

HIGH SPEED SCHOTTKY TTL 32,768-BIT PROM

DESCRIPTION

The Fujitsu MB7141 and MB7142 are high speed electrically field programmable read only memories. With open collector outputs on the MB7141 and three-state outputs on the MB7142, memory expansion is simple.

The memory is fabricated with all logic "zeros" (positive logic). Logic level "ones" can be programmed by the highly reliable DEAP™ (Diffused Eutectic Aluminum Process) during a simple programming procedure.

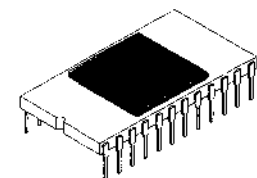
The sophisticated passive isolation termed IOP (Isolation by Oxide and Polysilicon) with thin epitaxial layer and Schottky TTL process permits minimal chip size and fast access time.

The extra test cell and unique testing methods provide enhanced correlation between programmed and unprogrammed circuits in order to perform AC, DC and programming test prior to shipment. This results in extremely high programmability.

FEATURES

- Organization: 4096 words x 8 bits, fully decoded
- TTL compatible input/output
- Fast Access Time:
MB7141E/MB7142E:
65 ns Max.
45 ns Typ.
MB7141H/MB7142H:
55 ns Max.
45 ns Typ.

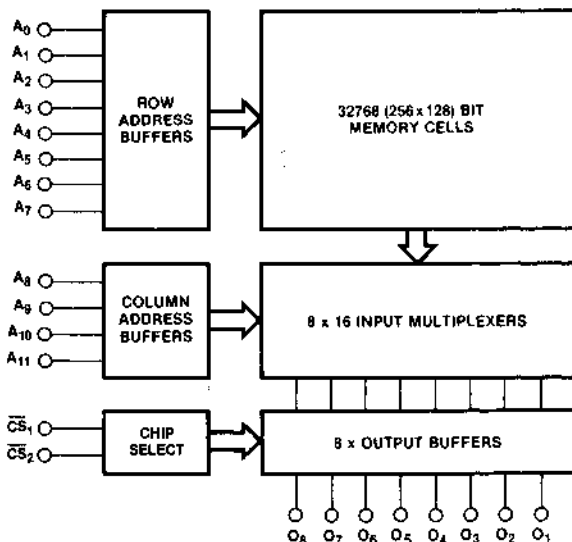
- Low power dissipation:
185mA max
- Single +5V supply voltage
- Simplified and lower power programming
- Proven high programmability and reliability of DEAP™ (Diffused Eutectic Aluminum Process)
- Low current PNP inputs



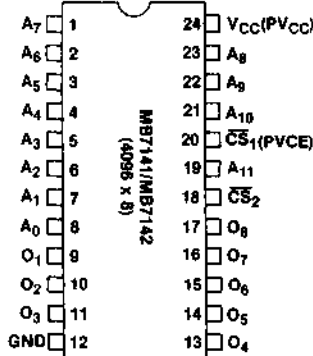
**CERAMIC PACKAGE
DIP-24C-A01**

- MB7141: Open collector outputs
- MB7142: Three-state outputs
- Two chip select leads for easy memory expansion
- Standard 24-pin DIP package
- MB7142 pin compatible with N82S321, HM76321 and 3632

MB7141/MB7142 BLOCK DIAGRAM



PIN ASSIGNMENT



This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

MB7141/MB7142**ABSOLUTE MAXIMUM RATINGS** (See Note)

Rating	Symbol	Value	Unit
Power Supply Voltage	V _{CC}	-0.5 to +7.0	V
Power Supply Voltage (during programming)	V _{CC}	-0.5 to +7.5	V
Input Voltage	V _{IN}	-1.5 to +5.5	V
Input Voltage (during programming)	V _{IPRG}	22.5	V
Output Voltage (during programming)	V _{OPRG}	-0.5 to +22.5	V
Input Current	I _{IN}	-20	mA
Input Current (during programming)	I _{IPRG}	+270	mA
Output Current	I _{OUT}	+100	mA
Output Current (during programming)	I _{OPRG}	+150	mA
Storage Temperature	T _{stg}	-65 to +150	°C
Output Voltage	V _{OUT}	-0.5 to +V _{CC}	V

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.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V _{CC}	4.75	5.0	5.25	V
Input Low Voltage	V _{IL}	0.0	—	0.8	V
Input High Voltage	V _{IH}	2.0	—	V _{CC}	V
Ambient Temperature	T _A	0	—	75	°C

DC CHARACTERISTICS

Full guaranteed ranges unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit
Input Leakage Current (V _{IH} = 4.5V)	I _{R1}	—	—	40	μA
Input Leakage Current (V _{IH} = 5.5V)	I _{R2}	—	—	1.0	mA
Input Load Current (V _{IL} = 0.45V)	I _F	—	—	-250	μA
Output Low Voltage (I _{OL} = 16 mA)	V _{OL}	—	—	0.50	V
Output Leakage Current (V _O = 2.4V, chip disable from a low)	MB7141	I _{OLK}	—	40	μA
	MB7142	I _{OIH}	—	40	μA
Output Leakage Current (V _O = 0.5V, chip disabled from a high)	MB7142	I _{OIL}	—	-40	μA
Input Clamp Voltage (I _{IN} = -18mA)	V _{IC}	—	—	-1.2	V
Power Supply Current (V _{IN} = OPEN or GND)	I _{CC}	—	140	185	mA
Output High Voltage (I _O = -2.4mA)	V _{OH} *	2.4	—	—	V
Output Short Circuit Current (V _O = GND)	I _{OS} *	-15	—	-60	mA

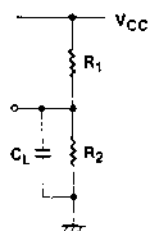
* **Note:** Denotes guaranteed characteristics of output high-level (ON) state when the chip is enabled and the programmed bit is addressed. These characteristics cannot be tested prior to programming, but are guaranteed by factory testing.

AC CHARACTERISTICS

Full guaranteed operating ranges unless otherwise noted.

Parameter	Symbol	MB7141E/MB7142E		MB7141H/MB7142H		Unit
		Typ	Max	Typ	Max	
Address Access Time	t _{AA}	45	65	45	55	ns
Output Disable Time	t _{DIS}	—	40	—	40	ns
Output Enable Time	t _{EN}	—	40	—	40	ns

AC TEST CONDITIONS



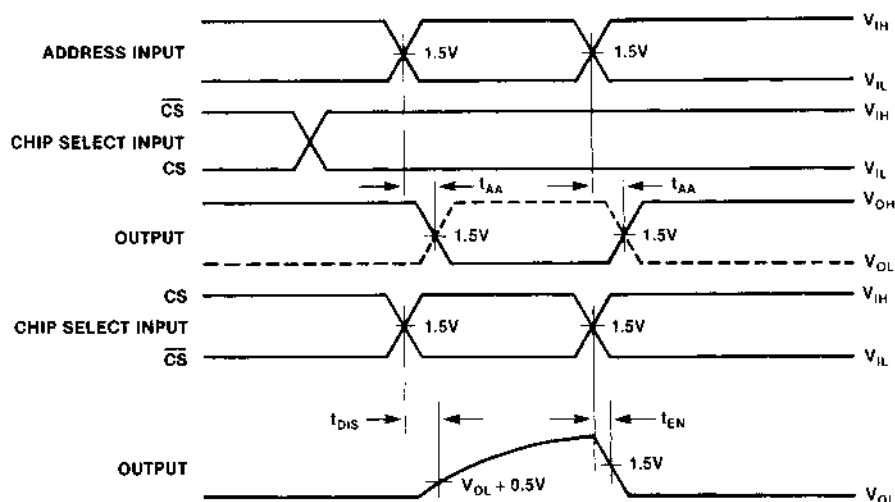
INPUT CONDITIONS

Amplitude 0V to 3V
 Rise and Fall Time 5 ns from 1V to 2V
 Frequency 1 MHz

MB7141/MB7142

R_1	R_2	C_L
300 Ω	600 Ω	30pF

OPERATION TIMING DIAGRAM

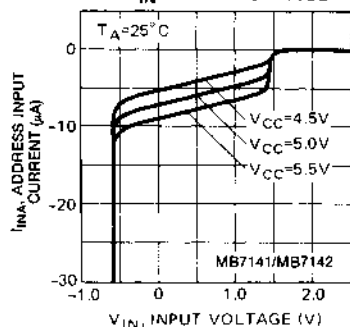
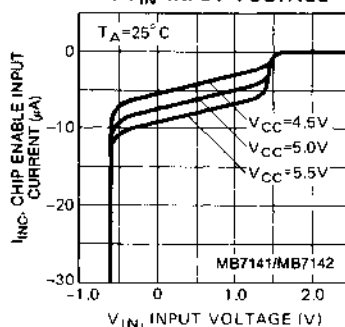
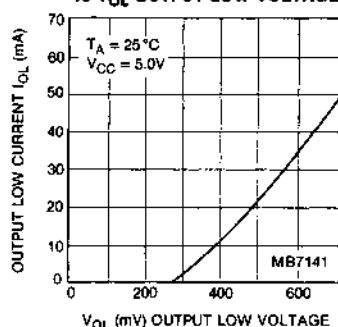
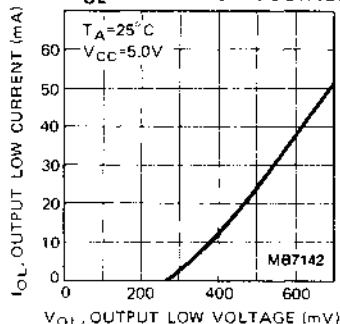
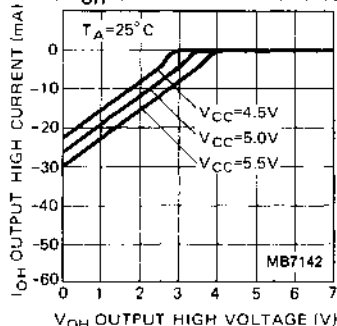
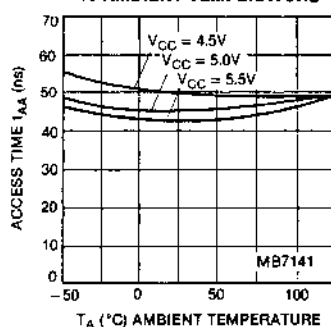
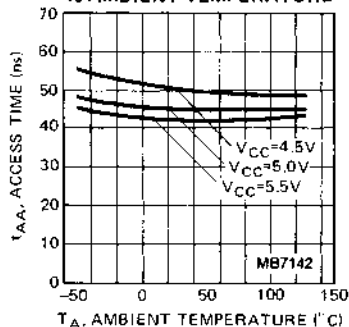


Notes: Output disable time is the time taken for the output to reach a high impedance state when either chip enable is taken to the inactive state. Output enable time is the time taken for the output to become active when both chip enables are taken to the active state. The high impedance state is defined as a point on the output waveform equal to a ΔV of 0.5V from the active output level.

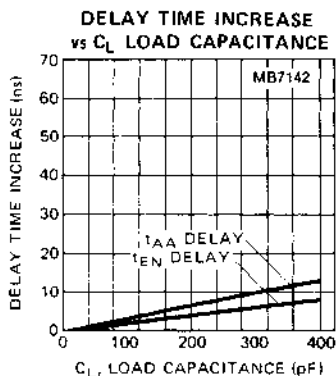
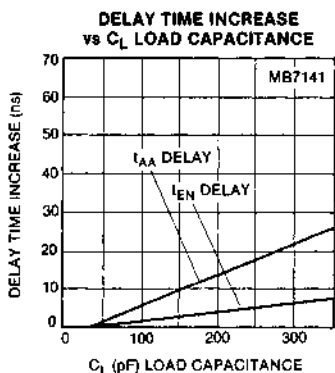
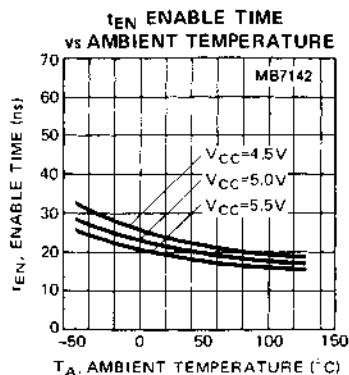
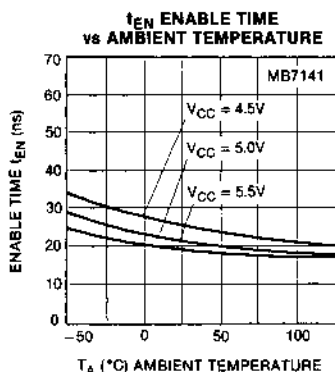
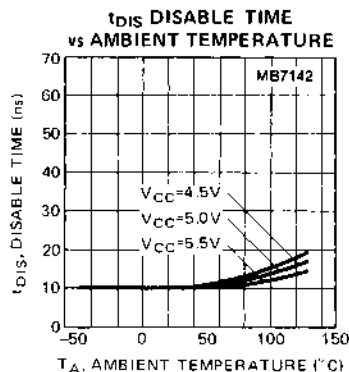
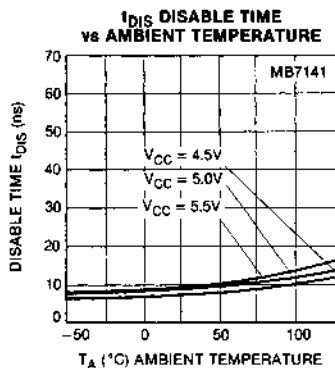
CAPACITANCE ($f = 1 \text{ MHz}$, $V_{CC} = +5V$, $V_{IN} = +2V$, $T_A = 25^\circ\text{C}$)

Parameter	Symbol	Min	Typ	Max	Unit
Input Capacitance	C_i	—	—	10	pF
Output Capacitance	C_o	—	—	15	pF

TYPICAL CHARACTERISTICS CURVES

 I_{INA} INPUT CURRENT
vs V_{IN} INPUT VOLTAGE I_{INC} INPUT CURRENT
vs V_{IN} INPUT VOLTAGE I_{OL} OUTPUT LOW CURRENT
vs V_{OL} OUTPUT LOW VOLTAGE I_{OL} OUTPUT LOW CURRENT
vs V_{OL} OUTPUT LOW VOLTAGE I_{OH} OUTPUT HIGH CURRENT
vs V_{OH} OUTPUT HIGH VOLTAGE t_{AA} ACCESS TIME
vs AMBIENT TEMPERATURE t_{AA} ACCESS TIME
vs AMBIENT TEMPERATURE

TYPICAL CHARACTERISTICS CURVES (Continued)



INPUT/OUTPUT CIRCUIT INFORMATION

INPUT

In the input circuit, Schottky TTL circuit technology is used to achieve high-speed operation. A PNP transistor in the first stage of input circuit remarkably improves input high/low current characteristics. Also, the input circuit includes a protection diode for reliable operation.

OPEN COLLECTOR OUTPUT

The open-collector output is often utilized in high speed applications where power dissipation must be minimized. When the device is switched, there is no current sourced from the supply rail. Consequently, the current spike normally associated with TTL totem-pole outputs is eliminated. In high frequency applications, this minimizes noise problems (false triggering) as well as power drain. For example, the transient current (low impedance high-level to low impedance low-level) is typically 30mA for the MB7142 (3-state) compared to 0mA for the MB7141 (open-collector).

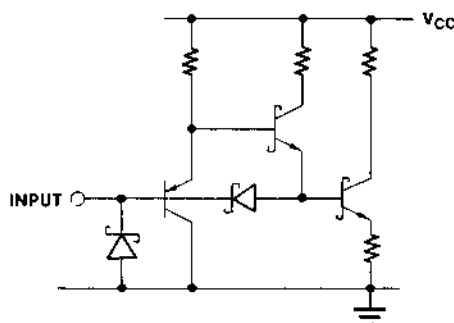
THREE-STATE OUTPUT

A "three-state" output is a logic element which has three distinct output states of LOW, HIGH and OFF (wherein OFF represents a high impedance condition which can neither sink nor source current at a definable logic level.) Effectively, then, the device has all the desirable features of a totem-pole TTL output (e.g., greater noise immunity, good rise time, line driving capacity), plus the ability to connect to bus-organized systems.

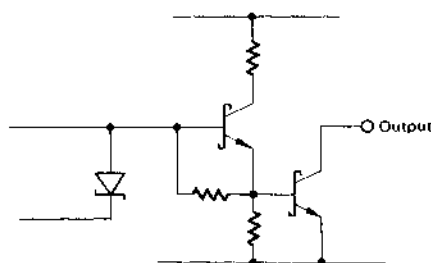
In the case where two devices are on at the same time, the possibility exists that they may be in opposite low impedance states simultaneously; thus, the short circuit current from one enabled device may flow through the other enabled device. While physical damage under these conditions is unlikely, system noise problems could result. Therefore, the system designer should consider these factors to ensure that this condition does not exist.

Also in the output circuit, Schottky TTL circuit technology is used to achieve high-speed operation. Also, a PNP transistor is provided in the output circuit to decrease the load on the Chip Select circuit.

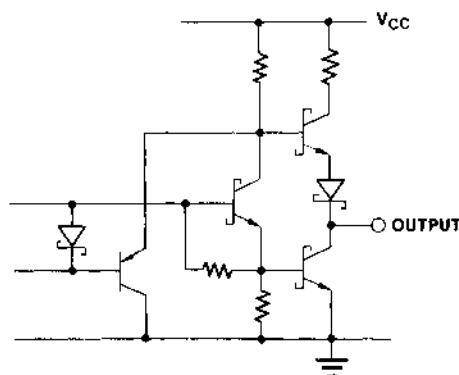
MB7141/MB7142 INPUT CIRCUIT



MB7141 OUTPUT CIRCUIT



MB7142 OUTPUT CIRCUIT



MB7141/MB7142 BIT MAP

A ₈ A ₉ A ₁₀ A ₁₁	
O ₈	↓
O ₇	
O ₆	
O ₅	
O ₄	
O ₃	
O ₂	
O ₁	
A ₀ 0	0
A ₁ 1	0
A ₆ 1	0
A ₅ 0	1
A ₇ 0	1
A ₄ 0	1
A ₃ 0	1
A ₂ 0	1

Multiplexer

A ₈ A ₉ A ₁₀ A ₁₁
0 0 0 0
0 0 0 1
0 0 1 1
0 0 1 0
0 1 1 0
0 1 1 1
0 1 0 1
0 1 0 0
1 0 1 0
1 0 1 1
1 0 0 1
1 0 0 0
1 1 0 0
1 1 0 1
1 1 1 1
1 1 1 0

Decoder/Driver

A ₀	01100110	01100110	01100110	01100110	01100110	01100110	01100110	01100110
A ₁	11000011	00111100	00111100	11000011	00111100	11000011	11000011	00111100
A ₆	11110000	11110000	11110000	11110000	11110000	11110000	11110000	11110000
A ₅	00000000	11111111	00000000	11111111	00000000	11111111	00000000	11111111
A ₇	00000000	00000000	11111111	11111111	00000000	00000000	11111111	11111111
A ₄	00000000	00000000	00000000	00000000	11111111	11111111	11111111	11111111
A ₃	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
A ₂	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

A ₀	01100110	01100110	01100110	01100110	01100110	01100110	01100110	01100110
A ₁	00111100	11000011	11000011	00111100	11000011	00111100	00111100	11000011
A ₆	11110000	11110000	11110000	11110000	11110000	11110000	11110000	11110000
A ₅	00000000	11111111	00000000	11111111	00000000	11111111	00000000	11111111
A ₇	00000000	00000000	11111111	11111111	00000000	00000000	11111111	11111111
A ₄	00000000	00000000	00000000	00000000	11111111	11111111	11111111	11111111
A ₃	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111
A ₂	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000

A ₀	01100110	01100110	01100110	01100110	01100110	01100110	01100110	01100110
A ₁	00111100	11000011	11000011	00111100	11000011	00111100	00111100	11000011
A ₆	11110000	11110000	11110000	11110000	11110000	11110000	11110000	11110000
A ₅	00000000	11111111	00000000	11111111	00000000	11111111	00000000	11111111
A ₇	00000000	00000000	11111111	11111111	00000000	00000000	11111111	11111111
A ₄	00000000	00000000	00000000	00000000	11111111	11111111	11111111	11111111
A ₃	00000000	00000000	00000000	00000000	00000000	00000000	00000000	00000000
A ₂	11111111	11111111	11111111	11111111	11111111	11111111	11111111	11111111

A ₀	01100110	01100110	01100110	01100110	01100110	01100110	01100110	01100110
A ₁	11000011	00111100	00111100	11000011	00111100	11000011	11000011	00111100
A ₆	11110000	11110000	11110000	11110000	11110000	11110000	11110000	11110000
A ₅	00000000	11111111	00000000	11111111	00000000	11111111	00000000	11111111
A ₇	00000000	00000000	11111111	11111111	00000000	00000000	11111111	11111111
A ₄	00000000	00000000	00000000	00000000	11111111	11111111	11111111	11111111
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