Winbond

# 32K × 8 HIGH SPEED CMOS STATIC RAM

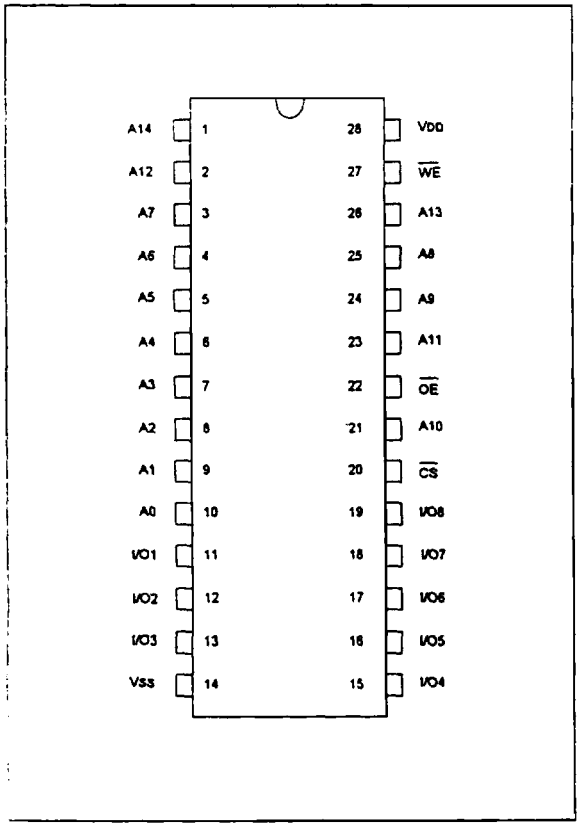
## GENERAL DESCRIPTION

The W24M257A is a high speed, low power CMOS static RAM organized as 32768 × 8 bits that operates on a single 5-volt power supply. This device is manufactured using Winbond's high performance CMOS technology.

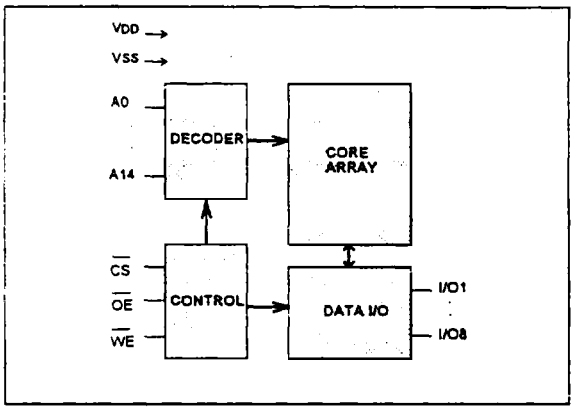
## FEATURES

- High speed access time: 12/15/20 nS (max.)
- Low power consumption:
  - Active: 400 mW (typ.)
- Single +5 V power supply
- Fully static operation
- All inputs and outputs directly TTL compatible
- Three-state outputs
- Output level: 3.3 V
- Available packages: 28-pin 300 mil SOJ and skinny DIP

## PIN CONFIGURATION




## BLOCK DIAGRAM




## PIN DESCRIPTION

| SYMBOL | DESCRIPTION |
|---|---|
| A0 - A14 | Address Inputs |
| I/O1 - I/O8 | Data Inputs/Outputs |
| $\overline{CS}$ | Chip Select Input |
| $\overline{WE}$ | Write Enable Input |
| $\overline{OE}$ | Output Enable Input |
| VDD | Power Supply |
| Vss | Ground |

*Publication Release Date: September 1994*
*Revision A3*

## 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 $V_{DD}$ +0.5 | V |
| Allowable Power Dissipation | 1.0 | W |
| Storage Temperature | -65 to +150 | °C |
| Operating Temperature | 0 to +70 | °C |

## TRUTH TABLE

| $\overline{CS}$ | $\overline{OE}$ | $\overline{WE}$ | MODE | I/O1 - I/O8 | $V_{DD}$ CURRENT |
|---|---|---|---|---|---|
| H | X | X | Not Selected | High Z | $I_{SB}$, $I_{SB1}$ |
| L | H | H | Output Disable | High Z | $I_{DD}$ |
| L | L | H | Read | Data Out | $I_{DD}$ |
| L | X | L | Write | Data In | $I_{DD}$ |

## OPERATING CHARACTERISTICS

($V_{DD}$= 5 V ± 5%, Vss= 0 V, Ta= 0 to 70° C)

| PARAMETER | SYM. | TEST CONDITIONS | | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Input Low Voltage | $V_{IL}$ | - | | -0.5 | - | +0.8 | V |
| Input High Voltage | $V_{IH}$ | - | | +2.2 | - | $V_{DD}$ +0.5 | V |
| Input Leakage Current | $I_{LI}$ | $V_{IN}$= Vss to $V_{DD}$ | | -10 | - | +10 | µA |
| Output Leakage Current | $I_{LO}$ | $V_{I/O}$= Vss to $V_{DD}$, $\overline{CS}$= $V_{IH}$ or $\overline{OE}$= $V_{IH}$ or $\overline{WE}$= $V_{IL}$ | | -10 | - | + 10 | µA |
| Output Low Voltage | $V_{OL}$ | $I_{OL}$= +8 mA | | - | - | 0.4 | V |
| Output High Voltage | $V_{OH}$ | $I_{OH}$= -4 mA | | 2.4 | - | 3.4 | V |
| Operating Power Supply Current | $I_{DD}$ | $\overline{CS}$= $V_{IL}$, I/O= 0 mA Cycle= MIN, Duty= 100% | 12 | - | - | 180 | mA |
| | | | 15 | - | - | 180 | mA |
| | | | 20 | - | - | 150 | mA |
| Standby Power Supply Current | $I_{SB}$ | $\overline{CS}$= $V_{IH}$, Cycle= MIN Duty= 100% | | - | - | 30 | mA |
| | $I_{SB1}$ | $\overline{CS}$≥ $V_{DD}$ -0.2 V | | - | - | 10 | mA |

Note: Typical characteristics are at $V_{DD}$= 5 V, Ta= 25° C.

## CAPACITANCE

($V_{DD}$= 5 V, Ta= 25° C, f= 1 MHz)

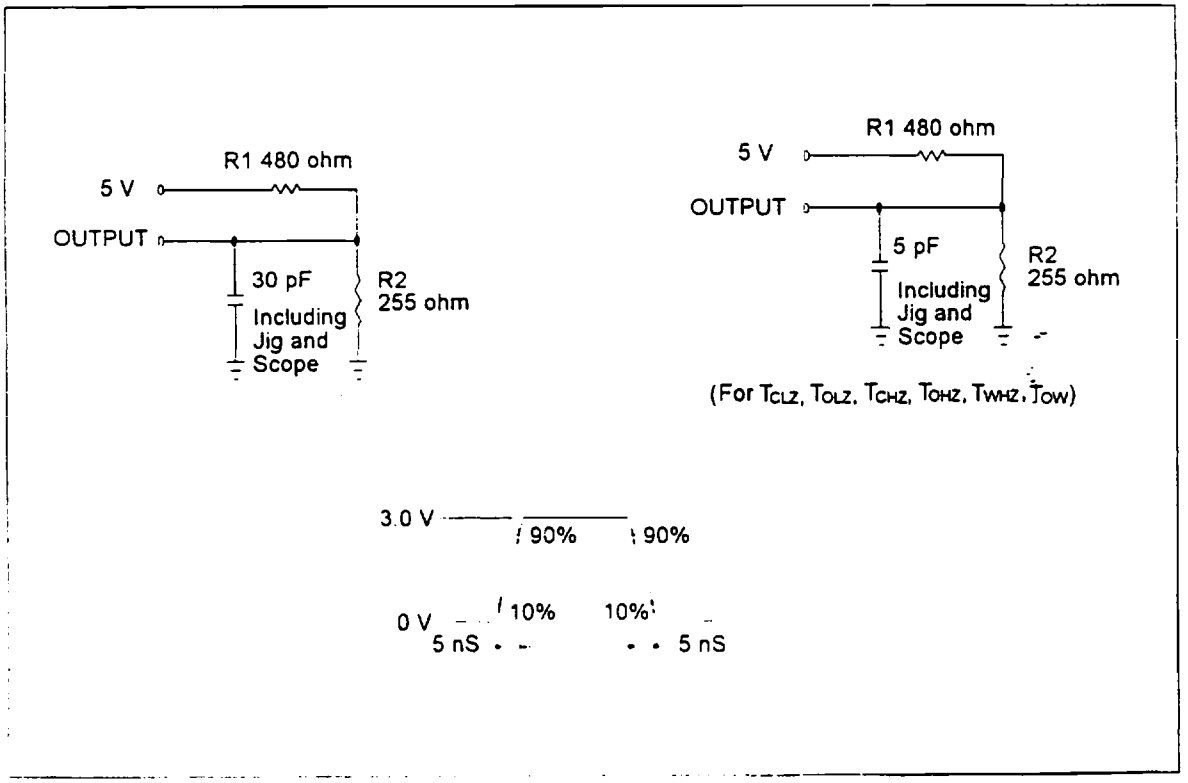
| PARAMETER | SYM. | CONDITIONS | MAX. | UNIT |
|---|---|---|---|---|
| Input Capacitance | $C_{IN}$ | $V_{IN}$= 0 V | 8 | pF |
| Input/Output Capacitance | $C_{I/O}$ | $V_{OUT}$= 0 V | 10 | pF |

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

## AC TEST CONDITIONS

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

## AC TEST LOADS AND WAVEFORM



## AC CHARACTERISTICS

($V_{DD}$= 5 V ± 5%, Vss= 0 V, Ta= 0 to 70° C)

### (1) Read Cycle

| PARAMETER | SYM. | W24M257A-12 | | W24M257A-15 | | W24M257A-20 | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| Read Cycle Time | $T_{RC}$ | 12 | - | 15 | - | 20 | - | nS |
| Address Access Time | $T_{AA}$ | - | 12 | - | 15 | - | 20 | nS |
| Chip Select Access Time | $T_{ACS}$ | - | 12 | - | 15 | - | 20 | nS |
| Output Enable to Output Valid | $T_{AOE}$ | - | 6 | - | 7 | - | 10 | nS |
| Chip Selection to Output in Low Z | $T_{CLZ}$* | 3 | - | 3 | - | 3 | - | nS |
| Output Enable to Output in Low Z | $T_{OLZ}$* | 0 | - | 0 | - | 0 | - | nS |
| Chip Deselection to Output in High Z | $T_{CHZ}$* | - | 6 | - | 7 | - | 10 | nS |
| Output Disable to Output in High Z | $T_{OHZ}$* | - | 6 | - | 7 | - | 10 | nS |
| Output Hold from Address Change | $T_{OH}$ | 3 | - | 3 | - | 3 | - | nS |

*These parameters are sampled but not 100% tested

### (2) Write Cycle

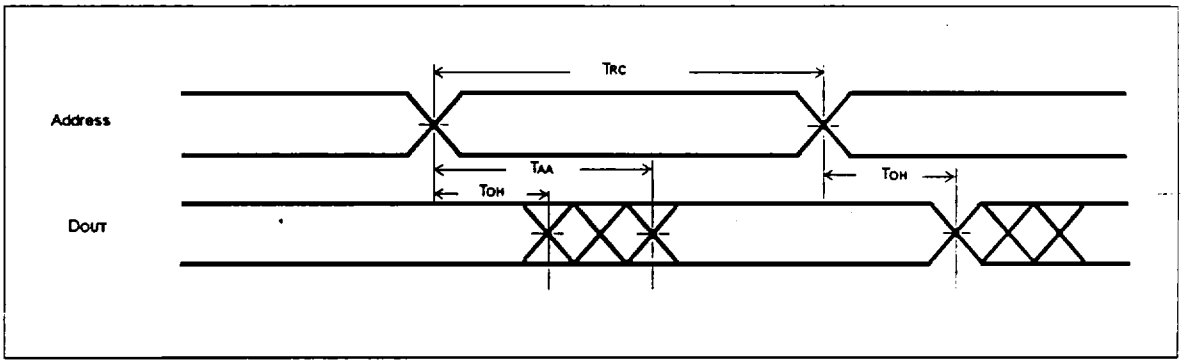
| PARAMETER | SYM. | W24M257A-12 | | W24M257A-15 | | W24M257A-20 | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| Write Cycle Time | $T_{WC}$ | 12 | - | 15 | - | 20 | - | nS |
| Chip Selection to End of Write | $T_{CW}$ | 10 | - | 13 | - | 17 | - | nS |
| Address Valid to End of Write | $T_{AW}$ | 10 | - | 13 | - | 17 | - | nS |
| Address Setup Time | $T_{AS}$ | 0 | - | 0 | - | 0 | - | |
| Write Pulse Width | $T_{WP}$ | 10 | - | 10 | - | 12 | - | nS |
| Write Recovery Time ($\overline{CS}$, $\overline{WE}$) | $T_{WR}$ | 0 | - | 0 | - | 0 | - | nS |
| Data Valid to End of Write | $T_{DW}$ | 7 | - | 9 | - | 10 | - | nS |
| Data Hold from End of Write | $T_{DH}$ | 0 | - | 0 | - | 0 | - | nS |
| Write to Output in High Z | $T_{WHZ}$* | - | 7 | - | 8 | - | 10 | nS |
| Output Disable to Output in High Z | $T_{OHZ}$* | - | 7 | - | 8 | - | 10 | nS |
| Output Active from End of Write | $T_{OW}$ | 0 | - | 0 | - | 0 | - | nS |

*These parameters are sampled but not 100% tested

## TIMING WAVEFORMS

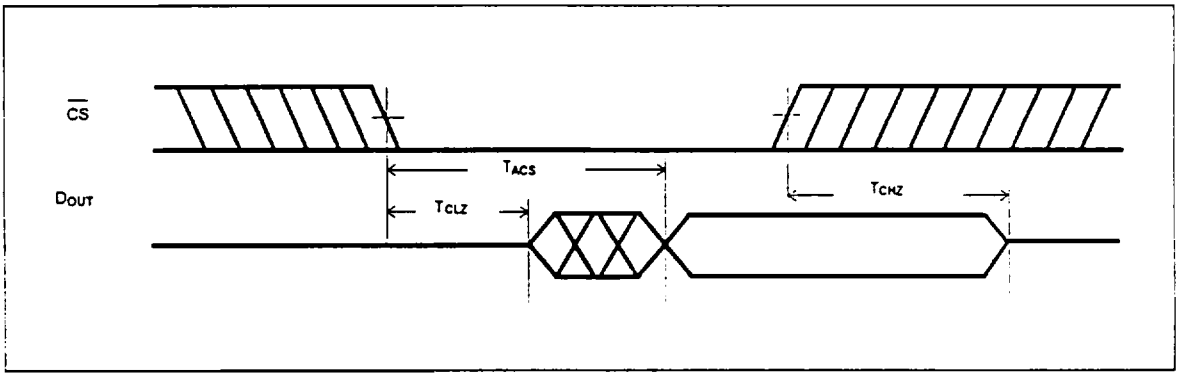
### Read Cycle 1

**(Address Controlled)**



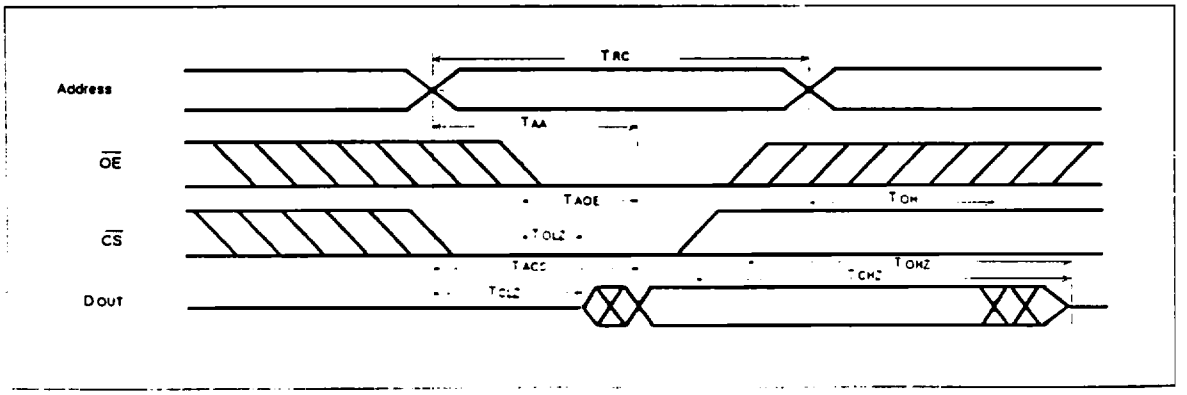

### Read Cycle 2

**(Chip Select Controlled)**



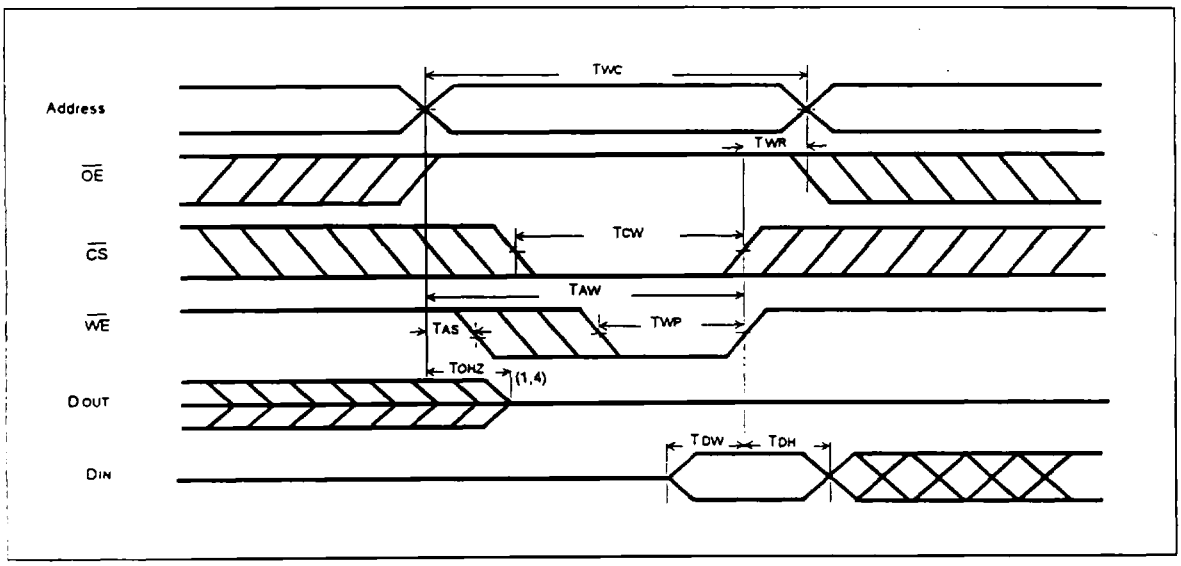

### Read Cycle 3

**(Output Enable Controlled)**



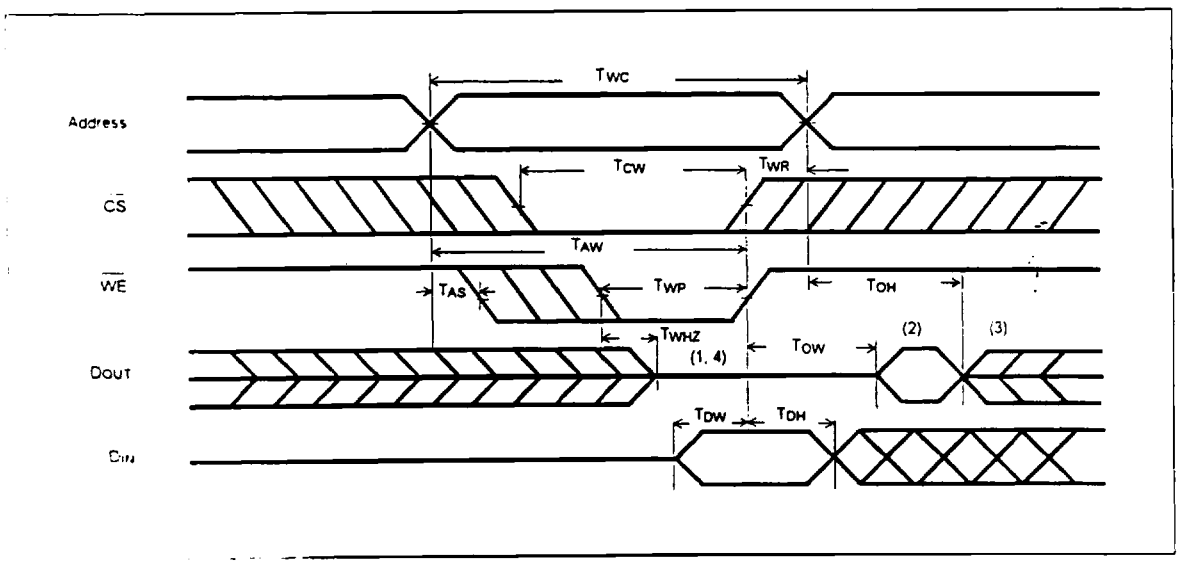
## Write Cycle 1

### ($\overline{OE}$ Clock)




## Write Cycle 2

### ($\overline{OE}$= VIL 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 CL= 5 pF. This parameter is guaranteed but not 100% tested.

## ORDERING INFORMATION

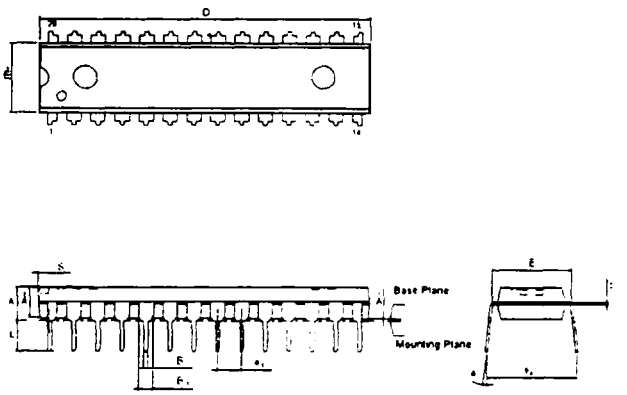
| PART NO. | ACCESS TIME (nS) | OPERATING CURRENT MAX. (mA) | STANDBY CURRENT MAX. (mA) | PACKAGE |
|---|---|---|---|---|
| W24M257AK-12 | 12 | 180 | 10 | 300mil Skinny |
| W24M257AK-15 | 15 | 180 | 10 | 300mil Skinny |
| W24M257AK-20 | 20 | 150 | 10 | 300mil Skinny |
| W24M257AJ-12 | 12 | 180 | 10 | 300mil SOJ |
| W24M257AJ-15 | 15 | 180 | 10 | 300mil SOJ |
| W24M257AJ-20 | 20 | 150 | 10 | 300mil SOJ |

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

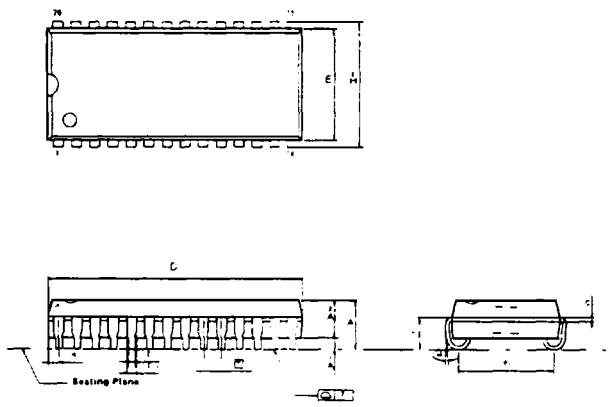
### 28-Lead P-DIP Skinny




| Symbol | Dimension in inches | | | Dimension in mm | | |
|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max |
| A | — | — | 0.175 | — | — | 4.45 |
| $A_1$ | 0.010 | — | — | 0.25 | — | — |
| $A_2$ | 0.125 | 0.130 | 0.135 | 3.18 | 3.30 | 3.43 |
| B | 0.016 | 0.018 | 0.020 | 0.41 | 0.46 | 0.51 |
| $B_1$ | 0.054 | 0.060 | 0.064 | 1.37 | 1.52 | 1.63 |
| C | 0.008 | 0.010 | 0.014 | 0.20 | 0.25 | 0.36 |
| D | — | 1.380 | 1.400 | — | 35.05 | 35.56 |
| E | 0.300 | 0.310 | 0.320 | 7.62 | 7.87 | 8.13 |
| $E_1$ | 0.285 | 0.290 | 0.295 | 7.19 | 7.32 | 7.44 |
| $e_1$ | 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 |
| $e_A$ | 0.330 | 0.350 | 0.370 | 8.38 | 8.89 | 9.40 |
| S | — | — | 0.055 | — | — | 1.40 |

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.

### 28-Lead Small Outline J Band




| Symbol | Dimension in inches | | | Dimension in mm | | |
|---|---|---|---|---|---|---|
| | Min | Nom | Max | Min | Nom | Max |
| A | — | — | 0.140 | — | — | 3.56 |
| $A_1$ | 0.027 | — | — | 0.69 | — | — |
| $A_2$ | 0.095 | 0.100 | 0.105 | 2.41 | 2.54 | 2.67 |
| $b_1$ | 0.026 | 0.028 | 0.032 | 0.66 | 0.71 | 0.81 |
| b | 0.016 | 0.018 | 0.022 | 0.41 | 0.46 | 0.56 |
| c | 0.009 | 0.010 | 0.014 | 0.23 | 0.25 | 0.36 |
| D | — | 0.750 | 0.756 | — | 19.05 | 19.94 |
| E | 0.295 | 0.300 | 0.305 | 7.49 | 7.62 | 7.75 |
| e | 0.044 | 0.050 | 0.056 | 1.12 | 1.27 | 1.42 |
| $e_1$ | 0.245 | 0.255 | 0.265 | 6.22 | 6.72 | 7.24 |
| $H_E$ | 0.327 | 0.337 | 0.347 | 8.31 | 8.56 | 8.81 |
| L | 0.077 | 0.087 | 0.097 | 1.96 | 2.21 | 2.46 |
| S | — | — | 0.045 | — | — | 1.14 |
| y | — | — | 0.004 | — | — | 0.10 |
| θ | 0° | — | 10° | 0° | — | 10° |

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

Winbond

Winbond

Electronics Corp.


**CORPORATE HEADQUARTERS:**
No. 4, Creation Rd. III
Science-Based Industrial Park
Hsinchu, Taiwan, R.O.C.
TEL: 886-35-770066
FAX: 886-35-789467

**TAIPEI SALES OFFICE:**
11Fl, No. 115, Sec. 3, Min Sheng E. Rd.
Taipei, Taiwan, R.O.C.
TEL: 886-2-7190505
FAX: 886-2-7197502
TLX: 16485 WINTPE

Winbond Electronics (H.K.) Ltd.
Rm. 803, World Trade Square, Tower II,
123 Hoi Bun Road, Kwun Tong,
Kowloon, Hong Kong
TEL: 852-7516023-7
FAX: 852-7552064

Winbond Electronics
(North America) Corp.
90 West Plumeria Drive
San Jose, CA 95134 U.S.A.
TEL: 1-408-943-6666
FAX: 1-408-943-6668