# IS63LV1024
# IS63LV1024L

## 128K x 8 HIGH-SPEED CMOS STATIC RAM
## 3.3V REVOLUTIONARY PINOUT

**DECEMBER 2005**

### FEATURES

- High-speed access times:
  8, 10, 12 ns
- High-performance, low-power CMOS process
- Multiple center power and ground pins for greater noise immunity
- Easy memory expansion with $\overline{CE}$ and $\overline{OE}$ options
- $\overline{CE}$ power-down
- Fully static operation: no clock or refresh required
- TTL compatible inputs and outputs
- Single 3.3V power supply
- Packages available:
  - 32-pin 300-mil SOJ
  - 32-pin 400-mil SOJ
  - 32-pin TSOP (Type II)
  - 32-pin STSOP (Type I)
  - 36-pin BGA (8mmx10mm)
- Lead-free Available

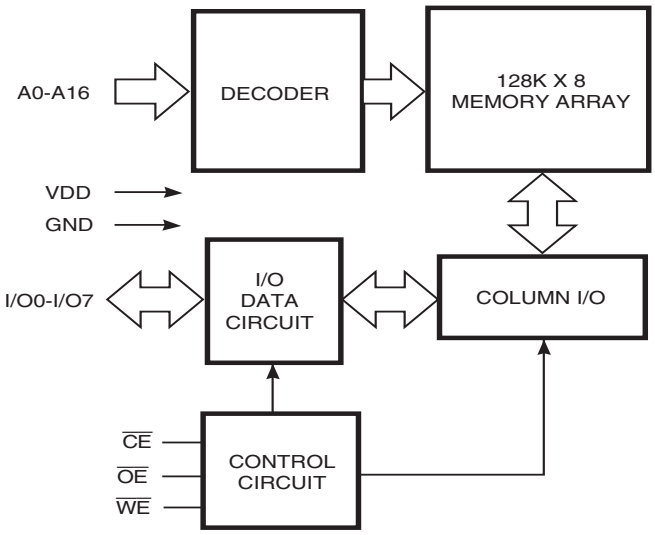
### DESCRIPTION

The *ISSI* IS63LV1024/IS63LV1024L is a very high-speed, low power, 131,072-word by 8-bit CMOS static RAM in revolutionary pinout. The IS63LV1024/IS63LV1024L is 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.

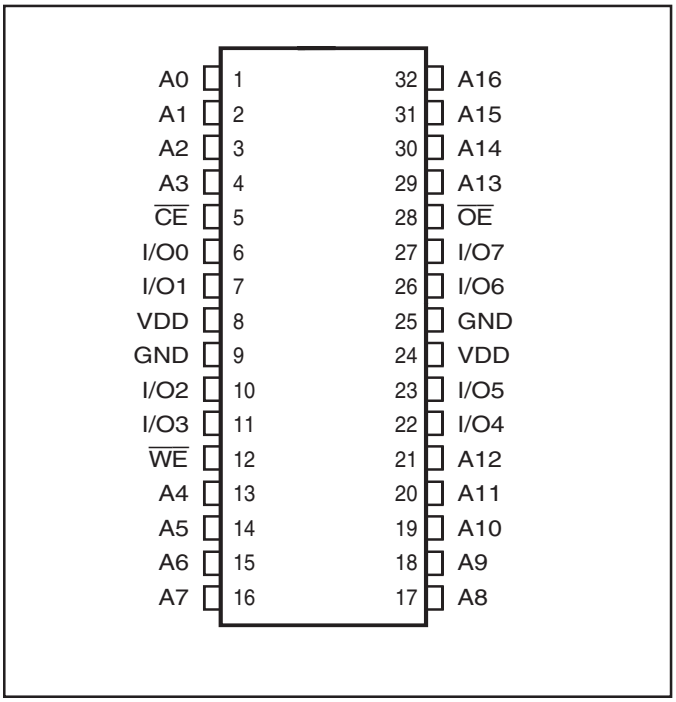
When $\overline{CE}$ is HIGH (deselected), the device assumes a standby mode at which the power dissipation can be reduced down to 250 µW (typical) with CMOS input levels.

The IS63LV1024/IS63LV1024L operates from a single 3.3V power supply and all inputs are TTL-compatible.

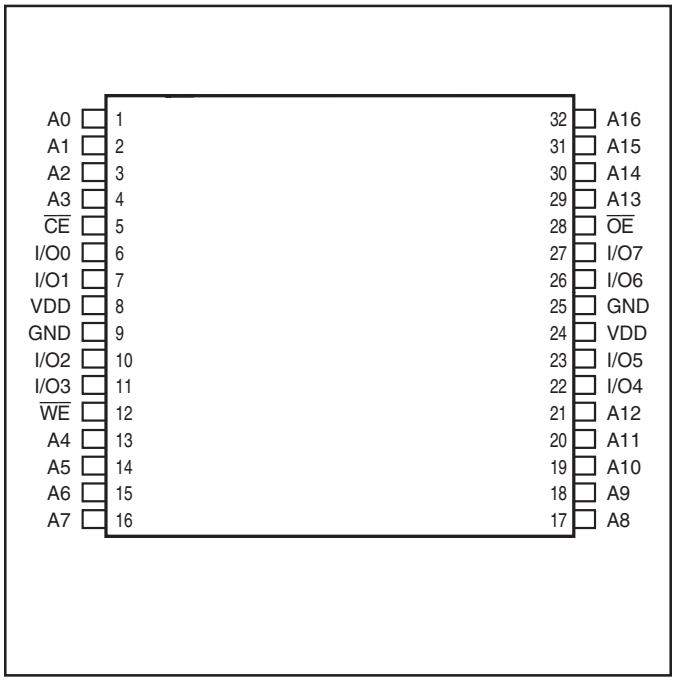
### FUNCTIONAL BLOCK DIAGRAM



## PIN CONFIGURATION
### 32-Pin SOJ



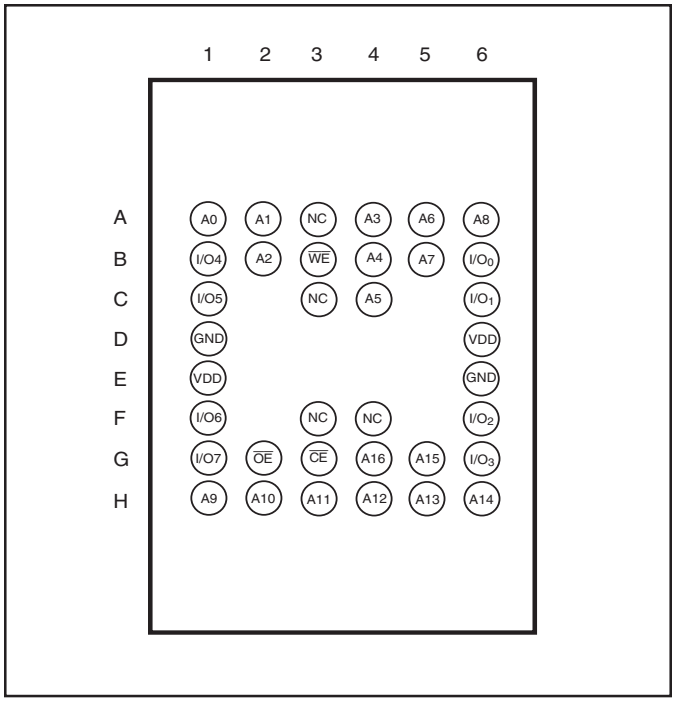

## PIN CONFIGURATION
### 32-Pin TSOP (Type II) (T)
### 32-Pin STSOP (Type I) (H)




## PIN DESCRIPTIONS

| | |
|---|---|
| A0-A16 | Address Inputs |
| $\overline{CE}$ | Chip Enable Input |
| $\overline{OE}$ | Output Enable Input |
| $\overline{WE}$ | Write Enable Input |
| I/O0-I/O7 | Data Inputs/Outputs |
| $V_{DD}$ | Power |
| GND | Ground |

## PIN CONFIGURATION
### 36-mini BGA (B) (8 mm x 10 mm)



## TRUTH TABLE

| Mode | $\overline{WE}$ | $\overline{CE}$ | $\overline{OE}$ | I/O Operation | $V_{DD}$ Current |
|---|---|---|---|---|---|
| Not Selected (Power-down) | X | H | X | High-Z | $I_{SB1}$, $I_{SB2}$ |
| Output Disabled | H | L | H | High-Z | $I_{CC1}$, $I_{CC2}$ |
| Read | H | L | L | $D_{OUT}$ | $I_{CC1}$, $I_{CC2}$ |
| Write | L | L | 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 $V_{DD}$ + 0.5 | V |
| $T_{STG}$ | Storage Temperature | –65 to +150 | °C |
| $P_T$ | Power Dissipation | 1.0 | W |

**Notes:**
1. Stress greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## OPERATING RANGE

| Range | Ambient Temperature | $V_{DD}$ |
|---|---|---|
| Commercial | 0°C to +70°C | 3.3V ± 0.3V |
| Industrial | –40°C to +85°C | 3.3V ± 0.15V |

## 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 | $V_{DD}$ + 0.3 | V |
| $V_{IL}$ | Input LOW Voltage[1] | | | –0.3 | 0.8 | V |
| $I_{LI}$ | Input Leakage | GND ≤ $V_{IN}$ ≤ $V_{DD}$ | Com.<br>Ind. | –1<br>–5 | 1<br>5 | µA |
| $I_{LO}$ | Output Leakage | GND ≤ $V_{OUT}$ ≤ $V_{DD}$, Outputs Disabled | Com.<br>Ind. | –1<br>–5 | 1<br>5 | µA |

**Notes:**
1. $V_{IL}$ = –3.0V for pulse width less than 10 ns.

## IS63LV1024 POWER SUPPLY CHARACTERISTICS[1] (Over Operating Range)

| Symbol | Parameter | Test Conditions | | -8 ns Min. | -8 ns Max. | -10 ns Min. | -10 ns Max. | -12 ns Min. | -12 ns Max. | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| $I_{CC1}$ | $V_{DD}$ Operating Supply Current | $V_{DD}$ = Max., $\overline{CE}$ = $V_{IL}$ | Com. | — | 160 | — | 150 | — | 130 | mA |
| | | $I_{OUT}$ = 0 mA, f = Max. | Ind. | — | 170 | — | 160 | — | 140 | |
| | | | typ.[2] | — | 105 | — | 95 | — | 75 | |
| | | | Ind. (@15 ns) | | | | | — | 90 | |
| $I_{SB}$ | TTL Standby Current (TTL Inputs) | $V_{DD}$ = Max., $V_{IN}$ = $V_{IH}$ or $V_{IL}$ $\overline{CE}$ ≥ $V_{IH}$, f = Max | Com. | — | 55 | — | 45 | — | 40 | mA |
| | | | Ind. | — | 55 | — | 45 | — | 40 | |
| $I_{SB1}$ | TTL Standby Current (TTL Inputs) | $V_{DD}$ = Max., $V_{IN}$ = $V_{IH}$ or $V_{IL}$ $\overline{CE}$ ≥ $V_{IH}$, f = 0 | Com. | — | 25 | — | 25 | — | 25 | mA |
| | | | Ind. | — | 30 | — | 30 | — | 30 | |
| $I_{SB2}$ | CMOS Standby Current (CMOS Inputs) | $V_{DD}$ = Max., $\overline{CE}$ ≥ $V_{DD}$ – 0.2V, $V_{IN}$ ≥ $V_{DD}$ – 0.2V, or $V_{IN}$ ≤ 0.2V, f = 0 | Com. | — | 5 | — | 5 | — | 5 | mA |
| | | | Ind. | — | 10 | — | 10 | — | 10 | |
| | | | typ.[2] | — | 0.5 | — | 0.5 | — | 0.5 | |

**Notes:**
1. At f = $f_{MAX}$, address and data inputs are cycling at the maximum frequency, f = 0 means no input lines change.
2. Typical values are measured at $V_{DD}$ = 3.3V, $T_A$ = 25°C. Not 100% tested.

## IS63LV1024L POWER SUPPLY CHARACTERISTICS[1] (Over Operating Range)

| Symbol | Parameter | Test Conditions | | -8 ns Min. | -8 ns Max. | -10 ns Min. | -10 ns Max. | -12 ns Min. | -12 ns Max. | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| $I_{CC1}$ | $V_{DD}$ Operating Supply Current | $V_{DD}$ = Max., $\overline{CE}$ = $V_{IL}$ | Com. | — | 100 | — | 95 | — | 90 | mA |
| | | $I_{OUT}$ = 0 mA, f = Max. | Ind. | — | 110 | — | 105 | — | 100 | |
| | | | typ.[2] | — | 75 | — | 70 | — | 65 | |
| $I_{SB}$ | TTL Standby Current (TTL Inputs) | $V_{DD}$ = Max., $V_{IN}$ = $V_{IH}$ or $V_{IL}$ $\overline{CE}$ ≥ $V_{IH}$, f = Max | Com. | — | 35 | — | 30 | — | 25 | mA |
| | | | Ind. | — | 40 | — | 35 | — | 30 | |
| $I_{SB1}$ | TTL Standby Current (TTL Inputs) | $V_{DD}$ = Max., $V_{IN}$ = $V_{IH}$ or $V_{IL}$ $\overline{CE}$ ≥ $V_{IH}$, f = 0 | Com. | — | 15 | — | 15 | — | 15 | mA |
| | | | Ind. | — | 20 | — | 20 | — | 20 | |
| $I_{SB2}$ | CMOS Standby Current (CMOS Inputs) | $V_{DD}$ = Max., $\overline{CE}$ ≥ $V_{DD}$ – 0.2V, $V_{IN}$ ≥ $V_{DD}$ – 0.2V, or $V_{IN}$ ≤ 0.2V, f = 0 | Com. | — | 1 | — | 1 | — | 1 | mA |
| | | | Ind. | — | 1.5 | — | 1.5 | — | 1.5 | |
| | | | typ.[2] | — | 0.05 | — | 0.05 | — | 0.05 | |

**Notes:**
1. At f = $f_{MAX}$, address and data inputs are cycling at the maximum frequency, f = 0 means no input lines change.
2. Typical values are measured at $V_{DD}$ = 3.3V, $T_A$ = 25°C. Not 100% tested.

## CAPACITANCE[1,2]

| Symbol | Parameter | Conditions | Max. | Unit |
|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance | $V_{IN}$ = 0V | 6 | pF |
| $C_{I/O}$ | Input/Output Capacitance | $V_{OUT}$ = 0V | 8 | 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, $V_{DD}$ = 3.3V.

## READ CYCLE SWITCHING CHARACTERISTICS[1] (Over Operating Range)

| Symbol | Parameter | -8 ns Min. | -8 ns Max. | -10 ns Min. | -10 ns Max. | -12 ns Min. | -12 ns Max. | Unit |
|---|---|---|---|---|---|---|---|---|
| $t_{RC}$ | Read Cycle Time | 8 | — | 10 | — | 12 | — | ns |
| $t_{AA}$ | Address Access Time | — | 8 | — | 10 | — | 12 | ns |
| $t_{OHA}$ | Output Hold Time | 2 | — | 2 | — | 2 | — | ns |
| $t_{ACE}$ | $\overline{CE}$ Access Time | — | 8 | — | 10 | — | 12 | ns |
| $t_{DOE}$ | $\overline{OE}$ Access Time | — | 4 | — | 5 | — | 6 | ns |
| $t_{LZOE}$[2] | $\overline{OE}$ to Low-Z Output | 0 | — | 0 | — | 0 | — | ns |
| $t_{HZOE}$[2] | $\overline{OE}$ to High-Z Output | 0 | 4 | 0 | 5 | 0 | 6 | ns |
| $t_{LZCE}$[2] | $\overline{CE}$ to Low-Z Output | 3 | — | 3 | — | 3 | — | ns |
| $t_{HZCE}$[2] | $\overline{CE}$ to High-Z Output | 0 | 4 | 0 | 5 | 0 | 6 | ns |
| $t_{PU}$ | $\overline{CE}$ to Power Up Time | 0 | — | 0 | — | 0 | — | ns |
| $t_{PD}$ | $\overline{CE}$ to Power Down Time | — | 8 | — | 10 | — | 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 loading specified in Figure 1.
2. Tested with the loading specified in Figure 2. Transition is measured ±500 mV from steady-state voltage. 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 Levels | 1.5V |
| Output Load | See Figures 1 and 2 |

## AC TEST LOADS

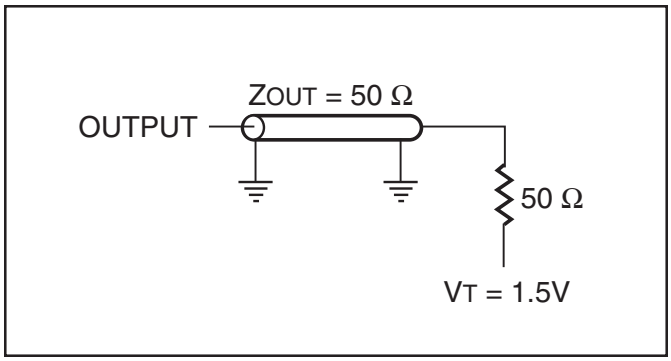



**Figure 1**

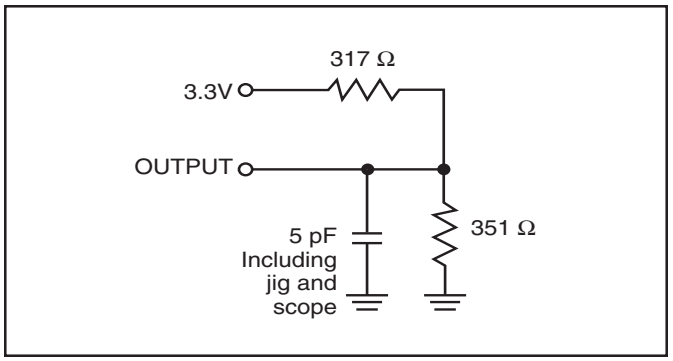
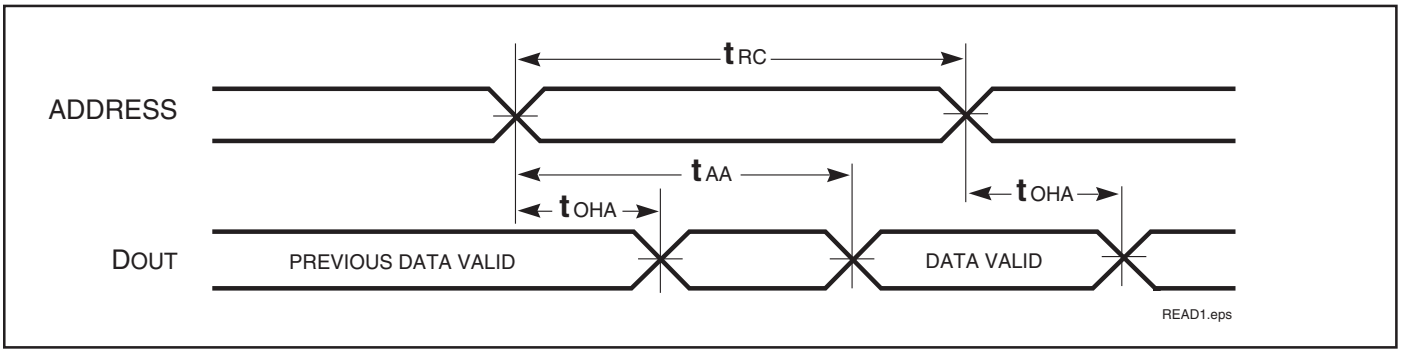


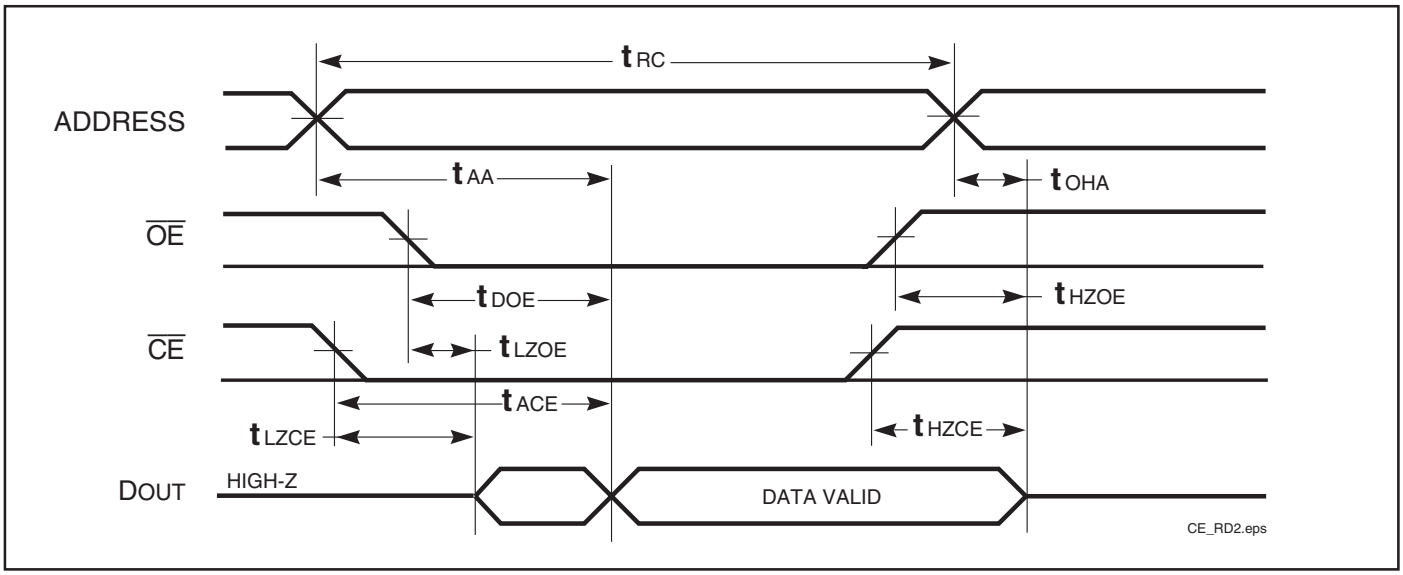

**Figure 2**

## 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. $\overline{OE}$, $\overline{CE}$ = $V_{IL}$.
3. Address is valid prior to or coincident with $\overline{CE}$ LOW transitions.

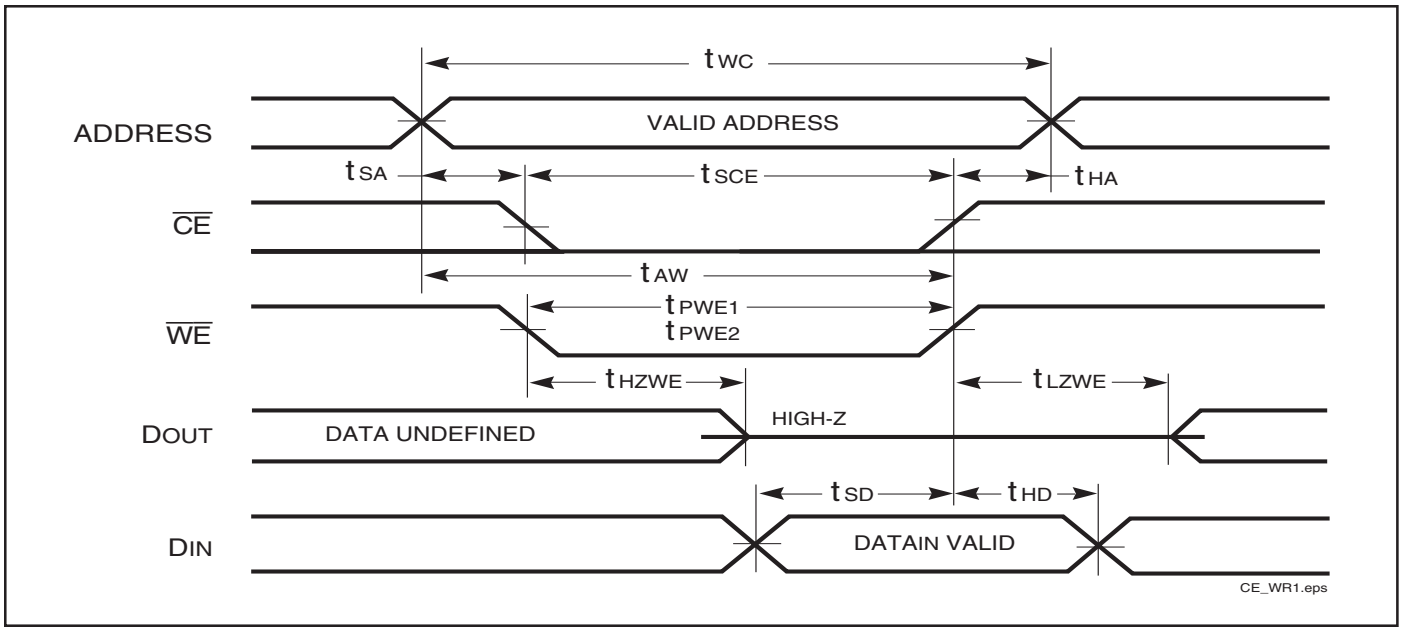
## WRITE CYCLE SWITCHING CHARACTERISTICS[1,3] (Over Operating Range)

| Symbol | Parameter | -8 ns Min. | -8 ns Max. | -10 ns Min. | -10 ns Max. | -12 ns Min. | -12 ns Max. | Unit |
|---|---|---|---|---|---|---|---|---|
| $t_{WC}$ | Write Cycle Time | 8 | — | 10 | — | 12 | — | ns |
| $t_{SCE}$ | $\overline{CE}$ to Write End | 7 | — | 7 | — | 8 | — | ns |
| $t_{AW}$ | Address Setup Time to Write End | 8 | — | 8 | — | 8 | — | ns |
| $t_{HA}$ | Address Hold from Write End | 0 | — | 0 | — | 0 | — | ns |
| $t_{SA}$ | Address Setup Time | 0 | — | 0 | — | 0 | — | ns |
| $t_{PWE_1}$[1] | $\overline{WE}$ Pulse Width ($\overline{OE}$ High) | 7 | — | 7 | — | 8 | — | ns |
| $t_{PWE_2}$[2] | $\overline{WE}$ Pulse Width ($\overline{OE}$ Low) | 8 | — | 10 | — | 12 | — | ns |
| $t_{SD}$ | Data Setup to Write End | 5 | — | 5 | — | 6 | — | ns |
| $t_{HD}$ | Data Hold from Write End | 0 | — | 0 | — | 0 | — | ns |
| $t_{HZWE}$[2] | $\overline{WE}$ LOW to High-Z Output | — | 4 | — | 5 | — | 6 | ns |
| $t_{LZWE}$[2] | $\overline{WE}$ HIGH to Low-Z Output | 3 | — | 3 | — | 3 | — | ns |

**Notes:**
1. Test conditions assume signal transition times of 3ns 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. The internal write time is defined by the overlap of $\overline{CE}$ LOW 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.

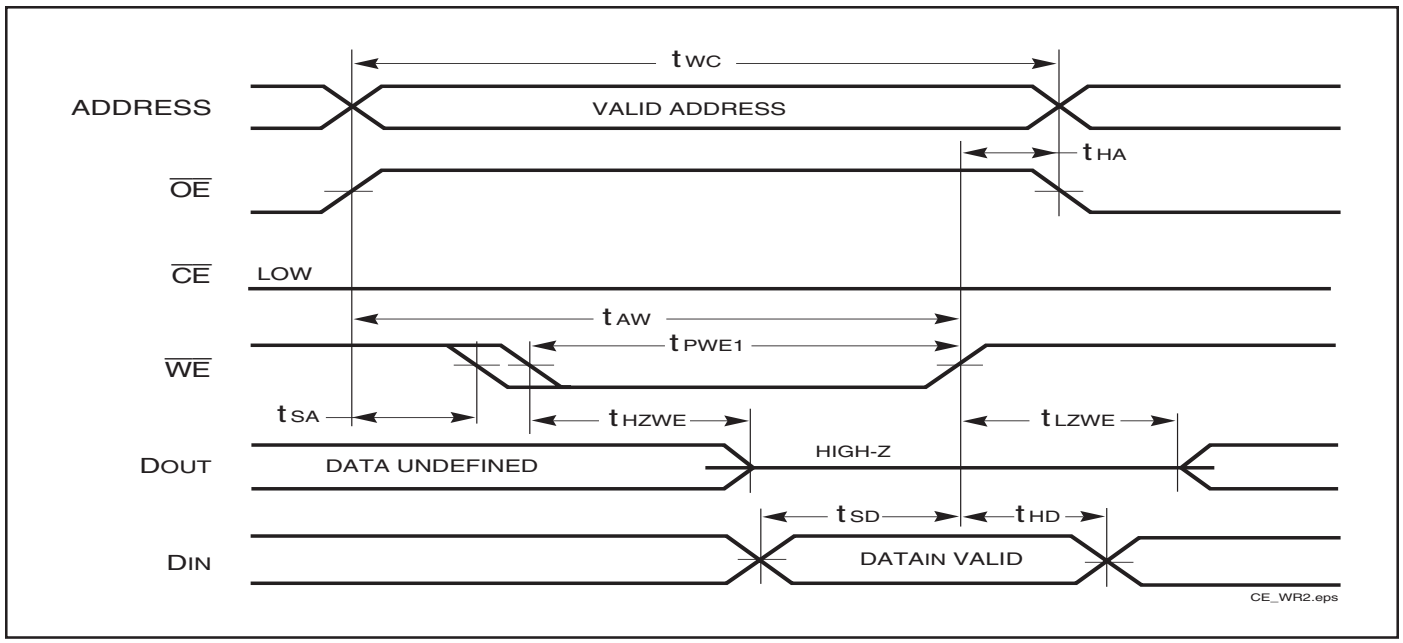
## AC WAVEFORMS

### WRITE CYCLE NO. 1[1,2] ($\overline{CE}$ Controlled, $\overline{OE}$ = HIGH or LOW)

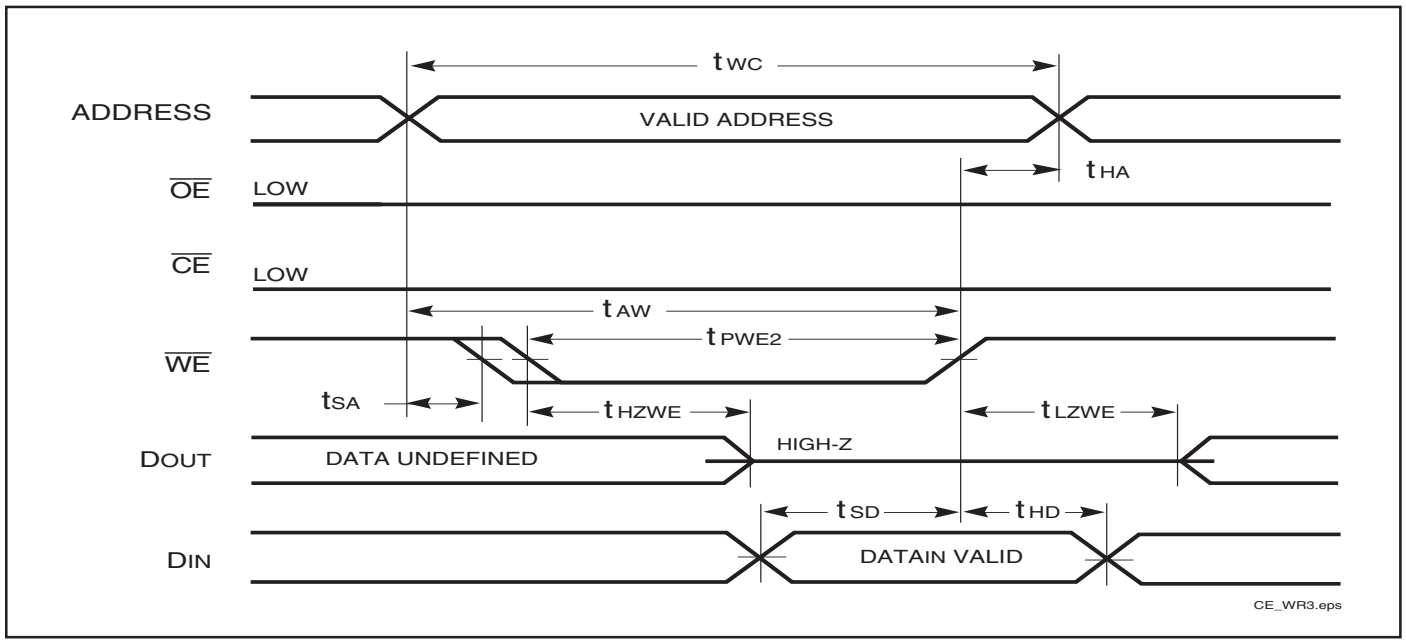


## AC WAVEFORMS

### WRITE CYCLE NO. 2[1] ($\overline{WE}$ Controlled, $\overline{OE}$ = HIGH during Write Cycle)




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



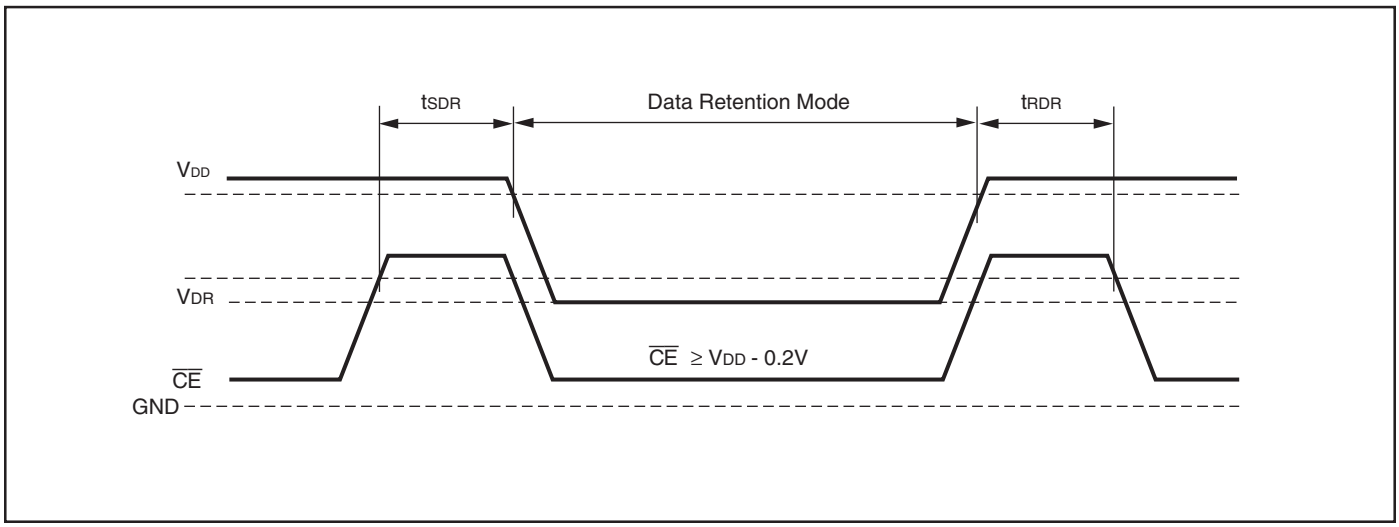

**Notes:**
1. The internal write time is defined by the overlap of $\overline{CE}$ LOW and $\overline{WE}$ LOW. All signals must be in valid states to initiate a Write, but any one can go inactive to terminate the Write. The Data Input Setup and Hold timing are referenced to the rising or falling edge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

## DATA RETENTION SWITCHING CHARACTERISTICS

| Symbol | Parameter | Test Condition | Options | Min. | Typ.(1) | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_{DR}$ | $V_{DD}$ for Data Retention | See Data Retention Waveform | | 2.0 | — | 3.6 | V |
| $I_{DR}$ | Data Retention Current | $V_{DD}$ = 2.0V, $\overline{CE} \geq V_{DD} - 0.2V$ | IS63LV1024 | — | 0.5 | 10 | mA |
| | | | IS63LV1024L | — | 0.05 | 1.5 | |
| $t_{SDR}$ | 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 $V_{DD}$ = 3.0V, $T_A$ = 25°C and not 100% tested.

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



## IS63LV1024 ORDERING INFORMATION

### Commercial Range: 0°C to +70°C

| Speed (ns) | Order Part No. | Package |
|---|---|---|
| 8 | IS63LV1024-8K | 400-mil Plastic SOJ |
| | IS63LV1024-8KL | 400-mil Plastic SOJ, Lead-free |
| 10 | IS63LV1024-10T | TSOP (Type II) |
| | IS63LV1024-10J | 300-mil Plastic SOJ |
| | IS63LV1024-10K | 400-mil Plastic SOJ |
| 12 | IS63LV1024-12T | TSOP (Type II) |
| | IS63LV1024-12J | 300-mil Plastic SOJ |
| | IS63LV1024-12KL | 400-mil Plastic SOJ, Lead-free |

### Industrial Range: –40°C to +85°C

| Speed (ns) | Order Part No. | Package |
|---|---|---|
| 8 | IS63LV1024-8KI | 400-mil Plastic SOJ |
| 10 | IS63LV1024-10KI | 400-mil Plastic SOJ |
| 12 | IS63LV1024-12TI | TSOP (Type II) |

## IS63LV1024L ORDERING INFORMATION

### Commercial Range: 0°C to +70°C

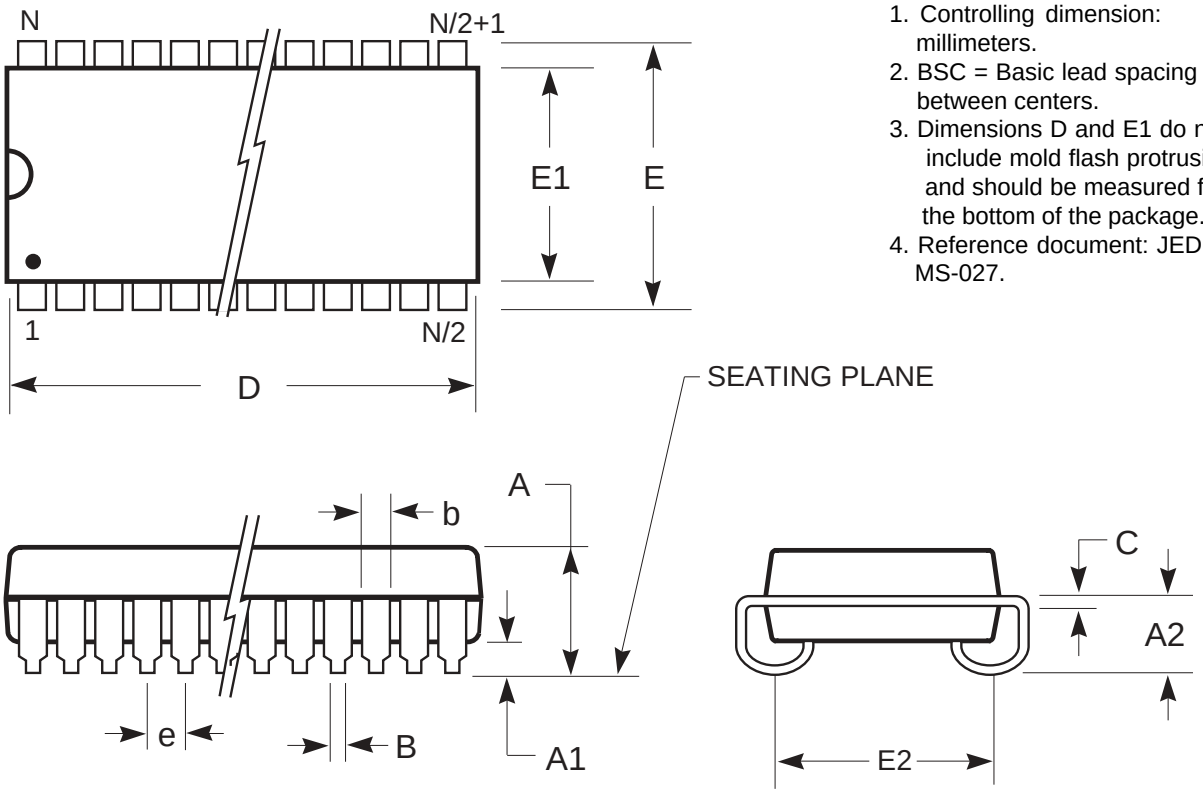
| Speed (ns) | Order Part No. | Package |
|---|---|---|
| 8 | IS63LV1024L-8T | TSOP (Type II) |
| | IS63LV1024L-8B | mBGA (8mmx10mm) |
| 10 | IS63LV1024L-10T | TSOP (Type II) |
| | IS63LV1024L-10TL | TSOP (Type II), Lead-free |
| | IS63LV1024L-10HL | sTSOP (Type I) (8mm x13.4mm), Lead-free |
| 12 | IS63LV1024L-12T | TSOP (Type II) |
| | IS63LV1024L-12H | sTSOP (Type I) (8mm x13.4mm) |
| | IS63LV1024L-12J | 300-mil Plastic SOJ |
| | IS63LV1024L-12JL | 300-mil Plastic SOJ, Lead-free |
| | IS63LV1024L-12B | mBGA (8mmx10mm) |

### Industrial Range: –40°C to +85°C

| Speed (ns) | Order Part No. | Package |
|---|---|---|
| 8 | IS63LV1024L-8TI | TSOP (Type II) |
| | IS63LV1024L-8JI | 300-mil Plastic SOJ |
| | IS63LV1024L-8KI | 400-mil Plastic SOJ |
| | IS63LV1024L-8BI | mBGA (8mmx10mm) |
| 10 | IS63LV1024L-10HI | sTSOP (Type I) (8mm x13.4mm) |
| | IS63LV1024L-10JLI | 300-mil Plastic SOJ, Lead-free |
| | IS63LV1024L-10KLI | 400-mil Plastic SOJ, Lead-free |
| | IS63LV1024L-10TLI | TSOP (Type II), Lead-free |
| 12 | IS63LV1024L-12BI | mBGA (8mmx10mm) |
| | IS63LV1024L-12BLI | mBGA (8mmx10mm), Lead-free |

# PACKAGING INFORMATION

**400-mil Plastic SOJ**
**Package Code: K**



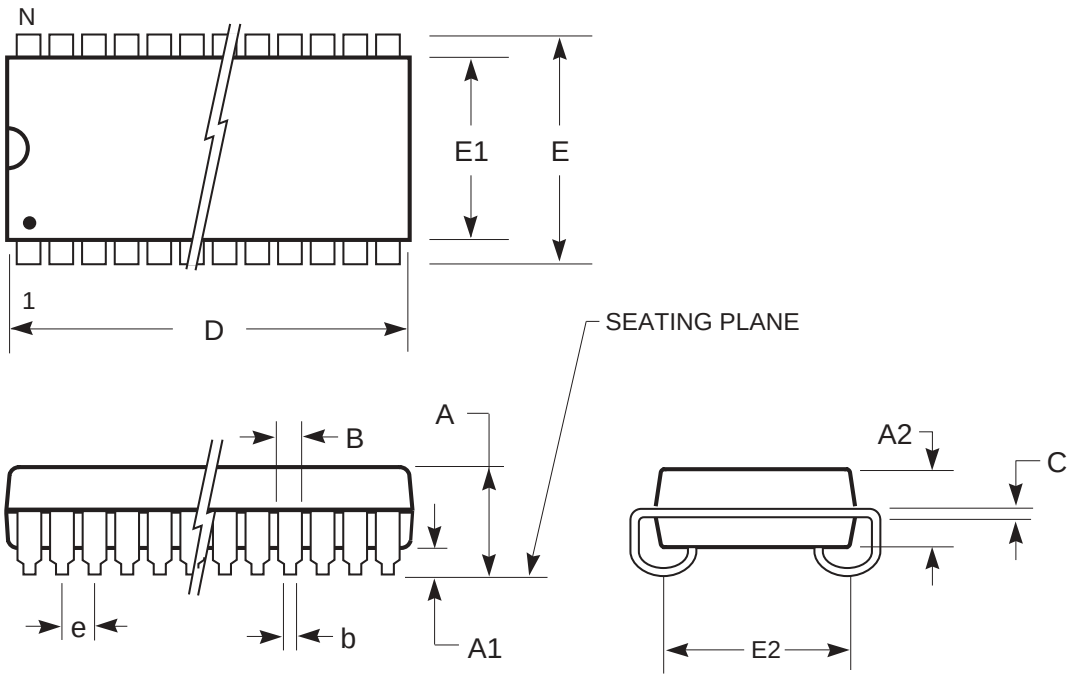

**Notes:**
1. Controlling dimension: millimeters.
2. BSC = Basic lead spacing between centers.
3. Dimensions D and E1 do not include mold flash protrusions and should be measured from the bottom of the package.
4. Reference document: JEDEC MS-027.

| | Millimeters | | Inches | | Millimeters | | Inches | | Millimeters | | Inches | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** |
| No. Leads (N) | | **28** | | | | **32** | | | | **36** | | |
| A | 3.25 | 3.75 | 0.128 | 0.148 | 3.25 | 3.75 | 0.128 | 0.148 | 3.25 | 3.75 | 0.128 | 0.148 |
| A1 | 0.64 | — | 0.025 | — | 0.64 | — | 0.025 | — | 0.64 | — | 0.025 | — |
| A2 | 2.08 | — | 0.082 | — | 2.08 | — | 0.082 | — | 2.08 | — | 0.082 | — |
| B | 0.38 | 0.51 | 0.015 | 0.020 | 0.38 | 0.51 | 0.015 | 0.020 | 0.38 | 0.51 | 0.015 | 0.020 |
| b | 0.66 | 0.81 | 0.026 | 0.032 | 0.66 | 0.81 | 0.026 | 0.032 | 0.66 | 0.81 | 0.026 | 0.032 |
| C | 0.18 | 0.33 | 0.007 | 0.013 | 0.18 | 0.33 | 0.007 | 0.013 | 0.18 | 0.33 | 0.007 | 0.013 |
| D | 18.29 | 18.54 | 0.720 | 0.730 | 20.82 | 21.08 | 0.820 | 0.830 | 23.37 | 23.62 | 0.920 | 0.930 |
| E | 11.05 | 11.30 | 0.435 | 0.445 | 11.05 | 11.30 | 0.435 | 0.445 | 11.05 | 11.30 | 0.435 | 0.445 |
| E1 | 10.03 | 10.29 | 0.395 | 0.405 | 10.03 | 10.29 | 0.395 | 0.405 | 10.03 | 10.29 | 0.395 | 0.405 |
| E2 | 9.40 BSC | | 0.370 BSC | | 9.40 BSC | | 0.370 BSC | | 9.40 BSC | | 0.370 BSC | |
| e | 1.27 BSC | | 0.050 BSC | | 1.27 BSC | | 0.050 BSC | | 1.27 BSC | | 0.050 BSC | |

| | Millimeters | | Inches | | Millimeters | | Inches | | Millimeters | | Inches | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Symbol | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max |
| No. Leads (N) | | 40 | | | | 42 | | | | 44 | | |
| A | 3.25 | 3.75 | 0.128 | 0.148 | 3.25 | 3.75 | 0.128 | 0.148 | 3.25 | 3.75 | 0.128 | 0.148 |
| A1 | 0.64 | — | 0.025 | — | 0.64 | — | 0.025 | — | 0.64 | — | 0.025 | — |
| A2 | 2.08 | — | 0.082 | — | 2.08 | — | 0.082 | — | 2.08 | — | 0.082 | — |
| B | 0.38 | 0.51 | 0.015 | 0.020 | 0.38 | 0.51 | 0.015 | 0.020 | 0.38 | 0.51 | 0.015 | 0.020 |
| b | 0.66 | 0.81 | 0.026 | 0.032 | 0.66 | 0.81 | 0.026 | 0.032 | 0.66 | 0.81 | 0.026 | 0.032 |
| C | 0.18 | 0.33 | 0.007 | 0.013 | 0.18 | 0.33 | 0.007 | 0.013 | 0.18 | 0.33 | 0.007 | 0.013 |
| D | 25.91 | 26.16 | 1.020 | 1.030 | 27.18 | 27.43 | 1.070 | 1.080 | 28.45 | 28.70 | 1.120 | 1.130 |
| E | 11.05 | 11.30 | 0.435 | 0.445 | 11.05 | 11.30 | 0.435 | 0.445 | 11.05 | 11.30 | 0.435 | 0.445 |
| E1 | 10.03 | 10.29 | 0.395 | 0.405 | 10.03 | 10.29 | 0.395 | 0.405 | 10.03 | 10.29 | 0.395 | 0.405 |
| E2 | 9.40 BSC | | 0.370 BSC | | 9.40 BSC | | 0.370 BSC | | 9.40 BSC | | 0.370 BSC | |
| e | 1.27 BSC | | 0.050 BSC | | 1.27 BSC | | 0.050 BSC | | 1.27 BSC | | 0.050 BSC | |

# PACKAGING INFORMATION

## 300-mil Plastic SOJ
## Package Code: J




| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| **Sym.** | **Min.** | **Typ.** | **Max.** | **Min.** | **Typ.** | **Max.** |
| N0. Leads | | **24/26** | | | | |
| A | — | — | 3.56 | — | — | 0.140 |
| A1 | 0.64 | — | — | 0.025 | — | — |
| A2 | 2.41 | — | 2.67 | 0.095 | — | 0.105 |
| b | 0.41 | — | 0.51 | 0.016 | — | 0.020 |
| B | 0.66 | — | 0.81 | 0.026 | — | 0.032 |
| C | 0.20 | — | 0.25 | 0.008 | — | 0.010 |
| D | 17.02 | — | 17.27 | 0.670 | — | 0.680 |
| E | 8.26 | — | 8.76 | 0.325 | — | 0.345 |
| E1 | 7.49 | — | 7.75 | 0.295 | — | 0.305 |
| E2 | 6.27 | — | 7.29 | 0.247 | — | 0.287 |
| e | 1.27 BSC | | | 0.050 BSC | | |

**Notes:**
1. Controlling dimension: inches, unless otherwise specified.
2. BSC = Basic lead spacing between centers.
3. Dimensions D and E1 do not include mold flash protrusions and should be measured from the bottom of the package.
4. Formed leads shall be planar with respect to one another within 0.004 inches at the seating plane.

# PACKAGING INFORMATION

ISSI®

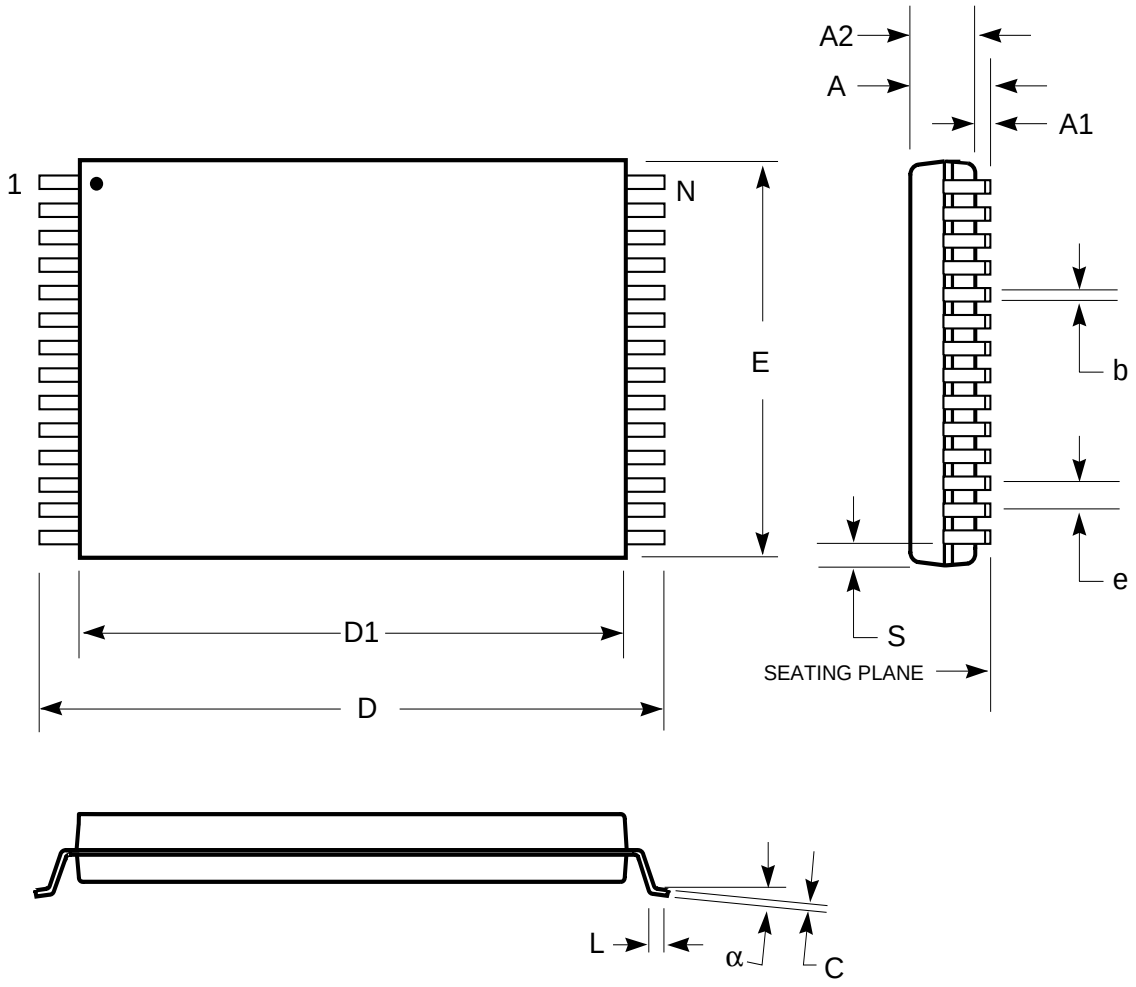
## 300-mil Plastic SOJ
## Package Code: J

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| **Sym.** | **Min.** | **Typ.** | **Max.** | **Min.** | **Typ.** | **Max.** |
| N0. Leads | | **28** | | | | |
| A | — | — | 3.56 | — | — | 0.140 |
| A1 | 0.64 | — | — | 0.025 | — | — |
| A2 | 2.41 | — | 2.67 | 0.095 | — | 0.105 |
| b | 0.41 | — | 0.51 | 0.016 | — | 0.020 |
| B | 0.66 | — | 0.81 | 0.026 | — | 0.032 |
| C | 0.20 | — | 0.25 | 0.008 | — | 0.010 |
| D | 18.29 | — | 18.54 | 0.720 | — | 0.730 |
| E | 8.26 | — | 8.76 | 0.325 | — | 0.345 |
| E1 | 7.49 | — | 7.75 | 0.295 | — | 0.305 |
| E2 | 6.27 | — | 7.29 | 0.247 | — | 0.287 |
| e | 1.27 BSC | | | 0.050 BSC | | |

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| **Sym.** | **Min.** | **Typ.** | **Max.** | **Min.** | **Typ.** | **Max.** |
| N0. Leads | | **32** | | | | |
| A | — | — | 3.56 | — | — | 0.140 |
| A1 | 0.64 | — | — | 0.025 | — | — |
| A2 | 2.41 | — | 2.67 | 0.095 | — | 0.105 |
| b | 0.41 | — | 0.51 | 0.016 | — | 0.020 |
| B | 0.66 | — | 0.81 | 0.026 | — | 0.032 |
| C | 0.20 | — | 0.25 | 0.008 | — | 0.010 |
| D | 20.83 | — | 21.08 | 0.820 | — | 0.830 |
| E | 8.26 | — | 8.76 | 0.325 | — | 0.345 |
| E1 | 7.49 | — | 7.75 | 0.295 | — | 0.305 |
| E2 | 6.27 | — | 7.29 | 0.247 | — | 0.287 |
| e | 1.27 BSC | | | 0.050 BSC | | |

# PACKAGING INFORMATION

**Plastic STSOP - 32 pins**
**Package Code: H (Type I)**

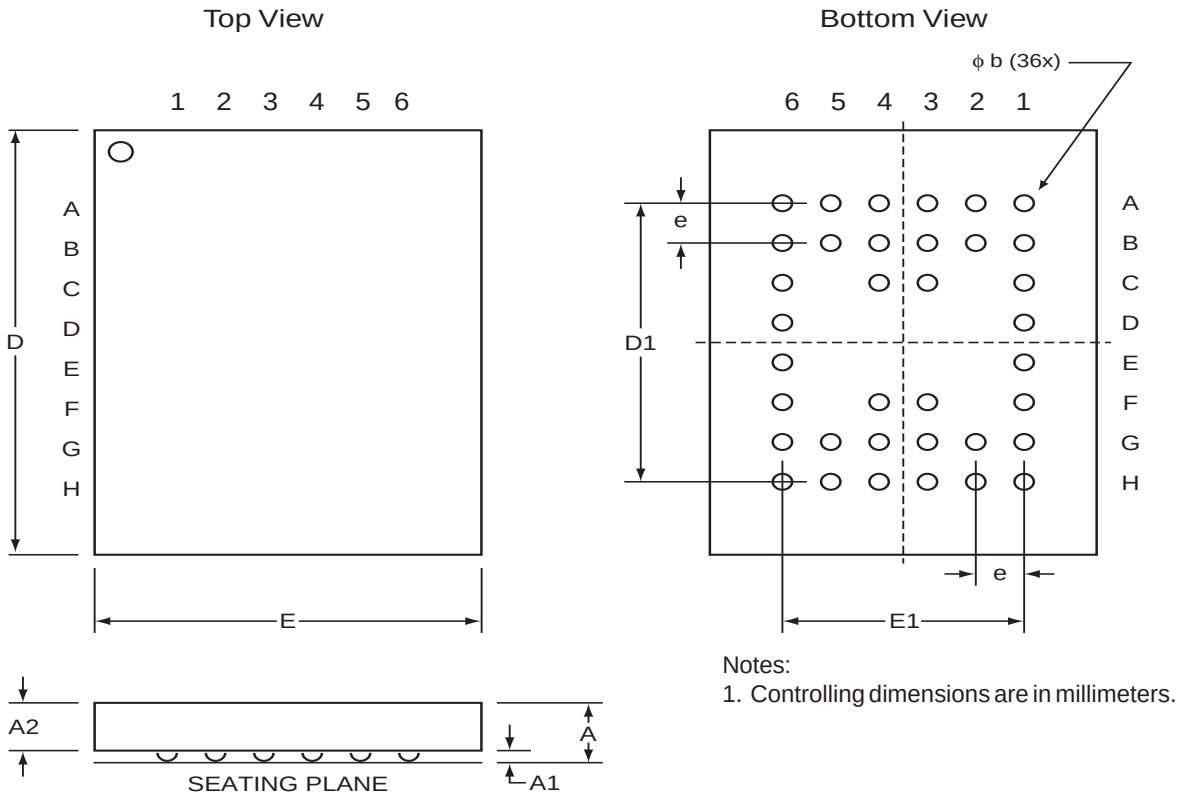



| Plastic STSOP (H - Type I) | | | | |
|---|---|---|---|---|
| | Millimeters | | Inches | |
| Symbol | Min | Max | Min | Max |
| Ref. Std. | | | | |
| N | | 32 | | |
| A | — | 1.25 | — | 0.049 |
| A1 | 0.05 | — | 0.002 | — |
| A2 | 0.95 | 1.05 | 0.037 | 0.041 |
| b | 0.17 | 0.23 | 0.007 | 0.009 |
| C | 0.14 | 0.16 | 0.0055 | 0.0063 |
| D | 13.20 | 13.60 | 0.520 | 0.535 |
| D1 | 11.70 | 11.90 | 0.461 | 0.469 |
| E | 7.90 | 8.10 | 0.311 | 0.319 |
| e | 0.50 BSC | | 0.020 BSC | |
| L | 0.30 | 0.70 | 0.012 | 0.028 |
| S | 0.28 Typ. | | 0.011 Typ. | |
| α | 0° | 5° | 0° | 5° |

**Notes:**
1. Controlling dimension: millimeters, unless otherwise specified.
2. BSC = Basic lead spacing between centers.
3. Dimensions D1 and E do not include mold flash protrusions and should be measured from the bottom of the package.
4. Formed leads shall be planar with respect to one another within 0.004 inches at the seating plane.

# PACKAGING INFORMATION

## Mini Ball Grid Array
## Package Code: B (36-pin)




Notes:
1. Controlling dimensions are in millimeters.

### mBGA - 6mm x 8mm

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| Sym. | Min. | Typ. | Max. | Min. | Typ. | Max. |
| N0. Leads | | 36 | | | 36 | |
| A | — | — | 1.20 | — | — | 0.047 |
| A1 | 0.24 | — | 0.30 | 0.009 | — | 0.012 |
| A2 | 0.60 | — | — | 0.024 | — | — |
| D | 7.90 | 8.00 | 8.10 | 0.311 | 0.315 | 0.319 |
| D1 | | 5.25BSC | | | 0.207BSC | |
| E | 5.90 | 6.00 | 6.10 | 0.232 | 0.236 | 0.240 |
| E1 | | 3.75BSC | | | 0.148BSC | |
| e | | 0.75BSC | | | 0.030BSC | |
| b | 0.30 | 0.35 | 0.40 | 0.012 | 0.014 | 0.016 |

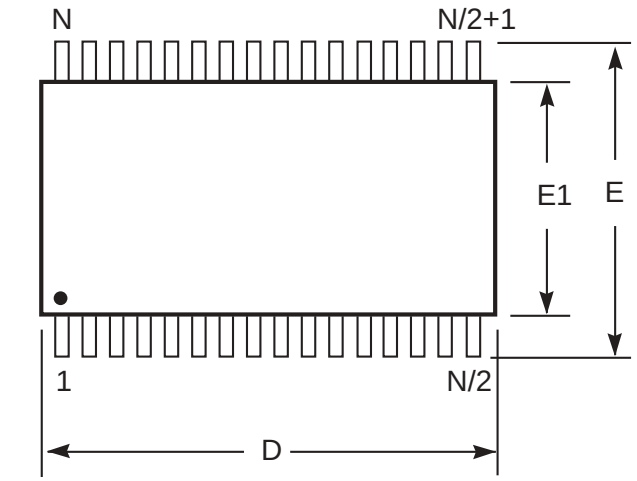
### mBGA - 8mm x 10mm

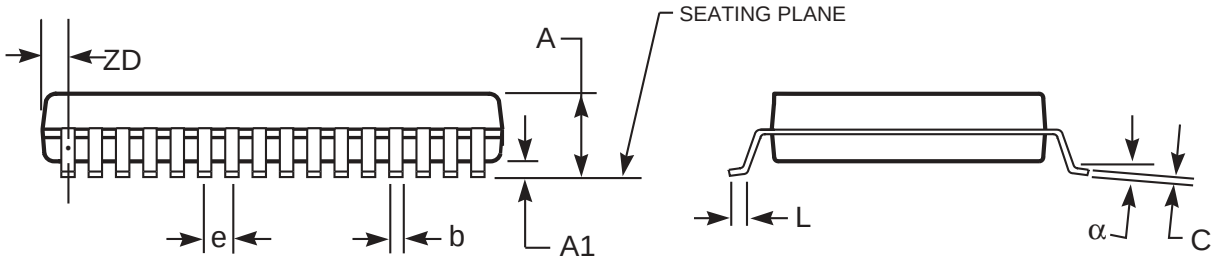
| | MILLIMETER | | | INCHES | | |
|---|---|---|---|---|---|---|
| Sym. | Min. | Typ. | Max. | Min. | Typ. | Max. |
| N0. Leads | | 36 | | | 36 | |
| A | — | — | 1.20 | — | — | 0.047 |
| A1 | 0.24 | — | 0.30 | 0.009 | — | 0.012 |
| A2 | 0.60 | — | — | 0.024 | — | — |
| D | 9.90 | 10.00 | 10.10 | 0.390 | 0.394 | 0.398 |
| D1 | | 5.25BSC | | | .207BSC | |
| E | 7.90 | 8.00 | 8.10 | 0.311 | 0.315 | 0.319 |
| E1 | | 3.75BSC | | | 0.148BSC | |
| e | | 0.75BSC | | | 0.030BSC | |
| b | 0.30 | 0.35 | 0.40 | 0.012 | 0.014 | 0.016 |

# PACKAGING INFORMATION

ISSI®

**Plastic TSOP**
**Package Code: T (Type II)**




**Notes:**
1. Controlling dimension: millimieters, unless otherwise specified.
2. BSC = Basic lead spacing between centers.
3. Dimensions D and E1 do not include mold flash protrusions and should be measured from the bottom of the package.
4. Formed leads shall be planar with respect to one another within 0.004 inches at the seating plane.

**Plastic TSOP (T - Type II)**

| | Millimeters | | Inches | | Millimeters | | Inches | | Millimeters | | Inches | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Symbol** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** |
| Ref. Std. | | | | | | | | | | | | |
| No. Leads (N) | | **32** | | | | **44** | | | | **50** | | |
| A | — | 1.20 | — | 0.047 | — | 1.20 | — | 0.047 | — | 1.20 | — | 0.047 |
| A1 | 0.05 | 0.15 | 0.002 | 0.006 | 0.05 | 0.15 | 0.002 | 0.006 | 0.05 | 0.15 | 0.002 | 0.006 |
| b | 0.30 | 0.52 | 0.012 | 0.020 | 0.30 | 0.45 | 0.012 | 0.018 | 0.30 | 0.45 | 0.012 | 0.018 |
| C | 0.12 | 0.21 | 0.005 | 0.008 | 0.12 | 0.21 | 0.005 | 0.008 | 0.12 | 0.21 | 0.005 | 0.008 |
| D | 20.82 | 21.08 | 0.820 | 0.830 | 18.31 | 18.52 | 0.721 | 0.729 | 20.82 | 21.08 | 0.820 | 0.830 |
| E1 | 10.03 | 10.29 | 0.391 | 0.400 | 10.03 | 10.29 | 0.395 | 0.405 | 10.03 | 10.29 | 0.395 | 0.405 |
| E | 11.56 | 11.96 | 0.451 | 0.466 | 11.56 | 11.96 | 0.455 | 0.471 | 11.56 | 11.96 | 0.455 | 0.471 |
| e | 1.27 BSC | | 0.050 BSC | | 0.80 BSC | | 0.032 BSC | | 0.80 BSC | | 0.031 BSC | |
| L | 0.40 | 0.60 | 0.016 | 0.024 | 0.41 | 0.60 | 0.016 | 0.024 | 0.40 | 0.60 | 0.016 | 0.024 |
| ZD | 0.95 REF | | 0.037 REF | | 0.81 REF | | 0.032 REF | | 0.88 REF | | 0.035 REF | |
| α | 0° | 5° | 0° | 5° | 0° | 5° | 0° | 5° | 0° | 5° | 0° | 5° |