MARCH 1980

OKI semiconductor

S-67 CRIG

003831

T-3631

# MSM2758 8,192-BIT (1024 × 8) UV ERASABLE PROM

## GENERAL DESCRIPTION

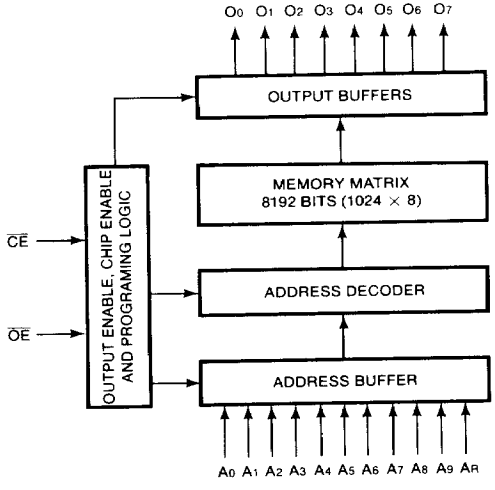
The Oki MSM2758 is a 8192-bit ultraviolet erasable and electrical programmable read-only memory organized as 1024-words by 8-bits using Oki's Floating Gate N-channel Silicon Gate MOS technology. It uses fully static circuitry and therefore requires no clocks or refreshing to operate. Directly TTL compatible inputs, outputs and operation from a single +5V supply with low-power stand-by mode simplify system designs. Common data input/output pins using three-state outputs are provided.

The MSM2758 is offered in a 24-pin dual-in-line ceramic (AS suffix) package with quartz glass window. Operation is guaranteed from 0°C to 70°C.

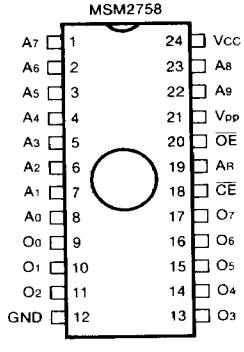
## FEATURES

- 450 ns maximum Access Time
- Low Power Dissipation
  525 mW operating
  132 mW standby
- Single +5V Supply
- 1024-word × 8-bit Organization
- UV Erasable and Electrically Programmable
- Minimal Programming Time
  50 seconds for all 8192 bits
  50 milliseconds for single location
- Pin compatible with MSM2128-1, 16,384 Bit Static RAM
- Interchangeable with Intel 2758 Devices

## FUNCTIONAL BLOCK DIAGRAM




## PIN CONFIGURATION




A0 to A9: Address Inputs
AR: Address Reference Input
O0 to O7: Outputs
$\overline{CE}$: Chip Enable
$\overline{OE}$: Output Enable
VPP: +25V Program Supply
VCC: +5V Supply
GND: Ground

| $\overline{CE}$ | $\overline{OE}$ | AR | VPP | Outputs | Mode |
|---|---|---|---|---|---|
| L | L | L | +5 | DOUT | Read |
| H | X | L | +5 | Hi-Z | Standby |
| H/L | H | L | +25 | DIN | Program |
| L | L | L | +25 | DOUT | Program Verify |
| L | H | L | +25 | Hi-Z | Program Inhibit |

## ABSOLUTE MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Temperature Under Bias | $T_{OP}$ | 0 to + 70 | °C |
| Storage Temperature | $T_{STG}$ | −55 to +125 | °C |
| Program Voltage (Respect to Gnd) | $V_{PP}$ | −0.3 to +28 | V |
| Supply Voltage (Respect to Gnd) | $V_{CC}$ | −0.3 to +6 | V |
| Input Voltage (Respect to Gnd) | $V_{IN}$ | −0.3 to +6 | V |
| Output Voltage (Respect to Gnd) | $V_{OUT}$ | −0.3 to +6 | V |
| Power Dissipation | $P_W$ | 0.6 | W |

**Note:** Stresses above those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or at any other condition above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## OPERATING CONDITIONS

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 4.75 | 5 | 5.25 | V | 5V ± 5% |
| Program Voltage | $V_{PP}$ | $V_{CC}$ − 0.6 | | $V_{CC}$ + 0.6 | V | Read Mode |
| | $V_{PP}$ | 24.0 | | 26.0 | V | Program Mode |
| Input Signal Level | $V_{IH}$ | 2.2 | 5 | 6.0 | V | Respect to Gnd |
| | $V_{IL}$ | −0.1 | 0 | 0.8 | V | |
| Operating Temperature | $T_a$ | 0 | | +70 | °C | |

## DC CHARACTERISTICS

($V_{CC}$ = 5V ± 5%; $V_{PP}$ = $V_{CC}$ ± 0.6V; $T_A$ = 0 to +70°C unless otherwise noted)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Input Load Current | $I_{LI}$ | | | 10 | μA | $V_{IN}$ = 5.25V/0.45V |
| Output Leakage Current | $I_{LO}$ | | | 10 | μA | $V_{OUT}$ = 5.25V |
| $V_{PP}$ Current | $I_{PP}$ | | | 5 | mA | $V_{PP}$ = 5.85V |
| | $I_{PP1}$ | | | 6 | mA | $V_{PP}$ = 25V ± 1V, $\overline{CE}$ = $V_{IL}$, $T_a$ = 25°C ± 5°C |
| | $I_{PP2}$ | | | 30 | mA | $V_{PP}$ = 25V ± 1V, $\overline{CE}$ = $V_{IH}$, $T_a$ = 25°C ± 5°C |
| $V_{CC}$ Current | $I_{CC1}$ | | 10 | 25 | mA | $\overline{CE}$ = $V_{IH}$, $\overline{OE}$ = $V_{IL}$ |
| | $I_{CC2}$ | | 60 | 100 | mA | $\overline{CE}$ = $V_{IL}$, $\overline{OE}$ = $V_{IL}$ |
| | $I_{CC}$ | | | 100 | mA | $V_{PP}$ = 25V ± 1V, $T_a$ = 25°C ± 5°C |
| Output High Voltage | $V_{OH}$ | 2.4 | | | V | $I_{OH}$ = −400μA |
| Output Low Voltage | $V_{OL}$ | | | 0.45 | V | $I_{OL}$ = 2.1 mA |

**Notes:** 1. $V_{CC}$ must be supplied before or when $V_{PP}$ is supplied, and must be cut off when or after $V_{PP}$ is cut off.

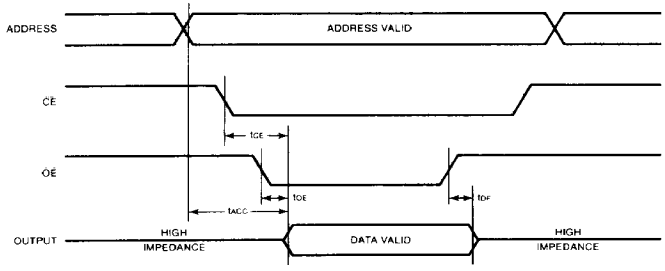
## AC CHARACTERISTICS

### READ MODE

($V_{CC}$ = 5V ± 5%; $V_{PP}$ = $V_{CC}$ ± 0.6V; $T_A$ = 0 to 70°C unless otherwise noted)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Access Time | $t_{ACC}$ | | 250 | 450 | ns |
| Chip Enable to Output Valid | $t_{CE}$ | | 280 | 450 | ns |
| Output Enable to Output Valid | $t_{OE}$ | | | 120 | ns |
| Output Disable to Output Float | $t_{DF}$ | 0 | | 100 | ns |

## READ MODE



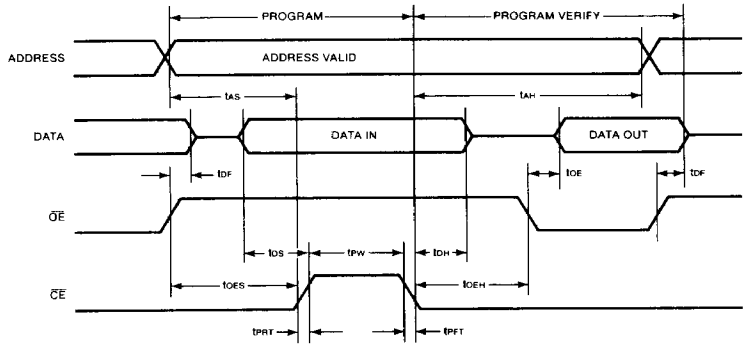

**Notes:** 1. A Read occurs during the overlap of a low $\overline{CE}$ and a low $\overline{OE}$.
2. $t_{ACC}$ is specified with $\overline{CE}$ = $\overline{OE}$ = $V_{IL}$.
3. $t_{CE}$ is specified with $\overline{OE}$ = $V_{IL}$.
4. Input Pulse Levels: 0.8V to +2.2V
5. Input Rise and Fall Time: 20 ns
6. Timing Measurements Reference Level: Input = 1.0V and 2.0V, Output = 0.8V and 2.4V
7. Output Load: 1 TTL Gate and $C_L$ = 100 pF

## PROGRAM MODE

($V_{CC}$ = 5V ± 5%; $V_{PP}$ = 25V ± 1V; $T_a$ = 25°C ± 5°C unless otherwise noted)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Address Setup Time | $t_{AS}$ | 2 | | | μS |
| $\overline{OE}$ Setup Time | $t_{OES}$ | 2 | | | μS |
| Data Setup Time | $t_{DS}$ | 2 | | | μS |
| Address Hold Time | $t_{AH}$ | 2 | | | μS |
| $\overline{OE}$ Hold Time | $t_{OEH}$ | 2 | | | μS |
| Data Hold Time | $t_{DH}$ | 2 | | | μS |
| Output Disable Delay Time | $t_{DF}$ | 0 | | 120 | ns |
| Output Enable Delay Time | $t_{OE}$ | | | 120 | ns |
| Program Pulse Width | $t_{PW}$ | 45 | 50 | 55 | ms |
| Program Pulse Rise Time | $t_{PRT}$ | 5 | | | ns |
| Program Pulse Fall Time | $t_{PFT}$ | 5 | | | ns |

## PROGRAM MODE




**Notes:** 1. Programming occurs with $V_{PP}$ = 25V ± IV during the overlap of a high $\overline{OE}$ and pulsed-high $\overline{CE}$.
2. Measurement conditions same as those for Read Mode. (Notes 4–7).

## CAPACITANCE

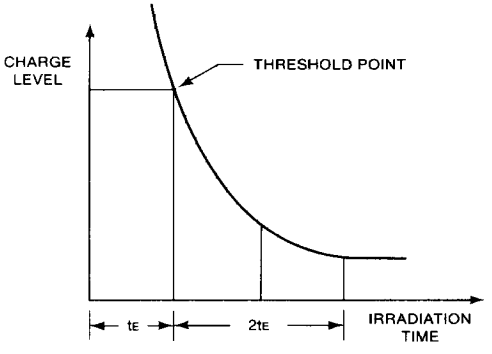
$T_A$ = 25°C, f = 1 MHz

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Output Capacitance | $C_{OUT}$ | | | 12 | pF |
| Input Capacitance | $C_{IN}$ | | | 6 | pF |

**Note:** This parameter is periodically sampled and not 100% tested.

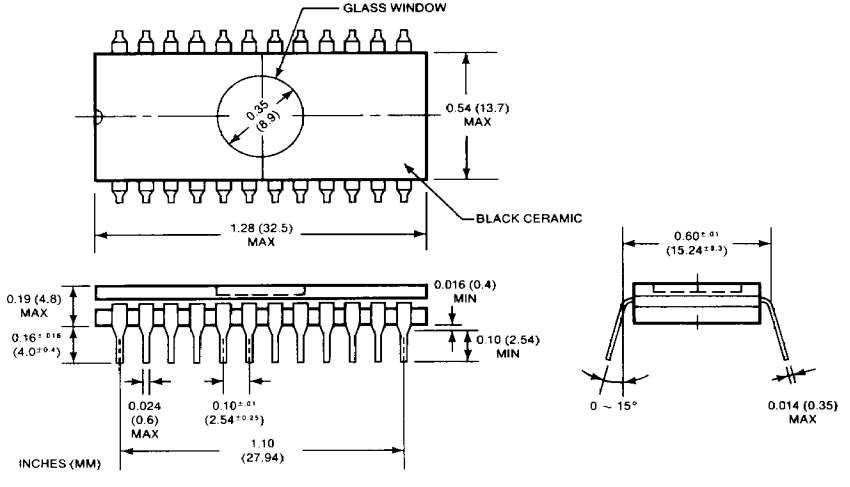
## FUNCTIONAL DESCRIPTION

**PROGRAMMING:** All bits of the EPROM are set to the "1" state at the time of delivery or after erasure. Data is introduced by selectively programming "0's" into the desired bit locations. The only way to change a "0" to a "1" is by ultraviolet light erasure.
**ERASURE:** The contents of the EPROM can be erased by irradiation of ultraviolet rays having a wavelength of 2537 Angstroms. The irradiation energy for erasure should be a minimum of 15W-sec/cm². The charge (electrons) in the floating gates decreases with irradiation time, but erasing time "$t_E$" until reaching the threshold point (where all bits are sensed as "1's") is insufficient. Irradiate for another 2 × $t_E$ for sufficient discharge of electrons.




## PACKAGE SPECIFICATIONS

*24 LEAD CERAMIC (AS)*

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