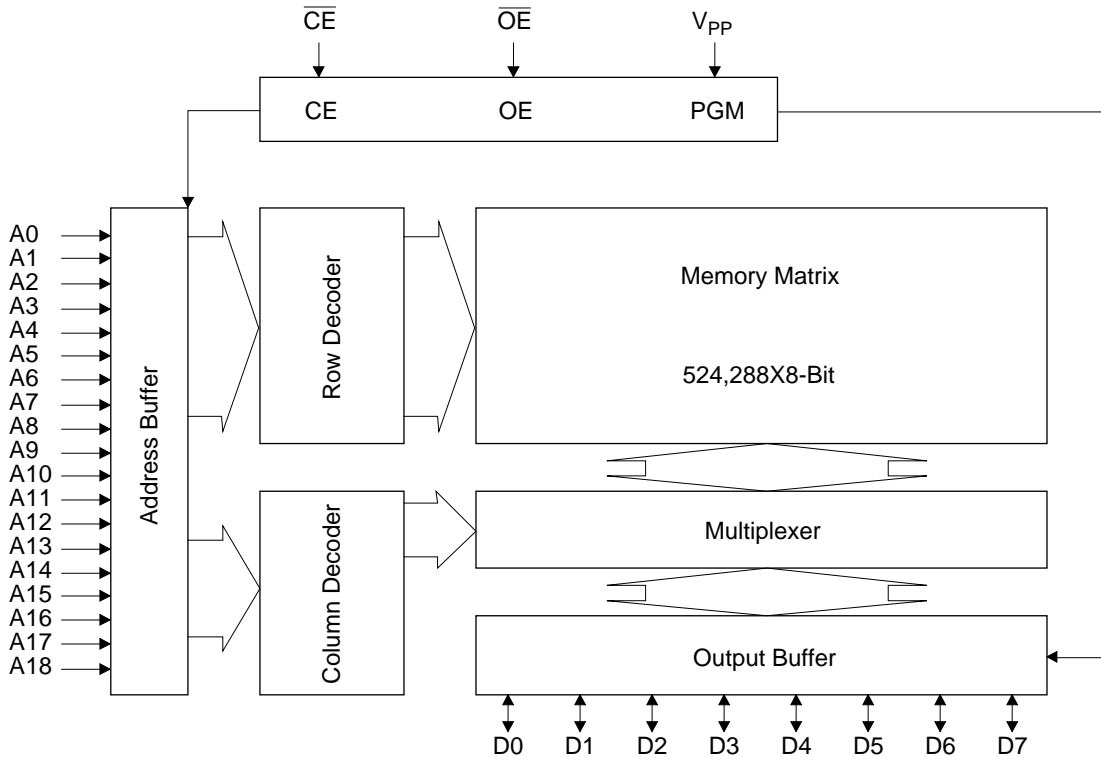
- 524,288 word x 8bit
- Single +3V-5V power supply
- Access time
 - 150ns access time (Vcc=+3V)
 - 120ns access time (Vcc=+3.3V)
 - 80ns access time (Vcc=+5V)
- Input / Output TTL compatible
- Three-state output
- Packages
 - 32-pin plastic DIP (DIP32-P-600-2.54)
 - 32-pin plastic SOP (SOP32-P-525-1.27-K)
 - 32-pin plastic TSOP (TSOP I 32-P-814-0.50-K)

PIN CONFIGURATION (TOP VIEW)



PIN NAMES	FUNCTIONS
A0 - A18	Address input
D0 - D7	Data output
\overline{CE}	Chip enable
\overline{OE}	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	*	2.7V to 5.5V	D_{OUT}
OUTPUT DISABLE	L	H			Hi-Z
STAND-BY	H	*			Hi-Z
PROGRAM	L	H	11.5V	6.25V	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	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

RECOMMENDED OPERATING CONDITIONS FOR READ

(Ta=0 to 70°C)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
V_{CC} power supply voltage	V_{CC}	$V_{CC}=2.7V - 5.5V$	2.7	-	5.5	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 1**(V_{CC}=3V±0.3V, T_a=0 to 70°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 _{CS1}	$\overline{CE}=V_{CC}$	-	-	10	μA
	I _{CS2}	$\overline{CE}=V_{IH}$	-	-	1	mA
V _{CC} power supply current (Read)	I _{CCA}	$\overline{CE}=V_{IL}$, $\overline{OE}=V_{IH}$ t _c =150ns	-	-	15	mA
V _{PP} power supply current	I _{PP}	V _{PP} =V _{CC}	-	-	10	μA
Input "H" level	V _{IH}	-	2.0	-	V _{CC} +0.5	V
Input "L" level	V _{IL}	-	-0.5	-	0.6	V
Output "H" level	V _{OH}	I _{OH} =-200μA	V _{CC} -0.4	-	-	V
Output "L" level	V _{OL}	I _{OL} =1mA	-	-	0.4	V

Voltage is relative to V_{SS}**DC Characteristics 2**(V_{CC}=3.3V±0.3V, T_a=0 to 70°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 _{CS1}	$\overline{CE}=V_{CC}$	-	-	10	μA
	I _{CS2}	$\overline{CE}=V_{IH}$	-	-	1	mA
V _{CC} power supply current (Read)	I _{CCA}	$\overline{CE}=V_{IL}$, $\overline{OE}=V_{IH}$ t _c =120ns	-	-	20	mA
V _{PP} power supply current	I _{PP}	V _{PP} =V _{CC}	-	-	10	μA
Input "H" level	V _{IH}	-	2.0	-	V _{CC} +0.5	V
Input "L" level	V _{IL}	-	-0.5	-	0.6	V
Output "H" level	V _{OH}	I _{OH} =-200μA	V _{CC} -0.4	-	-	V
Output "L" level	V _{OL}	I _{OL} =1mA	-	-	0.4	V

Voltage is relative to V_{SS}

DC Characteristics 3 $(V_{CC}=5V\pm 0.5V, T_a=0 \text{ to } 70^\circ\text{C})$

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_{CS1}	$\overline{CE}=V_{CC}$	-	-	50	μA
	I_{CS2}	$\overline{CE}=V_{IH}$	-	-	1	mA
V_{CC} power supply current (Read)	I_{CCA}	$\overline{CE}=V_{IL}, \overline{OE}=V_{IH}$ $t_c=80\text{ns}$	-	-	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	-	0.8	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

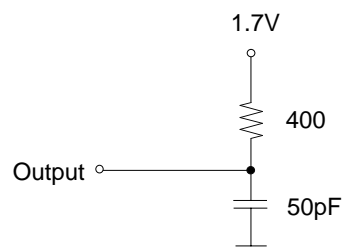
Voltage is relative to Vss

AC Characteristics 1 $(V_{CC}=3V\pm 0.3V, T_a=0 \text{ to } 70^\circ\text{C})$

Parameter	Symbol	Condition	Min.	Max.	Unit
Access cycle time	T_C	-	150	-	ns
Address access time	T_{ACC}	$\overline{CE}=\overline{OE}=V_{IL}$	-	150	ns
\overline{CE} access time	T_{CE}	$\overline{OE}=V_{IL}$	-	150	ns
\overline{OE} access time	T_{OE}	$\overline{CE}=V_{IL}$	-	80	ns
Output disable time	T_{CHZ}	$\overline{OE}=V_{IL}$	0	70	ns
	T_{OHZ}	$\overline{CE}=V_{IL}$	0	65	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 $(V_{CC}=3.3V\pm 0.3V, T_a=0 \text{ to } 70^\circ\text{C})$

Parameter	Symbol	Condition	Min.	Max.	Unit
Access cycle time	T_C	-	120	-	ns
Address access time	T_{ACC}	$\overline{CE}=\overline{OE}=V_{IL}$	-	120	ns
\overline{CE} access time	T_{CE}	$\overline{OE}=V_{IL}$	-	120	ns
\overline{OE} access time	T_{OE}	$\overline{CE}=V_{IL}$	-	70	ns
Output disable time	T_{CHZ}	$\overline{OE}=V_{IL}$	0	60	ns
	T_{OHZ}	$\overline{CE}=V_{IL}$	0	55	ns
Output hold time	T_{OH}	$\overline{CE}=\overline{OE}=V_{IL}$	0	-	ns

Measurement conditions

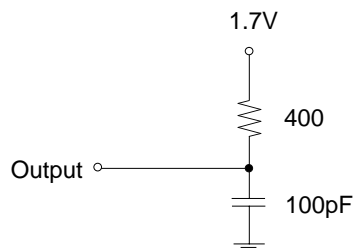
Input signal level	-----	0V/3V
Input timing reference level	-----	0.8V/2.0V
Output load	-----	100pF
Output timing reference level	-----	0.8V/2.0V

AC Characteristics 3 $(V_{CC}=5V\pm 0.5V, T_a=0 \text{ to } 70^\circ\text{C})$

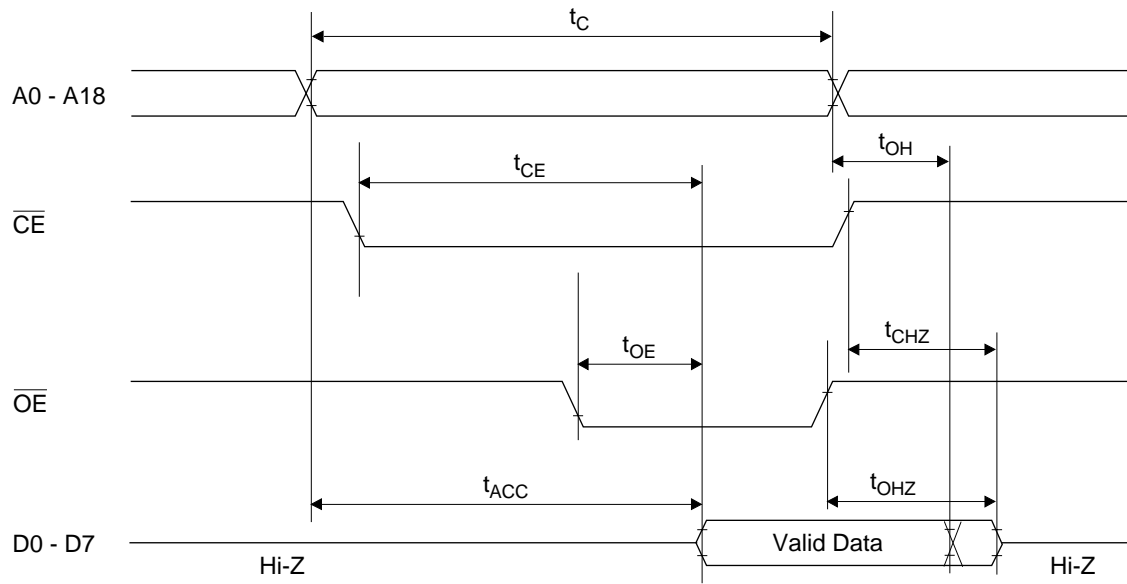
Parameter	Symbol	Condition	Min.	Max.	Unit
Access cycle time	T_C	-	80	-	ns
Address access time	T_{ACC}	$\overline{CE}=\overline{OE}=V_{IL}$	-	80	ns
\overline{CE} access time	T_{CE}	$\overline{OE}=V_{IL}$	-	80	ns
\overline{OE} access time	T_{OE}	$\overline{CE}=V_{IL}$	-	50	ns
Output disable time	T_{CHZ}	$\overline{OE}=V_{IL}$	0	40	ns
	T_{OHZ}	$\overline{CE}=V_{IL}$	0	35	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	-----	1TTL gate + 100pF
Output timing reference level	-----	0.8V/2.0V



TIMING CHART (READ CYCLE)



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

(Ta=25°C±5°C)

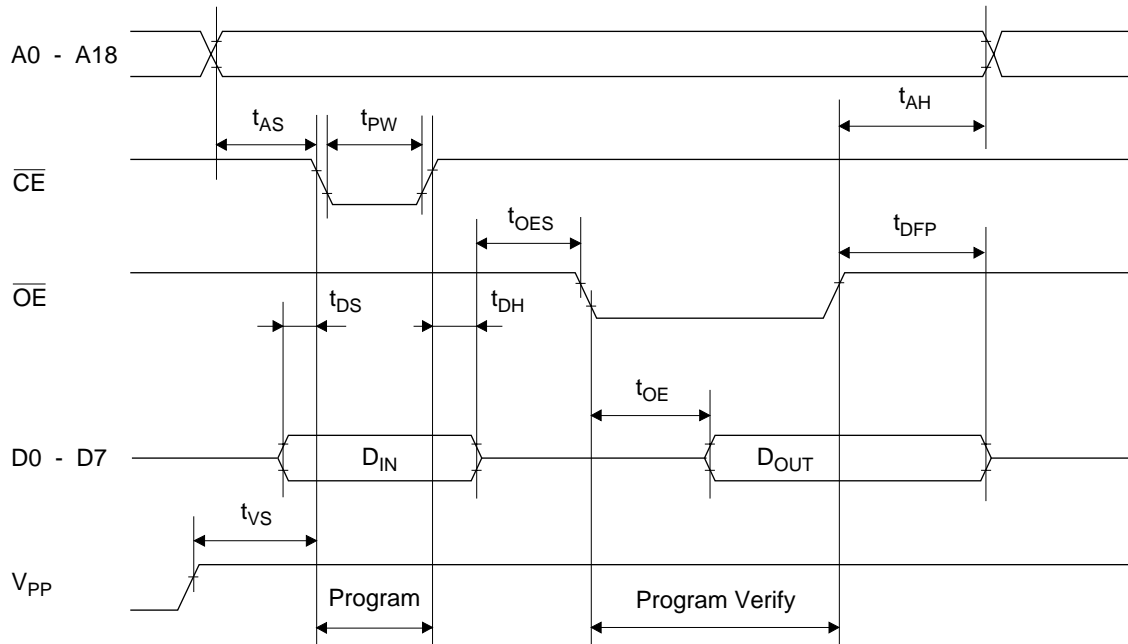
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input leakage current	I _{LI}	V _I =V _{CC} +0.5V	-	-	10	μA
V _{PP} power supply current (Program)	I _{PP2}	$\overline{CE}=V_{IL}$	-	-	50	mA
V _{CC} power supply current	I _{CC}	-	-	-	80	mA
Input "H" level	V _{IH}	-	2.2	-	V _{CC} +0.5	V
Input "L" level	V _{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}	-	11.25	11.5	11.75	V
V _{CC} power supply voltage	V _{CC}	-	6.0	6.25	6.5	V

Voltage is relative to Vss

AC Characteristics(V_{CC}=6.25V±0.25V, V_{pp}=11.5V±0.25V, Ta=25°C±5°C)

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

Programming Waveform

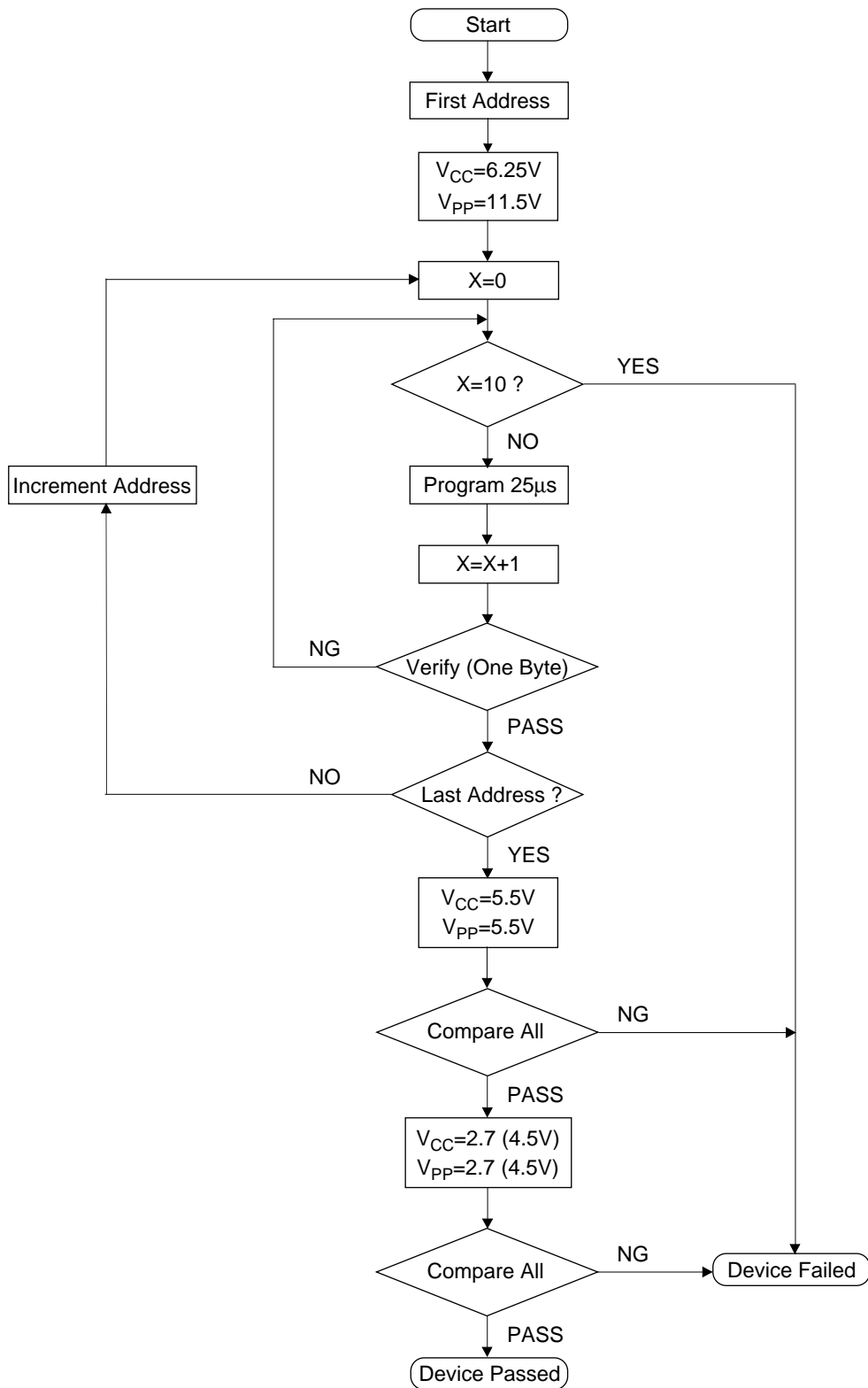


PIN Capacitance

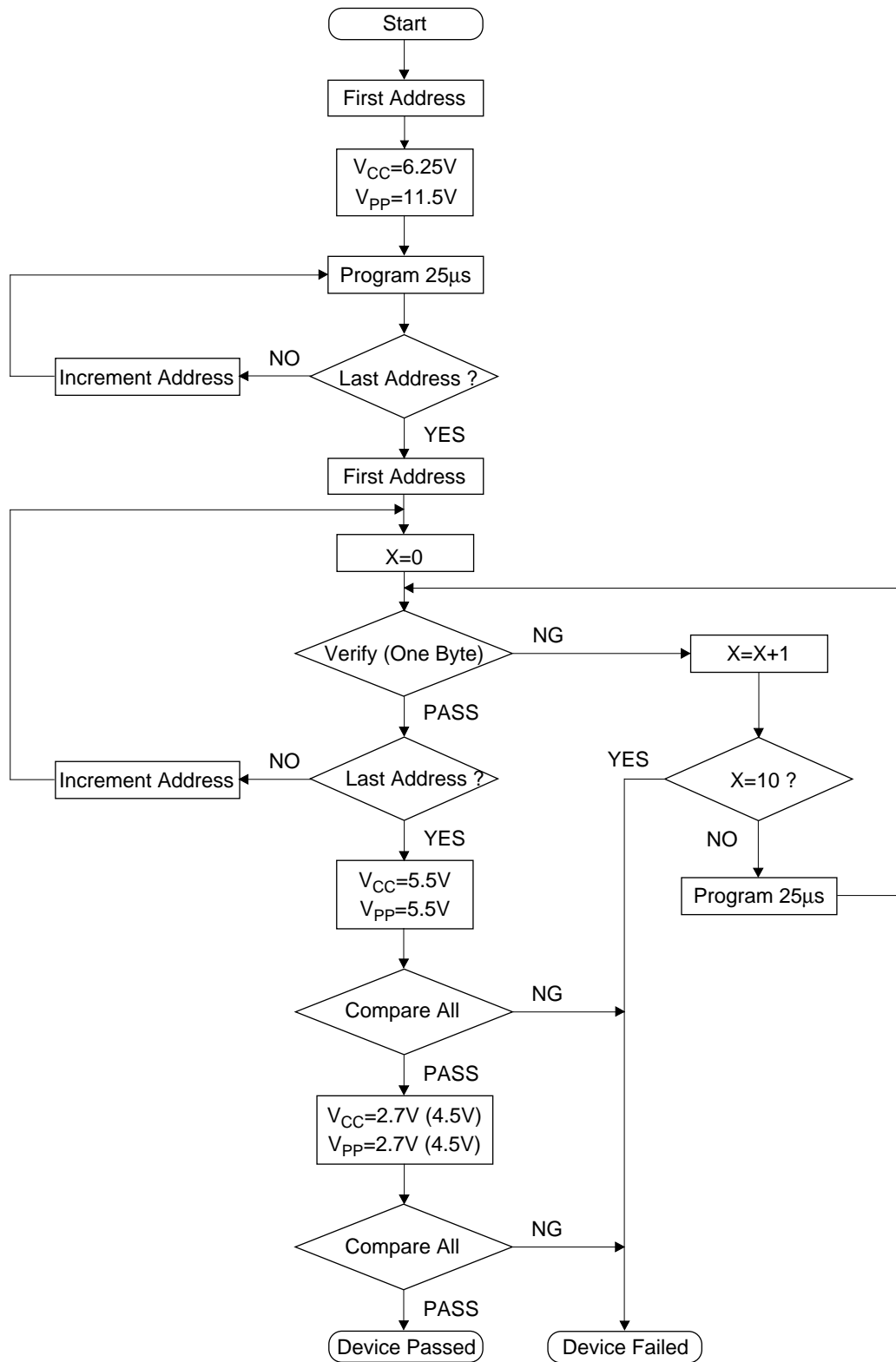
(V_{CC}=5V, T_a=25°C, f=1MHz)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input	C _{IN}	V _I =0V	-	-	12	pF
Output	C _{OUT}	V _O =0V	-	-	15	

High Speed Programming Algorithm (I)



High Speed Programming Algorithm (II)



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