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IS61C1024AL IS64C1024AL



128K x 8 HIGH-SPEED CMOS STATIC RAM

JULY 2015

FEATURES

- High-speed access time: 12, 15 ns
- Low active power: 160 mW (typical)
- Low standby power: 1000 μ W (typical) CMOS standby
- Output Enable (\overline{OE}) and two Chip Enable ($\overline{CE1}$ and $\overline{CE2}$) inputs for ease in applications
- Fully static operation: no clock or refresh required
- TTL compatible inputs and outputs
- Single 5V ($\pm 10\%$) power supply
- Commercial, industrial, and automotive temperature ranges available
- Lead free available

DESCRIPTION

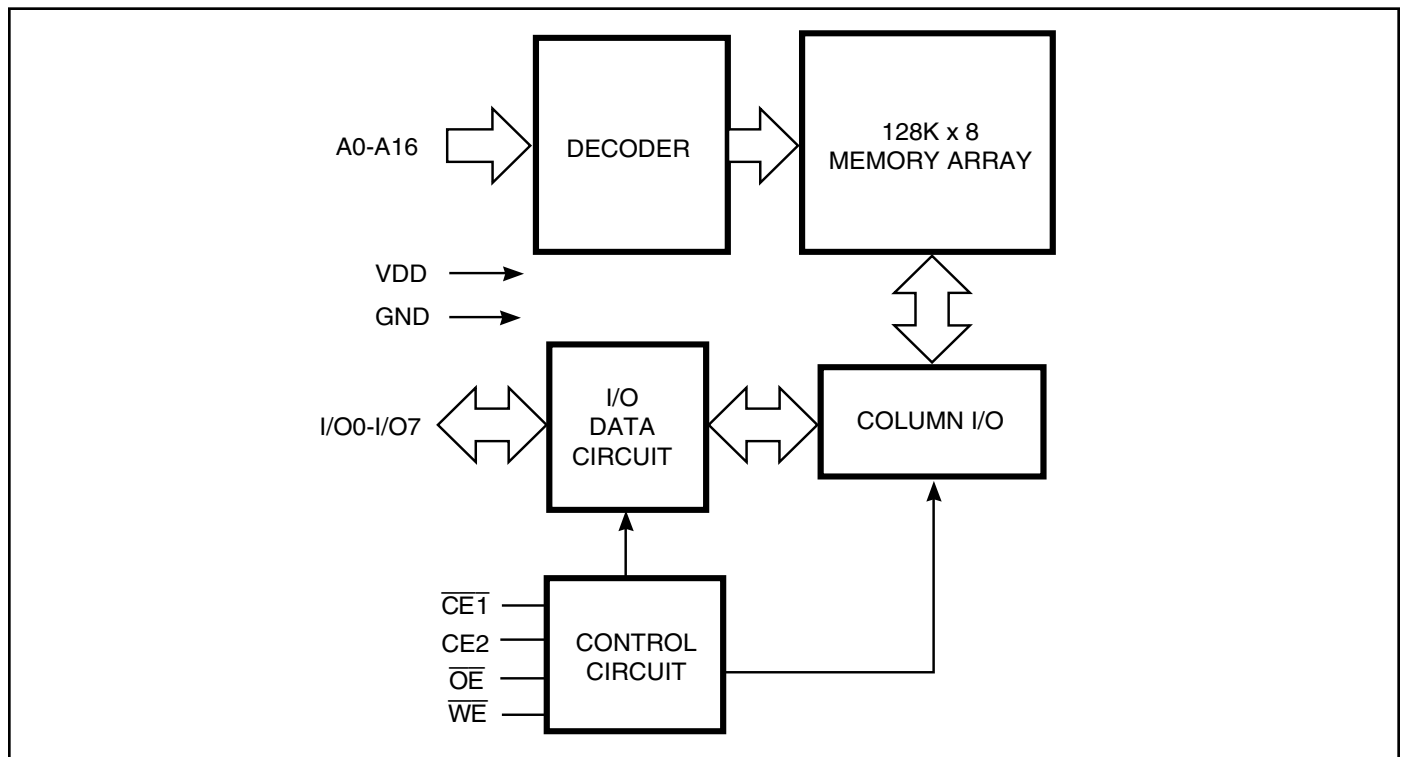
The *ISSI* IS61C1024AL/IS64C1024AL is a very high-speed, low power, 131,072-word by 8-bit CMOS static RAMs. They are fabricated using *ISSI*'s high-performance CMOS technology. This highly reliable process coupled with innovative circuit design techniques, yields higher performance and low power consumption devices.

When $\overline{CE1}$ is HIGH or $\overline{CE2}$ 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 $\overline{CE2}$. The active LOW Write Enable (\overline{WE}) controls both writing and reading of the memory.

The IS61C1024AL/IS64C1024AL is available in 32-pin 300-mil SOJ, 32-pin 400-mil SOJ, 32-pin TSOP (Type I, 8x20), and 32-pin sTSOP (Type I, 8 x 13.4) packages.

FUNCTIONAL BLOCK DIAGRAM



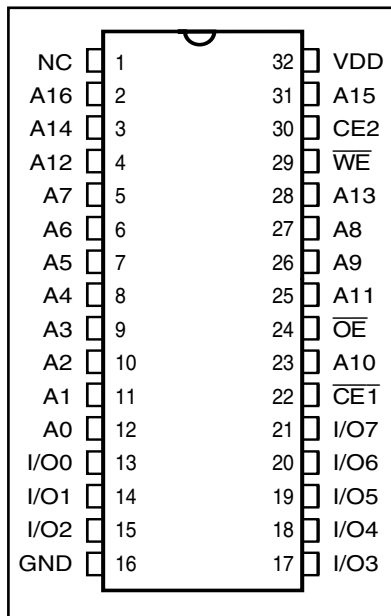
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- a.) the risk of injury or damage has been minimized;
- b.) the user assume all such risks; and
- c.) potential liability of Integrated Silicon Solution, Inc is adequately protected under the circumstances

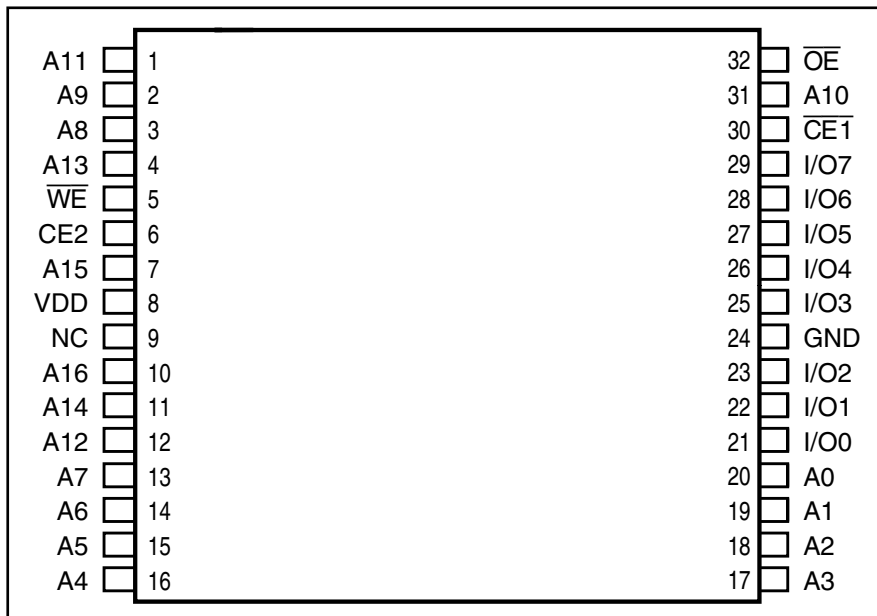
PIN CONFIGURATION

32-Pin SOJ



PIN CONFIGURATION

32-Pin TSOP (Type 1) (T) and sTSOP (Type 1) (H)



PIN DESCRIPTIONS

| | |
|------------------|---------------------|
| A0-A16 | Address Inputs |
| $\overline{CE1}$ | Chip Enable 1 Input |
| CE2 | Chip Enable 2 Input |
| \overline{OE} | Output Enable Input |
| \overline{WE} | Write Enable Input |
| I/O0-I/O7 | Input/Output |
| V _{DD} | Power |
| GND | Ground |

OPERATING RANGE (IS61C1024AL)

| Range | Ambient Temperature | V _{DD} |
|------------|---------------------|-----------------|
| Commercial | 0°C to +70°C | 5V ± 10% |
| Industrial | -40°C to +85°C | 5V ± 10% |

OPERATING RANGE (IS64C1024AL)

| Range | Ambient Temperature | V _{DD} |
|------------|---------------------|-----------------|
| Automotive | -40°C to +125°C | 5V ± 10% |

TRUTH TABLE

| Mode | \overline{WE} | $\overline{CE1}$ | CE2 | \overline{OE} | I/O Operation | V _{DD} Current |
|-----------------|-----------------|------------------|-----|-----------------|------------------|-------------------------------------|
| Not Selected | X | H | X | X | High-Z | I _{SB1} , I _{SB2} |
| (Power-down) | X | X | L | X | High-Z | I _{SB1} , I _{SB2} |
| Output Disabled | H | L | H | H | High-Z | I _{CC1} , I _{CC2} |
| Read | H | L | H | L | D _{OUT} | I _{CC1} , I _{CC2} |
| Write | L | L | H | X | D _{IN} | I _{CC1} , I _{CC2} |

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

| Symbol | Parameter | Value | Unit |
|-------------------|--------------------------------------|--------------|------|
| V _{TERM} | Terminal Voltage with Respect to GND | -0.5 to +7.0 | V |
| T _{STG} | Storage Temperature | -65 to +150 | °C |
| P _T | Power Dissipation | 1.5 | W |
| I _{OUT} | 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.

CAPACITANCE^(1,2)

| Symbol | Parameter | Conditions | Max. | Unit |
|------------------|--------------------|-----------------------|------|------|
| C _{IN} | Input Capacitance | V _{IN} = 0V | 5 | pF |
| C _{OUT} | Output Capacitance | V _{OUT} = 0V | 7 | pF |

Notes:

1. Tested initially and after any design or process changes that may affect these parameters.
2. Test conditions: T_A = 25°C, f = 1 MHz, V_{DD} = 5.0V.

DC ELECTRICAL CHARACTERISTICS (Over Operating Range)

| Symbol | Parameter | Test Conditions | Min. | Max. | Unit | |
|-----------------|----------------------------------|--|-----------------------|-----------------------|-------------|----|
| V _{OH} | Output HIGH Voltage | V _{DD} = Min., I _{OH} = -4.0 mA | 2.4 | — | V | |
| V _{OL} | Output LOW Voltage | V _{DD} = Min., I _{OL} = 8.0 mA | — | 0.4 | V | |
| V _{IH} | Input HIGH Voltage | | 2.2 | V _{DD} + 0.5 | V | |
| V _{IL} | Input LOW Voltage ⁽¹⁾ | | -0.3 | 0.8 | V | |
| I _{LI} | Input Leakage | GND ≤ V _{IN} ≤ V _{DD} | Com. Ind. Auto. | -1 -2 -5 | 1 2 5 | μA |
| I _{LO} | Output Leakage | GND ≤ V _{OUT} ≤ V _{DD} Outputs Disabled | Com. Ind. Auto. | -1 -2 -5 | 1 2 5 | μA |

Note:

1. V_{IL} = -3.0V for pulse width less than 10 ns.

IS61C1024AL/IS64C1024AL POWER SUPPLY CHARACTERISTICS⁽¹⁾ (Over Operating Range)

| Symbol | Parameter | Test Conditions | | -12 ns | | -15 ns | | Unit |
|------------------|--|--|------------------------------|--------|------|--------|------|------|
| | | | | Min. | Max. | Min. | Max. | |
| I _{CC1} | V _{DD} Operating Supply Current | V _{DD} = V _{DD MAX.} , $\overline{CE1} = V_{IL}$ I _{OUT} = 0 mA, f = 0 | Com. | — | 35 | | | mA |
| | | | Ind. | — | 40 | | | |
| | | | Auto. | | | — | 45 | |
| I _{CC2} | V _{DD} Dynamic Operating Supply Current | V _{DD} = V _{DD MAX.} , $\overline{CE1} = V_{IL}$ I _{OUT} = 0 mA, f = f _{MAX} | Com. | — | 45 | | | mA |
| | | | Ind. | — | 50 | | | |
| | | | Auto. typ. ⁽²⁾ | — | 32 | — | 55 | |
| I _{SB1} | TTL Standby Current (TTL Inputs) | V _{DD} = V _{DD MAX.} , V _{IN} = V _{IH} or V _{IL} $\overline{CE1} \geq V_{IH}$, f = 0 or CE2 ≤ V _{IL} , f = 0 | Com. | — | 1 | | | mA |
| | | | Ind. | — | 1.5 | | | |
| | | | Auto. | | | — | 2 | |
| I _{SB2} | CMOS Standby Current (CMOS Inputs) | V _{DD} = V _{DD MAX.} , $\overline{CE1} \geq V_{DD} - 0.2V$, CE2 ≤ 0.2V V _{IN} ≥ V _{DD} - 0.2V, or V _{IN} ≤ 0.2V, f = 0 | Com. | — | 400 | | | μA |
| | | | Ind. | — | 450 | | | |
| | | | Auto. typ. ⁽²⁾ | — | 200 | — | 500 | |

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} = 5V, T_A = 25°C and not 100% tested.

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

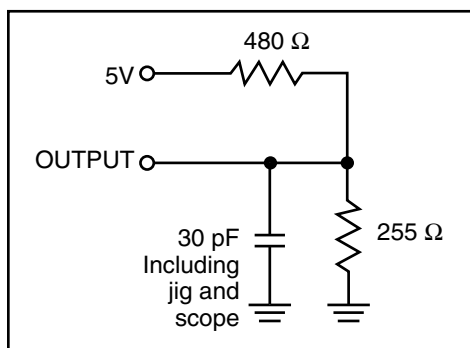
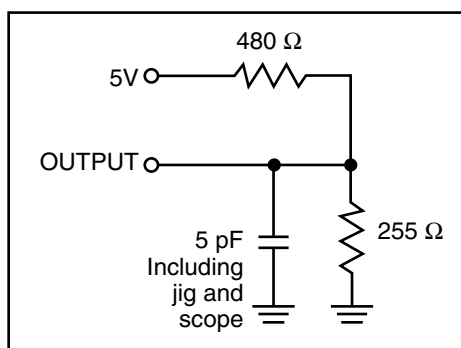
| Symbol | Parameter | -12 | | -15 | | Unit |
|----------------------------------|---|------|------|------|------|------|
| | | Min. | Max. | Min. | Max. | |
| t _{RC} | Read Cycle Time | 12 | — | 15 | — | ns |
| t _{AA} | Address Access Time | — | 12 | — | 15 | ns |
| t _{OHA} | Output Hold Time | 3 | — | 3 | — | ns |
| t _{ACE1} | $\overline{CE1}$ Access Time | — | 12 | — | 15 | ns |
| t _{ACE2} | $\overline{CE2}$ Access Time | — | 12 | — | 15 | ns |
| t _{DOE} | \overline{OE} Access Time | — | 6 | — | 7 | ns |
| t _{LZOE⁽²⁾} | \overline{OE} to Low-Z Output | 0 | — | 0 | — | ns |
| t _{HZOE⁽²⁾} | \overline{OE} to High-Z Output | 0 | 6 | 0 | 6 | ns |
| t _{LZCE1⁽²⁾} | $\overline{CE1}$ to Low-Z Output | 2 | — | 2 | — | ns |
| t _{LZCE2⁽²⁾} | $\overline{CE2}$ to Low-Z Output | 2 | — | 2 | — | ns |
| t _{HZCE⁽²⁾} | $\overline{CE1}$ or $\overline{CE2}$ to High-Z Output | 0 | 7 | 0 | 8 | ns |
| t _{PU⁽³⁾} | $\overline{CE1}$ or $\overline{CE2}$ to Power-Up | 0 | — | 0 | — | ns |
| t _{PD⁽³⁾} | $\overline{CE1}$ or $\overline{CE2}$ to Power-Down | — | 12 | — | 12 | ns |

Notes:

1. Test conditions assume signal transition times of 3 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V and output loading specified in Figure 1.
2. Tested with the load in Figure 2. Transition is measured ± 500 mV from steady-state voltage. Not 100% tested.
3. Not 100% tested.

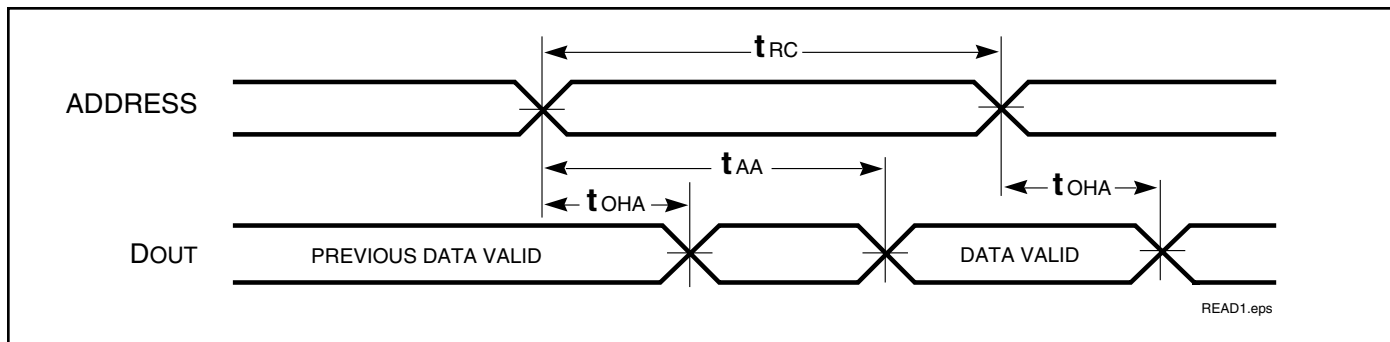
AC TEST CONDITIONS

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

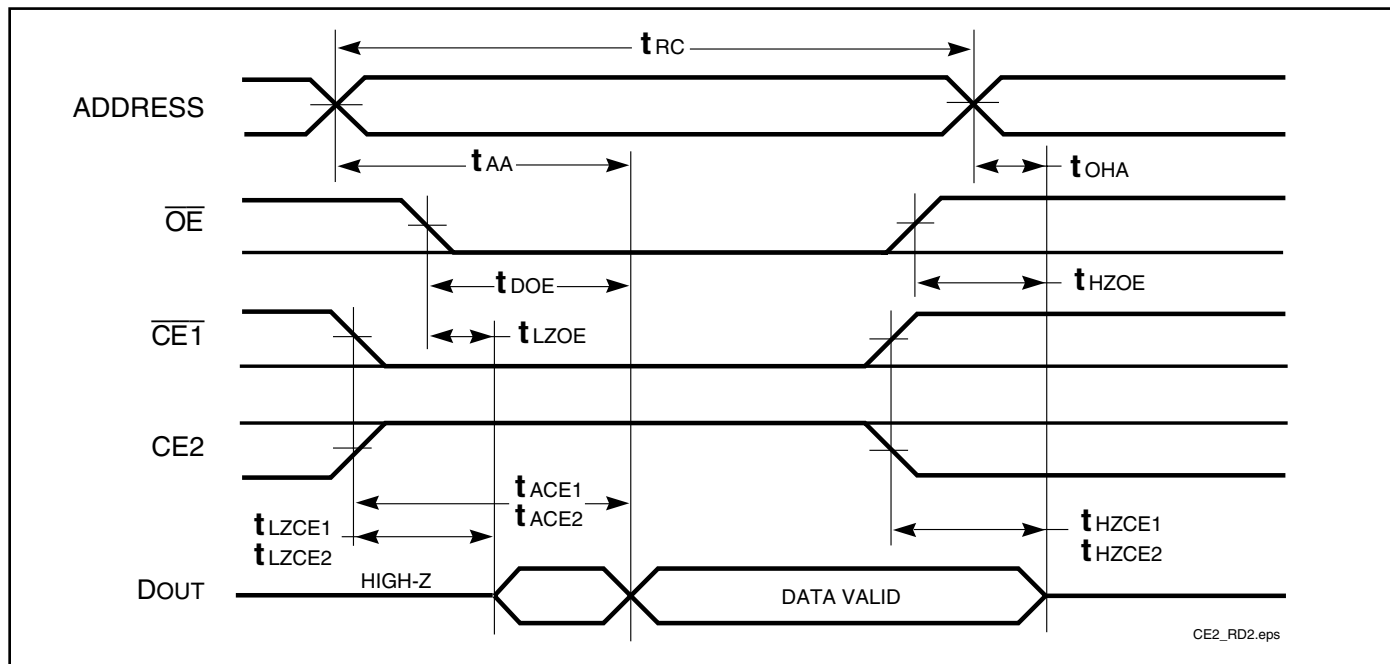
AC TEST LOADS

Figure 1

Figure 2

AC WAVEFORMS

READ CYCLE NO. 1^(1,2)



READ CYCLE NO. 2^(1,3)



Notes:

1. \overline{WE} is HIGH for a Read Cycle.
2. The device is continuously selected. \overline{OE} , $\overline{CE1}$ = V_{IL} , CE2 = V_{IH} .
3. Address is valid prior to or coincident with $\overline{CE1}$ LOW and CE2 HIGH transitions.

WRITE CYCLE SWITCHING CHARACTERISTICS^(1,2) (Over Operating Range, Standard and Low Power)

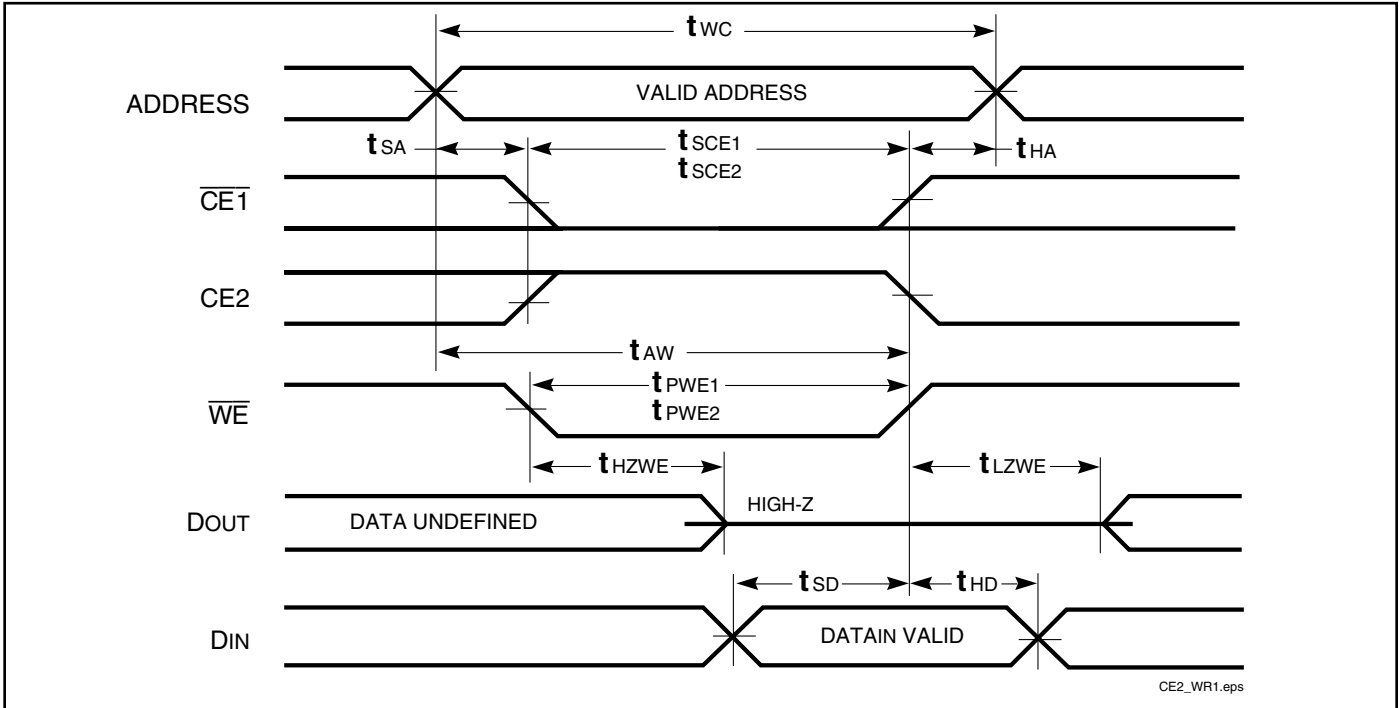
| Symbol | Parameter | -12 ns | | -15 ns | | Unit |
|---------------------------------|--------------------------------------|--------|------|--------|------|------|
| | | Min. | Max. | Min. | Max. | |
| t _{WC} | Write Cycle Time | 12 | — | 15 | — | ns |
| t _{SCE1} | $\overline{CE1}$ to Write End | 10 | — | 12 | — | ns |
| t _{SCE2} | CE2 to Write End | 10 | — | 12 | — | ns |
| t _{AW} | Address Setup Time to Write End | 10 | — | 12 | — | ns |
| t _{HA} | Address Hold from Write End | 0 | — | 0 | — | ns |
| t _{SA} | Address Setup Time | 0 | — | 0 | — | ns |
| t _{PWE⁽³⁾} | \overline{WE} Pulse Width | 10 | — | 12 | — | ns |
| t _{SD} | Data Setup to Write End | 7 | — | 10 | — | ns |
| t _{HD} | Data Hold from Write End | 0 | — | 0 | — | ns |
| t _{HZWE⁽⁴⁾} | \overline{WE} LOW to High-Z Output | — | 7 | — | 7 | ns |
| t _{LZWE⁽⁴⁾} | \overline{WE} HIGH to Low-Z Output | 2 | — | 2 | — | ns |

Notes:

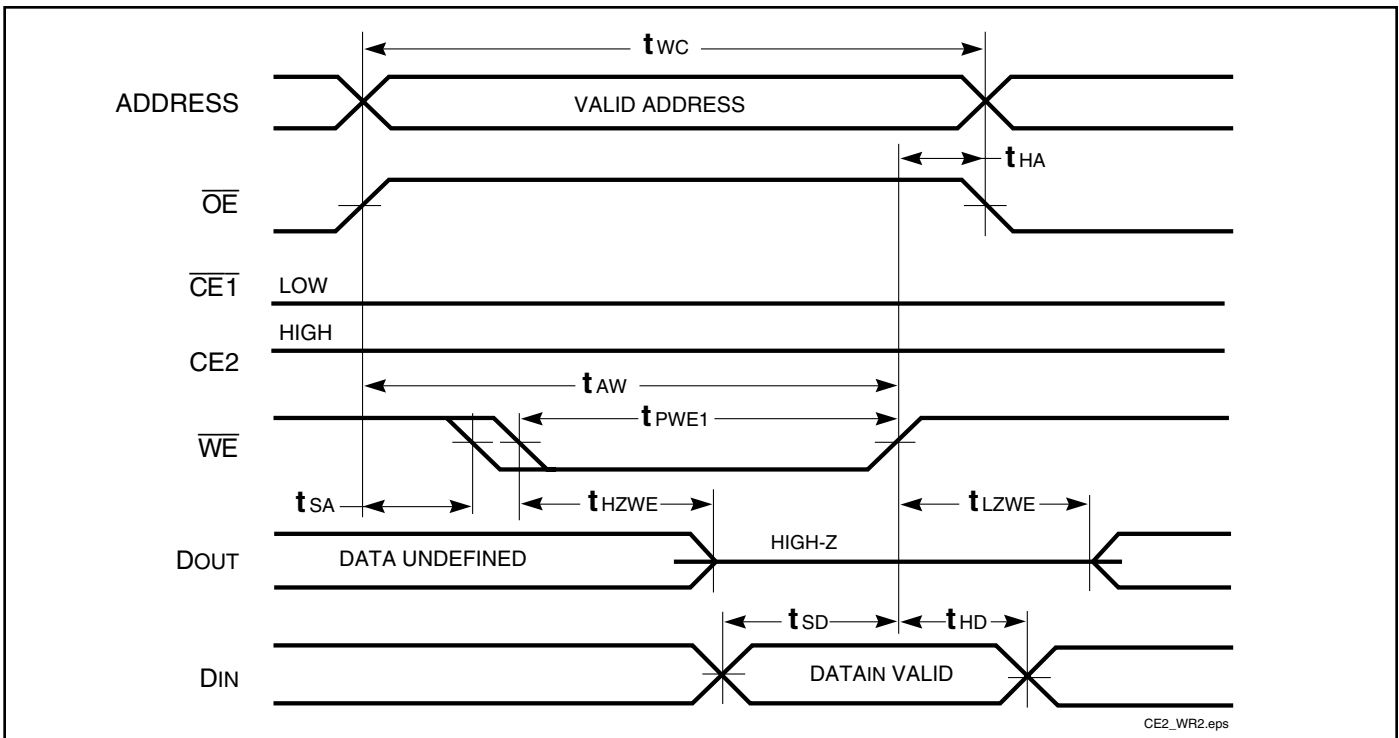
1. Test conditions assume signal transition times of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V and output loading specified in Figure 1.
2. The internal write time is defined by the overlap of $\overline{CE1}$ LOW, CE2 HIGH and \overline{WE} LOW. All signals must 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 OE HIGH.
4. Tested with the load in Figure 2. Transition is measured ± 500 mV from steady-state voltage. Not 100% tested.

AC WAVEFORMS

WRITE CYCLE NO. 1 ($\overline{CE1}$ Controlled, \overline{OE} is HIGH or LOW) ⁽¹⁾



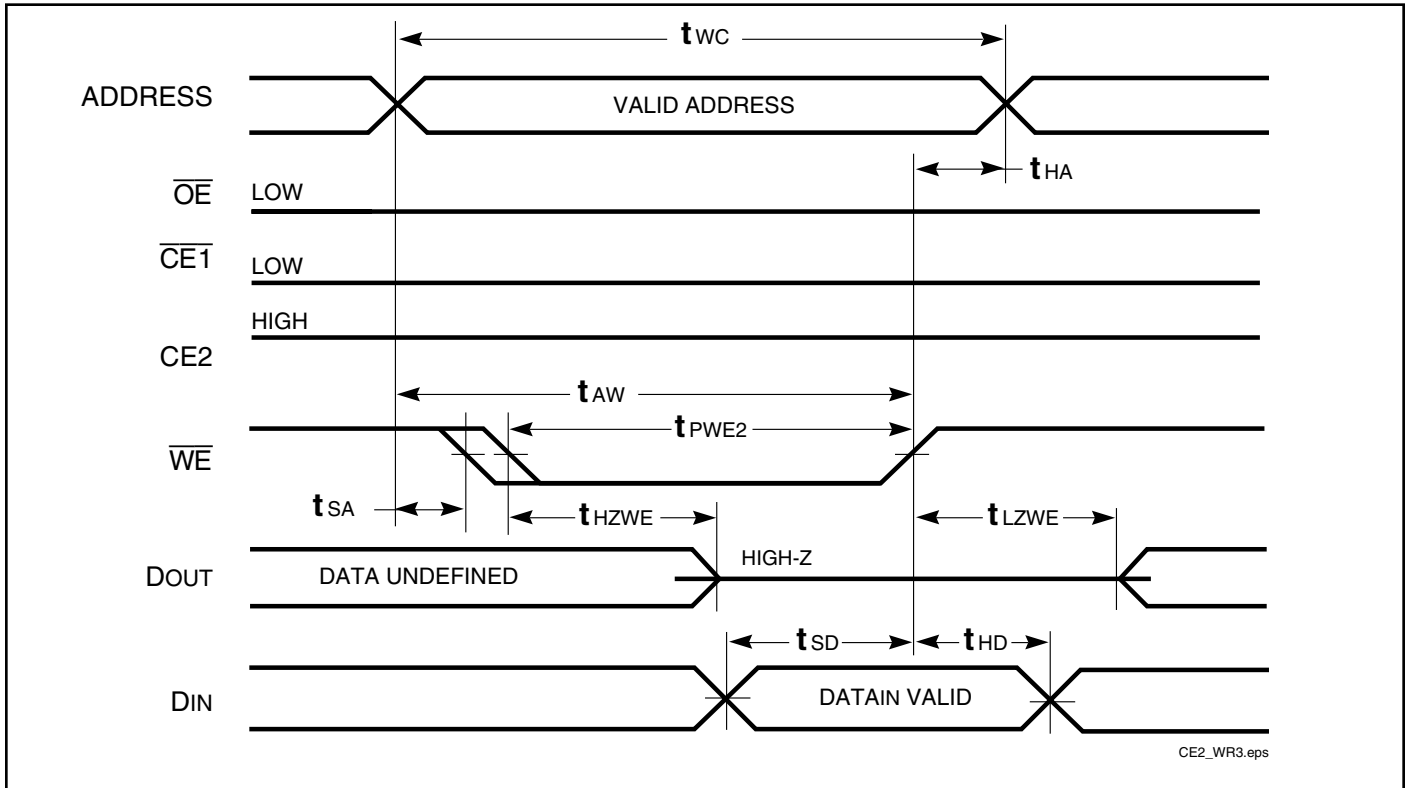
WRITE CYCLE NO. 2 (\overline{OE} is HIGH During Write Cycle) ^(1,2)



Notes:

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

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



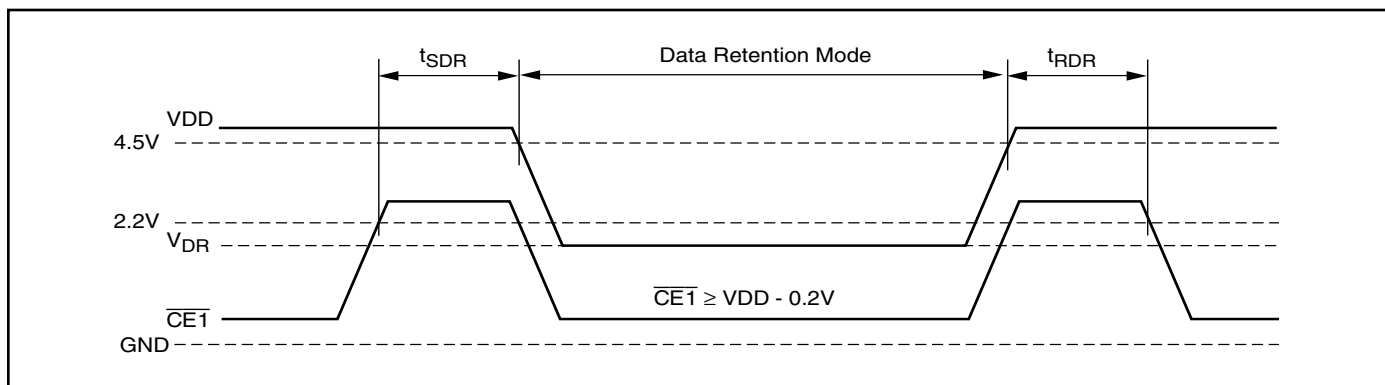
DATA RETENTION SWITCHING CHARACTERISTICS

| Symbol | Parameter | Test Condition | Min. | Typ. ⁽¹⁾ | Max. | Unit |
|------------------|------------------------------------|--|-----------------|---------------------|------|------|
| V _{DR} | V _{DD} for Data Retention | See Data Retention Waveform | 2.0 | | 5.5 | V |
| I _{DR} | Data Retention Current | V _{DD} = 2.0V, $\overline{CE1} \geq V_{DD} - 0.2V$ or $CE2 \leq 0.2V$ V _{IN} ≥ V _{DD} - 0.2V, or V _{IN} ≤ V _{SS} + 0.2V | — | 200 | 400 | μA |
| | | | | — | 450 | |
| | | | | — | 500 | |
| t _{SDR} | Data Retention Setup Time | See Data Retention Waveform | 0 | | — | ns |
| t _{RDR} | Recovery Time | See Data Retention Waveform | t _{RC} | | — | ns |

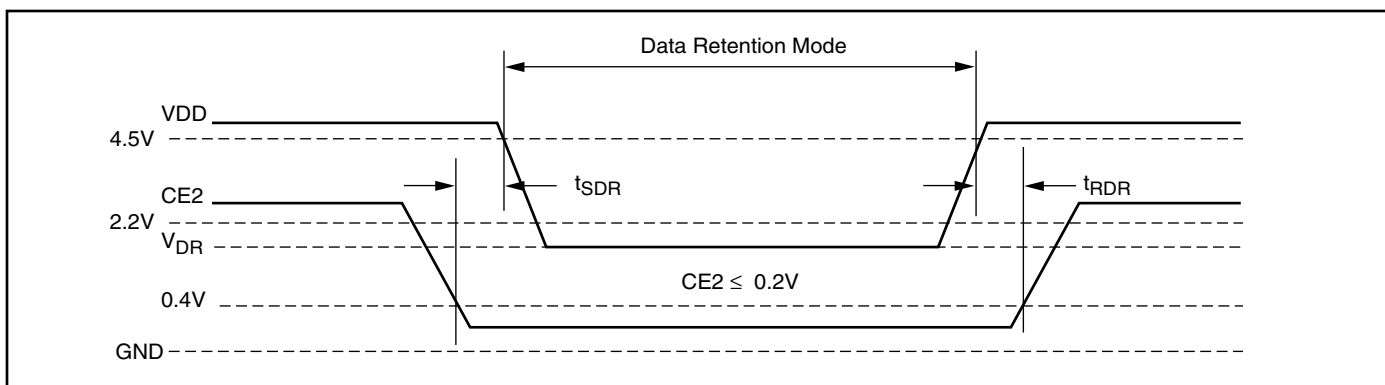
Note:

1. Typical Values are measured at V_{DD} = 5V, T_A = 25°C and not 100% tested.

DATA RETENTION WAVEFORM ($\overline{CE1}$ Controlled)



DATA RETENTION WAVEFORM (CE2 Controlled)



IS61C1024AL, IS64C1024AL

ORDERING INFORMATION: IS61C1024AL

Commercial Range: 0°C to +70°C

| Speed (ns) | Order Part No. | Package |
|------------|-----------------|---------------|
| 12 | IS61C1024AL-12T | TSOP (Type I) |

ORDERING INFORMATION: IS61C1024AL

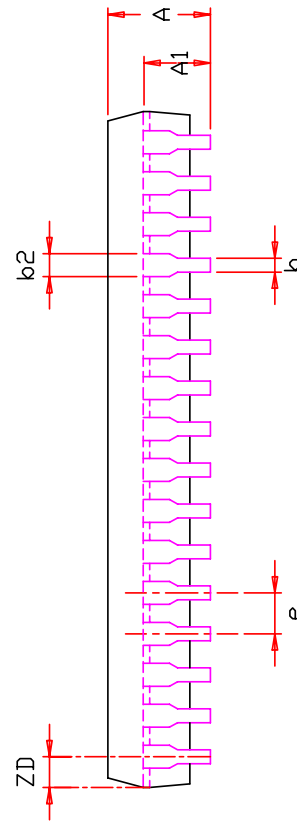
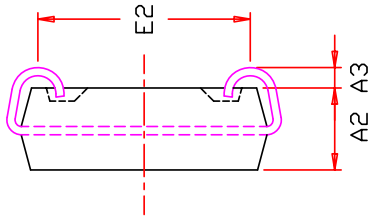
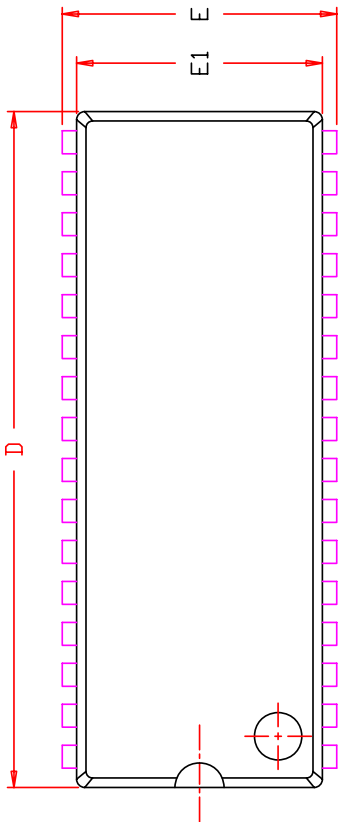
Industrial Range: -40°C to +85°C

| Speed (ns) | Order Part No. | Package |
|------------|-------------------|--------------------------------|
| 12 | IS61C1024AL-12JLI | 300-mil Plastic SOJ, Lead-free |
| | IS61C1024AL-12KI | 400-mil Plastic SOJ |
| | IS61C1024AL-12KLI | 400-mil Plastic SOJ, Lead-free |
| | IS61C1024AL-12HI | sTSOP (Type I) |
| | IS61C1024AL-12HLI | sTSOP (Type I), Lead-free |
| | IS61C1024AL-12TI | TSOP (Type I) |
| | IS61C1024AL-12TLI | TSOP (Type I), Lead-free |

ORDERING INFORMATION: IS64C1024AL

Automotive Range: -40°C to +125°C

| Speed (ns) | Order Part No. | Package |
|------------|--------------------|--------------------------------|
| 15 | IS64C1024AL-15KLA3 | 400-mil Plastic SOJ, Lead-free |
| | IS64C1024AL-15TLA3 | TSOP (Type I), Lead-free |



| SYMBOL | DIMENSION IN MM | | | DIMENSION IN INCH | | |
|--------|-----------------|------|-------|-------------------|-------|-------|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 3.05 | | 3.76 | 0.120 | | 0.148 |
| A1 | 2.08 | | 2.41 | 0.082 | | 0.095 |
| A2 | 2.41 | 2.54 | 2.67 | 0.095 | 0.100 | 0.105 |
| A3 | 0.64 | | 1.09 | 0.025 | | 0.043 |
| b | 0.41 | | 0.51 | 0.016 | | 0.020 |
| b2 | 0.66 | | 0.81 | 0.026 | | 0.032 |
| D | 20.82 | | 21.09 | 0.820 | | 0.830 |
| E | 8.38 | 8.51 | 8.64 | 0.330 | 0.335 | 0.340 |
| E1 | 7.49 | 7.62 | 7.75 | 0.295 | 0.300 | 0.305 |
| E2 | 6.48 | | 6.99 | 0.255 | | 0.275 |
| e | 1.27 | BSC. | 0.050 | BSC. | | |
| ZD | 0.95 | REF. | 0.037 | REF. | | |

NOTE :

1. CONTROLLING DIMENSION : MM
2. DIMENSION D AND E1 DO NOT INCLUDE MOLD PROTRUSION.
3. DIMENSION b2 DOES NOT INCLUDE DAMBAR PROTRUSION/INTRUSION.



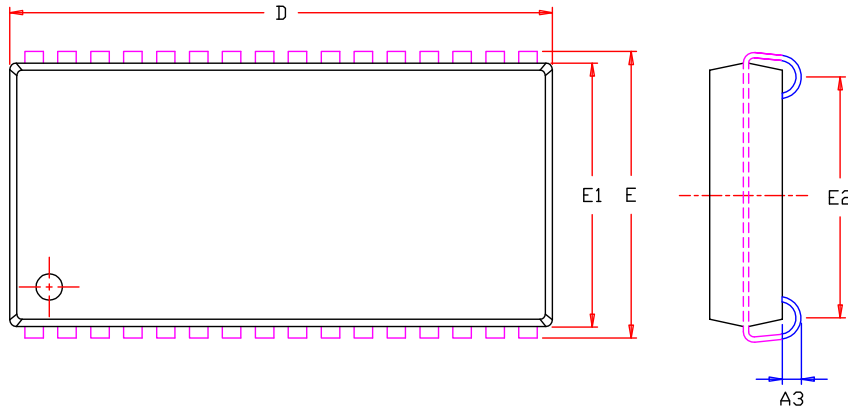
TITLE

32L 300mil SOJ
Package Outline

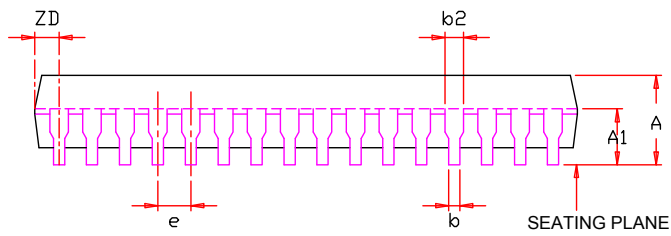
REV. C

DATE

08/14/2009



| SYMBOL | DIMENSION IN MM | | | DIMENSION IN INCH | | |
|--------|-----------------|-------|-------|-------------------|-------|-------|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. |
| A | 3.25 | | 3.76 | 0.128 | | 0.148 |
| A1 | 2.08 | | | 0.082 | | |
| A3 | 0.635 | | | 0.025 | | |
| b | 0.38 | | 0.51 | 0.015 | | 0.020 |
| b2 | 0.66 | 0.71 | 0.81 | 0.026 | 0.028 | 0.032 |
| D | 20.82 | 20.95 | 21.08 | 0.820 | 0.825 | 0.830 |
| E | 11.05 | 11.18 | 11.30 | 0.435 | 0.440 | 0.445 |
| E1 | 10.03 | 10.16 | 10.29 | 0.395 | 0.400 | 0.405 |
| E2 | 9.40 BSC | | | 0.370 BSC | | |
| e | 1.27 BSC. | | | 0.050 BSC. | | |
| ZD | 0.95 REF | | | 0.037 REF | | |

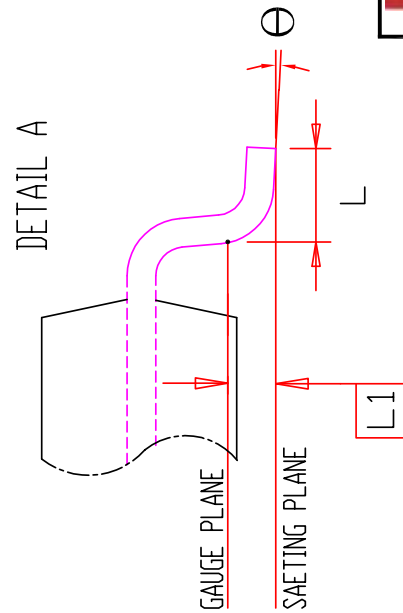
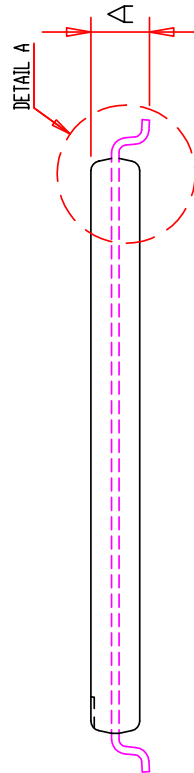
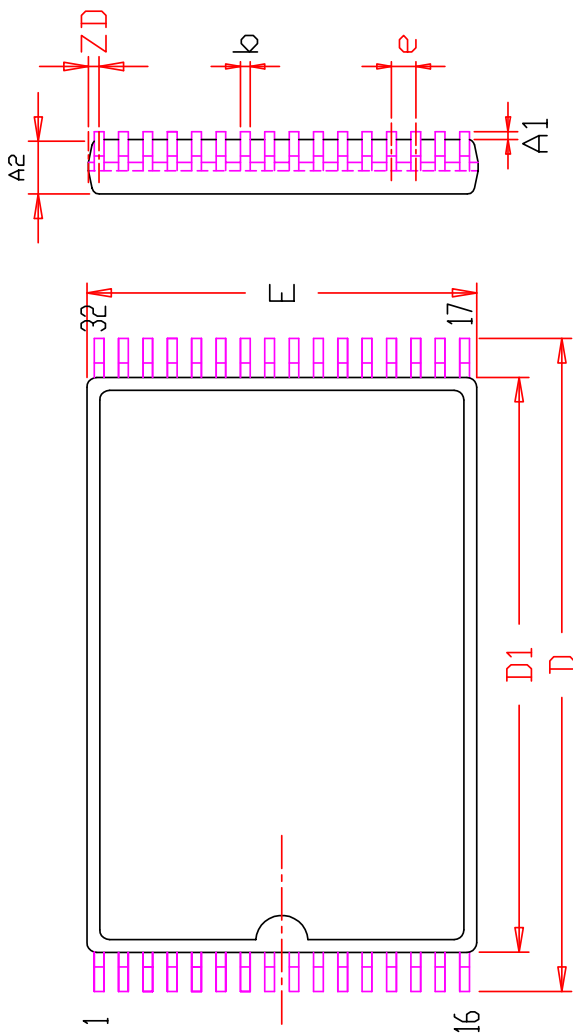


NOTE :

1. Controlling dimension : mm
2. Dimension D and E1 do not include mold protrusion .
3. Dimension b2 does not include dambar protrusion/intrusion.
4. Formed leads shall be planar with respect to one another within 0.1mm at the seating plane after final test.
5. Reference document : JEDEC SPEC MS-027.

| | | | | | | |
|-------------|-------|-----------------------------------|------|----------|------|------------|
| ISSI | TITLE | 32L 400mil SOJ Package Outline | REV. | E | DATE | 12/19/2007 |
|-------------|-------|-----------------------------------|------|----------|------|------------|





| SYMBOL | DIMENSION IN MM | | | DIMENSION IN INCH | | |
|--------|-----------------|-------|-------|-------------------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.95 | | 1.25 | 0.037 | | 0.049 |
| A1 | 0.05 | | 0.15 | 0.002 | | 0.008 |
| A2 | 0.90 | | 1.05 | 0.035 | | 0.041 |
| b | 0.16 | | 0.27 | 0.006 | | 0.011 |
| D | 13.10 | 13.40 | 13.70 | 0.516 | 0.528 | 0.539 |
| D1 | 11.70 | 11.80 | 11.90 | 0.461 | 0.465 | 0.469 |
| E | 7.90 | 8.00 | 8.10 | 0.311 | 0.315 | 0.319 |
| e | 0.50 BSC. | | | 0.020 BSC. | | |
| L | 0.30 | 0.50 | 0.70 | 0.012 | 0.020 | 0.028 |
| L1 | 0.25 BSC. | | | 0.010 BSC. | | |
| ZD | 0.25 REF. | | | 0.010 REF. | | |
| Θ | 0 | 3° | 5° | 0 | 3° | 5° |

NOTE :

1. CONTROLLING DIMENSION : MM
2. DIMENSION D1 AND E DO NOT INCLUDE MOLD PROTRUSION.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION/INTRUSION.
4. Reference Document : JEDEC MO-183



TITLE

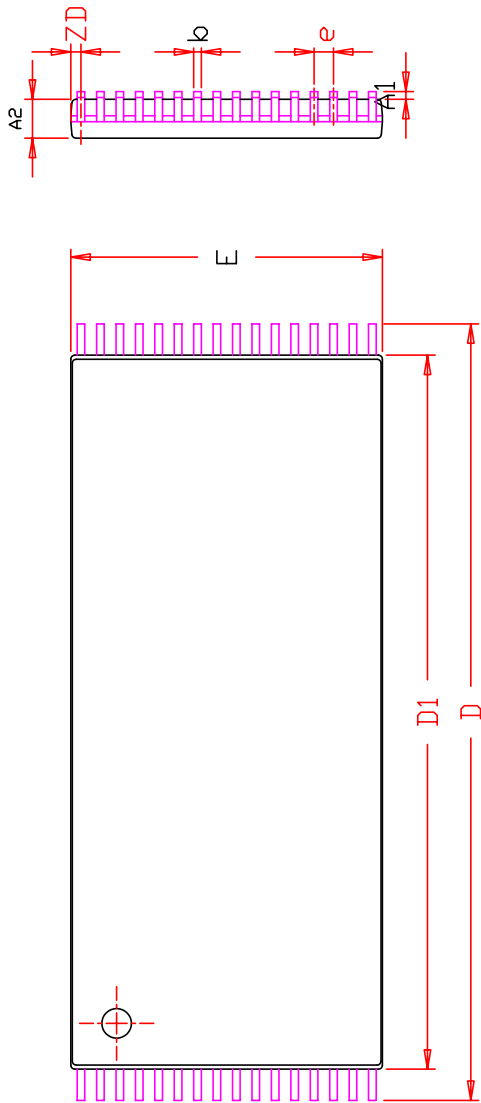
32L 8x13.4mm TSOP-1
Package Outline

REV.

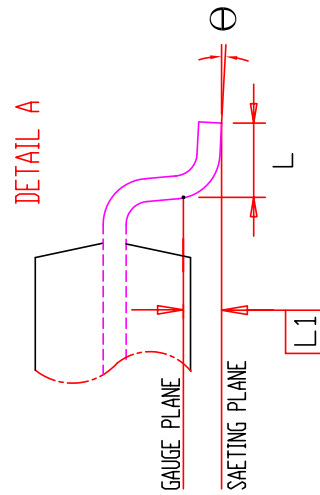
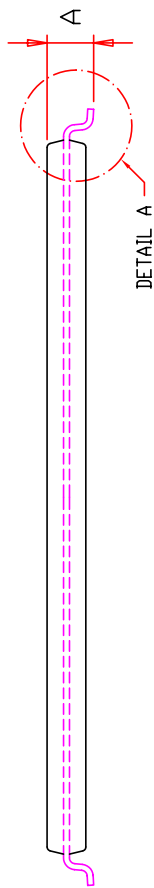
E

DATE

04/24/2009



| SYMBOL | DIMENSION IN MM | | |
|--------|-----------------|-------|-------|
| | MIN | NOM | MAX |
| A | 1.00 | | 1.20 |
| A1 | 0.05 | | 0.20 |
| A2 | 0.95 | 1.00 | 1.05 |
| b | 0.17 | | 0.27 |
| D | 19.80 | 20.00 | 20.20 |
| D1 | 18.30 | 18.40 | 18.50 |
| E | 7.80 | 8.00 | 8.20 |
| e | 0.50 BSC. | | |
| L | 0.40 | | 0.70 |
| L1 | 0.25 BSC. | | |
| ZD | 0.25 REF. | | |
| ∅ | 0 | 5° | 8° |



NOTE :

1. Controlling dimension : mm
2. Dimension D1 adn E do not include mold protrusion .
3. Dimension b does not include dambar protrusion/intrusion.
4. Formed leads shall be planar with respect to one another within 0.1mm at the seating plane after final test.

| | | | |
|-------|--------------------------------------|------|------------|
| ISSI® | TITLE | REV. | DATE |
| | 32L 8x20mm TSOP-1 Package Outline | E | 06/08/2006 |