FUJITSU

# MASK PROGRAMMABLE ROM CARD

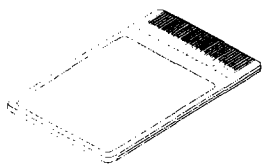
**MB98522RC**
**MB98523RC**
**MB98525RC**

April 1989
Edition 1.0

## CMOS 1M-BIT AND 2M-BIT MASK PROGRAMMABLE READ ONLY MEMORY CARD

The MB98522/523/525 are memory cards which are composed of one or two MB831000 MASK ROM in 38-pin plastic package. These cards have TTL compatible Input/Output and three state output level with fully static operation and a single +5V power supply is required.
They are capable of storing large amount of data and be interfaced to a host or personal computer. Their unique size and portability make them ideal for a wide variety of applications.

- Dimensions of the card are Fujitsu standard:
  2.216 width x 3.370 length x 0.081 height (inches)
- Fujitsu's original recessed edge connector helps to prevent chip damage from static electricity.
- Available various ZIF/LIF (Zero/Low Insertion Force) connectors for electrical interface between card and system
- Applications
  Printer, Typewriter, Word Processor Fonts and Type Styles
  Software Programs for Electronic Games
  Cooking Program cards for Electronic Ovens
  Program Control for Test Equipment



**PLASTIC CARD**
**CRD-38P-M03**

2

| Construction | | MB98522RC | MB98523RC | MB98525RC | Unit |
|---|---|---|---|---|---|
| Organization (word x bit) | | 131,072 x 8 | 262,144 x 8 | 131,072 x 16 | bit |
| Access Time (max.) | | 200 | 200 | 200 | ns |
| Power Dissipation | Active | 220 | 237 | 440 | mW |
| | TTL input level: Standby | 16.5 | 33.0 | 33.0 | mW |
| | CMOS input level: Standby | 0.28 | 0.55 | 0.55 | mW |

**ABSOLUTE MAXIMUM RATINGS (See NOTE)**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Supply Voltage | $V_{CC}$ | −0.3 to +7.0 | V |
| Input Voltage | $V_{IN}$ | −0.3 to $V_{CC}$ +0.3 | V |
| Output Voltage | $V_{OUT}$ | −0.3 to $V_{CC}$ +0.3 | V |
| Temperature under Bias | $T_{BIAS}$ | −10 to +60 | °C |
| Storage Temperature | $T_{STG}$ | −30 to +70 | °C |

**NOTE:** Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**MB98522RC**

## CMOS 1M (1,048,576)-BIT MASK PROGRAMMABLE READ ONLY MEMORY CARD

The MB98522 is a memory card which is composed of one MB831000 MASK ROM organized as 131,072 words x 8 bits housed in 38-pin plastic package. This card has TTL compatible Input/Output and three state output level with fully static operation and a single +5V power supply is required.

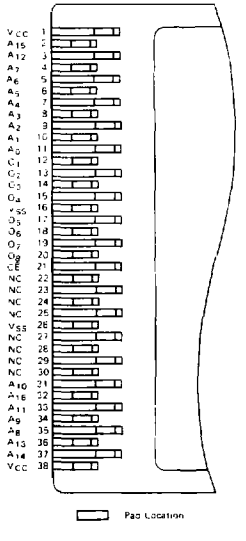
- Card size: 2.216 width x 3.370 length x 0.081 height (inches)
- Organization: 131,072 words x 8 bits
- Access time: 200 ns max.
- Full static operation: No clock required
- Three state output
- TTL compatible Input/Output
- Single +5V power supply
- Power dissipation: 220 mW max. (Active)
  16.5 mW max. (Standby, TTL input level)
  0.28 mW max. (Standby, CMOS input level)

2

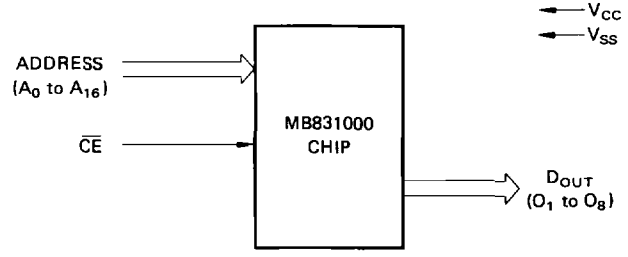
# PIN DESCRIPTION

| Symbol | Pin Number | Parameter |
|---|---|---|
| $A_0$ to $A_{16}$ | 2, 3, 4, 5, 6, 7, 8, 9, 10, 11<br>31, 32, 33, 34, 35, 36, 37 | Address Input |
| $O_1$ to $O_8$ | 12, 13, 14, 15, 17, 18, 19, 20 | Data Output |
| $\overline{CE}$ | 21 | Chip Enable |
| $V_{CC}$ | 1, 38 | Supply Voltage (+5V) |
| $V_{SS}$ | 16, 26 | Ground |
| NC | 22, 23, 24, 25, 27, 28, 29, 30 | Non Connection |

PIN ASSIGNMENT
(TOP VIEW)



FUNCTIONAL BLOCK DIAGRAM

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## FUNCTION TABLE

| $\overline{CE}$ | Selection Mode | Output | Power Dissipation Mode |
|---|---|---|---|
| H | Not Selected | High-Z | Standby |
| L | Selected | Output Data | Active |

**Note:** H = High level, L = Low level

## DC CHARACTERISTICS

(Recommended operating conditions unless otherwise noted.)

| Parameter | Test Condition | Symbol | Value | | Unit |
|---|---|---|---|---|---|
| | | | Min | Max | |
| Active Supply Current | $\overline{CE}$ = $V_{IL}$, Minimum Cycle | $I_{CC}$ | | 40 | mA |
| Standby Supply Current | $\overline{CE}$ = $V_{IH}$ | $I_{SB1}$ | | 3 | mA |
| | $\overline{CE}$ = $V_{CC}$, $V_{IN}$ = $V_{SS}$ or $V_{CC}$ | $I_{SB2}$ | | 50 | μA |
| Input Leakage Current | $V_{IN}$ = 0V to $V_{CC}$ | $I_{LI}$ | −10 | 10 | μA |
| Output Leakage Current | $\overline{CE}$ = $V_{IH}$ | $I_{LO}$ | −10 | 10 | μA |
| Output High Voltage | $I_{OH}$ = −400μA | $V_{OH}$ | 2.4 | | V |
| Output Low Voltage | $I_{OL}$ = 2.1mA | $V_{OL}$ | | 0.4 | V |

## CAPACITANCE

($T_A$ = 25°C, f = 1MHz)

| Parameter | Symbol | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| Input Capacitance ($V_{IN}$ = 0V) | $C_{IN}$ | – | 15 | 20 | pF |
| Output Capacitance ($V_{OUT}$ = 0V) | $C_{OUT}$ | – | 15 | 20 | pF |

**MB98523RC**

## CMOS 2M (2,097,152)-BIT MASK PROGRAMMABLE READ ONLY MEMORY CARD

The MB98523 is a memory card which is composed of two MB831000 MASK ROM organized as 262,144 words x 8 bits housed in 38-pin plastic package. This card has TTL compatible Input/Output and three state output level with fully static operation and a single +5V power supply is required.

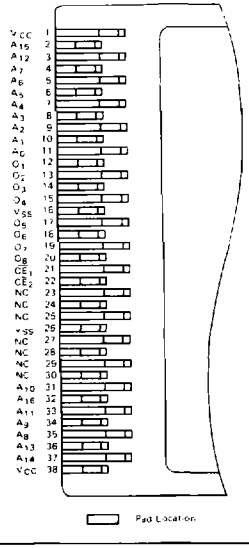
- Card size: 2.216 width x 3.370 length x 0.081 height (inches)
- Organization: 262,144 words x 8 bits
- Access time: 200 ns max.
- Full static operation: No clock required
- Three state output
- TTL compatible Input/Output
- Single +5V power supply
- Power dissipation: 237 mW max. (Active)
  33.0 mW max. (Standby, TTL input level)
  0.55 mW max. (Standby, CMOS input level)

2

# PIN DESCRIPTION

| Symbol | Pin Number | Parameter |
|---|---|---|
| $A_0$ to $A_{16}$ | 2, 3, 4, 5, 6, 7, 8, 9, 10, 11<br>31, 32, 33, 34, 35, 36, 37 | Address Input |
| $O_1$ to $O_8$ | 12, 13, 14, 15, 17, 18, 19, 20 | Data Output |
| $\overline{CE}_1$, $\overline{CE}_2$ | 21, 22 | Chip Enable |
| $V_{CC}$ | 1, 38 | Supply Voltage (+5V) |
| $V_{SS}$ | 16, 26 | Ground |
| NC | 23, 24, 25, 27, 28, 29, 30 | Non Connection |

PIN ASSIGNMENT
(TOP VIEW)



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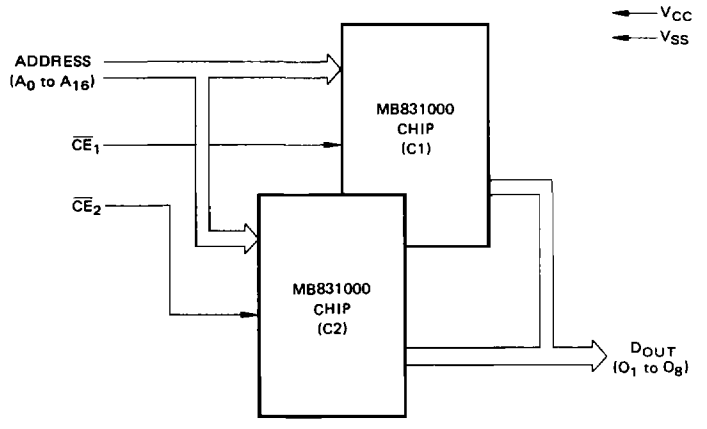
FUNCTIONAL BLOCK DIAGRAM




## FUNCTION TABLE

| $\overline{CE}_1$ | $\overline{CE}_2$ | Selection Mode | Output | Power Dissipation Mode |
|---|---|---|---|---|
| H | H | Not Selected | High-Z | Standby |
| L | H | Selected | Output Data ($C_1$) | Active |
| H | L | Selected | Output Data ($C_2$) | Active |

**Note:** H = High level, L = Low level.

## DC CHARACTERISTICS

**(Recommended operating conditions unless otherwise noted.)**

| Parameter | Test Condition | Symbol | Value | | Unit |
|---|---|---|---|---|---|
| | | | Min | Max | |
| Active Supply Current | $\overline{CE}$ = $V_{IL}$*, Minimum Cycle | $I_{CC}$ | | 43 | mA |
| Standby Supply Current | $\overline{CE_1}$ = $\overline{CE_2}$ = $V_{IH}$ | $I_{SB1}$ | | 6 | mA |
| | $\overline{CE_1}$ = $\overline{CE_2}$ = $V_{CC}$<br>$V_{IN}$ = $V_{SS}$ or $V_{CC}$ | $I_{SB2}$ | | 100 | μA |
| Input Leakage Current | $V_{IH}$ = 0V to $V_{CC}$ | $I_{LI}$ | −20 | 20 | μA |
| Output Leakage Current | $\overline{CE_1}$ = $\overline{CE_2}$ = $V_{IH}$ | $I_{LO}$ | −20 | 20 | μA |
| Output High Voltage | $I_{OH}$ = −400μA | $V_{OH}$ | 2.4 | | V |
| Output Low Voltage | $I_{OL}$ = 2.1mA | $V_{OL}$ | | 0.6 | V |

**Note:** *Either $\overline{CE_1}$ or $\overline{CE_2}$ must be satisfied with $V_{IH}$.

## CAPACITANCE

**($T_A$ = 25°C, f = 1MHz)**

| Parameter | Symbol | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| Input Capacitance ($V_{IN}$ = 0V) | $C_{IN}$ | – | 20 | 25 | pF |
| Output Capacitance ($V_{OUT}$ = 0V) | $C_{OUT}$ | – | 20 | 25 | pF |

**MB98525RC**

## CMOS 2M (2,097,152)-BIT MASK PROGRAMMABLE READ ONLY MEMORY CARD

The MB98525 is a memory card which is composed of two MB831000 MASK ROM organized as 131,072 words x 16 bits housed in 38-pin plastic package. This card has TTL compatible Input/Output and three state output level with fully static operation and a single +5V power supply is required.

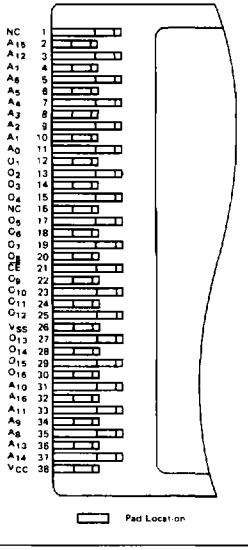
- Card size: 2.216 width x 3.370 length x 0.081 height (inches)
- Organization: 131,072 words x 16 bits
- Access time: 200 ns max.
- Full static operation: No clock required
- Three state output
- TTL compatible Input/Output
- Single +5V power supply
- Power dissipation: 440 mW max. (Active)
  33.0 mW max. (Standby, TTL input level)
  0.55 mW max. (Standby, CMOS input level)

2

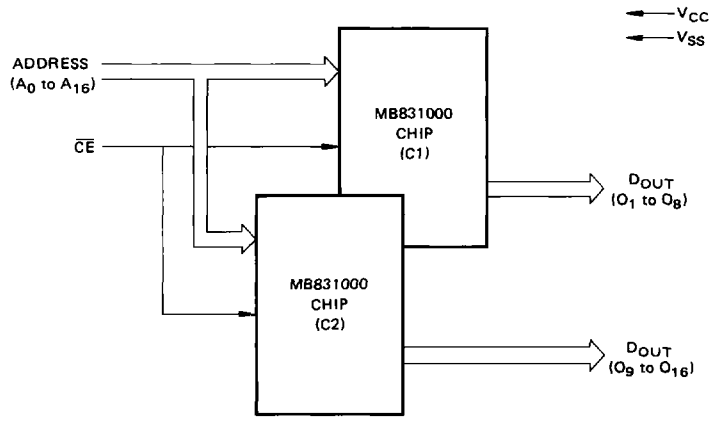
# PIN DESCRIPTION

| Symbol | Pin Number | Parameter |
|---|---|---|
| $A_0$ to $A_{16}$ | 2, 3, 4, 5, 6, 7, 8, 9, 10, 11<br>31, 32, 33, 34, 35, 36, 37 | Address Input |
| $O_1$ to $O_{16}$ | 12, 13, 14, 15, 17, 18, 19, 20<br>22, 23, 24, 25, 27, 28, 29, 30 | Data Output |
| $\overline{CE}$ | 21 | Chip Enable |
| $V_{CC}$ | 38 | Supply Voltage (+5V) |
| $V_{SS}$ | 26 | Ground |
| NC | 1, 16 | Non Connection |

PIN ASSIGNMENT
(TOP VIEW)



FUNCTIONAL BLOCK DIAGRAM

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## FUNCTION TABLE

| $\overline{CE}$ | Selection Mode | Output | Power Dissipation Mode |
|---|---|---|---|
| H | Not Selected | High-Z | Standby |
| L | Selected | Output Data | Active |

**Note:** H = High level, L = Low level

## DC CHARACTERISTICS

(Recommended operating conditions unless otherwise noted.)

| Parameter | Test Condition | Symbol | Value | | Unit |
|---|---|---|---|---|---|
| | | | Min | Max | |
| Active Supply Current | $\overline{CE}$ = $V_{IL}$, Minimum Cycle | $I_{CC}$ | | 80 | mA |
| Standby Supply Current | $\overline{CE}$ = $V_{IH}$ | $I_{SB1}$ | | 6 | mA |
| | $\overline{CE}$ = $V_{CC}$, $V_{IN}$ = $V_{SS}$ or $V_{CC}$ | $I_{SB2}$ | | 100 | μA |
| Input Leakage Current | $V_{IH}$ = 0V to $V_{CC}$ | $I_{LI}$ | −20 | 20 | μA |
| Output Leakage Current | $\overline{CE}$ = $V_{IH}$ | $I_{LO}$ | −20 | 20 | μA |
| Output High Voltage | $I_{OH}$ = −400μA | $V_{OH}$ | 2.4 | | V |
| Output Low Voltage | $I_{OL}$ = 2.1mA | $V_{OL}$ | | 0.4 | V |

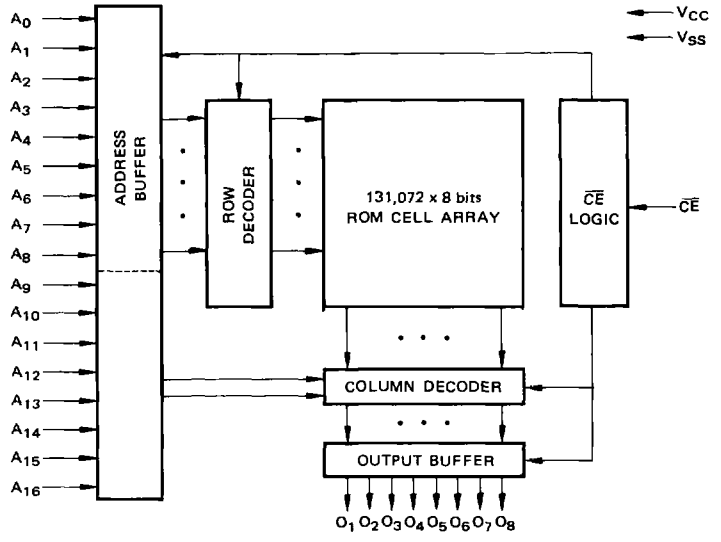
## CAPACITANCE

($T_A$ = 25°C, f = 1MHz)

| Parameter | Symbol | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| Input Capacitance ($V_{IN}$ = 0V) | $C_{IN}$ | – | 20 | 25 | pF |
| Output Capacitance ($V_{OUT}$ = 0V) | $C_{OUT}$ | – | 20 | 25 | pF |

COMMON CHARACTERISTICS (MB831000)

BLOCK DIAGRAM FOR EACH CHIP

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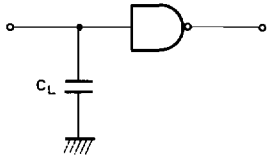
## RECOMMENDED OPERATING CONDITIONS

(Referenced to GND)

| Parameter | Symbol | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min | Typ | Max | |
| Supply Voltage | $V_{CC}$ | 4.5 | 5.0 | 5.5 | V |
| Input Low Voltage | $V_{IL}$ | -0.3 | | 0.8 | V |
| Input High Voltage | $V_{IH}$ | 2.2 | | $V_{CC}$ +0.3 | V |
| Ambient Temperature | $T_A$ | 0 | | 50 | °C |

**AC TEST CONDITION**

| | | |
|---|---|---|
| Input Pulse Level | : | 0.6 to 2.4V |
| Input Pulse Rise/Fall Time | : | $t_T$ = 10ns |
| Timing Reference Levels | | |
| Input | : | $V_{IL}$ = 0.8V, $V_{IH}$ = 2.2V |
| Output | : | $V_{OL}$ = 0.8V, $V_{OH}$ = 2.0V |
| Output Load | : | 1TTL gate and 100pF |

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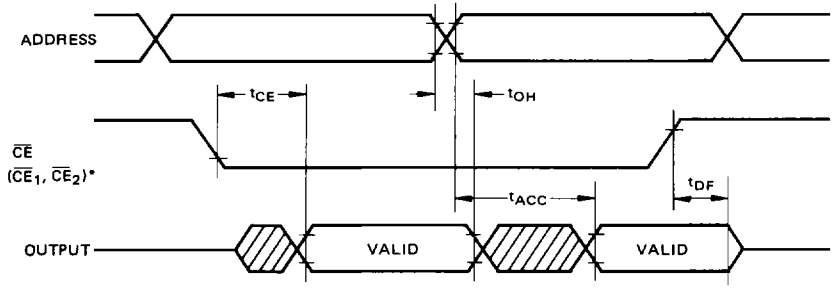
# AC CHARACTERISTICS

**(Recommended operating conditions unless otherwise noted.)**

| Parameter | Symbol | Value | | Unit |
|---|---|---|---|---|
| | | Min | Max | |
| Address Access Time | $t_{ACC}$ | | 200 | ns |
| Chip Enable Access Time | $t_{CE}$ | | 200 | ns |
| Output Disable Time | $t_{DF}$ | | 60 | ns |
| Output Hold Time | $t_{OH}$ | 0 | | ns |

**READ WAVEFORM**




**Note:** * When MB98523 is used, either $\overline{CE}_1$ or $\overline{CE}_2$ must be satisfied with $V_{IH}$.

# PACKAGE DIMENSIONS