

# OKI Semiconductor

## MSM538052E

524,288-Words x 16-bit or 1,048,576-Bytes x 8-bit MaskROM  
8Words x 16-Bit or 16Bytes x 8-Bit/Page Mode MASKROM

### ■ DESCRIPTION

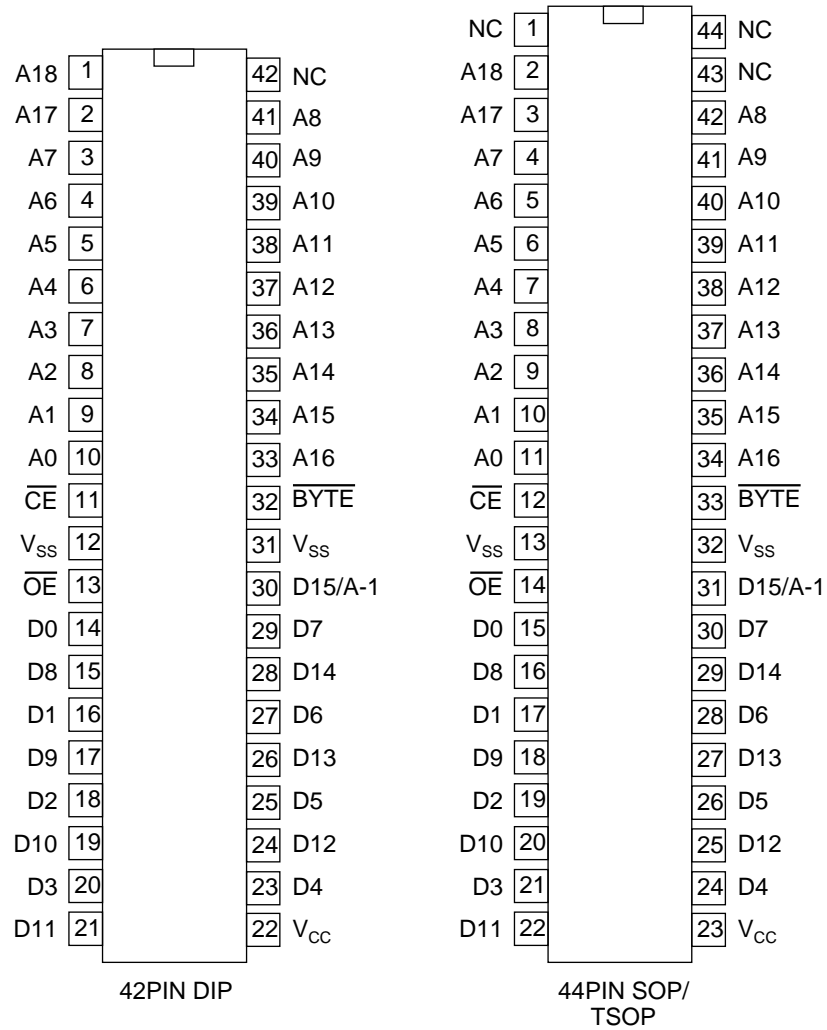
The OKI MSM538052E is a 524,288-words x 16-bit or 1,048,576-Bytes x 8-bit CMOS Mask ROM with an asynchronous page read mode. Each page is organized 8 words x 16-bit or 16 words x 8-bit. It operates on a single 5.0V power supply and is TTL compatible. The chip's asynchronous I/O requires no external clock 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 MSM538052E is suited for use as large capacity fixed memory for microcomputers and data terminals.

### ■ FEATURES

- Single 5.0V power supply
- 524,288-words x 16-bit / 1,048,576-Bytes x 8-bit
- 8-words(A2,A1,A0) or 16-Bytes(A2,A1,A0,A-1) / Page
- Access time
  - 100ns Max (Normal access)
  - 50ns Max (Page access)
- Input/Output TTL compatible
- Tri-State output configurations
- Internal powerdown function
- Packages:

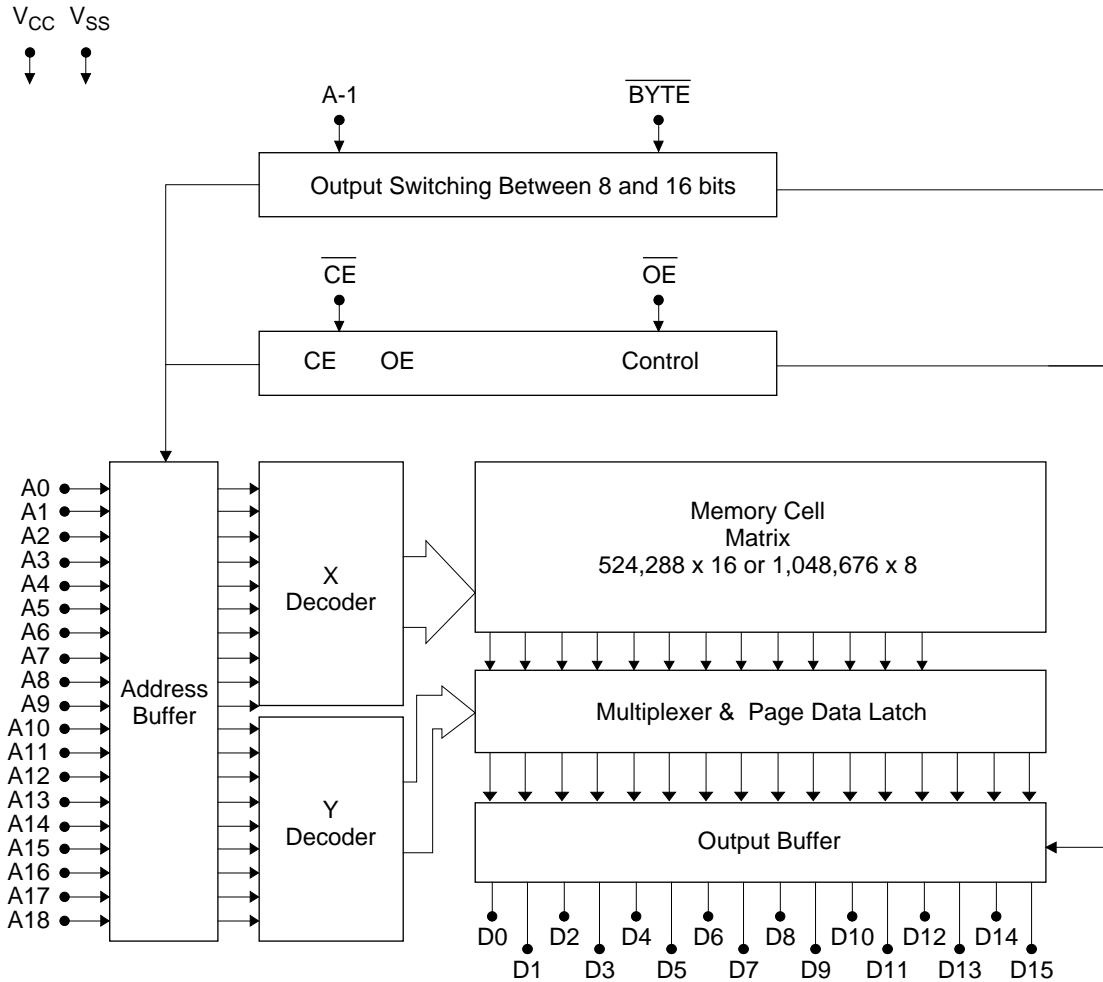
|                     |                        |                      |
|---------------------|------------------------|----------------------|
| 42-PIN PLASTIC DIP  | (DIP42-P-600-2.54)     | (MSM538052E-xxRS)    |
| 44-PIN PLASTIC SOP  | (SOP44-P-600-1.27-K)   | (MSM538052E-xxGS-K)  |
| 44-PIN PLASTIC TSOP | (TSOP44-P-400-0.80-1K) | (MSM538052E-xxTS-AK) |
- Pin compatible OTP available

## 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 <sub>CC</sub> , V <sub>SS</sub> | Power supply                |

## BLOCK DIAGRAM



## FUNCTION TABLE

| $\overline{\text{CE}}$ | $\overline{\text{OE}}$ | $\overline{\text{BYTE}}$ | A-1/D15               | D0—D7     | D8—D15    | $D_{\text{OUT}}$ 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                      | H                        | Input Inhibited (D15) | D0 to D7  | D8 to D15 | 16 bit(Page Mode)     | A0  | A2  |
| L                      | L                      | L                        | L                     | D0 to D7  | Hi-Z      | 8 bit                 | A-1 | A18 |
| L                      | L                      | L                        | H                     | D8 to D15 | Hi-Z      |                       |     |     |
| L                      | L                      | L                        | L                     | D0 to D7  | Hi-Z      | 8 bit(Page Mode)      | A-1 | A2  |
| L                      | L                      | L                        | H                     | D8 to D15 | Hi-Z      |                       |     |     |

## ABSOLUTE MAXIMUM LIMITS

| 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  | 5.5  | 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>$CE = V_{IH\text{ MIN}}$ | -10    | —    | 10   | $\mu\text{A}$ |
| Power Supply Current (Operating) | $I_{CC}$   | $CE = V_{IL}, OE = V_{IH}, t_C = 100\text{ns}$           | —      | —    | 80   | mA            |
| Power Supply Current (Standby)   | $I_{CCS1}$ | $CE = V_{CC} - 0.2\text{V}$                              | —      | —    | 50   | $\mu\text{A}$ |
|                                  | $I_{CCS}$  | $CE = V_{IH\text{ MIN}}$                                 | —      | —    | 500  | $\mu\text{A}$ |

## AC CHARACTERISTICS

Test conditions

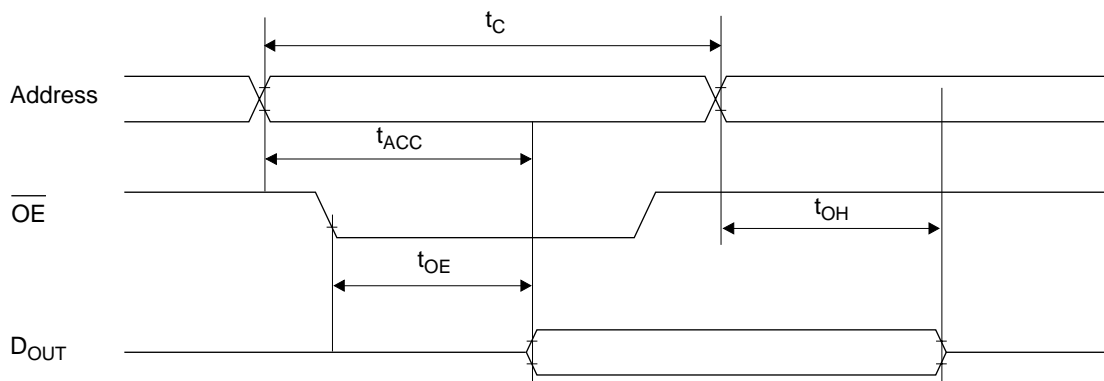
| Parameter              | Conditions                                     |
|------------------------|--|
| Input Signal Level     | $V_{IH}=3.0V, V_{IL}=0.0V$                     |
| Transtion Time         | $t_r=t_f=5ns$                                  |
| Timing Reference Level | Input Voltage=1.5V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

## Read Cycle

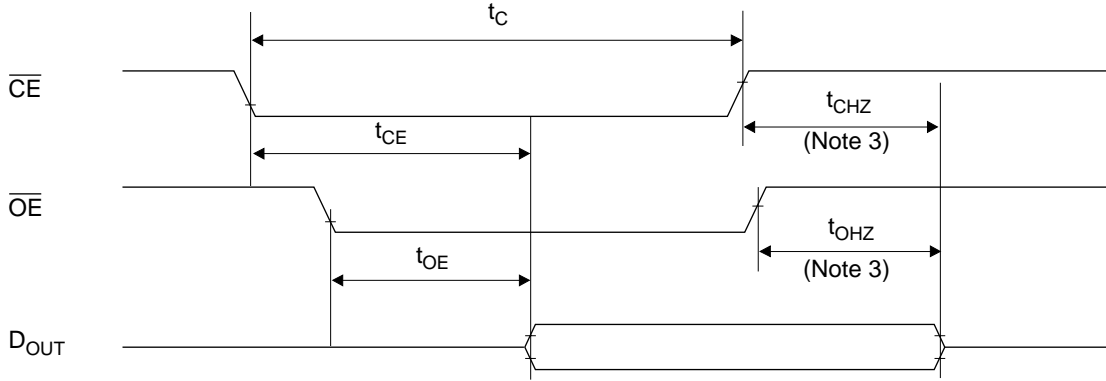
(Ta = 0 to 70°C)

| Parameter                           | Symbol     | Conditions | Limits |      |      | Unit |
|-------------------------------------|------------|------------|--------|------|------|------|
|                                     |            |            | Min.   | Typ. | Max. |      |
| Random Access Cycle time            | $t_C$      | —          | 100    | —    | —    | ns   |
| Random Address Access time          | $t_{ACC}$  | —          | —      | —    | 100  | ns   |
| Page Set up time                    | $t_{PSET}$ | —          | 120    | —    | —    | ns   |
| Page Access Cycle time              | $t_{PC}$   | —          | 50     | —    | —    | ns   |
| Page Access time                    | $t_{PAC}$  | —          | —      | —    | 50   | 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   |

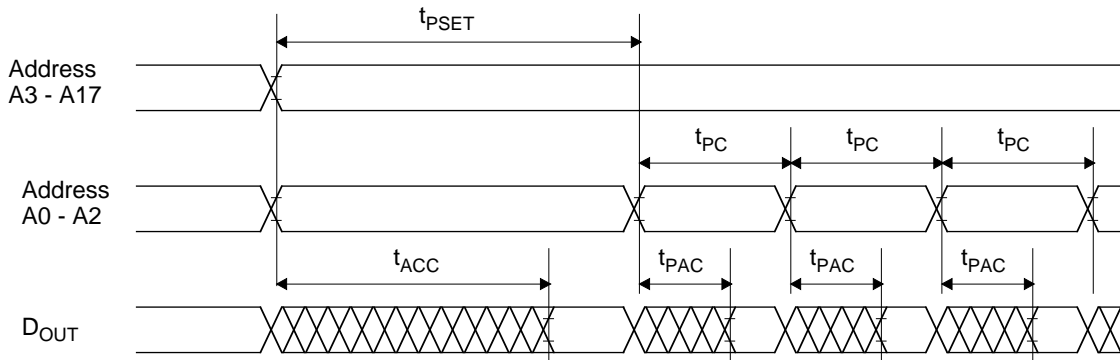
## Read Cycle (Note1)



Read Cycle (Note2)



Page Mode Read Cycle (Note4)



- 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.
  4.  $\overline{CE}$  is low level and  $\overline{OE}$  is low 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   |

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Marketing Communications Team (RB)

# OKI

People To People Technology

## ADDRESSES & SEMICONDUCTOR WEB SITES

### **OKI Electric Industry Co., Ltd.,**

Device Business Group,  
10-3, Shibaura, 4-chome,  
Minato-ku, Tokyo 108, Japan,  
Tel.: +81-(0)3-5445-6327,  
Fax.: +81-(0)3-5445-6328,  
<http://www.oki.co.jp/semi/>

### **OKI Semiconductor Group,**

785 North Mary Avenue,  
Sunnyvale, CA 94086, U.S.A.,  
Tel.: +1-408-720-1900,  
Fax.: +1-408-720-1918,  
<http://www.okisemi.com/>

### **OKI Electric Europe GmbH,**

Head Office Europe,  
Hellersbergstrasse 2,  
D-41460 Neuss, Germany,  
Tel: +49-2131-15960,  
Fax: +49-2131-103539,  
<http://www.oki-europe.de/>

### **OKI Electronics (Hong Kong) Ltd.,**

Suite 1901-1&19, Tower 3,  
China Hong Kong City,  
33 Canton Road, Tsimshatsui,  
Kowloon, Hong Kong,  
Tel.: +852-2-736-2336,  
Fax.: +852-2-736-2395

### **OKI Semiconductor (Asia) Pte. Ltd.,**

78 Shenton Way 09-01,  
Singapore 0207,  
Tel.: +65-221-3722,  
Fax.: +65-323-5376

### **OKI Semiconductor (Asia) Pte. Ltd.,**

Taipei Branch,  
7th Fl. No.260, Tun Hwa North Road,  
Taipei, Taiwan, R.O.C.,  
Sumitomo-Flysun Building,  
Tel.: +886-2-2719-2561,  
Fax.: +886-2-2715-2892  
<http://www.oki.net.tw/>

*For further information, please contact:*