

# OKI semiconductor

## MSM27256

32,768-Word x 8-Bit UV EPROM

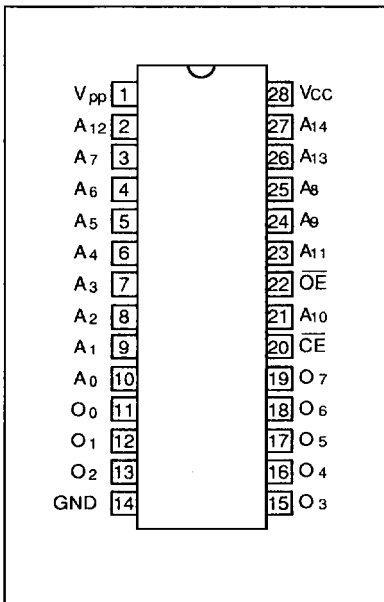
### GENERAL DESCRIPTION

The MSM27256 is a 32,768-word x 8-bit ultraviolet erasable and electrically programmable read-only memory. The MSM27256 is manufactured by the N channel double silicon gate MOS technology and is contained in the 28-pin package.

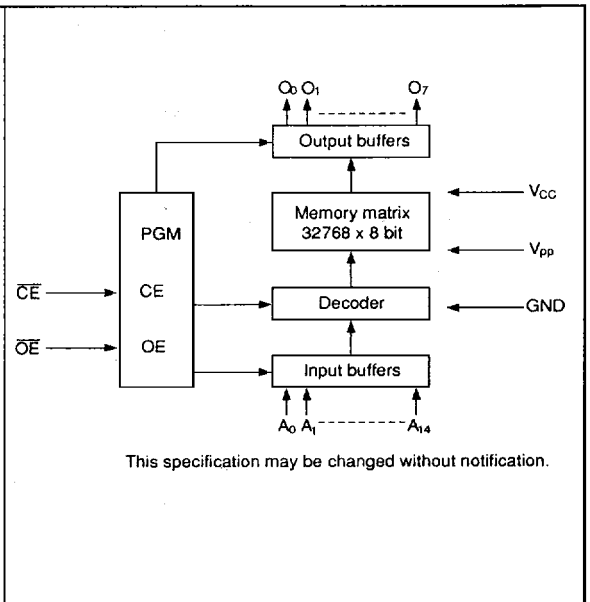
### FEATURES

- +5V single power supply
- 32,768-word x 8-bit configuration
- Access time:
  - MAX 150 ns (MSM27256-15)
  - MAX 200 ns (MSM27256-20)
  - MAX 250 ns (MSM27256-25)
- Power consumption
  - MAX525 mW (during operation)
  - MAX184 mW (during standby)
- Completely static operation
- INPUT/OUTPUT TTL compatible (three state output)

### PIN CONFIGURATION (TOP VIEW)



### FUNCTIONAL BLOCK DIAGRAM



**TRUTH TABLE**

Mode \ Pins	CE (20)	OE (22)	V <sub>pp</sub> (1)	V <sub>CC</sub> (28)	Outputs
Read	V <sub>IL</sub>	V <sub>IL</sub>	+5V	+5V	D <sub>OUT</sub>
Output Disable	V <sub>IL</sub>	V <sub>IH</sub>	+5V	+5V	High impedance
Standby	V <sub>IH</sub>	—	+5V	+5V	High impedance
Program	V <sub>IL</sub>	V <sub>IH</sub>	+12.5V	+6V	D <sub>IN</sub>
Program Verify	V <sub>IH</sub>	V <sub>IL</sub>	+12.5V	+6V	D <sub>OUT</sub>
Program Inhibit	V <sub>IH</sub>	V <sub>IH</sub>	+12.5V	+6V	High impedance

—: Can be either V<sub>IL</sub> or V<sub>IH</sub>

**ELECTRICAL CHARACTERISTICS  
ABSOLUTE MAXIMUM RATINGS**

Rating	Symbol	Conditions	Value	Unit
Temperature Under Bias	T <sub>a</sub>	—————	0 ~ 70	°C
Storage Temperature	T <sub>stg</sub>	—————	-55 ~ 125	°C
Input Voltage	V <sub>IN</sub>	—————	-0.6 ~ 13.5	V
Output voltage	V <sub>OUT</sub>	—————	-0.6 ~ 7	V
V <sub>CC</sub> Supply Voltage	V <sub>CC</sub>	—————	-0.6 ~ 7	V
Program Voltage	V <sub>pp</sub>	—————	-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<sub>a</sub> = 0 ~ 70°C)

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Supply Voltage	V <sub>CC</sub>	V <sub>CC</sub> = 5V ± 5% V <sub>pp</sub> = V <sub>CC</sub>	4.75	5.0	5.25	V
V <sub>pp</sub> Voltage	V <sub>pp</sub>		4.75	5.0	5.25	V
"H" Level Input Voltage	V <sub>IH</sub>		2.0	—	6.25	V
"L" Level Input Voltage	V <sub>IL</sub>		-0.1	—	0.8	V

The voltage referenced to GND.

**DC CHARACTERISTICS**

( $V_{CC} = 5V \pm 5\%$ ,  $V_{pp} = V_{CC}$ ,  $T_a = 0 \sim 70^\circ C$ )

Parameter	Symbol	Conditions	MSM27256			Unit	Notes
			Min.	Typ.	Max.		
Input Leakage Current	$I_{LI}$	$V_{IN} = 5.25V$	-	-	10	$\mu A$	
Output Leakage Current	$I_{LO}$	$V_{OUT} = 5.25V$	-	-	10	$\mu A$	
$V_{CC}$ Power Current (Standby)	$I_{CC1}$	$\overline{CE} = V_{IH}$	-	-	35	mA	
$V_{CC}$ Power Current (Operation)	$I_{CC2}$	$\overline{CE} = V_{IL}$	-	-	100	mA	
Program Power Current	$I_{pp1}$	$V_{pp} = V_{CC}$	-	-	5	mA	
Input Voltage "H" Level	$V_{IH}$	-	2.0	-	$V_{CC}+1$	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	$V_{OL}$	$I_{OL} = 2.1 \text{ mA}$	-	-	0.45	V	

**AC CHARACTERISTICS**

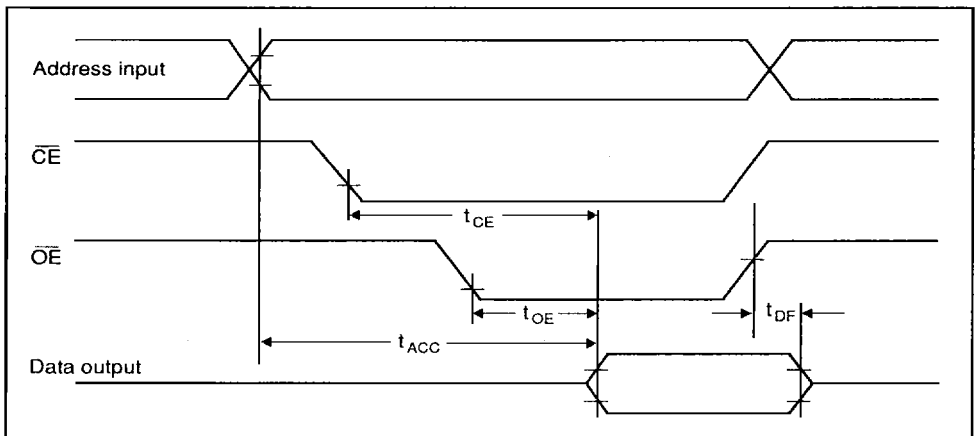
( $V_{CC} = 5V \pm 5\%$ ,  $V_{pp} = V_{CC}$ ,  $T_a = 0 \sim 70^\circ C$ )

Parameter	Symbol	Conditions	27256-15		27256-20		27256-25		Unit	Notes
			Min.	Max.	Min.	Max.	Min.	Max.		
Address Access Time	$t_{ACC}$	$\overline{CE} = \overline{OE} = V_{IL}$	-	150	-	200	-	250	ns	
$\overline{CE}$ Access Time	$t_{CE}$	$\overline{OE} = V_{IL}$	-	150	-	200	-	250	ns	
$\overline{OE}$ Access Time	$t_{OE}$	$\overline{CE} = V_{IL}$	-	60	-	70	-	100	ns	
Output Disable Time	$t_{DF}$	$\overline{CE} = V_{IL}$	0	50	0	55	0	60	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**

( $V_{CC} = 5.75V \sim 6.5V$ ,  $V_{pp} = 12.5V \pm 0.5V$ ,  $T_a = 25^\circ C \pm 5^\circ C$ )

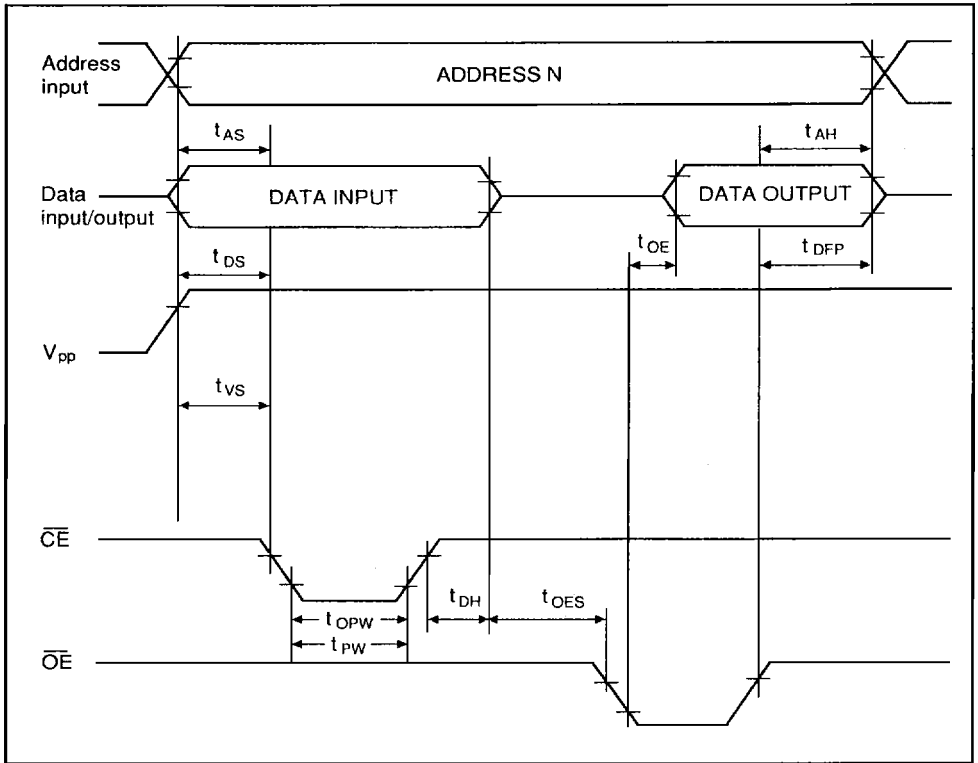
Parameter	Symbol	Conditions	MSM27256			Unit	Notes
			Min.	Typ.	Max.		
Input Leakage Current	$I_{LI}$	$V_{IN} = 5.25V$	–	–	10	$\mu A$	
$V_{pp}$ Power Current	$I_{pp2}$	$\overline{CE} = V_{IL}, \overline{OE} = V_{IH}$	–	–	50	mA	
$V_{CC}$ Power Current	$I_{CC}$	–	–	–	100	mA	
Input Voltage "H" Level	$V_{IH}$	–	2.0	–	$V_{CC}+1$	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**

( $V_{CC} = 5.75V \sim 6.5V$ ,  $V_{pp} = 12.5V \pm 0.5V$ ,  $T_a = 25^\circ C \pm 5^\circ C$ )

Parameter	Symbol	Conditions	MSM27256			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	–	–	$\mu S$	
$\overline{CE}$ Initial Program Pulse Width	$t_{PW}$	$V_{CC} = 6V \pm 0.25V$	0.95	1.0	1.05	mS	
$\overline{CE}$ Program Pulse Width	$t_{PW}$	$V_{CC} = 6.25V \pm 0.25V$	95	100	105	$\mu S$	
$\overline{CE}$ Overprogram Pulse Width	$t_{OPW}$	$V_{CC} = 6V \pm 0.25V$	2.85	–	78.75	ms	
Data Valid from $\overline{OE}$	$t_{OE}$	–	–	–	150	ns	

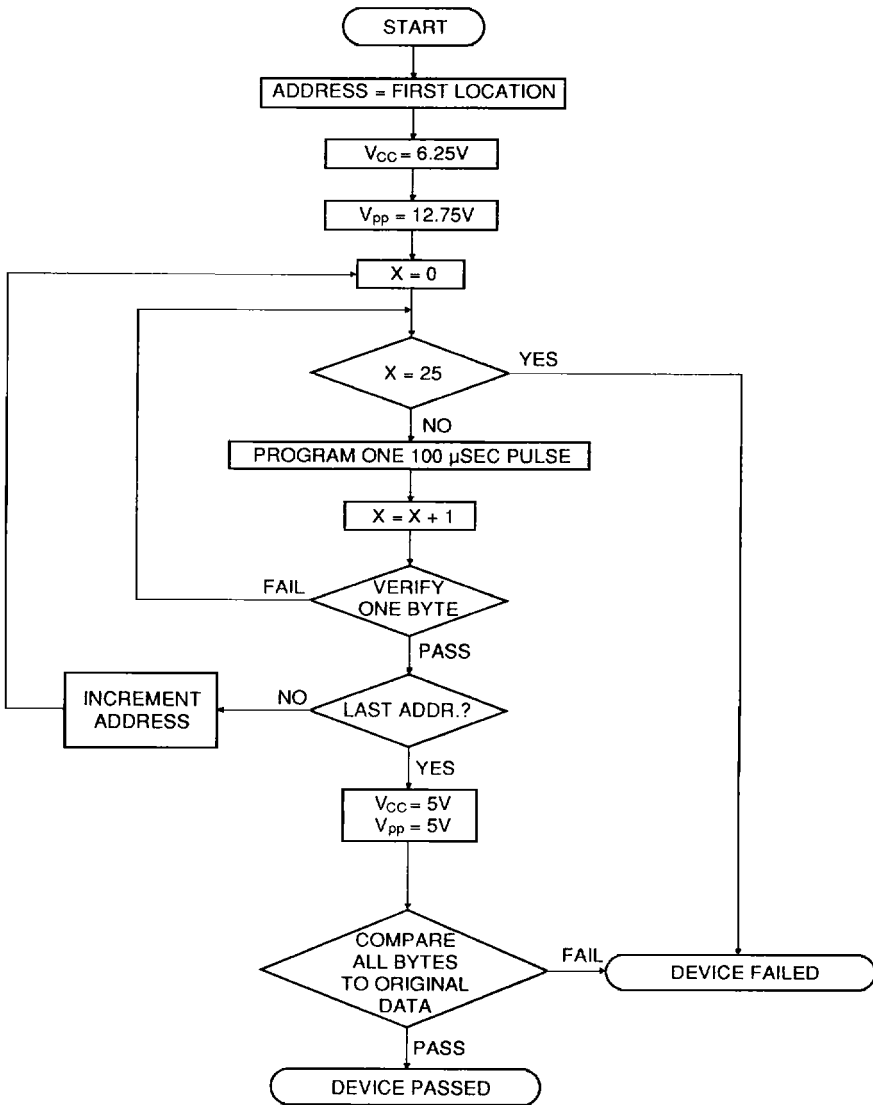
**TIME CHART**



**CAPACITANCE**

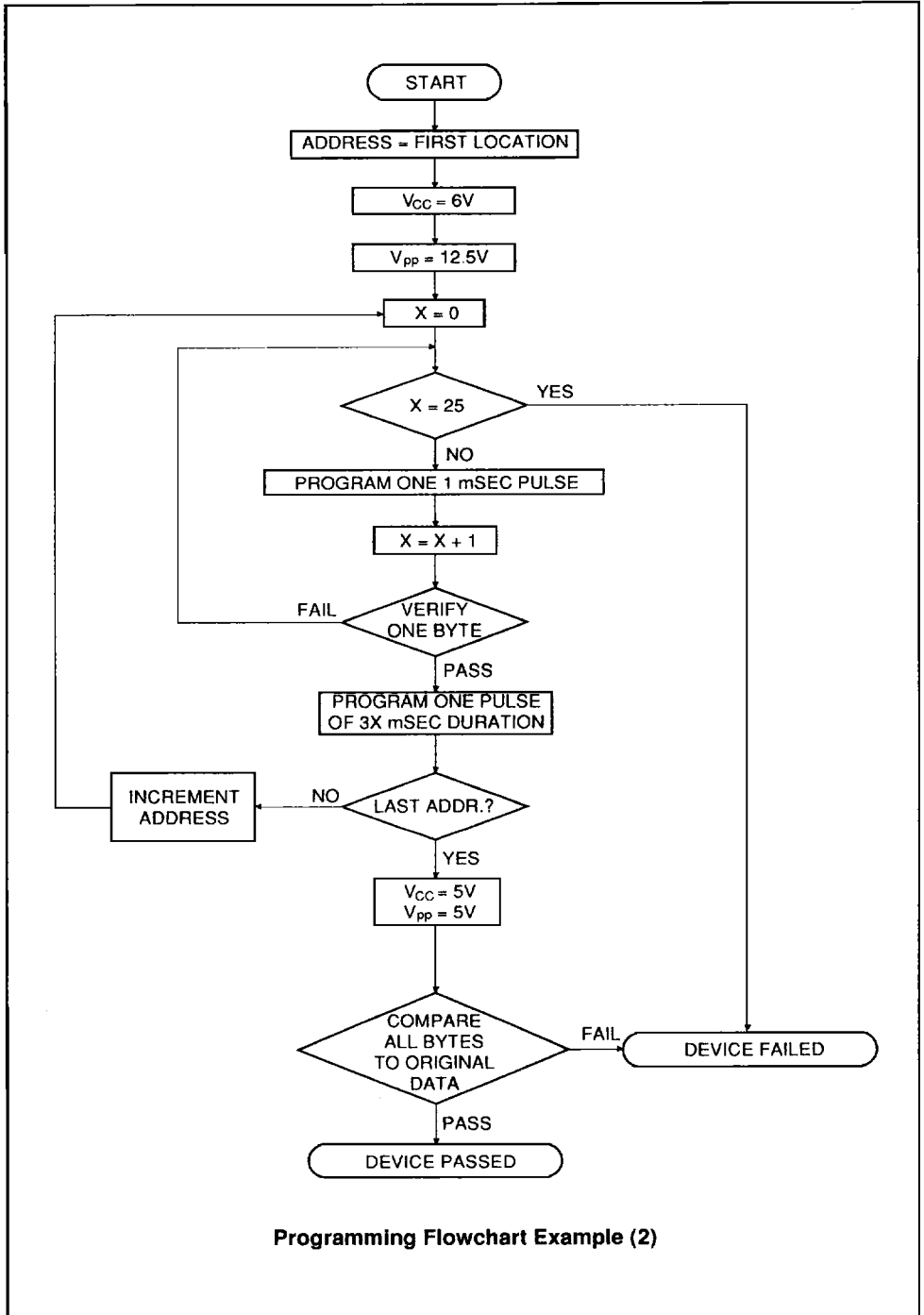
( $T_a = 25^\circ\text{C}$ ,  $f = 1\text{ MHz}$ ,  $V_{cc} = 5\text{V}$ )

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	$C_{IN}$	$V_{IN} = 0\text{V}$	—	4	6	pF
Output Capacitance	$C_{OUT}$	$V_{OUT} = 0\text{V}$	—	8	12	pF



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Programming Flowchart Example (1)



Programming Flowchart Example (2)