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HN4827128G-25, HN4827128G-30, HN4827128G-45

Preliminary

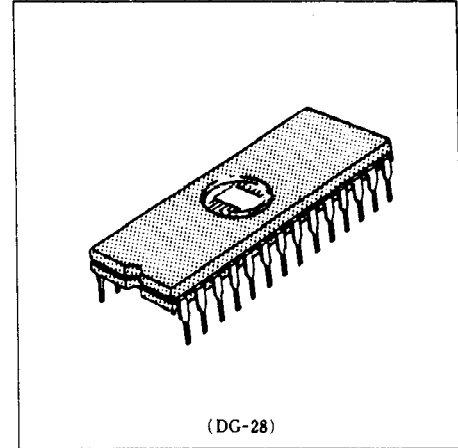
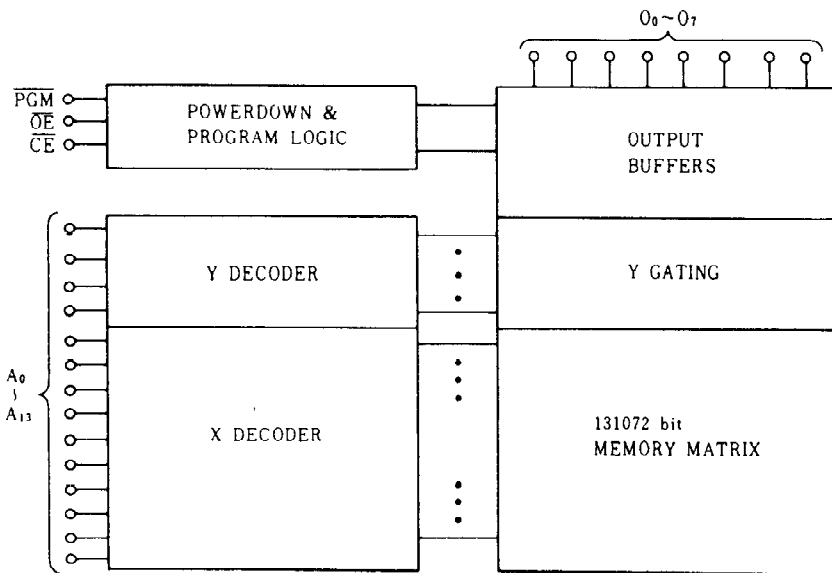
16384-Word x 8-bit UV Erasable and Programmable Read Only Memory

The HN4827128 is a 16384 word by 8 bit erasable and electrically programmable ROM. This device is packaged in a dual-in-line package with transparent lid. The transparent lid 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.

FEATURES

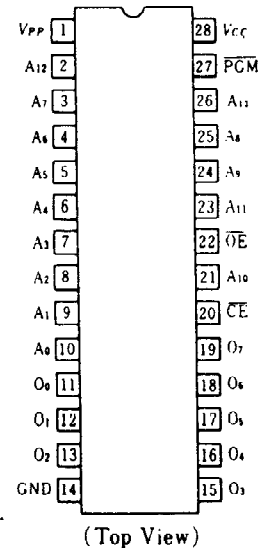
- Single Power Supply +5V ± 5%
- Simple Programming Program Voltage: +21V DC
Program with One 50ms Pulse
- Static No Clocks Required
Inputs and Outputs TTL Compatible During Both Read and Program Mode.
- Access Time 250ns/300ns/450ns
- Absolute Max. Rating of Vpp Pin 26.5V
- Low Stand-by Current 35mA
- High Performance Programming Available
- Compatible with INTEL 27128

BLOCK DIAGRAM



(DG-28)

PIN ARRANGEMENT



(Top View)

MODE SELECTION

| MODE | Pins | CE (20) | OE (22) | PGM (27) | V _{PP} (1) | V _{CC} (28) | Outputs (11~13, 15~19) |
|-----------------|------|-----------------|-----------------|-----------------|------------------------|-------------------------|---------------------------|
| Read | | V _{IL} | V _{IL} | V _{IH} | V _{CC} | V _{CC} | Dout |
| Stand by | | V _{IH} | × | × | V _{CC} | V _{CC} | High Z |
| Program | | V _{IL} | × | V _{IL} | V _{PP} | V _{CC} | Din |
| Program Verify | | V _{IL} | V _{IL} | V _{IH} | V _{PP} | V _{CC} | Dout |
| Program Inhibit | | V _{IH} | × | × | V _{PP} | V _{CC} | High Z |

Note) The specifications of this device are subject to change without notice.
Please contact your nearest Hitachi's Sales Dept. regarding specifications.

PROGRAMMING OPERATION

DC PROGRAMMING CHARACTERISTICS ($T_a = 25^\circ\text{C} \pm 5^\circ\text{C}$, $V_{CC} = 5\text{V} \pm 5\%$, $V_{PP} = 21\text{V} \pm 0.5\text{V}$)

| Parameter | Symbol | Test Condition | min | typ | max | Unit |
|-----------------------------------|-----------|---|------|-----|--------------|---------------|
| Input Leakage Current | I_{LI} | $V_{IN} = 5.25\text{V}$ | — | — | 10 | μA |
| Output Low Voltage During Verify | V_{OL} | $I_{OL} = 2.1\text{mA}$ | — | — | 0.45 | V |
| Output High Voltage During Verify | V_{OH} | $I_{OH} = -400\mu\text{A}$ | 2.4 | — | — | V |
| V_{CC} Current (Active) | I_{CC2} | | — | — | 100 | mA |
| Input Low Level | V_{IL} | | -0.1 | — | 0.8 | V |
| Input High Level | V_{IH} | | 2.0 | — | $V_{CC} + 1$ | V |
| V_{PP} Supply Current | I_{PP} | $\overline{\text{CE}} = \overline{\text{PGM}} = V_{IL}$ | — | — | 30 | mA |

AC PROGRAMMING CHARACTERISTICS ($T_a = 25^\circ\text{C} \pm 5^\circ\text{C}$, $V_{CC} = 5\text{V} \pm 5\%$, $V_{PP} = 21\text{V} \pm 0.5\text{V}$)

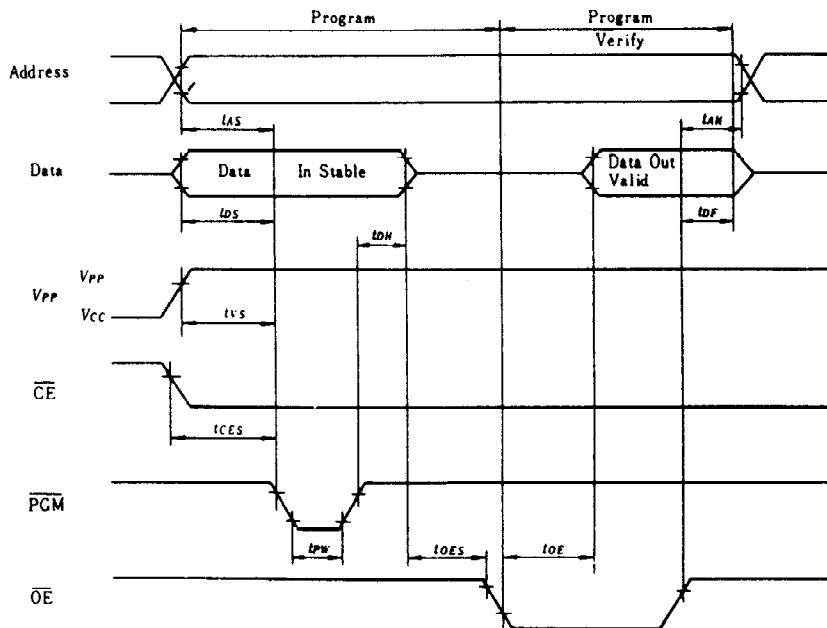
| Parameter | Symbol | Test Condition | min | typ | max | Unit |
|------------------------------------|-----------|----------------|-----|-----|-----|---------------|
| Address Setup Time | t_{AS} | | 2 | — | — | μs |
| OE Setup Time | t_{OES} | | 2 | — | — | μs |
| Data Setup Time | t_{DS} | | 2 | — | — | μs |
| Address Hold Time | t_{AH} | | 0 | — | — | μs |
| Data Hold Time | t_{DH} | | 2 | — | — | μs |
| OE to Output Float Delay | t_{DF} | | 0 | — | 130 | ns |
| V_{PP} Setup Time | t_{VS} | | 2 | — | — | μs |
| PGM Pulse Width During Programming | t_{PW} | | 45 | 50 | 55 | ms |
| CE Setup Time | t_{CES} | | 2 | — | — | μs |
| Data Valid from OE | t_{OE} | | — | — | 150 | ns |

Note: t_{DF} defines the time at which the output achieves the open circuit condition and is not referenced to output voltage levels.

SWITCHING CHARACTERISTICS

Test Condition

- Input Pulse Level: 0.8V to 2.2V
- Input Rise and Fall Time: $\leq 20\text{ ns}$
- Reference Level for Measuring Timing: Input; 1V and 2V
Output; 0.8V and 2V



ERASE

Erase of HN4827128 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/cm².

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 |
| All Input and Output Voltages* | V_{IN}, V_{out} | -0.3 to +7 | V |
| V_{PP} Voltage* | V_{PP} | -0.3 to +26.5 | V |
| V_{CC} Voltage* | V_{CC} | -0.3 to +7 | V |

* with respect to GND

READ OPERATION

● DC AND OPERATING CHARACTERISTICS ($T_a=0$ to +70°C, $V_{CC}=5V \pm 5\%$, $V_{PP}=V_{CC} \pm 0.6V$)

| Parameter | Symbol | Test Conditions | min | typ | max | Unit |
|----------------------------|-----------|--|------|-----|------------|---------|
| Input Leakage Current | I_{LI} | $V_{CC}=5.25V, V_{IN}=5.25V$ | — | — | 10 | μA |
| Output Leakage Current | I_{LO} | $V_{CC}=5.25V, V_{out}=5.25V/0.4V$ | — | — | 10 | μA |
| V_{PP} Current | I_{PP1} | $V_{PP}=V_{CC}+0.6V$ | — | — | 5 | mA |
| V_{CC} Current (Standby) | I_{CC1} | $\overline{CE} = V_{IH}$ | — | — | 35 | mA |
| V_{CC} Current (Active) | I_{CC2} | $\overline{CE} = \overline{OE} = V_{IL}$ | — | 60 | 100 | mA |
| Input Low Voltage | V_{IL} | | -0.1 | — | 0.8 | V |
| Input High Voltage | V_{IH} | | 2.0 | — | $V_{CC}+1$ | V |
| Output Low Voltage | V_{OL} | $I_{OL}=2.1mA$ | — | — | 0.45 | V |
| Output High Voltage | V_{OH} | $I_{OH}=-400\mu A$ | 2.4 | — | — | V |

● AC CHARACTERISTICS ($T_a=0$ to 70°C, $V_{CC}=5V \pm 5\%$, $V_{PP}=V_{CC} \pm 0.6V$)

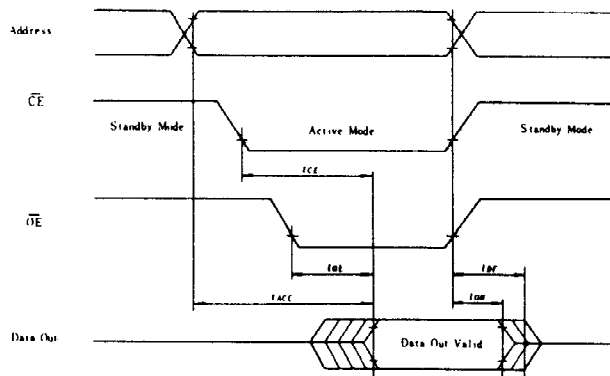
| Parameter | Symbol | Test Condition | HN4827128G-25 | | HN4827128G-30 | | HN4827128G-45 | | Unit |
|--------------------------------------|-----------|--|---------------|-----|---------------|-----|---------------|-----|------|
| | | | min | max | min | max | min | max | |
| Address to Output Delay | t_{ACC} | $\overline{CE} = \overline{OE} = V_{IL}$ | — | 250 | — | 300 | — | 450 | ns |
| \overline{CE} to Output Delay | t_{CE} | $\overline{OE} = V_{IL}$ | — | 250 | — | 300 | — | 450 | ns |
| \overline{OE} to Output Delay | t_{OE} | $\overline{CE} = V_{IL}$ | — | 100 | — | 120 | — | 150 | ns |
| \overline{OE} High to Output Float | t_{DF} | $\overline{CE} = V_{IL}$ | 0 | 85 | 0 | 105 | 0 | 130 | ns |
| Address to Output Hold | t_{OH} | $\overline{CE} = \overline{OE} = V_{IL}$ | 0 | — | 0 | — | 0 | — | ns |

* t_{DF} defines the time at which the output achieves the open circuit condition and is not referenced to output voltage levels.

SWITCHING CHARACTERISTICS

Test Condition

- Input Pulse Levels: 0.8V to 2.2V
- Input Rise and Fall Time: ≤ 20 ns
- Output Load: 1 TTL Gate + 100 pF
- Reference Level for Measuring Timing: Inputs; 1V and 2V
Outputs; 0.8V and 2.0V

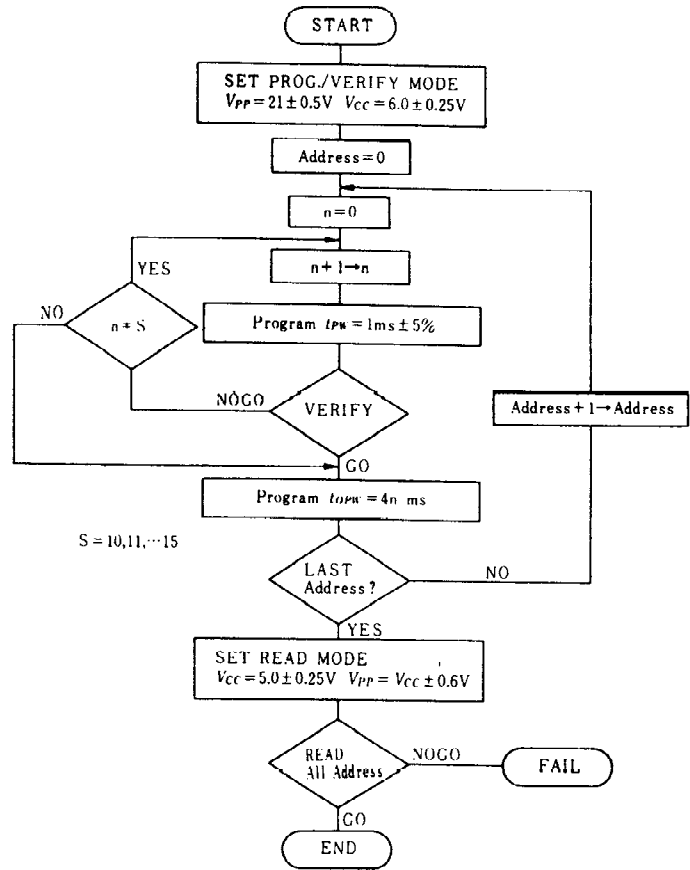


● CAPACITANCE ($T_a=25^\circ C, f=1$ MHz)

| 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 flow chart. 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

AC PROGRAMMING CHARACTERISTICS ($T_a = 25^\circ\text{C} \pm 5^\circ\text{C}$, $V_{CC} = 6\text{V} \pm 0.25\text{V}$, $V_{PP} = 21\text{V} \pm 0.5\text{V}$)

| Parameter | Symbol | Test Condition | min | typ | max | Unit |
|--|-----------|----------------|------|-----|------|---------------|
| Address Setup Time | t_{AS} | | 2 | — | — | μs |
| 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 |
| OE to Output Float Delay* | t_{DF} | | 0 | — | 130 | ns |
| V_{PP} Setup Time | t_{VPS} | | 2 | — | — | μs |
| V_{CC} Setup Time | t_{VCS} | | 2 | — | — | μs |
| PGM Pulse Width during Initial Program | t_{PW} | | 0.95 | 1.0 | 1.05 | ms |
| PGM Pulse Width during Over Program** | t_{OPW} | | 3.8 | — | 63 | ms |
| CE Setup Time | t_{CES} | | 2 | — | — | μs |
| Data Valid from OE | t_{OE} | | — | — | 150 | ns |

* t_{DF} defines the time at which the output achieves the open circuit conditions and is not referenced to output voltage levels.

** t_{OPW} is defined as mentioned in flow chart.

SWITCHING CHARACTERISTICS

Test Condition

Input Pulse Level: 0.8V to 2.2V
 Input Rise and Fall Time: $\leq 20\text{ ns}$
 Reference Level for Measuring Timing: Input; 1V and 2V
 Output; 0.8V and 2V

