NEC
μPD2114L
μPD2114L-1
μPD2114L-2
μPD2114L-3
μPD2114L-5

# 4096 BIT (1024 × 4 BITS) STATIC RAM

3

## DESCRIPTION

The NEC μPD2114L is a 4096 bit static Random Access Memory organized as 1024 words by 4 bits using N-channel Silicon-gate MOS technology. It uses fully DC stable (static) circuitry throughout, in both the array and the decoding. It therefore requires no clocks or refreshing to operate and simplifies system design. The data is read out nondestructively and has the same polarity as the input data. Common input/output pins are provided.

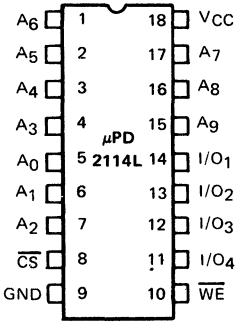
The μPD2114L is designed for memory applications where high performance, low cost, large bit storage, and simple interfacing are important design objectives. The μPD2114L is placed in an 18-pin package for the highest possible density.

It is directly TTL compatible in all respects: inputs, outputs, and a single +5V supply. A separate Chip Select ($\overline{CS}$) lead allows easy selection of an individual package when outputs are OR-Tied.

## FEATURES

- Access Time: Selection from 150-450 ns
- Single +5 Volt Supply
- Directly TTL Compatible – All Inputs and Outputs
- Completely Static – No Clock or Timing Strobe Required
- Low Operating Power – Typically 0.06 mW/Bit
- Identical Cycle and Access Times
- Common Data Input and Output using Three-State Output
- High Density 18-pin Plastic and Ceramic Packages
- Replacement for 2114L and Equivalent Devices

## PIN CONFIGURATION

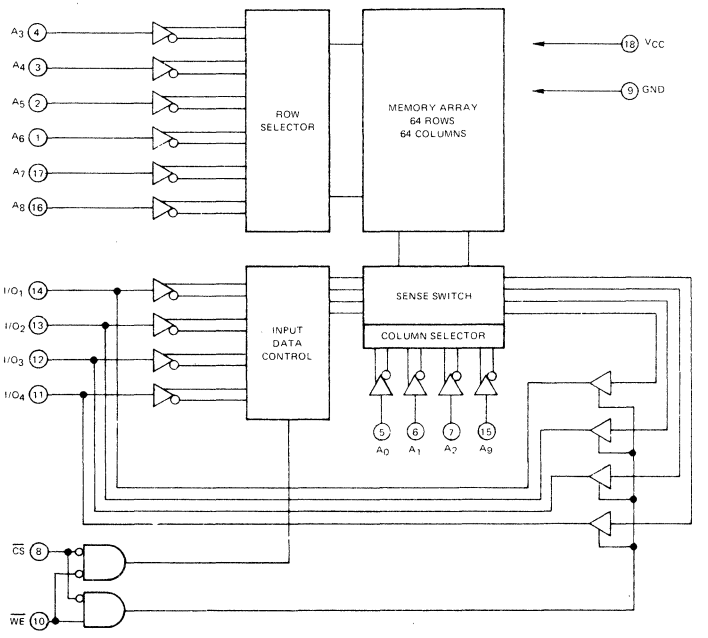



**PIN NAMES**

| | |
|---|---|
| $A_0$-$A_9$ | Address Inputs |
| $\overline{WE}$ | Write Enable |
| $\overline{CS}$ | Chip Select |
| $I/O_1$-$I/O_4$ | Data Input/Output |
| $V_{CC}$ | Power (+5V) |
| GND | Ground |

Rev/1

## BLOCK DIAGRAM




## ABSOLUTE MAXIMUM RATINGS*

| | |
|---|---|
| Operating Temperature | −10°C to +80°C |
| Storage Temperature | −65°C to +150°C |
| Voltage on any Pin | −0.5 to 7 Volts 1 |

Note: ① With respect to ground.

COMMENT: Stress above 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 device reliability.

*$T_a$ = 25°C

## DC CHARACTERISTICS

$T_a$ = 0°C to 70°C; $V_{CC}$ = +5V ± 10% unless otherwise noted.

| PARAMETER | SYMBOL | LIMITS MIN | LIMITS TYP | LIMITS MAX | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Input Load Current (All Input Pins) | $I_{LI}$ | | | 10 | μA | $V_{IN}$ = 0 to 5.5V |
| I/O Leakage Current | $I_{LO}$ | | | 10 | μA | $\overline{CS}$ = 2V, $V_{I/O}$ = 0.4V to $V_{CC}$ |
| Power Supply Current | $I_{CC1}$ | | | 65 | mA | $V_{IN}$ = 5.5V, $I_{I/O}$ = 0 mA, $T_a$ = 25°C |
| Power Supply Current | $I_{CC2}$ | | | 70 | mA | $V_{IN}$ = 5.5V, $I_{I/O}$ = 0 mA, $T_a$ = 0°C |
| Input Low Voltage | $V_{IL}$ | -0.5 | | 0.8 | V | |
| Input High Voltage | $V_{IH}$ | 2.0 | | 6.0 | V | |
| Output Low Current | $I_{OL}$ | 3.2 | | | mA | $V_{OL}$ = 0.4V |
| Output High Current | $I_{OH}$ | | | -1.0 | mA | $V_{OH}$ = 2.4V, $V_{CC}$ = 4.75V |
| | | | | | | $V_{OH}$ = 2.2V, $V_{CC}$ = 4.5V |

## CAPACITANCE

$T_a$ = 25°C; f = 1.0 MHz

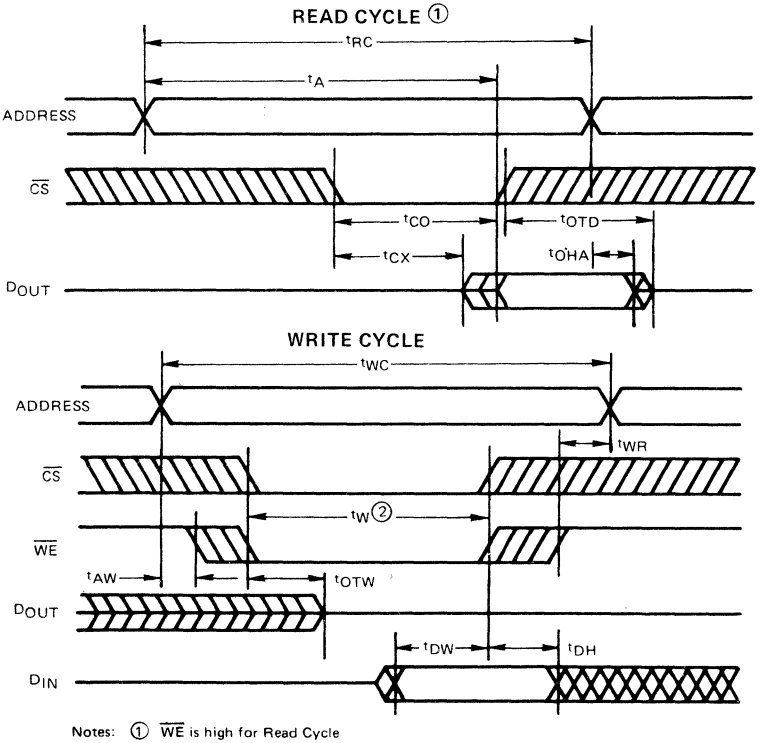
| PARAMETER | SYMBOL | LIMITS MIN | LIMITS TYP | LIMITS MAX | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Input/Output Capacitance | $C_{I/O}$ | | | 8 | pf | $V_{I/O}$ = 0V |
| Input Capacitance | $C_{IN}$ | | | 5 | pf | $V_{IN}$ = 0V |

## AC CHARACTERISTICS

$T_a$ = 0°C to +70°C; $V_{CC}$ = +5V ± 10%, unless otherwise noted.

| PARAMETER | SYMBOL | LIMITS | | | | | | | | | | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2114L | | 2114L-1 | | 2114L-2 | | 2114L-3 | | 2114L-5 | | | |
| | | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | MIN | MAX | | |
| **READ CYCLE** | | | | | | | | | | | | | |
| Read Cycle Time | $t_{RC}$ | 450 | | 300 | | 250 | | 200 | | 150 | | ns | $t_T = t_r = t_f = 10$ ns |
| Access Time | $t_A$ | | 450 | | 300 | | 250 | | 200 | | 150 | ns | $C_L$ = 100 pF |
| Chip Selection to Output Valid | $t_{CO}$ | | 120 | | 100 | | 80 | | 70 | | 60 | ns | Load = 1 TTL gate |
| Chip Selection to Output Active | $t_{CX}$ | 20 | | 20 | | 20 | | 20 | | 20 | | ns | Input Levels = 0.8 and 2.0V |
| Output 3-State from Deselection | $t_{OTD}$ | | 100 | | 80 | | 70 | | 60 | | 50 | ns | $V_{ref}$ = 1.5V |
| Output Hold from Address Change | $t_{OHA}$ | 50 | | 50 | | 50 | | 50 | | 50 | | ns | |
| **WRITE CYCLE** | | | | | | | | | | | | | |
| Write Cycle Time | $t_{WC}$ | 450 | | 300 | | 250 | | 200 | | 150 | | ns | $t_T = t_r = t_f = 10$ ns |
| Write Time | $t_W$ | 200 | | 150 | | 120 | | 120 | | 80 | | ns | $C_L$ = 100 pF |
| Write Release Time | $t_{WR}$ | 0 | | 0 | | 0 | | 0 | | 0 | | ns | Load = 1 TTL gate |
| Output 3-State from Write | $t_{OTW}$ | | 100 | | 80 | | 70 | | 60 | | 50 | ns | Input Levels = 0.8 and 2.0V |
| Data to Write Time Overlap | $t_{DW}$ | 200 | | 150 | | 120 | | 120 | | 80 | | ns | $V_{ref}$ = 1.5V |
| Data Hold from Write Time | $t_{DH}$ | 0 | | 0 | | 0 | | 0 | | 0 | | ns | |
| Address to Write Setup Time | $t_{AW}$ | 0 | | 0 | | 0 | | 0 | | 0 | | ns | |

## TIMING WAVEFORMS

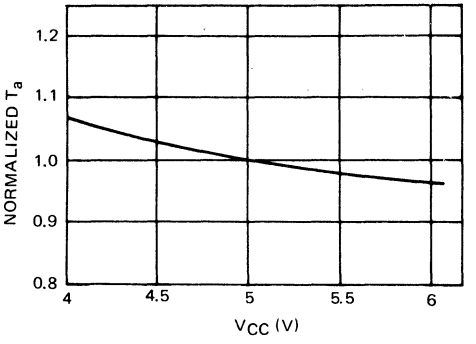



Notes: ① $\overline{WE}$ is high for Read Cycle

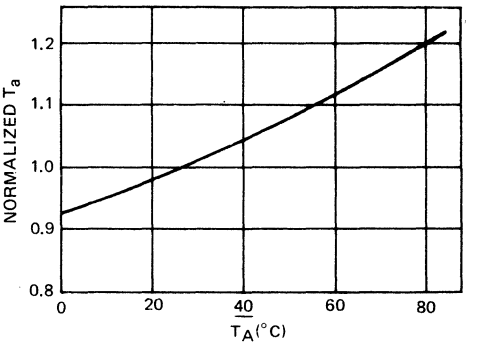
② $t_W$ is measured from the latter of $\overline{CS}$ or $\overline{WE}$ going low to the earlier of $\overline{CS}$ or $\overline{WE}$ going high.

## TYPICAL OPERATING CHARACTERISTICS

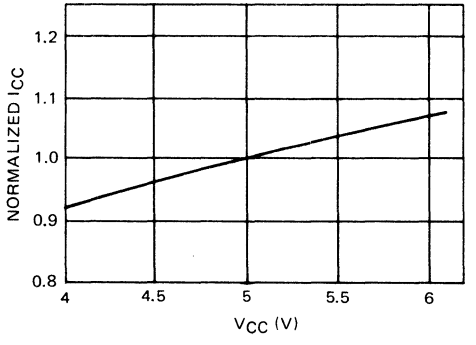
NORMALIZED ACCESS TIME VS. SUPPLY VOLTAGE



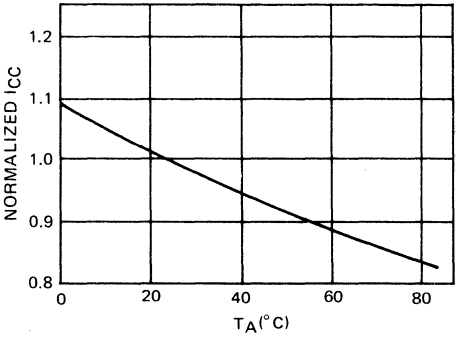

NORMALIZED ACCESS TIME VS. AMBIENT TEMPERATURE



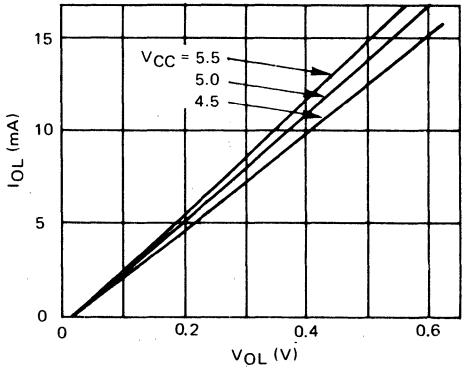

NORMALIZED POWER SUPPLY CURRENT VS. SUPPLY VOLTAGE



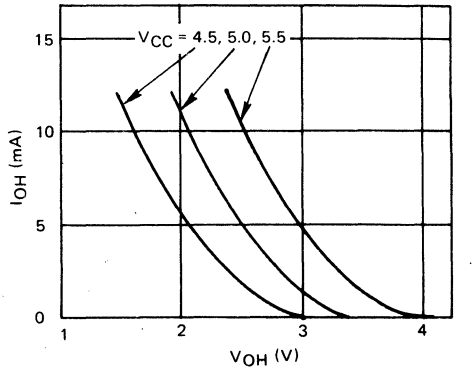

NORMALIZED POWER SUPPLY CURRENT VS. AMBIENT TEMPERATURE



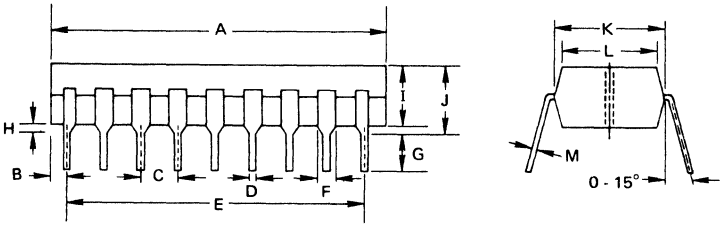

OUTPUT SINK CURRENT VS. OUTPUT VOLTAGE




OUTPUT SOURCE CURRENT VS. OUTPUT VOLTAGE



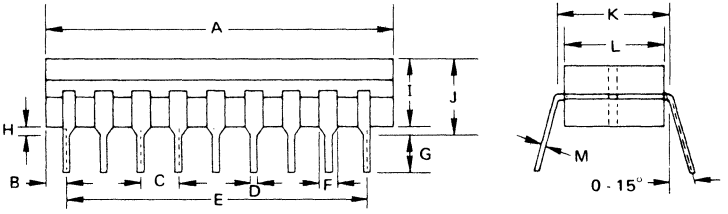
PACKAGE OUTLINES
μPD2114LC




**(PLASTIC)**

| ITEM | MILLIMETERS | INCHES |
|---|---|---|
| A | 23.2 MAX. | 0.91 MAX. |
| B | 1.44 | 0.055 |
| C | 2.54 | 0.1 |
| D | 0.45 | 0.02 |
| E | 20.32 | 0.8 |
| F | 1.2 | 0.06 |
| G | 2.5 MIN. | 0.1 MIN. |
| H | 0.5 MIN. | 0.02 MIN. |
| I | 4.6 MAX. | 0.18 MAX. |
| J | 5.1 MAX. | 0.2 MAX. |
| K | 7.62 | 0.3 |
| L | 6.7 | 0.26 |
| M | 0.25 | 0.01 |

μPD2114LD




**(CERDIP)**

| ITEM | MILLIMETERS | INCHES |
|---|---|---|
| A | 23.2 MAX. | 0.91 MAX. |
| B | 1.44 | 0.055 |
| C | 2.54 | 0.1 |
| D | 0.45 | 0.02 |
| E | 20.32 | 0.8 |
| F | 1.2 | 0.06 |
| G | 2.5 MIN. | 0.1 MIN. |
| H | 0.5 MIN. | 0.02 MIN. |
| I | 4.6 MAX. | 0.18 MAX. |
| J | 5.1 MAX. | 0.2 MAX. |
| K | 7.62 | 0.3 |
| L | 6.7 | 0.26 |
| M | 0.25 | 0.01 |