

# **OKI Semiconductor**

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## **MSM531632E**

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1,048,576-Word x 16-Bit or 2,097,152-Word x 8-Bit MASKROM

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### DESCRIPTION

The OKI MSM531632E is a high-speed CMOS Mask ROM that can electrically switch between 1,048,576-word x 16-bit or 2,097,152-word x 8-bit configurations. The MSM531622E 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 MSM531622E is suited for use as large capacity fixed memory for microcomputers and data terminals.

### FEATURES

3.0V or 3.3V single power supply

1,048,576-word x 16-bit / 2,097,152-word x 8-bit

Access Time - Current Consumption

200ns - 20mA (When power supply is 3.0V±0.3V)

150ns - 30mA (When power supply is 3.3V±0.3V)

Tri-state output configurations

Internal powerdown function

Package:

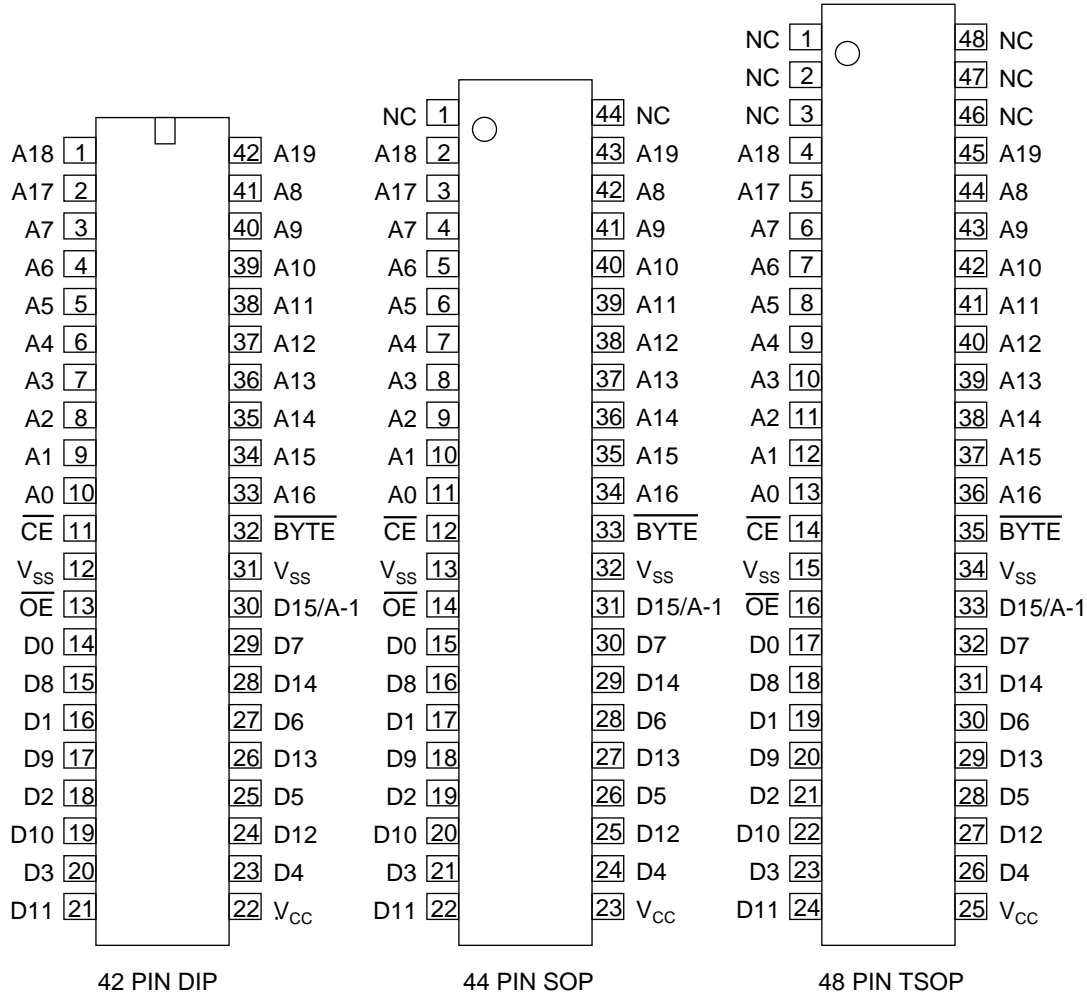
42-PIN PLASTIC DIP (DIP42-P-600) (MSM531632E-xxRS)

44-PIN PLASTIC SOP (SOP44-P-600-K) (MSM531632E-xxGS-K)

48-PIN PLASTIC TSOP (TSOP48-P-550-K) (MSM531632E-xxTS-K)

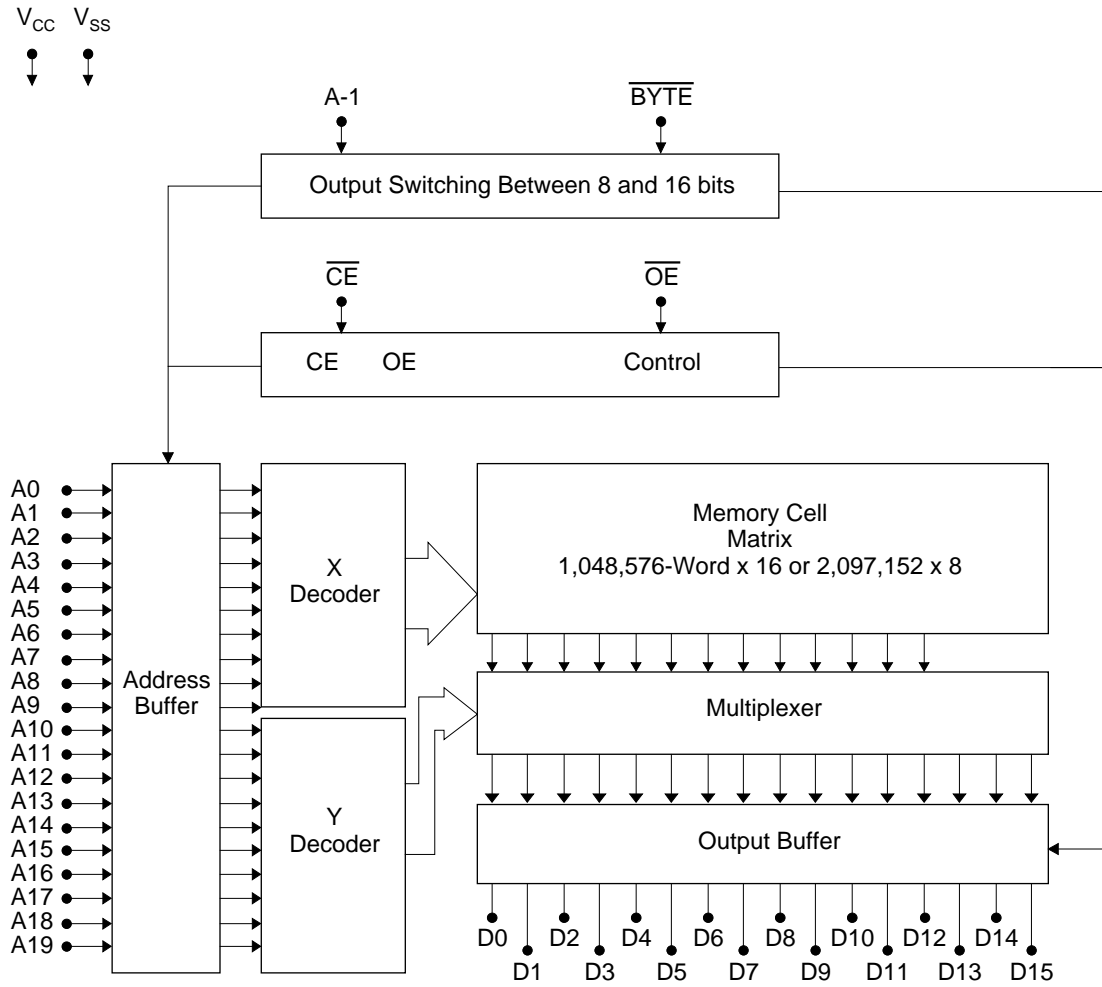
16MEPROM (42-PIN) pin compatible

PIN CONFIGURATION



Pin Name	Function
D15/A-1	Data output / address input
A0 to A19	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
NC	No Connect

## BLOCK DIAGRAM



## FUNCTION TABLE

$\overline{\text{CE}}$	$\overline{\text{OE}}$	$\overline{\text{BYTE}}$	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	A19
L	L	L	L	D0 to D7	Hi-Z	8 bit	A-1	A19
L	L	L	H	D8 to D15	Hi-Z			

## 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 ( $V_{CC}=3.0\text{V}$ )

Parameter	Symbol	Conditions	Limits			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	0.8	V
Operating Temperature	$T_{opr}$	—	0	—	70	$^{\circ}\text{C}$

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

Parameter	Symbol	Conditions	Limits			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	$^{\circ}\text{C}$

DC CHARACTERISTICS ( $V_{CC}=3.0V\pm 0.3V$ )

(Ta = 0 to 70°C)

Parameter	Symbol	Conditions	Limits			Unit
			Min.	Typ.	Max.	
"H" Output Voltage	$V_{OH1}$	$I_{OH} = -100\mu A$	$V_{CC} - 0.1$	—	—	V
	$V_{OH2}$	$I_{OH} = -400\mu A$	$V_{CC} - 0.4$	—	—	V
"L" Output Voltage	$V_{OL1}$	$I_{OL} = 100\mu A$	—	—	0.1	V
	$V_{OL2}$	$I_{OI} = 1.0mA$	—	—	0.4	V
Input Leakage Current	$I_{LI}$	$V_I = 0$ to $V_{CC}$	-10	—	10	$\mu A$
Output Leakage Current	$I_{LO}$	$V_O = 0$ to $V_{CC}$ $CE = V_{IH MIN}$	-10	—	10	$\mu A$
Power Supply Current (Operating)	$I_{CC}$	$CE = V_{IL}, OE = V_{IH}, t_C = 200ns$	—	—	20	mA
Power Supply Current (Standby)	$I_{CCS}^C$	$CE = V_{CC} - 0.2V$	—	—	10	$\mu A$
	$I_{CCS}^T$	$CE = V_{IH MIN}$	—	—	50	$\mu A$

DC CHARACTERISTICS ( $V_{CC}=3.3V\pm 0.3V$ )(V<sub>CC</sub> = 5V±10%, Ta = 0 to 70°C)

Parameter	Symbol	Conditions	Limits			Unit
			Min.	Typ.	Max.	
"H" Output Voltage	$V_{OH1}$	$I_{OH} = -100\mu A$	$V_{CC} - 0.1$	—	—	V
	$V_{OH2}$	$I_{OH} = -400\mu A$	$V_{CC} - 0.4$	—	—	V
"L" Output Voltage	$V_{OL1}$	$I_{OL} = 100\mu A$	—	—	0.1	V
	$V_{OL2}$	$I_{OI} = 1.0mA$	—	—	0.4	V
Input Leakage Current	$I_{LI}$	$V_I = 0$ to $V_{CC}$	-10	—	10	$\mu A$
Output Leakage Current	$I_{LO}$	$V_O = 0$ to $V_{CC}$ $CE = V_{IH MIN}$	-10	—	10	$\mu A$
Power Supply Current (Operating)	$I_{CC}$	$CE = V_{IL}, OE = V_{IH}, t_C = 150ns$	—	—	30	mA
Power Supply Current (Standby)	$I_{CCS}^C$	$CE = V_{CC} - 0.2V$	—	—	10	$\mu A$
	$I_{CCS}^T$	$CE = V_{IH MIN}$	—	—	50	$\mu A$

## 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 Output Voltage=0.8V&2.0V
Load Condition	CL=50pF

Read Cycle ( $V_{CC}=3.0V\pm 0.3V$ )

(Ta = 0 to 70°C)

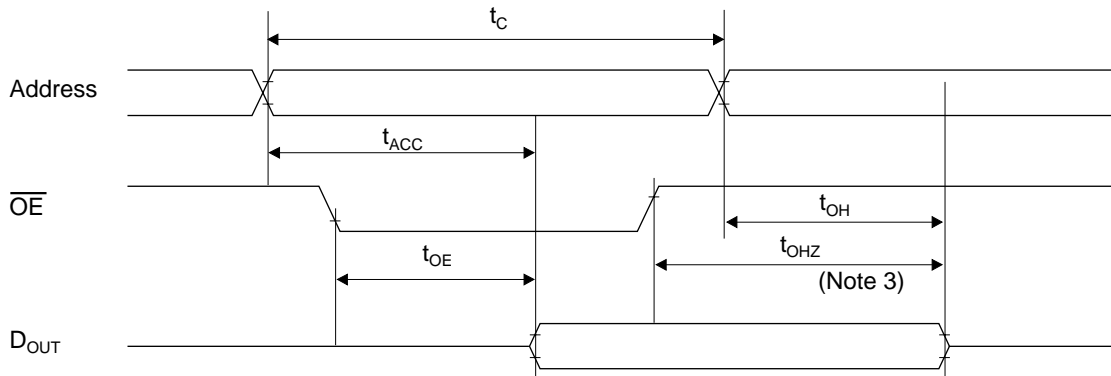
Parameter	Symbol	Conditions	Rated Value			Unit
			Min.	Typ.	Max.	
Cycle time	$t_C$	—	200	—	—	ns
Address Access time	$t_{ACC}$	—	—	—	200	ns
$\overline{CE}$ Access time	$t_{CE}$	—	—	—	200	ns
$\overline{OE}$ Access time	$t_{OE}$	—	—	—	100	ns
$\overline{CE}$ Output Disable time	$t_{CHZ}$	—	0	—	70	ns
$\overline{OE}$ Output Disable time	$t_{OHZ}$	—	0	—	60	ns
Output Hold time	$t_{OH}$	—	0	—	—	ns

Read Cycle ( $V_{CC}=3.3V\pm 0.3V$ )

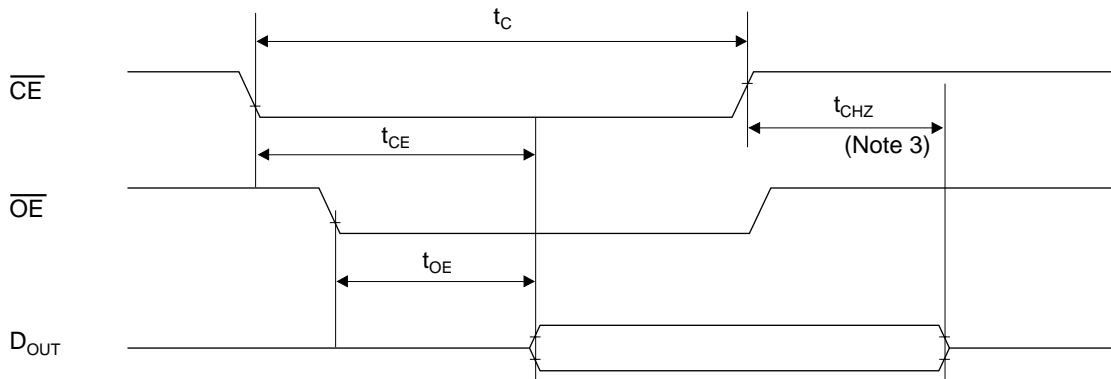
(Ta = 0 to 70°C)

Parameter	Symbol	Conditions	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	—	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

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