

# HM101514 Series

Preliminary

**262,144-words x 4-Bit Random Access Memory**

T-46-23-10

## DESCRIPTION

The Hitachi HM101514 is ECL 100k compatible, 262,144 words by 4 bits read/write random access memory developed for high speed systems.

## FEATURES

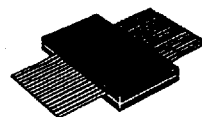
- 262,144-words x 4 bit organization
- Fully compatible with 100k ECL level
- 0.8  $\mu$ m Hi-BiCMOS process
- Address access time: 15 ns (max.)
- Write pulse width: 9 ns (min.)
- Low power dissipation: 800 mW (typ.)
- Output obtainable by wired-OR (open emitter)

## ORDERING INFORMATION

| Type No.     | Cycle Time | Package                                          |
|--------------|------------|--------------------------------------------------|
| HM101514F-15 | 15 ns      | 32 pin Ceramic Flat (30 mil Lead Pitch) (FG-32D) |

## PIN DESCRIPTION

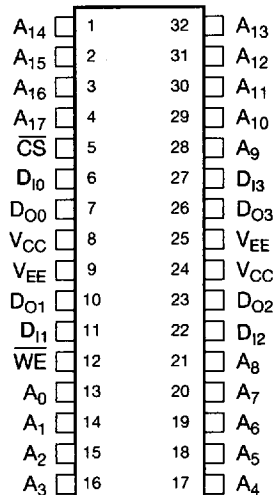
| Pin Name | Function       |
|----------|----------------|
| A0-A17   | Address Input  |
| D10-D13  | Data Input     |
| D00-D03  | Data Output    |
| WE       | Write Enable   |
| CS       | Chip Select    |
| VCC      | Ground         |
| VEE      | Supply Voltage |



(FG-32D)

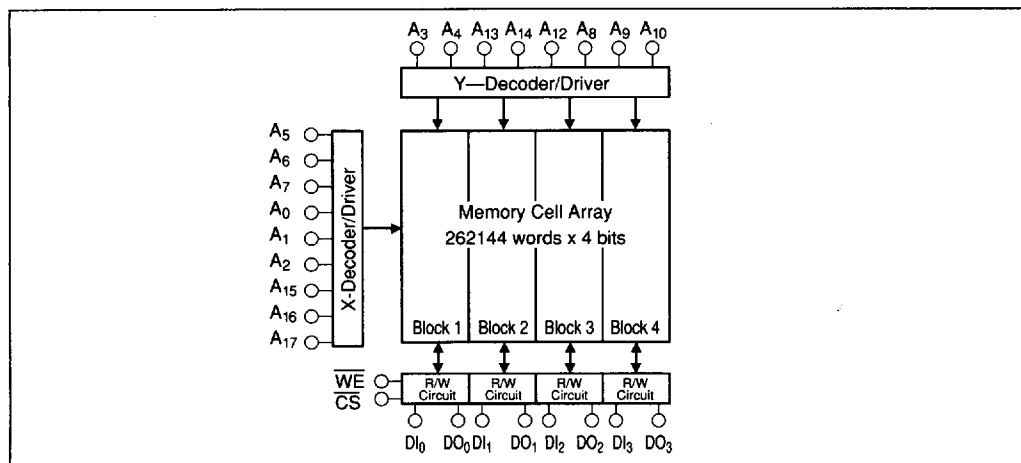
## PIN ARRANGEMENT

HM101514 Series



(Top View)

## BLOCK DIAGRAM



T-46-23-10

## ■ FUNCTION TABLE

| Input |                | Din            | Output            | Mode         |
|-------|----------------|----------------|-------------------|--------------|
| CS    | WE             |                |                   |              |
| H     | X <sup>1</sup> | X <sup>1</sup> | L                 | Not Selected |
| L     | L              | L              | L                 | Write "0"    |
| L     | L              | H              | L                 | Write "1"    |
| L     | H              | X <sup>1</sup> | Dout <sup>2</sup> | Read         |

Notes: 1. Irrelevant  
2. Read Out Noninvert

■ ABSOLUTE MAXIMUM RATING (T<sub>a</sub> = 25°C)

| Item                | Symbol                               | Rating                  | Unit |
|---------------------|--------------------------------------|-------------------------|------|
| Supply Voltage      | V <sub>EE</sub> to V <sub>CC</sub>   | +0.5 to -7.0            | V    |
| Input Voltage       | V <sub>in</sub>                      | +0.5 to V <sub>EE</sub> | V    |
| Output Current      | I <sub>out</sub>                     | -30                     | mA   |
| Storage Temperature | T <sub>stg</sub>                     | -65 to +150             | °C   |
| Storage Temperature | T <sub>stg</sub> (bias) <sup>1</sup> | -55 to +125             | °C   |

Note: 1. Under bias (V<sub>EE</sub> = -6.0V min.)

## ■ ELECTRICAL CHARACTERISTICS

• DC Characteristics (V<sub>EE</sub> = -5.2V, R<sub>L</sub> = 50Ω to -2.0V, T<sub>C</sub> = 0 to +85°C)

| Item                     | Symbol          | Min (B) | Typ   | Max (A) | Unit | Test Condition                                   |
|--------------------------|-----------------|---------|-------|---------|------|--------------------------------------------------|
| Output Voltage           | V <sub>OH</sub> | -1025   | -955  | -880    | mV   | V <sub>in</sub> = VIHA or VILB                   |
|                          | V <sub>OL</sub> | -1810   | -1715 | -1620   | mV   |                                                  |
| Output Threshold Voltage | VOHC            | -1035   | —     | —       | mV   | V <sub>in</sub> = VIHB or VILA                   |
|                          | VOLC            | —       | —     | -1610   | mV   |                                                  |
| Input Voltage            | VIH             | -1165   | —     | -880    | mV   | Guaranteed Input Voltage High/Low for All Inputs |
|                          | VIL             | -1810   | —     | -1475   | mV   |                                                  |
| Input Current            | I <sub>IH</sub> | —       | —     | 220     | μA   | V <sub>in</sub> = VIHA                           |
|                          | I <sub>IL</sub> | 0.5     | —     | 170     | μA   | V <sub>in</sub> = VILB (CS)                      |
|                          |                 | -50     | —     | —       | μA   | V <sub>in</sub> = VILB (Others)                  |
| Supply Current           | IEE             | -200    | —     | —       | mA   | All Outputs Open                                 |

■ AC CHARACTERISTICS (V<sub>EE</sub> = -5.2V ± 5%, T<sub>C</sub> = 0 to +85°C)

## • Read Mode

| Item                      | Symbol           | Min | Typ | Max | Unit | Test Condition |
|---------------------------|------------------|-----|-----|-----|------|----------------|
| Chip Select Access Time   | t <sub>ACS</sub> | —   | —   | 10  | ns   |                |
| Chip Select Recovery Time | t <sub>RCS</sub> | —   | —   | 10  | ns   |                |
| Address Access Time       | t <sub>AA</sub>  | —   | —   | 15  | ns   |                |



## • Write Mode

| Item                   | Symbol | Min | Typ | Max | Unit | Test Condition  |
|------------------------|--------|-----|-----|-----|------|-----------------|
| Write Pulse Width      | tw     | 9   | —   | —   | ns   | tWSA = tWSA min |
| Data Setup Time        | tWSD   | 3   | —   | —   | ns   |                 |
| Data Hold              | tWHD   | 3   | —   | —   | ns   |                 |
| Address Setup Time     | tWSA   | 3   | —   | —   | ns   | tw = tw min     |
| Address Hold Time      | tWHA   | 3   | —   | —   | ns   |                 |
| Chip Select Setup Time | tWSCS  | 3   | —   | —   | ns   |                 |
| Chip Select Hold Time  | tWHCS  | 3   | —   | —   | ns   |                 |
| Write Disable Time     | tWS    | —   | —   | 15  | ns   |                 |
| Write Recovery Time    | tWR    | —   | —   | 18  | ns   |                 |

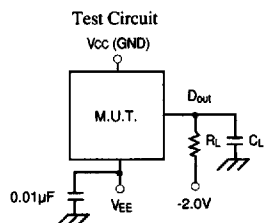
## • Rise/Fall Time

| Item             | Symbol         | Min | Typ | Max | Unit | Test Condition |
|------------------|----------------|-----|-----|-----|------|----------------|
| Output Rise Time | t <sub>r</sub> | —   | 1.5 | —   | ns   |                |
| Output Fall Time | t <sub>f</sub> | —   | 1.5 | —   | ns   |                |

## • Capacitance

| Item               | Symbol           | Min | Typ | Max | Unit | Test Condition |
|--------------------|------------------|-----|-----|-----|------|----------------|
| Input Capacitance  | C <sub>in</sub>  | —   | 3   | —   | pF   |                |
| Output Capacitance | C <sub>OUT</sub> | —   | 5   | —   | pF   |                |

## ■ AC TEST CONDITION

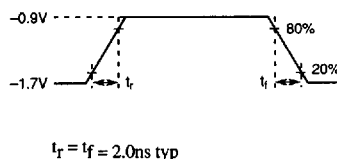


$$R_L = 50\Omega$$

$$C_L = 30\text{pF}$$

(Includes probe and jig capacitance)

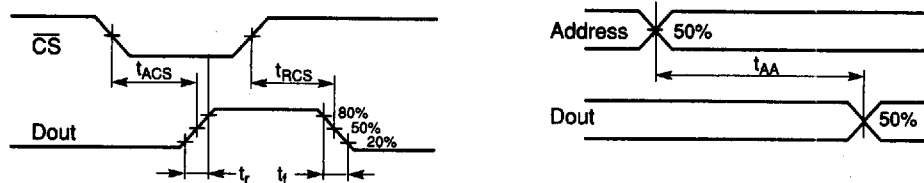
## ■ INPUT PULSE



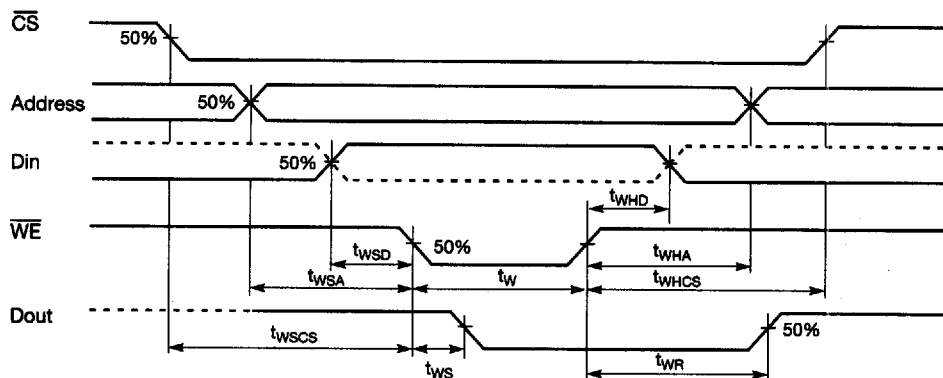
# TIMING WAVEFORM

T-46-23-10

## Read



## Write



# HM101510 Series

Preliminary

**1,048,576-words x 1-Bit Random Access Memory**

T-46-23-10

## ■ DESCRIPTION

The Hitachi HM101510 is ECL 100k compatible, 1,048,576 words by 1 bit read/write random access memory developed for high speed systems.

## ■ FEATURES

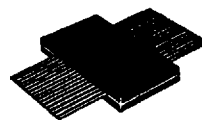
- 1,048,576-words x 1 bit organization
- Fully compatible with 100k ECL level
- 0.8  $\mu$ m Hi-BICMOS process
- Address access time: 15 ns (max.)
- Write pulse width: 9 ns (min.)
- Low power dissipation: 700 mW (typ.)
- Output obtainable by wired-OR (open emitter)

## ■ ORDERING INFORMATION

| Type No.     | Access Time | Package                                                 |
|--------------|-------------|---------------------------------------------------------|
| HM101510F-15 | 15 ns       | 32 pin Ceramic Flat<br>(30 mil Lead Pitch)<br>(FG-28DB) |

## ■ PIN DESCRIPTION

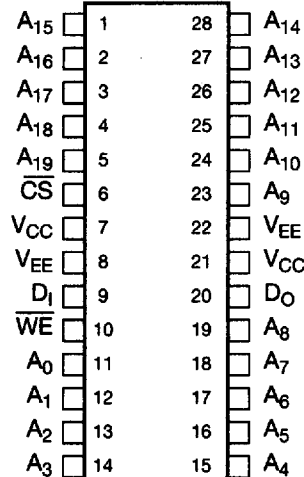
| Pin Name | Function       |
|----------|----------------|
| A0-A19   | Address Input  |
| DI       | Data Input     |
| DO       | Data Output    |
| WE       | Write Enable   |
| CS       | Chip Select    |
| VCC      | Ground         |
| VEE      | Supply Voltage |



(FG-28DB)

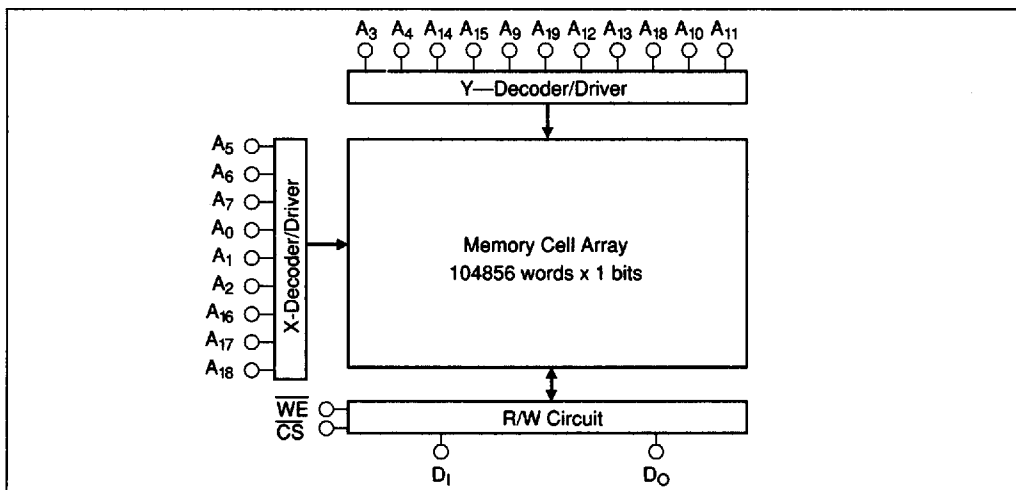
## ■ PIN ARRANGEMENT

HM101510 Series



(Top View)

## ■ BLOCK DIAGRAM



## ■ FUNCTION TABLE

T-46-23-10

| Input           |                 |                | Output      | Mode         |
|-----------------|-----------------|----------------|-------------|--------------|
| $\overline{CS}$ | $\overline{WE}$ | $D_{in}$       |             |              |
| H               | X <sup>1</sup>  | X <sup>1</sup> | L           | Not Selected |
| L               | L               | L              | L           | Write "0"    |
| L               | L               | H              | L           | Write "1"    |
| L               | H               | X <sup>1</sup> | $D_{out}^2$ | Read         |

Notes: 1. Irrelevant  
2. Read Out Noninvert

■ ABSOLUTE MAXIMUM RATING ( $T_a = 25^\circ\text{C}$ )

| Item                | Symbol                   | Rating           | Unit             |
|---------------------|--------------------------|------------------|------------------|
| Supply Voltage      | $V_{EE}$ to $V_{CC}$     | +0.5 to -7.0     | V                |
| Input Voltage       | $V_{in}$                 | +0.5 to $V_{EE}$ | V                |
| Output Current      | $I_{out}$                | -30              | mA               |
| Storage Temperature | $T_{stg}$                | -65 to +150      | $^\circ\text{C}$ |
| Storage Temperature | $T_{stg}(\text{bias})^1$ | -55 to +125      | $^\circ\text{C}$ |

Note: 1. Under bias ( $V_{EE} = -6.0\text{V min.}$ )

## ■ ELECTRICAL CHARACTERISTICS

• DC Characteristics ( $V_{EE} = -5.2\text{V}$ ,  $R_L = 50\Omega$  to  $-2.0\text{V}$ ,  $T_c = 0$  to  $+85^\circ\text{C}$ )

| Item                     | Symbol    | Min (B) | Typ   | Max (A) | Unit          | Test Condition                                      |
|--------------------------|-----------|---------|-------|---------|---------------|-----------------------------------------------------|
| Output Voltage           | $V_{OH}$  | -1025   | -955  | -880    | mV            | $V_{in} = V_{IHA}$ or $V_{ILB}$                     |
|                          | $V_{OL}$  | -1810   | -1715 | -1620   | mV            |                                                     |
| Output Threshold Voltage | $V_{OHC}$ | -1035   | —     | —       | mV            | $V_{in} = V_{IHB}$ or $V_{ILA}$                     |
|                          | $V_{OLC}$ | —       | —     | -1610   | mV            |                                                     |
| Input Voltage            | $V_{IH}$  | -1165   | —     | -880    | mV            | Guaranteed Input Voltage<br>High/Low for All Inputs |
|                          | $V_{IL}$  | -1810   | —     | -1475   | mV            |                                                     |
| Input Current            | $I_{IH}$  | —       | —     | 220     | $\mu\text{A}$ | $V_{in} = V_{IHA}$                                  |
|                          | $I_{IL}$  | 0.5     | —     | 170     | $\mu\text{A}$ | $V_{in} = V_{ILB}(\overline{CS})$                   |
|                          |           | -50     | —     | —       | $\mu\text{A}$ | $V_{in} = V_{ILB}(\text{Others})$                   |
| Supply Current           | $I_{EE}$  | -180    | —     | —       | mA            | All Outputs Open                                    |

■ AC CHARACTERISTICS ( $V_{EE} = -5.2\text{V} \pm 5\%$ ,  $T_c = 0$  to  $+85^\circ\text{C}$ )

## • Read Mode

| Item                      | Symbol    | Min | Typ | Max | Unit | Test Condition |
|---------------------------|-----------|-----|-----|-----|------|----------------|
| Chip Select Access Time   | $t_{ACS}$ | —   | —   | 10  | ns   |                |
| Chip Select Recovery Time | $t_{RCS}$ | —   | —   | 10  | ns   |                |
| Address Access Time       | $t_{AA}$  | —   | —   | 15  | ns   |                |



## • Write Mode

| Item                   | Symbol | Min | Typ | Max | Unit | Test Condition  |
|------------------------|--------|-----|-----|-----|------|-----------------|
| Write Pulse Width      | tw     | 9   | —   | —   | ns   | tWSA = tWSA min |
| Data Setup Time        | twSD   | 3   | —   | —   | ns   |                 |
| Data Hold              | tWHD   | 3   | —   | —   | ns   |                 |
| Address Setup Time     | tWSA   | 3   | —   | —   | ns   | tw = tw min     |
| Address Hold Time      | tWHA   | 3   | —   | —   | ns   |                 |
| Chip Select Setup Time | twSCS  | 3   | —   | —   | ns   |                 |
| Chip Select Hold Time  | tWHCS  | 3   | —   | —   | ns   |                 |
| Write Disable Time     | tWS    | —   | —   | 15  | ns   |                 |
| Write Recovery Time    | tWR    | —   | —   | 18  | ns   |                 |

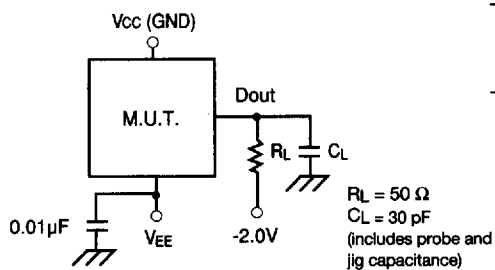
## • Rise/Fall Time

| Item             | Symbol | Min | Typ | Max | Unit | Test Condition |
|------------------|--------|-----|-----|-----|------|----------------|
| Output Rise Time | tr     | —   | 1.5 | —   | ns   |                |
| Output Fall Time | tf     | —   | 1.5 | —   | ns   |                |

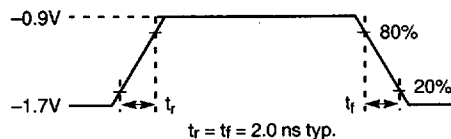
## • Capacitance

| Item               | Symbol | Min | Typ | Max | Unit | Test Condition |
|--------------------|--------|-----|-----|-----|------|----------------|
| Input Capacitance  | Cin    | —   | 3   | —   | pF   |                |
| Output Capacitance | COUT   | —   | 5   | —   | pF   |                |

## ■ AC TEST CONDITION



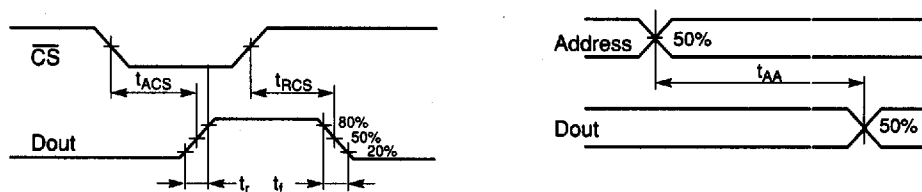
## ■ INPUT PULSE



## ■ TIMING WAVEFORM

T-46-23-10

## • Read



## • Write

