

### 256 BIT BIPOLAR TTL

#### PROGRAMMABLE READ ONLY MEMORY

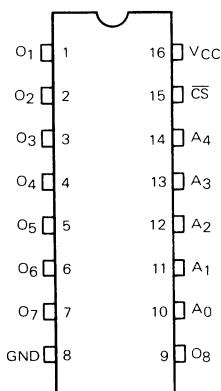
#### Description

The  $\mu$ PB400C,  $\mu$ PB400D,  $\mu$ PB410C and  $\mu$ PB410D are high speed, electrically programmable, fully decoded 256 bit TTL read only memories. On-chip address decoding, chip select input and open-collector/three-state outputs allow easy expansion of memory capacity. The  $\mu$ PB400C,  $\mu$ PB400D,  $\mu$ PB410C and  $\mu$ PB410D are fabricated with logic level zero (low); logic level one (high) can be electrically programmed into the selected bit locations. The same address inputs are used for both programming and reading.

#### Features

- 32 WORDS x 8 BITS organization (Fully decoded)
- TTL Interface
- Fast read access time : 30 ns MAX. ( $\mu$ PB400-1,  $\mu$ PB410-1)
- Medium power consumption: : 350 mW TYP.
- A chip select input for memory expansion
- Open-Collector outputs ( $\mu$ PB400C,  $\mu$ PB400D)/Three-state outputs ( $\mu$ PB410C,  $\mu$ PB410D)
- Cerdip 16-Lead Dual In-Line Package ( $\mu$ PB400D,  $\mu$ PB410D)
- Plastic 16-Lead Dual In-Line Package ( $\mu$ PB400C,  $\mu$ PB410C)
- Fast Programming time : 200 $\mu$ s/bit TYP.
- Replaceable with : Harris' HM7602/7603, MMI's 63S080/081 and equivalent devices (as a ROM)

#### Connection Diagram (Top View)



#### PIN NAMES

- $A_0 \sim A_4$  : Address Inputs
- $O_1 \sim O_8$  : Data Outputs
- $\overline{CS}$  : Chip Select Input (Active Low)
- $V_{CC}$  : Power Supply (+5 V)
- GND : Ground

### ABSOLUTE MAXIMUM RATINGS

Supply Voltage	$V_{CC}$	-0.5 to +7.0	V
Input Voltage	$V_I$	-0.5 to +5.5	V
Output Voltage	$V_O$	-0.5 to +5.5	V
Output Current	$I_O$	50	mA
Operating Temperature	$T_{opt}$	-25 to +75	°C
Storage Temperature			°C
Cerdip Package	$T_{stg}$	-65 to +150	°C
Plastic Package	$T_{stg}$	-55 to +125	°C

### D.C. CHARACTERISTICS ( $V_{CC} = 4.5$ to $5.5$ V, $T_a = 0$ to $75$ °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Input High Voltage	$V_{IH}$	2.0			V	
Input Low Voltage	$V_{IL}$			0.85	V	
Input High Current	$I_{IH}$			40	μA	$V_I = 5.5$ V $V_{CC} = 5.5$ V
Input Low Current	$-I_{IL}$			0.25	mA	$V_I = 0.4$ V $V_{CC} = 5.5$ V
Output Low Voltage	$V_{OL}$			0.45	V	$I_O = 16$ mA $V_{CC} = 4.5$ V
Output Leakage Current	$I_{OFF1}$			40	μA	$V_O = 5.5$ V $V_{CC} = 5.5$ V
Output Leakage Current	$-I_{OFF2}$			40	μA	$V_O = 0.4$ V $V_{CC} = 5.5$ V
Input Clamp Voltage	$-V_{IC}$			1.2	V	$I_I = -18$ mA $V_{CC} = 4.5$ V
Power Supply Current	$I_{CC}$		60	100	mA	All Inputs Grounded. $V_{CC} = 5.5$ V
Output High Voltage	$V_{OH}$	2.4			V	$I_O = -2.4$ mA $V_{CC} = 4.5$ V
Output Short Circuit Current	$-I_{SC}$	15		60	mA	$V_O = 0$ V

\* Note: Applicable to μPB410C and μPB410D.

### CAPACITANCE ( $V_{CC} = 5$ V, $f = 1$ MHz, $T_a = 25$ °C)

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT	TEST CONDITION
Input Capacitance	$C_{IN}$		8	pF	$V_{IN} = 2.5$ V
Output Capacitance	$C_{OUT}$		10	pF	$V_{OUT} = 2.5$ V

### A.C. CHARACTERISTICS ( $V_{CC} = 4.5$ to $5.5$ V, $T_a = 0$ to $75$ °C)

CHARACTERISTIC	SYMBOL	μPB400C-1, μPB410C-1 μPB400D-1, μPB410D-1		μPB400C, μPB410C μPB400D, μPB410D		UNIT
		MIN.	MAX.	MIN.	MAX.	
Address Access Time	$t_{AA}$		30		35	ns
Chip Select Access Time	$t_{ACS}$		20		25	ns
Chip Select Disable Time	$t_{DCS}$		20		25	ns

- Note 1.** Output Load: See Fig. 1.  
**Note 2.** Input Waveform: 0.0 V for low level and 3.0 V for high level, less than 10 ns for both rise and fall times.  
**Note 3.** Measurement References: 1.5 V for both inputs and outputs.  
**Note 4.**  $C_L$  in Fig. 1 includes jig and probe stray capacitances.

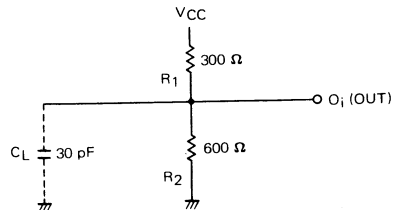


Fig. 1

### Operation

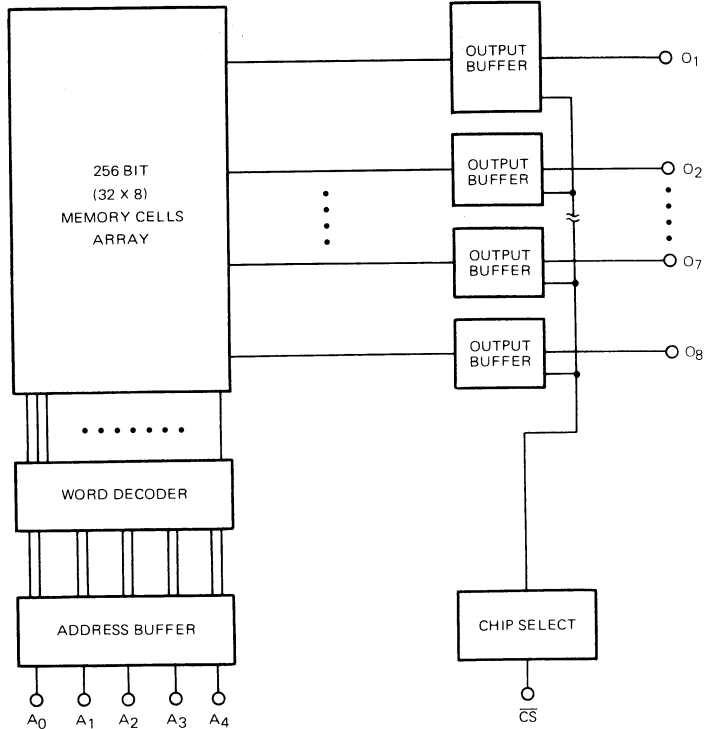
#### 1. Programming

A logic one can be permanently programmed into a selected bit location by using special equipment (programmer). First the Chip Select input CS must be a logical one in order to disable the outputs. Second, the desired word is selected by the five address inputs in TTL levels. Third, a train of high current programming pulses is applied to the desired output. After the sensed voltage indicates that the selected bit is in the logic one state, an additional pulse train is applied, then is stopped.

#### 2. Reading

To read the memory, the Chip Select input must be a logical zero. The outputs then correspond to the data programmed in the selected words. When the Chip Select input is a logical one, all the outputs will be high (floating).

### Logic Diagram

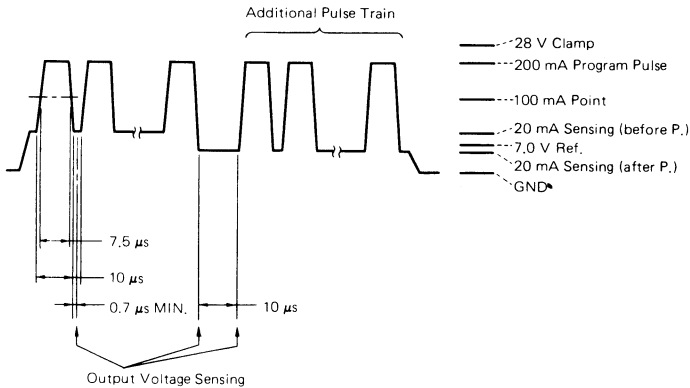


**PROGRAMMING SPECIFICATION**

It is imperative that this specification be rigorously observed in order to correctly program the μPB400C, μPB400D, μPB410C and μPB410D. NEC will not accept responsibility for any device found to be defective if it were not programmed according to this specification.

CHARACTERISTIC	LIMIT	UNIT	NOTES
Ambient Temperature	25 ±5	° C	
Programming Pulse			
Amplitude	200 ±5 %	mA	
Clamp Voltage	28 +0 % -2 %	V	
Ramp Rate (Both in Rise and in Fall)	70 MAX.	V/μs	
Pulse Width	7.5 ±5 %	μs	15 V point/150 Ω load.
Duty Cycle	70 % MIN.		
Sense Current			
Amplitude	20 ±0.5	mA	
Clamp Voltage	28 +0 % -2 %	V	
Ramp Rate	70 MAX.	V/μs	
Sense Current Interruption before and after address change	10 MIN.	μs	15 V point/150 Ω load.
Programming V <sub>CC</sub>	5.0 +5 % -0 %	V	
Maximum Sensed Voltage* for programmed "1"	7.0 ±0.1	V	
Delay from trailing edge of programming pulse before sensing output voltage	0.7 MIN.	μs	

\* A bit is judged to be programmed when two successive sense readings 10 μs apart with no intervening programming pulse, pass the limit. When this condition has been met, four additional pulses are applied and the pulse train, then the sense current is terminated.

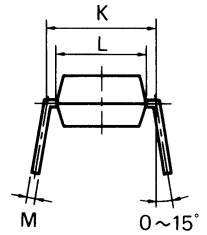
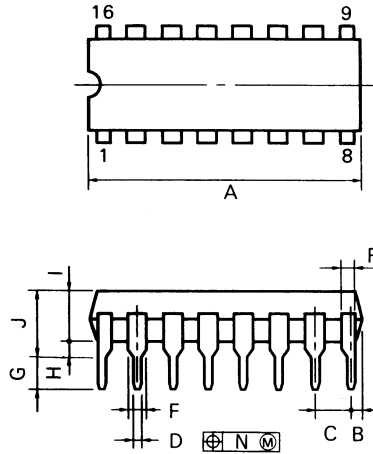


**Fig. 2 Typical Output Voltage Waveform.**

### Package Dimensions

#### 16PIN Plastic DIP

ITEM	MILLIMETERS
A	20.32 MAX.
B	1.27 MAX.
C	2.54 (T.P.)
D	0.50 <sup>+0.10</sup>
F	1.2 MIN.
G	3.5 <sup>+0.3</sup>
H	0.51 MIN.
I	4.31 MAX.
J	5.08 MAX.
K	7.62 (T.P.)
L	6.4
M	0.25 <sup>+0.10</sup> <sub>-0.08</sub>
N	0.25
P	1.0 MIN.



#### 16PIN Cerdip DIP (300 mil)

ITEM	MILLIMETERS
A	20.32 MAX.
B	1.27 MAX.
C	2.54 (T.P.)
D	0.46 <sup>+0.05</sup>
F	1.42 MIN.
G	3.5 <sup>+0.3</sup>
H	0.51 MIN.
I	3.70
J	5.08 MAX.
K	7.62 (T.P.)
L	6.75
M	0.25 <sup>+0.05</sup>
N	0.25
P	0.89 MIN.

