

# HN25088, HN25089

## 1024-word × 8-bit Programmable Read Only Memories

The HITACHI HN25088 and HN25089 are high speed electrically programmable, fully decoded TTL Bipolar 8192 bit read only memories organized as 1024 words by 8 bits with on-chip address decoding and four chip enable inputs. The HN25088 and HN25089 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.

### ■ FEATURES

- 1024 words x 8 bits organization (fully decoded)
- DTL/TTL compatible inputs and outputs
- Fast read access time: 40 ns (typ), 60 ns (max)
- Medium power consumption: 600 mW typ.
- Four chip enable inputs for memory expansion
- Open collector outputs (HN25088)/Three-state outputs (HN25089)
- Standard cerdip 24-pin dual in-line package

### ■ OPERATION

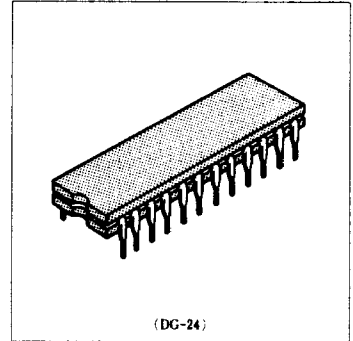
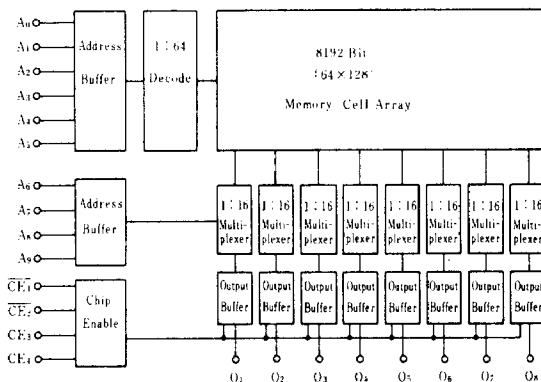
#### ● Programming

A logic one can be permanently programmed into a selected bit location by using programming equipment. First, the desired word is selected by the ten address inputs in TTL level. The device is disabled by bringing  $\overline{CE1}$  and/or  $\overline{CE2}$  to as logic "one" or  $\overline{CE3}$  and/or  $\overline{CE4}$  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 train is applied, then is stopped.

#### ● Reading

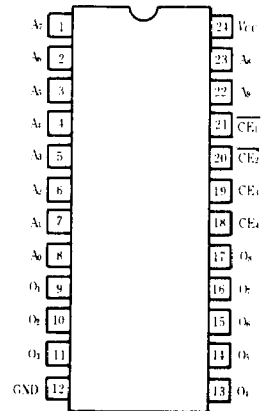
To read the memory the device is enabled by bringing  $\overline{CE1}$  and  $\overline{CE2}$  to a logic "zero".  $\overline{CE3}$  and  $\overline{CE4}$  to a logic "one". The outputs then corresponded to the data programmed in the selected word.

### ■ LOGIC DIAGRAM



(DG-24)

### ■ PIN ARRANGEMENT



(Top View)

**■ ABSOLUTE MAXIMUM RATINGS**

Item	Symbol	Rating	Unit
Supply Voltage	$V_{CC}$	-0.5 to +7.0	V
Input Voltage	$V_{i,s}$	-0.5 to +5.5	V
Output Voltage	$V_{out}$	-0.5 to +5.5	V
Output Current	$I_{out}$	50	mA
Operating Temperature	$T_{op}$	-25 to +75	°C
Storage Temperature	$T_{stg}$	-65 to +150	°C

**■ DC CHARACTERISTICS ( $V_{CC}=4.75$  to  $5.25V$ ,  $T_a=0$  to  $+75^\circ C$ )**

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	$\mu A$
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	$\mu A$
Output Leakage Current	$I_{OLK2}$	$V_o=0.4V$	—	—	40	$\mu A$
Input Clamp Voltage	$V_i$	$I_i=-18mA$	—	—	-1.2	V
Power Supply Current	$I_{CC}$	Inputs Either Open or at Ground	—	120	160	mA
Output High Voltage*	$V_{OH}$	$I_{OH}=-2mA$	2.4	—	—	V
Output Short Circuit Current*	$-I_{OS}$	$V_o=0V$	15	—	60	mA

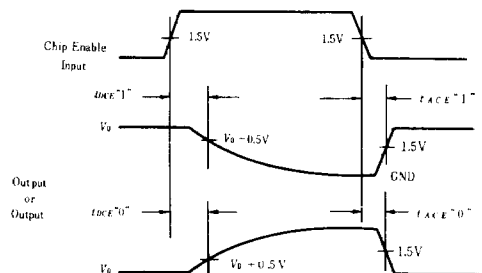
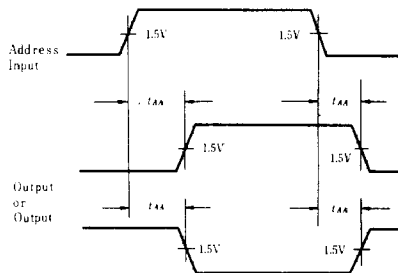
\* Note: Applicable to HN25089 only.

**■ AC CHARACTERISTICS ( $V_{CC}=4.75$  to  $5.25V$ ,  $T_a=0$  to  $75^\circ C$ )**

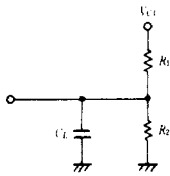
Characteristic	Symbol	Test Conditions	min	typ	max	Unit
Address Access Time	$t_{AA}$		—	40	60	ns
Chip Enable Access Time	$t_{ACE}$		—	20	35	ns
Chip Enable Disable Time	$t_{DCE}$		—	20	35	ns

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	HN25088			HN25089		
	$R_1$	$R_2$	$C_L$	$R_1$	$R_2$	$C_L$
$t_{AA}$	300 $\Omega$	600 $\Omega$	30pF	300 $\Omega$	600 $\Omega$	30pF
$t_{ACE}$ "1"	—	—	—	$\infty$	600 $\Omega$	10pF
$t_{ACE}$ "0"	300 $\Omega$	600 $\Omega$	10pF	300 $\Omega$	600 $\Omega$	10pF
$t_{DCE}$ "1"	—	—	—	$\infty$	600 $\Omega$	30pF
$t_{DCE}$ "0"	300 $\Omega$	600 $\Omega$	30pF	300 $\Omega$	600 $\Omega$	30pF

### INPUT CONDITIONS

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

## PROGRAMMING SPECIFICATION

Characteristic	Limit	Unit	Notes
Ambient Temperature	25 $\pm$ 5	$^{\circ}$ C	
Programming Pulse			
Amplitude	130 $\pm$ 5%	mA	
Clamp Voltage	20 $\pm$ 2%	V	
Ramp Rate	70max	V/ $\mu$ s	
Pulse Width	7.5 $\pm$ 5%	$\mu$ s	10V point/150 $\Omega$ load
Duty Cycle	70% min		
Sense Current			
Amplitude	20 $\pm$ 0.5	mA	
Clamp Voltage	20 $\pm$ 2%	V	
Ramp Rate	70max	V/ $\mu$ s	
Sense Current Interruption before and after address change	10min	$\mu$ s	
Programming $V_{CC}$	5.0 + 5% – 0%	V	
Maximum Sensed Voltage for programmed "1"	7.5 $\pm$ 0.1	V	
Delay from trailing edge of programming pulse before sensing output voltage	0.7min	$\mu$ s	
Programming Pulse Number	100max	ms	
Additional Programming Pulse Number	4	Time	

