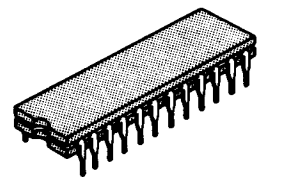
2048-word × 8-bit Programmable Read Only Memories

The HITACHI HN25168S and HN25169S are high speed electrically programmable, fully decoded TTL Bipolar 16384 bit read only memories organized as 2048 words by 8 bits with on-chip address decoding and three chip enable inputs. The HN25168S and HN25166S are fabricated with logic level "zeros" (low); logic level "ones" (high) can be electrically programmed in the selected bit locations. The same address inputs are used for both programming and reading.

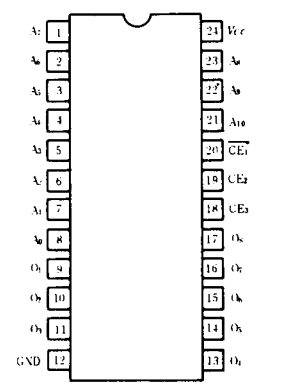


(DG-24)

■ FEATURES

- 2048 words x 8 bits organization (fully decoded)
- TTL compatible inputs and outputs
- Fast read access time: 40 ns typ. (60 ns max)
- Medium power consumption: 600 mW typ.
- Three chip enable inputs for memory expansion.
- Open collector outputs (HN25168S)/Three-state outputs (HN25169S)
- Standard cerdip 24-pin dual in-line package

■ PIN ARRANGEMENT



(Top View)

■ OPERATION

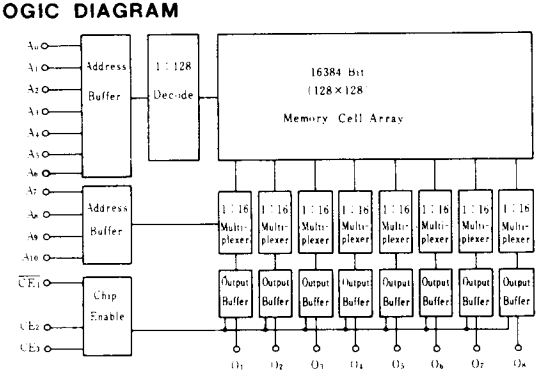
- **Programming**

A logic one can be permanently programmed into a selected bit location by using programming equipment. First, the desired world is selected by the eleven address inputs in TTL level. The device is disabled by bringing $\overline{CE1}$ to as logic "one" or CE2 and/or CE3 to a logic "zero". Then 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 is applied, then is stopped.

- **Reading**

To read the memory the device is enabled by bringing $\overline{CE1}$ to a logic "zero", CE2 and CE3 to a logic "one". The outputs then correspond to the data programmed in the selected word.

■ LOGIC DIAGRAM



HITACHI

■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Supply Voltage	V_{CC}	−0.5 to +7.0	V
Input Voltage	V_{in}	−0.5 to +5.5	V
Output Voltage	V_{out}	−0.5 to +5.5	V
Output Current	I_{out}	50	mA
Operating Temperature	T_{opr}	−25 to +75	°C
Storage Temperature	T_{stg}	−65 to +150	°C

■ DC CHARACTERISTICS (V_{CC}=4.75 to 5.25V, Ta=0 to +75°C)

Characteristic	Symbol	Test Conditions	min	typ	max	Unit
Input High Voltage	V_{IH}		2.0	—	—	V
Input Low Voltage	V_{IL}		—	—	0.8	V
Input High Current	I_{IH}	V_I=2.7V	—	—	40	μA
Input Low Current	$-I_{IL}$	V_I=0.4V	—	—	0.40	mA
Output Low Voltage	V_{OL}	I_{OL}=16mA	—	—	0.45	V
Output Leakage Current	I_{OLK1}	V_O=5.25V	—	—	100	μA
Output Leakage Current	I_{OLK2}	V_O=0.4V	—	—	40	μA
Input Clamp Voltage	V_I	I_I=−18mA	—	—	−1.2	V
Power Supply Current	I_{CC}	Inputs Either Open or at Ground	—	120	170	mA
Output High Voltage*	V_{OH}	I_{OH}=−2mA	2.4	—	—	V
Output Short Circuit Current*	$-I_{OS}$	V_O=0V	15	—	60	mA

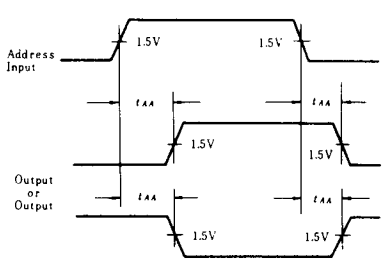
* Note: Applicable to HN25169S only.

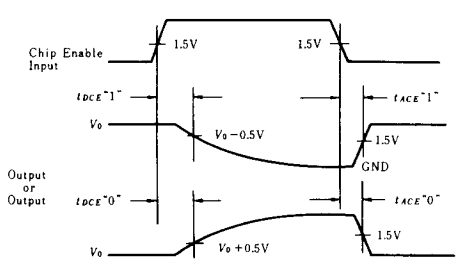
■ AC CHARACTERISTICS (V_{CC}=4.75 to 5.25V, Ta=0 to 75°C)

Characteristic	Symbol	Test Conditions	min	typ	max	Unit
Address Access Time	t_{AA}		—	40	60	ns
Chip Enable Access Time	t_{ACE}		—	20	35	ns
Chip Enable Disable Time	t_{DCE}		—	20	35	ns

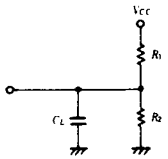
Note) 1. Output Load: See Test Circuit.
2. Measurement Reference: 1.5V for both inputs and outputs.

■ SWITCHING WAVEFORMS





■ SWITCHING TIME TEST CONDITIONS



SWITCHING PARAMETER	HN25168S			HN25169S		
	R_1	R_2	C_L	R_1	R_2	C_L
t_{AA}	300Ω	600Ω	30pF	300Ω	600Ω	30pF
t_{ACE} "1"	—	—	—	∞	600Ω	10pF
t_{ACE} "0"	300Ω	600Ω	10pF	300Ω	600Ω	10pF
t_{DCE} "1"	—	—	—	∞	600Ω	30pF
t_{DCE} "0"	300Ω	600Ω	30pF	300Ω	600Ω	30pF

INPUT CONDITIONS
Amplitude – 0V to 3V
Rise and Fall time – 5ns from 1V to 2V
Frequency – 1MHz

■ PROGRAMMING SPECIFICATION

PARAMETER	Symbol	min	typ	max	Unit	Note
Ambient Temperature	Ta	20	25	30	°C	
Programming V_{CC}	V_{CC}	4.75	5.0	5.25	V	
Programming Pulse						
Amplitude	I_W	88	90	92	mA	
Clamp Voltage	V_W	19.0	19.5	20.0	V	
Ramp Rate		10	—	70	V/μs	
Pulse Width	t_{PW}	7.1	7.5	7.9	μs	9V point/200Ω load
Duty Cycle		70	—	—	%	
Sense Current						
Amplitude	I_S	19	20	21	mA	
Sense Voltage	V_S	7.4	7.5	7.6	V	
Clamp Voltage		19.0	19.5	20.0	V	
Ramp Rate		70	—	—	V/μs	
Address Setup Time	t_{SA}	10	—	—	μs	
Address Hold Time	t_{HA}	10	—	—	μs	
Sense Setup Time	t_{SS}	0.7	—	—	μs	
Sense Hold Time	t_{HS}	0.7	—	—	μs	
Additional Programming Pulse		1	1	1	time	
Programming Pulse Number per bit	n	—	—	10000	time