

JANUARY 2015

## 1Mx16 LOW VOLTAGE, ULTRA LOW POWER CMOS STATIC RAM

### KEY FEATURES

- High-speed access time: 45ns, 55ns
- CMOS low power operation
  - 30 mW (typical) operating
  - 12  $\mu$ W (typical) CMOS standby
- TTL compatible interface levels
- Single power supply
  - 1.65V—1.98V V<sub>DD</sub> (62/65WV102416EALL)
  - 2.2V--3.6V V<sub>DD</sub> (62/65WV102416EBLL)
- Data control for upper and lower bytes
- Industrial and Automotive temperature support

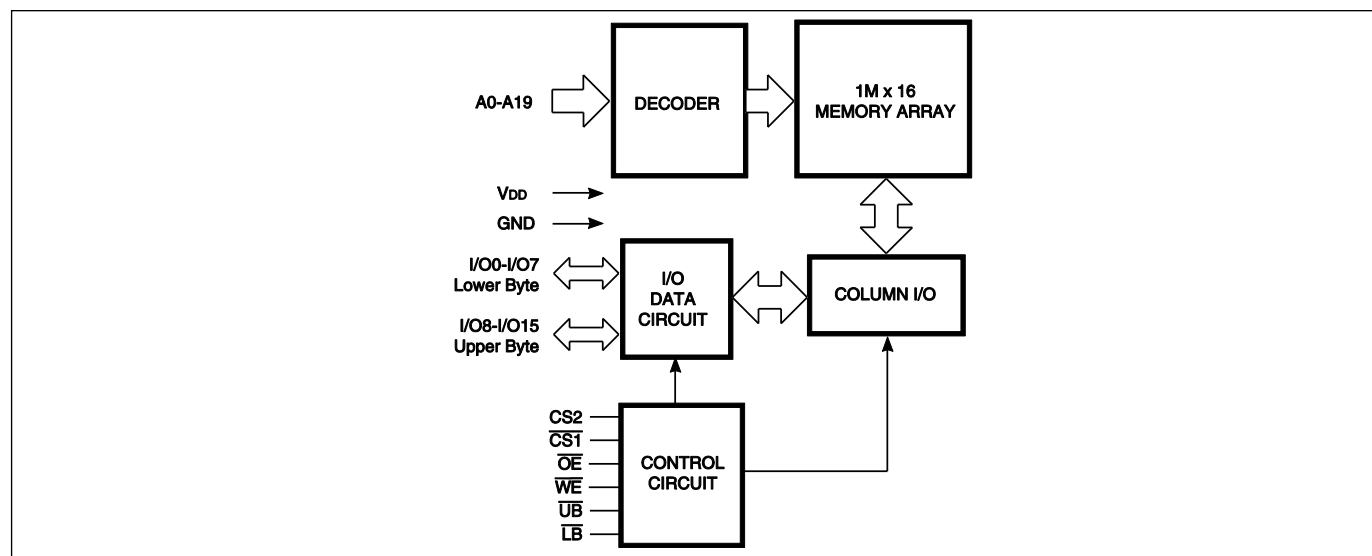
### DESCRIPTION

The *ISSI* IS62WV102416EALL/BLL and IS65WV102416EALL/BLL are Low Power, 16M bit static RAMs organized as 1024K words by 16bits. It is fabricated using *ISSI*'s high-performance CMOS technology. This highly reliable process coupled with innovative circuit design techniques, yields high-performance and low power consumption devices. When  $\overline{CS1}$  is HIGH (deselected) or when  $\overline{CS2}$  is low (deselected) or when  $\overline{CS1}$  is low,  $\overline{CS2}$  is high and both  $\overline{LB}$  and  $\overline{UB}$  are HIGH, the device assumes a standby mode at which the power dissipation can be reduced down with CMOS input levels.

Easy memory expansion is provided by using Chip Enable and Output Enable inputs. The active LOW Write Enable ( $\overline{WE}$ ) controls both writing and reading of the memory. A data byte allows Upper Byte ( $\overline{UB}$ ) and Lower Byte ( $\overline{LB}$ ) access.

The IS62WV102416EALL/BLL and IS65WV102416EALL/BLL are packaged in the JEDEC standard 48-pin BGA (6mm x 8mm).

### BLOCK DIAGRAM

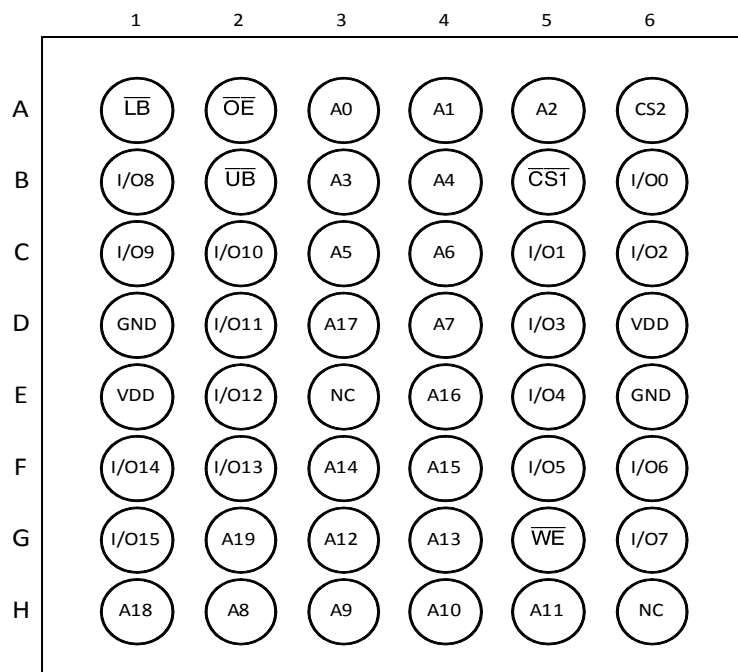


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**PIN CONFIGURATIONS**  
**48-PIN BGA**



**PIN DESCRIPTIONS – 2 CS OPTION**

|                               |                                 |
|-------------------------------|---------------------------------|
| A0-A19                        | Address Inputs                  |
| I/O0-I/O15                    | Data Inputs/Outputs             |
| $\overline{\text{CS1}}$ , CS2 | Chip Enable Inputs              |
| $\overline{\text{OE}}$        | Output Enable Input             |
| $\overline{\text{WE}}$        | Write Enable Input              |
| $\overline{\text{LB}}$        | Lower-byte Control (I/O0-I/O7)  |
| $\overline{\text{UB}}$        | Upper-byte Control (I/O8-I/O15) |
| NC                            | No Connection                   |
| VDD                           | Power                           |
| GND                           | Ground                          |

## FUNCTION DESCRIPTION

SRAM is one of random access memories. Each byte or word has an address and can be accessed randomly. SRAM has three different modes supported. Each function is described below with Truth Table.

### STANDBY MODE

Device enters standby mode when deselected ( $\overline{CS1}$  HIGH or CS2 LOW or both  $\overline{UB}$  and  $\overline{LB}$  are HIGH). The input and output pins (I/O0-15) are placed in a high impedance state. The current consumption in this mode will be either ISB1 or ISB2 depending on the input level. CMOS input in this mode will maximize saving power.

### WRITE MODE

Write operation issues with Chip selected ( $\overline{CS1}$  LOW and CS2 HIGH) and Write Enable ( $\overline{WE}$ ) input LOW. The input and output pins(I/O0-15) are in data input mode. Output buffers are closed during this time even if  $\overline{OE}$  is LOW.  $\overline{UB}$  and  $\overline{LB}$  enables a byte write feature. By enabling  $\overline{LB}$  LOW, data from I/O pins (I/O0 through I/O7) are written into the location specified on the address pins. And with  $\overline{UB}$  being LOW, data from I/O pins (I/O8 through I/O15) are written into the location.

### READ MODE

Read operation issues with Chip selected ( $\overline{CS1}$  LOW and CS2 HIGH) and Write Enable ( $\overline{WE}$ ) input HIGH. When  $\overline{OE}$  is LOW, output buffer turns on to make data output. Any input to I/O pins during READ mode is not permitted.  $\overline{UB}$  and  $\overline{LB}$  enables a byte read feature. By enabling  $\overline{LB}$  LOW, data from memory appears on I/O0-7. And with  $\overline{UB}$  being LOW, data from memory appears on I/O8-15.

In the READ mode, output buffers can be turned off by pulling  $\overline{OE}$  HIGH. In this mode, internal device operates as READ but I/Os are in a high impedance state. Since device is in READ mode, active current is used.

## TRUTH TABLE

| Mode            | $\overline{CS1}$ | CS2 | $\overline{WE}$ | $\overline{OE}$ | $\overline{LB}$ | $\overline{UB}$ | I/O0-I/O7 | I/O8-I/O15 | VDD Current |
|-----------------|------------------|-----|-----------------|-----------------|-----------------|-----------------|-----------|------------|-------------|
| Not Selected    | H                | X   | X               | X               | X               | X               | High-Z    | High-Z     | ISB1,ISB2   |
|                 | X                | L   | X               | X               | X               | X               | High-Z    | High-Z     |             |
|                 | X                | X   | X               | X               | H               | H               | High-Z    | High-Z     |             |
| Output Disabled | L                | H   | H               | H               | L               | X               | High-Z    | High-Z     | ICC         |
|                 | L                | H   | H               | H               | X               | L               | High-Z    | High-Z     |             |
| Read            | L                | H   | H               | L               | L               | H               | DOUT      | High-Z     | ICC         |
|                 | L                | H   | H               | L               | H               | L               | High-Z    | DOUT       |             |
|                 | L                | H   | H               | L               | L               | L               | DOUT      | DOUT       |             |
| Write           | L                | H   | L               | X               | L               | H               | DIN       | High-Z     | ICC         |
|                 | L                | H   | L               | X               | H               | L               | High-Z    | DIN        |             |
|                 | L                | H   | L               | X               | L               | L               | DIN       | DIN        |             |

## ABSOLUTE MAXIMUM RATINGS AND OPERATING RANGE

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

| Symbol            | Parameter                            | Value                               | Unit |
|-------------------|--------------------------------------|-------------------------------------|------|
| V <sub>term</sub> | Terminal Voltage with Respect to GND | -0.2 to +3.9(V <sub>DD</sub> +0.3V) | V    |
| t <sub>BIAS</sub> | Temperature Under Bias               | -55 to +125                         | °C   |
| V <sub>DD</sub>   | V <sub>DD</sub> Related to GND       | -0.2 to +3.9(V <sub>DD</sub> +0.3V) | V    |
| t <sub>Stg</sub>  | Storage Temperature                  | -65 to +150                         | °C   |
| 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.

### OPERATING RANGE<sup>(1)</sup>

| Range      | Device Marking   | Ambient Temperature | V <sub>DD</sub> (min) | V <sub>DD</sub> (typ) | V <sub>DD</sub> (max) |
|------------|------------------|---------------------|-----------------------|-----------------------|-----------------------|
| Commercial | IS62WV102416EALL | 0°C to +70°C        | 1.65V                 | 1.8V                  | 1.98V                 |
| Industrial | IS62WV102416EALL | -40°C to +85°C      | 1.65V                 | 1.8V                  | 1.98V                 |
| Automotive | IS65WV102416EALL | -40°C to +125°C     | 1.65V                 | 1.8V                  | 1.98V                 |
| Commercial | IS62WV102416EBLL | 0°C to +70°C        | 2.2V                  | 3.3V                  | 3.6V                  |
| Industrial | IS62WV102416EBLL | -40°C to +85°C      | 2.2V                  | 3.3V                  | 3.6V                  |
| Automotive | IS65WV102416EBLL | -40°C to +125°C     | 2.2V                  | 3.3V                  | 3.6V                  |

Note:

1. Full device AC operation assumes a 100 μs ramp time from 0 to V<sub>CC</sub>(min) and 200 μs wait time after V<sub>CC</sub> stabilization.

### PIN CAPACITANCE<sup>(1)</sup>

| Parameter                 | Symbol           | Test Condition                                                            | Max | Units |
|---------------------------|------------------|---------------------------------------------------------------------------|-----|-------|
| Input capacitance         | C <sub>IN</sub>  | T <sub>A</sub> = 25°C, f = 1 MHz, V <sub>DD</sub> = V <sub>DD</sub> (typ) | 10  | pF    |
| DQ capacitance (IO0–IO15) | C <sub>I/O</sub> |                                                                           | 10  | pF    |

Note:

1. These parameters are guaranteed by design and tested by a sample basis only.

### THERMAL CHARACTERISTICS<sup>(1)</sup>

| Parameter                                                    | Symbol           | Rating | Units |
|--------------------------------------------------------------|------------------|--------|-------|
| Thermal resistance from junction to ambient (airflow = 0m/s) | R <sub>θJA</sub> | 43.05  | °C/W  |
| Thermal resistance from junction to case                     | R <sub>θJC</sub> | 5.75   | °C/W  |

Note:

1. These parameters are guaranteed by design and tested by a sample basis only.

## ELECTRICAL CHARACTERISTICS

### IS62(5)WV102416EALL DC ELECTRICAL CHARACTERISTICS-I (OVER THE OPERATING RANGE)

| Symbol         | Parameter           | Test Conditions                           | Min. | Max.           | Unit          |
|----------------|---------------------|-------------------------------------------|------|----------------|---------------|
| $V_{OH}$       | Output HIGH Voltage | $I_{OH} = -0.1 \text{ mA}$                | 1.4  | —              | V             |
| $V_{OL}$       | Output LOW Voltage  | $I_{OL} = 0.1 \text{ mA}$                 | —    | 0.2            | V             |
| $V_{IH}^{(1)}$ | Input HIGH Voltage  |                                           | 1.4  | $V_{DD} + 0.2$ | V             |
| $V_{IL}^{(1)}$ | Input LOW Voltage   |                                           | -0.2 | 0.4            | V             |
| $I_{LI}$       | Input Leakage       | $GND < V_{IN} < V_{DD}$                   | -1   | 1              | $\mu\text{A}$ |
| $I_{LO}$       | Output Leakage      | $GND < V_{IN} < V_{DD}$ , Output Disabled | -1   | 1              | $\mu\text{A}$ |

Notes:

1.  $V_{ILL}(\text{min}) = -1.0\text{V AC}$  (pulse width < 10ns). Not 100% tested.  
 $V_{IHH}(\text{max}) = V_{DD} + 1.0\text{V AC}$  (pulse width < 10ns). Not 100% tested.

### IS62(5)WV102416EBLL DC ELECTRICAL CHARACTERISTICS-I (OVER THE OPERATING RANGE)

| Symbol         | Parameter           | Test Conditions                                         | Min. | Max.           | Unit          |
|----------------|---------------------|---------------------------------------------------------|------|----------------|---------------|
| $V_{OH}$       | Output HIGH Voltage | $2.2 \leq V_{DD} < 2.7$ , $I_{OH} = -0.1 \text{ mA}$    | 2.0  | —              | V             |
|                |                     | $2.7 \leq V_{DD} \leq 3.6$ , $I_{OH} = -1.0 \text{ mA}$ | 2.4  | —              | V             |
| $V_{OL}$       | Output LOW Voltage  | $2.2 \leq V_{DD} < 2.7$ , $I_{OL} = 0.1 \text{ mA}$     | —    | 0.4            | V             |
|                |                     | $2.7 \leq V_{DD} \leq 3.6$ , $I_{OL} = 2.1 \text{ mA}$  | —    | 0.4            | V             |
| $V_{IH}^{(1)}$ | Input HIGH Voltage  | $2.2 \leq V_{DD} < 2.7$                                 | 1.8  | $V_{DD} + 0.3$ | V             |
|                |                     | $2.7 \leq V_{DD} \leq 3.6$                              | 2.2  | $V_{DD} + 0.3$ | V             |
| $V_{IL}^{(1)}$ | Input LOW Voltage   | $2.2 \leq V_{DD} < 2.7$                                 | -0.3 | 0.6            | V             |
|                |                     | $2.7 \leq V_{DD} \leq 3.6$                              | -0.3 | 0.8            | V             |
| $I_{LI}$       | Input Leakage       | $GND < V_{IN} < V_{DD}$                                 | -1   | 1              | $\mu\text{A}$ |
| $I_{LO}$       | Output Leakage      | $GND < V_{IN} < V_{DD}$ , Output Disabled               | -1   | 1              | $\mu\text{A}$ |

Notes:

1.  $V_{ILL}(\text{min}) = -2.0\text{V AC}$  (pulse width < 10ns). Not 100% tested.  
 $V_{IHH}(\text{max}) = V_{DD} + 2.0\text{V AC}$  (pulse width < 10ns). Not 100% tested.

**IS62(5)WV102416EALL DC ELECTRICAL CHARACTERISTICS-II FOR POWER  
(OVER THE OPERATING RANGE)**

| Symbol | Parameter                                        | Test Conditions                                                                                                                                                                                                                                                                 | Grade | Typ. | Max. | Unit |
|--------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|------|------|
| ICC    | V <sub>DD</sub> Dynamic Operating Supply Current | V <sub>DD</sub> =V <sub>DD</sub> (max), I <sub>OUT</sub> =0mA, f=f <sub>MAX</sub>                                                                                                                                                                                               | Com.  | 6    | 12   | mA   |
|        |                                                  |                                                                                                                                                                                                                                                                                 | Ind.  | -    | 12   |      |
|        |                                                  |                                                                                                                                                                                                                                                                                 | Auto. | -    | 12   |      |
| ICC1   | V <sub>DD</sub> Static Operating Supply Current  | V <sub>DD</sub> =V <sub>DD</sub> (max), I <sub>OUT</sub> = 0mA, f=0Hz                                                                                                                                                                                                           | Com.  | 3    | 6    | mA   |
|        |                                                  |                                                                                                                                                                                                                                                                                 | Ind.  | -    | 6    |      |
|        |                                                  |                                                                                                                                                                                                                                                                                 | Auto. | -    | 6    |      |
| ISB1   | CMOS Standby Current (CMOS Inputs)               | V <sub>DD</sub> =V <sub>DD</sub> (max),<br>(1) 0V ≤ CS2 ≤ 0.2V<br>or<br>(2) $\overline{CS1} \geq V_{DD} - 0.2V$ , CS2 ≥ V <sub>DD</sub> - 0.2V<br>or<br>(3) $\overline{LB}$ and $\overline{UB} \geq V_{DD} - 0.2V$<br>$\overline{CS1} \leq 0.2V$ , CS2 ≥ V <sub>DD</sub> - 0.2V | Com.  | 30   | 50   | μA   |
|        |                                                  |                                                                                                                                                                                                                                                                                 | Ind.  | -    | 65   | μA   |
|        |                                                  |                                                                                                                                                                                                                                                                                 | Auto. | -    | 165  | μA   |

Note:

Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at VDD = VDD(typ), TA = 25°C

**IS62(5)WV102416EBLL DC ELECTRICAL CHARACTERISTICS-II FOR POWER  
(OVER THE OPERATING RANGE)**

| Symbol | Parameter                                        | Test Conditions                                                                                                                                                                                                                                                                 | Grade | Typ. | Max. | Unit |
|--------|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|------|------|
| ICC    | V <sub>DD</sub> Dynamic Operating Supply Current | V <sub>DD</sub> =V <sub>DD</sub> (max), I <sub>OUT</sub> =0mA, f=f <sub>MAX</sub>                                                                                                                                                                                               | Com.  | 6    | 12   | mA   |
|        |                                                  |                                                                                                                                                                                                                                                                                 | Ind.  | -    | 12   |      |
|        |                                                  |                                                                                                                                                                                                                                                                                 | Auto. | -    | 12   |      |
| ICC1   | V <sub>DD</sub> Static Operating Supply Current  | V <sub>DD</sub> =V <sub>DD</sub> (max), I <sub>OUT</sub> = 0mA, f=0Hz                                                                                                                                                                                                           | Com.  | 3    | 6    | mA   |
|        |                                                  |                                                                                                                                                                                                                                                                                 | Ind.  | -    | 6    |      |
|        |                                                  |                                                                                                                                                                                                                                                                                 | Auto. | -    | 6    |      |
| ISB1   | CMOS Standby Current (CMOS Inputs)               | V <sub>DD</sub> =V <sub>DD</sub> (max),<br>(1) 0V ≤ CS2 ≤ 0.2V<br>or<br>(2) $\overline{CS1} \geq V_{DD} - 0.2V$ , CS2 ≥ V <sub>DD</sub> - 0.2V<br>or<br>(3) $\overline{LB}$ and $\overline{UB} \geq V_{DD} - 0.2V$<br>$\overline{CS1} \leq 0.2V$ , CS2 ≥ V <sub>DD</sub> - 0.2V | Com.  | 30   | 50   | μA   |
|        |                                                  |                                                                                                                                                                                                                                                                                 | Ind.  | -    | 65   | μA   |
|        |                                                  |                                                                                                                                                                                                                                                                                 | Auto. | -    | 165  | μA   |

Note:

Typical values are included for reference only and are not guaranteed or tested. Typical values are measured at VDD = VDD(typ), TA = 25°C

## AC CHARACTERISTICS<sup>(6)</sup> (OVER OPERATING RANGE)

### READ CYCLE AC CHARACTERISTICS

| Parameter                                          | Symbol                                | 45ns |     | 55ns |     | unit | notes |
|----------------------------------------------------|---------------------------------------|------|-----|------|-----|------|-------|
|                                                    |                                       | Min  | Max | Min  | Max |      |       |
| Read Cycle Time                                    | t <sub>RC</sub>                       | 45   | -   | 55   | -   | ns   | 1,5   |
| Address Access Time                                | t <sub>AA</sub>                       | -    | 45  | -    | 55  | ns   | 1     |
| Output Hold Time                                   | t <sub>OHA</sub>                      | 8    | -   | 8    | -   | ns   | 1     |
| $\overline{CS1}$ , CS2 Access Time                 | t <sub>ACS1</sub> /t <sub>ACS2</sub>  | -    | 45  | -    | 55  | ns   | 1     |
| $\overline{OE}$ Access Time                        | t <sub>DOE</sub>                      | -    | 22  | -    | 25  | ns   | 1     |
| $\overline{OE}$ to High-Z Output                   | t <sub>HZOE</sub>                     | -    | 18  | -    | 18  | ns   | 2     |
| $\overline{OE}$ to Low-Z Output                    | t <sub>LZOE</sub>                     | 5    | -   | 5    | -   | ns   | 2     |
| $\overline{CS1}$ , CS2 to High-Z Output            | t <sub>HZCS</sub> /t <sub>HZCS2</sub> | -    | 18  | -    | 18  | ns   | 2     |
| $\overline{CS1}$ , CS2 to Low-Z Output             | t <sub>LZCS</sub> /t <sub>LZCS2</sub> | 10   | -   | 10   | -   | ns   | 2     |
| $\overline{LB}$ , $\overline{UB}$ Access Time      | t <sub>BA</sub>                       | -    | 45  | -    | 55  | ns   | 1     |
| $\overline{LB}$ , $\overline{UB}$ to High-Z Output | t <sub>HZB</sub>                      | -    | 18  | -    | 18  | ns   | 2     |
| $\overline{LB}$ , $\overline{UB}$ to Low-Z Output  | t <sub>LZB</sub>                      | 10   | -   | 10   | -   | ns   | 2     |

### WRITE CYCLE AC CHARACTERISTICS

| Parameter                                               | Symbol                               | 45ns |     | 55ns |     | unit | notes |
|---------------------------------------------------------|--------------------------------------|------|-----|------|-----|------|-------|
|                                                         |                                      | Min  | Max | Min  | Max |      |       |
| Write Cycle Time                                        | t <sub>WC</sub>                      | 45   | -   | 55   | -   | ns   | 1,3,5 |
| $\overline{CS1}$ , CS2 to Write End                     | t <sub>SCS1</sub> /t <sub>SCS2</sub> | 35   | -   | 40   | -   | ns   | 1,3   |
| Address Setup Time to Write End                         | t <sub>AW</sub>                      | 35   | -   | 40   | -   | ns   | 1,3   |
| Address Hold from Write End                             | t <sub>HA</sub>                      | 0    | -   | 0    | -   | ns   | 1,3   |
| Address Setup Time                                      | t <sub>SA</sub>                      | 0    | -   | 0    | -   | ns   | 1,3   |
| $\overline{LB}$ , $\overline{UB}$ Valid to End of Write | t <sub>PWB</sub>                     | 35   | -   | 40   | -   | ns   | 1,3   |
| $\overline{WE}$ Pulse Width                             | t <sub>PWE</sub>                     | 35   | -   | 40   | -   | ns   | 1,3,4 |
| Data Setup to Write End                                 | t <sub>SD</sub>                      | 28   | -   | 28   | -   | ns   | 1,3   |
| Data Hold from Write End                                | t <sub>HD</sub>                      | 0    | -   | 0    | -   | ns   | 1,3   |
| $\overline{WE}$ LOW to High-Z Output                    | t <sub>HZWE</sub>                    | -    | 18  | -    | 18  | ns   | 2,3   |
| $\overline{WE}$ HIGH to Low-Z Output                    | t <sub>LZWE</sub>                    | 10   | -   | 10   | -   | ns   | 2,3   |

Notes:

1. Tested with the load in Figure 1.
2. Tested with the load in Figure 2. Transition is measured  $\pm 500$  mV from steady-state voltage. t<sub>HZOE</sub>, t<sub>HZCS</sub>, t<sub>HZB</sub>, and t<sub>HZWE</sub> transitions are measured when the output enters a high impedance state. Not 100% tested.
3. The internal write time is defined by the overlap of  $\overline{CS1}$ =LOW, CS2=HIGH, ( $\overline{UB}$  or  $\overline{LB}$ )=LOW, and  $\overline{WE}$ =LOW. All four conditions must be in valid states to initiate a Write, but any condition 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. t<sub>PWE</sub> > t<sub>HZWE</sub> + t<sub>SD</sub> when OE is LOW.
5. Address inputs must meet V<sub>IH</sub> and V<sub>IL</sub> SPEC during this period. Any glitch or unknown inputs are not permitted. Unknown input with standby mode is acceptable.
6. Data retention characteristics are defined later in DATA RETENTION CHARACTERISTICS.

AC TEST CONDITIONS (OVER THE OPERATING RANGE)

| Parameter                     | Symbol                  | Conditions           | Units |
|-------------------------------|-------------------------|----------------------|-------|
| Input Rise Time               | $T_R$                   | 1.0                  | V/ns  |
| Input Fall Time               | $T_F$                   | 1.0                  | V/ns  |
| Output Timing Reference Level | $V_{REF}$               | $\frac{1}{2} V_{TM}$ | V     |
| Output Load Conditions        | Refer to Figure 1 and 2 |                      |       |

OUTPUT LOAD CONDITIONS FIGURES

Figure1

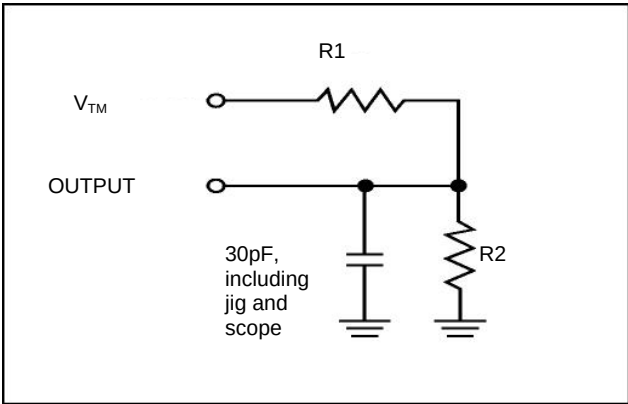
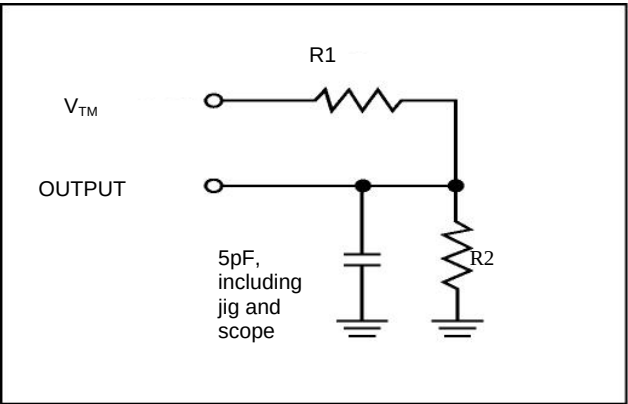


Figure2

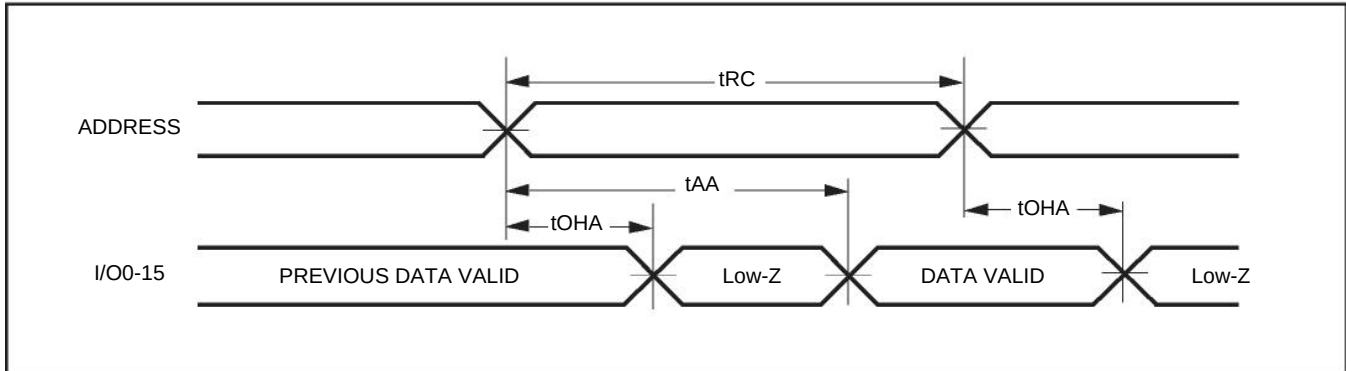


| Parameters | $V_{DD}=1.65\sim1.98V$ | $V_{DD}=2.2\sim2.7V$ | $V_{DD}=2.7\sim3.6V$ |
|------------|------------------------|----------------------|----------------------|
| R1         | 13500 $\Omega$         | 16667 $\Omega$       | 1103 $\Omega$        |
| R2         | 10800 $\Omega$         | 15385 $\Omega$       | 1554 $\Omega$        |
| $V_{TM}$   | VDD                    | VDD                  | VDD                  |

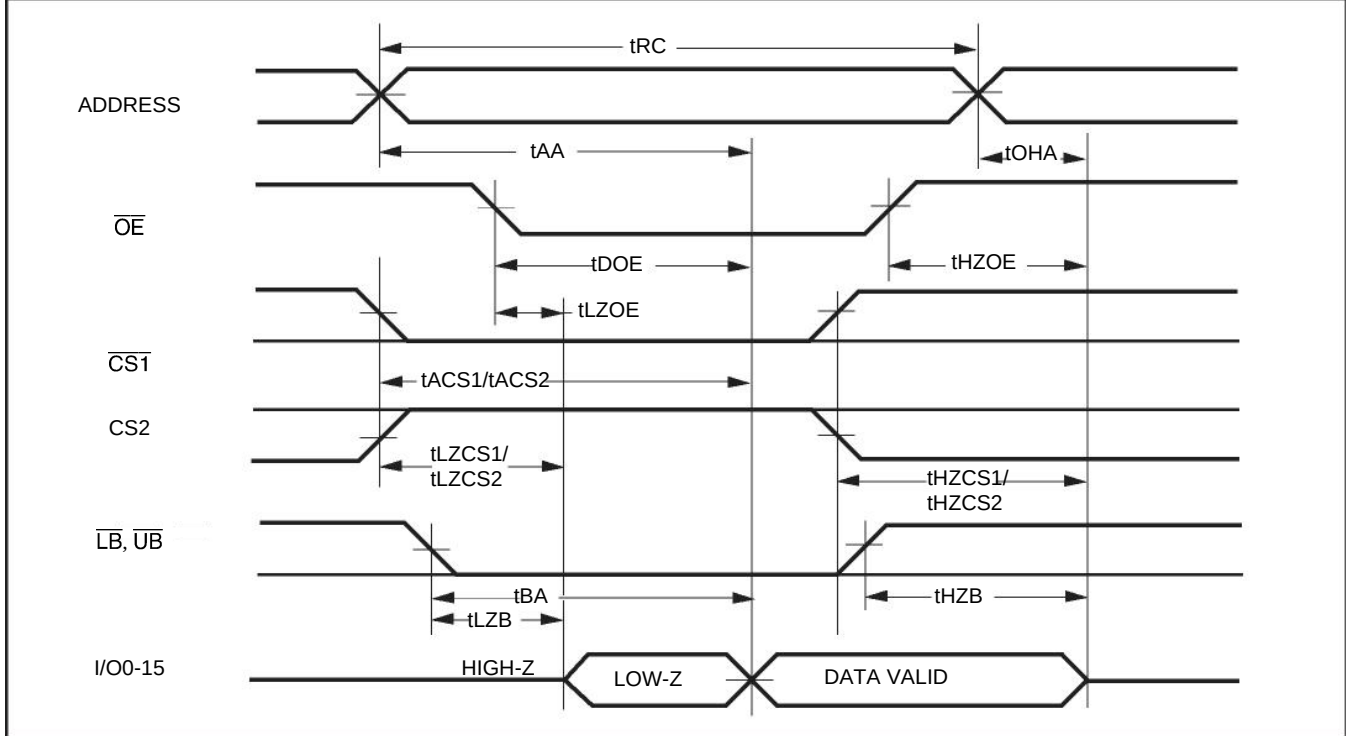


## TIMING DIAGRAM

### READ CYCLE NO. 1<sup>(1,2)</sup> (ADDRESS CONTROLLED) ( $\overline{CS1}=\overline{OE}=V_{IL}$ , $CS2=\overline{WE}=V_{IH}$ )



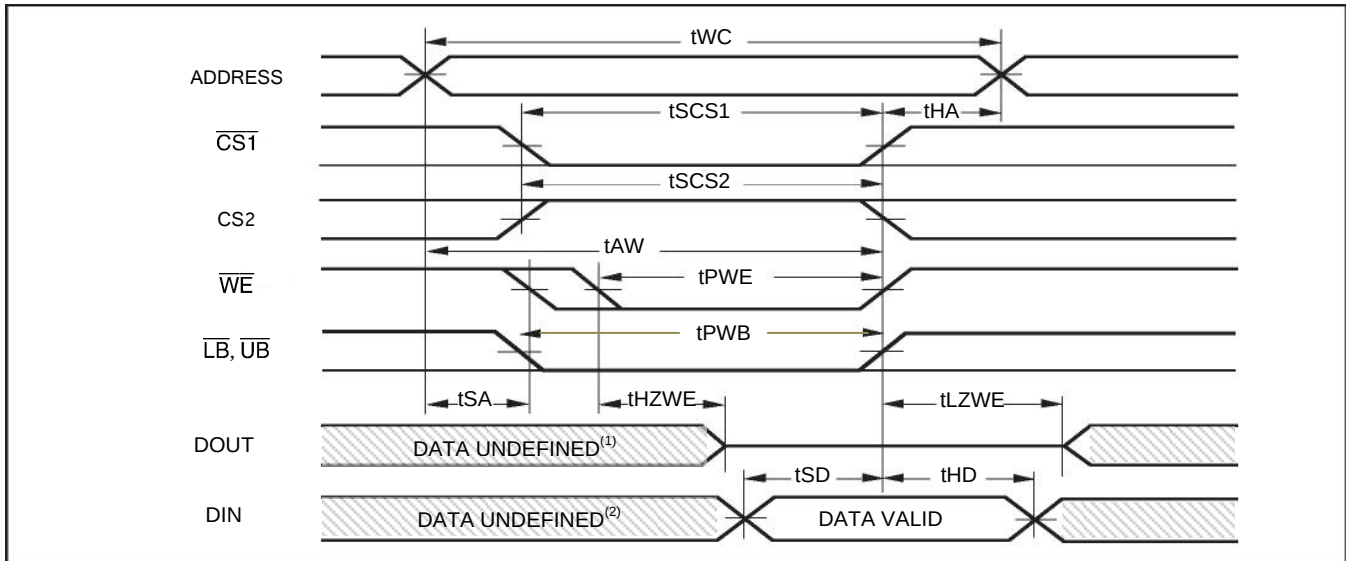
### READ CYCLE NO. 2<sup>(1,3)</sup> ( $\overline{CS1}$ , $CS2$ , $\overline{OE}$ , AND $\overline{UB}$ & $\overline{LB}$ CONTROLLED)



#### Notes:

1.  $\overline{WE}$  is HIGH for Read Cycle.
2. The device is continuously selected.  $\overline{OE}$ ,  $\overline{CS1}$ ,  $\overline{UB}$ , or  $\overline{LB}=V_{IL}$ .  $CS2=\overline{WE}=V_{IH}$ .
3. Address is valid prior to or coincident with  $\overline{CS1}$  LOW transition.

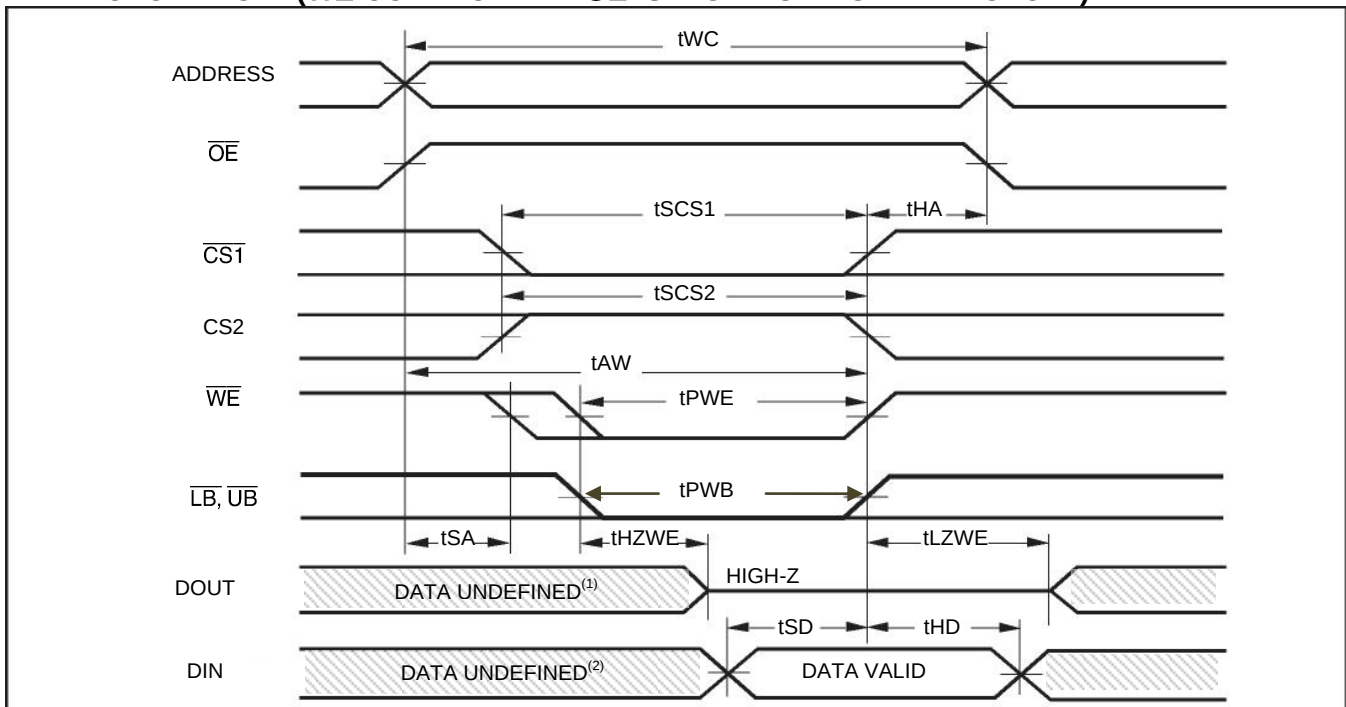
**WRITE CYCLE NO. 1 ( $\overline{CS1}$  CONTROLLED,  $\overline{OE}$  = HIGH OR LOW)**



**Notes:**

1. tHZWE is based on the assumption when tSA=0nS after READ operation. Actual DOUT for tHZWE may not appear if  $\overline{OE}$  goes high before Write Cycle. tHZOE is the time DOUT goes to High-Z after  $\overline{OE}$  goes high.
2. During this period the I/Os are in output state. Do not apply input signals.

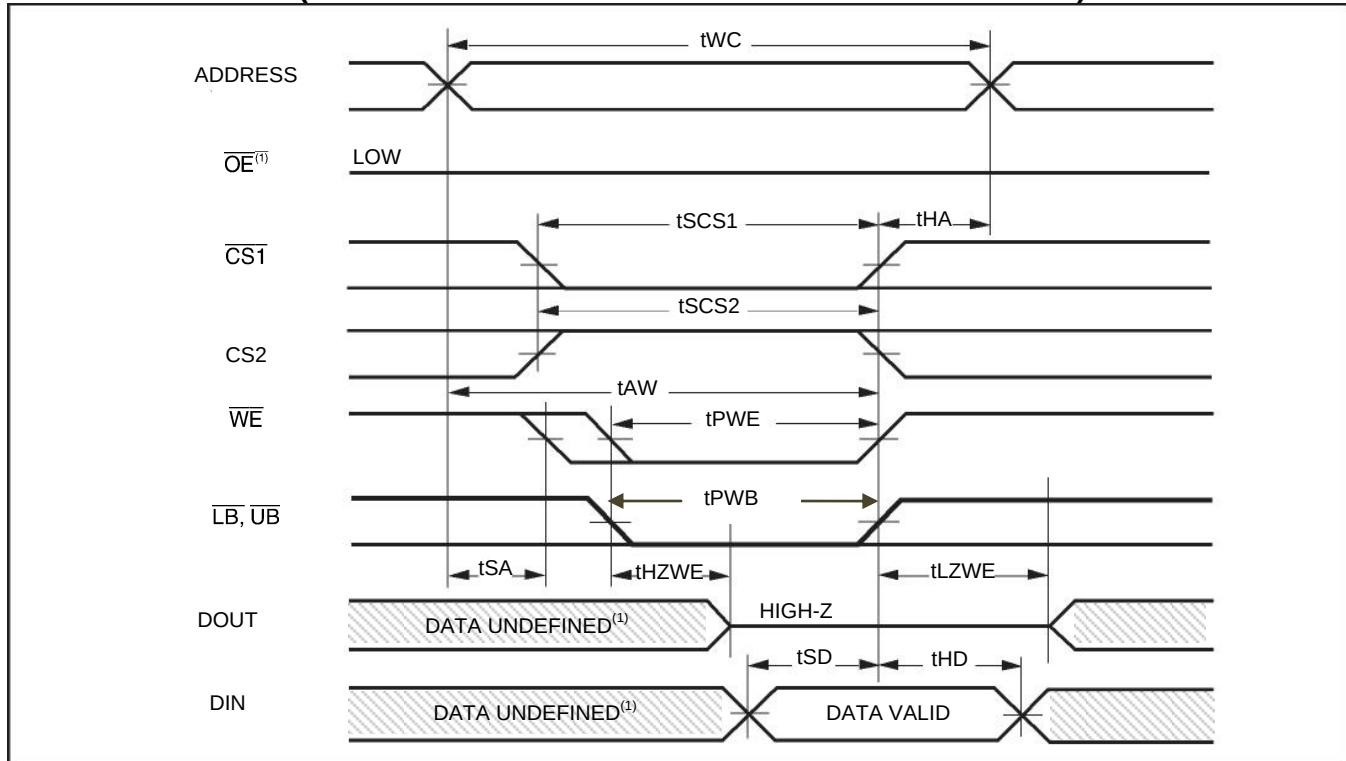
**WRITE CYCLE NO. 2 ( $\overline{WE}$  CONTROLLED:  $\overline{OE}$  IS HIGH DURING WRITE CYCLE)**



**Notes:**

1. tHZWE is based on the assumption when tSA=0nS after READ operation. Actual DOUT for tHZWE may not appear if  $\overline{OE}$  goes high before Write Cycle. tHZOE is the time DOUT goes to High-Z after  $\overline{OE}$  goes high.
2. During this period the I/Os are in output state. Do not apply input signals.

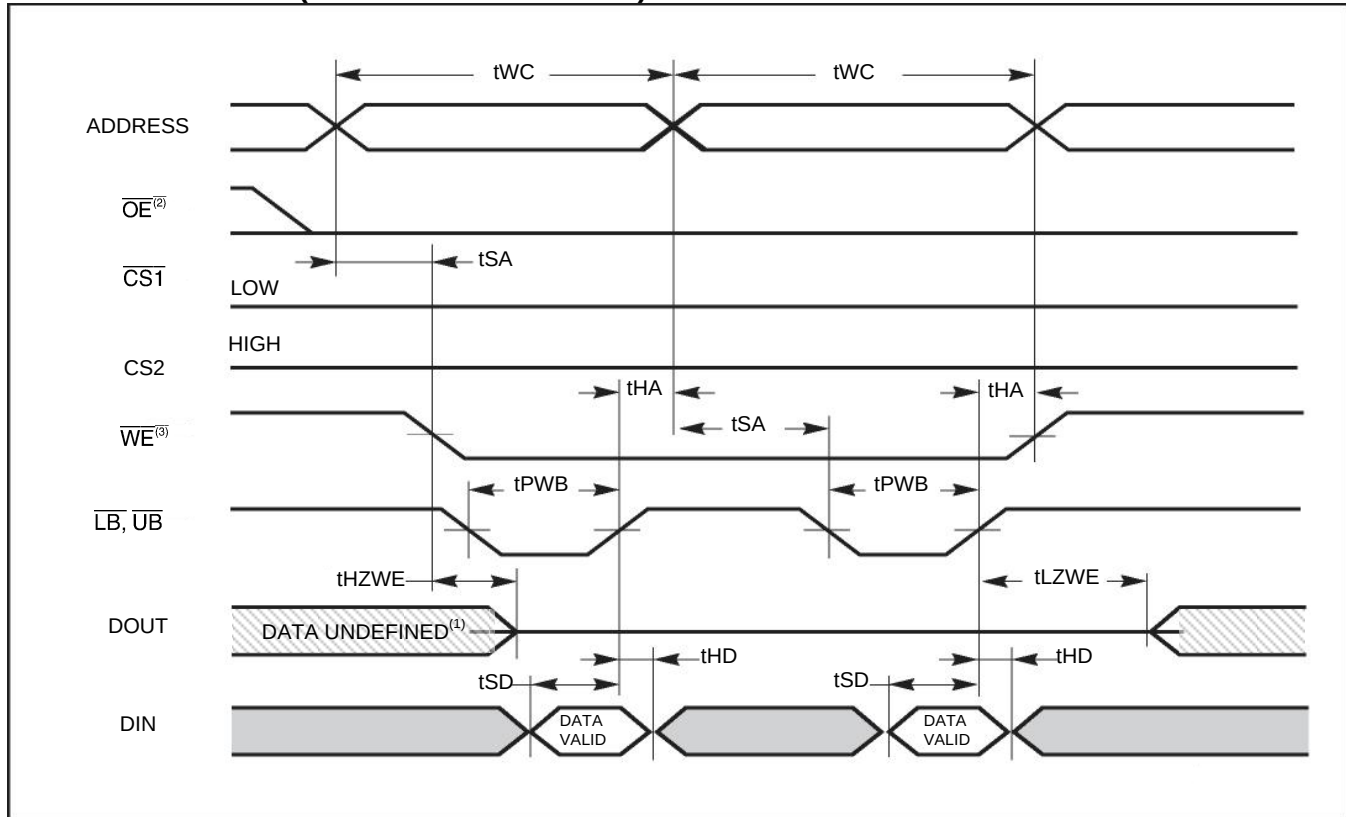
WRITE CYCLE NO. 3 ( $\overline{WE}$  CONTROLLED:  $\overline{OE}$  IS LOW DURING WRITE CYCLE)



Notes:

1. If  $\overline{OE}$  is low during write cycle,  $t_{HZWE}$  must be met in the application. Do not apply input signal during this period. Data output from the previous READ operation will drive IO BUS.

WRITE CYCLE NO. 4 ( $\overline{UB}$  &  $\overline{LB}$  CONTROLLED)



Notes:

1. If  $\overline{OE}$  is low during write cycle,  $t_{HZWE}$  must be met in the application. Do not apply input signal during this period. Data output from the previous READ operation will drive IO BUS.
2. Due to the restriction of note1,  $\overline{OE}$  is recommended to be HIGH during write period.
3. Note  $\overline{WE}$  stays LOW in this example. If  $\overline{WE}$  toggles,  $t_{PWE}$  and  $t_{HZWE}$  must be considered.

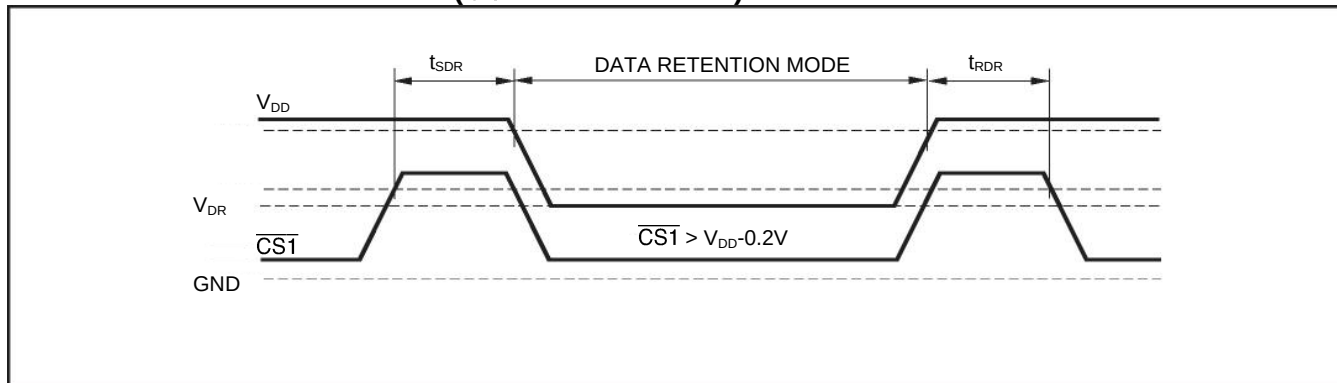
## DATA RETENTION CHARACTERISTICS

| Symbol    | Parameter                   | Test Condition                                                                                                                                                                                                                                                        | OPTION              | Min.     | Typ. <sup>(2)</sup> | Max. | Unit    |
|-----------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------|---------------------|------|---------|
| $V_{DR}$  | $V_{DD}$ for Data Retention | See Data Retention Waveform                                                                                                                                                                                                                                           | IS62(5)WV102416EALL | 1.5      |                     | -    | V       |
|           |                             |                                                                                                                                                                                                                                                                       | IS62(5)WV102416EBLL | 1.5      |                     | -    | V       |
| $I_{DR}$  | Data Retention Current      | $V_{DD} = V_{DR}(\text{min})$ ,<br>(1) $0V \leq CS2 \leq 0.2V$ , or<br>(2) $\overline{CS1} \geq V_{DD} - 0.2V$ ,<br>$CS2 \geq V_{DD} - 0.2V$<br>(3) $\overline{LB}$ and $\overline{UB} \geq V_{DD} - 0.2V$ ,<br>$\overline{CS1} \leq 0.2V$ , $CS2 \geq V_{DD} - 0.2V$ | Com.                | -        | -                   | 50   | $\mu A$ |
|           |                             |                                                                                                                                                                                                                                                                       | Ind.                | -        | -                   | 65   |         |
|           |                             |                                                                                                                                                                                                                                                                       | Auto                | -        | -                   | 165  |         |
| $t_{SDR}$ | Data Retention Setup Time   | See Data Retention Waveform                                                                                                                                                                                                                                           |                     | 0        | -                   | -    | ns      |
| $t_{RDR}$ | Recovery Time               | See Data Retention Waveform                                                                                                                                                                                                                                           |                     | $t_{RC}$ | -                   | -    | ns      |

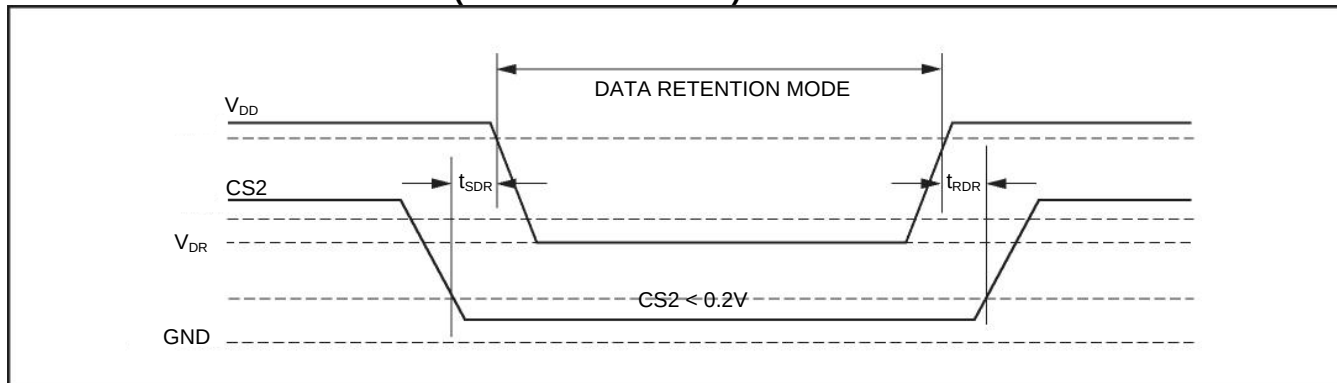
Note:

1. If  $\overline{CS1} > V_{DD} - 0.2V$ , all other inputs including  $CS2$  and  $\overline{UB}$  and  $\overline{LB}$  must meet this condition.
2. Typical values are measured at  $V_{DD} = V_{DR}(\text{min})$ ,  $T_A = 25^\circ C$  and not 100% tested.

### DATA RETENTION WAVEFORM ( $\overline{CS1}$ CONTROLLED)



### DATA RETENTION WAVEFORM (CS2 CONTROLLED)



## ORDERING INFORMATION

### 1.65V~1.98V Industrial Range (-40°C to +85°C)

| Speed (ns) | Order Part No          | Package               |
|------------|------------------------|-----------------------|
| 55         | IS62WV102416EALL-55BI  | 48-pin BGA            |
|            | IS62WV102416EALL-55BLI | 48-pin BGA, Lead-free |

### 1.65V~1.98V Automotive (A3) Range (-40°C to +125°C)

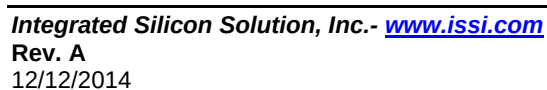
| Speed (ns) | Order Part No           | Package               |
|------------|-------------------------|-----------------------|
| 55         | IS65WV102416EALL-55BA3  | 48-pin BGA            |
|            | IS65WV102416EALL-55BLA3 | 48-pin BGA, Lead-free |

### 2.2V~3.6V Industrial Range (-40°C to +85°C)

| Speed (ns) | Order Part No          | Package               |
|------------|------------------------|-----------------------|
| 45         | IS62WV102416EBLL-45BI  | 48-pin BGA            |
|            | IS62WV102416EBLL-45BLI | 48-pin BGA, Lead-free |
| 55         | IS62WV102416EBLL-55BLI | 48-pin BGA, Lead-free |

### 2.2V~3.6V Automotive (A3) Range (-40°C to +125°C)

| Speed (ns) | Order Part No           | Package               |
|------------|-------------------------|-----------------------|
| 55         | IS65WV102416EBLL-55BA3  | 48-pin BGA            |
|            | IS65WV102416EBLL-55BLA3 | 48-pin BGA, Lead-free |



Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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