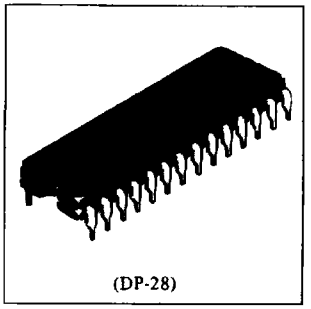
HN27128AP Series

16384-word x 8-bit One Time Electrically Programmable Read Only Memory

The HN27128AP is a 16384-word by 8-bit one time electrically programmable ROM. Initially, all bits of the HN27128AP are in the "1" state (Output High). Data is introduced by selectively programming "0" into the desired bit locations. This device is packaged in a 28 pin, plastic dual-in-line package. Therefore, this device can not be re-written.

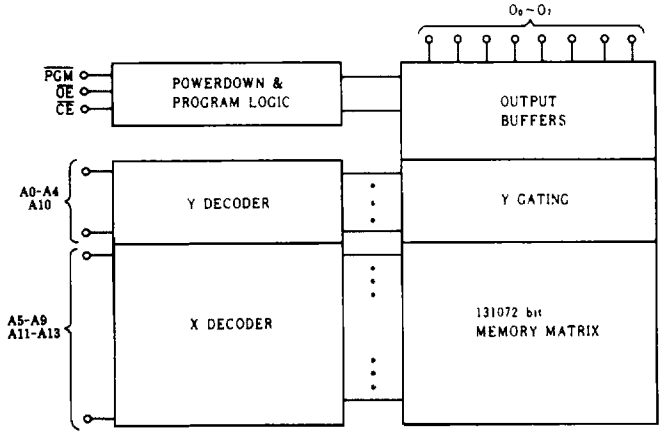


(DP-28)

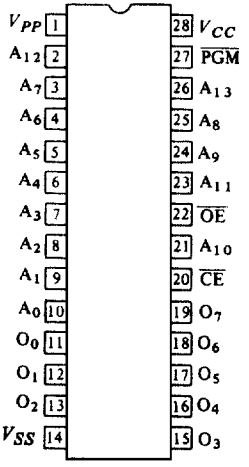
■ FEATURES

- Single Power Supply . . . . . +5V ±5%
- High Performance Programming . . . . . Program Voltage: +12.5V D.C. High Performance Programming Operations
- Static . . . . . No Clocks Required
- Inputs and Outputs TTL Compatible During Both Read and Program Modes
- Access Time . . . . . 200/250ns (max.)
- Absolute Max. Rating of Vpp pin . . . . . 14.0V Max.
- Low Standby Current . . . . . 35mA Max. (stand-by)
- Device Identifier Mode . . . . . Manufacturer Code and Device Code

■ BLOCK DIAGRAM



■ PIN ARRANGEMENT



(Top View)

■ MODE SELECTION

MODE \ Pins	$\overline{CE}$ (20)	$\overline{OE}$ (22)	$\overline{PGM}$ (27)	A9 (24)	V_{PP} (1)	V_{CC} (28)	Outputs (11 – 13, 15 – 19)
Read	V_{IL}	V_{IL}	V_{IH}	X	V_{CC}	V_{CC}	Dout
Output Disable	V_{IL}	V_{IH}	V_{IH}	X	V_{CC}	V_{CC}	High Z
Standby	V_{IH}	X	X	X	V_{CC}	V_{CC}	High Z
High Performance Program	V_{IL}	X	V_{IL}	X	V_{PP}	V_{CC}	Din
Program Verify	V_{IL}	V_{IL}	V_{IH}	X	V_{PP}	V_{CC}	Dout
Program Inhibit	V_{IH}	X	X	X	V_{PP}	V_{CC}	High Z
Identifier	V_{IL}	V_{IL}	V_{IH}	V_H*2	V_{CC}	V_{CC}	Code

Notes) *1. X . . . Don't care
*2. V_H = 12.0V ±0.5V

■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Value	Unit
Operating Temperature Range	T_{opr}	0 to +70	°C
Storage Temperature Range	T_{stg}	−55 to +125	°C
Storage Temperature Range Under Bias	T_{bias}	−10 to +80	°C
All Input and Output Voltages*1	V_{IN}, V_{out}	−0.6 to +7	V
Voltage on Pin 24 (A9)*1	V_{ID}	−0.6 to + 13.5	V
V_{PP} Voltage*1	V_{PP}	−0.6 to +14.0	V
V_{CC} Voltage *1	V_{CC}	−0.6 to +7	V

Note) *1. With respect to V_{SS}

■ READ OPERATION

• DC AND OPERATING CHARACTERISTICS (T_a = 0 to +70°C, V_{CC} = 5V ±5%, V_{PP} = V_{CC})

Parameter	Symbol	Test Conditions	min.	typ.	max.	Unit
Input Leakage Current	I_{LI}	V_{IN} = 5.25V	–	–	10	μA
Output Leakage Current	I_{LO}	V_{out} = 5.25V/0.45V	–	–	10	μA
V_{PP} Current	I_{PP1}	V_{PP} = 5.25V	–	–	5	mA
V_{CC} Current (Standby)	I_{CC1}	$\overline{CE}$ = V_{IH}	–	–	35	mA
V_{CC} Current (Active)	I_{CC2}	$\overline{CE}$ = $\overline{OE}$ = V_{IL}	–	40	100	mA
Input Low voltage	V_{IL}		−0.1*1	–	0.8	V
Input High Voltage	V_{IH}		2.0	–	V_{CC}+1*2	V
Output Low Voltage	V_{OL}	I_{OL} = 2.1mA	–	–	0.45	V
Output High Voltage	V_{OH}	I_{OH} = −400μA	2.4	–	–	V

Notes) *1. −0.6V for pulse width ≦ 20ns
*2. V_{CC} + 1.5V for pulse width ≦ 20ns. If V_{IH} is over the specified maximum value, read operation cannot be guaranteed.

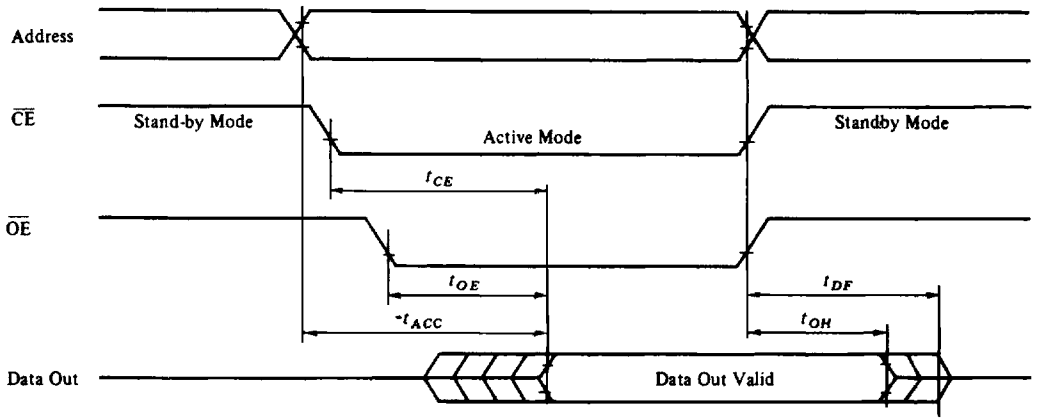
• AC CHARACTERISTICS (T_a = 0 to + 70°C, V_{CC} = 5V ± 5%, V_{PP} = V_{CC})

Parameter	Symbol	Test Condition	HN27128AP-20		HN27128AP-25		
			min.	max.	min.	max.	
Address to Output Delay	t_{ACC}	$\overline{CE}$ = $\overline{OE}$ = V_{IL}	–	200	–	250	ns
$\overline{CE}$ to Output Delay	t_{CE}	$\overline{OE}$ = V_{IL}	–	200	–	250	ns
$\overline{OE}$ to Output Delay	t_{OE}	$\overline{CE}$ = V_{IL}	–	75	–	100	ns
$\overline{OE}$ High to Output Float	t_{DF}	$\overline{CE}$ = V_{IL}	0	55	0	60	ns
Address to Output Hold	t_{OH}	$\overline{CE}$ = $\overline{OE}$ = V_{IL}	0	–	0	–	ns

Note) t_{DF} defines the time at which the Output achieves the open circuit condition and Data is no longer driven.

• SWITCHING CHARACTERISTICS

Test Condition
Input Pulse Levels: 0.45V to 2.4V
Input Rise and Fall Time: ≤ 20ns
Output Load: 1 TTL Gate +100pF
Reference Level for Measuring Timing: 0.8V and 2.0V

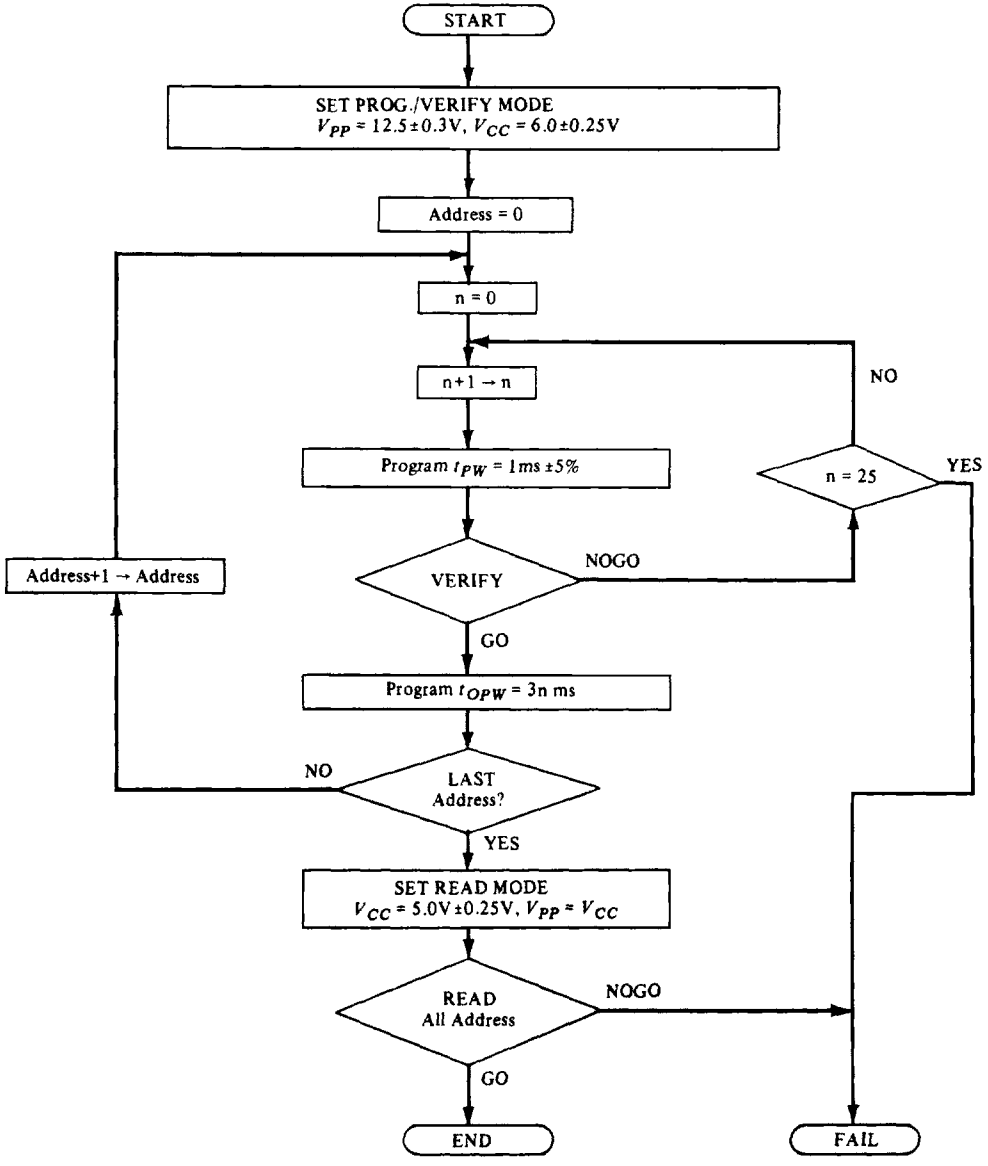


• CAPACITANCE (T_a = 25°C, f = 1MHz)

Parameter	Symbol	Test Condition	min.	typ.	max.	Unit
Input Capacitance	C_{in}	V_{in} = 0V	–	4	6	pF
Output Capacitance	C_{out}	V_{out} = 0V	–	8	12	pF

■ HIGH PERFORMANCE PROGRAMMING

This device can be applied the High Performance Programming algorithm shown in following flowchart. This algorithm allows to obtain faster programming time without any voltage stress to the device nor deterioration in reliability of programmed data.



High Performance Programming Flowchart

■ HIGH PERFORMANCE PROGRAMMING OPERATION

• DC PROGRAMMING CHARACTERISTICS (T_a = 25°C ±5°C, V_{CC} = 6V±0.25V, V_{PP} = 12.5V±0.3V)

Parameter	Symbol	Test Condition	min.	typ.	max.	Unit
Input Leakage Current	I_{LI}	V_{IN} = 5.25V	–	–	10	μA
Output Low Voltage During Verify	V_{OL}	I_{OL} = 2.1mA	–	–	0.45	V
Output High Voltage During Verify	V_{OH}	I_{OH} = −400μA	2.4	–	–	V
V_{CC} Current (Active)	I_{CC2}		–	–	100	mA
Input Low Level	V_{IL}		−0.1*1	–	0.8	V
Input High Level	V_{IH}		2.0	–	V_{CC}+0.5*2	V
V_{PP} Supply Current	I_{PP2}	$\overline{CE}$ = $\overline{PGM}$ = V_{IL}	–	–	50	mA

Notes) *1. −0.6V for pulse width ≦ 20ns.
*2. If V_{IH} is over the specified maximum value, programming operation cannot be guaranteed.

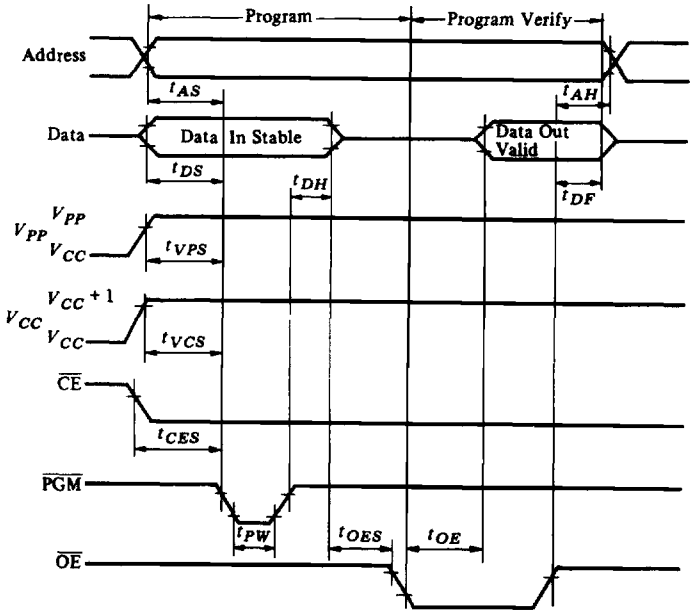
• AC PROGRAMMING CHARACTERISTICS (T_a = 25°C ±5°C, V_{CC} = 6V ±0.25V, V_{PP} = 12.5V ±0.3V)

Parameter	Symbol	Test Condition	min.	typ.	max.	Unit
Address Setup Time	t_{AS}		2	–	–	μs
$\overline{OE}$ Setup Time	t_{OES}		2	–	–	μs
Data Setup Time	t_{DS}		2	–	–	μs
Address Hold Time	t_{AH}		0	–	–	μs
Data Hold Time	t_{DH}		2	–	–	μs
$\overline{OE}$ to Output Float Delay	t_{DF}*1		0	–	130	ns
V_{PP} Setup Time	t_{VPS}		2	–	–	μs
V_{CC} Setup Time	t_{VCS}		2	–	–	μs
$\overline{PGM}$ Pulse Width During Initial Programming	t_{PW}		0.95	1.0	1.05	ms
$\overline{PGM}$ Pulse Width During Overprogramming	t_{OPW}*2		2.85	–	78.75	ms
$\overline{CE}$ Setup Time	t_{CES}		2	–	–	μs
Data Valid from $\overline{OE}$	t_{OE}		–	–	150	ns

Notes: *1. t_{DF} defines the time at which the output achieves the open circuit condition and data is no longer driven.
*2. t_{OPW} is defined as mentioned in flow chart.

• SWITCHING CHARACTERISTICS

Test Condition
Input Pulse Level: 0.45V to 2.4V
Input Rise and Fall Time: ≤ 20ns
Reference Level for Measuring Timing: 0.8V and 2.0V



■ DEVICE IDENTIFIER MODE

The Identifier Mode allows the reading out of binary codes that identify manufacturer and type of device, from outputs of OTPROM. By this Mode, the device will be automatically matched its own corresponding programming algorithm, using programming equipment.

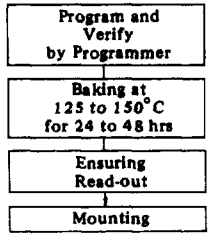
• HN27128AP SERIES IDENTIFIER CODE

Identifier \ Pins	A_0 (10)	O_7 (19)	O_6 (18)	O_5 (17)	O_4 (16)	O_3 (15)	O_2 (13)	O_1 (12)	O_0 (11)	Hex Data
Manufacturer Code	V_{IL}	0	0	0	0	0	1	1	1	07
Device Code	V_{IH}	0	0	0	0	1	1	0	1	0D

Notes: 1. $A_9 = 12.0V \pm 0.5V$.
2. $A_1 - A_8$, $A_{10} - A_{13}$, $\overline{CE}$, $\overline{OE} = V_{IL}$, $\overline{PGM} = V_{IH}$.

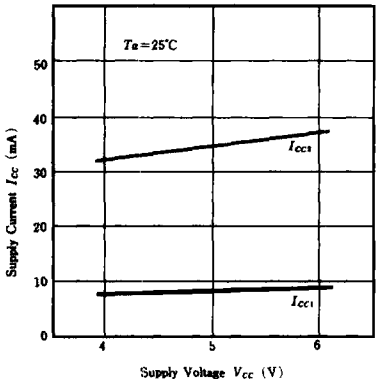
■ RECOMMENDED SCREENING CONDITIONS

Before mounting, please make the screening (baking without bias) shown in the right.

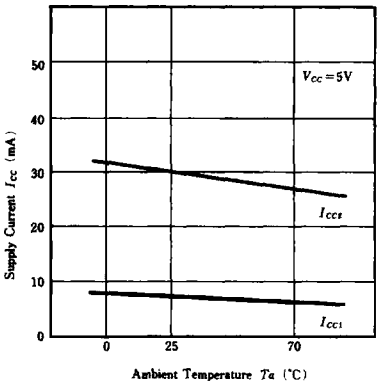


Recommended Screening conditions

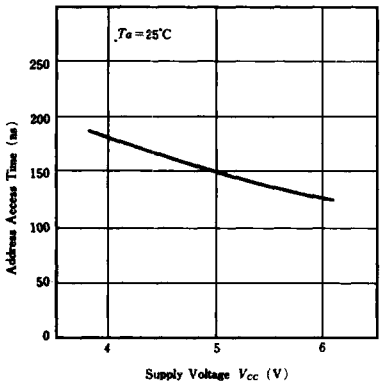
SUPPLY CURRENT vs. SUPPLY VOLTAGE



SUPPLY CURRENT vs. AMBIENT TEMPERATURE



ADDRESS ACCESS TIME vs. SUPPLY VOLTAGE



ADDRESS ACCESS TIME vs. AMBIENT TEMPERATURE