

# OKI semiconductor

## MSM27C401

524,288-Word x 8-Bit UV EPROM

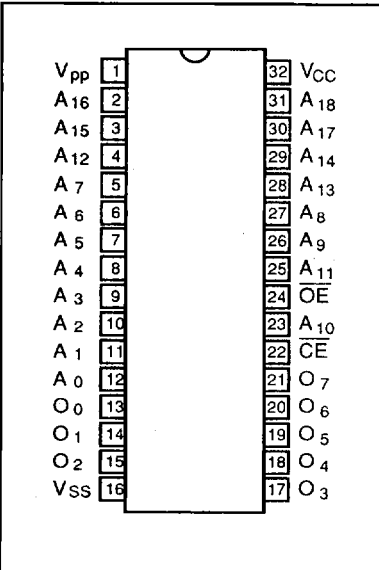
### GENERAL DESCRIPTION

The MSM27C401 is read-only memory consisting of 524,288-word x 8-bit. Its contents can be erased by ultraviolet. The user can store arbitrary data in memory and change it with ease, making the MSM27C401 suitable for microprocessor programming.

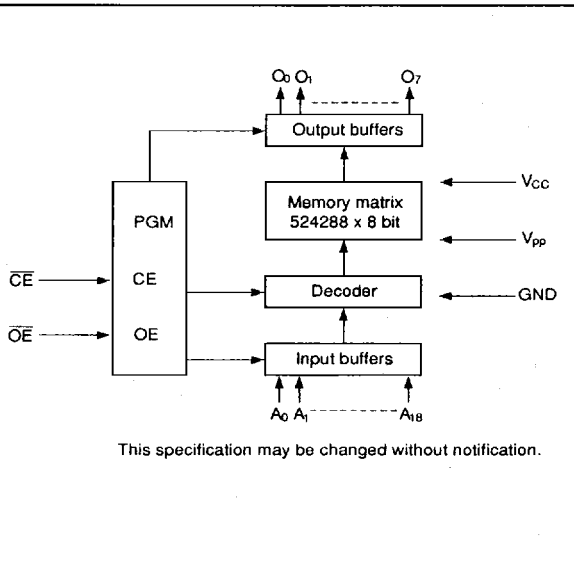
### FEATURES

- +5V single power supply
- 524,288-word x 8-bit configuration
- Access time:
  - MAX 100 ns (MSM27C401-10)
  - MAX 120 ns (MSM27C401-12)
- Power consumption
  - MAX330 mW (during operation)
  - MAX28 mW (during standby)
- Completely static operation
- INPUT/OUTPUT TTL compatible (three state output)

### PIN CONFIGURATION (TOP VIEW)



### FUNCTIONAL BLOCK DIAGRAM



**TRUTH TABLE**

Mode \ Pins	$\overline{CE}$ (22)	$\overline{OE}$ (24)	$V_{PP}$ (1)	$V_{CC}$ (32)	Outputs
Read	$V_{IL}$	$V_{IL}$	+5V	+5V	$D_{OUT}$
Output Disable	$V_{IL}$	$V_{IH}$	+5V	+5V	High impedance
Standby	$V_{IH}$	—	+5V	+5V	High impedance
Program	$V_{IL}$	$V_{IH}$	+12.75V	+6.25V	$D_{IN}$
Program Verify	$V_{IH}$	$V_{IL}$	+12.75V	+6.25V	$D_{OUT}$
Program Inhibit	$V_{IH}$	$V_{IH}$	+12.75V	+6.25V	High impedance

—: Can be either  $V_{IL}$  or  $V_{IH}$

**ELECTRICAL CHARACTERISTICS  
ABSOLUTE MAXIMUM RATINGS**

Rating	Symbol	Conditions	Value	Unit
Temperature Under Bias	$T_a$	—————	0 ~ 70	°C
Storage Temperature	$T_{stg}$	—————	-55 ~ 125	°C
Input Voltage	$V_{IN}$	—————	-0.6 ~ 13.5	V
Output Voltage	$V_{OUT}$	—————	-0.6 ~ $V_{CC} + 0.5$	V
Supply Voltage	$V_{CC}$	—————	-0.6 ~ 7	V
Program Voltage	$V_{PP}$	—————	-0.6 ~ 14	V

The voltage referenced to GND.

Note: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**READ OPERATION  
RECOMMENDED OPERATING CONDITIONS**

( $T_a = 0 \sim 70^\circ\text{C}$ )

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Supply Voltage	$V_{CC}$	$V_{CC} = 5V \pm 10\%$ $V_{PP} = V_{CC}$	4.5	5.0	5.5	V
$V_{PP}$ Voltage	$V_{PP}$		4.5	5.0	5.5	V
"H" Level Input Voltage	$V_{IH}$		2.0	—	$V_{CC} + 0.5$	V
"L" Level Input Voltage	$V_{IL}$		-0.1	—	0.8	V

The voltage referenced to GND.

**DC CHARACTERISTICS**

(V<sub>CC</sub> = 5V ± 10%, T<sub>a</sub> = 0 ~ 70°C)

Parameter	Symbol	Conditions	MSM27C401			Unit	Notes
			Min.	Typ.	Max.		
Input Leakage Current	I <sub>LI</sub>	V <sub>IN</sub> = 5.5V	-	-	10	μA	
Output Leakage Current	I <sub>LO</sub>	V <sub>OUT</sub> = 5.5V	-	-	10	μA	
V <sub>CC</sub> Power Current (Standby)	I <sub>CC1</sub>	$\overline{CE} = V_{IH}$	-	-	5	mA	
V <sub>CC</sub> Power Current (Operation)	I <sub>CC2</sub>	$\overline{CE} = V_{IL}, f = 6.7 \text{ MHz}, I_{OUT} = 0 \text{ mA}$	-	-	60	mA	
Program Power Current	I <sub>pp1</sub>	V <sub>pp</sub> = V <sub>CC</sub>	-	-	100	μA	
Input Voltage "H" Level	V <sub>IH</sub>	-	2.0	-	V <sub>CC</sub> +0.5	V	
Input Voltage "L" Level	V <sub>IL</sub>	-	-0.1	-	0.8	V	
Output Voltage "H" Level	V <sub>OH</sub>	I <sub>OH</sub> = -400 μA	2.4	-	-	V	
Output Voltage "L" Level	V <sub>OL</sub>	I <sub>OL</sub> = 2.1 mA	-	-	0.45	V	

**AC CHARACTERISTICS**

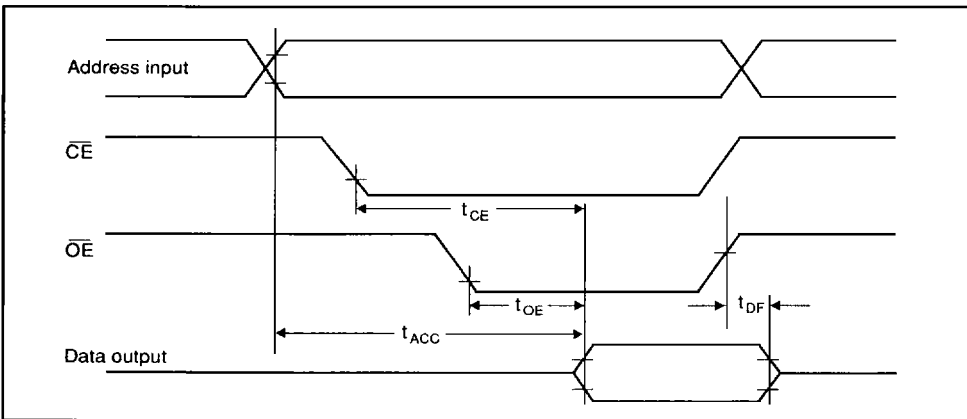
(V<sub>CC</sub> = 5V ± 10%, T<sub>a</sub> = 0 ~ 70°C)

Parameter	Symbol	Conditions	27C401-10		27C401-12		Unit	Notes
			Min.	Max.	Min.	Max.		
Address Access Time	t <sub>ACC</sub>	$\overline{CE} = \overline{OE} = V_{IL}$	-	100	-	120	ns	
$\overline{CE}$ Access Time	t <sub>CE</sub>	$\overline{OE} = V_{IL}$	-	100	-	120	ns	
$\overline{OE}$ Access Time	t <sub>OE</sub>	$\overline{CE} = V_{IL}$	-	50	-	50	ns	
Output Disable Time	t <sub>DF</sub>	$\overline{CE} = V_{IL}$	0	40	0	40	ns	

**Measurement Conditions**

- Input pulse level ..... 0.45V and 2.4V
- Input timing reference level ..... 0.8V and 2.0V
- Output load ..... 1 TTL GATE + 100 pF
- Output timing reference level ..... 0.8V and 2.0V

**TIME CHART**



**PROGRAMMING OPERATION  
DC CHARACTERISTICS**

( $V_{CC} = 6.25V \pm 0.25V$ ,  $V_{pp} = 12.75V \pm 0.25V$ ,  $T_a = 25^\circ C \pm 5^\circ C$ )

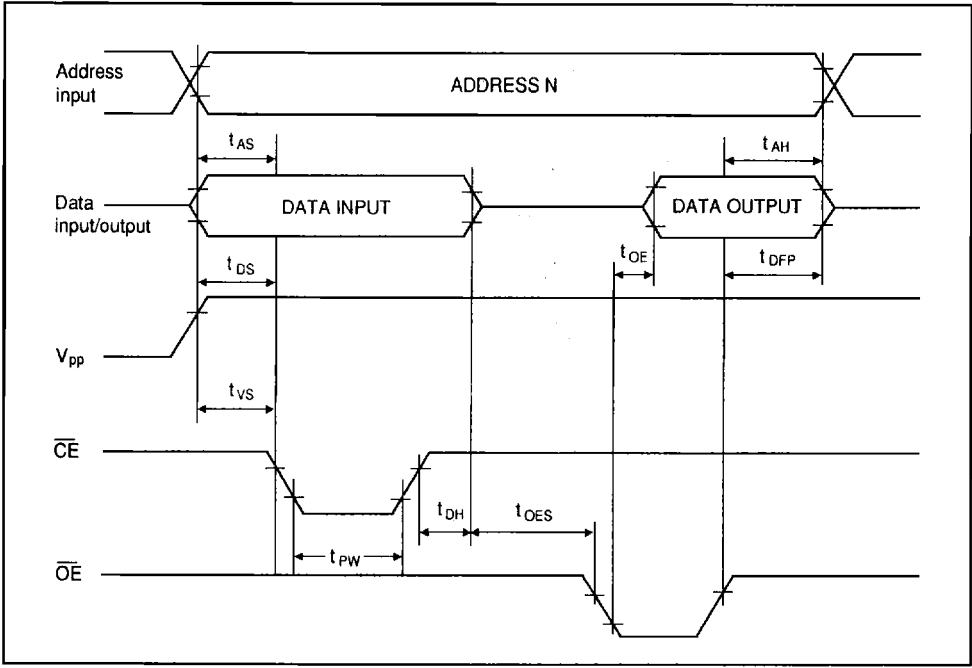
Parameter	Symbol	Conditions	MSM27C401			Unit	Notes
			Min.	Typ.	Max.		
Input Leakage Current	$I_{LI}$	$V_{IN} = 5.5V$	–	–	10	$\mu A$	
$V_{pp}$ Power Current	$I_{PP2}$	$\overline{CE} = V_{IL}$	–	–	50	mA	
$V_{CC}$ Power Current	$I_{CC}$	–	–	–	100	mA	
Input Voltage "H" Level	$V_{IH}$	–	2.0	–	$V_{CC}+0.5$	V	
Input Voltage "L" Level	$V_{IL}$	–	-0.1	–	0.8	V	
Output Voltage "H" Level	$V_{OH}$	$I_{OH} = -400 \mu A$	2.4	–	–	V	
Output Voltage "L" Level	$V_{OL}$	$I_{OL} = 2.1 mA$	–	–	0.45	V	

**AC CHARACTERISTICS**

( $V_{CC} = 6.25V \pm 0.25V$ ,  $V_{pp} = 12.75V \pm 0.25V$ ,  $T_a = 25^\circ C \pm 5^\circ C$ )

Parameter	Symbol	Conditions	MSM27C401			Unit	Notes
			Min.	Typ.	Max.		
Address Set-up Time	$t_{AS}$	–	2	–	–	$\mu S$	
$\overline{OE}$ Set-up Time	$t_{OES}$	–	2	–	–	$\mu S$	
Data Set-up Time	$t_{DS}$	–	2	–	–	$\mu S$	
Address Hold Time	$t_{AH}$	–	0	–	–	$\mu S$	
Data Hold Time	$t_{DH}$	–	2	–	–	$\mu S$	
Output Enable to Output Float Delay	$t_{DFP}$	–	0	–	130	ns	
$V_{pp}$ Power Set-up Time	$t_{VS}$	–	2	–	–	$\mu S$	
PGM Program Pulse Width	$t_{PW}$	–	95	100	105	$\mu S$	
Data Valid from $\overline{OE}$	$t_{OE}$	–	–	–	150	ns	

**TIME CHART**



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**CAPACITANCE**

( $T_a = 25^\circ\text{C}$ ,  $f = 1 \text{ MHz}$ ,  $V_{CC} = 5\text{V}$ )

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	$C_{IN}$	$V_{IN} = 0\text{V}$	–	–	12	pF
Output Capacitance	$C_{OUT}$	$V_{OUT} = 0\text{V}$	–	–	15	pF

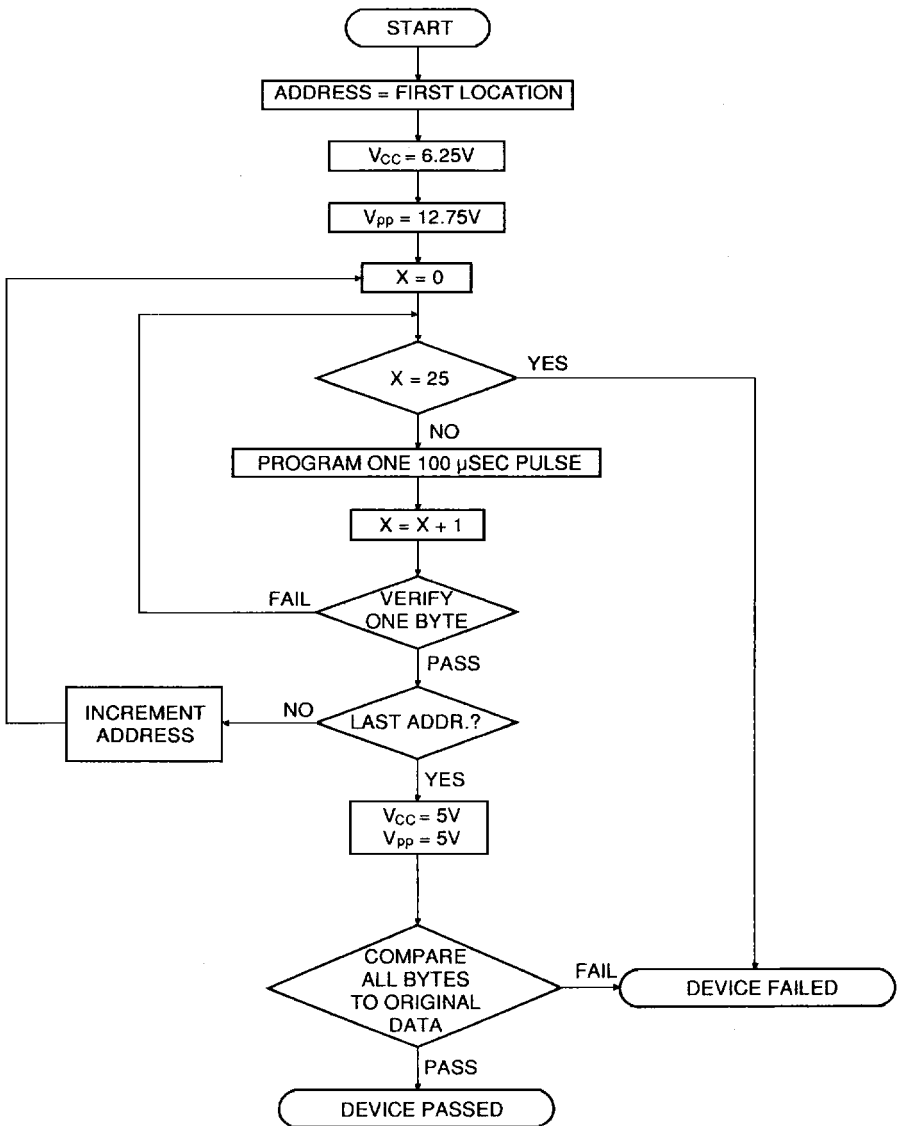
**MSM27C401**

**IDENTIFIER BYTES**

Code	Pins	Identifier Bytes									Hex Data
		A <sub>0</sub> (12)	D <sub>7</sub> (21)	D <sub>6</sub> (20)	D <sub>5</sub> (19)	D <sub>4</sub> (18)	D <sub>3</sub> (17)	D <sub>2</sub> (15)	D <sub>1</sub> (14)	D <sub>0</sub> (13)	
Manufacturer Code	V <sub>IL</sub>	1	0	1	0	1	1	1	0	0	AE
Device Code	V <sub>IH</sub>	1	0	0	0	1	1	0	0	0	8C

Note:  $A_9 = 12.0 \pm 0.5\text{V}$

$A_1 \sim A_8, A_{10} \sim A_{18}, \overline{\text{CE}}, \overline{\text{OE}} = V_{IL}, V_{pp} = V_{CC}$



Programming Flowchart Example