

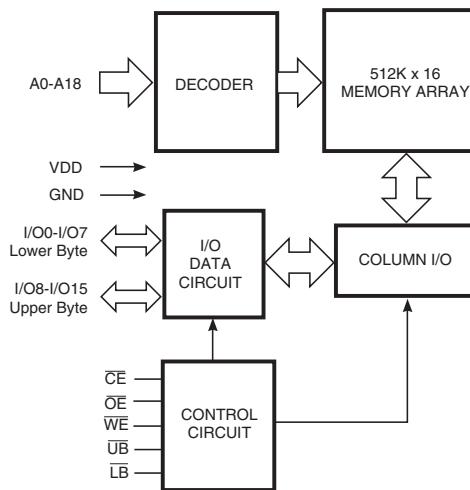
## 512K x 16 HIGH-SPEED ASYNCHRONOUS CMOS STATIC RAM WITH 3.3V SUPPLY

OCTOBER 2009

### FEATURES

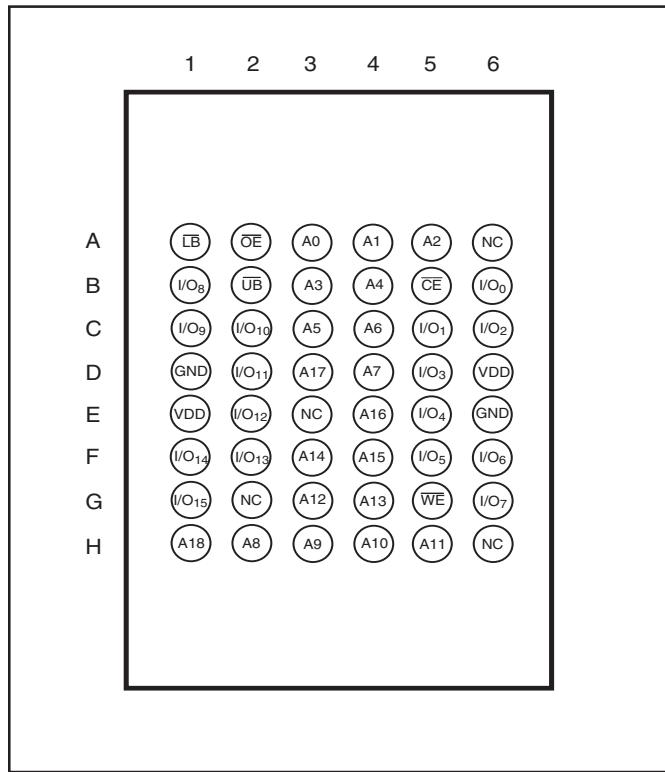
- High-speed access times:  
8, 10, 20 ns
- High-performance, low-power CMOS process
- Multiple center power and ground pins for greater noise immunity
- Easy memory expansion with  $\overline{CE}$  and  $\overline{OE}$  options
- $\overline{CE}$  power-down
- Fully static operation: no clock or refresh required
- TTL compatible inputs and outputs
- Single power supply  
V<sub>DD</sub> 1.65V to 2.2V (IS61WV51216ALL)  
speed = 20ns for V<sub>DD</sub> 1.65V to 2.2V  
V<sub>DD</sub> 2.4V to 3.6V (IS61/64WV51216BLL)  
speed = 10ns for V<sub>DD</sub> 2.4V to 3.6V  
speed = 8ns for V<sub>DD</sub> 3.3V ± 5%
- Packages available:
  - 48-ball miniBGA (9mm x 11mm)
  - 44-pin TSOP (Type II)
- Industrial and Automotive Temperature Support
- Lead-free available
- Data control for upper and lower bytes

### FUNCTIONAL BLOCK DIAGRAM



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**48-pin mini BGA (9mmx11mm)**

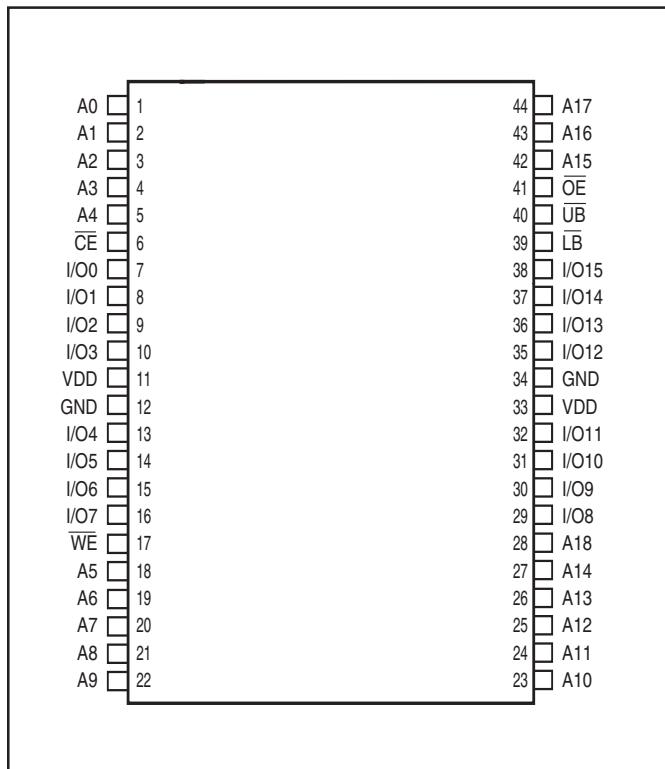


**PIN DESCRIPTIONS**

A0-A18	Address Inputs
I/O0-I/O15	Data Inputs/Outputs
CE	Chip Enable Input
OE	Output Enable Input
WE	Write Enable Input
LB	Lower-byte Control (I/O0-I/O7)
UB	Upper-byte Control (I/O8-I/O15)
NC	No Connection
V <sub>DD</sub>	Power
GND	Ground

## PIN CONFIGURATIONS

### 44-Pin TSOP (Type II)



## PIN DESCRIPTIONS

A0-A18	Address Inputs
I/O0-I/O15	Data Inputs/Outputs
CE	Chip Enable Input
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WE	Write Enable Input
LB	Lower-byte Control (I/O0-I/O7)
UB	Upper-byte Control (I/O8-I/O15)
NC	No Connection
VDD	Power
GND	Ground

## TRUTH TABLE

Mode	<b>WE</b>	<b>CE</b>	<b>OE</b>	<b>LB</b>	<b>UB</b>	I/O PIN		
						I/O0-I/O7	I/O8-I/O15	V <sub>DD</sub> Current
Not Selected	X	H	X	X	X	High-Z	High-Z	I <sub>SB1</sub> , I <sub>SB2</sub>
Output Disabled	H	L	H	X	X	High-Z	High-Z	I <sub>CC</sub>
	X	L	X	H	H	High-Z	High-Z	
Read	H	L	L	L	H	D <sub>OUT</sub>	High-Z	I <sub>CC</sub>
	H	L	L	H	L	High-Z	D <sub>OUT</sub>	
	H	L	L	L	L	D <sub>OUT</sub>	D <sub>OUT</sub>	
Write	L	L	X	L	H	D <sub>IN</sub>	High-Z	I <sub>CC</sub>
	L	L	X	H	L	High-Z	D <sub>IN</sub>	
	L	L	X	L	L	D <sub>IN</sub>	D <sub>IN</sub>	

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

Symbol	Parameter	Value	Unit
V <sub>TERM</sub>	Terminal Voltage with Respect to GND	-0.5 to V <sub>DD</sub> + 0.5	V
V <sub>DD</sub>	V <sub>DD</sub> Relates to GND	-0.3 to 4.0	V
T <sub>STG</sub>	Storage Temperature	-65 to +150	°C
P <sub>T</sub>	Power Dissipation	1.0	W

### 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>I/O</sub>	Input/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>DD</sub> = 3.3V.

**OPERATING RANGE (V<sub>DD</sub>) (IS61WV51216ALL)**

Range	Ambient Temperature	V <sub>DD</sub> (20 ns)
Commercial	0°C to +70°C	1.65V-2.2V
Industrial	-40°C to +85°C	1.65V-2.2V
Automotive	-40°C to +125°C	1.65V-2.2V

**OPERATING RANGE (V<sub>DD</sub>) (IS61WV51216BLL)<sup>(1)</sup>**

Range	Ambient Temperature	V <sub>DD</sub> (8 ns)	V <sub>DD</sub> (10 ns)
Commercial	0°C to +70°C	3.3V $\pm$ 5%	2.4V-3.6V
Industrial	-40°C to +85°C	3.3V $\pm$ 5%	2.4V-3.6V

**Note:**

1. When operated in the range of 2.4V-3.6V, the device meets 10ns. When operated in the range of 3.3V  $\pm$  5%, the device meets 8ns.

**OPERATING RANGE (V<sub>DD</sub>) (IS64WV51216BLL)**

Range	Ambient Temperature	V <sub>DD</sub> (10 ns)
Automotive	-40°C to +125°C	2.4V-3.6V

### DC ELECTRICAL CHARACTERISTICS (Over Operating Range)

**V<sub>DD</sub> = 3.3V ± 5%**

Symbol	Parameter	Test Conditions	Min.	Max.	Unit
V <sub>OH</sub>	Output HIGH Voltage	V <sub>DD</sub> = Min., I <sub>OH</sub> = -4.0 mA	2.4	—	V
V <sub>OL</sub>	Output LOW Voltage	V <sub>DD</sub> = Min., I <sub>OL</sub> = 8.0 mA	—	0.4	V
V <sub>IH</sub>	Input HIGH Voltage		2	V <sub>DD</sub> + 0.3	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>DD</sub>	-1	1	µA
I <sub>LO</sub>	Output Leakage	GND ≤ V <sub>OUT</sub> ≤ V <sub>DD</sub> , Outputs Disabled	-1	1	µA

**Note:**

1. V<sub>IL</sub>(min.) = -0.3V DC; V<sub>IL</sub>(min.) = -2.0V AC (pulse width < 10 ns). Not 100% tested.  
V<sub>IH</sub>(max.) = V<sub>DD</sub> + 0.3V DC; V<sub>IH</sub>(max.) = V<sub>DD</sub> + 2.0V AC (pulse width < 10 ns). Not 100% tested.

### DC ELECTRICAL CHARACTERISTICS (Over Operating Range)

**V<sub>DD</sub> = 2.4V-3.6V**

Symbol	Parameter	Test Conditions	Min.	Max.	Unit
V <sub>OH</sub>	Output HIGH Voltage	V <sub>DD</sub> = Min., I <sub>OH</sub> = -1.0 mA	1.8	—	V
V <sub>OL</sub>	Output LOW Voltage	V <sub>DD</sub> = Min., I <sub>OL</sub> = 1.0 mA	—	0.4	V
V <sub>IH</sub>	Input HIGH Voltage		2.0	V <sub>DD</sub> + 0.3	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>DD</sub>	-1	1	µA
I <sub>LO</sub>	Output Leakage	GND ≤ V <sub>OUT</sub> ≤ V <sub>DD</sub> , Outputs Disabled	-1	1	µA

**Note:**

1. V<sub>IL</sub>(min.) = -0.3V DC; V<sub>IL</sub>(min.) = -2.0V AC (pulse width < 10 ns). Not 100% tested.  
V<sub>IH</sub>(max.) = V<sub>DD</sub> + 0.3V DC; V<sub>IH</sub>(max.) = V<sub>DD</sub> + 2.0V AC (pulse width < 10 ns). Not 100% tested.

### DC ELECTRICAL CHARACTERISTICS (Over Operating Range)

**V<sub>DD</sub> = 1.65V-2.2V**

Symbol	Parameter	Test Conditions	V <sub>DD</sub>	Min.	Max.	Unit
V <sub>OH</sub>	Output HIGH Voltage	I <sub>OH</sub> = -0.1 mA	1.65-2.2V	1.4	—	V
V <sub>OL</sub>	Output LOW Voltage	I <sub>OL</sub> = 0.1 mA	1.65-2.2V	—	0.2	V
V <sub>IH</sub>	Input HIGH Voltage		1.65-2.2V	1.4	V <sub>DD</sub> + 0.2	V
V <sub>IL</sub> <sup>(1)</sup>	Input LOW Voltage		1.65-2.2V	-0.2	0.4	V
I <sub>LI</sub>	Input Leakage	GND ≤ V <sub>IN</sub> ≤ V <sub>DD</sub>		-1	1	µA
I <sub>LO</sub>	Output Leakage	GND ≤ V <sub>OUT</sub> ≤ V <sub>DD</sub> , Outputs Disabled		-1	1	µA

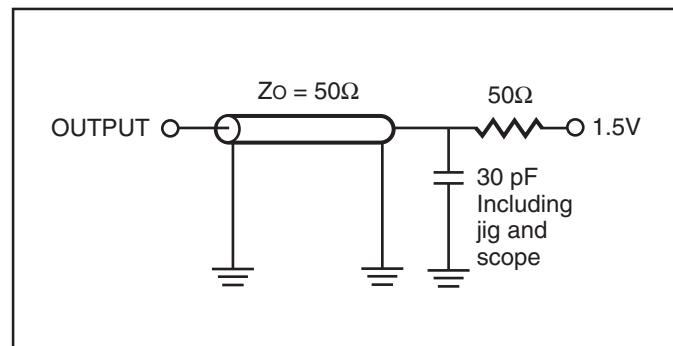
**Notes:**

1. V<sub>IL</sub>(min.) = -0.3V DC; V<sub>IL</sub>(min.) = -2.0V AC (pulse width < 10 ns). Not 100% tested.  
V<sub>IH</sub>(max.) = V<sub>DD</sub> + 0.3V DC; V<sub>IH</sub>(max.) = V<sub>DD</sub> + 2.0V AC (pulse width < 10 ns). Not 100% tested.

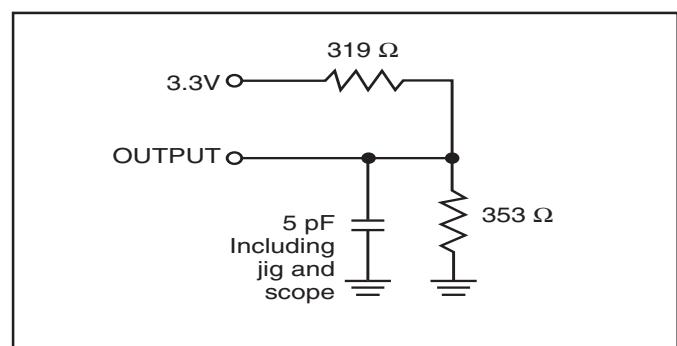
### AC TEST CONDITIONS (HIGH SPEED)

Parameter	Unit (2.4V-3.6V)	Unit (3.3V $\pm$ 5%)	Unit (1.65V-2.2V)
Input Pulse Level	0.4V to V <sub>DD</sub> -0.3V	0.4V to V <sub>DD</sub> -0.3V	0.4V to V <sub>DD</sub> -0.2V
Input Rise and Fall Times	1.5ns	1.5ns	1.5ns
Input and Output Timing and Reference Level (V <sub>Ref</sub> )	V <sub>DD</sub> /2	V <sub>DD</sub> /2 + 0.05	V <sub>DD</sub> /2
Output Load	See Figures 1 and 2	See Figures 1 and 2	See Figures 1 and 2

### AC TEST LOADS



**Figure 1.**



**Figure 2.**

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

Symbol	Parameter	Test Conditions	-8		-10		-20		Unit	
			Min.	Max.	Min.	Max.	Min.	Max.		
I <sub>CC</sub>	V <sub>DD</sub> Dynamic Operating Supply Current	V <sub>DD</sub> = Max., I <sub>OUT</sub> = 0 mA, f = f <sub>MAX</sub>	Com.	—	110	—	90	—	50	mA
			Ind.	—	115	—	95	—	60	
			Auto.	—	—	—	140	—	100	
			typ. <sup>(2)</sup>			60				
I <sub>CC1</sub>	Operating Supply Current	V <sub>DD</sub> = Max., I <sub>OUT</sub> = 0 mA, f = 0	Com.	—	85	—	85	—	45	mA
			Ind.	—	90	—	90	—	55	
			Auto.	—	—	—	110	—	90	
I <sub>SB1</sub>	TTL Standby Current (TTL Inputs)	V <sub>DD</sub> = Max., V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> , $\overline{CE} \geq V_{IH}$ , f = 0	Com.	—	30	—	30	—	30	mA
			Ind.	—	35	—	35	—	35	
			Auto.	—	—	—	70	—	70	
I <sub>SB2</sub>	CMOS Standby Current (CMOS Inputs)	V <sub>DD</sub> = Max., $\overline{CE} \geq V_{DD} - 0.2V$ , V <sub>IN</sub> $\geq V_{DD} - 0.2V$ , or V <sub>IN</sub> $\leq 0.2V$ , f = 0	Com.	—	20	—	20	—	15	mA
			Ind.	—	25	—	25	—	20	
			Auto.	—	—	—	60	—	60	
			typ. <sup>(2)</sup>			4				

**Note:**

- At f = f<sub>MAX</sub>, address and data inputs are cycling at the maximum frequency, f = 0 means no input lines change.
- Typical values are measured at V<sub>DD</sub> = 3.0V, T<sub>A</sub> = 25°C and not 100% tested.

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

Symbol	Parameter	<b>-8</b>		<b>-10</b>		Unit
		Min.	Max.	Min.	Max.	
t <sub>RC</sub>	Read Cycle Time	8	—	10	—	ns
t <sub>TAA</sub>	Address Access Time	—	8	—	10	ns
t <sub>OHA</sub>	Output Hold Time	2.5	—	2.5	—	ns
t <sub>TACE</sub>	$\overline{CE}$ Access Time	—	8	—	10	ns
t <sub>TDOE</sub>	$\overline{OE}$ Access Time	—	5.5	—	6.5	ns
t <sub>HZOE<sup>(2)</sup></sub>	$\overline{OE}$ to High-Z Output	—	3	—	4	ns
t <sub>LZOE<sup>(2)</sup></sub>	$\overline{OE}$ to Low-Z Output	0	—	0	—	ns
t <sub>HZCE<sup>(2)</sup></sub>	$\overline{CE}$ to High-Z Output	0	3	0	4	ns
t <sub>LZCE<sup>(2)</sup></sub>	$\overline{CE}$ to Low-Z Output	3	—	3	—	ns
t <sub>TBA</sub>	$\overline{LB}, \overline{UB}$ Access Time	—	5.5	—	6.5	ns
t <sub>HZB<sup>(2)</sup></sub>	$\overline{LB}, \overline{UB}$ to High-Z Output	0	3	0	3	ns
t <sub>LZB<sup>(2)</sup></sub>	$\overline{LB}, \overline{UB}$ to Low-Z Output	0	—	0	—	ns
t <sub>PU</sub>	Power Up Time	0	—	0	—	ns
t <sub>PD</sub>	Power Down Time	—	8	—	10	ns

**Notes:**

1. Test conditions assume signal transition times of 3 ns or less, timing reference levels of 1.5V, input pulse levels of 0V to 3.0V and output loading specified in Figure 1.
2. Tested with the load in Figure 2. Transition is measured  $\pm 500$  mV from steady-state voltage.

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

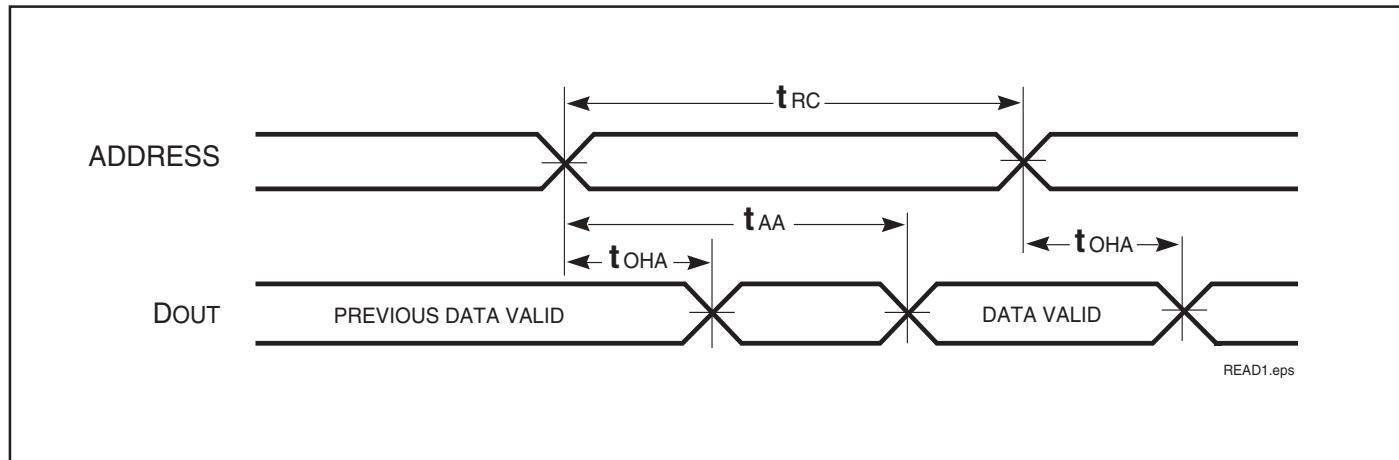
Symbol	Parameter	<b>-20 ns</b>		Unit
		Min.	Max.	
t <sub>RC</sub>	Read Cycle Time	20	—	ns
t <sub>AA</sub>	Address Access Time	—	20	ns
t <sub>OH</sub>	Output Hold Time	2.5	—	ns
t <sub>ACE</sub>	$\overline{CE}$ Access Time	—	20	ns
t <sub>DOE</sub>	$\overline{OE}$ Access Time	—	8	ns
t <sub>HZOE</sub> <sup>(2)</sup>	$\overline{OE}$ to High-Z Output	0	8	ns
t <sub>LZOE</sub> <sup>(2)</sup>	$\overline{OE}$ to Low-Z Output	0	—	ns
t <sub>HZCE</sub> <sup>(2)</sup>	$\overline{CE}$ to High-Z Output	0	8	ns
t <sub>LZCE</sub> <sup>(2)</sup>	$\overline{CE}$ to Low-Z Output	3	—	ns
t <sub>BA</sub>	$\overline{LB}$ , $\overline{UB}$ Access Time	—	8	ns
t <sub>HZB</sub>	$\overline{LB}$ , $\overline{UB}$ to High-Z Output	0	8	ns
t <sub>LZB</sub>	$\overline{LB}$ , $\overline{UB}$ to Low-Z Output	0	—	ns

**Notes:**

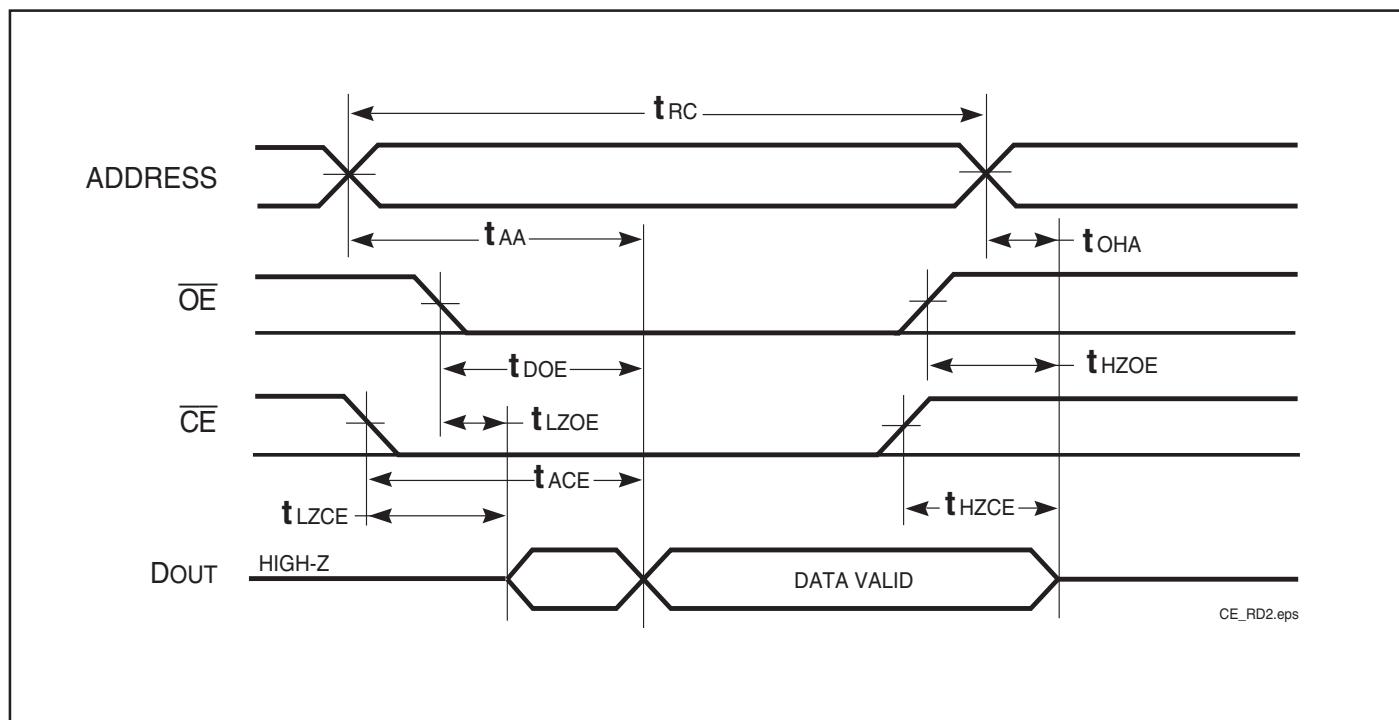
1. Test conditions assume signal transition times of 1.5 ns or less, timing reference levels of 1.25V, input pulse levels of 0.4V to V<sub>DD</sub>-0.3V and output loading specified in Figure 1a.
2. Tested with the load in Figure 1b. Transition is measured  $\pm 500$  mV from steady-state voltage. Not 100% tested.
3. Not 100% tested.

### AC WAVEFORMS

**READ CYCLE NO. 1<sup>(1,2)</sup>** (Address Controlled) ( $\overline{CE} = \overline{OE} = V_{IL}$ )



**READ CYCLE NO. 2<sup>(1,3)</sup>** ( $\overline{CE}$  and  $\overline{OE}$  Controlled)



**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<sup>(1,3)</sup> (Over Operating Range)

Symbol	Parameter	-8		-10		Unit
		Min.	Max.	Min.	Max.	
t <sub>WC</sub>	Write Cycle Time	8	—	10	—	ns
t <sub>SCE</sub>	$\overline{OE}$ to Write End	6.5	—	8	—	ns
t <sub>AW</sub>	Address Setup Time to Write End	6.5	—	8	—	ns
t <sub>HA</sub>	Address Hold from Write End	0	—	0	—	ns
t <sub>SA</sub>	Address Setup Time	0	—	0	—	ns
t <sub>PWB</sub>	$\overline{LB}$ , $\overline{UB}$ Valid to End of Write	6.5	—	8	—	ns
t <sub>PWE1</sub>	$\overline{WE}$ Pulse Width	6.5	—	8	—	ns
t <sub>PWE2</sub>	$\overline{WE}$ Pulse Width ( $\overline{OE}$ =LOW)	8.0	—	10	—	ns
t <sub>SD</sub>	Data Setup to Write End	5	—	6	—	ns
t <sub>HD</sub>	Data Hold from Write End	0	—	0	—	ns
t <sub>HZWE<sup>(2)</sup></sub>	$\overline{WE}$ LOW to High-Z Output	—	3.5	—	5	ns
t <sub>LZWE<sup>(2)</sup></sub>	$\overline{WE}$ HIGH to Low-Z Output	2	—	2	—	ns

**Notes:**

1. Test conditions assume signal transition times of 3 ns or less, timing reference levels of 1.5V, input pulse levels of 0V to 3.0V and output loading specified in Figure 1.
2. Tested with the load in Figure 2. Transition is measured  $\pm 500$  mV from steady-state voltage. Not 100% tested.
3. The internal write time is defined by the overlap of  $\overline{OE}$  LOW and  $\overline{UB}$  or  $\overline{LB}$ , 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. Shaded area product in development

**WRITE CYCLE SWITCHING CHARACTERISTICS<sup>(1,2)</sup> (Over Operating Range)**

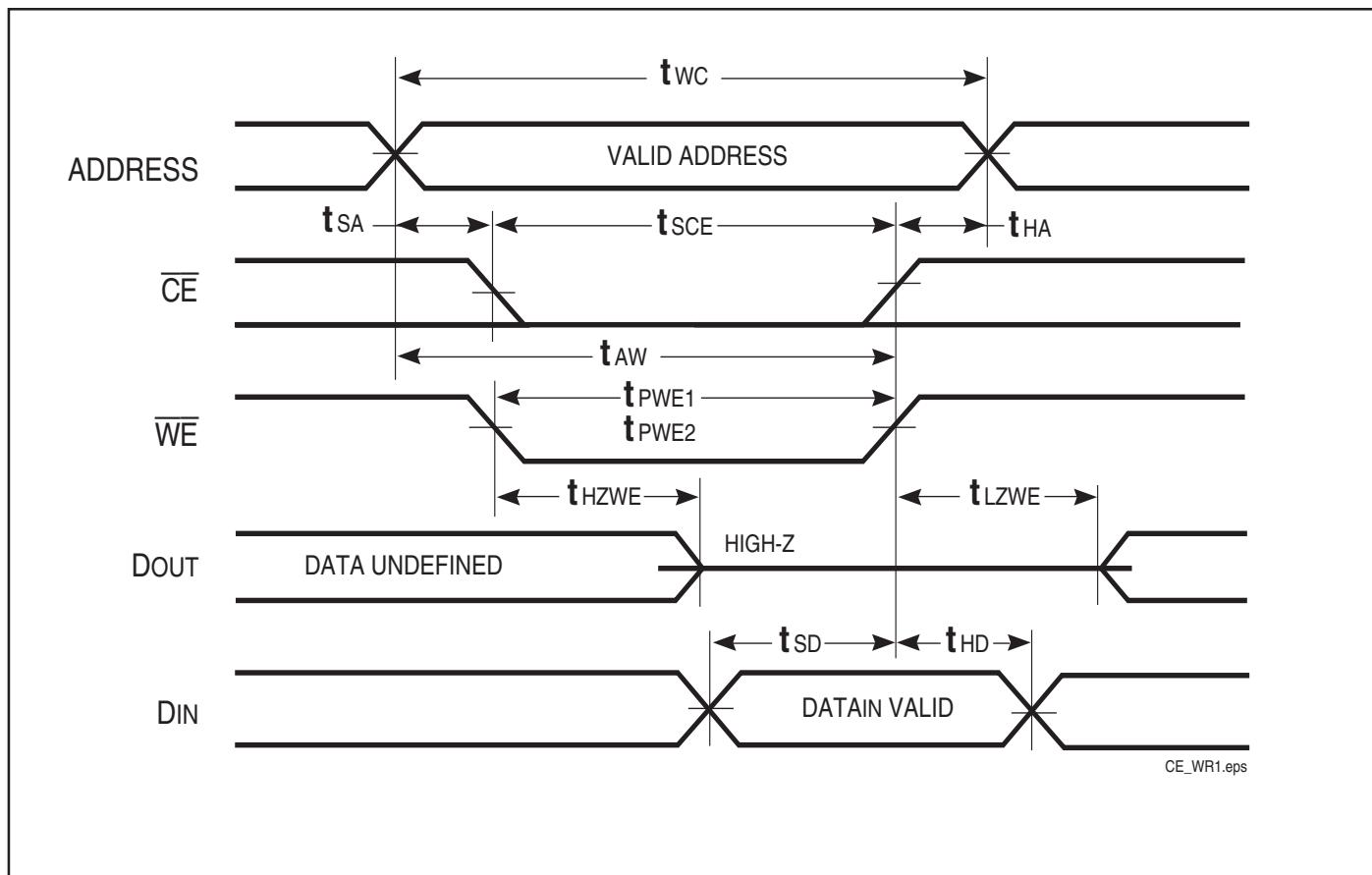
<b>Symbol</b>	<b>Parameter</b>	<b>-20 ns</b>		<b>Unit</b>
		<b>Min.</b>	<b>Max.</b>	
t <sub>WC</sub>	Write Cycle Time	20	—	ns
t <sub>SCE</sub>	$\overline{\text{CE}}$ to Write End	12	—	ns
t <sub>AW</sub>	Address Setup Time to Write End	12	—	ns
t <sub>HA</sub>	Address Hold from Write End	0	—	ns
t <sub>SA</sub>	Address Setup Time	0	—	ns
t <sub>PWB</sub>	$\overline{\text{LB}}$ , $\overline{\text{UB}}$ Valid to End of Write	12	—	ns
t <sub>PWE1</sub>	$\overline{\text{WE}}$ Pulse Width ( $\overline{\text{OE}} = \text{HIGH}$ )	12	—	ns
t <sub>PWE2</sub>	$\overline{\text{WE}}$ Pulse Width ( $\overline{\text{OE}} = \text{LOW}$ )	17	—	ns
t <sub>SD</sub>	Data Setup to Write End	9	—	ns
t <sub>HD</sub>	Data Hold from Write End	0	—	ns
t <sub>HZWE<sup>(3)</sup></sub>	$\overline{\text{WE}}$ LOW to High-Z Output	—	9	ns
t <sub>LZWE<sup>(3)</sup></sub>	$\overline{\text{WE}}$ HIGH to Low-Z Output	3	—	ns

**Notes:**

1. Test conditions for IS61WV51216ALL/BLL assume signal transition times of 1.5ns or less, timing reference levels of 1.25V, input pulse levels of 0.4V to V<sub>DD</sub>-0.3V 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  $\overline{\text{CE}}$  LOW and  $\overline{\text{UB}}$  or  $\overline{\text{LB}}$ , and  $\overline{\text{WE}}$  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.

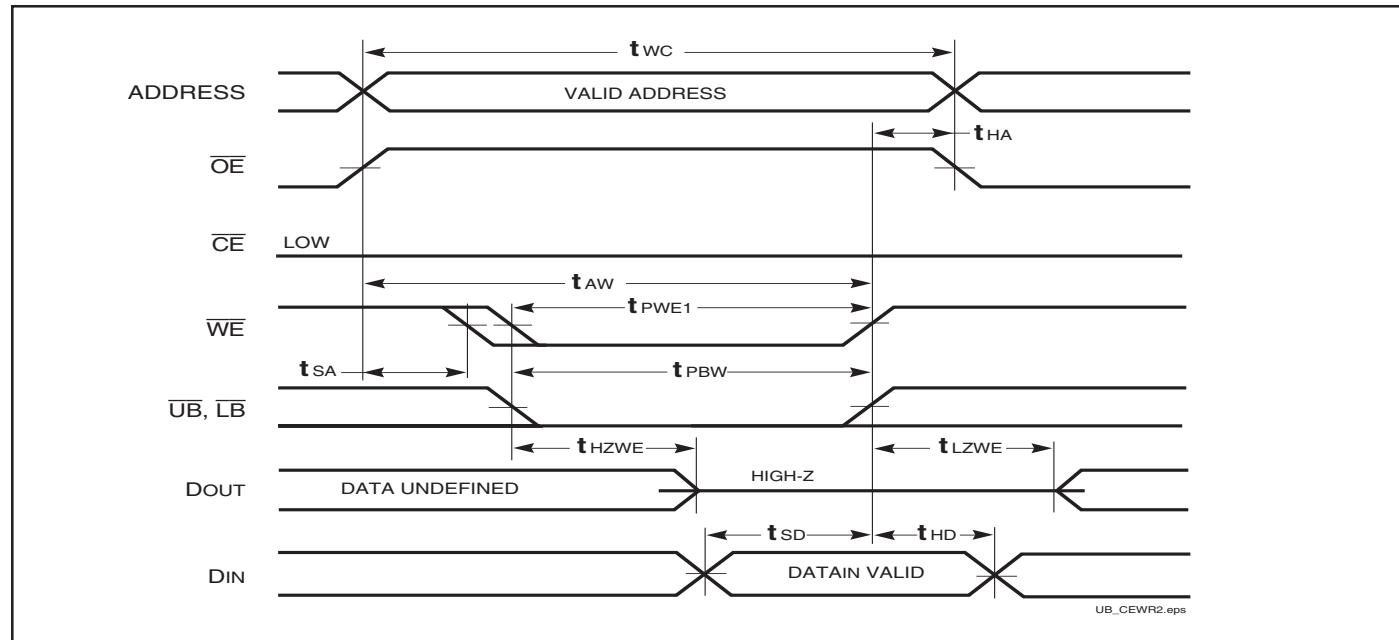
### AC WAVEFORMS

**WRITE CYCLE NO. 1<sup>(1,2)</sup>** ( $\overline{CE}$  Controlled,  $\overline{OE}$  = HIGH or LOW)

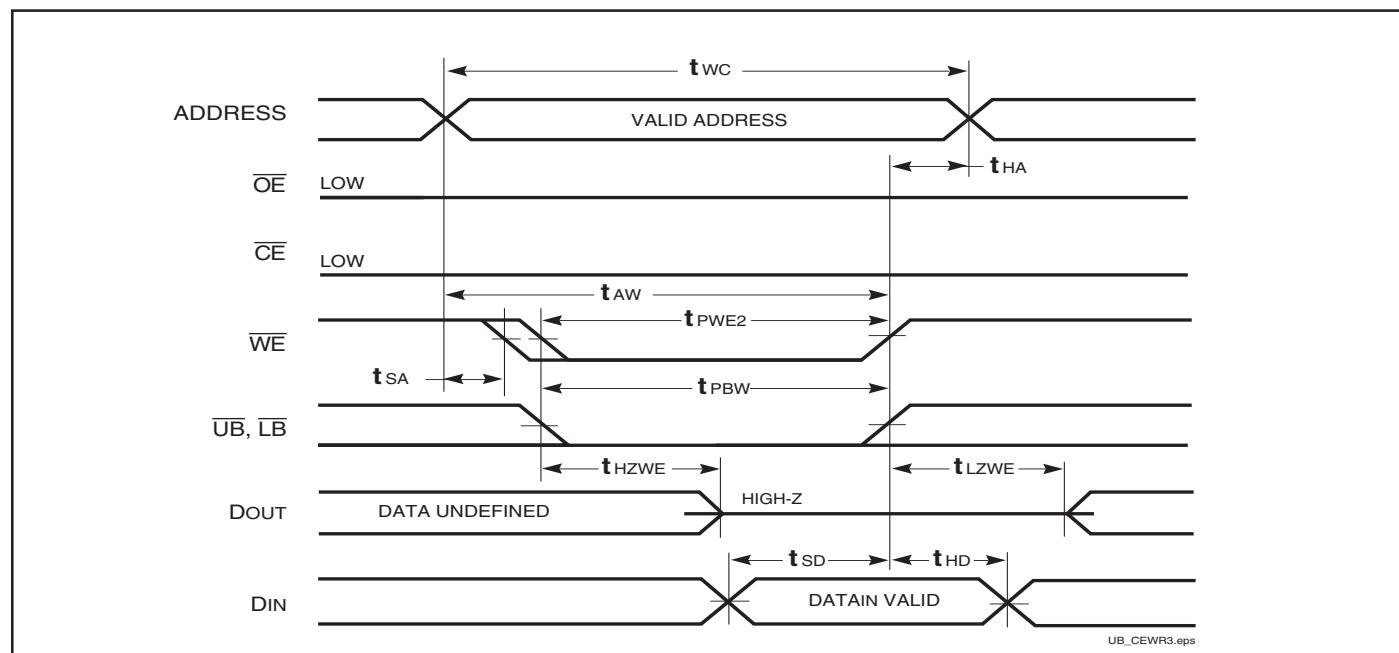


## AC WAVEFORMS

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

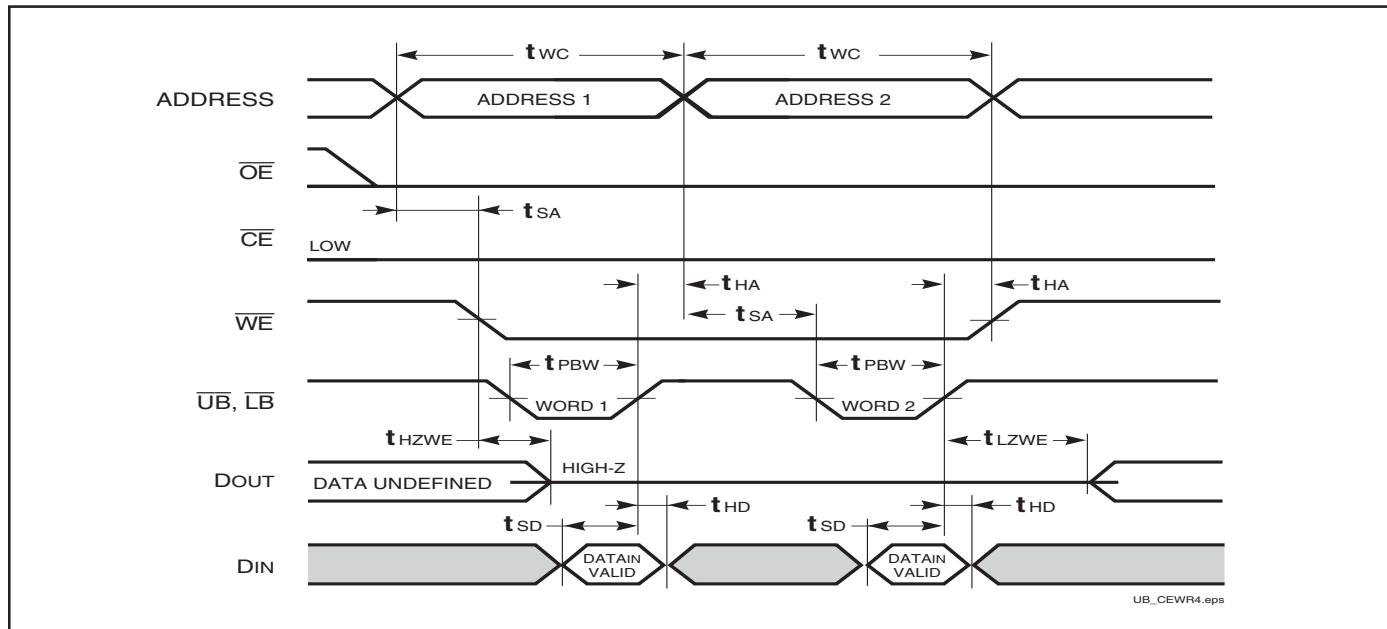


**WRITE CYCLE NO. 3 ( $\overline{WE}$  Controlled.  $\overline{OE}$  is LOW During Write Cycle) <sup>(1)</sup>**



## AC WAVEFORMS

### WRITE CYCLE NO. 4 ( $\overline{LB}$ , $\overline{UB}$ Controlled, Back-to-Back Write) <sup>(1,3)</sup>



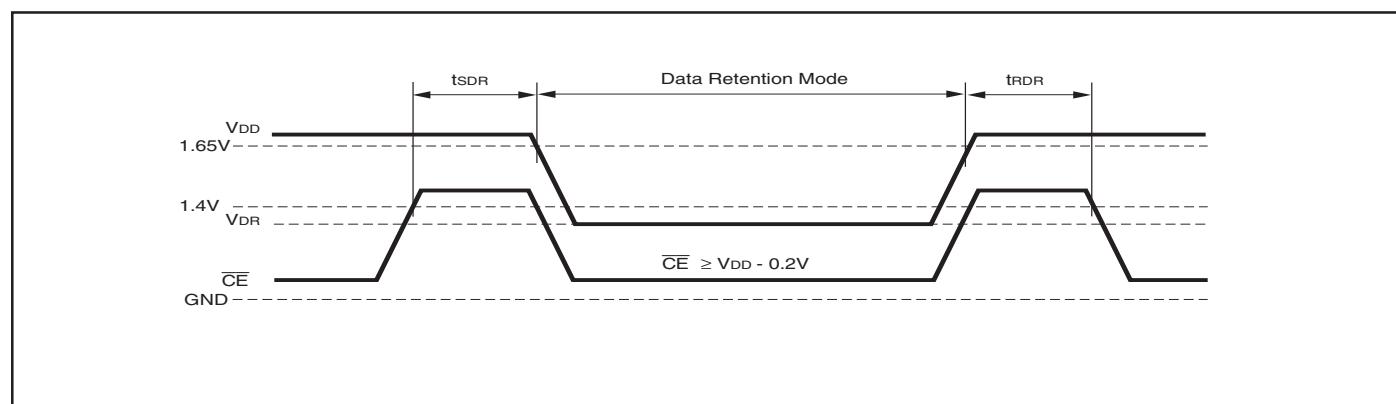
#### Notes:

1. The internal Write time is defined by the overlap of  $\overline{CE} = \text{LOW}$ ,  $\overline{UB}$  and/or  $\overline{LB} = \text{LOW}$ , and  $\overline{WE} = \text{LOW}$ . All signals must be in valid states to initiate a Write, but any can be deasserted to terminate the Write. The  $t_{SA}$ ,  $t_{HA}$ ,  $t_{SD}$ , and  $t_{HD}$  timing is referenced to the rising or falling edge of the signal that terminates the Write.
2. Tested with  $\overline{OE}$  HIGH for a minimum of 4 ns before  $\overline{WE} = \text{LOW}$  to place the I/O in a HIGH-Z state.
3.  $\overline{WE}$  may be held LOW across many address cycles and the  $\overline{LB}$ ,  $\overline{UB}$  pins can be used to control the Write function.

## DATA RETENTION SWITCHING CHARACTERISTICS

Symbol	Parameter	Test Condition	Min.	Max.	Unit
$V_{DR}$	V <sub>DD</sub> for Data Retention	See Data Retention Waveform	1.2	3.6	V
$I_{DR}$	Data Retention Current	$V_{DD} = 1.2V, \overline{CE} \geq V_{DD} - 0.2V$	Ind.	—	20 mA
$t_{SDR}$	Data Retention Setup Time		Auto.	—	50
$t_{RDR}$	Recovery Time	See Data Retention Waveform	0	—	ns
			$t_{RC}$	—	ns

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



## ORDERING INFORMATION

**Industrial Range: -40°C to +85°C**

**Voltage Range: 2.4V to 3.6V**

Speed(ns)	Order Part No.	Package
10(8 <sup>1</sup> )	IS61WV51216BLL-10MI	48 mini BGA (9mm x 11mm)
	IS61WV51216BLL-10MLI	48 mini BGA (9mm x 11mm), Lead-free
	IS61WV51216BLL-10TI	TSOP (Type II)
	IS61WV51216BLL-10TLI	TSOP (Type II), Lead-free

Note:

1. Speed = 8ns for V<sub>DD</sub> = 3.3V ± 5%. Speed = 10ns for V<sub>DD</sub> = 2.4V - 3.6V

**Industrial Range: -40°C to +85°C**

**Voltage Range: 1.65V to 2.2V**

Speed(ns)	Order Part No.	Package
20	IS61WV51216ALL-20MI	48 mini BGA (9mm x 11mm)
	IS61WV51216ALL-20TI	TSOP (Type II)

**Automotive Range: -40°C to +125°C**

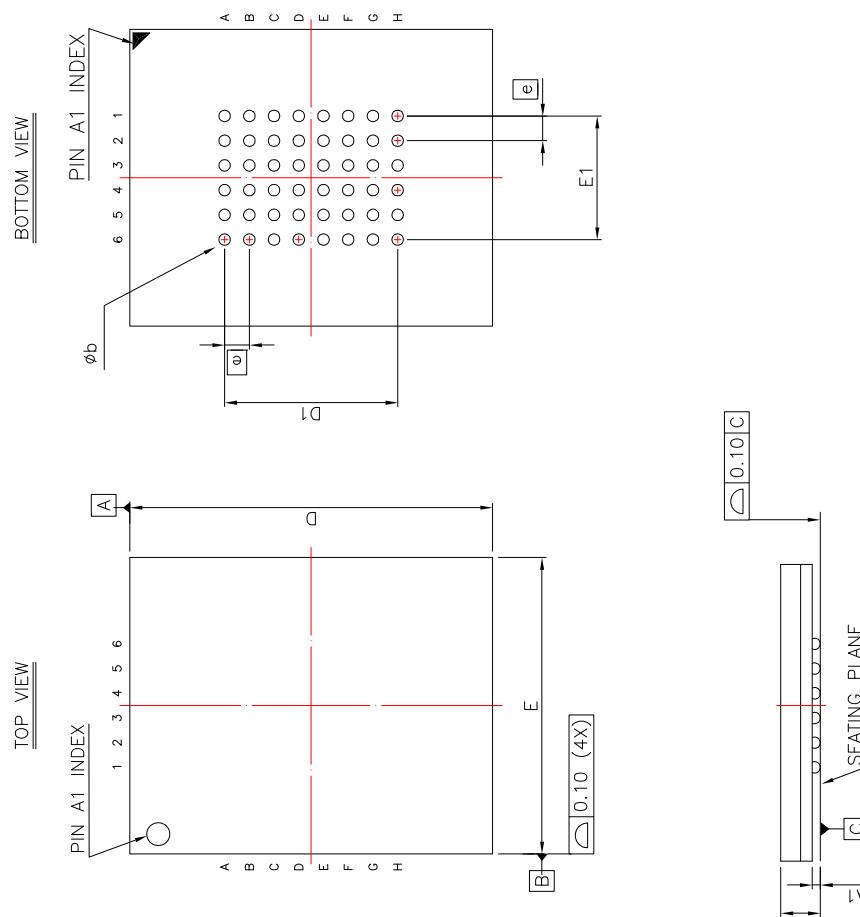
**Voltage Range: 2.4V to 3.6V**

Speed(ns)	Order Part No.	Package
10	IS64WV51216BLL-10MA3	48 mini BGA (9mm x 11mm)
	IS64WV51216BLL-10MLA3	48 mini BGA (9mm x 11mm), Lead-free
	IS64WV51216BLL-10CTA3	TSOP (Type II), Copper Leadframe
	IS64WV51216BLL-10CTLA3	TSOP (Type II), Lead-free, Copper Leadframe

SYM.	DIMENSION (mm)		DIMENSION (INCH)		MAX.
	MIN.	NOM.	MIN.	NOM.	
A	—	—	1.20	—	0.047
A1	0.20	—	0.30	0.0083	—
b	0.30	0.35	0.40	0.012	0.016
D	10.90	11.00	11.10	0.429	0.433
D1	5.25	BSC	—	0.207	BSC
E	8.90	9.00	9.10	0.350	0.354
E1	3.75	BSC	—	0.148	BSC
E2	0.75	BSC	—	0.030	BSC

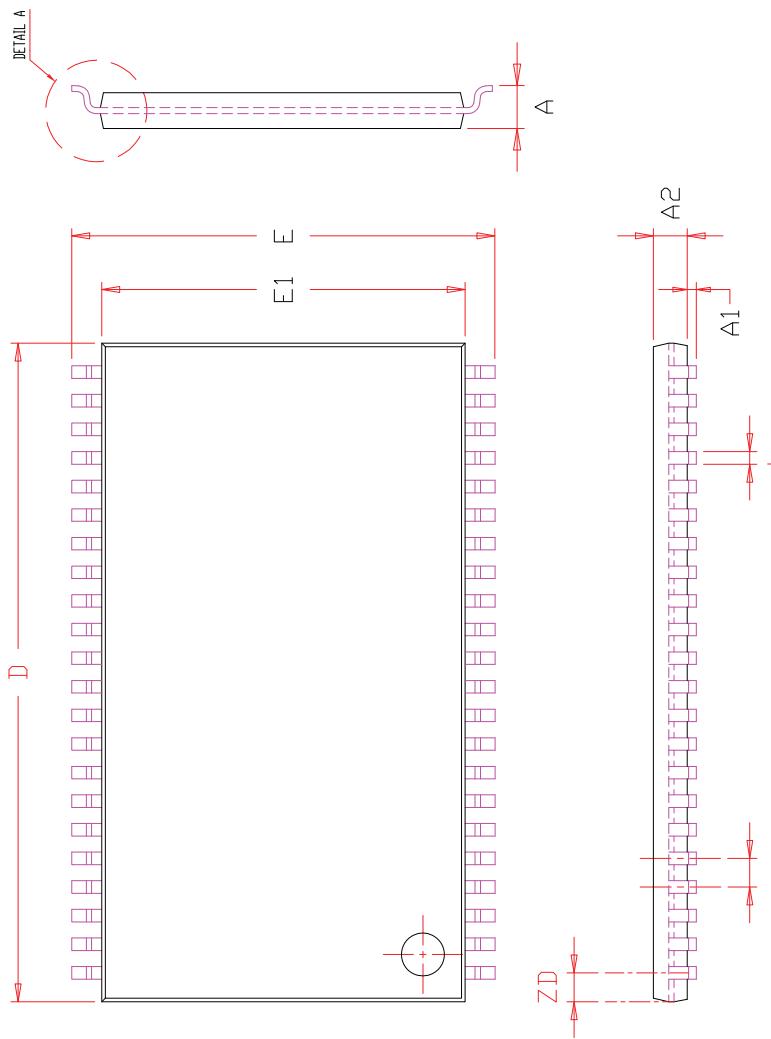
**NOTE :**

1. CONTROLLING DIMENSION : MM.
2. Reference document: JEDEC MO-207



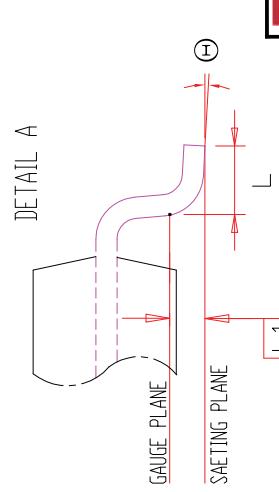
<b>ISSI</b>	<b>TITLE</b>	<b>48L 9x11mm TF-BGA</b>	<b>REV.</b>	<b>B</b>	<b>DATE</b>	<b>08/21/2008</b>
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SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.00		1.20	0.039		0.047
A1	0.05		0.15	0.002		0.006
A2	0.95	1.00	1.05	0.037	0.039	0.041
b	0.30		0.45	0.012		0.018
D	18.28	18.41	18.54	0.7200	0.7250	0.730
E	11.56	11.76	11.96	0.4550	0.4630	0.471
E1	10.03	10.16	10.29	0.3950	0.4000	0.405
e	0.80	BSC.		0.031	BSC.	
L	0.40		0.69	0.016		0.027
L1	0.25	BSC.		0.010	BSC.	
ZD	0.805	REF.		0.032	REF.	
④	0		8°	0		8°



**NOTE :**

1. CONTROLLING DIMENSION : MM
2. DIMENSION D AND E1 DO NOT INCLUDE MOLD PROTRUSION.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION/INTRUSION.



ISSI	TITLE	44L 400mil TSOP-2 Package Outline	REV.	F	DATE	06/04/2008
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