

128K x 16 LOW VOLTAGE, ULTRA LOW POWER CMOS STATIC RAM

MAY 2011

FEATURES

- High-speed access time: 45ns, 55ns, 70ns
- CMOS low power operation
 - 36 mW (typical) operating
 - 9 μ W (typical) CMOS standby
- TTL compatible interface levels
- Single power supply
 - 1.65V--2.2V V_{DD} (62WV12816ALL)
 - 2.5V--3.6V V_{DD} (62WV12816BLL)
- Fully static operation: no clock or refresh required
- Three state outputs
- Data control for upper and lower bytes
- Industrial temperature available
- 2CS Option Available
- Lead-free available

DESCRIPTION

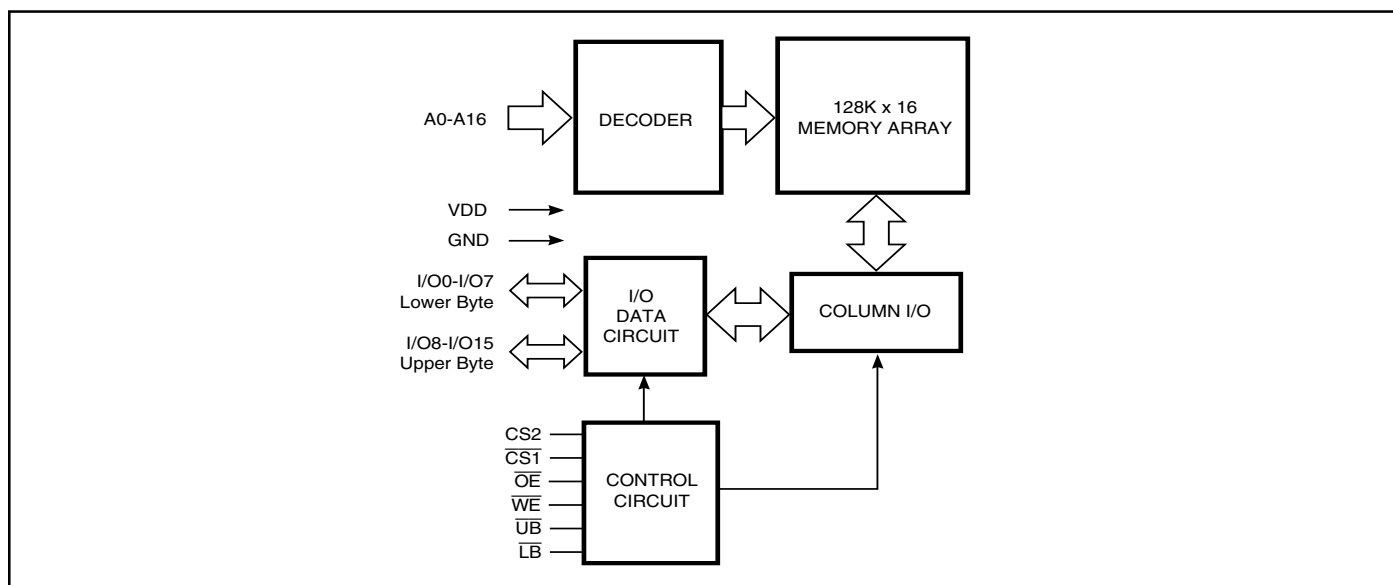
The *ISSI* IS62WV12816ALL/IS62WV12816BLL are high-speed, 2M bit static RAMs organized as 128K words by 16 bits. It is fabricated using *ISSI*'s high-performance CMOS technology. This highly reliable process coupled with innovative circuit design techniques, yields high-performance and low power consumption 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 IS62WV12816ALL and IS62WV12816BLL are packaged in the JEDEC standard 48-pin mini BGA (6mm x 8mm) and 44-Pin TSOP (TYPE II).

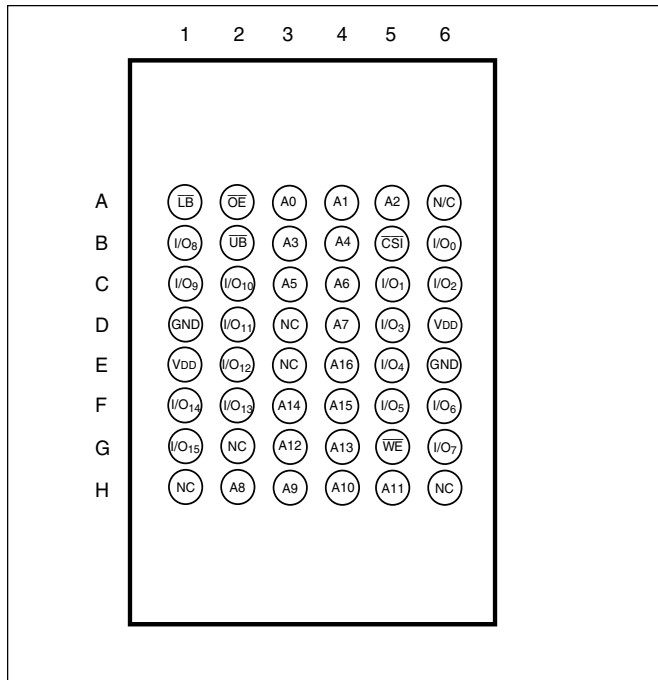
FUNCTIONAL BLOCK DIAGRAM



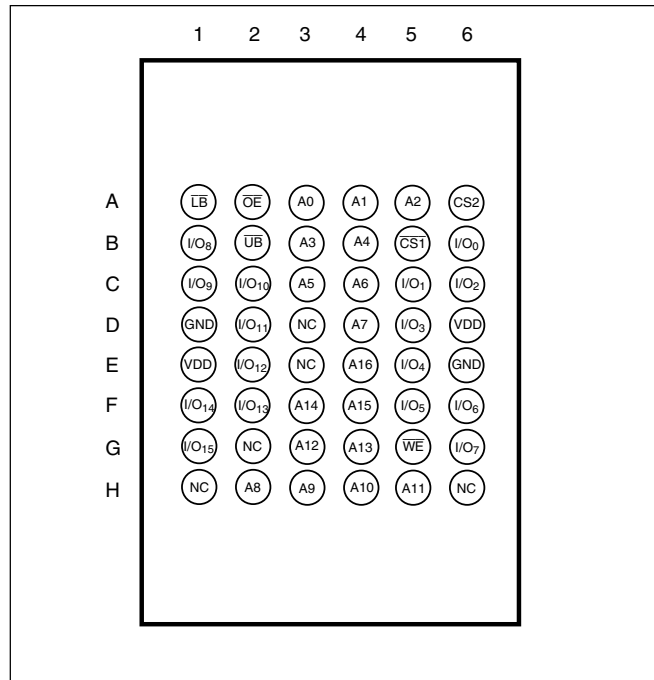
Copyright © 2011 Integrated Silicon Solution, Inc. All rights reserved. ISSI reserves the right to make changes to this specification and its products at any time without notice. ISSI assumes no liability arising out of the application or use of any information, products or services described herein. Customers are advised to obtain the latest version of this device specification before relying on any published information and before placing orders for products.

PIN CONFIGURATIONS

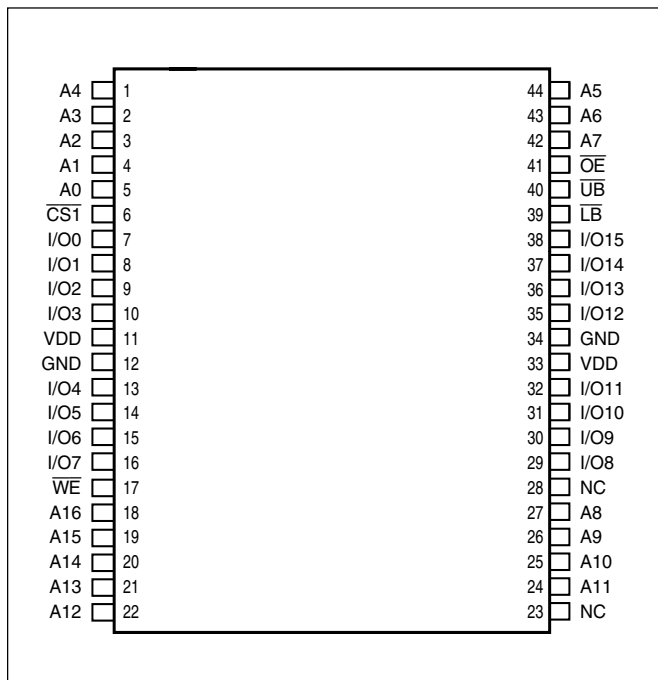
**48-Pin mini BGA (6mm x 8mm)
(Package Code B)**



**48-Pin mini BGA (6mm x 8mm)
2 CS Option (Package Code B2)**



**44-Pin mini TSOP (Type II)
(Package Code T)**



PIN DESCRIPTIONS

| | |
|------------|---------------------------------|
| A0-A16 | Address Inputs |
| I/O0-I/O15 | Data Inputs/Outputs |
| CS1, CS2 | 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 |
| VDD | Power |
| GND | Ground |

TRUTH TABLE

| Mode | \overline{WE} | $\overline{CS1}$ | CS2 | \overline{OE} | \overline{LB} | \overline{UB} | I/O PIN | | V _{DD} Current |
|-----------------|-----------------|------------------|-----|-----------------|-----------------|-----------------|------------------|------------------|-------------------------------------|
| | | | | | | | I/O0-I/O7 | I/O8-I/O15 | |
| Not Selected | X | H | X | X | X | X | High-Z | High-Z | I _{SB1} , I _{SB2} |
| | X | X | L | X | X | X | High-Z | High-Z | I _{SB1} , I _{SB2} |
| | X | X | X | X | H | H | High-Z | High-Z | I _{SB1} , I _{SB2} |
| Output Disabled | H | L | H | H | L | X | High-Z | High-Z | I _{CC} |
| | H | L | H | H | X | L | High-Z | High-Z | I _{CC} |
| Read | H | L | H | L | L | H | D _{OUT} | High-Z | I _{CC} |
| | H | L | H | L | H | L | High-Z | D _{OUT} | |
| | H | L | H | L | L | L | D _{OUT} | D _{OUT} | |
| Write | L | L | H | X | L | H | D _{IN} | High-Z | I _{CC} |
| | L | L | H | X | H | L | High-Z | D _{IN} | |
| | L | L | H | X | L | L | D _{IN} | D _{IN} | |

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

| Symbol | Parameter | Value | Unit |
|-------------------|--------------------------------------|------------------------------|------|
| V _{TERM} | Terminal Voltage with Respect to GND | -0.2 to V _{DD} +0.3 | V |
| T _{STG} | Storage Temperature | -65 to +150 | °C |
| P _T | Power Dissipation | 1.0 | W |

Note:

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 (V_{DD})

| Range | Ambient Temperature | IS62WV12816ALL | IS62WV12816BLL |
|------------|---------------------|----------------|----------------|
| Commercial | 0°C to +70°C | 1.65V - 2.2V | 2.5V - 3.6V |
| Industrial | -40°C to +85°C | 1.65V - 2.2V | 2.5V - 3.6V |

DC ELECTRICAL CHARACTERISTICS (Over Operating Range)

| Symbol | Parameter | Test Conditions | V _{DD} | Min. | Max. | Unit |
|--------------------------------|---------------------|---|-----------------|------|-----------------------|------|
| V _{OH} | Output HIGH Voltage | I _{OH} = -0.1 mA | 1.65-2.2V | 1.4 | — | V |
| | | I _{OH} = -1 mA | 2.5-3.6V | 2.2 | — | V |
| V _{OL} | Output LOW Voltage | I _{OL} = 0.1 mA | 1.65-2.2V | — | 0.2 | V |
| | | I _{OL} = 2.1 mA | 2.5-3.6V | — | 0.4 | V |
| V _{IH} | Input HIGH Voltage | | 1.65-2.2V | 1.4 | V _{DD} + 0.2 | V |
| | | | 2.5-3.6V | 2.2 | V _{DD} + 0.3 | V |
| V _{IL} ⁽¹⁾ | Input LOW Voltage | | 1.65-2.2V | -0.2 | 0.4 | V |
| | | | 2.5-3.6V | -0.2 | 0.8 | V |
| I _{LI} | Input Leakage | GND ≤ V _{IN} ≤ V _{DD} | | -1 | 1 | μA |
| I _{LO} | Output Leakage | GND ≤ V _{OUT} ≤ V _{DD} , Outputs Disabled | | -1 | 1 | μA |

Notes:

- V_{IL} (min.) = -1.0V for pulse width less than 10 ns.

CAPACITANCE⁽¹⁾

| Symbol | Parameter | Conditions | Max. | Unit |
|------------------|--------------------------|-----------------------|------|------|
| C _{IN} | Input Capacitance | V _{IN} = 0V | 8 | pF |
| C _{OUT} | Input/Output Capacitance | V _{OUT} = 0V | 10 | pF |

Note:

- Tested initially and after any design or process changes that may affect these parameters.

IS62WV12816ALL, IS62WV12816BLL

IS62WV12816ALL, POWER SUPPLY CHARACTERISTICS⁽¹⁾ (Over Operating Range)

| Symbol | Parameter | Test Conditions | | Max. 70 | Unit |
|------------------|--|--|-----------|------------|------|
| I _{CC} | V _{DD} Dynamic Operating Supply Current | V _{DD} =Max., | Com. | 15 | mA |
| | | I _{OUT} =0 mA, f=f _{MAX} | Ind. | 20 | |
| I _{CC1} | Operating Supply Current | V _{DD} =Max., | Com. | 3 | mA |
| | | I _{OUT} =0 mA, f=0 | Ind. | 3 | |
| I _{SB1} | TTL Standby Current (TTL Inputs) | V _{DD} =Max., | Com. | 0.3 | mA |
| | | V _{IN} =V _{IH} or V _{IL} , CS1=V _{IH} , CS2=V _{IL} , f=1 MHz | Ind. | 0.3 | |
| | ULB Control | V _{DD} =Max., V _{IN} =V _{IH} or V _{IL} , CS1=V _{IL} , f=0, UB=V _{IH} , LB=V _{IH} | OR | | |
| I _{SB2} | CMOS Standby Current (CMOS Inputs) | V _{DD} =Max., | Com. | 5 | μA |
| | | CS1 ≥ V _{DD} -0.2V, CS2 ≤ 0.2V, V _{IN} ≥ V _{DD} -0.2V, or V _{IN} ≤ 0.2V, f=0 | Ind. | 10 | |
| | ULB Control | V _{DD} = Max., CS1 = V _{IL} , CS2=V _{IH} V _{IN} ≤ 0.2V, f=0; UB/LB=V _{DD} -0.2V | OR | | |

IS62WV12816BLL, POWER SUPPLY CHARACTERISTICS⁽¹⁾ (Over Operating Range)

| Symbol | Parameter | Test Conditions | | Max. 45 | Max. 55 | Unit |
|------------------|--|--|---------------------|------------|------------|------|
| I _{CC} | V _{DD} Dynamic Operating Supply Current | V _{DD} =Max., | Com. | 35 | 25 | mA |
| | | I _{OUT} =0 mA, f=f _{MAX} | Ind. | 40 | 30 | |
| | | | typ. ⁽²⁾ | 25 | 20 | |
| I _{CC1} | Operating Supply Current | V _{DD} =Max., | Com. | 3 | 3 | mA |
| | | I _{OUT} =0 mA, f=0 | Ind. | 3 | 3 | |
| I _{SB1} | TTL Standby Current (TTL Inputs) | V _{DD} =Max., | Com. | 0.3 | 0.3 | mA |
| | | V _{IN} =V _{IH} or V _{IL} , CS1=V _{IH} , CS2=V _{IL} , f=1 MHz | Ind. | 0.3 | 0.3 | |
| | ULB Control | V _{DD} =Max., V _{IN} =V _{IH} or V _{IL} , CS1=V _{IL} , f=0, UB=V _{IH} , LB=V _{IH} | OR | | | |
| I _{SB2} | CMOS Standby Current (CMOS Inputs) | V _{DD} =Max., | Com. | 10 | 10 | μA |
| | | CS1 ≥ V _{DD} -0.2V, CS2 ≤ 0.2V, V _{IN} ≥ V _{DD} -0.2V, or V _{IN} ≤ 0.2V, f=0 | Ind. | 10 | 10 | |
| | | | typ. ⁽²⁾ | 3 | 3 | |
| | ULB Control | V _{DD} = Max., CS1 = V _{IL} , CS2=V _{IH} V _{IN} ≤ 0.2V, f=0; UB/LB=V _{DD} -0.2V | OR | | | |

Note:

- At f = f_{MAX}, address and data inputs are cycling at the maximum frequency, f = 0 means no input lines change.
- Typical values are measured at V_{DD} = 3.0V, T_A = 25°C and not 100% tested.

AC TEST CONDITIONS

| Parameter | 62WV12816ALL (Unit) | 62WV12816BLL (Unit) |
|---|------------------------|------------------------|
| Input Pulse Level | 0.4V to $V_{DD}-0.2V$ | 0.4V to $V_{DD}-0.3V$ |
| Input Rise and Fall Times | 5 ns | 5ns |
| Input and Output Timing and Reference Level | V_{REF} | V_{REF} |
| Output Load | See Figures 1 and 2 | See Figures 1 and 2 |

| | 1.65-2.2V | 2.5V - 3.6V |
|----------------|-----------|-------------|
| R1(Ω) | 3070 | 3070 |
| R2(Ω) | 3150 | 3150 |
| V_{REF} | 0.9V | 1.5V |
| V_{TM} | 1.8V | 2.8V |

AC TEST LOADS

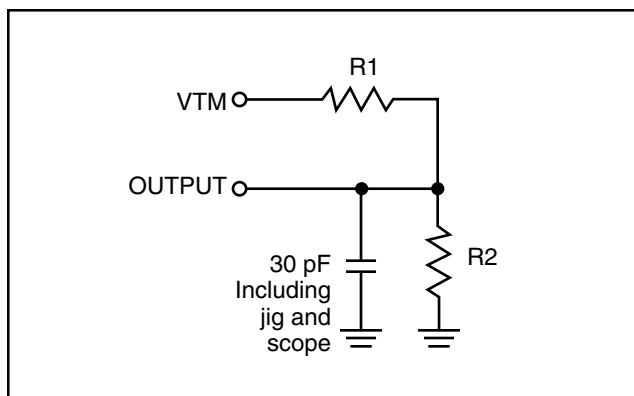


Figure 1

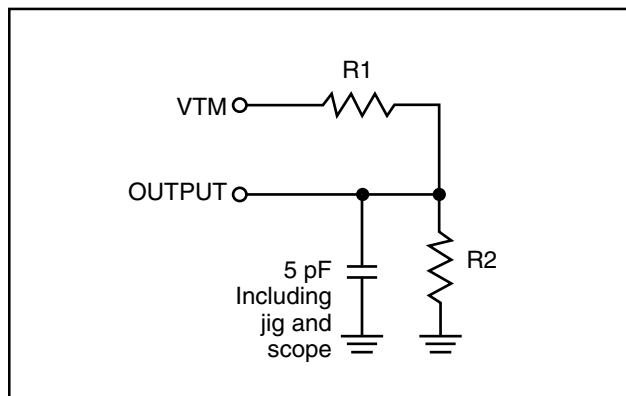


Figure 2

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

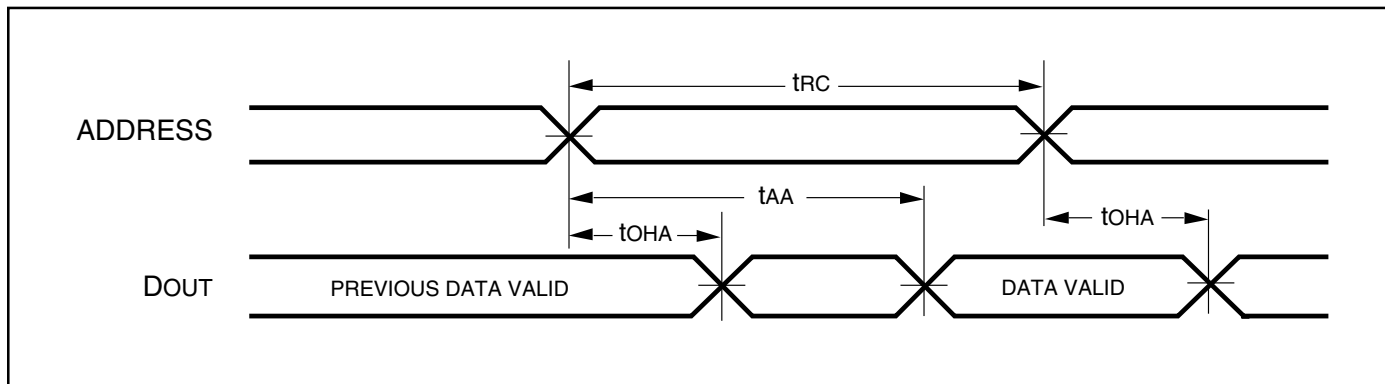
| Symbol | Parameter | 45 ns | | 55 ns | | 70 ns | | Unit |
|--|--|-------|------|-------|------|-------|------|------|
| | | Min. | Max. | Min. | Max. | Min. | Max. | |
| t _{RC} | Read Cycle Time | 45 | — | 55 | — | 70 | — | ns |
| t _{AA} | Address Access Time | — | 45 | — | 55 | — | 70 | ns |
| t _{OHA} | Output Hold Time | 10 | — | 10 | — | 10 | — | ns |
| t _{ACS1} /t _{ACS2} | $\overline{\text{CS1}}/\overline{\text{CS2}}$ Access Time | — | 45 | — | 55 | — | 70 | ns |
| t _{DOE} | $\overline{\text{OE}}$ Access Time | — | 20 | — | 25 | — | 35 | ns |
| t _{HZOE⁽²⁾} | $\overline{\text{OE}}$ to High-Z Output | — | 15 | — | 20 | — | 25 | ns |
| t _{LZOE⁽²⁾} | $\overline{\text{OE}}$ to Low-Z Output | 5 | — | 5 | — | 5 | — | ns |
| t _{HZCS1} /t _{HZCS2⁽²⁾} | $\overline{\text{CS1}}/\overline{\text{CS2}}$ to High-Z Output | 0 | 15 | 0 | 20 | 0 | 25 | ns |
| t _{LZCS1} /t _{LZCS2⁽²⁾} | $\overline{\text{CS1}}/\overline{\text{CS2}}$ to Low-Z Output | 10 | — | 10 | — | 10 | — | ns |
| t _{BA} | $\overline{\text{LB}}, \overline{\text{UB}}$ Access Time | — | 45 | — | 55 | — | 70 | ns |
| t _{HZB} | $\overline{\text{LB}}, \overline{\text{UB}}$ to High-Z Output | 0 | 15 | 0 | 20 | 0 | 25 | ns |
| t _{LZB} | $\overline{\text{LB}}, \overline{\text{UB}}$ to Low-Z Output | 0 | — | 0 | — | 0 | — | ns |

Notes:

1. Test conditions assume signal transition times of 5 ns or less, timing reference levels of 0.9V, input pulse levels of 0.4 to 1.4V and output loading specified in Figure 1.
2. Tested with the load in Figure 2. Transition is measured ± 500 mV from steady-state voltage. Not 100% tested.

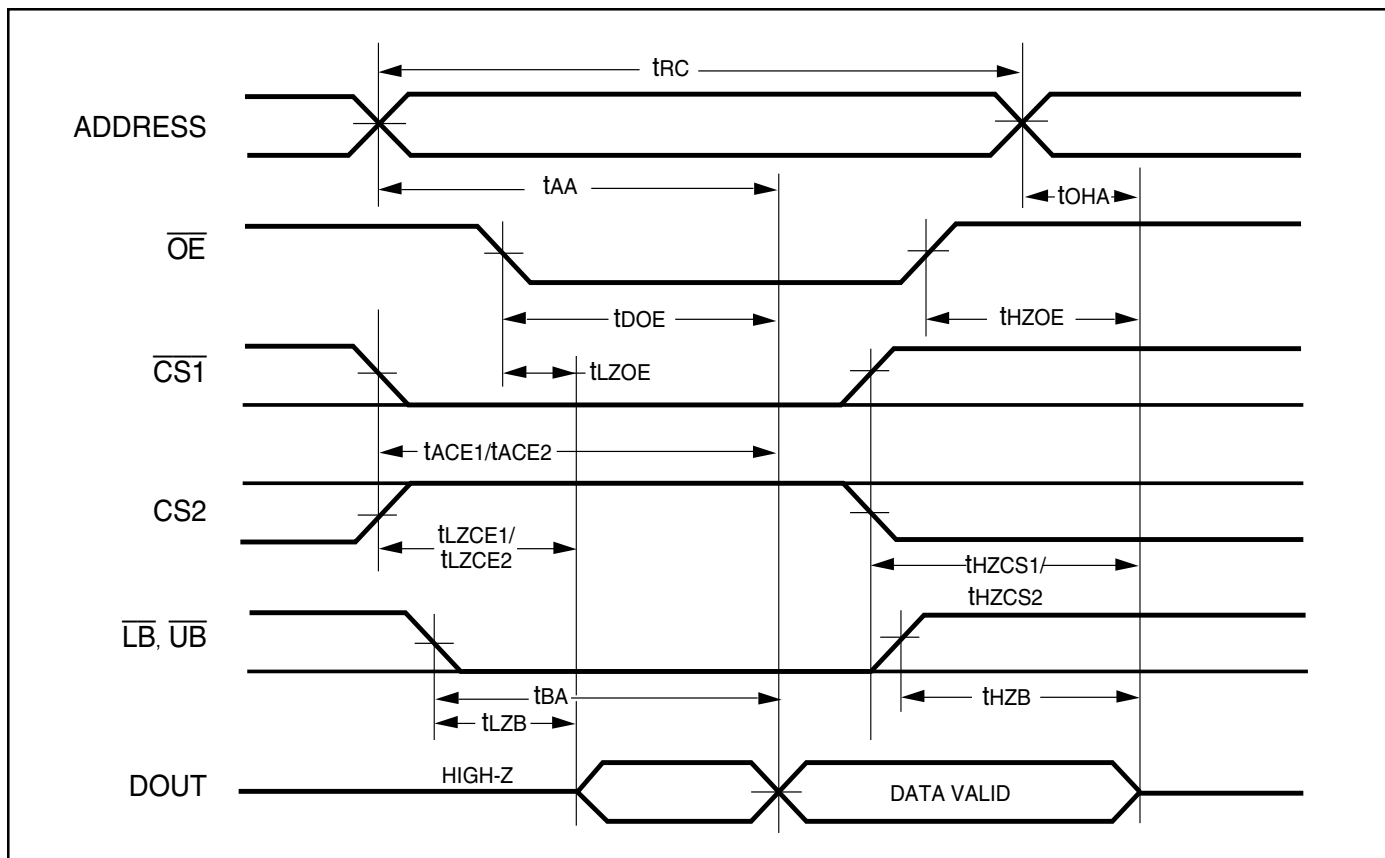
AC WAVEFORMS

READ CYCLE NO. 1^(1,2) (Address Controlled) ($\overline{CS1} = \overline{OE} = V_{IL}$, $CS2 = \overline{WE} = V_{IH}$, \overline{UB} or $\overline{LB} = V_{IL}$)



AC WAVEFORMS

READ CYCLE NO. 2^(1,3) ($\overline{CS1}$, $CS2$, \overline{OE} , AND $\overline{UB}/\overline{LB}$ Controlled)



Notes:

1. \overline{WE} is HIGH for a 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 SWITCHING CHARACTERISTICS^(1,2) (Over Operating Range)

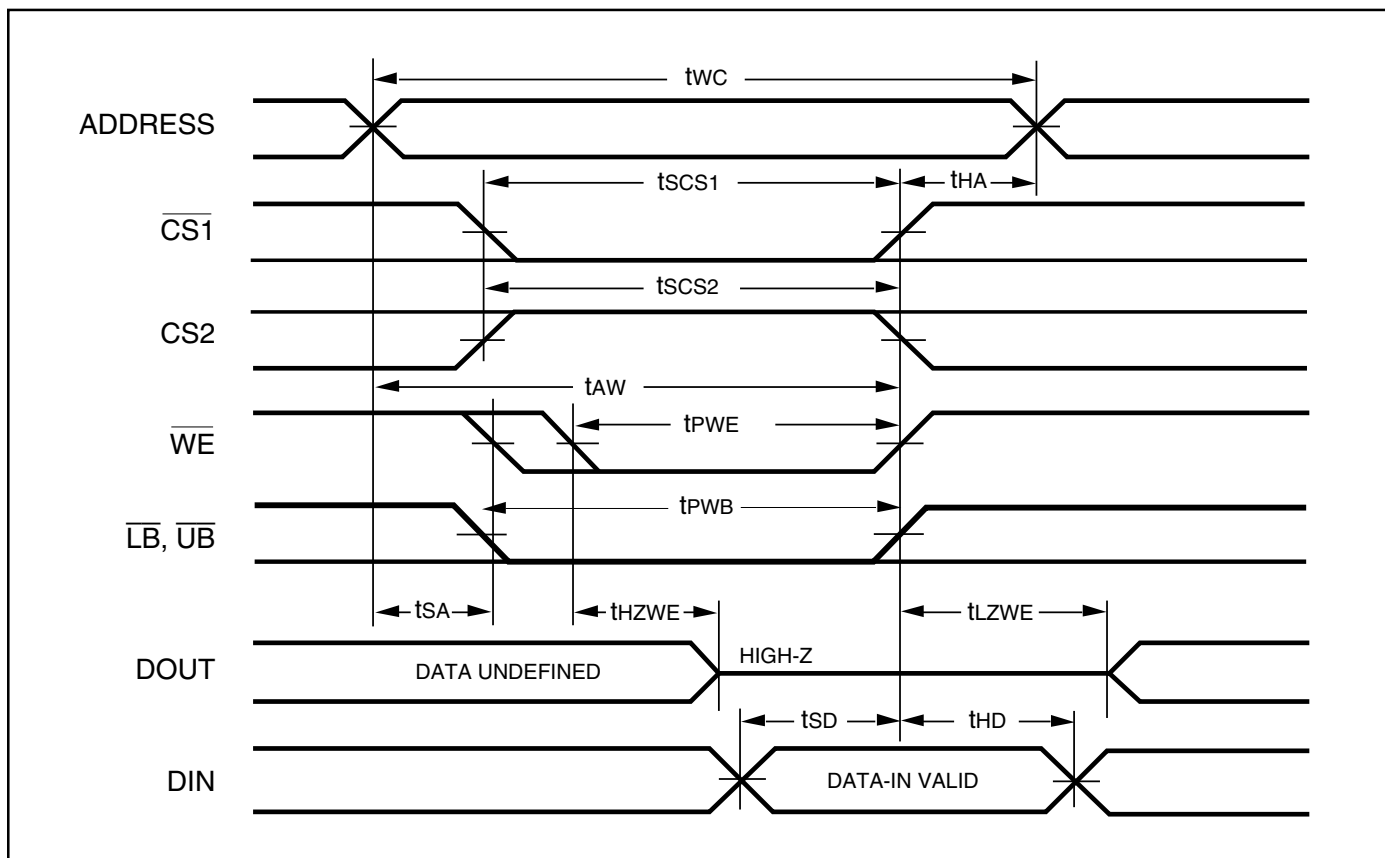
| Symbol | Parameter | 45ns | | 55 ns | | 70 ns | | Unit |
|------------------------------------|---|------|------|-------|------|-------|------|------|
| | | Min. | Max. | Min. | Max. | Min. | Max. | |
| t _{WC} | Write Cycle Time | 45 | — | 55 | — | 70 | — | ns |
| t _{CS1} /t _{CS2} | $\overline{CS1}/\overline{CS2}$ to Write End | 35 | — | 45 | — | 60 | — | ns |
| t _{AW} | Address Setup Time to Write End | 35 | — | 45 | — | 60 | — | ns |
| t _{HA} | Address Hold from Write End | 0 | — | 0 | — | 0 | — | ns |
| t _{SA} | Address Setup Time | 0 | — | 0 | — | 0 | — | ns |
| t _{PWB} | \overline{LB} , \overline{UB} Valid to End of Write | 35 | — | 45 | — | 60 | — | ns |
| t _{PWE} | \overline{WE} Pulse Width | 35 | — | 40 | — | 50 | — | ns |
| t _{SD} | Data Setup to Write End | 20 | — | 25 | — | 30 | — | ns |
| t _{HD} | Data Hold from Write End | 0 | — | 0 | — | 0 | — | ns |
| t _{HZWE} ⁽³⁾ | \overline{WE} LOW to High-Z Output | — | 20 | — | 20 | — | 20 | ns |
| t _{LZWE} ⁽³⁾ | \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 0.9V, input pulse levels of 0.4V to 1.4V and output loading specified in Figure 1.
2. The internal write time is defined by the overlap of $\overline{CS1}$ LOW, CS2 HIGH 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.
3. 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^(1,2) ($\overline{CS1}$ Controlled, \overline{OE} = HIGH or LOW)

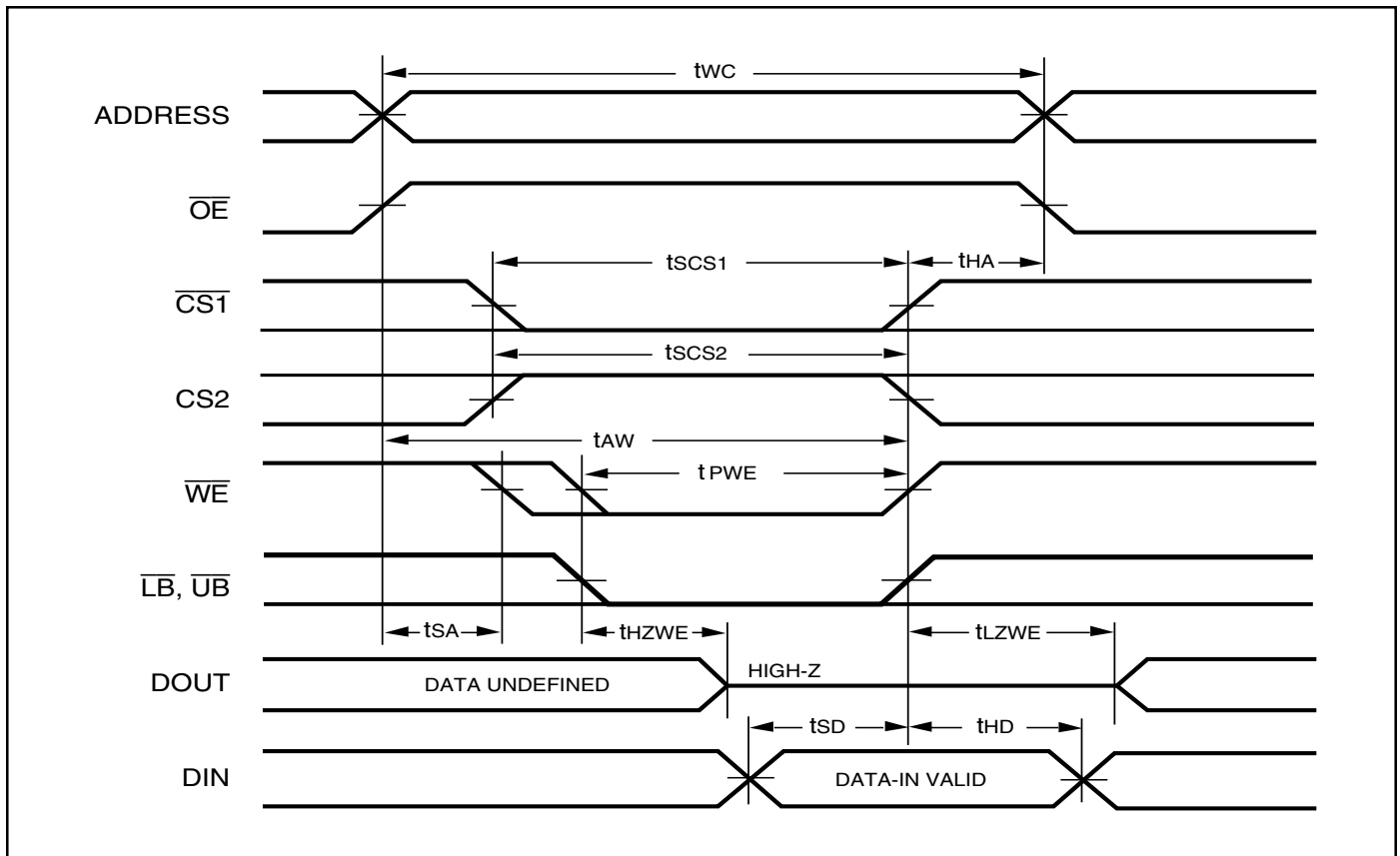


Notes:

1. WRITE is an internally generated signal asserted during an overlap of the LOW states on the $\overline{CS1}$, CS2 and \overline{WE} inputs and at least one of the \overline{LB} and \overline{UB} inputs being in the LOW state.
2. WRITE = ($\overline{CS1}$) [(LB) = (UB)] (\overline{WE}).

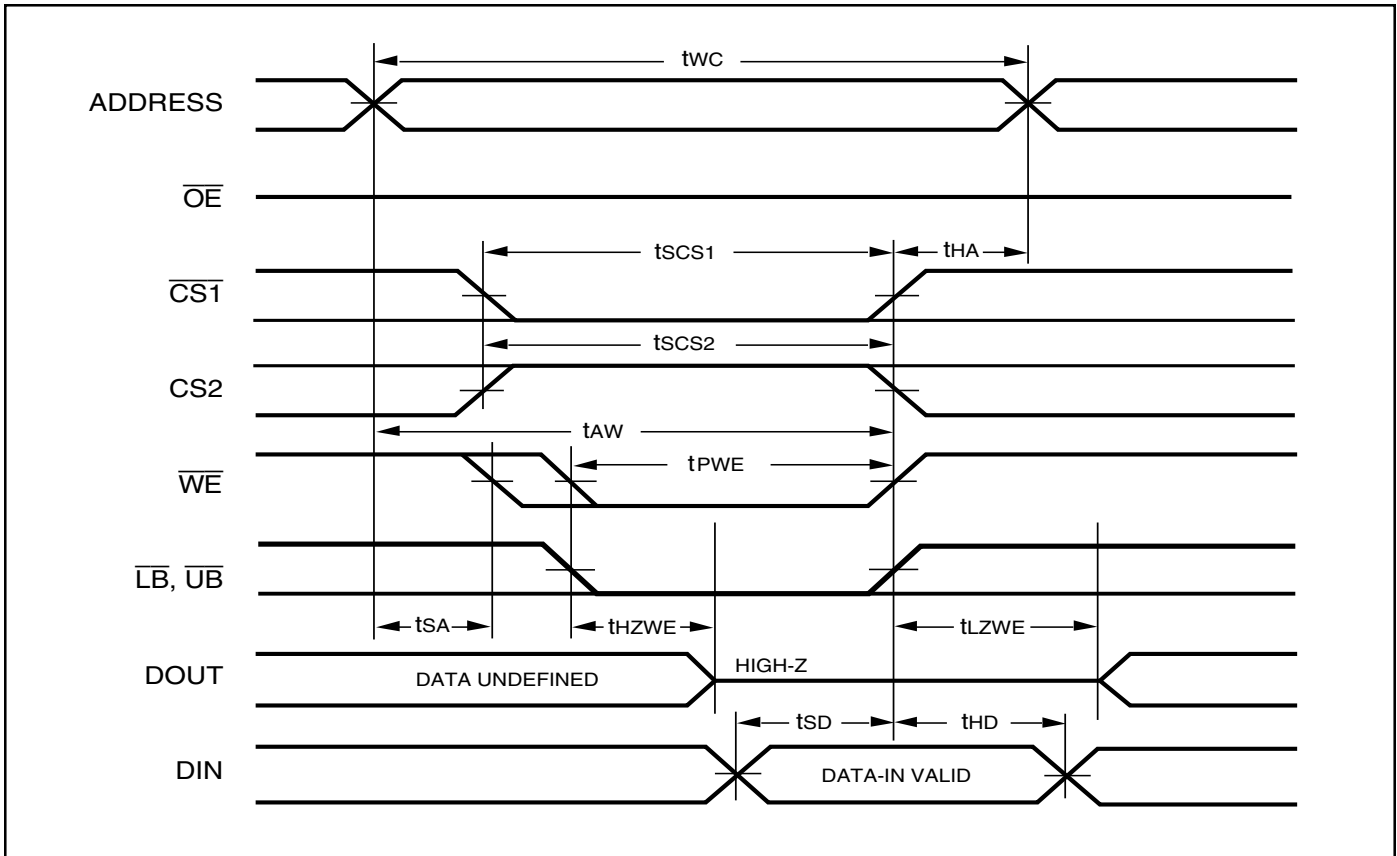
AC WAVEFORMS

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



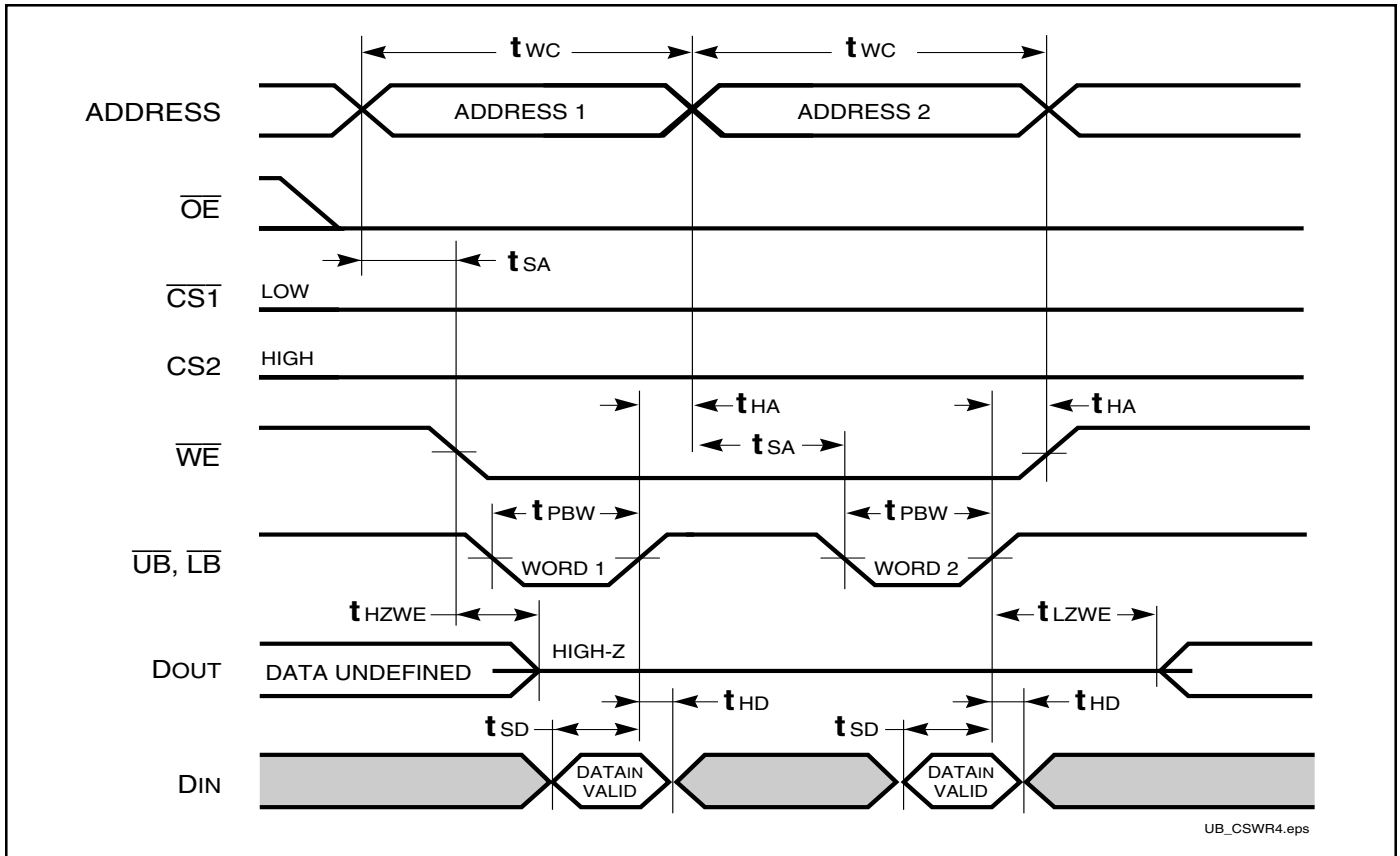
AC WAVEFORMS

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



AC WAVEFORMS

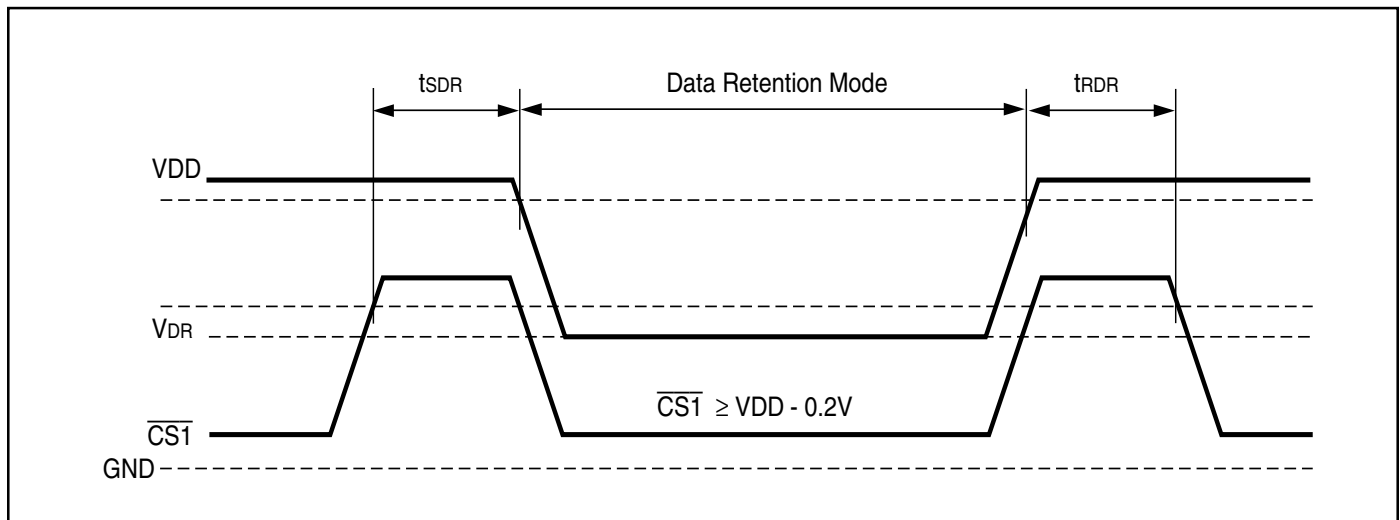
WRITE CYCLE NO. 4 ($\overline{UB}/\overline{LB}$ Controlled)



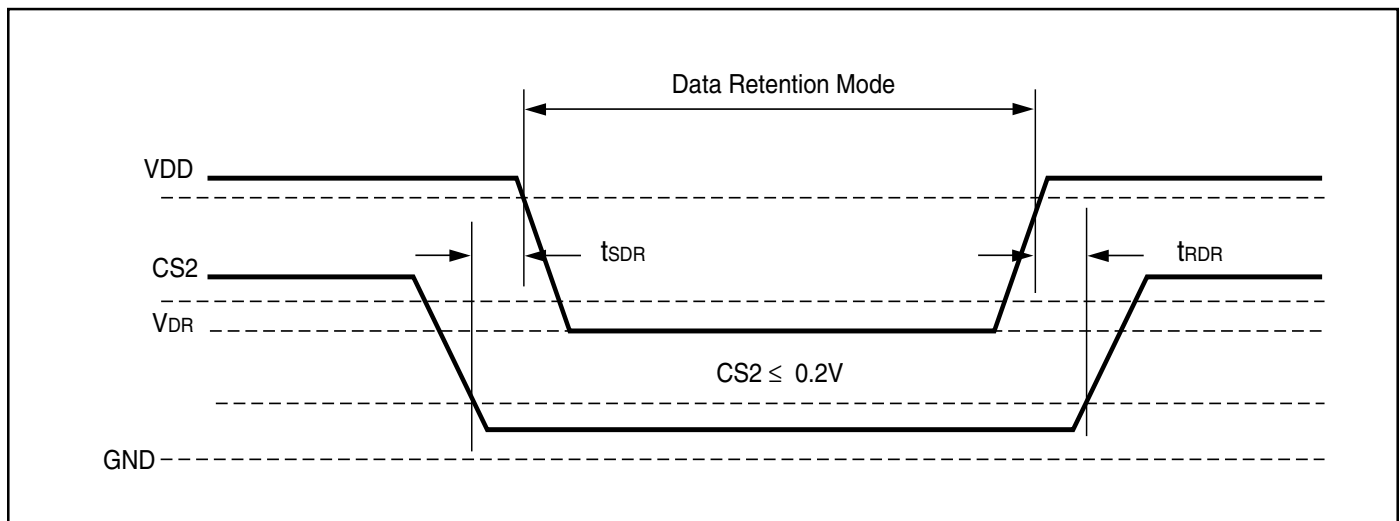
DATA RETENTION SWITCHING CHARACTERISTICS

| Symbol | Parameter | Test Condition | Min. | Max. | Unit |
|------------------|------------------------------------|---|-----------------|------|------|
| V _{DR} | V _{DD} for Data Retention | See Data Retention Waveform | 1.0 | 3.6 | V |
| I _{DR} | Data Retention Current | V _{DD} = 1.0V, $\overline{CS1} \geq V_{DD} - 0.2V$ | — | 10 | μA |
| 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 ($\overline{CS1}$ Controlled)



DATA RETENTION WAVEFORM (CS2 Controlled)



IS62WV12816ALL, IS62WV12816BLL

ORDERING INFORMATION: IS62WV12816ALL (1.65V - 2.2V)

Commercial Range: 0°C to +70°C

| Speed (ns) | Order Part No. | Package |
|------------|--------------------|----------------|
| 70 | IS62WV12816ALL-70T | TSOP (Type II) |

Industrial Range: -40°C to +85°C

| Speed (ns) | Order Part No. | Package |
|------------|----------------------|-----------------------------------|
| 70 | IS62WV12816ALL-70TI | TSOP (Type II) |
| 70 | IS62WV12816ALL-70BI | mini BGA (6mm x 8mm) |
| 70 | IS62WV12816ALL-70BLI | mini BGA (6mm x 8mm), Lead-free |
| 70 | IS62WV12816ALL-70B2I | mini BGA (6mm x 8mm), 2 CS Option |

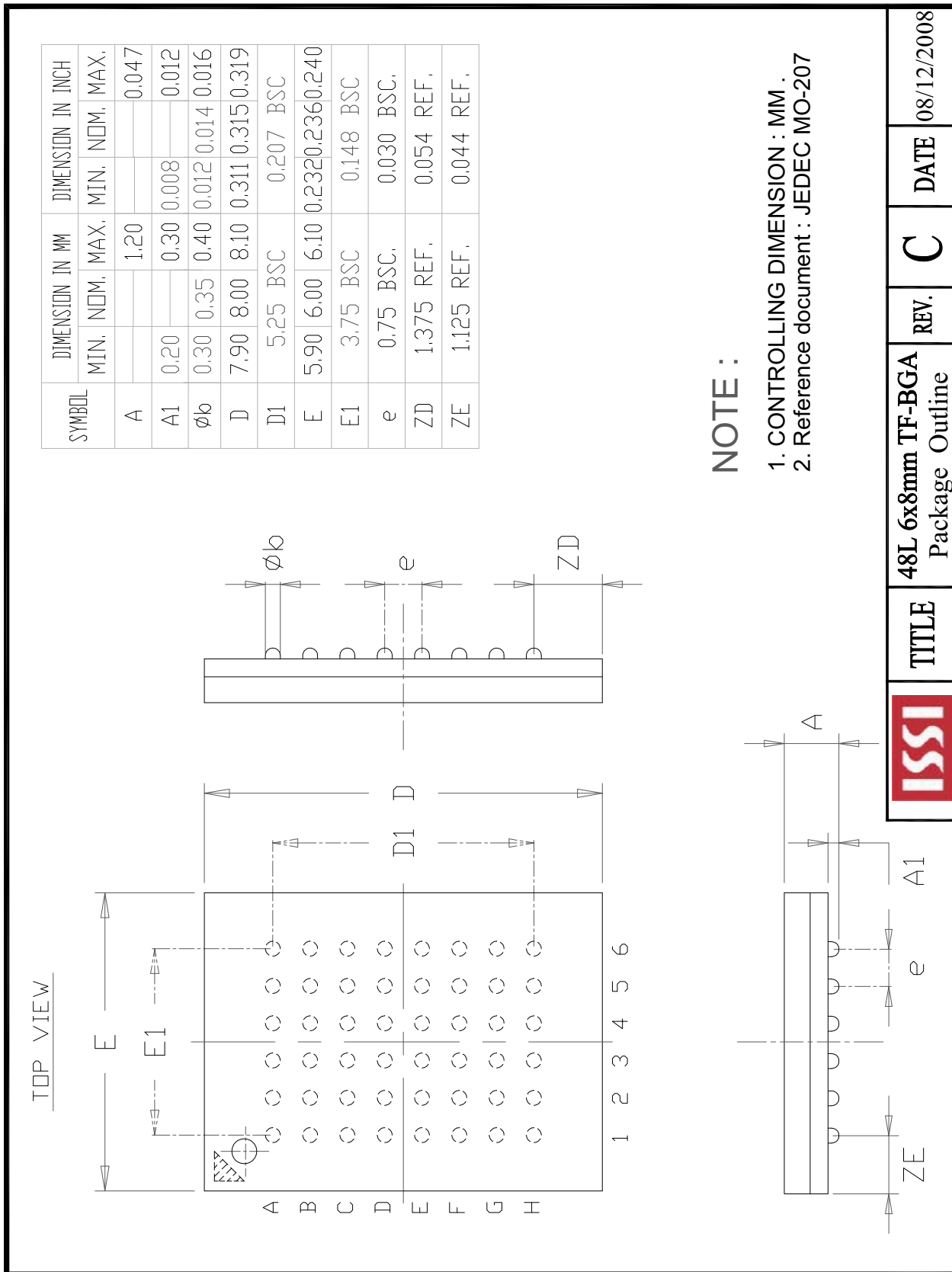
ORDERING INFORMATION: IS62WV12816BLL (2.5V - 3.6V)

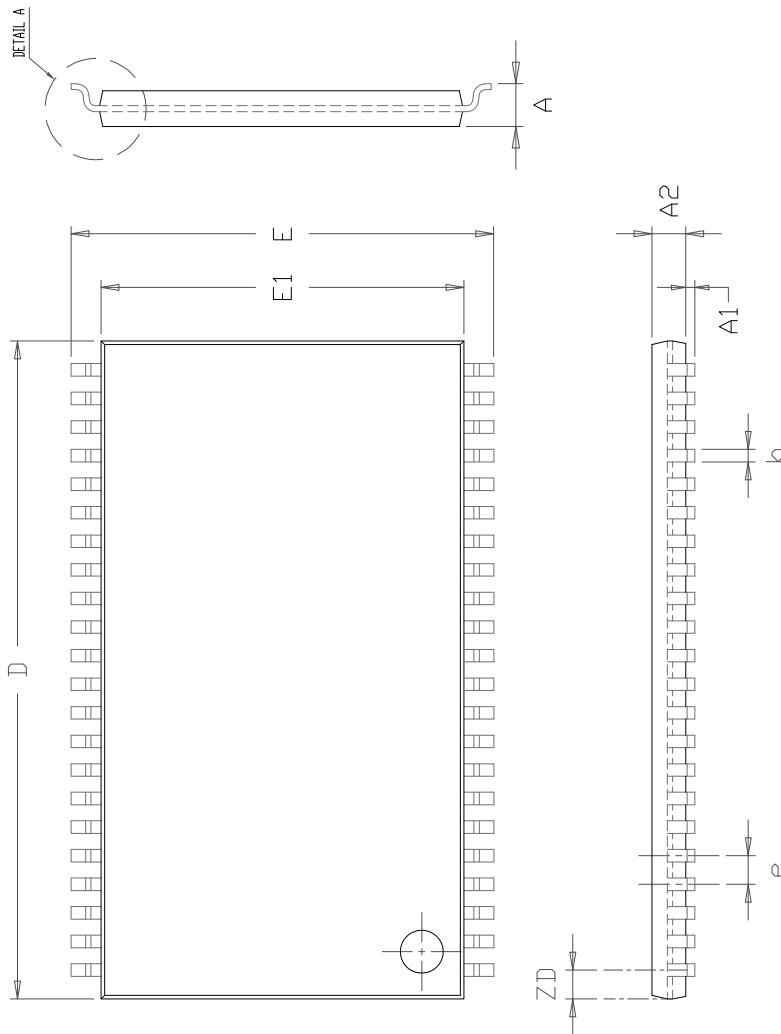
Commercial Range: 0°C to +70°C

| Speed (ns) | Order Part No. | Package |
|------------|---------------------|-----------------------------------|
| 45 | IS62WV12816BLL-45B | mini BGA (6mm x 8mm) |
| 45 | IS62WV12816BLL-45B2 | mini BGA (6mm x 8mm), 2 CS Option |
| 55 | IS62WV12816BLL-55T | TSOP (Type II) |

Industrial Range: -40°C to +85°C

| Speed (ns) | Order Part No. | Package |
|------------|-----------------------|--|
| 45 | IS62WV12816BLL-45TLI | TSOP (Type II), Lead-free |
| 55 | IS62WV12816BLL-55TI | TSOP (Type II) |
| 55 | IS62WV12816BLL-55TLI | TSOP (Type II), Lead-free |
| 55 | IS62WV12816BLL-55BI | mini BGA (6mm x 8mm) |
| 55 | IS62WV12816BLL-55BLI | mini BGA (6mm x 8mm), Lead-free |
| 55 | IS62WV12816BLL-55B2I | mini BGA (6mm x 8mm), 2 CS Option |
| 55 | IS62WV12816BLL-55B2LI | mini BGA (6mm x 8mm), 2 CS Option, Lead-free |

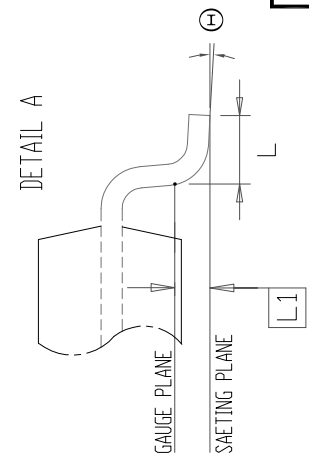




| SYMBOL | DIMENSION IN MM | | | DIMENSION IN INCH | | |
|--------|-----------------|-------|-------|-------------------|--------|-------|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 1.00 | | 1.20 | 0.039 | | 0.047 |
| A1 | 0.05 | | 0.15 | 0.002 | | 0.006 |
| A2 | 0.95 | 1.00 | 1.05 | 0.037 | 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 | 0.400 | 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. |
| ⊕ | 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.



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



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.