32K x 8 LOW VOLTAGE CMOS STATIC RAM

OCTOBER 1999

FEATURES

- High-speed access times:
  -- 8, 10, 12, 15, 20 ns
- Automatic power-down when chip is deselected
- CMOS low power operation
  -- 345 mW (max.) operating
  -- 7 mW (max.) CMOS standby
- TTL compatible interface levels
- Single 3.3V power supply
- Fully static operation: no clock or refresh required
- Three-state outputs

DESCRIPTION

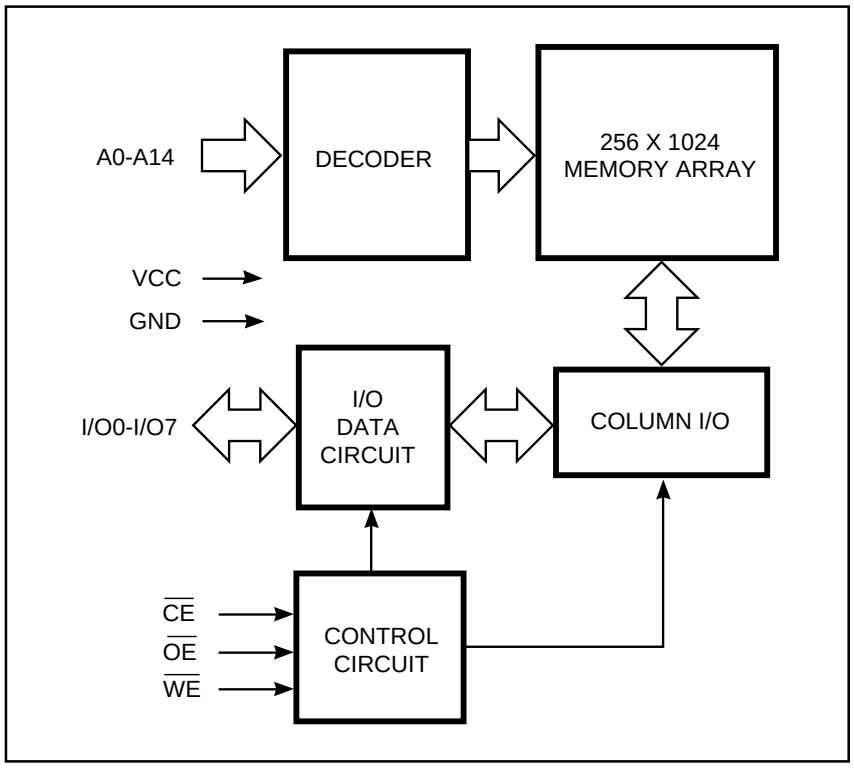
The *ISSI* IS61LV256 is a very high-speed, low power, 32,768-word by 8-bit static RAM. It is fabricated using *ISSI*'s high-performance CMOS technology. This highly reliable process coupled with innovative circuit design techniques, yields access times as fast as 8 ns maximum.

When $\overline{CE}$ is HIGH (deselected), the device assumes a standby mode at which the power dissipation is reduced to 50 µW (typical) with CMOS input levels.

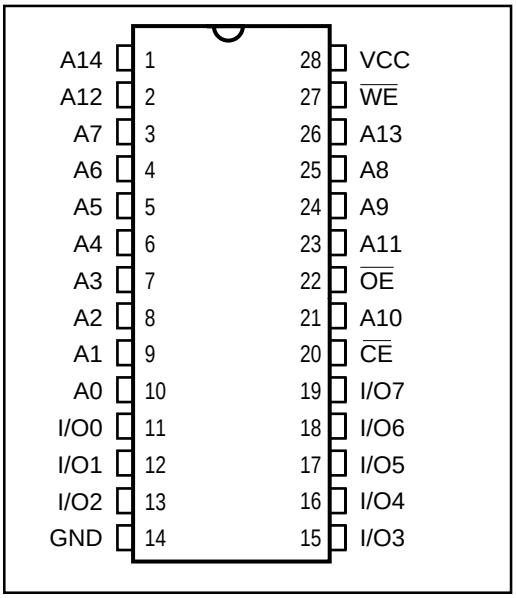
Easy memory expansion is provided by using an active LOW Chip Enable ($\overline{CE}$). The active LOW Write Enable ($\overline{WE}$) controls both writing and reading of the memory.

The IS61LV256 is available in the JEDEC standard 28-pin, 300-mil SOJ and the 450-mil TSOP (Type I) package.

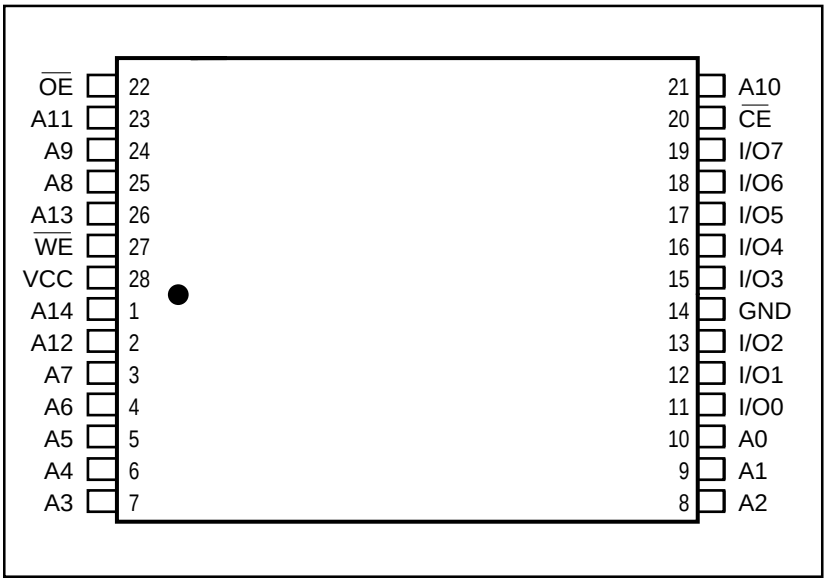
FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION
28-Pin SOJ



PIN CONFIGURATION
28-Pin TSOP (Type I)



PIN DESCRIPTIONS

A0-A14	Address Inputs
$\overline{CE}$	Chip Enable Input
$\overline{OE}$	Output Enable Input
$\overline{WE}$	Write Enable Input
I/O0-I/O7	Input/Output
Vcc	Power
GND	Ground

TRUTH TABLE

Mode	$\overline{WE}$	$\overline{CE}$	$\overline{OE}$	I/O Operation	Vcc Current
Not Selected (Power-down)	X	H	X	High-Z	I_{SB1}, I_{SB2}
Output Disabled	H	L	H	High-Z	I_{CC}
Read	H	L	L	D_{OUT}	I_{CC}
Write	L	L	X	D_{IN}	I_{CC}

ABSOLUTE MAXIMUM RATINGS[(1)]

Symbol	Parameter		Value	Unit
V_{CC}	Power Supply Voltage Relative to GND		–0.5 to +4.6	V
V_{TERM}	Terminal Voltage with Respect to GND		–0.5 to +4.6	V
T_{BIAS}	Temperature Under Bias	Com. Ind.	–10 to +85 –45 to +90	°C
T_{STG}	Storage Temperature		–65 to +150	°C
P_D	Power Dissipation		1	W
I_{OUT}	DC Output Current		±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.

OPERATING RANGE

Range	Ambient Temperature	Speed	Vcc
Commercial	0°C to +70°C	8, 10, 12 15, 20	3.3V, +10%, –5% 3.3V ± 10%
Industrial	–40°C to +85°C	All	3.3V + 10%, –5%

DC ELECTRICAL CHARACTERISTICS (Over Operating Range)

Symbol	Parameter	Test Conditions		Min.	Max.	Unit
V_{OH}	Output HIGH Voltage	V_{CC} = Min., I_{OH} = –2.0 mA		2.4	—	V
V_{OL}	Output LOW Voltage	V_{CC} = Min., I_{OL} = 4.0 mA		—	0.4	V
V_{IH}	Input HIGH Voltage			2.2	V_{CC} + 0.3	V
V_{IL}	Input LOW Voltage[1]			–0.3	0.8	V
I_{LI}	Input Leakage	GND ≤ V_{IN} ≤ V_{CC}	Com. Ind.	–1 –5	1 5	µA
I_{LO}	Output Leakage	GND ≤ V_{OUT} ≤ V_{CC}, Outputs Disabled	Com. Ind.	–1 –5	1 5	µA

Notes:
1. V_{IL} (min.) = –0.3V (DC); V_{IL} (min.) = –2.0V (pulse width ≤ 2.0 ns).
   V_{IH} (max.) = V_{CC} + 0.5V (DC); V_{IH} (max.) = Vcc + 2.0V (pulse width ≤ 2.0 ns).
2. Not more than one output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.

POWER SUPPLY CHARACTERISTICS[1] (Over Operating Range)

Sym.	Parameter	Test Conditions		-8 ns[2] Min.	-8 ns[2] Max.	-10 ns[2] Min.	-10 ns[2] Max.	-12 ns Min.	-12 ns Max.	-15 ns Min.	-15 ns Max.	-20 ns Min.	-20 ns Max.	Unit
I_{CC}	Vcc Dynamic Operating Supply Current	V_{CC} = Max., $\overline{CE}$ = V_{IL} I_{OUT} = 0 mA, f = f_{MAX}	Com. Ind.	— —	120 —	— —	110 120	— —	100 110	— —	90 100	— —	80 90	mA
I_{SB1}	TTL Standby Current (TTL Inputs)	V_{CC} = Max., V_{IN} = V_{IH} or V_{IL} $\overline{CE}$ ≥ V_{IH}, f = 0	Com. Ind.	— —	15 —	— —	10 20	— —	10 20	— —	10 20	— —	10 20	mA
I_{SB2}	CMOS Standby Current (CMOS Inputs)	V_{CC} = Max., $\overline{CE}$ ≤ V_{CC} – 0.2V, V_{IN} > V_{CC} – 0.2V, or V_{IN} ≤ 0.2V, f = 0	Com. Ind.	— —	2 —	— —	2 5	— —	2 5	— —	2 5	— —	2 5	mA

Notes:
1. At f = f_{MAX}, address and data inputs are cycling at the maximum frequency, f = 0 means no input lines change.
2. Shaded area = **PREPRODUCTION AVAILABILITY.**

CAPACITANCE[1,2]

Symbol	Parameter	Conditions	Max.	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V	6	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0V	5	pF

Notes:
1. Tested initially and after any design or process changes that may affect these parameters.
2. Test conditions: T_A = 25°C, f = 1 MHz, Vcc = 3.3V.

READ CYCLE SWITCHING CHARACTERISTICS[1] (Over Operating Range)

Symbol	Parameter	-8 ns[2] Min.	-8 ns[2] Max.	-10 ns[2] Min.	-10 ns[2] Max.	-12 ns Min.	-12 ns Max.	-15 ns Min.	-15 ns Max.	-20 ns Min.	-20 ns Max.	Unit
t_{RC}	Read Cycle Time	8	—	10	—	12	—	15	—	20	—	ns
t_{AA}	Address Access Time	—	8	—	10	—	12	—	15	—	20	ns
t_{OHA}	Output Hold Time	2	—	2	—	2	—	2	—	2	—	ns
t_{ACE}	$\overline{CE}$ Access Time	—	8	—	10	—	12	—	15	—	20	ns
t_{DOE}	$\overline{OE}$ Access Time	—	4	—	5	—	6	—	7	—	8	ns
t_{LZOE}[3]	$\overline{OE}$ to Low-Z Output	0	—	0	—	0	—	0	—	0	—	ns
t_{HZOE}[3]	$\overline{OE}$ to High-Z Output	—	4	—	5	—	5	—	6	—	6	ns
t_{LZCE}[3]	$\overline{CE}$ to Low-Z Output	3	—	3	—	3	—	3	—	3	—	ns
t_{HZCE}[3]	$\overline{CE}$ to High-Z Output	—	4	—	5	—	6	—	7	—	7	ns
t_{PU}[4]	$\overline{CE}$ to Power-Up	0	—	0	—	0	—	0	—	0	—	ns
t_{PD}[4]	$\overline{CE}$ to Power-Down	—	8	—	10	—	12	—	15	—	20	ns

Notes:
1. Test conditions assume signal transition times of 3 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V and output loading specified in Figure 1.
2. Shaded area = **PREPRODUCTION AVAILABILITY.**
3. Tested with the load in Figure 2. Transition is measured ±200 mV from steady-state voltage. Not 100% tested.
4. Not 100% tested.

AC TEST CONDITIONS

Parameter	Unit
Input Pulse Level	0V to 3.0V
Input Rise and Fall Times	3 ns
Input and Output Timing and Reference Levels	1.5V
Output Load	See Figures 1 and 2

AC TEST LOADS

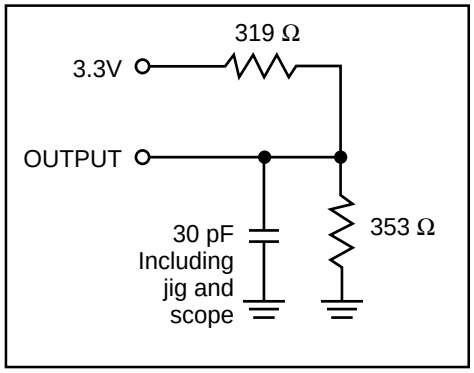


Figure 1.

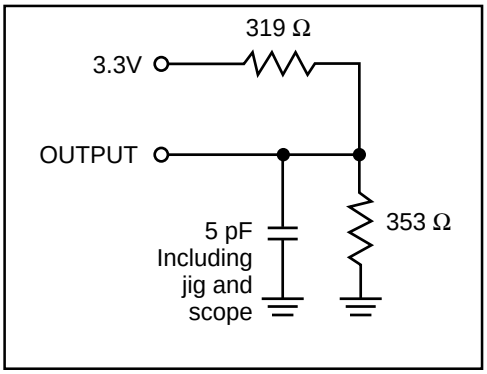
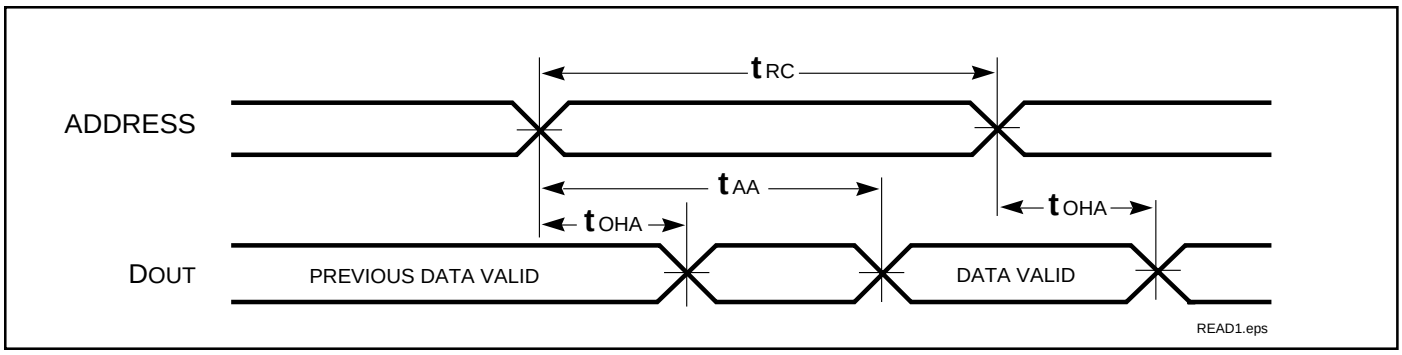


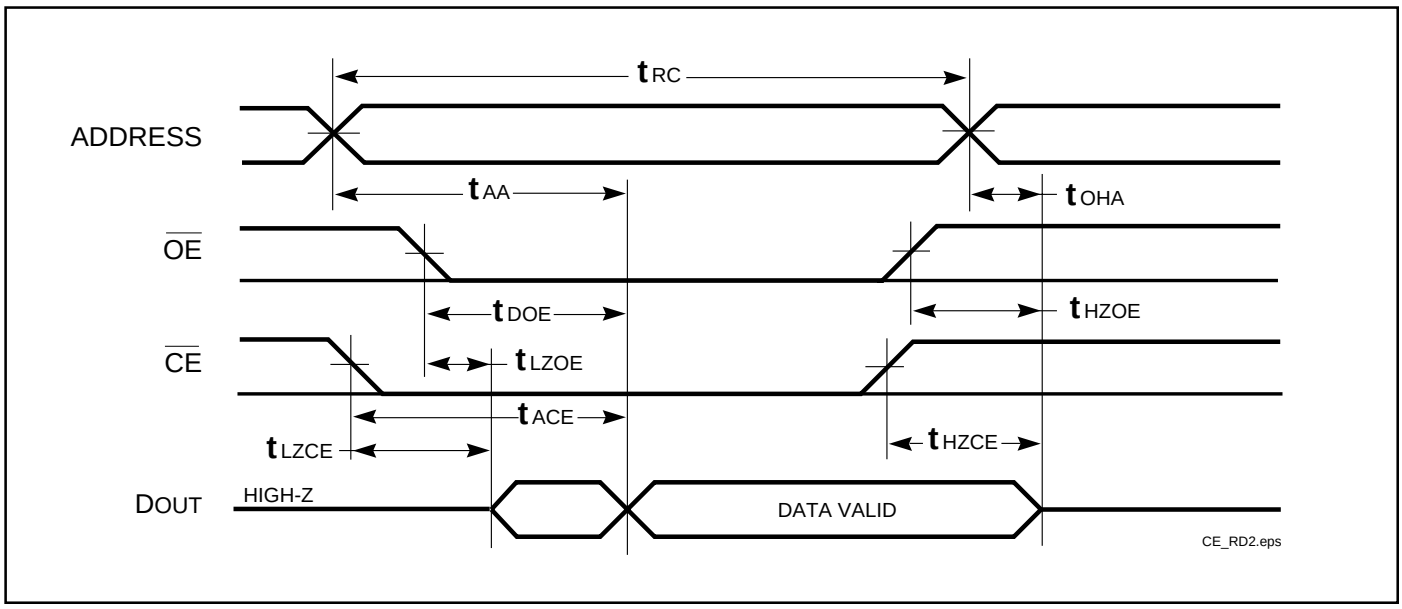
Figure 2.

AC WAVEFORMS

READ CYCLE NO. 1[1,2]



READ CYCLE NO. 2[1,3]



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

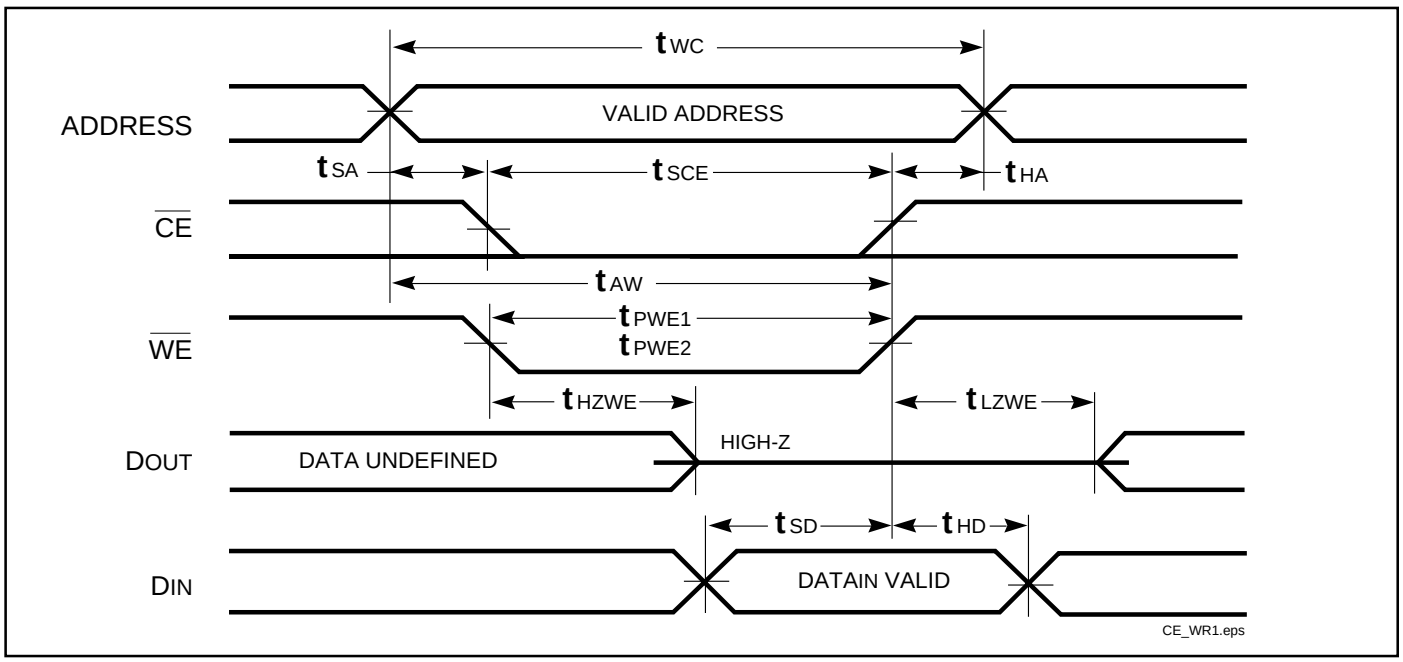
WRITE CYCLE SWITCHING CHARACTERISTICS[1,2] (Over Operating Range)

Symbol	Parameter	-8 ns[3] Min.	-8 ns[3] Max.	-10 ns[3] Min.	-10 ns[3] Max.	-12 ns Min.	-12 ns Max.	-15 ns Min.	-15 ns Max.	-20 ns Min.	-20 ns Max.	Unit
t_{WC}	Write Cycle Time	8	—	10	—	12	—	15	—	20	—	ns
t_{SCE}	$\overline{CE}$ to Write End	6.5	—	8	—	8	—	10	—	12	—	ns
t_{AW}	Address Setup Time to Write End	6.5	—	8	—	8	—	10	—	12	—	ns
t_{HA}	Address Hold from Write End	0	—	0	—	0	—	0	—	0	—	ns
t_{SA}	Address Setup Time	0	—	0	—	0	—	0	—	0	—	ns
t_{PWE1}	$\overline{WE}$ Pulse Width ($\overline{OE}$ HIGH)	6.5	—	7	—	8	—	10	—	12	—	ns
t_{PWE2}	$\overline{WE}$ Pulse Width ($\overline{OE}$ LOW)	8	—	10	—	12	—	15	—	20	—	ns
t_{SD}	Data Setup to Write End	5	—	5	—	6	—	7	—	10	—	ns
t_{HD}	Data Hold from Write End	0	—	0	—	0	—	0	—	0	—	ns
t_{HZWE}[4]	$\overline{WE}$ LOW to High-Z Output	—	3.5	—	4	—	6	—	7	—	7	ns
t_{LZWE}[4]	$\overline{WE}$ HIGH to Low-Z Output	0	—	0	—	0	—	0	—	0	—	ns

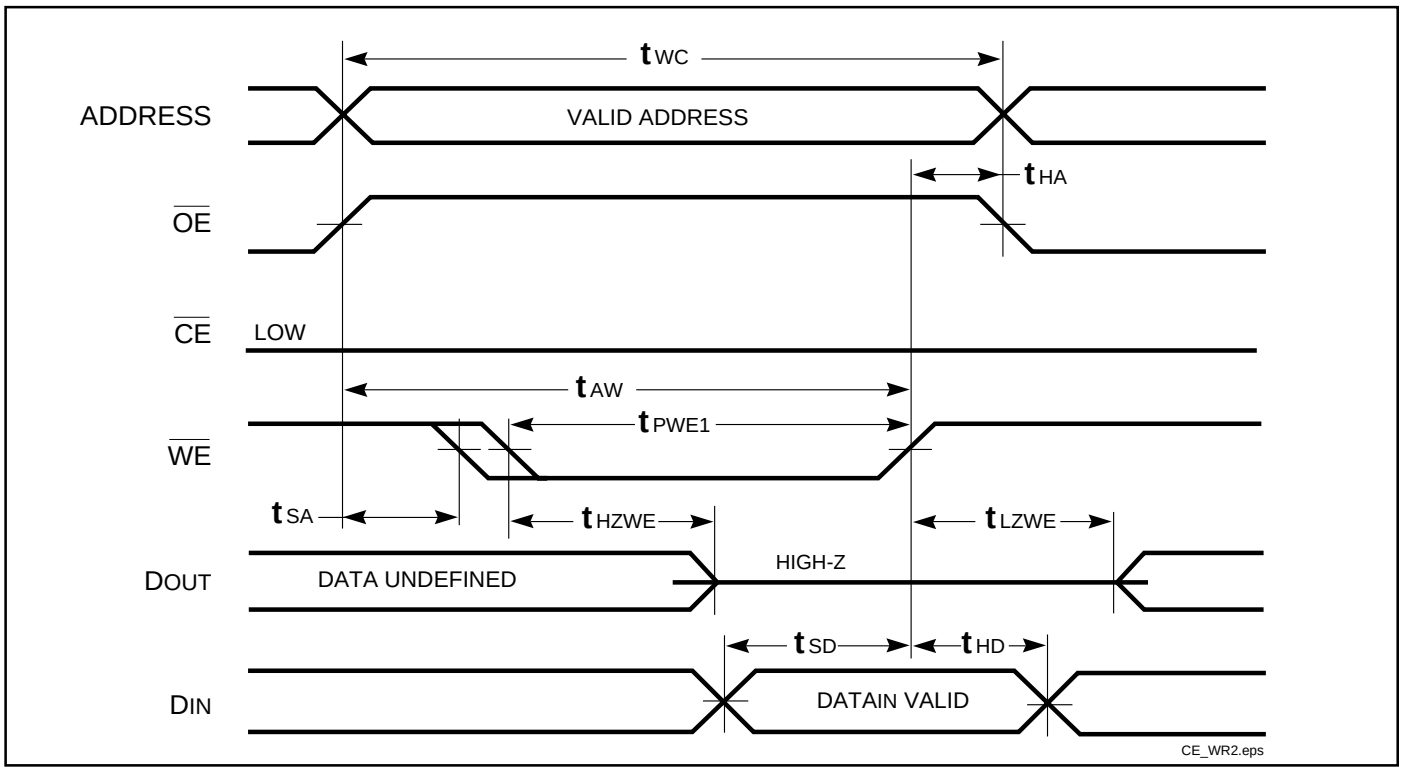
Notes:
1. Test conditions assume signal transition times of 3 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V and output loading specified in Figure 1.
2. The internal write time is defined by the overlap of $\overline{CE}$ LOW and $\overline{WE}$ LOW. All signals must be 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.
3. Shaded area = **PREPRODUCTION AVAILABILITY.**
4. Tested with the load in Figure 2. Transition is measured ±500 mV from steady-state voltage. Not 100% tested.

AC WAVEFORMS

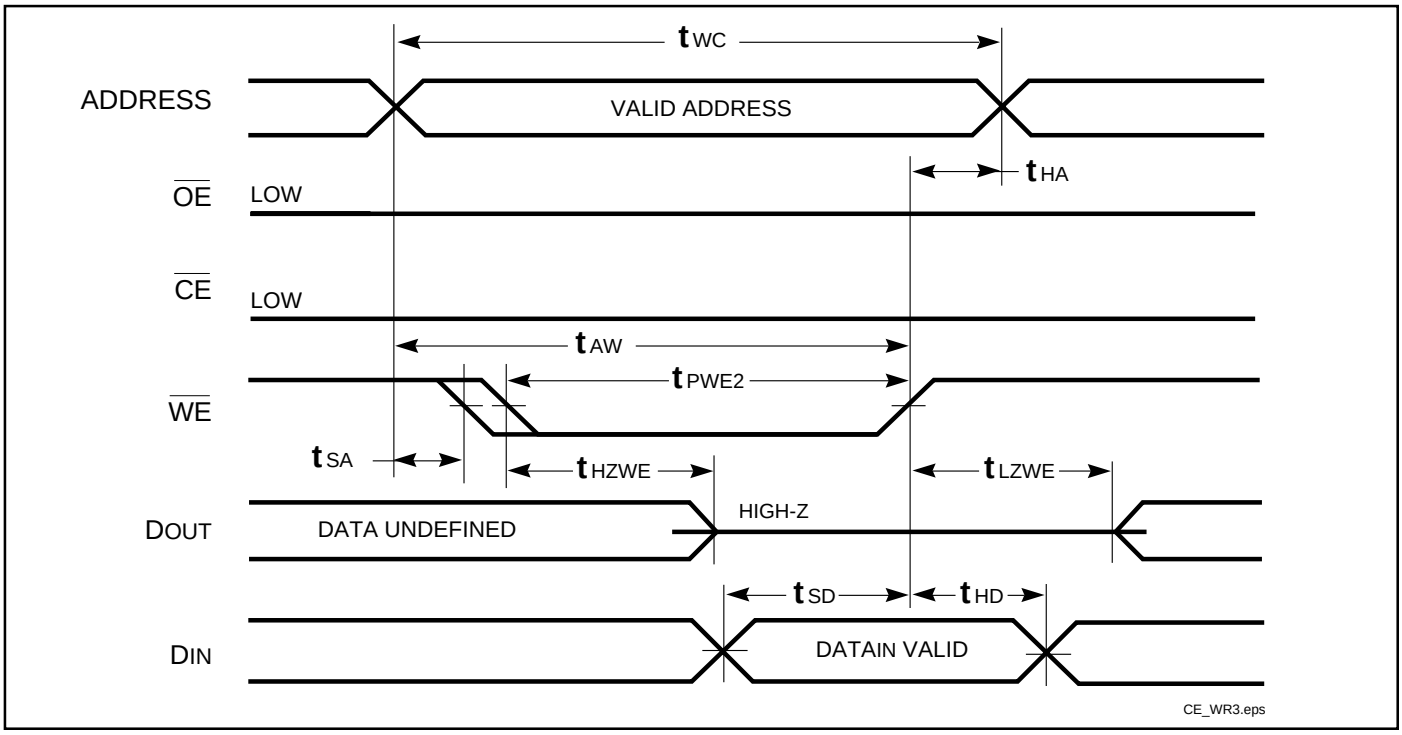
WRITE CYCLE NO. 1 ($\overline{CE}$ Controlled, $\overline{OE}$ is HIGH or LOW) [1]



WRITE CYCLE NO. 2 ($\overline{WE}$ Controlled, $\overline{OE}$ is HIGH During Write Cycle) (1,2)



WRITE CYCLE NO. 3 ($\overline{WE}$ Controlled, $\overline{OE}$ is LOW During Write Cycle) (1)



Notes:

1. The internal write time is defined by the overlap of $\overline{CE}$ LOW 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}.

ORDERING INFORMATION
Commercial Range: 0°C to +70°C

Speed (ns)	Order Part No.	Package
8	IS61LV256-8T IS61LV256-8J	TSOP - Type I 300-mil Plastic SOJ
10	IS61LV256-10T IS61LV256-10J	TSOP - Type I 300-mil Plastic SOJ
12	IS61LV256-12T IS61LV256-12J	TSOP - Type I 300-mil Plastic SOJ
15	IS61LV256-15T IS61LV256-15J	TSOP - Type I 300-mil Plastic SOJ
20	IS61LV256-15T IS61LV256-20J	TSOP - Type I 300-mil Plastic SOJ

ORDERING INFORMATION
Industrial Range: –40°C to +85°C

Speed (ns)	Order Part No.	Package
10	IS61LV256-10TI IS61LV256-10JI	TSOP - Type I 300-mil Plastic SOJ
12	IS61LV256-12TI IS61LV256-12JI	TSOP - Type I 300-mil Plastic SOJ
15	IS61LV256-15TI IS61LV256-15JI	TSOP - Type I 300-mil Plastic SOJ
20	IS61LV256-20TI IS61LV256-20JI	TSOP - Type I 300-mil Plastic SOJ

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