

# OKI Semiconductor

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## MSM531655E

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524,288-Double Words x 32-bit or 1,048,576-Words x 16-bit MaskROM  
8Double Word x 32-Bit or 16Word x 16-Bit/Page Mode MASKROM

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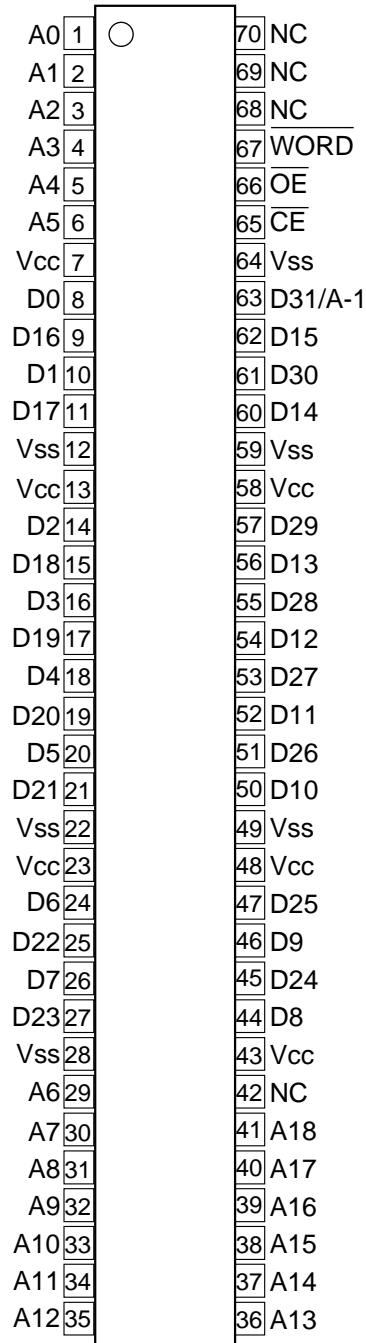
### ■ DESCRIPTION

The OKI MSM531655E is a 524,288-double words x 32-bit or 1,048,576-words x 16-bit CMOS Mask ROM with an asynchronous page read mode. Each page is organized 8 double words x 32-bit or 16 words x 16-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 MSM531655E is suited for use as large capacity fixed memory for microcomputers and data terminals.

### ■ FEATURES

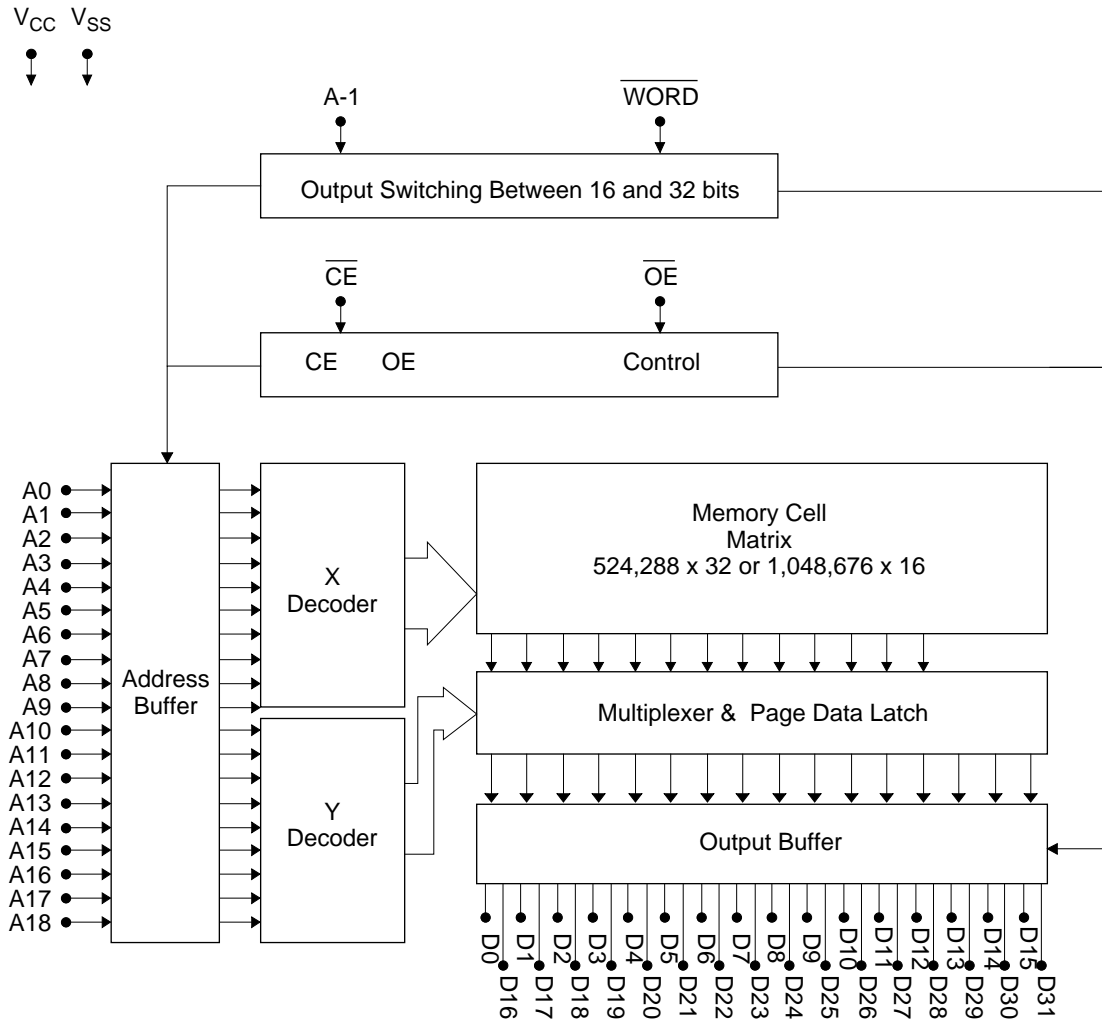
- Single 5.0V power supply
- 524,288-double words x 32-bit / 1,048,576-words x 16-bit
- 8-double words(A2,A1,A0) or 16-words(A2,A1,A0,A-1) / Page
- Access time
  - 100ns Max (Normal access)
  - 50ns Max (Page access)
- Input/Output TTL compatible
- Tri-State output configurations
- Internal powerdown function
- Packages:
  - 70-PIN PLASTIC SSOPP (SSOP70-P-500/0.8-K) (MSM531655E-xxGS-K)
  - 70-PIN PLASTIC TSOP(Type II) (TSOP70-P-400/0.65-K) (MSM531655E-xxTS-K)
- Pin compatible OTP available

## PIN CONFIGURATION



Pin Name	Function
D31/A-1	Data output / address input
A0 to A18	Address input
D0 to D30	Data output
CE	Chip enable
OE	Output enable
WORD	Mode switch (H:DW/L:W)
V <sub>CC</sub> , V <sub>SS</sub>	Power supply

## BLOCK DIAGRAM



## FUNCTION TABLE

$\overline{\text{CE}}$	$\overline{\text{OE}}$	BYTE	A-1/D31	D0—D15	D16—D31	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 (D31)	D0 to D15	D16 to D31	32 bit	A0	A18
L	L	H	Input Inhibited (D31)	D0 to D15	D16 to D31	32 bit(Page Mode)	A0	A2
L	L	L	L	D0 to D15	Hi-Z	16 bit	A-1	A18
L	L	L	H	D16 to D31	Hi-Z			
L	L	L	L	D0 to D15	Hi-Z	16 bit(Page Mode)	A-1	A2
L	L	L	H	D16 to D31	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	$^\circ\text{C}$

## n 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	$I_{LO}$	$V_O = 0 \text{ to } V_{CC}$ $\overline{CE} = V_{IH \text{ MIN}}$	-10	—	10	$\mu\text{A}$
Power Supply Current (Operating)	$I_{CC}$	$\overline{CE} = V_{IL}, \overline{OE} = V_{IH}, t_C = 100\text{ns}$	—	—	120	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

Test conditions

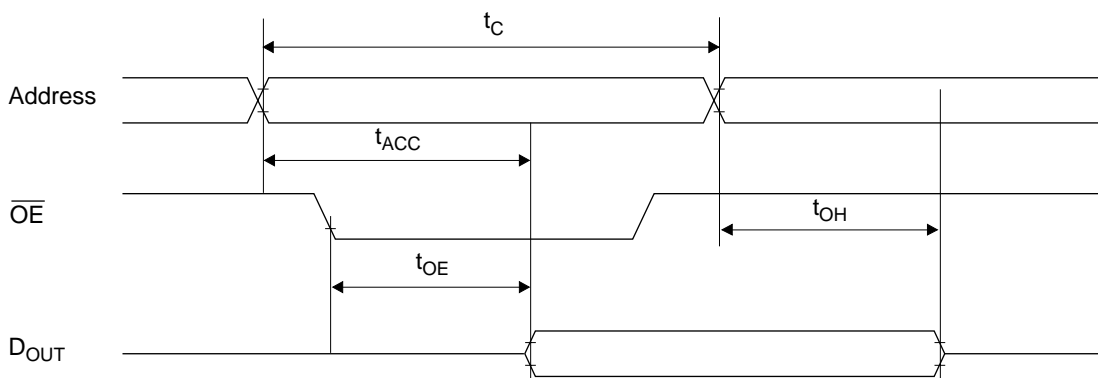
Parameter	Conditions
Input Signal Level	$V_{IH}=3.0V, V_{IL}=0.0V$
Transtion Time	$t_r=t_f=5ns$
Timing Reference Level	Input Voltage=1.5V Output Voltage=0.8V&2.0V
Load Condition	$CL=100pF+1TTL$

## Read Cycle

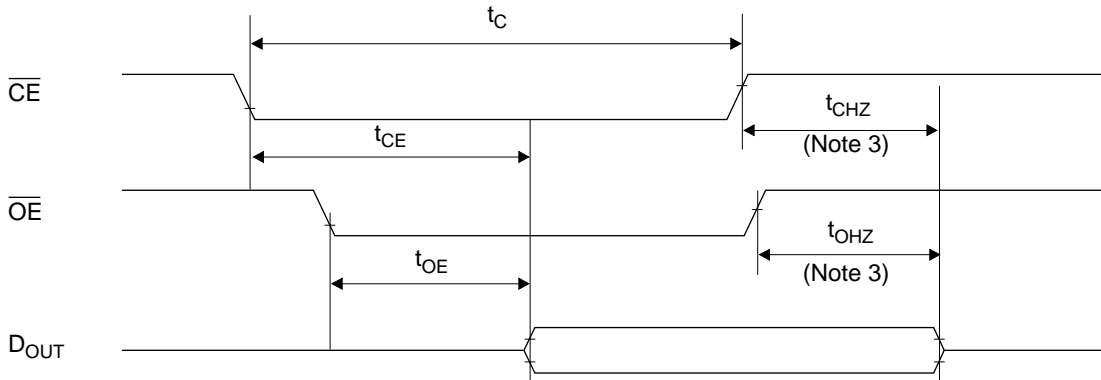
(Ta = 0 to 70°C)

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

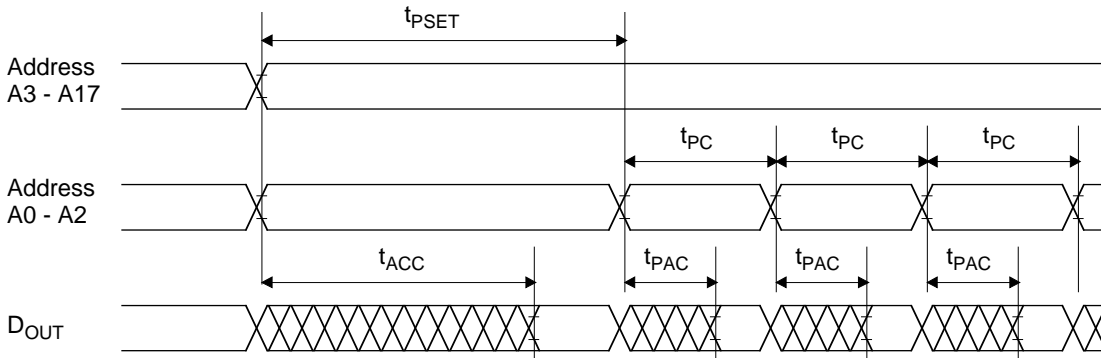
## Read Cycle (Note1)



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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