

# IS62LV2568L IS62LV2568LL



## 256K x 8 LOW POWER and LOW V<sub>CC</sub> CMOS STATIC RAM

### FEATURES

- Access times of 55, 70, 100 ns
- Low active power: 126 mW (max, L, LL)
- Low standby power: 36  $\mu$ W (max, L) and 7.2  $\mu$ W (max, LL) CMOS standby
- Low data retention voltage: 1.5V (min.)
- Available in Low Power (-L) and Ultra-Low Power (-LL)
- Output Enable ( $\overline{OE}$ ) and two Chip Enable
- TTL compatible inputs and outputs
- Single 2.7V-3.6V power supply
- Available in the 32-pin 8x20mm TSOP-1, 32-pin 8x13.4mm TSOP-1 and 48-pin 6\*8mm TF-BGA

### DESCRIPTION

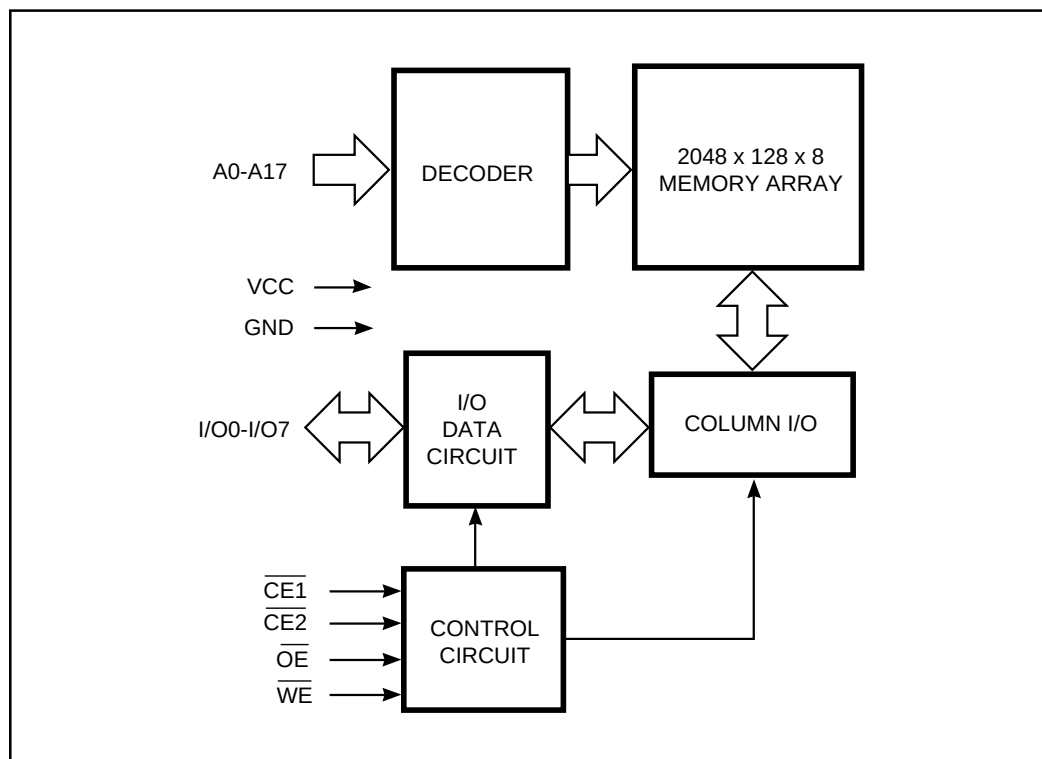
The *ICSI* IS62LV2568L and IS62LV2568LL are low power and low V<sub>CC</sub>, 262,144-bit words by 8 bits CMOS static RAMs. They are fabricated using *ICSI*'s high-performance CMOS technology. This highly reliable process coupled with innovative circuit design techniques, yields higher performance and 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 IS62LV2568L and IS62LV2568LL are available in 32-pin 8\*20mm TSOP-1, 8\*13.4mm TSOP-1 and 48-pin 6\*8mm TF-BGA.

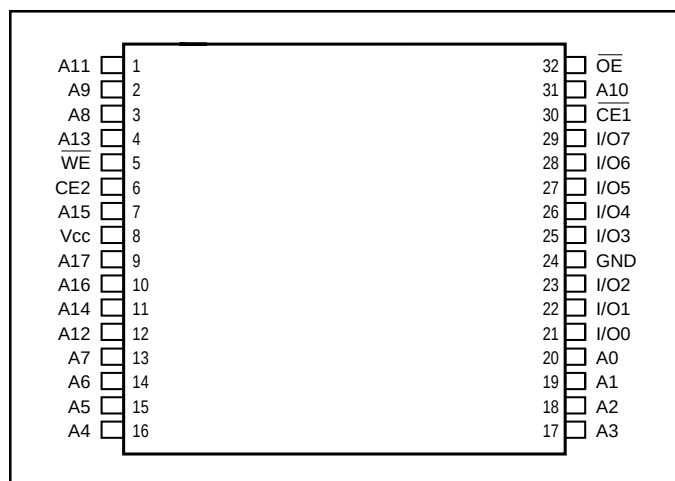
### FUNCTIONAL BLOCK DIAGRAM



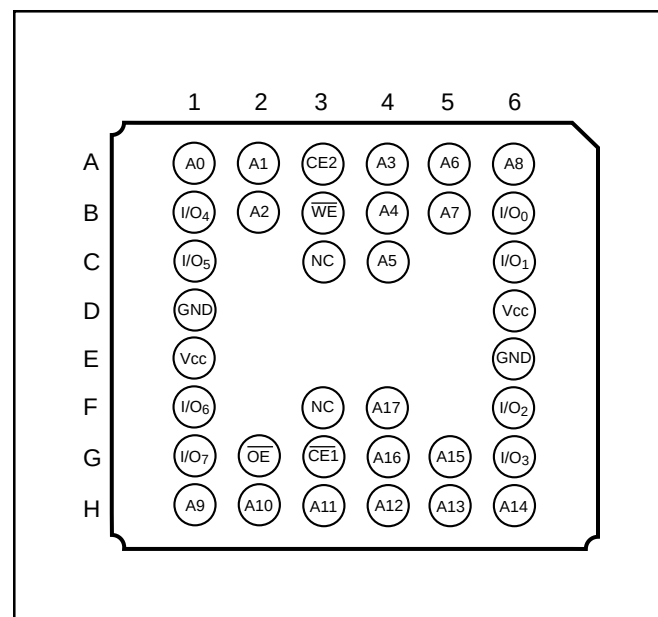
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## PIN CONFIGURATIONS

32-Pin 8\*20mm TSOP-1, 8\*13.4mm STSOP-1



48-Pin 6\*8mm TF-BGA



## PIN DESCRIPTIONS

|                  |                     |
|------------------|---------------------|
| A0-A17           | Address Inputs      |
| $\overline{CE1}$ | Chip Enable 1 Input |
| CE2              | Chip Enable 2 Input |
| $\overline{OE}$  | Output Enable Input |
| WE               | Write Enable Input  |
| I/O0-I/O7        | Data Input/Output   |
| NC               | No Connection       |
| Vcc              | Power               |
| GND              | Ground              |

## OPERATING RANGE

| Range      | Ambient Temperature | Vcc         |
|------------|---------------------|-------------|
| Commercial | 0°C to +70°C        | 2.7V - 3.6V |
| Industrial | -40°C to +85°C      | 2.7V - 3.6V |

## TRUTH TABLE

| Mode            | $\overline{WE}$ | $\overline{CE1}$ | 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         |

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>CC</sub> + 0.5 | V    |
| V <sub>CC</sub>   | Vcc related to GND                   | -0.3 to +4.0                  | V    |
| T <sub>BIAS</sub> | Temperature Under Bias               | -40 to +85                    | °C   |
| T <sub>STG</sub>  | Storage Temperature                  | -65 to +150                   | °C   |
| P <sub>T</sub>    | Power Dissipation                    | 0.7                           | 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)</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.

## 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 | 2.2  | —                     | 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> + 0.3 | V    |
| V <sub>IL</sub> <sup>(1)</sup> | Input LOW Voltage <sup>(1)</sup> |                                                   | -0.3 | 0.4                   | V    |
| I <sub>LI</sub>                | Input Leakage                    | GND ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>           | -1   | 1                     | μA   |
| I <sub>LO</sub>                | Output Leakage                   | GND ≤ V <sub>OUT</sub> ≤ V <sub>CC</sub>          | -1   | 1                     | μA   |

## Notes:

1. V<sub>IL</sub> = -2.0V for pulse width less than 10 ns.

# IS62LV2568L POWER SUPPLY CHARACTERISTICS<sup>(1)</sup> (Over Operating Range)

| Symbol           | Parameter                                        | Test Conditions                                                                                                                                      |      | -55  |      | -70  |      | -100 |      | Unit |
|------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|------|------|------|------|
|                  |                                                  |                                                                                                                                                      |      | Min. | Max. | Min. | Max. | Min. | Max. |      |
| I <sub>CC</sub>  | V <sub>CC</sub> Dynamic Operating Supply Current | V <sub>CC</sub> = Max.,<br>I <sub>OUT</sub> = 0 mA, f = f <sub>MAX</sub>                                                                             | Com. | —    | 40   | —    | 30   | —    | 20   | mA   |
|                  |                                                  |                                                                                                                                                      | Ind. | —    | 45   | —    | 35   | —    | 25   |      |
| I <sub>SB1</sub> | TTL Standby Current (TTL Inputs)                 | V <sub>CC</sub> = Max.,<br>V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br>CE1 ≥ V <sub>IH</sub> or CE2 ≤ V <sub>IL</sub> , f = 0          | Com. | —    | 0.4  | —    | 0.4  | —    | 0.4  | mA   |
|                  |                                                  |                                                                                                                                                      | Ind. | —    | 1.0  | —    | 1.0  | —    | 1.0  |      |
| I <sub>SB2</sub> | CMOS Standby Current (CMOS Inputs)               | V <sub>CC</sub> = Max., f = 0<br>CE1 ≥ V <sub>CC</sub> - 0.2V,<br>CE2 ≤ 0.2V,<br>or V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2V, V <sub>IN</sub> ≤ 0.2V | Com. | —    | 35   | —    | 35   | —    | 35   | μA   |
|                  |                                                  |                                                                                                                                                      | Ind. | —    | 50   | —    | 50   | —    | 50   |      |

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.

# IS62LV2568LL POWER SUPPLY CHARACTERISTICS<sup>(1)</sup> (Over Operating Range)

| Symbol           | Parameter                                        | Test Conditions                                                                                                                                     |      | -55  |      | -70  |      | -100 |      | Unit |
|------------------|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|------|------|------|------|------|
|                  |                                                  |                                                                                                                                                     |      | Min. | Max. | Min. | Max. | Min. | Max. |      |
| I <sub>CC</sub>  | V <sub>CC</sub> Dynamic Operating Supply Current | V <sub>CC</sub> = Max.,<br>I <sub>OUT</sub> = 0 mA, f = f <sub>MAX</sub>                                                                            | Com. | —    | 40   | —    | 30   | —    | 20   | mA   |
|                  |                                                  |                                                                                                                                                     | Ind. | —    | 45   | —    | 35   | —    | 25   |      |
| I <sub>SB1</sub> | TTL Standby Current (TTL Inputs)                 | V <sub>CC</sub> = Max.,<br>V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br>CE1 ≥ V <sub>IH</sub> or CE2 ≤ V <sub>IL</sub> , f = 0         | Com. | —    | 0.4  | —    | 0.4  | —    | 0.4  | mA   |
|                  |                                                  |                                                                                                                                                     | Ind. | —    | 1.0  | —    | 1.0  | —    | 1.0  |      |
| I <sub>SB2</sub> | CMOS Standby Current (CMOS Inputs)               | V <sub>CC</sub> = Max., f = 0<br>CE ≥ V <sub>CC</sub> - 0.2V,<br>CE2 ≤ 0.2V,<br>or V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2V, V <sub>IN</sub> ≤ 0.2V | Com. | —    | 10   | —    | 10   | —    | 10   | μA   |
|                  |                                                  |                                                                                                                                                     | Ind. | —    | 15   | —    | 15   | —    | 15   |      |

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                               | -55  |      | -70  |      | -100 |      | Unit |
|-----------------------------------|-----------------------------------------|------|------|------|------|------|------|------|
|                                   |                                         | Min. | Max. | Min. | Max. | Min. | Max. |      |
| t <sub>RC</sub>                   | Read Cycle Time                         | 55   | —    | 70   | —    | 100  | —    | ns   |
| t <sub>AA</sub>                   | Address Access Time                     | —    | 55   | —    | 70   | —    | 100  | ns   |
| t <sub>OH</sub>                   | Output Hold Time                        | 10   | —    | 10   | —    | 15   | —    | ns   |
| t <sub>ACE1</sub>                 | $\overline{CE1}$ Access Time            | —    | 55   | —    | 70   | —    | 100  | ns   |
| t <sub>ACE2</sub>                 | CE2 Access Time                         | —    | 55   | —    | 70   | —    | 100  | ns   |
| t <sub>DOE</sub>                  | $\overline{OE}$ Access Time             | —    | 30   | —    | 35   | —    | 50   | ns   |
| t <sub>LZOE</sub> <sup>(2)</sup>  | $\overline{OE}$ to Low-Z Output         | 5    | —    | 5    | —    | 5    | —    | ns   |
| t <sub>HZOE</sub> <sup>(2)</sup>  | $\overline{OE}$ to High-Z Output        | —    | 20   | 0    | 25   | 0    | 30   | ns   |
| t <sub>LZCE1</sub> <sup>(2)</sup> | $\overline{CE1}$ to Low-Z Output        | 10   | —    | 10   | —    | 10   | —    | ns   |
| t <sub>LZCE2</sub> <sup>(2)</sup> | CE2 to Low-Z Output                     | 10   | —    | 10   | —    | 10   | —    | ns   |
| t <sub>HZCE</sub> <sup>(2)</sup>  | $\overline{CE1}$ or CE2 to Low-Z Output | 0    | 20   | 0    | 25   | 0    | 30   | ns   |

### Notes:

1. Test conditions assume signal transition times of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0.4V to 2.2V 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.

## AC TEST CONDITIONS

| Parameter                                   | Unit                |
|---------------------------------------------|---------------------|
| Input Pulse Level                           | 0.4V to 2.2V        |
| Input Rise and Fall Times                   | 5 ns                |
| Input and Output Timing and Reference Level | 1.5V                |
| Output Load                                 | See Figures 1 and 2 |

## AC TEST LOADS

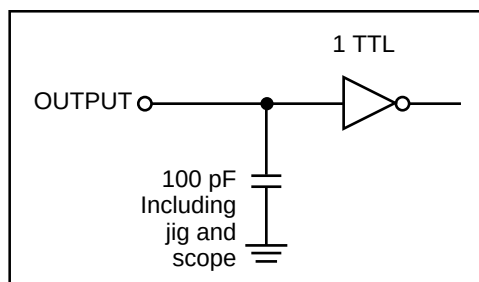


Figure 1

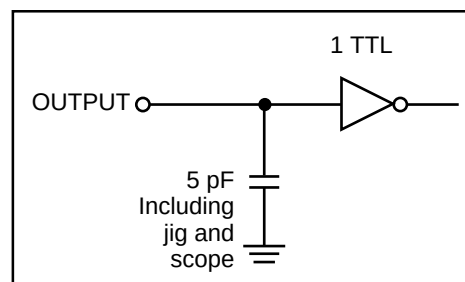
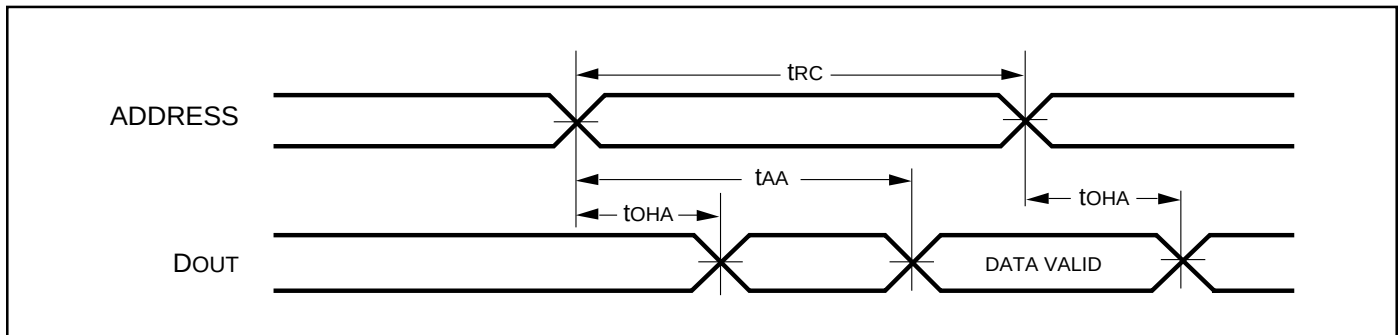
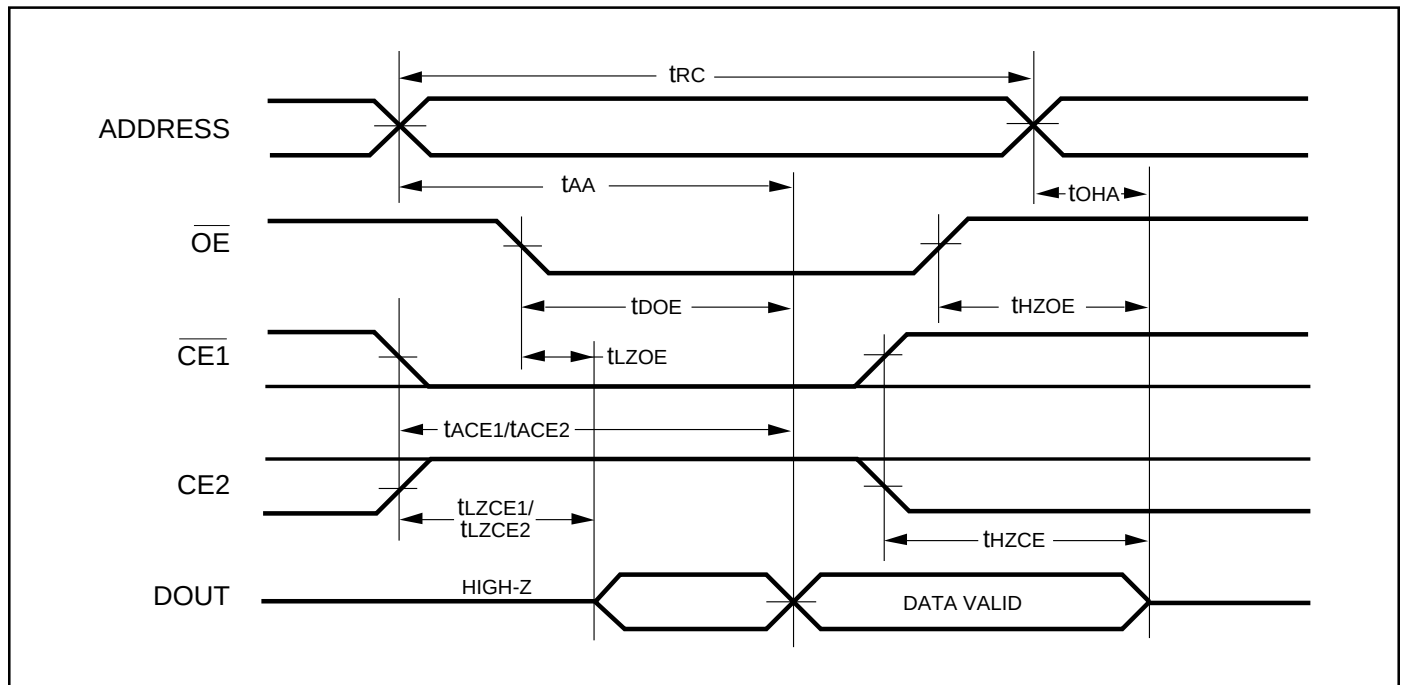


Figure 2

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



## AC WAVEFORMS 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 =  $V_{IL}$ .
3. Address is valid prior to or coincident with  $\overline{CE1}$  LOW and CE2 HIGH transitions.

## WRITE CYCLE SWITCHING CHARACTERISTICS<sup>(1,2)</sup> (Over Operating Range, Standard and Low Power)

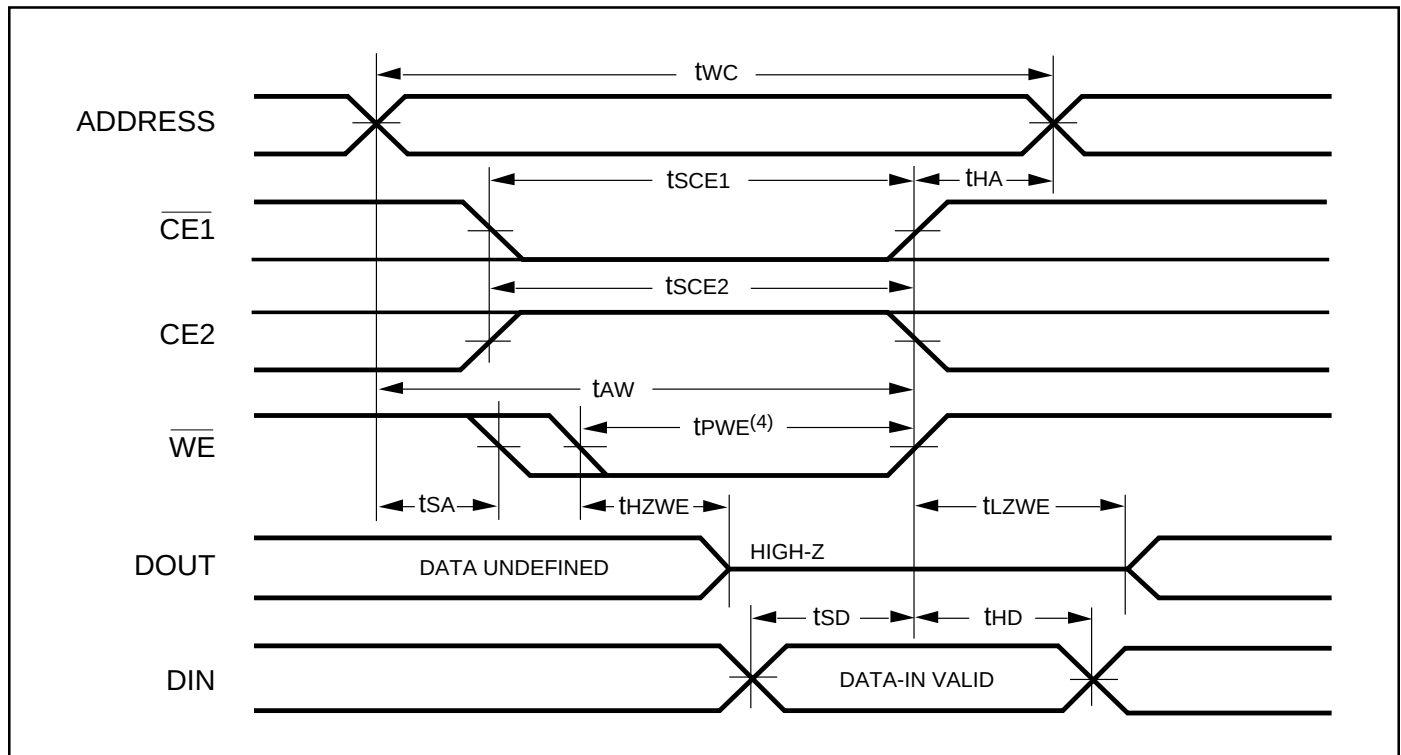
| Symbol                           | Parameter                            | -55  |      | -70  |      | -100 |      | Unit |
|----------------------------------|--------------------------------------|------|------|------|------|------|------|------|
|                                  |                                      | Min. | Max. | Min. | Max. | Min. | Max. |      |
| t <sub>wc</sub>                  | Write Cycle Time                     | 55   | —    | 70   | —    | 100  | —    | ns   |
| t <sub>sce1</sub>                | $\overline{CE1}$ to Write End        | 45   | —    | 65   | —    | 80   | —    | ns   |
| t <sub>sce2</sub>                | CE2 to Write End                     | 45   | —    | 65   | —    | 80   | —    | ns   |
| t <sub>aw</sub>                  | Address Setup Time to Write End      | 45   | —    | 65   | —    | 80   | —    | ns   |
| t <sub>ha</sub>                  | Address Hold from Write End          | 0    | —    | 0    | —    | 0    | —    | ns   |
| t <sub>sa</sub>                  | Address Setup Time                   | 0    | —    | 0    | —    | 0    | —    | ns   |
| t <sub>pwe</sub> <sup>(4)</sup>  | $\overline{WE}$ Pulse Width          | 50   | —    | 55   | —    | 70   | —    | ns   |
| t <sub>sd</sub>                  | Data Setup to Write End              | 25   | —    | 30   | —    | 40   | —    | ns   |
| t <sub>hd</sub>                  | Data Hold from Write End             | 0    | —    | 0    | —    | 0    | —    | ns   |
| t <sub>hzwe</sub> <sup>(3)</sup> | $\overline{WE}$ LOW to High-Z Output | —    | 25   | —    | 25   | —    | 30   | ns   |
| t <sub>lzwe</sub> <sup>(3)</sup> | $\overline{WE}$ HIGH to Low-Z Output | 5    | —    | 5    | —    | 5    | —    | ns   |

### Notes:

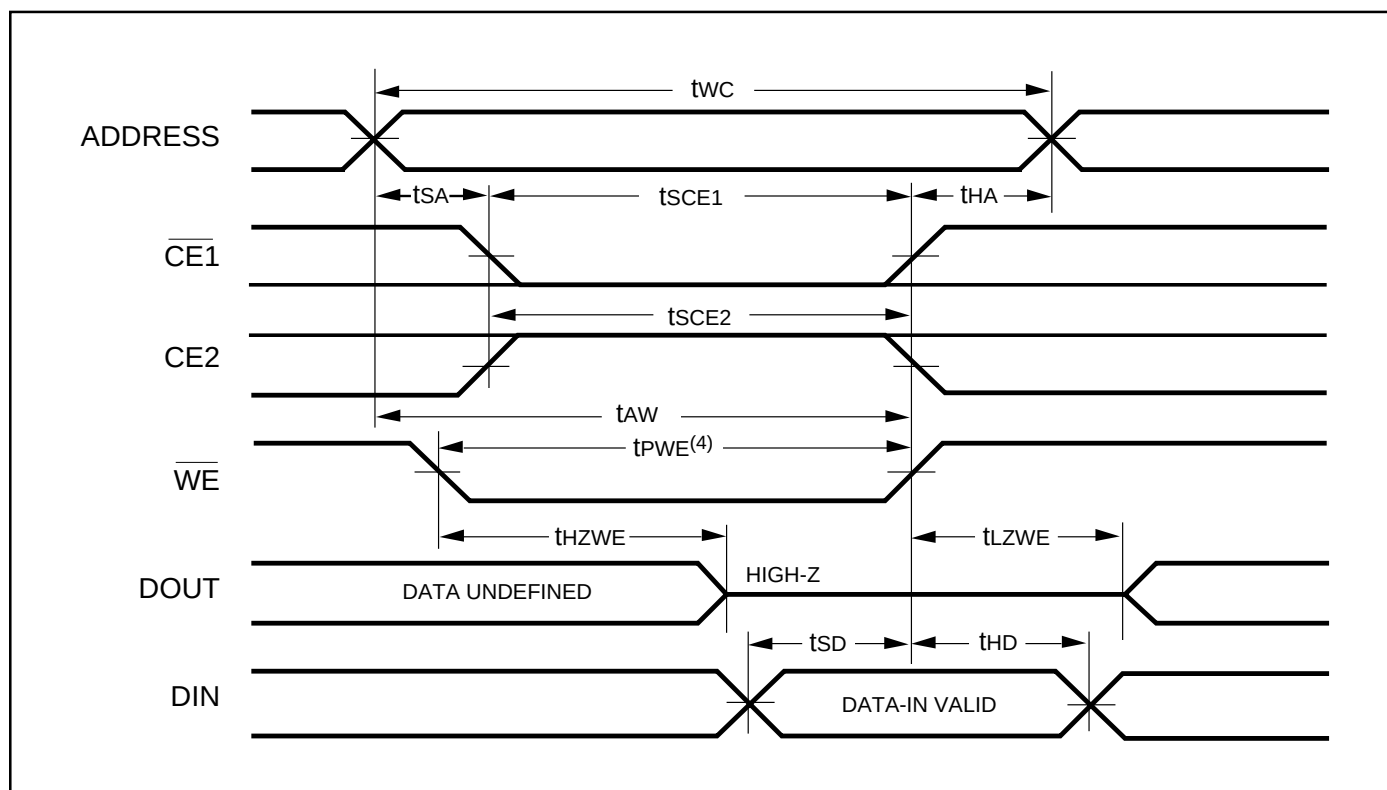
1. Test conditions assume signal transition times of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0.4V to 2.2V and output loading specified in Figure 1.
2. Tested with the load in Figure 2. Transition is measured  $\pm 500$  mV from steady-state voltage. Not 100% tested.
3. The internal write time is defined by the overlap of CE1 LOW, CE2 HIGH and 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 OE HIGH.

## AC WAVEFORMS

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



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



Notes:

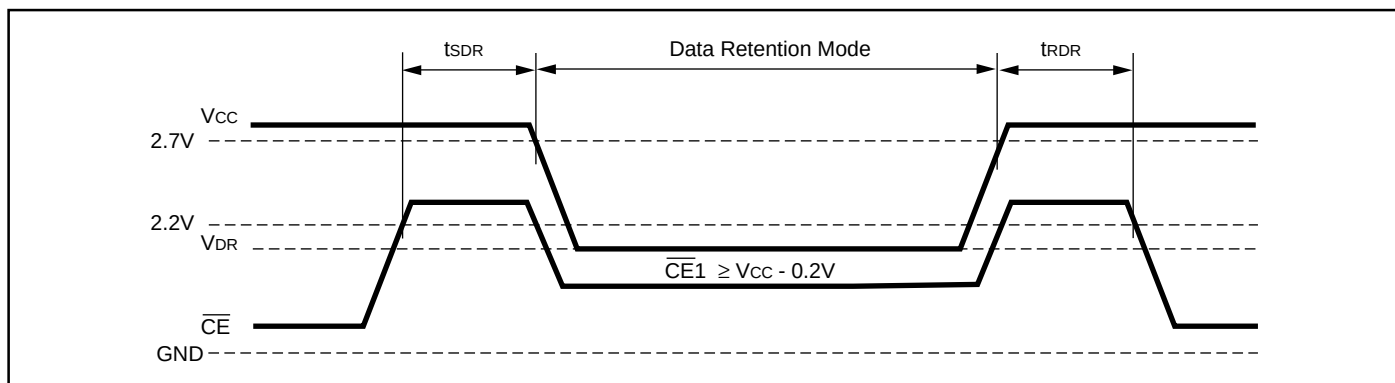
1. The internal write time is defined by the overlap of  $\overline{\text{CE1}}$  LOW, CE2 HIGH and  $\overline{\text{WE}}$  LOW. All signals must be in valid states to initiate a Write, but any one can go inactive to terminate the Write. The Data Input Setup and Hold timing are referenced to the rising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



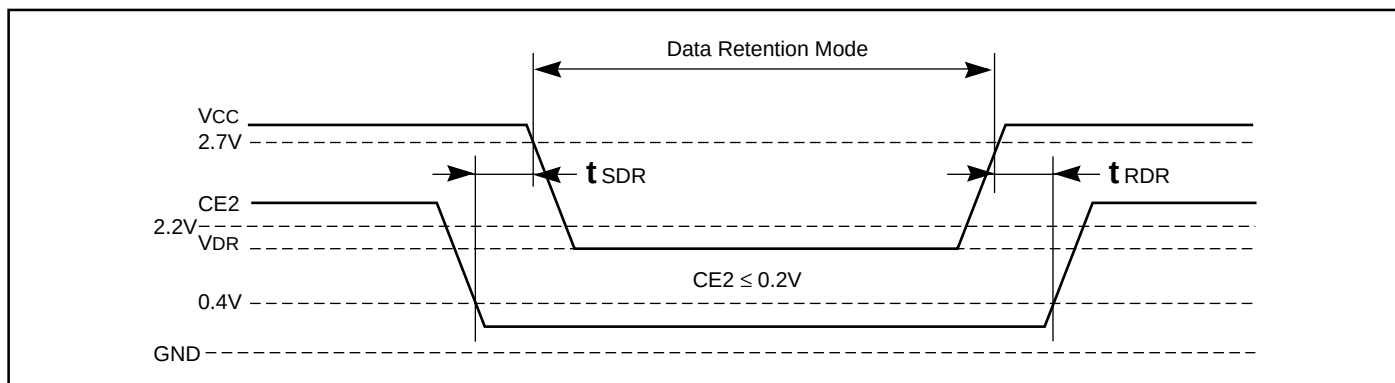
## DATA RETENTION SWITCHING CHARACTERISTICS

| Symbol    | Parameter                   | Test Condition                                        | Min.                                               | Max.             | Unit                          |
|-----------|-----------------------------|-------------------------------------------------------|----------------------------------------------------|------------------|-------------------------------|
| $V_{DR}$  | $V_{CC}$ for Data Retention | See Data Retention Waveform                           | 1.5                                                | 3.6              | V                             |
| $I_{DR}$  | Data Retention Current      | $V_{CC} = 2.0V$ , $\overline{CE1} \geq V_{CC} - 0.2V$ | Com. (-L)<br>Com. (-LL)<br>Ind. (-L)<br>Ind. (-LL) | —<br>—<br>—<br>— | 20<br>5<br>25<br>7<br>$\mu A$ |
| $t_{SDR}$ | Data Retention Setup Time   | See Data Retention Waveform                           | 0                                                  | —                | ns                            |
| $t_{RDR}$ | Recovery Time               | See Data Retention Waveform                           | $t_{RC}$                                           | —                | ns                            |

### 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         |
|------------|------------------|-----------------|
| 55         | IS62LV2568L-55T  | 8*20mm TSOP-1   |
|            | IS62LV2568L-55H  | 8*13.4mm TSOP-1 |
|            | IS62LV2568L-55B  | 6*8mm TF-BGA    |
| 70         | IS62LV2568L-70T  | 8*20mm TSOP-1   |
|            | IS62LV2568L-70H  | 8*13.4mm TSOP-1 |
|            | IS62LV2568L-70B  | 6*8mm TF-BGA    |
| 100        | IS62LV2568L-100T | 8*20mm TSOP-1   |
|            | IS62LV2568L-100H | 8*13.4mm TSOP-1 |
|            | IS62LV2568L-100B | 6*8mm TF-BGA    |

Industrial Range: -40°C to +85°C

| Speed (ns) | Order Part No.    | Package         |
|------------|-------------------|-----------------|
| 55         | IS62LV2568L-55TI  | 8*20mm TSOP-1   |
|            | IS62LV2568L-55HI  | 8*13.4mm TSOP-1 |
|            | IS62LV2568L-55BI  | 6*8mm TF-BGA    |
| 70         | IS62LV2568L-70TI  | 8*20mm TSOP-1   |
|            | IS62LV2568L-70HI  | 8*13.4mm TSOP-1 |
|            | IS62LV2568L-70BI  | 6*8mm TF-BGA    |
| 100        | IS62LV2568L-100TI | 8*20mm TSOP-1   |
|            | IS62LV2568L-100HI | 8*13.4mm TSOP-1 |
|            | IS62LV2568L-100BI | 6*8mm TF-BGA    |



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