

MSM27C402CZ

262,144-Word x 16-Bit or 524,288-Word x 8-Bit One Time PROM

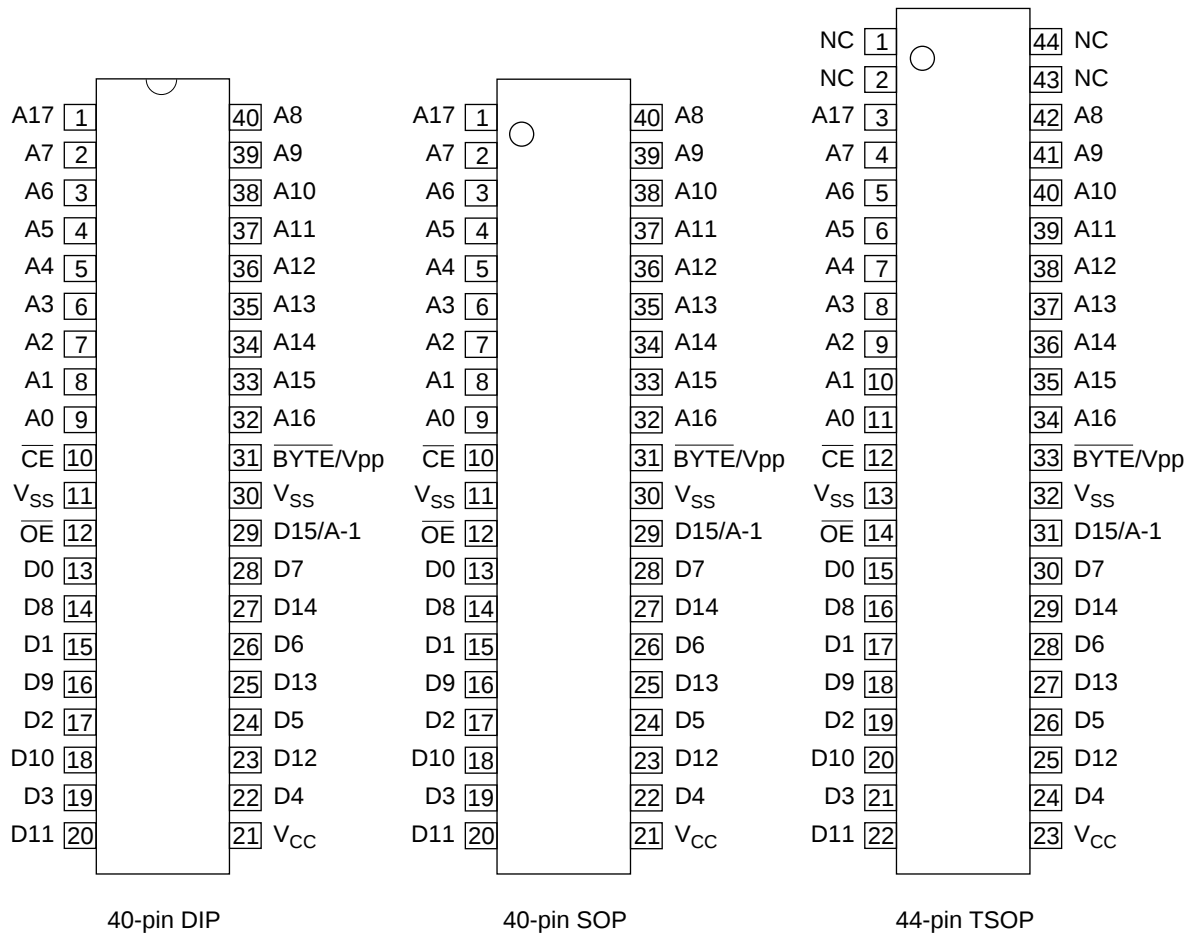
DESCRIPTION

The MSM27C402CZ is a 4Mbit electrically Programmable Read-Only Memory whose configuration can be electrically switched between 262,144 word x 16bit and 524,288 word x 8bit. The MSM27C402CZ operates on a single +3.3V - 5V power supply and is TTL compatible. Since the MSM27C402CZ operates asynchronously, external clocks are not required, making this device easy-to-use. The MSM27C402CZ 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 40-pin DIP, 40-pin SOP or 44-pin TSOP packages.

FEATURES

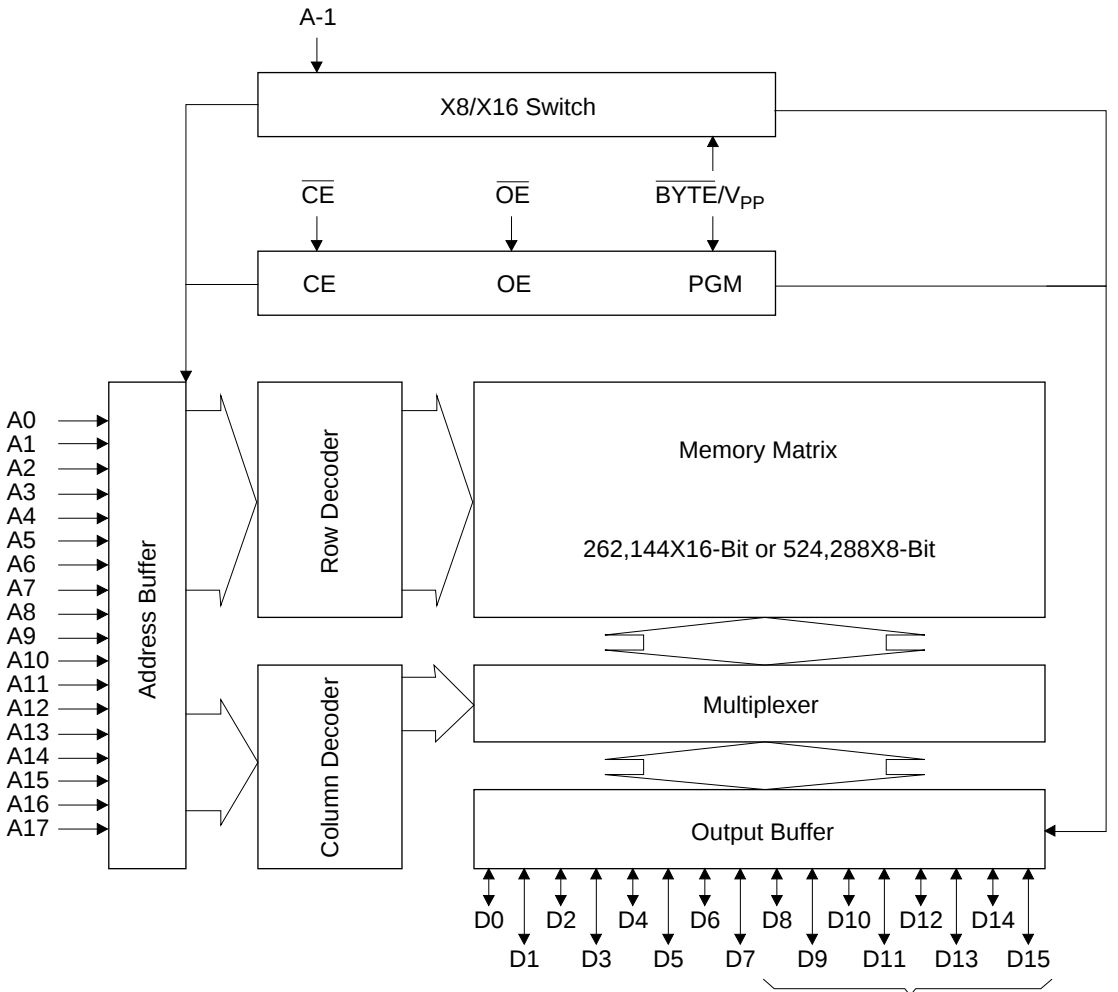
- 262,144 word x 16bit / 524,288 word x 8bit electrically switchable configuration
- Single +3.3V - 5V power supply
- Access time 120ns (Vcc=3.3V)
 80ns (Vcc=5V)
- Input / Output TTL compatible
- Three-state output
- Packages 40-pin plastic DIP (DIP40-P-600-2.54)
 40-pin plastic SOP (SOP40-P-525-1.27-K)
 44-pin plastic TSOP (TSOP II 44-P-400-0.80-K)

PIN CONFIGURATION (TOP VIEW)



PIN NAMES	FUNCTIONS
D15/A-1	Data output / Address input
A0 - A17	Address input
D0 - D14	Data output
CE	Chip enable
OE	Output enable
V _{CC}	Power supply voltage
V _{SS}	GND
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	$\overline{\text{CE}}$	$\overline{\text{OE}}$	BYTE/ V_{PP}	V_{CC}	D0 - D7	D8 - D14	D15/A-1
READ (16-Bit)	L	L	H	3.0V to 5.5V	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	6.25V	Hi-Z		
			L		*		
PROGRAM	L	H	11.5V		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	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}	$V_{CC}=3.0V - 5.5V$	3.0	-	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 Vss

ELECTRICAL CHARACTERISTICS (Read operation)**DC Characteristics 1**(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 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}	$\overline{CE}=V_{IL}$, $\overline{OE}=V_{IH}$ tc=120ns	-	-	40	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 Vss

DC Characteristics 2(V_{CC}=5V±0.5V, Ta=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}	$\overline{CE}=V_{CC}$	-	-	50	μA
	I _{CS2}	$\overline{CE}=V_{IH}$	-	-	1	mA
V _{CC} power supply current (Read)	I _{CCA}	$\overline{CE}=V_{IL}$, $\overline{OE}=V_{IH}$ tc=80ns	-	-	70	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} =-400μA	2.4	-	-	V
Output "L" level	V _{OL}	I _{OL} =2.1mA	-	-	0.45	V

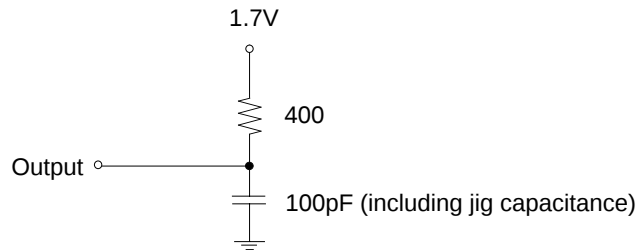
Voltage is relative to Vss

AC Characteristics 1(V_{CC}=3.3V±0.3V, Ta=0 to 70°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

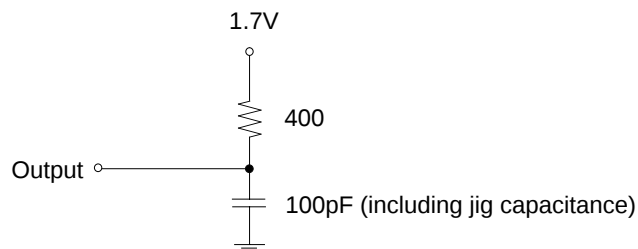
Input signal level ----- 0V/3V
 Input timing reference level ----- 0.8V/2.0V
 Output load ----- 100pF
 Output timing reference level ----- 0.8V/2.0V

**AC Characteristics 2**(V_{CC}=5V±0.5V, Ta=0 to 70°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

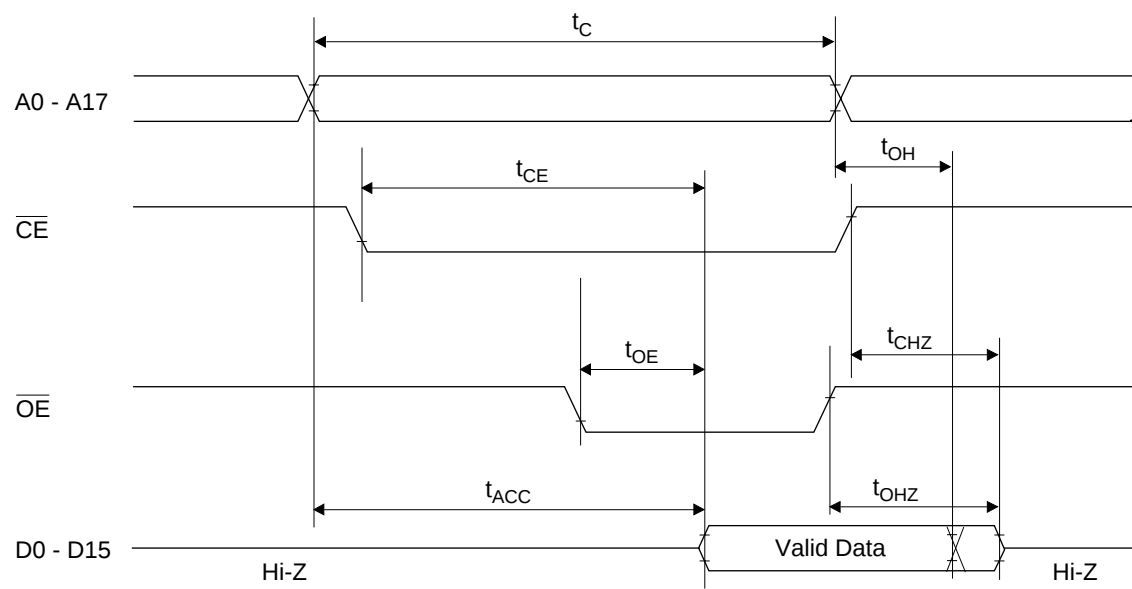
Measurement conditions

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

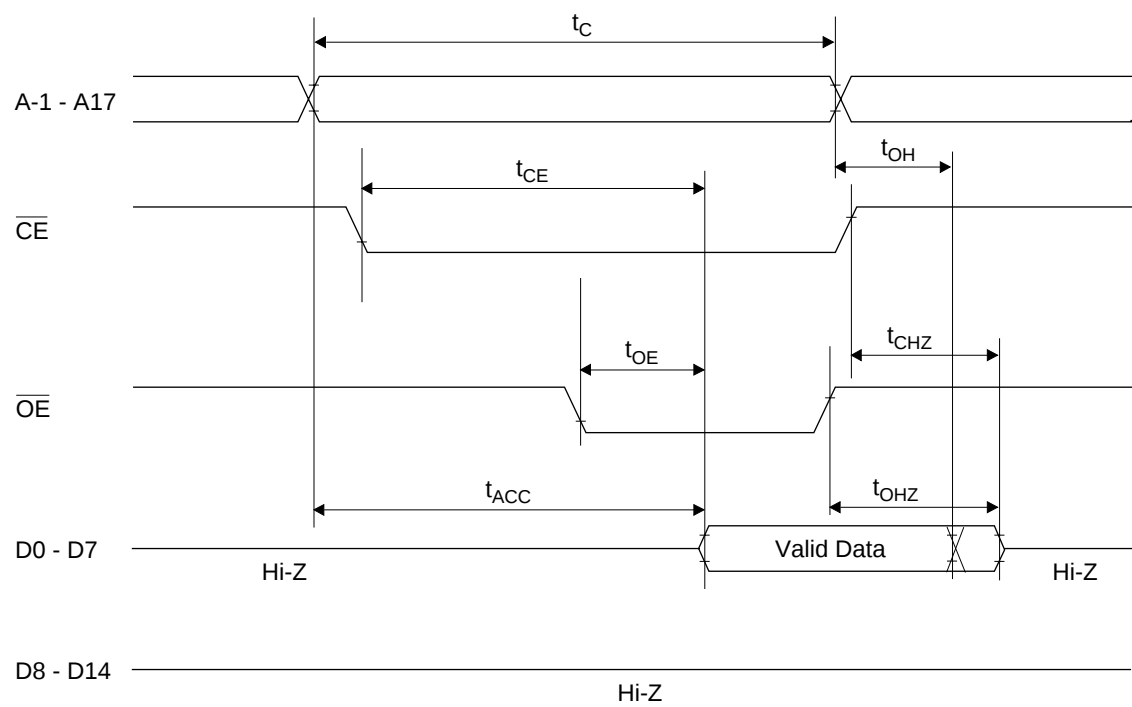


TIMING CHART (READ CYCLE)

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)

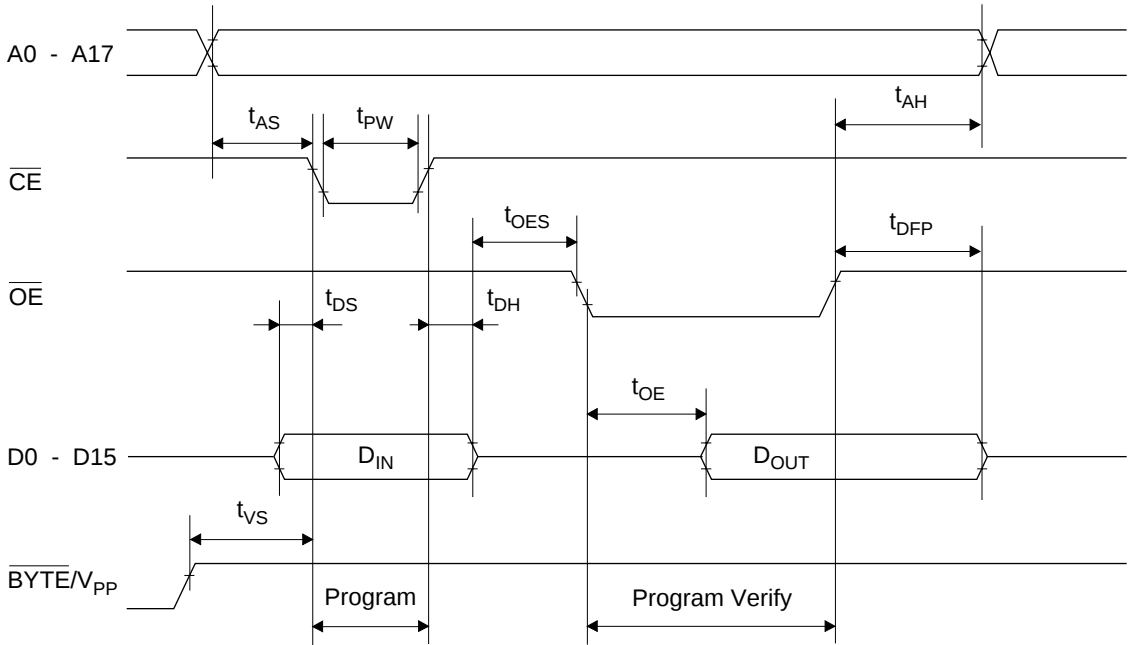
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input leakage current	I_{LI}	$V_I = V_{CC} + 0.5V$	-	-	10	μA
V_{PP} power supply current (Program)	I_{PP2}	$\overline{CE} = V_{IL}$	-	-	50	mA
V_{CC} power supply current	I_{CC}	-	-	-	80	mA
Input "H" level	V_{IH}	-	2.2	-	$V_{CC} + 0.5$	V
Input "L" level	V_{IL}	-	-0.5	-	0.8	V
Output "H" level	V_{OH}	$I_{OH} = -400\mu A$	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

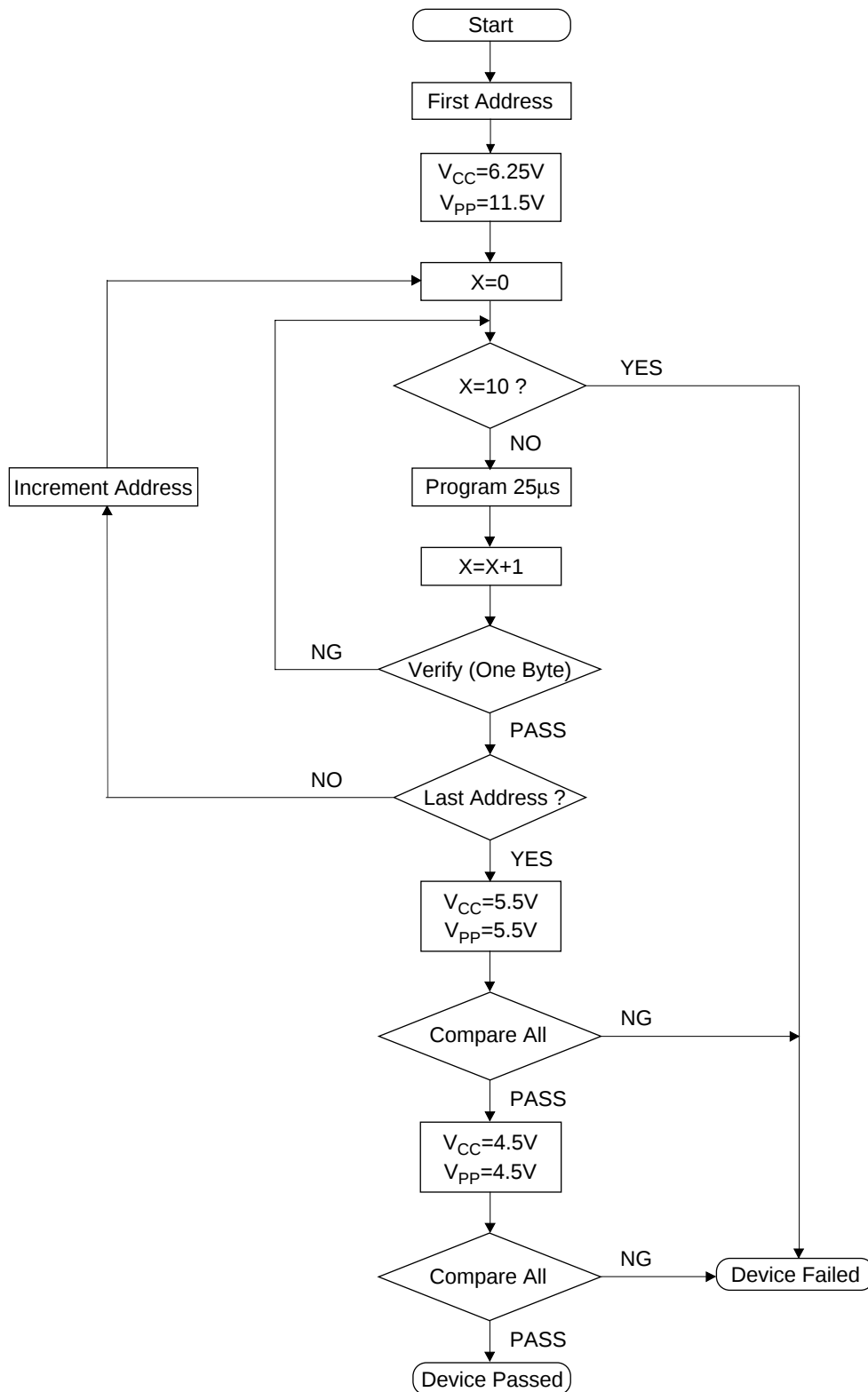
Programming Waveform



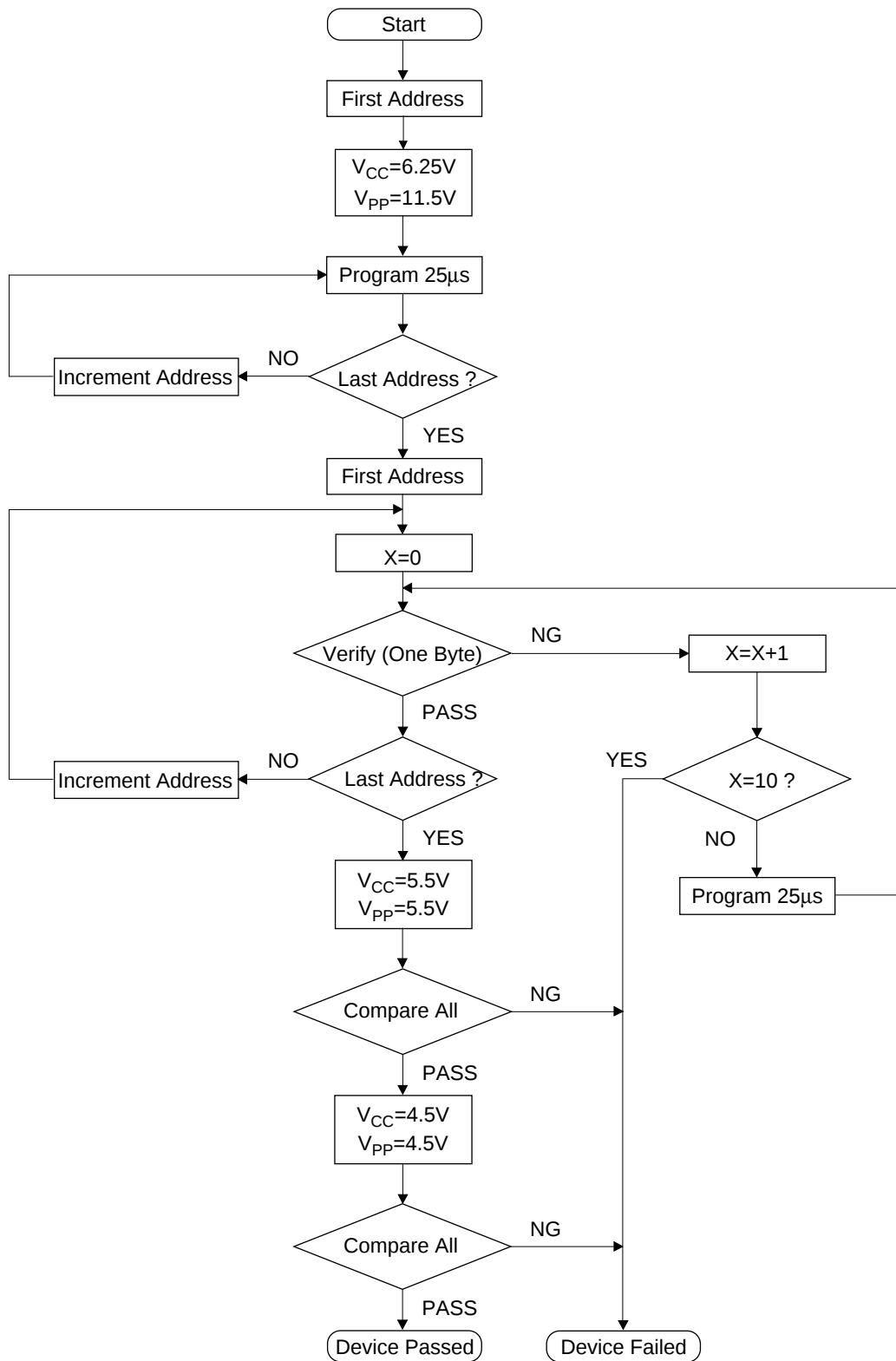
PIN Capacitance

(V _{CC} =5V, Ta=25°C, f=1MHz)						
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input	C _{IN1}	V _I =0V	-	-	12	pF
$\overline{BYTE}/V_{PP}$	C _{IN2}		-	-	60	
Output	C _{OUT}	V _O =0V	-	-	15	

High Speed Programming Algorithm (I)



High Speed Programming Algorithm (II)



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ADDRESSES & SEMICONDUCTOR WEB SITES

OKI Electric Industry Co., Ltd.,

Device Business Group,
10-3, Shibaura, 4-chome,
Minato-ku, Tokyo 108, Japan,
Tel.: +81-(0)3-5445-6327,
Fax.: +81-(0)3-5445-6328,
<http://www.oki.co.jp/OKI/DBG/english/index.htm>
(NOTE: URL is case sensitive)

OKI Semiconductor Group,

785 North Mary Avenue,
Sunnyvale, CA 94086, U.S.A.,
Tel.: +1-408-720-1900,
Fax.: +1-408-720-1918,
<http://www.okisemi.com/>

OKI Electric Europe GmbH,

Head Office Europe,
Hellersbergstrasse 2,
D-41460 Neuss, Germany,
Tel: +49-2131-15960,
Fax: +49-2131-103539,
<http://www.oki-europe.de/>

OKI Electronics (Hong Kong) Ltd.,

Suite 1901-1&19, Tower 3,
China Hong Kong City,
33 Canton Road, Tsimshatsui,
Kowloon, Hong Kong,
Tel.: +852-2-736-2336,
Fax.: +852-2-736-2395

OKI Semiconductor (Asia) Pte. Ltd.,

78 Shenton Way 09-01,
Singapore 0207,
Tel.: +65-221-3722,
Fax.: +65-323-5376

OKI Semiconductor (Asia) Pte. Ltd.,

Taipei Branch,
7th Fl. No.260, Tun Hwa North Road,
Taipei, Taiwan, R.O.C.,
Sumitomo-Flysun Building,
Tel.: +886-2-2719-2561,
Fax.: +886-2-2715-2892
<http://www.oki.net.tw/>

For further information, please contact:

OKI

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