



# IS62C1024LL

## 128K x 8 LOW POWER CMOS STATIC RAM

### FEATURES

- High-speed access time: 70 ns
- Low active power: 350 mW (typical)
- Low standby power: 125  $\mu$ W (typical) CMOS standby
- Output Enable ( $\overline{OE}$ ) and two Chip Enable ( $\overline{CE1}$  and CE2) inputs for ease in applications
- Fully static operation: no clock or refresh required
- TTL compatible inputs and outputs
- Single 5V ( $\pm 10\%$ ) power supply
- Data retention voltage: 2V(min.)

### DESCRIPTION

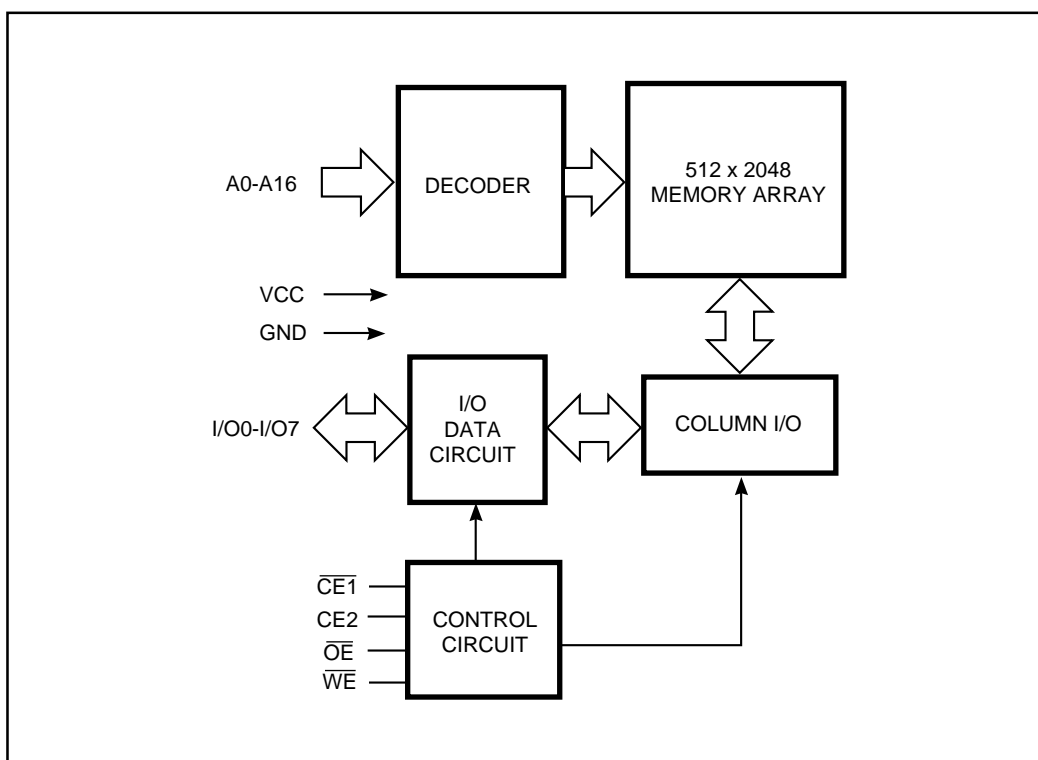
The *ICSI* IS62C1024LL is a low power, 131,072-word by 8-bit CMOS static RAM. It is fabricated using *ICSI*'s high-performance CMOS technology. This highly reliable process coupled with innovative circuit design techniques, yields higher performance and low power consumption devices.

When  $\overline{CE1}$  is HIGH or CE2 is LOW (deselected), the device assumes a standby mode at which the power dissipation can be reduced by using CMOS input levels.

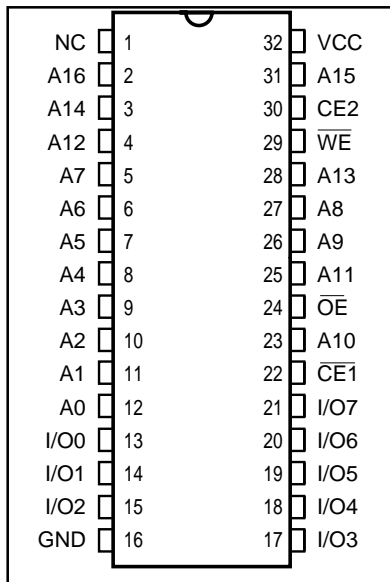
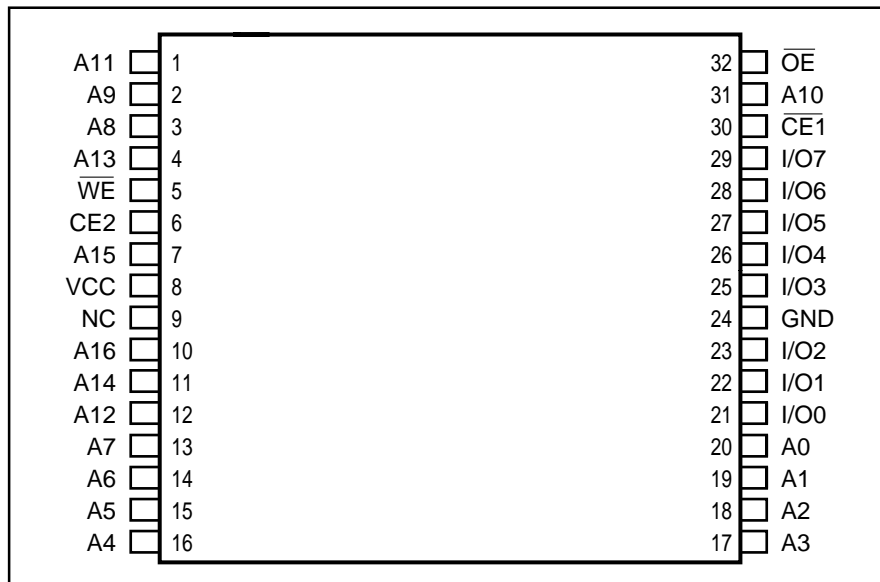
Easy memory expansion is provided by using two Chip Enable inputs,  $\overline{CE1}$  and CE2. The active LOW Write Enable ( $\overline{WE}$ ) controls both writing and reading of the memory.

The IS62C1024LL is available in 32-pin 600mil DIP, 450mil SOP and 8\*20mm TSOP-1 packages.

### FUNCTIONAL BLOCK DIAGRAM



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**PIN CONFIGURATION**  
 32-Pin SOP and DIP

**PIN CONFIGURATION**  
 32-Pin 8x20mm TSOP-1

**PIN DESCRIPTIONS**

A0-A16	Address Inputs
CE1	Chip Enable 1 Input
CE2	Chip Enable 2 Input
$\overline{OE}$	Output Enable Input
$\overline{WE}$	Write Enable Input
I/O0-I/O7	Input/Output
Vcc	Power
GND	Ground

**OPERATING RANGE**

Range	Ambient Temperature	Vcc
Commercial	0°C to +70°C	5V ± 10%

**TRUTH TABLE**

Mode	$\overline{WE}$	CE1	CE2	$\overline{OE}$	I/O Operation	Vcc Current
Not Selected	X	H	X	X	High-Z	Isb1, Isb2
(Power-down)	X	X	L	X	High-Z	Isb1, Isb2
Output Disabled	H	L	H	H	High-Z	Icc
Read	H	L	H	L	DOUT	Icc
Write	L	L	H	X	DIN	Icc



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## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

Symbol	Parameter	Value	Unit
V <sub>TERM</sub>	Terminal Voltage with Respect to GND	-0.5 to +7.0	V
T <sub>BIAS</sub>	Temperature Under Bias	-45 to +85	°C
T <sub>STG</sub>	Storage Temperature	-65 to +150	°C
P <sub>T</sub>	Power Dissipation	1.5	W
I <sub>OUT</sub>	DC Output Current (LOW)	20	mA

### Notes:

1. Stress greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## CAPACITANCE<sup>(1,2)</sup>

Symbol	Parameter	Conditions	Max.	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> = 0V	6	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>OUT</sub> = 0V	8	pF

### Notes:

1. Tested initially and after any design or process changes that may affect these parameters.
2. Test conditions: T<sub>A</sub> = 25°C, f = 1 MHz, V<sub>CC</sub> = 5.0V.

## DC ELECTRICAL CHARACTERISTICS (Over Operating Range)

Symbol	Parameter	Test Conditions	Min.	Max.	Unit
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = Min., I <sub>OH</sub> = -1.0 mA	2.4	—	V
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = Min., I <sub>OL</sub> = 2.1 mA	—	0.4	V
V <sub>IH</sub>	Input HIGH Voltage		2.2	V <sub>CC</sub> + 0.5	V
V <sub>IL</sub>	Input LOW Voltage <sup>(1)</sup>		-0.3	0.8	V
I <sub>LI</sub>	Input Leakage	GND ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>	Com.	-2	1 μA
I <sub>LO</sub>	Output Leakage	GND ≤ V <sub>OUT</sub> ≤ V <sub>CC</sub>	Com.	-2	1 μA

### Notes:

1. V<sub>IL</sub> = -3.0V for pulse width less than 10 ns.

## POWER SUPPLY CHARACTERISTICS<sup>(1)</sup> (Over Operating Range)

Symbol	Parameter	Test Conditions	-70 ns		Unit	
			Min.	Max.		
I <sub>CC1</sub>	V <sub>CC</sub> Dynamic Operating Supply Current	V <sub>CC</sub> = Max., $\overline{CE} = V_{IL}$ I <sub>OUT</sub> = 0 mA, f = f <sub>MAX</sub>	Com.	—	70	mA
I <sub>CC2</sub>	V <sub>CC</sub> Dynamic Operating Supply Current	V <sub>CC</sub> = Max., $\overline{CE} = V_{IL}$ I <sub>OUT</sub> = 0 mA, f = 1 MHz	Com.	—	15	mA
I <sub>SB1</sub>	TTL Standby Current (TTL Inputs)	V <sub>CC</sub> = Max., V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , $\overline{CE1} \geq V_{IH}$ , or CE2 ≤ V <sub>IL</sub> , f = 0	Com.	—	2	mA
I <sub>SB2</sub>	CMOS Standby Current (CMOS Inputs)	V <sub>CC</sub> = Max., $\overline{CE1} \leq V_{CC} - 0.2V$ , CE2 ≤ 0.2V, V <sub>IN</sub> > V <sub>CC</sub> - 0.2V, or V <sub>IN</sub> ≤ 0.2V, f = 0	Com.	—	25	μA

### Note:

1. At f = f<sub>MAX</sub>, address and data inputs are cycling at the maximum frequency, f = 0 means no input lines change.

## READ CYCLE SWITCHING CHARACTERISTICS<sup>(1)</sup>

(Over Operating Range)

Symbol	Parameter	-70		Unit
		Min.	Max.	
$t_{RC}$	Read Cycle Time	70	—	ns
$t_{AA}$	Address Access Time	—	70	ns
$t_{OHA}$	Output Hold Time	3	—	ns
$t_{ACE1}$	$\overline{CE1}$ Access Time	—	70	ns
$t_{ACE2}$	CE2 Access Time	—	70	ns
$t_{DOE}$	$\overline{OE}$ Access Time	—	35	ns
$t_{LZOE}^{(2)}$	$\overline{OE}$ to Low-Z Output	0	—	ns
$t_{HZOE}^{(2)}$	$\overline{OE}$ to High-Z Output	0	25	ns
$t_{LZCE1}^{(2)}$	$\overline{CE1}$ to Low-Z Output	10	—	ns
$t_{LZCE2}^{(2)}$	CE2 to Low-Z Output	10	—	ns
$t_{HZCE}^{(2)}$	$\overline{CE1}$ or CE2 to High-Z Output	0	25	ns

### Notes:

1. Test conditions assume signal transition times of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V and output loading specified in Figure 1a.
2. Tested with the load in Figure 1b. Transition is measured  $\pm 500$  mV from steady-state voltage. Not 100% tested.

## AC TEST CONDITIONS

Parameter	Unit
Input Pulse Level	0V to 3.0V
Input Rise and Fall Times	5 ns
Input and Output Timing and Reference Level	1.5V
Output Load	See Figures 1a and 1b

## AC TEST LOADS

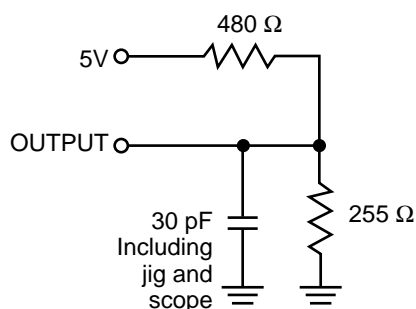


Figure 1a.

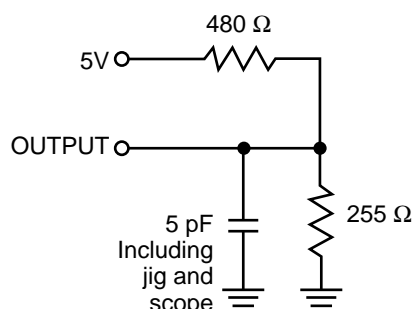
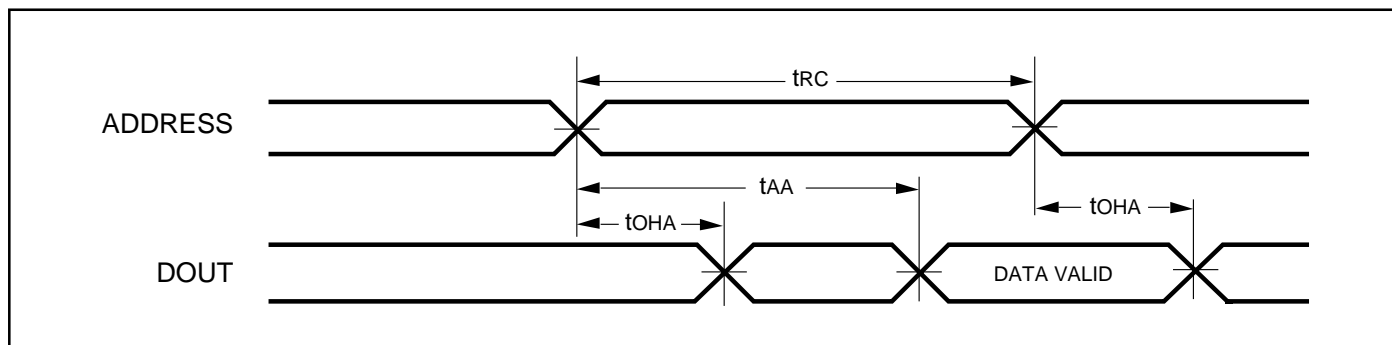


Figure 1b.

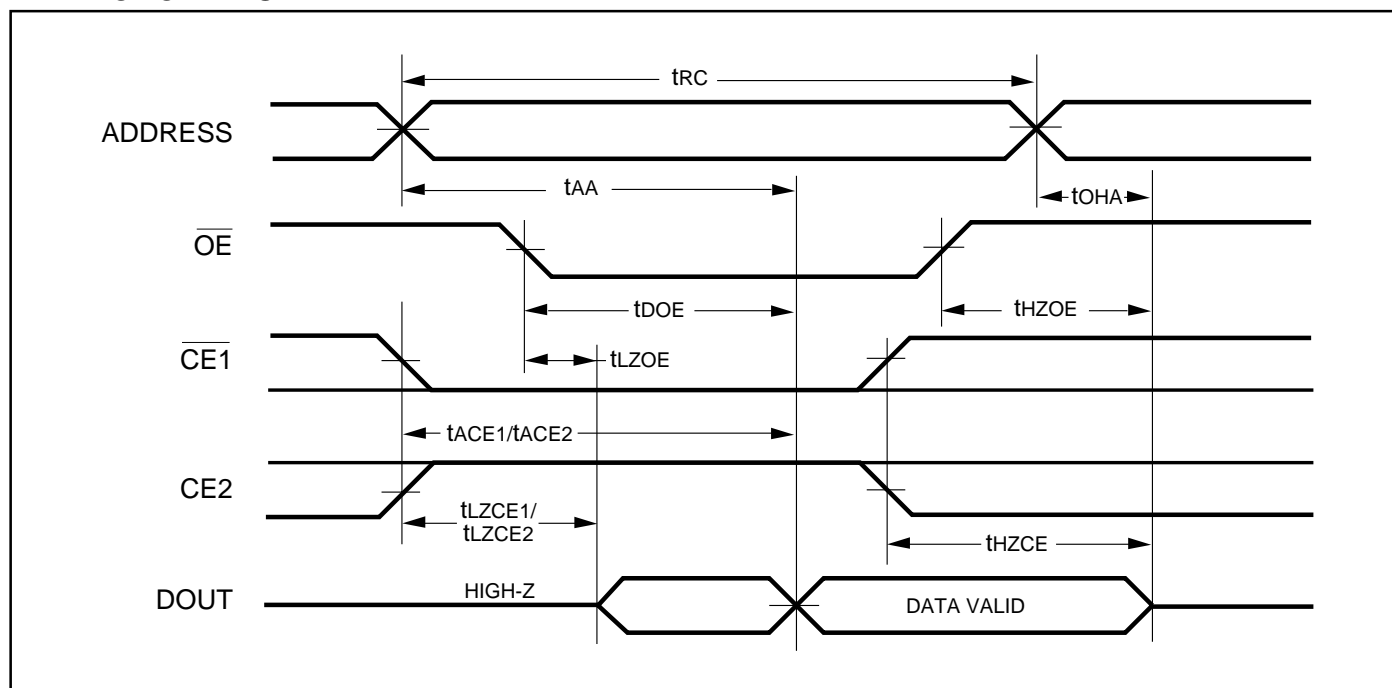
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## AC WAVEFORMS

### READ CYCLE NO. 1<sup>(1,2)</sup>



### READ CYCLE NO. 2<sup>(1,3)</sup>



**Notes:**

1.  $\overline{WE}$  is HIGH for a Read Cycle.
2. The device is continuously selected.  $\overline{OE}$ ,  $\overline{CE1} = V_{IL}$ ,  $CE2 = V_{IH}$ .
3. Address is valid prior to or coincident with  $\overline{CE1}$  LOW and CE2 HIGH transitions.

## WRITE CYCLE SWITCHING CHARACTERISTICS<sup>(1,3)</sup>

(Over Operating Range, Standard and Low Power)

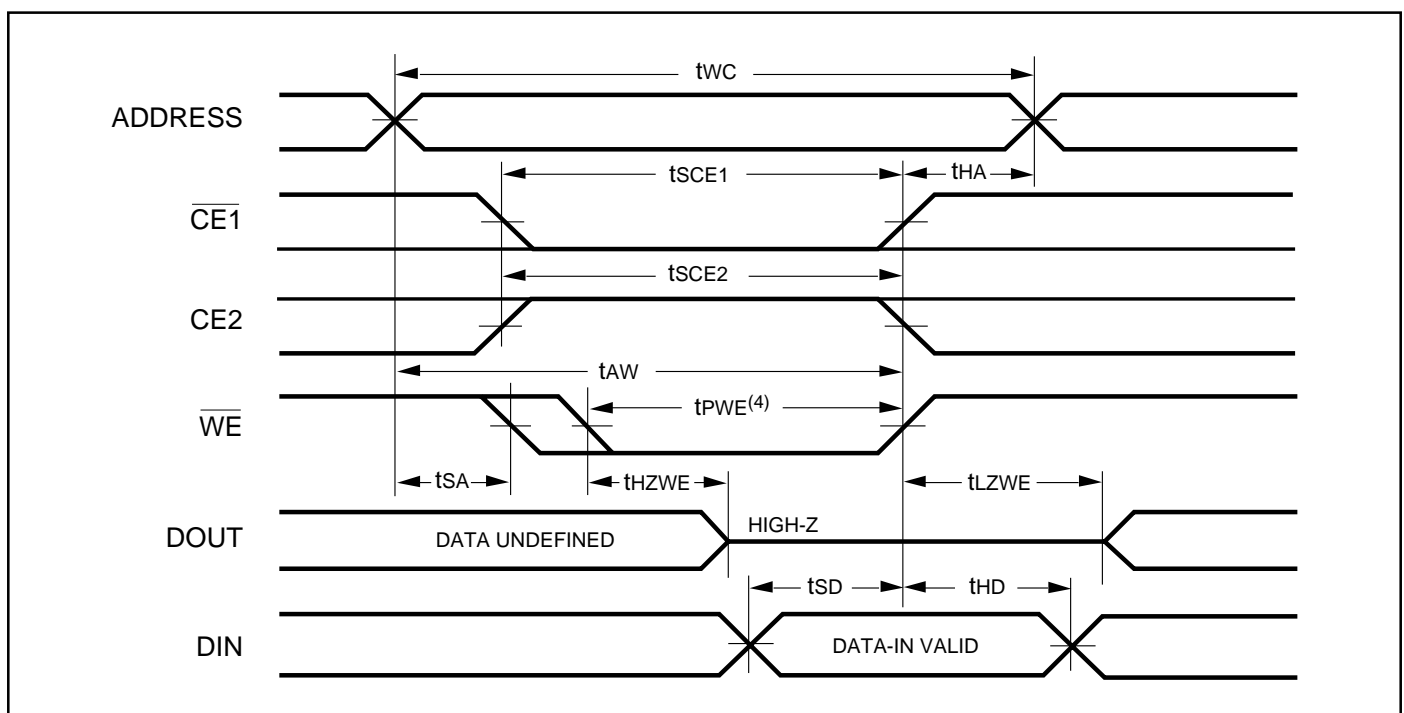
Symbol	Parameter	-70		Unit
		Min.	Max.	
t <sub>wc</sub>	Write Cycle Time	70	—	ns
t <sub>sce1</sub>	$\overline{CE1}$ to Write End	60	—	ns
t <sub>sce2</sub>	CE2 to Write End	60	—	ns
t <sub>aw</sub>	Address Setup Time to Write End	60	—	ns
t <sub>ha</sub>	Address Hold from Write End	0	—	ns
t <sub>sa</sub>	Address Setup Time	0	—	ns
t <sub>pwe<sup>(4)</sup></sub>	$\overline{WE}$ Pulse Width	50	—	ns
t <sub>sd</sub>	Data Setup to Write End	30	—	ns
t <sub>hd</sub>	Data Hold from Write End	0	—	ns
t <sub>hzwe<sup>(2)</sup></sub>	$\overline{WE}$ LOW to High-Z Output	—	25	ns
t <sub>lzwe<sup>(2)</sup></sub>	$\overline{WE}$ HIGH to Low-Z Output	5	—	ns

### Notes:

1. Test conditions assume signal transition times of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V and output loading specified in Figure 1a.
2. Tested with the load in Figure 1b. Transition is measured  $\pm 500$  mV from steady-state voltage. Not 100% tested.
3. The internal write time is defined by the overlap of  $\overline{CE1}$  LOW, CE2 HIGH and  $\overline{WE}$  LOW. All signals must be in valid states to initiate a Write, but any one can go inactive to terminate the Write. The Data Input Setup and Hold timing are referenced to the rising or falling edge of the signal that terminates the Write.
4. Tested with  $\overline{OE}$  HIGH.

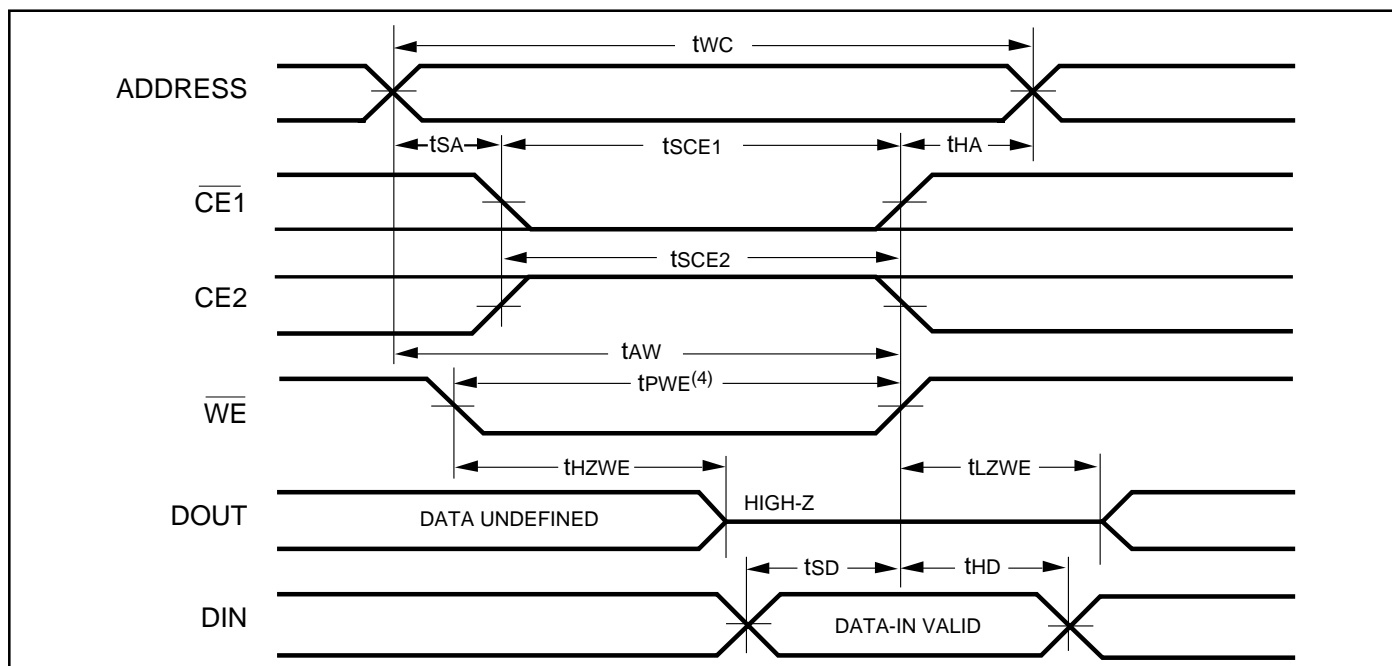
## AC WAVEFORMS

### WRITE CYCLE NO. 1 ( $\overline{WE}$ Controlled)<sup>(1,2)</sup>



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## WRITE CYCLE NO. 2 ( $\overline{CE1}$ , CE2 Controlled)<sup>(1,2)</sup>



**Notes:**

1. The internal write time is defined by the overlap of  $\overline{CE1}$  LOW, CE2 HIGH and  $\overline{WE}$  LOW. All signals must be in valid states to initiate a Write, but any one can go inactive to terminate the Write. The Data Input Setup and Hold timing are referenced to the rising or falling edge of the signal that terminates the Write.
2. I/O will assume the High-Z state if  $\overline{OE} = V_{IH}$ .

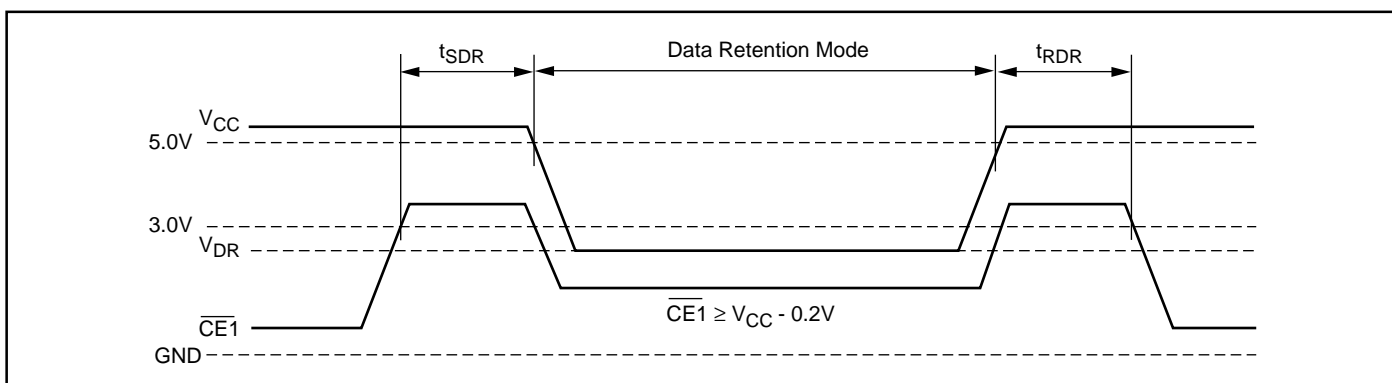
## DATA RETENTION SWITCHING CHARACTERISTICS

Symbol	Parameter	Test Condition	Min.	Max.	Unit
$V_{DR}$	Vcc for Data Retention	See Data Retention Waveform	2.0	5.5	V
$I_{DR}$	Data Retention Current	$V_{CC} = 3.0V, \overline{CE1} \geq V_{CC} - 0.2V$ $V_{CC} = 3.0V, \overline{CE2} \leq 0.2V$	Com.	—	$10^{(1)}$ $\mu A$
$t_{SDR}$	Data Retention Setup Time	See Data Retention Waveform	0	—	ns
$t_{RDR}$	Recovery Time	See Data Retention Waveform	5	—	ms

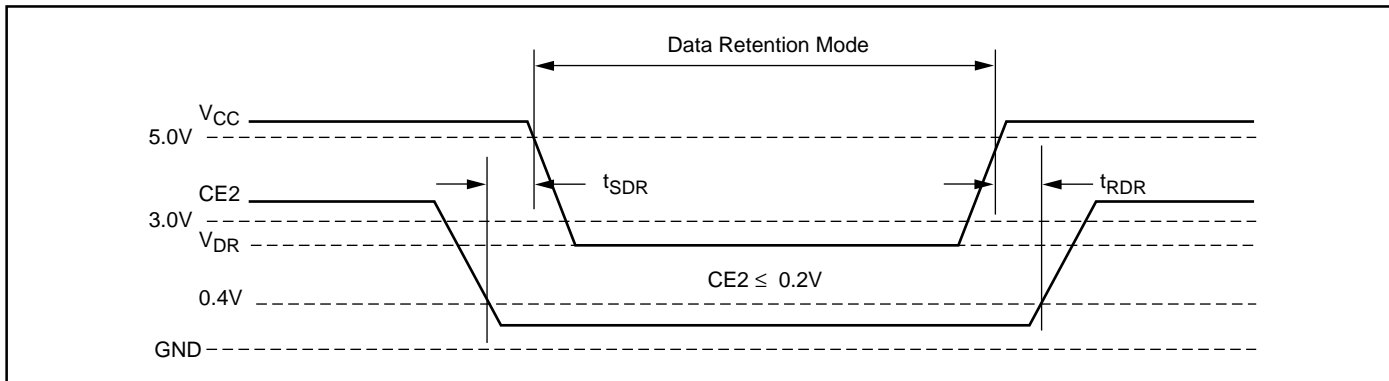
**Notes:**

1.  $I_{DR}$  Maximum  $3 \mu A$  @  $T_A$  0°C to 40°C.

## DATA RETENTION WAVEFORM ( $\overline{CE1}$ Controlled)



## DATA RETENTION WAVEFORM (CE2 Controlled)



## ORDERING INFORMATION

Commercial Range: 0°C to +70°C

Speed (ns)	Order Part No.	Package
70	IS62C1024LL-70W	600mil DIP
70	IS62C1024LL-70Q	450mil SOP
70	IS62C1024LL-70T	8*20mm TSOP-1

*Integrated Circuit Solution Inc.*

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