

W241024A



128K × 8 HIGH SPEED CMOS STATIC RAM

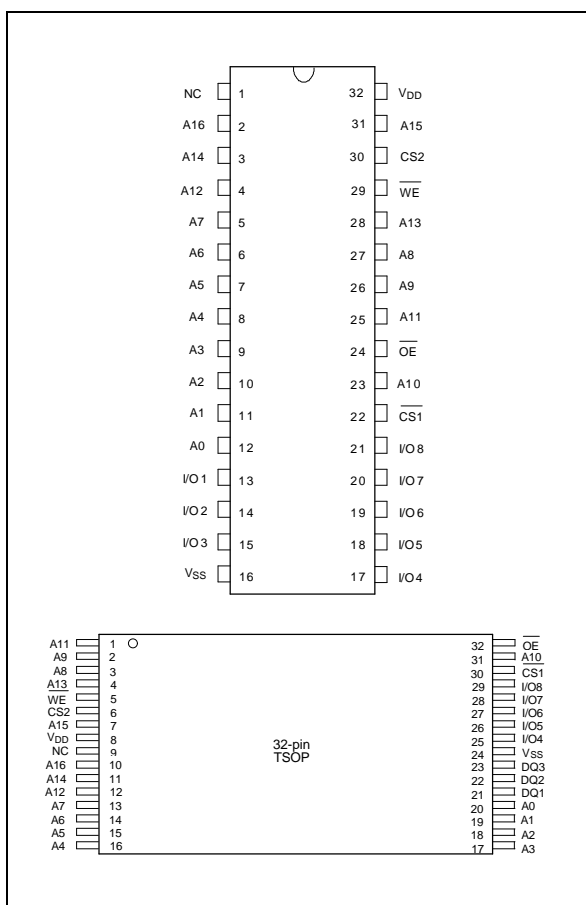
GENERAL DESCRIPTION

The W241024A is a high speed, low power CMOS static RAM organized as 131072 × 8 bits that operates on a single 5-volt power supply. This device is manufactured using Winbond's high performance CMOS technology.

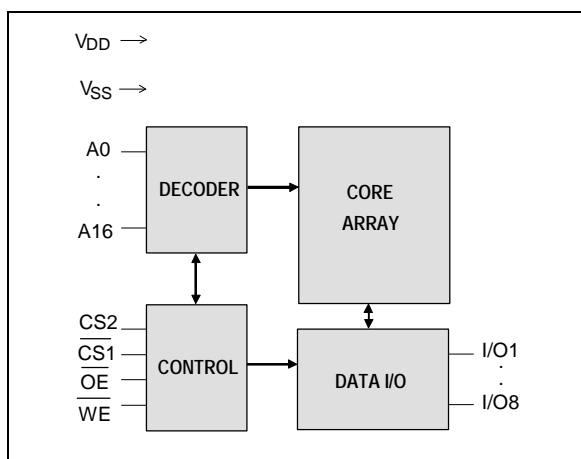
FEATURES

- High speed access time: 12/15/20 nS (max.)
- Low power consumption:
 - Active: 600 mW (typ.)
- Single +5V power supply
- Fully static operation
- All inputs and outputs directly TTL compatible
- Three-state outputs
- Available packages: 32-pin 300 mil SOJ, 400 mil SOJ, skinny DIP and standard type one TSOP (8 mm × 20 mm), and small type one TSOP (8 mm × 13.4 mm)

PIN CONFIGURATIONS



BLOCK DIAGRAM



PIN DESCRIPTION

| SYMBOL | DESCRIPTION |
|-------------------------------------|---------------------|
| A0–A16 | Address Inputs |
| I/O1–I/O8 | Data Inputs/Outputs |
| $\overline{CS1}$, $\overline{CS2}$ | Chip Select Inputs |
| \overline{WE} | Write Enable Input |
| \overline{OE} | Output Enable Input |
| VDD | Power Supply |
| VSS | Ground |
| NC | No Connection |

TRUTH TABLE

| $\overline{CS1}$ | CS2 | \overline{OE} | \overline{WE} | MODE | I/O1- I/O8 | VDD CURRENT |
|------------------|-----|-----------------|-----------------|----------------|------------|-------------|
| H | X | X | X | Not Selected | High Z | ISB, ISB1 |
| X | L | X | X | Not Selected | High Z | ISB, ISB1 |
| L | H | H | H | Output Disable | High Z | IDD |
| L | H | L | H | Read | Data Out | IDD |
| L | H | X | L | Write | Data In | IDD |

DC CHARACTERISTICS

Absolute Maximum Ratings

| PARAMETER | RATING | UNIT |
|---------------------------------|------------------|------|
| Supply Voltage to Vss Potential | -0.5 to +7.0 | V |
| Input/Output to Vss Potential | -0.5 to VDD +0.5 | V |
| Allowable Power Dissipation | 1.0 | W |
| Storage Temperature | -65 to +150 | °C |
| Operating Temperature | 0 to +70 | °C |

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

Operating Characteristics

(VDD = 5V ±10%, Vss = 0V, TA = 0 to 70° C)

| PARAMETER | SYM. | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT | |
|--------------------------------|------|---|------|------|----------|------|----|
| Input Low Voltage | VIL | - | -0.5 | - | +0.8 | V | |
| Input High Voltage | VIH | - | +2.2 | - | VDD +0.5 | V | |
| Input Leakage Current | ILI | VIN = VSS to VDD | -10 | - | +10 | μA | |
| Output Leakage Current | ILO | VIO = VSS to VDD $\overline{CS1}$ = VIH (min.) or CS2 = VIL (max.) or \overline{OE} = VIH (min.) or \overline{WE} = VIL (max.) | -10 | - | +10 | μA | |
| Output Low Voltage | VOL | IOL = +8.0 mA | - | - | 0.4 | V | |
| Output High Voltage | VOH | IOH = -4.0 mA | 2.4 | - | - | V | |
| Operating Power Supply Current | IDD | $\overline{CS1}$ = VIL (max.), and CS2 = VIH (min.) I/O = 0 mA, Cycle = min. Duty = 100% | 12 | - | - | 200 | mA |
| | | | 15 | - | - | 200 | mA |
| | | | 20 | - | - | 170 | mA |
| Standby Power Supply Current | ISB | $\overline{CS1}$ = VIH (min.), or CS2 = VIL (max.) Cycle = min. | - | - | 30 | mA | |
| | ISB1 | $\overline{CS1}$ ≥ VDD -0.2V or CS2 ≤ 0.2V | - | - | 10 | mA | |

Note: Typical characteristics are at VDD = 5V, TA = 25° C.



CAPACITANCE

(V_{DD} = 5V, T_A = 25° C, f = 1 MHz)

| PARAMETER | SYM. | CONDITIONS | MAX. | UNIT |
|--------------------------|------------------|-----------------------|------|------|
| Input Capacitance | C _{IN} | V _{IN} = 0V | 8 | pF |
| Input/Output Capacitance | C _{I/O} | V _{OUT} = 0V | 10 | pF |

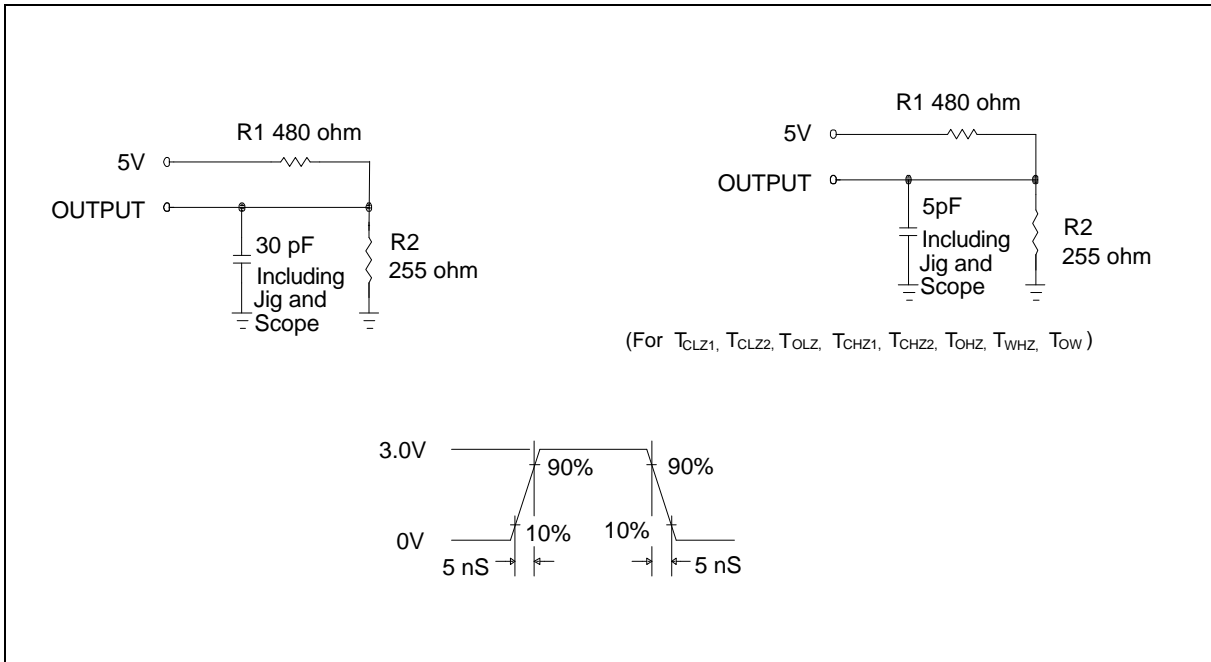
Note: These parameters are sampled but not 100% tested.

AC CHARACTERISTICS

AC Test Conditions

| PARAMETER | CONDITIONS |
|---|---|
| Input Pulse Levels | 0V to 3V |
| Input Rise and Fall Times | 5 nS |
| Input and Output Timing Reference Level | 1.5V |
| Output Load | C _L = 30 pF, I _{OH} /I _{OL} = -4 mA/8 mA |

AC Test Loads and Waveform





AC Characteristics, continued

(V_{DD} = 5V ±10%, V_{SS} = 0V, T_A = 0 to 70° C)

Read Cycle

| PARAMETER | | SYM. | W241024A-12 | | W241024A-15 | | W241024A-20 | | UNIT |
|--------------------------------------|-------------------------|--------|-------------|------|-------------|------|-------------|------|------|
| | | | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| Read Cycle Time | | TRC | 12 | - | 15 | - | 20 | - | nS |
| Address Access Time | | TAA | - | 12 | - | 15 | - | 20 | nS |
| Chip Select Access Time | $\overline{\text{CS1}}$ | TACS1 | - | 12 | - | 15 | - | 20 | nS |
| | CS2 | TACS2 | - | 12 | - | 15 | - | 20 | nS |
| Output Enable to Output Valid | | TAOE | - | 6 | - | 7 | - | 10 | nS |
| Chip Selection to Output in Low Z | $\overline{\text{CS1}}$ | TCLZ1* | 3 | - | 3 | - | 3 | - | nS |
| | CS2 | TCLZ2* | 3 | - | 3 | - | 3 | - | nS |
| Output Enable to Output in Low Z | | TOLZ* | 0 | - | 0 | - | 0 | - | nS |
| Chip Deselection to Output in High Z | $\overline{\text{CS1}}$ | TCHZ1* | - | 6 | - | 7 | - | 10 | nS |
| | CS2 | TCHZ2* | - | 6 | - | 7 | - | 10 | nS |
| Output Disable to Output in High Z | | TOHZ* | - | 6 | - | 7 | - | 10 | nS |
| Output Hold from Address Change | | TOH | 3 | - | 3 | - | 3 | - | nS |

* These parameters are sampled but not 100% tested.

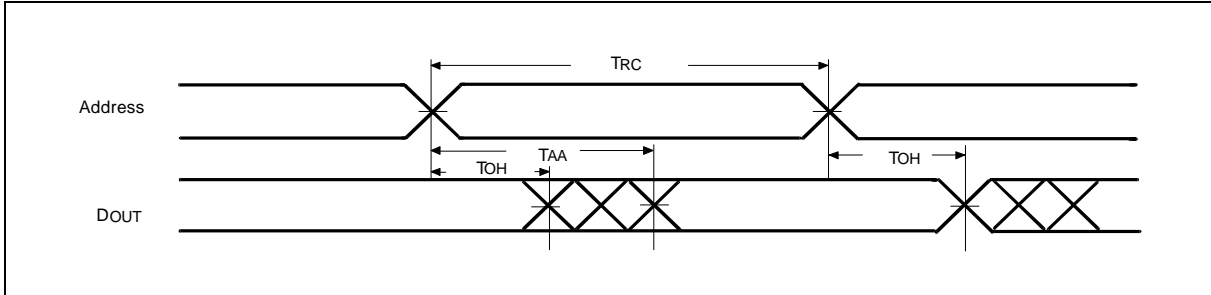
Write Cycle

| PARAMETER | | SYM. | W241024A-12 | | W241024A-15 | | W241024A-20 | | UNIT |
|------------------------------------|---|-------|-------------|------|-------------|------|-------------|------|------|
| | | | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| Write Cycle Time | | TWC | 12 | - | 15 | - | 20 | - | nS |
| Chip Selection to End of Write | $\overline{\text{CS1}}$ | TCW1 | 10 | - | 13 | - | 17 | - | nS |
| | CS2 | TCW2 | 10 | - | 13 | - | 17 | - | nS |
| Address Valid to End of Write | | TAW | 10 | - | 13 | - | 17 | - | nS |
| Address Setup Time | | TAS | 0 | - | 0 | - | 0 | - | nS |
| Write Pulse Width | | TWP | 10 | - | 10 | - | 12 | - | nS |
| Write Recovery Time | $\overline{\text{CS1}}, \overline{\text{WE}}$ | TWR1 | 0 | - | 0 | - | 0 | - | nS |
| | CS2 | TWR2 | 0 | - | 0 | - | 0 | - | nS |
| Data Valid to End of Write | | TDW | 7 | - | 9 | - | 10 | - | nS |
| Data Hold from End of Write | | TDH | 0 | - | 0 | - | 0 | - | nS |
| Write to Output in High Z | | TWHZ* | - | 7 | - | 8 | - | 10 | nS |
| Output Disable to Output in High Z | | TOHZ* | - | 7 | - | 8 | - | 10 | nS |
| Output Active from End of Write | | TOW | 0 | - | 0 | - | 0 | - | nS |

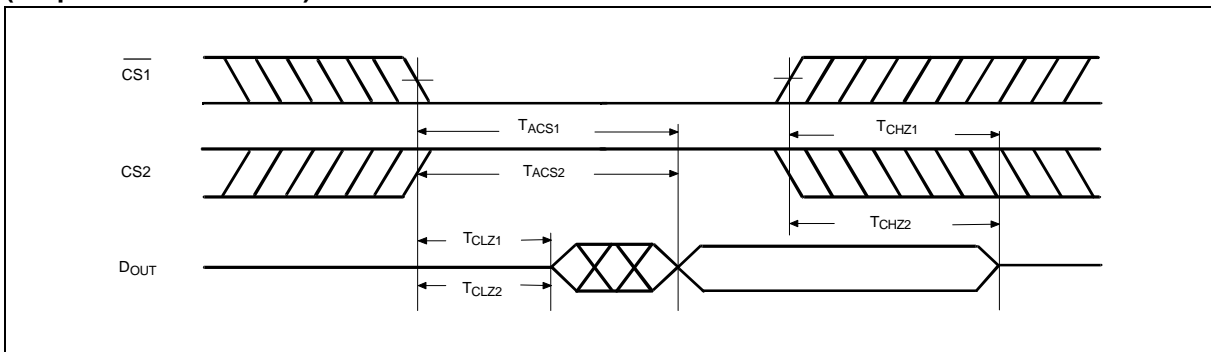
* These parameters are sampled but not 100% tested.

TIMING WAVEFORMS

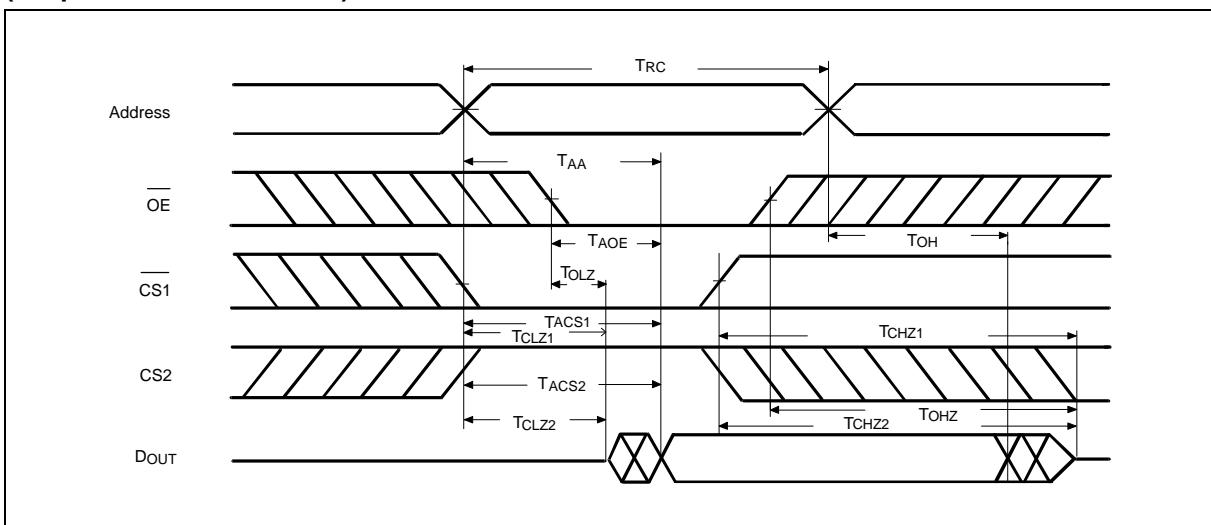
**Read Cycle 1
(Address Controlled)**



**Read Cycle 2
(Chip Select Controlled)**



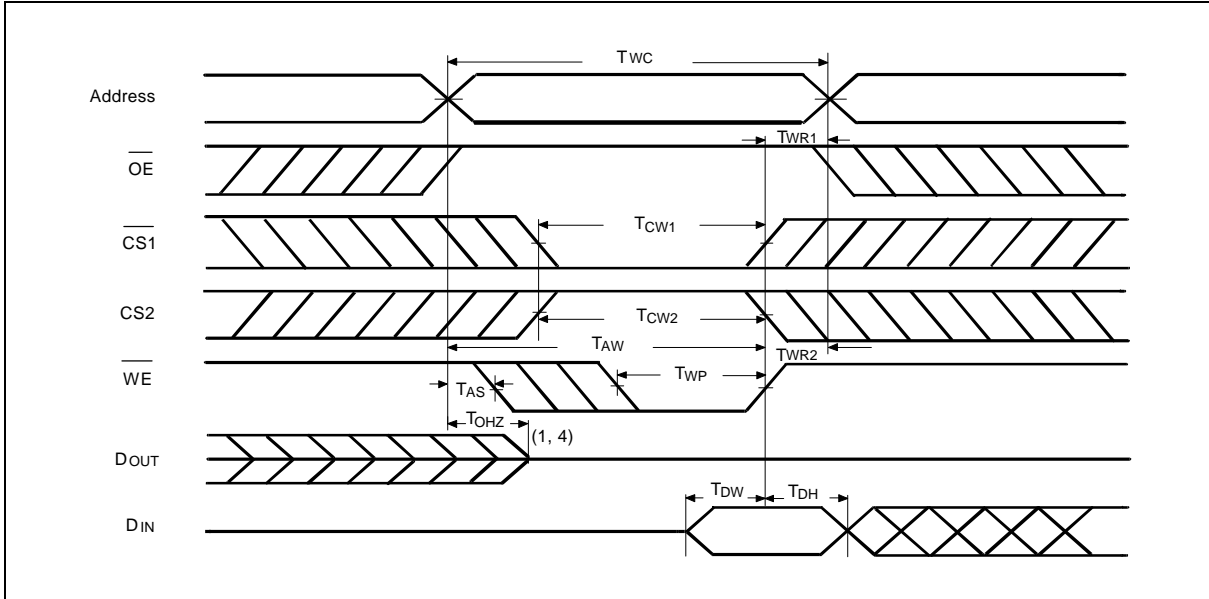
**Read Cycle 3
(Output Enable Controlled)**



Timing Waveforms, continued

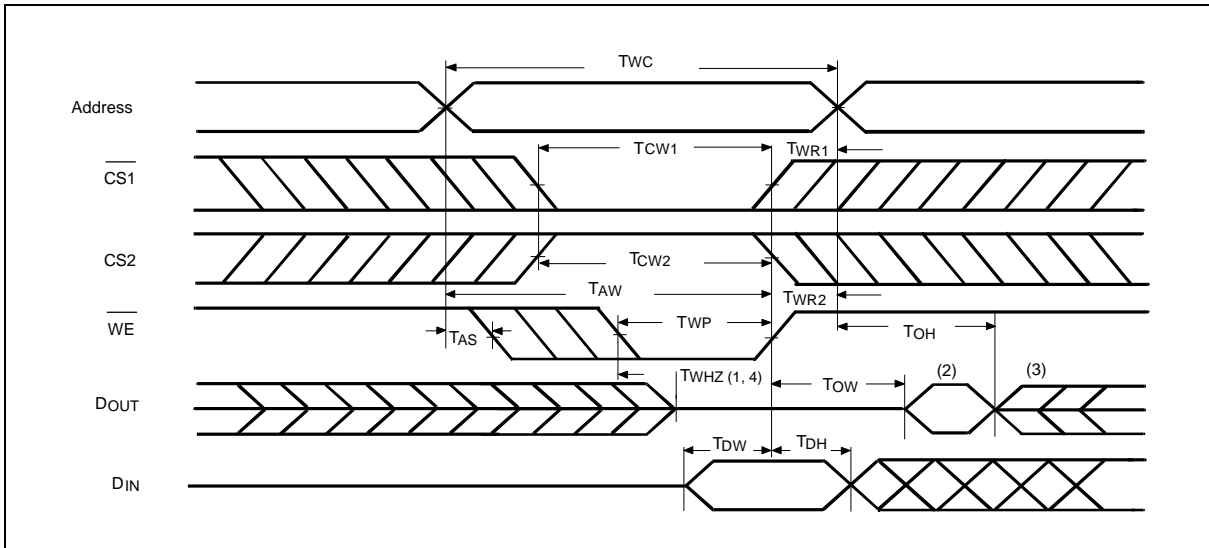
Write Cycle 1

(\overline{OE} Clock)



Write Cycle 2

($\overline{OE} = V_{IL}$ Fixed)



Notes:

1. During this period, I/O pins are in the output state, so input signals of opposite phase to the outputs should not be applied.
2. The data output from DOUT are the same as the data written to DIN during the write cycle.
3. DOUT provides the read data for the next address.
4. Transition is measured ± 500 mV from steady state with $C_L = 5$ pF. This parameter is guaranteed but not 100% tested.



ORDERING INFORMATION

| PART NO. | ACCESS TIME (nS) | OPERATING CURRENT MAX. (mA) | STANDBY CURRENT MAX. (mA) | PACKAGE |
|--------------|------------------|-----------------------------|---------------------------|------------------------|
| W241024AI-12 | 12 | 200 | 10 | 400 mil SOJ |
| W241024AI-15 | 15 | 200 | 10 | 400 mil SOJ |
| W241024AI-20 | 20 | 170 | 10 | 400 mil SOJ |
| W241024AJ-12 | 12 | 200 | 10 | 300 mil SOJ |
| W241024AJ-15 | 15 | 200 | 10 | 300 mil SOJ |
| W241024AJ-20 | 20 | 170 | 10 | 300 mil SOJ |
| W241024AK-12 | 12 | 200 | 10 | 300 mil skinny DIP |
| W241024AK-15 | 15 | 200 | 10 | 300 mil skinny DIP |
| W241024AK-20 | 20 | 170 | 10 | 300 mil skinny DIP |
| W241024AQ-12 | 12 | 200 | 10 | Small type one TSOP |
| W241024AQ-15 | 15 | 200 | 10 | Small type one TSOP |
| W241024AQ-20 | 20 | 170 | 10 | Small type one TSOP |
| W241024AT-12 | 12 | 200 | 10 | Standard type one TSOP |
| W241024AT-15 | 15 | 200 | 10 | Standard type one TSOP |
| W241024AT-20 | 20 | 170 | 10 | Standard type one TSOP |

Notes:

1. Winbond reserves the right to make changes to its products without prior notice.
2. Purchasers are responsible for performing appropriate quality assurance testing on products intended for use in applications where personal injury might occur as a consequence of product failure.

PACKAGE DIMENSIONS

32-pin P-DIP Skinny (300 mil)

| Symbol | Dimension in Inches | | | Dimension in mm | | |
|----------------|---------------------|-------|-------|-----------------|-------|-------|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | — | — | 0.200 | — | — | 5.08 |
| A ₁ | 0.015 | — | — | 0.38 | — | — |
| A ₂ | 0.145 | 0.150 | 0.155 | 3.68 | 3.81 | 3.94 |
| B | 0.016 | 0.018 | 0.022 | 0.41 | 0.46 | 0.56 |
| B ₁ | 0.058 | 0.060 | 0.064 | 1.47 | 1.52 | 1.63 |
| c | 0.008 | 0.010 | 0.014 | 0.20 | 0.25 | 0.36 |
| D | — | 1.60 | 1.62 | — | 40.64 | 41.15 |
| E | 0.295 | 0.315 | 0.335 | 7.49 | 8.00 | 8.50 |
| E ₁ | 0.286 | 0.290 | 0.294 | 7.26 | 7.36 | 7.46 |
| e ₁ | 0.090 | 0.100 | 0.110 | 2.29 | 2.54 | 2.79 |
| L | 0.120 | 0.130 | 0.140 | 3.05 | 3.30 | 3.56 |
| a | 0 | — | 15 | 0° | — | 15° |
| e _A | 0.430 | 0.450 | 0.470 | 10.92 | 11.43 | 11.94 |
| S | — | — | 0.065 | — | — | 1.65 |

Notes:

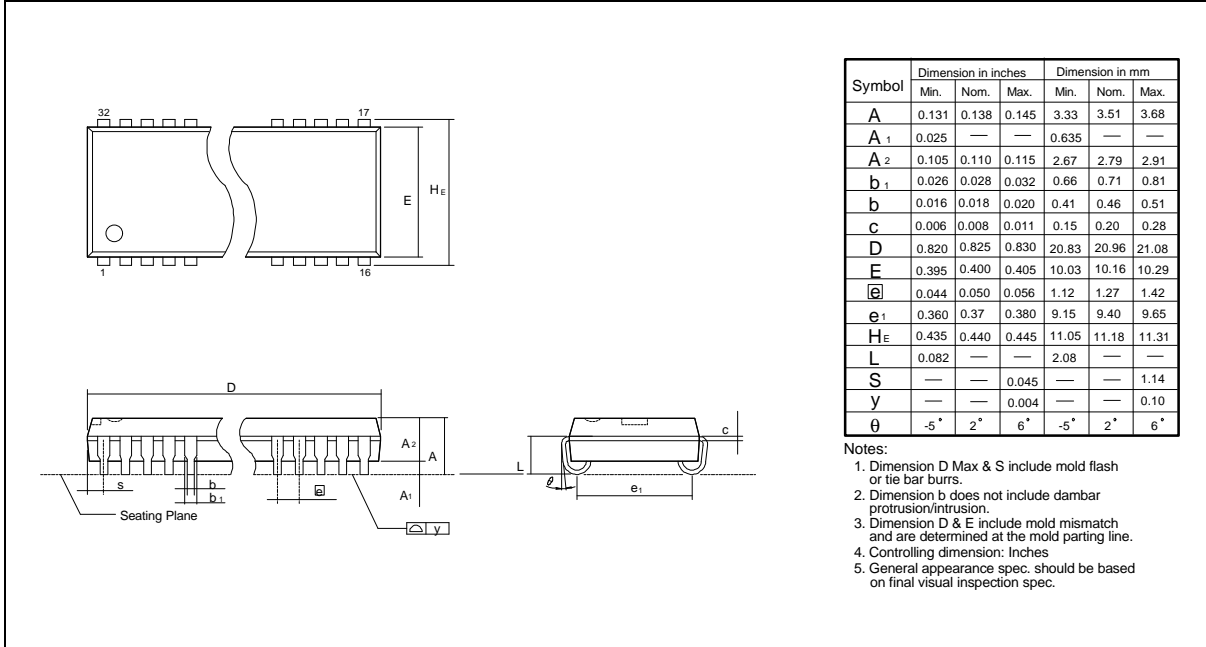
1. Dimension D Max. & S include mold flash or tie bar burrs.
2. Dimension E1 does not include interlead flash.
3. Dimension D & E1 include mold mismatch and are determined at the mold parting line.
4. Dimension B1 does not include dambar protrusion/intrusion.
5. Controlling dimension: Inches.
6. General appearance spec. should be based on final visual inspection spec.

32-pin SOJ (300 mil)

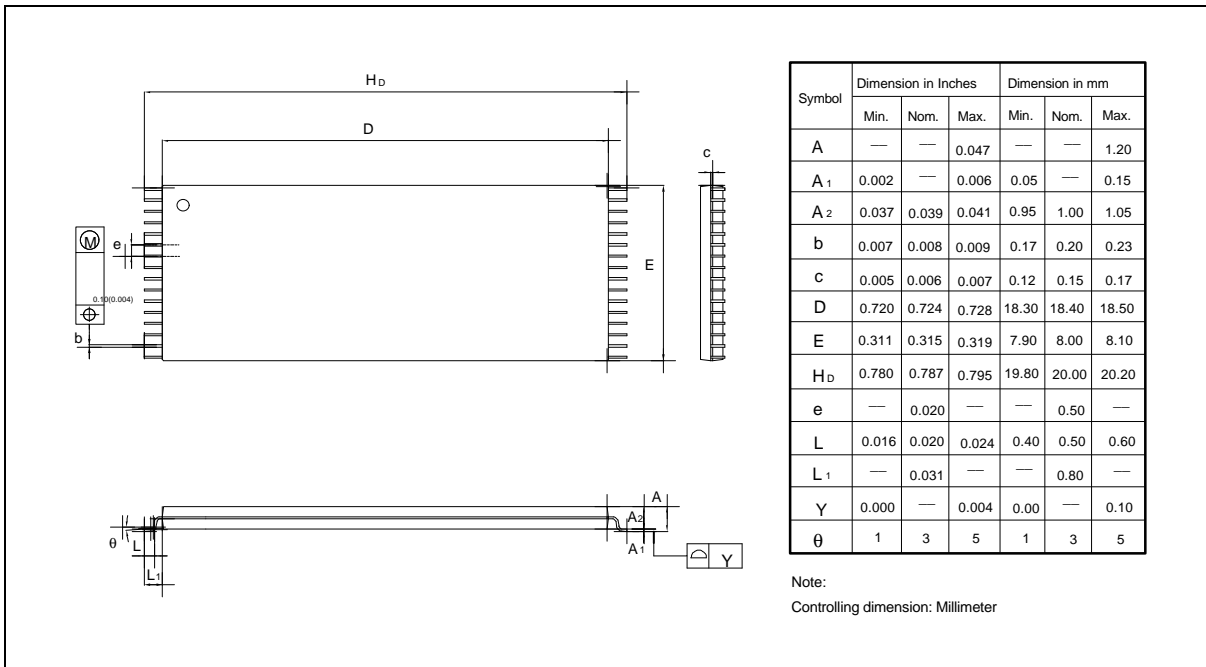
| Symbol | Dimension in Inches | | | Dimension in mm | | |
|----------------|---------------------|-------|-------|-----------------|--------|--------|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | — | — | 0.140 | — | — | 3.556 |
| A ₁ | 0.020 | — | — | 0.508 | — | — |
| A ₂ | 0.095 | 0.100 | 0.105 | 2.413 | 2.540 | 2.667 |
| B | 0.026 | 0.028 | 0.032 | 0.660 | 0.711 | 0.813 |
| b | 0.016 | 0.018 | 0.022 | 0.406 | 0.457 | 0.559 |
| c | 0.008 | 0.010 | 0.014 | 0.203 | 0.254 | 0.356 |
| D | 0.815 | 0.825 | 0.835 | 20.701 | 20.955 | 21.209 |
| E | 0.295 | 0.300 | 0.305 | 7.493 | 7.620 | 7.747 |
| e | 0.044 | 0.050 | 0.056 | 1.118 | 1.270 | 1.422 |
| e ₁ | 0.247 | 0.267 | 0.287 | 6.274 | 6.782 | 7.290 |
| He | 0.325 | 0.335 | 0.345 | 8.255 | 8.509 | 8.763 |
| L | 0.080 | — | — | 2.032 | — | — |
| S | — | — | 0.045 | — | — | 1.143 |
| Y | — | — | 0.004 | — | — | 0.102 |
| θ | 0 | — | 10 | 0° | — | 10° |

Package Dimensions, continued

32-pin SOJ (400 mil)

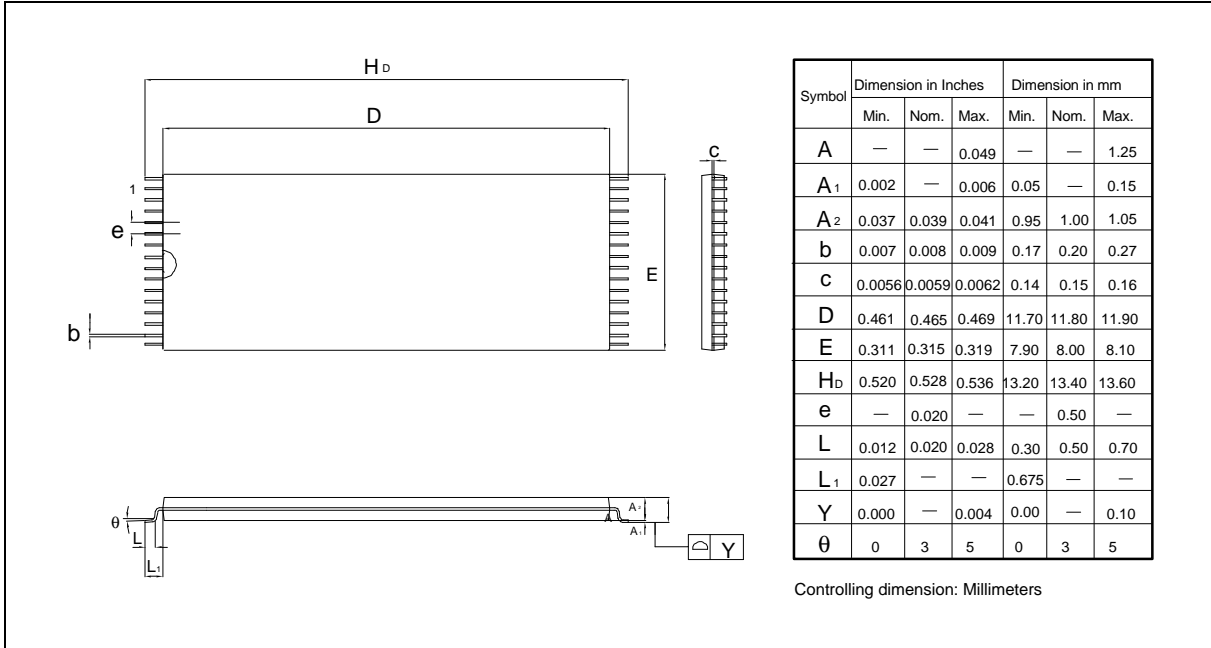


32-pin Standard Type One TSOP



Package Dimensions, continued

32-pin Small Type One TSOP





VERSION HISTORY

| VERSION | DATE | PAGE | DESCRIPTION |
|---------|-----------|----------|--|
| A9 | Jul. 1998 | 1, 7, 10 | Add small type one TSOP (8 mm × 13.4 mm) package |



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Note: All data and specifications are subject to change without notice.

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