# OKI Semiconductor

# MSM538032E

524,288-Word x 16-Bit or 1,048,576-Word x 8-Bit MASKROM

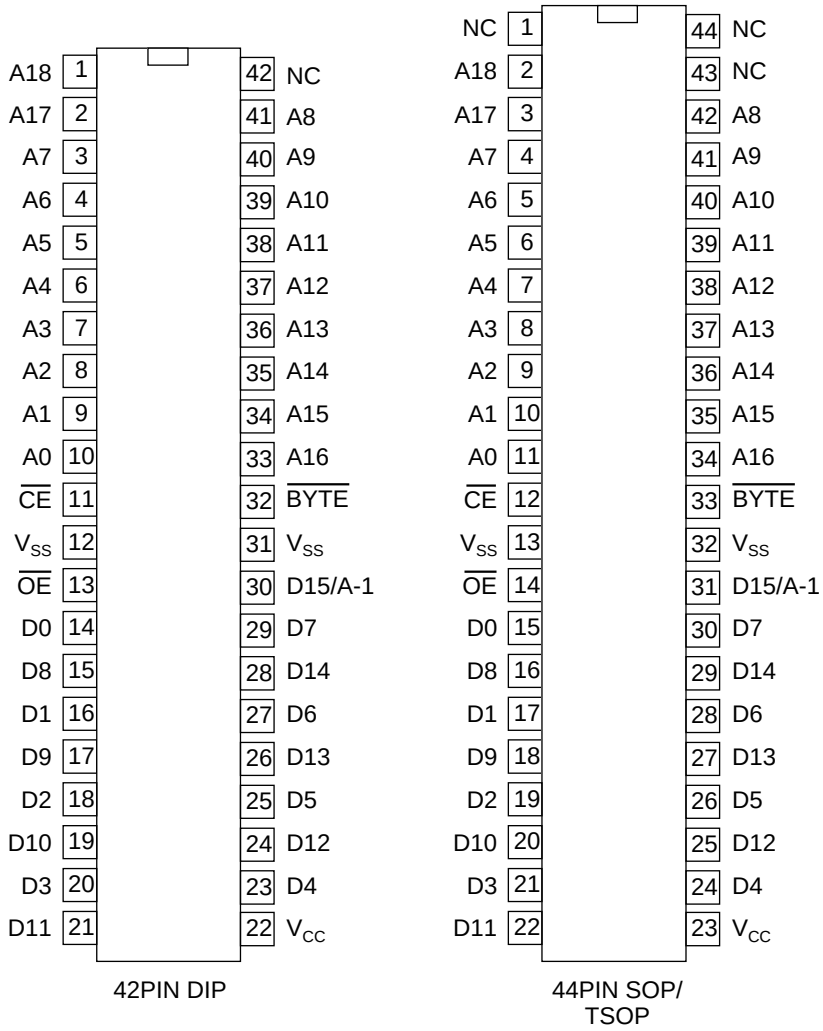
## DESCRIPTION

The OKI MSM538032E is a high-speed CMOS Mask ROM that can electrically switch between 524,288-word x 16-bit and 1,048,576-word x 8-bit configurations. The MSM538032E operates on a single 3.0V or 3.3V power supply but offers access times equivalent to products operating at 5.0V. The MSM538032E's applied byte system and pin compatibility with UV erasable EPROMs, make it ideally suited as large capacity read-only memory for portable microcomputers and data terminal equipment. Optional products with 2.7~5.5V operating parameters are also available.

## FEATURES

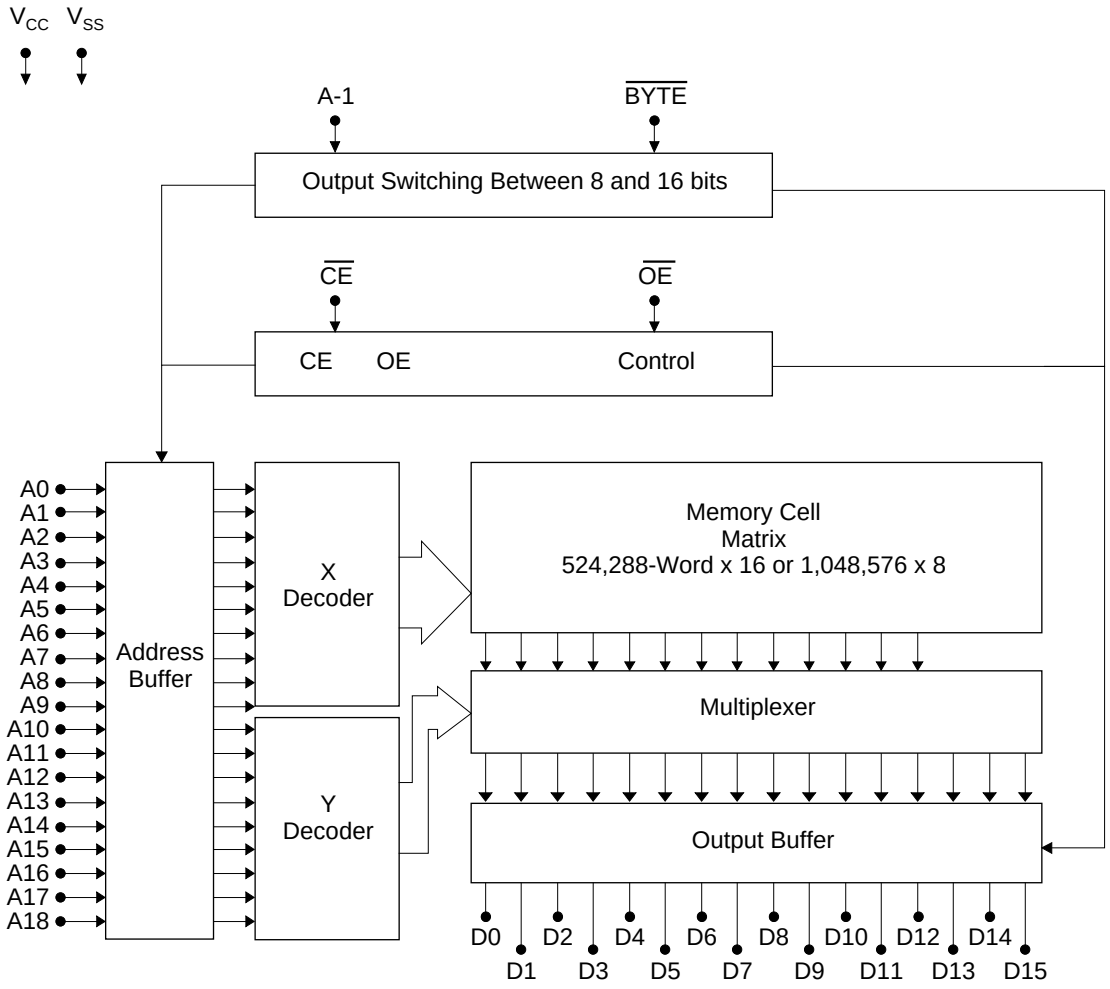
- 3.0V or 3.3V single power supply
- 524,288-word x 16-bit / 1,048,576-word x 8-bit
- Access time–Current consumption
  - 150ns–20mA (When power supply is 3.0V±0.3V)
  - 120ns–30mA (When power supply is 3.3V±0.3V)
- Tri-state output configurations
- Internal powerdown function
- Package:
  - 42-PIN PLASTIC DIP (DIP42-P-600-2.54)
  - 44-PIN PLASTIC SOP (SOP44-P-600-1.27-K)
  - 44-PIN PLASTIC TSOP (TSOP48-P-550-0.80-K)
- 8MEPROM (42-PIN) pin compatible

## PIN CONFIGURATION




| Pin Name | Function |
|---|---|
| D15/A-1 | Data output / address input |
| A0 to A18 | Address input |
| D0 to D15 | Data output |
| $\overline{CE}$ | Chip enable |
| $\overline{OE}$ | Output enable |
| $\overline{BYTE}$ | Mode switch |
| $V_{CC}$, $V_{SS}$ | Power supply |

## BLOCK DIAGRAM




## FUNCTION TABLE

| $\overline{CE}$ | $\overline{OE}$ | $\overline{BYTE}$ | A-1/D15 | D0 to D7 | D8 to D15 | $D_{OUT}$ 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 | A18 |
| L | L | L | L | D0 to D7 | Hi-Z | 8 bit | A-1 | A18 |
| L | L | L | H | D8 to D15 | Hi-Z | | | |

# ELECTRICAL CHARACTERISTICS

## Absolute Maximum Ratings

| Parameter | Symbol | Conditions | Rating | 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°C | 1.0 | W |
| Operating Temperature | $T_{opr}$ | | 0 to 70 | °C |
| Storage Temperature | $T_{stg}$ | | –55 to 150 | °C |

## Recommended Operating Conditions ($V_{CC}$=3.0V)

| Parameter | Symbol | Conditions | Rated Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Power Supply Voltage | $V_{CC}$ | — | 2.7 | 3.0 | 3.3 | V |
| | $V_{SS}$ | — | 0.0 | 0.0 | 0.0 | V |
| "H" Input Voltage | $V_{IH}$ | — | 2.0 | 3.0 | 6.0 | V |
| "L" Input Voltage | $V_{IL}$ | — | –0.3 | 0.0 | 0.6 | V |
| Operating Temperature | $T_{opr}$ | — | 0 | — | 70 | °C |

## Recommended Operating Conditions ($V_{CC}$=3.3V)

| Parameter | Symbol | Conditions | Rated Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Power Supply Voltage | $V_{CC}$ | — | 3.0 | 3.3 | 3.6 | V |
| | $V_{SS}$ | — | 0.0 | 0.0 | 0.0 | V |
| "H" Input Voltage | $V_{IH}$ | — | 2.0 | 3.3 | 6.0 | V |
| "L" Input Voltage | $V_{IL}$ | — | –0.3 | 0.0 | 0.6 | V |
| Operating Temperature | $T_{opr}$ | — | 0 | — | 70 | °C |

## DC CHARACTERISTICS ($V_{CC}$=3.0V±0.3V)

(Ta = 0 to 70°C)

| Parameter | Symbol | Conditions | Rated Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| "H" Output Voltage | $V_{OH}1$ | $I_{OH}$ = –100µA | $V_{CC}$ – 0.1 | — | — | V |
| | $V_{OH}2$ | $I_{OH}$ = –1.0mA | $V_{CC}$ – 0.4 | — | — | V |
| "L" Output Voltage | $V_{OL}1$ | $I_{OL}$ = 100µA | — | — | 0.1 | V |
| | $V_{OL}2$ | $I_{OI}$ = 1.0mA | — | — | 0.4 | V |
| Input Leakage Current | $I_{LI}$ | $V_I$ = 0 to $V_{CC}$ | –10 | — | 10 | µA |
| Output Leakage Current | $I_{LO}$ | $V_O$ = 0 to $V_{CC}$<br>$\overline{CE}$ = $V_{IH\ MIN}$ | –10 | — | 10 | µA |
| Power Supply Current (Operating) | $I_{CC}$ | $\overline{CE}$ = $V_{IL}$, $\overline{OE}$ = $V_{IH}$, $t_C$ = 200ns | — | — | 20 | mA |
| Power Supply Current (Standby) | $I_{CCS}C$ | $\overline{CE}$ = $V_{CC}$–0.2V | — | — | 10 | µA |
| | $I_{CCS}T$ | $\overline{CE}$ = $V_{IH\ MIN}$ | — | — | 50 | µA |

## DC CHARACTERISTICS ($V_{CC}$=3.3V±0.3V)

(Ta = 0 to 70°C)

| Parameter | Symbol | Conditions | Rated Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| "H" Output Voltage | $V_{OH}1$ | $I_{OH}$ = –100µA | $V_{CC}$ – 0.1 | — | — | V |
| | $V_{OH}2$ | $I_{OH}$ = –1.0mA | $V_{CC}$ – 0.4 | — | — | V |
| "L" Output Voltage | $V_{OL}1$ | $I_{OL}$ = 100µA | — | — | 0.1 | V |
| | $V_{OL}2$ | $I_{OI}$ = 1.0mA | — | — | 0.4 | V |
| Input Leakage Current | $I_{LI}$ | $V_I$ = 0 to $V_{CC}$ | –10 | — | 10 | µA |
| Output Leakage Current | $I_{LO}$ | $V_O$ = 0 to $V_{CC}$<br>$\overline{CE}$ = $V_{IH\ MIN}$ | –10 | — | 10 | µA |
| Power Supply Current (Operating) | $I_{CC}$ | $\overline{CE}$ = $V_{IL}$, $\overline{OE}$ = $V_{IH}$, $t_C$ = 150ns | — | — | 30 | mA |
| Power Supply Current (Standby) | $I_{CCS}C$ | $\overline{CE}$ = $V_{CC}$–0.2V | — | — | 10 | µA |
| | $I_{CCS}T$ | $\overline{CE}$ = $V_{IH\ MIN}$ | — | — | 50 | µA |

## AC CHARACTERISTICS

### Timing conditions

| Parameter | Conditions |
|---|---|
| Input Signal Level | $V_{IH}$=2.7V, $V_{IL}$=0.0V |
| Transtion Time | $t_r$=$t_f$=5ns |
| Timing Reference Level | Input Voltage=1.5V<br>Output Voltage=0.8V&2.0V |
| Load Condition | CL=50pF |

### Read Cycle ($V_{CC}$=3.0V±0.3V)

(Ta = 0 to 70°C)

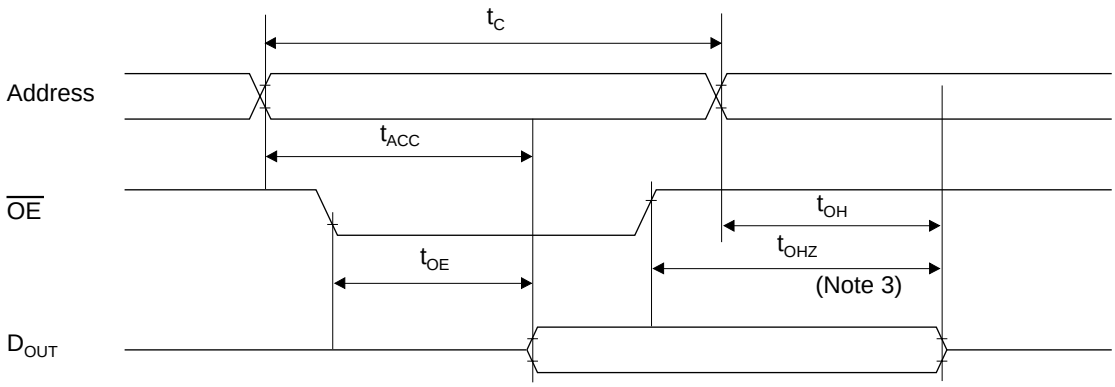
| Parameter | Symbol | Conditions | Rated Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Cycle time | $t_C$ | — | 150 | — | — | ns |
| Address Access time | $t_{ACC}$ | — | — | — | 150 | ns |
| $\overline{CE}$ Access time | $t_{CE}$ | — | — | — | 150 | ns |
| $\overline{OE}$ Access time | $t_{OE}$ | — | — | — | 80 | ns |
| $\overline{CE}$ Output Disable time | $t_{CHZ}$ | — | 0 | — | 70 | ns |
| $\overline{OE}$ Output Disable time | $t_{OHZ}$ | — | 0 | — | 60 | ns |
| Output Hold time | $t_{OH}$ | — | 0 | — | — | ns |

### Read Cycle ($V_{CC}$=3.3V±0.3V)

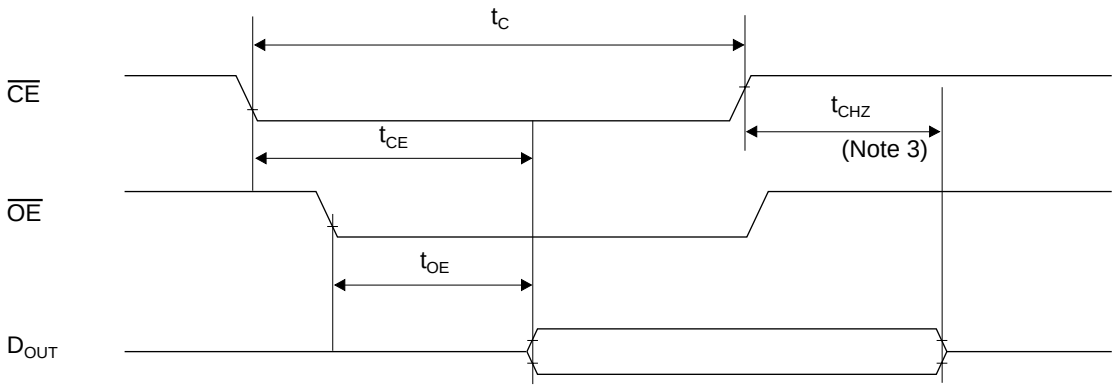
(Ta = 0 to 70°C)

| Parameter | Symbol | Conditions | Rated Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Cycle time | $t_C$ | — | 120 | — | — | ns |
| Address Access time | $t_{ACC}$ | — | — | — | 120 | ns |
| $\overline{CE}$ Access time | $t_{CE}$ | — | — | — | 120 | ns |
| $\overline{OE}$ Access time | $t_{OE}$ | — | — | — | 70 | ns |
| $\overline{CE}$ Output Disable time | $t_{CHZ}$ | — | 0 | — | 60 | ns |
| $\overline{OE}$ Output Disable time | $t_{OHZ}$ | — | 0 | — | 50 | ns |
| Output Hold time | $t_{OH}$ | — | 0 | — | — | ns |

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 | Rated Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Input Capacitance | $C_I$ | $V_I$=0V | — | — | 8 | pF |
| Output Capacitance | $C_O$ | $V_O$=0V | — | — | 10 | pF |

## NOTICE

The information contained herein can change without notice owing to product and/or technical improvements. Before using the product, please make sure that the information being referred to is up-to-date.

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