

# **OKI** Semiconductor

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## **MSM533222E**

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2,097,152-Word x 16-Bit or 4,194,304-Word x 8-Bit MASKROM

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### DESCRIPTION

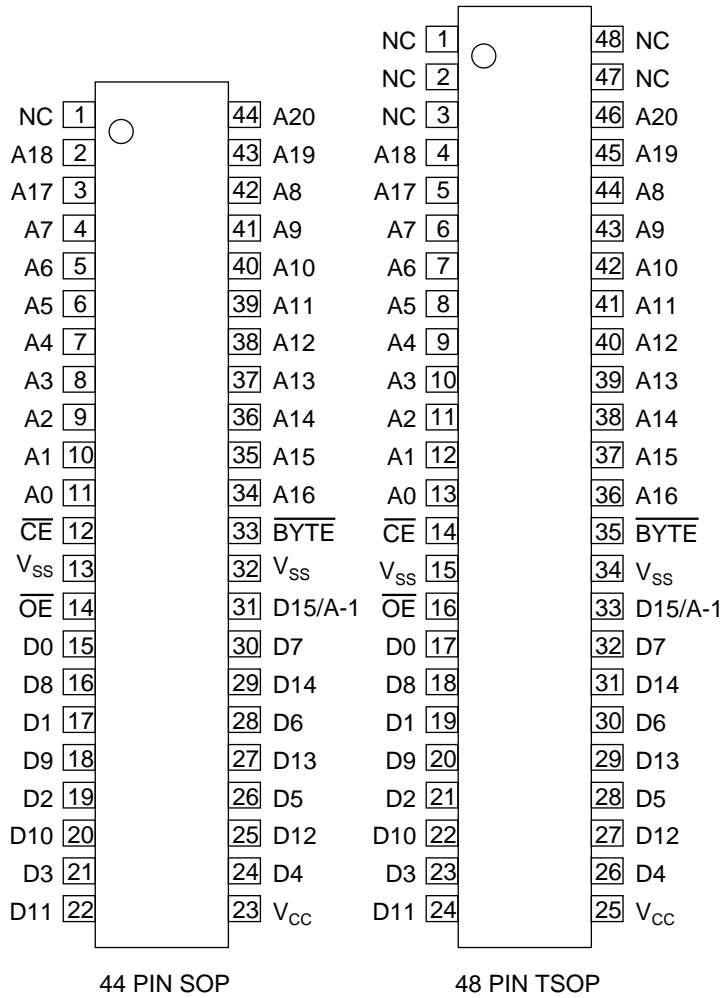
The OKI MSM533222E is a high-speed CMOS Mask ROM that can electrically switch between 2,097,152-word x 16-bit or 4,194,304-word x 8-bit configurations. The MSM533222E Operates on a single 5.0V power supply and is TTL compatible. The chip's asynchronous I/O requires no external clock assuring easy operation. A power-down mode provides low power dissipation when the chip is not selected. The CE and OE pins are provided as control signals that permit three-stated output allowing easy memory expansion on a system bus. The MSM533222E is suited for use as large capacity fixed memory for microcomputers and data terminals.

### FEATURES

- Single 5.0V power supply
- 2,097,152-words x 16-bit/4,194,304-words x 8-bit
- Access time
  - 100ns MAX
- Input/Output TTL compatible
- Tri-State output configurations
- Internal powerdown function
- Packages:
  - 44-PIN PLASTIC SOP (SOP44-P-600-K)
  - 48-PIN PLASTIC TSOP (TSOP48-P-550-K)

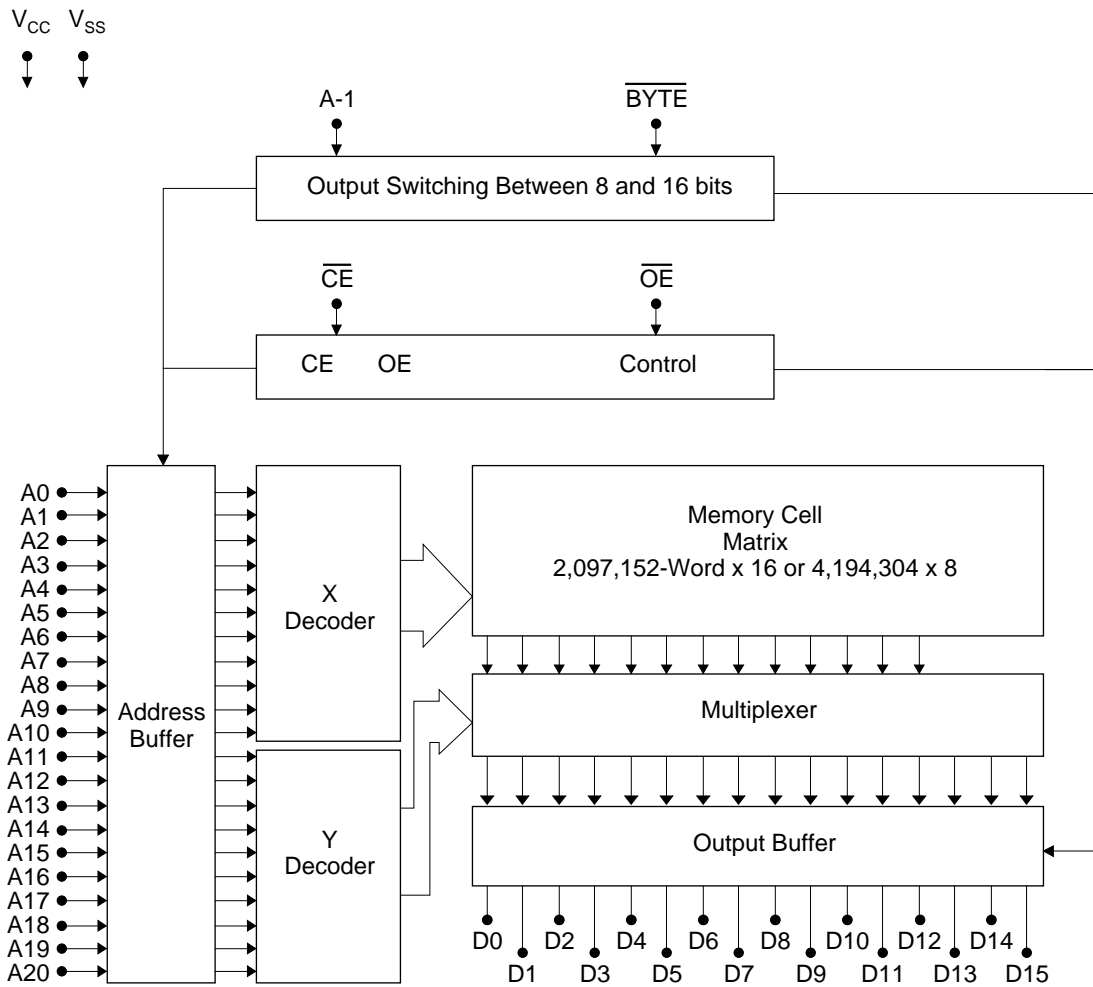
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## PIN CONFIGURATION



| Pin Name                          | Function                    |
|-----------------------------------|-----------------------------|
| D15/A-1                           | Data output / address input |
| A0 to A20                         | Address input               |
| D0 to D15                         | Data output                 |
| CE                                | Chip enable                 |
| OE                                | Output enable               |
| BYTE                              | Mode switch                 |
| V <sub>CC</sub> , V <sub>SS</sub> | Power supply                |

### BLOCK DIAGRAM



### FUNCTION TABLE

| $\overline{CE}$ | $\overline{OE}$ | $\overline{BYTE}$ | A-1/D15               | D0 to D7  | D8 to D15 | D <sub>OUT</sub> Mode | LSB | MSB |
|-----------------|-----------------|-------------------|-----------------------|-----------|-----------|-----------------------|-----|-----|
| H               | X               | X                 | X                     | Hi-Z      | Hi-Z      | Hi-Z                  | —   | —   |
| L               | H               | X                 | X                     | Hi-Z      | Hi-Z      |                       | —   | —   |
| L               | L               | H                 | Input Inhibited (D15) | D0 to D7  | D8 to D15 | 16 bit                | A0  | A20 |
| L               | L               | L                 | L                     | D0 to D7  | Hi-Z      | 8 bit                 | A-1 | A20 |
| L               | L               | L                 | H                     | D8 to D15 | Hi-Z      |                       |     |     |

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## ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings

| Parameter             | Symbol    | Conditions                               | Limits                 | Unit             |
|-----------------------|-----------|--|------------------------|------------------|
| Power Supply Voltage  | $V_{CC}$  | to $V_{SS}$                              | -0.3 to 7              | V                |
| Input Voltage         | $V_I$     |  | -0.3 to $V_{CC} + 0.5$ | V                |
| Output Voltage        | $V_O$     |  | -0.3 to $V_{CC} + 0.5$ | V                |
| Power Dissipation     | $P_D$     | Per Package $T_{opr} = 25^\circ\text{C}$ | 1.0                    | W                |
| Operating Temperature | $T_{opr}$ | —  | 0 to 70                | $^\circ\text{C}$ |
| Storage Temperature   | $T_{stg}$ | —  | -55 to 150             | $^\circ\text{C}$ |

### Recommended Operating Conditions

| Parameter             | Symbol    | Conditions | Limits |      |                | Unit             |
|-----------------------|-----------|------------|--------|------|----------------|------------------|
|                       |           |            | Min.   | Typ. | Max.           |                  |
| Power Supply Voltage  | $V_{CC}$  | —          | 4.5    | 5.0  | 5.5            | V                |
|                       | $V_{SS}$  | —          | 0.0    | 0.0  | 0.0            | V                |
| "H" Input Voltage     | $V_{IH}$  | —          | 2.2    | 5.0  | $V_{CC} + 0.5$ | V                |
| "L" Input Voltage     | $V_{IL}$  | —          | -0.3   | 0.0  | 0.8            | V                |
| Operating Temperature | $T_{opr}$ | —          | 0      | —    | 70             | $^\circ\text{C}$ |

### DC Characteristics

 $(V_{CC} = 5V \pm 10\%, T_a = 0 \text{ to } 70^\circ\text{C})$ 

| Parameter                        | Symbol     | Conditions   | Limits |      |      | Unit          |
|----------------------------------|------------|--|--------|------|------|---------------|
|                                  |            |  | Min.   | Typ. | Max. |               |
| "H" Output Voltage               | $V_{OH}$   | $I_{OH} = -400\mu\text{A}$   | 2.4    | —    | —    | V             |
| "L" Output Voltage               | $V_{OL}$   | $I_{OH} = 2.1\text{mA}$  | —      | —    | 0.4  | V             |
| Input Leakage Current            | $I_{LI}$   | $V_I = 0 \text{ to } V_{CC}$   | -10    | —    | 10   | $\mu\text{A}$ |
| Output Leakage Current           | $I_{LO}$   | $V_O = 0 \text{ to } V_{CC}$<br>$\overline{CE} = V_{IH\text{MIN}}$   | -10    | —    | 10   | $\mu\text{A}$ |
| Power Supply Current (Operating) | $I_{CC}$   | $\overline{CE} = V_{IL}, \overline{OE} = V_{IH}, t_C = 120\text{ns}$ | —      | —    | 65   | mA            |
| Power Supply Current (Standby)   | $I_{CCS1}$ | $\overline{CE} = V_{CC} - 0.2\text{V}$                               | —      | —    | 50   | $\mu\text{A}$ |
|                                  | $I_{CCS}$  | $\overline{CE} = V_{IH\text{MIN}}$                                   | —      | —    | 500  | $\mu\text{A}$ |

## AC CHARACTERISTICS

## Timing conditions

| Parameter              | Conditions                                     |
|------------------------|--|
| Input Signal Level     | $V_{IH}=3.0V, V_{IL}=0.0V$                     |
| Transition Time        | $t_r=t_f=5ns$                                  |
| Timing Reference Level | Input Voltage=1.5V<br>Output Voltage=0.8V&2.0V |
| Load Condition         | $CL=100pF+1TTL$                                |

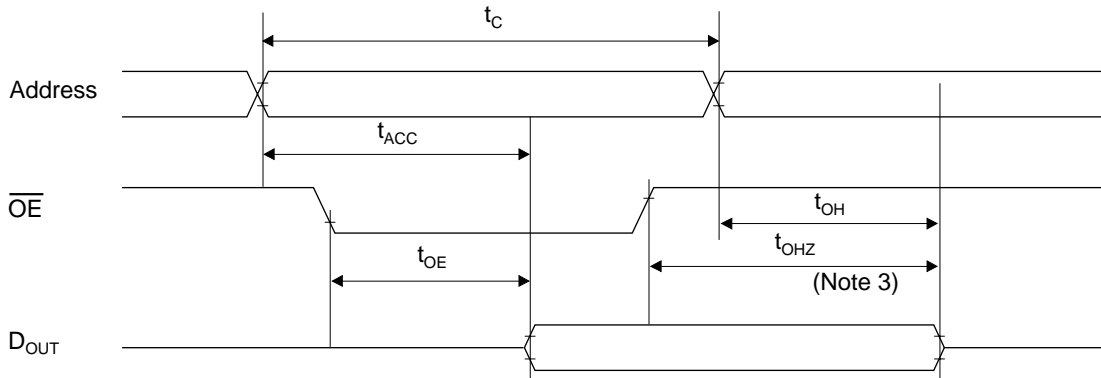
## Read Cycle

(Ta = 0 to 70°C)

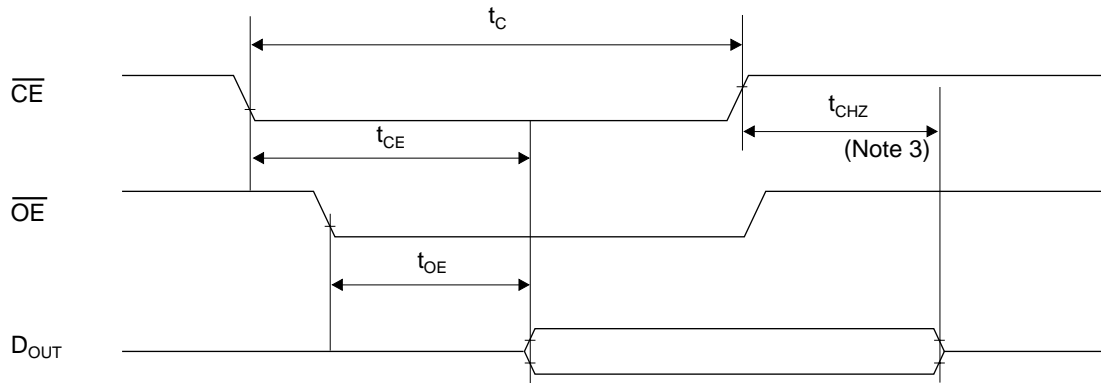
| Parameter                           | Symbol    | Conditions | Limits |      |      | Unit |
|-------------------------------------|-----------|------------|--------|------|------|------|
|                                     |           |            | Min.   | Typ. | Max. |      |
| Cycle time                          | $t_C$     | —          | 100    | —    | —    | ns   |
| Address Access time                 | $t_{ACC}$ | —          | —      | —    | 100  | ns   |
| $\overline{CE}$ Access time         | $t_{CE}$  | —          | —      | —    | 100  | ns   |
| $\overline{OE}$ Access time         | $t_{OE}$  | —          | —      | —    | 50   | ns   |
| $\overline{CE}$ Output Disable time | $t_{CHZ}$ | —          | 0      | —    | 40   | ns   |
| $\overline{OE}$ Output Disable time | $t_{OHZ}$ | —          | 0      | —    | 30   | ns   |
| Output Hold time                    | $t_{OH}$  | —          | 0      | —    | —    | ns   |

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Read Cycle (Note 1)



Read Cycle (Note 2)



- Note)
1.  $\overline{CE}$  is low level.
  2. Address is fixed before or at the same time when  $\overline{CE}$  level falls.
  3.  $t_{CHZ}$  &  $t_{OHZ}$  indicate the time until floating. They are not determined by the output level.

I/O CAPACITANCE

| Parameter          | Symbol | Conditions | Limits |      |      | Unit |
|--------------------|--------|------------|--------|------|------|------|
|                    |        |            | Min.   | Typ. | Max. |      |
| Input Capacitance  | $C_I$  | $V_I=0V$   | —      | —    | 8    | pF   |
| Output Capacitance | $C_O$  | $V_O=0V$   | —      | —    | 10   | pF   |

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