

16384 BIT BIPOLAR TTL

PROGRAMMABLE READ ONLY MEMORY

Description

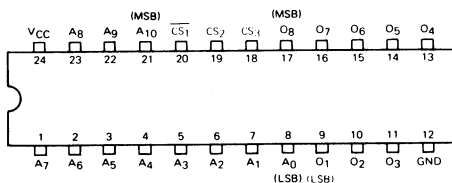
The μPB409C, μPB409D, μPB429C and μPB429D are high speed, electrically programmable, fully decoded 16384 bit TTL read only memories. On-chip address decoding, three chip select inputs and open-collector/three-state outputs allow easy expansion of memory capacity. The μPB409C, μPB409D, μPB429C and μPB29D 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

- 2048 WORDS x 8 BITS organization (Fully decoded)
- TTL Interface
- Fast read access time : 45 ns MAX. (μPB409-3, μPB429-3)
- Medium power consumption : 500 mW TYP.
- Three chip select inputs for memory expansion
- Open-Collector outputs (μPB409C, μPB409D) / Three-state outputs (μPB429C, μPB429D)
- Cerdip 24-Lead Dual In-Line Package (μPB409D, 429D)
- Plastic 24-Lead Dual In-Line Package (μPB409C, 429C)
- Fast Programming time : 200 μs/bit TYP.
- Replaceable with : Signetics' 82S190/191, Harris' HM76160/76171 and equivalent devices (as a ROM)

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Connection Diagram (Top View)



Pin names

- A0 - A10 : Address Inputs
- O1 - O8 : Data Outputs
- CS1, CS2, CS3 : Chip Select Inputs
- VCC : Power Supply (+5V)
- GND : Ground

Operation

First we define an internal Chip Select logic by three Chip Select inputs:

$$CS' = \overline{CS_1} + CS_2 \cdot CS_3$$

That is, CS' is a logical zero (low) if and only if $\overline{CS_1} = 0$ and $CS_2 = CS_3 = 1$, While CS' is a logical one (high) in all the other cases.

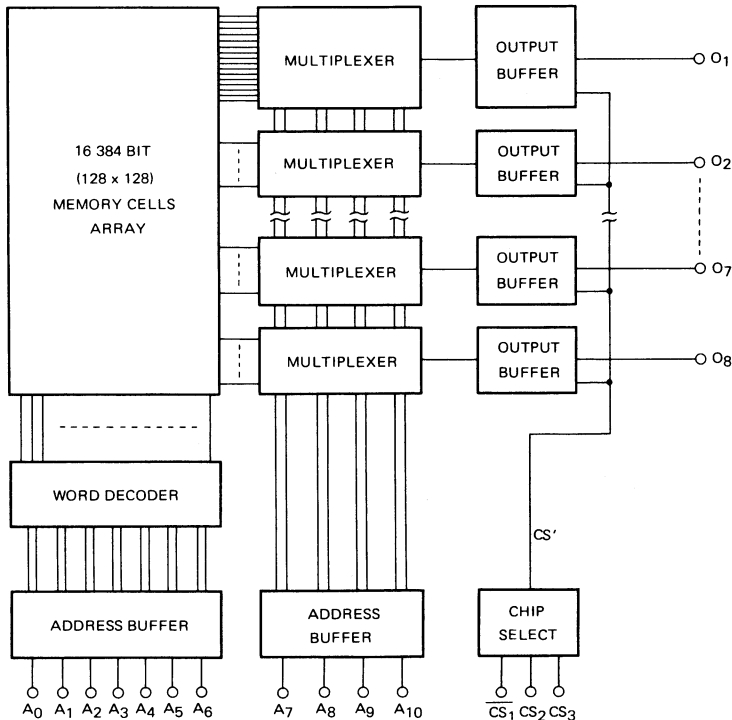
1. Programming

A logic one can be permanently programmed into a selected bit location by using special equipment (programmer). First, the desired word is selected by the eleven address inputs in TTL levels. The three Chip Select inputs must be set so that CS' is a logical one. Secondly, 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 three Chip Select inputs must be set so that CS' is a logical zero. The outputs then correspond to the data programmed in the selected words. When the three Chip Select inputs are set so that CS' becomes a logical one, all the outputs will be high (floating).

Logic Diagram



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			
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 CONDITIONS
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}		100	160	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}	20		70	mA	V _O =0 V

* Note: Applicable to μPB429C and μPB429D.

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

CHARACTERISTIC	SYMBOL	MIN.	MAX.	UNIT	TEST CONDITIONS
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	μPB409C-3, μPB429C-3 μPB409D-3, μPB429D-3		μPB409C-2, μPB429C-2 μPB409D-2, μPB429D-2		μPB409C-1, μPB429C-1 μPB409D-1, μPB429D-1		μPB409C, μPB429C μPB409D, μPB429D		UNIT
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
Address Access Time	t _{AA}		45		50		60		70	ns
Chip Select Access Time	t _{ACS}		30		30		40		50	ns
Chip Select Disable Time	t _{DCS}		30		30		40		50	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.

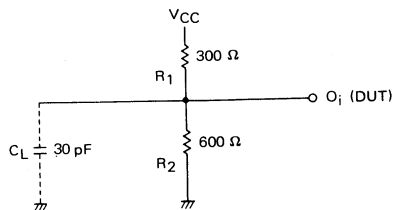


Fig. 1

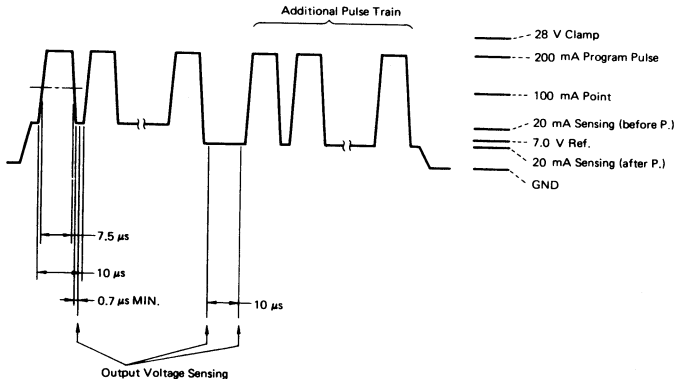
Programming Specification

It is imperative that this specification be rigorously observed in order to correctly program the μPB409C, μPB409D, μPB429C and μPB429D. 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	15 V point/150 Ω load.
Clamp Voltage	28 +0 % -2 %	V	
Ramp Rate (Both in Rise and in Fall)	70 MAX.	V/μs	
Pulse Width	7.5 ±5 %	μs	
Duty Cycle	70 % MIN.		
Sense Current			
Amplitude	20 ±0.5	mA	15 V point/150 Ω load.
Clamp Voltage	28 +0 % -2 %	V	
Ramp Rate	70 MAX.	V/μs	
Sense Current Interruption before and after address change	10 MIN.	μs	
Programming V _{CC}	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.

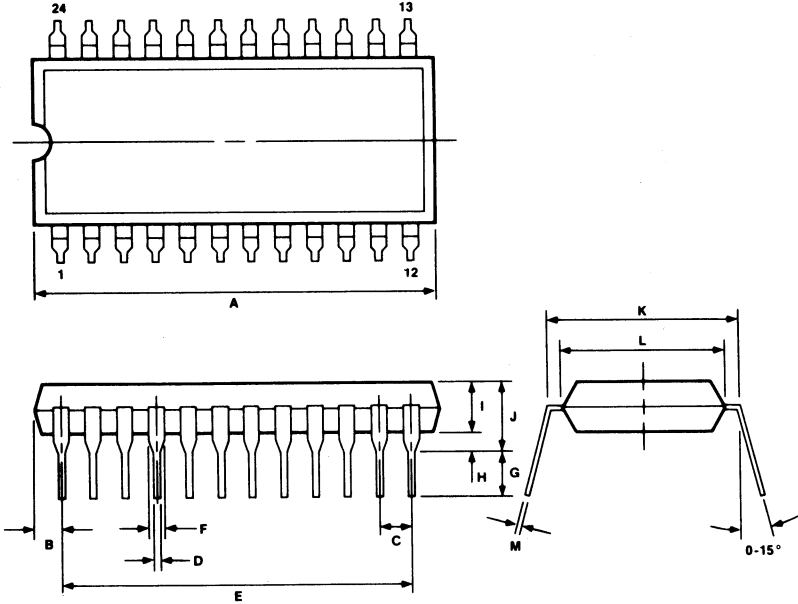
Fig. 2 Typical Output Voltage Waveform.



Package Dimensions

24PIN Plastic DIP

Item	Millimeters
A	33.02 max
B	2.54 max
C	2.54 [TP]
D	.50 ± .10
E	27.94
F	1.2 min
G	3.5 ± 0.3
H	.51 min
I	4.31 max
J	5.72 max
K	15.24 [TP]
L	13.2
M	.25 ^{+ .10} / _{-.05}



24PIN Cerdip

Item	Millimeters
A	33.02 max
B	2.54 max
C	2.54 [TP]
D	.50 ± .010
E	27.94
F	1.2 min
G	3.0 ± .3
H	.51 min
I	3.80
J	5.08 max
K	15.24 [TP]
L	13.21
M	.25 ± .05

