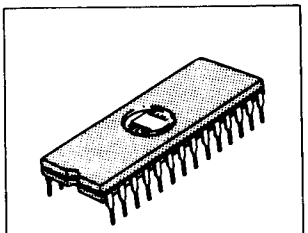
HN27128AG Series

16384-word X 8-bit UV Erasable and Programmable ROM

The HN27128AG is a 16384-word by 8-bit erasable and electrically programmable ROM. This device is packaged in a 28-pin, dual-in-line package with transparent window. The transparent window allows the user to expose the chip to ultraviolet light to erase the bit pattern, whereby a new pattern can then be written into the device.



(DG-28)

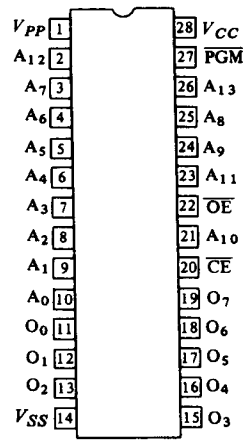
■ FEATURES

- 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 . . . . . 170/200/250/300ns(max.)
- Absolute Max. Rating of Vpp pin . . . . . 14.0V Max.
- Low Stand-by Current . . . . . 35mA Max. (stand-by)
- Device Identifier Mode . . . . . Manufacturer Code and Device Code

■ ORDERING INFORMATION

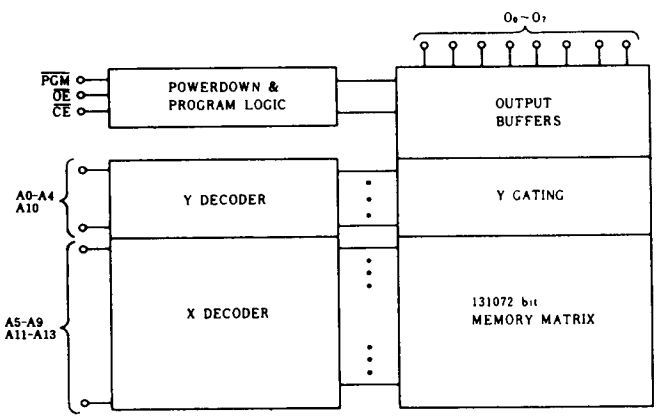
Type No.	Access Time	Package
HN27128AG-17	170ns	600 mil 28 pin Cerdip
HN27128AG-20	200ns	
HN27128AG-25	250ns	
HN27128AG-30	300ns	

■ PIN ARRANGEMENT



(Top View)

■ BLOCK DIAGRAM



■ 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

Note) *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}	−65 to +125	°C
Storage Temperature Range Under Bias	T_{bias}	−10 to +80	°C
Voltage on Pin 24 (A9) *1	V_{ID}	−0.6 to +13.5	V
All Input and Output Voltages *1	V_{IN}, V_{out}	−0.6 to +7	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.

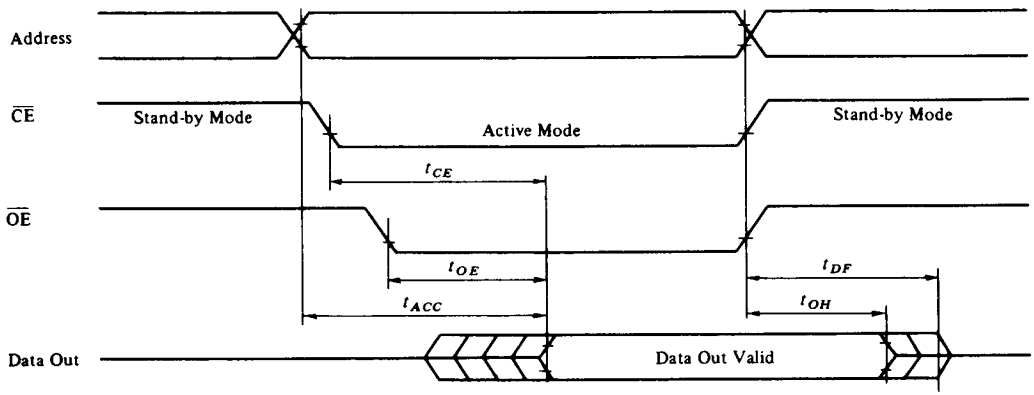
• AC CHARACTERISTICS (T_a = 0 to +70°C, V_{CC}=5V ± 5%, V_{PP} = V_{CC})

Parameter	Symbol	Test Condition	HN27128AG-17		HN27128AG-20		HN27128AG-25		HN27128AG-30		Unit
			min.	max.	min.	max.	min.	max.	min.	max.	
Address to Output Delay	t_{ACC}	$\overline{CE}$=$\overline{OE}$=V_{IL}	–	170	–	200	–	250	–	300	ns
$\overline{CE}$ to Output Delay	t_{CE}	$\overline{OE}$=V_{IL}	–	170	–	200	–	250	–	300	ns
$\overline{OE}$ to Output Delay	t_{OE}	$\overline{CE}$=V_{IL}	–	75	–	75	–	100	–	120	ns
$\overline{OE}$ High Output Float	t_{DF}	$\overline{CE}$=V_{IL}	0	55	0	55	0	60	0	105	ns
Address to Output Hold	t_{OH}	$\overline{CE}$=$\overline{OE}$=V_{IL}	0	–	0	–	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

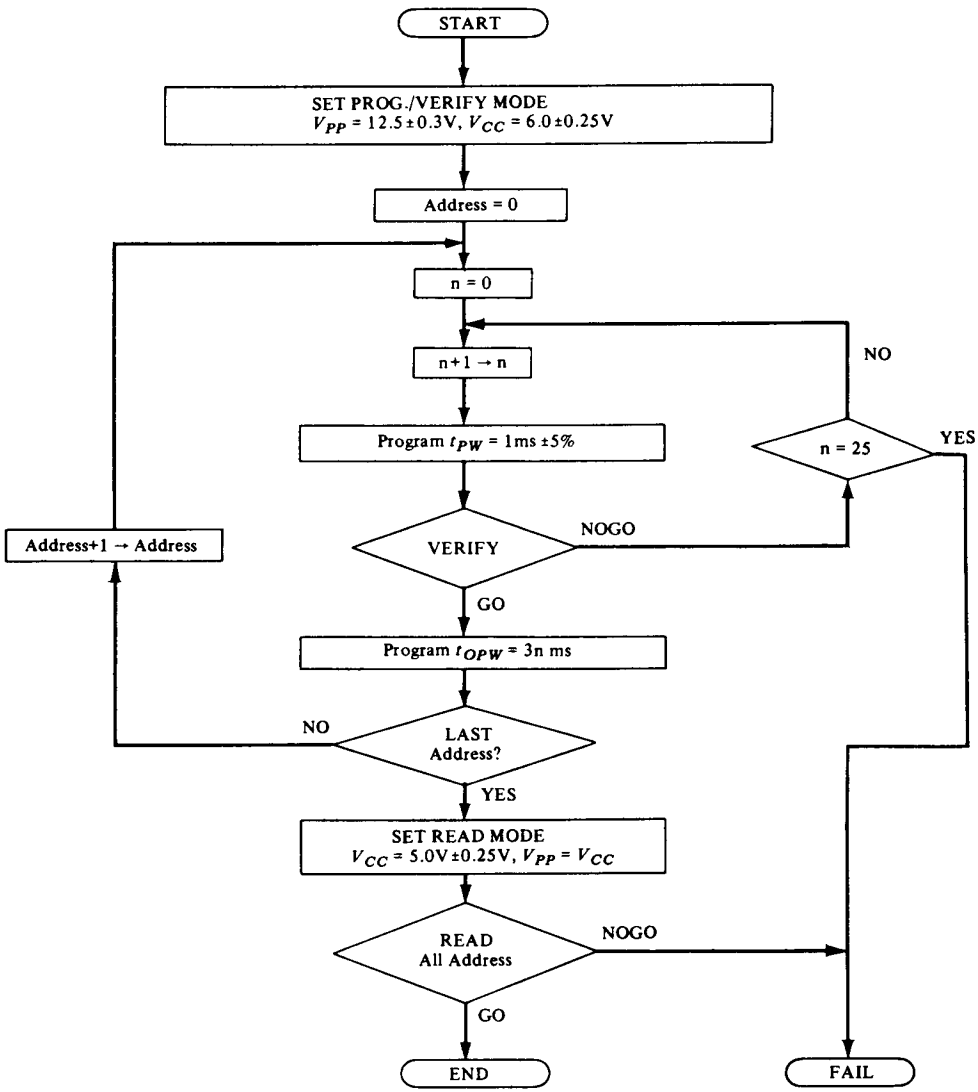


• CAPACITANCE (T_a = 25°C, f = 1MHz)

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}	$\overline{CE}$ = PGM = V_{IL}	–	–	50	mA

Notes) *1. −6.0V for pulse width ≤ 20ns.
*2. If V_{IH} is over the specified maximum value, programming operation cannot be guaranteed.

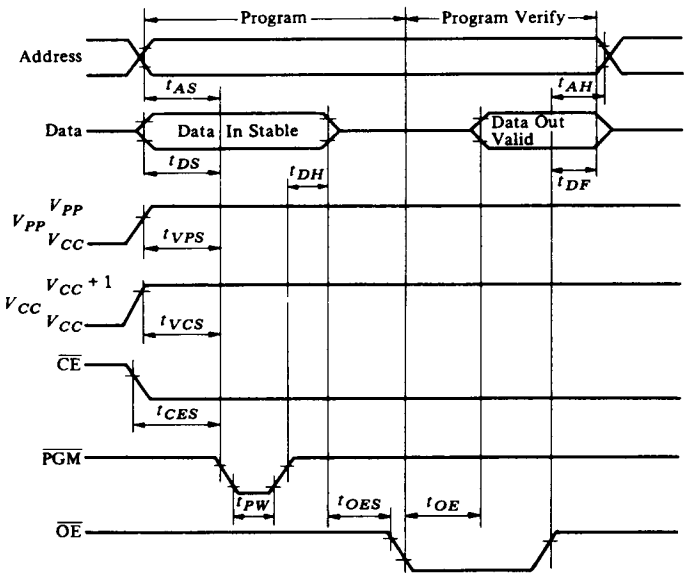
• AC PROGRAMMING CHARACTERISTICS (T_a = 25°C ±5°C, V_{CC} = 6V ±0.25V, V_{PP} = 12.5V ±0.3V)

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



■ ERASE

Erasure of HN27128AG is performed by exposure to ultraviolet light of 2537Å and all the output data are changed to "1" after this erasure procedure. The minimum integrated dose (i.e. UV intensity x exposure time) for erasure is 15 W.sec/cm^2.

■ DEVICE IDENTIFIER MODE

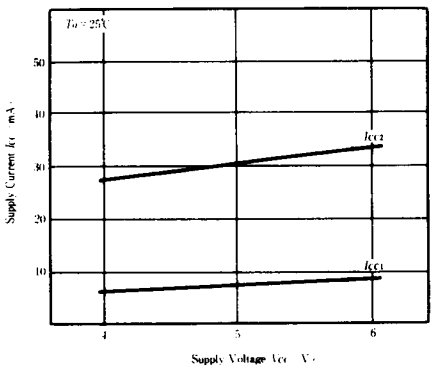
The Identifier Mode allows the reading out of binary codes that identify manufacturer and type of device, from outputs of EPROM. By this Mode, the device will be automatically matched its own corresponding programming algorithm, using programming equipment.

• HN27128AG SERIES IDENTIFIER CODE

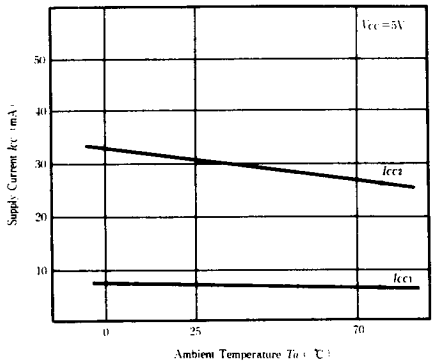
Pins / Identifier	A_0 (10)	O_7 (19)	O_6 (18)	O_5 (17)	O_4 (16)	O_3 (15)	O_2 (13)	O_1 (12)	O_0 (11)	Hex Data
Manufacturer Code	V_{IL}	0	0	0	0	0	1	1	1	07
Device Code	V_{IH}	0	0	0	0	1	1	0	1	0D

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

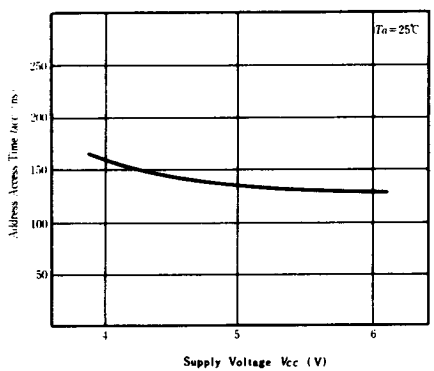
SUPPLY CURRENT VS. SUPPLY VOLTAGE



SUPPLY CURRENT VS. AMBIENT TEMPERATURE



ADDRESS ACCESS TIME VS. SUPPLY VOLTAGE



ADDRESS ACCESS TIME VS. AMBIENT TEMPERATURE