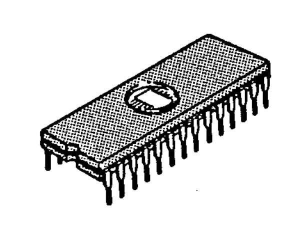
HN27C256G Series

T-46-13-29

32768-word x 8-bit CMOS UV Erasable and Programmable ROM

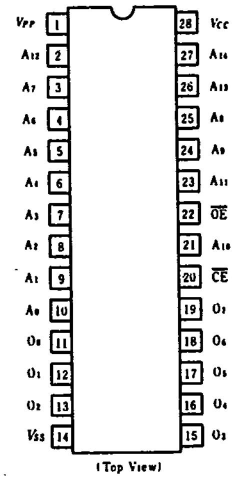
■ FEATURES

- Low Power Dissipation .... 40mW/MHz max. (Active Mode) 110μW max. (Stand-by Mode)
- Access Time .... 170/200/250/300ns (max.)
- Single Power Supply .... 5V ± 5%
- High Performance Programming .. Program Voltage: +12.5V DC
- Static .... No Clocks Required
- Inputs and Outputs TTL Compatible During Both Read and Program Modes
- Absolute Max. Rating of V_{PP} pin. . .14.0V
- Device Identifier Mode .... Manufacturer Code and Device Code
- Compatible with INTEL 27256

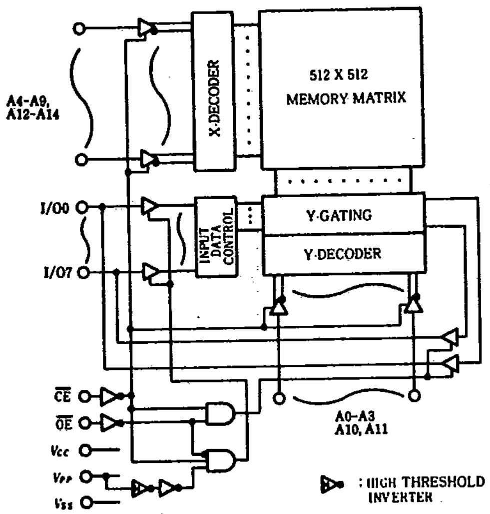


(DG-28)

■ PIN ARRANGEMENT



■ BLOCK DIAGRAM



■ MODE SELECTION

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

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

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■ 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
All Input and Output Voltage*1	V_{IN}, V_{OUT}	−0.6*2 to +7	V
Voltage on Pin 24 (A9)*1	V_{ID}	−0.6*2 to +13.5	V
V_{PP} Voltage*1	V_{PP}	−0.6 to +14	V
V_{CC} Voltage*1	V_{CC}	−0.6 to +7	V

Notes: *1. With respect to V_{SS}.
*2. −1.0V for pulse width ≦ 50ns.

■ READ OPERATION

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

Parameter	Symbol	Test Condition	min	typ	max	Unit
Input Leakage Current	I_{LI}	V_{in} = 5.25V	–	–	2	μA
Output Leakage Current	I_{LO}	V_{out} = 5.25V/0.45V	–	–	2	μA
V_{PP} Current	I_{PP1}	V_{PP} = 5.5V	–	1	20	μA
V_{CC} Current (Standby)	I_{SB1}	$\overline{CE}$ = V_{IH}	–	–	1	mA
	I_{SB2}	$\overline{CE}$ = V_{CC} ± 0.3V	–	1	20	μA
V_{CC} Current (Active)	I_{CC1}	$\overline{CE}$ = V_{IL}, I_{out} = 0 mA	–	–	30	mA
	I_{CC2}	f = 5 MHz, I_{out} = 0 mA	–	–	30	mA
	I_{CC3}	f = 1 MHz, I_{out} = 0 mA	–	–	8	mA
Input Voltage	V_{IL}		−0.3*1	–	0.8	V
	V_{IH}		2.2	–	V_{CC}+1.0*2	V
Output Voltage	V_{OL}	I_{OL} = 2.1 mA	–	–	0.45	V
	V_{OH1}	I_{OH} = −400 μA	2.4	–	–	V
	V_{OH2}	I_{OH} = −100 μA	V_{CC}−0.7	–	–	V

Notes) *1. −1.0V for pulse width ≦ 50ns.
*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	HN27C256G-17		HN27C256G-20		HN27C256G-25		HN27C256G-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}	10	60	10	70	10	100	10	120	ns
$\overline{OE}$ High to Output Float	t_{DF}	$\overline{CE}$=V_{IL}	0	50	0	50	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.

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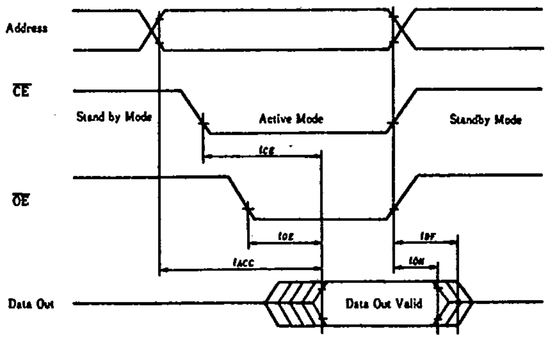
- **SWITCHING CHARACTERISTICS**

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

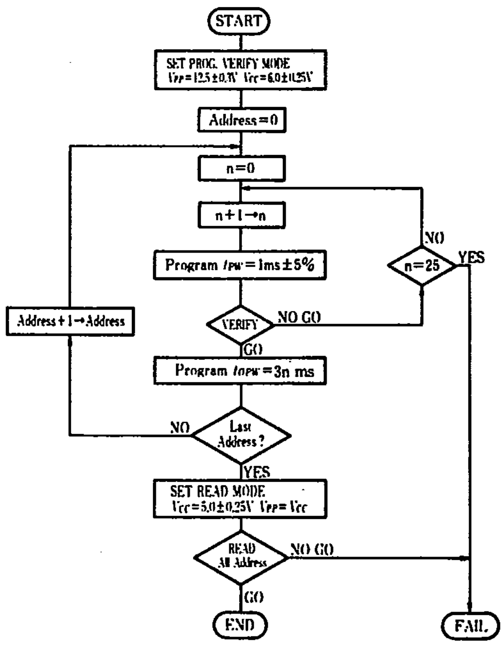


■ **CAPACITANCE** (Ta=25°C, f=1MHz)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit.
Input Capacitance	C_{in}	V_{in} = 0 V	–	4	6	pF
Output Capacitance	C_{out}	V_{out} = 0 V	–	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 (Ta=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} = 6.25V/0.45V	–	–	2	μA
Output Low Voltage During Verify	V_{OL}	I_{OL} = 2.1 mA	–	–	0.45	V
Output High Voltage During Verify	V_{OH}	I_{OH} = −400 μA	2.4	–	–	V
V_{CC} Current (Active)	I_{CC2}		–	–	30	mA
Input Low Level	V_{IL}		−0.1*5	–	0.8	V
Input High Level	V_{IH}		2.2	–	V_{CC}+0.5*6	V
V_{PP} Supply Current	I_{PP2}	$\overline{CE}$ = V_{IL}	–	–	40	mA

Notes) *1. V_{CC} must be applied before V_{PP} and removed after V_{PP}.
*2. V_{PP} must not exceed 14V including overshoot.
*3. An influence may be had upon device reliability if the device is installed or removed while V_{PP} = 12.5V.
*4. Do not alter V_{PP} either V_{IL} to 12.5V or 12.5V to V_{IL} when $\overline{CE}$ = Low.
*5. −0.6V for pulse width ≦ 20ns.
*6. If V_{IH} is over the specified maximum value, programming operation cannot be guaranteed.

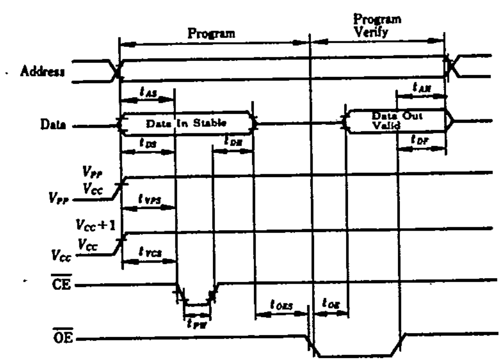
● AC PROGRAMMING CHARACTERISTICS (Ta=25°C±5°C, V_{CC}=6V±0.25V, V_{PP}=12.5V±0.3V)

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}		0	–	130	ns
V_{PP} Setup Time	t_{VPS}		2	–	–	μs
V_{CC} Setup Time	t_{VCS}		2	–	–	μs
$\overline{CE}$ Pulse Width During Initial Programming	t_{PW}		0.95	1.0	1.05	ms
$\overline{CE}$ Pulse Width During Overprogramming	t_{OPW}		2.85	–	78.75	ms
Data Valid from $\overline{OE}$	t_{OE}		0	–	150	ns

Notes: t_{OPW} is defined as mentioned in flow chart.
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 level: 0.45V to 2.4V
Input rise and fall time: ≦ 20ns
Reference level for measuring time: 0.8V and 2V



■ ERASE

Erasure of HN27C256G is performed by exposure to ultraviolet light of 2537 Å 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 15W. sec/cm²

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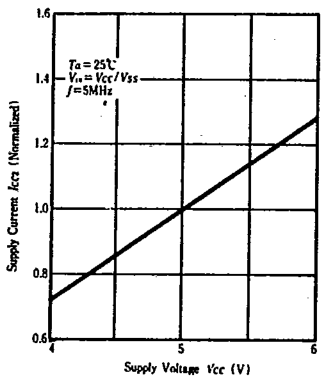
• HN27C256G IDENTIFIER CODES

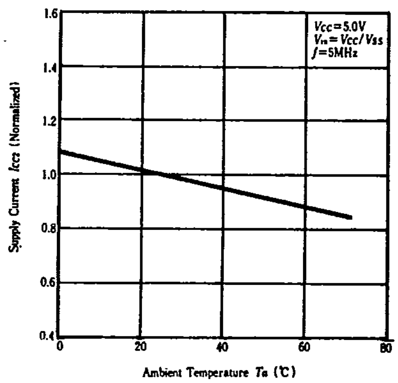
Identifier \ Pins	A_0 (10)	O_7 (19)	O_6 (18)	O_5 (17)	O_4 (16)	O_3 (15)	O_2 (13)	O_1 (12)	O_0 (11)	Hex Data
Manufacturer Code	V_{IL}	0	0	0	0	0	1	1	1	07
Device Code	V_{IH}	1	0	1	1	0	0	0	0	B0

Notes: 1. $A_9 = 12.0V \pm 0.5V$.
2. $A_1 - A_8, A_{10} - A_{14}, \overline{CE}, \overline{OE} = V_{IL}$.

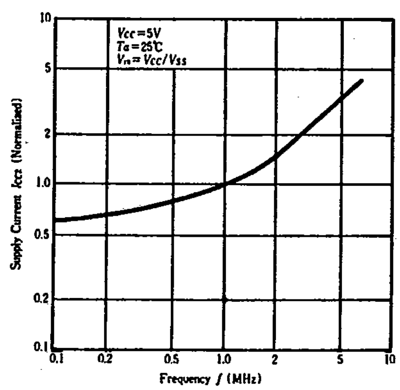
SUPPLY CURRENT VS. SUPPLY VOLTAGE



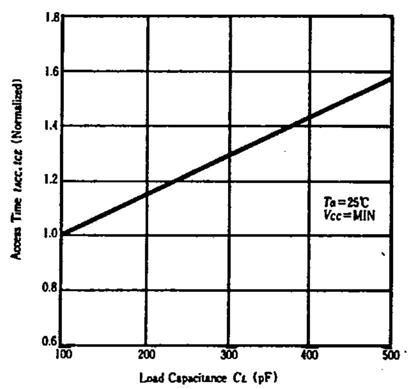
SUPPLY CURRENT VS. AMBIENT TEMPERATURE



SUPPLY CURRENT VS. FREQUENCY



ACCESS TIME VS. LOAD CAPACITANCE



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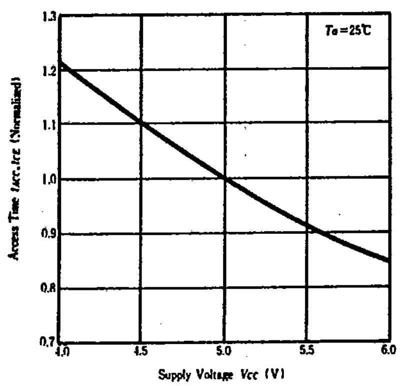
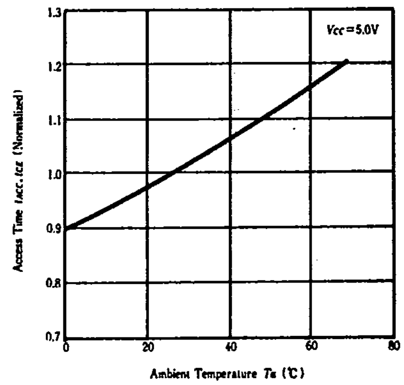
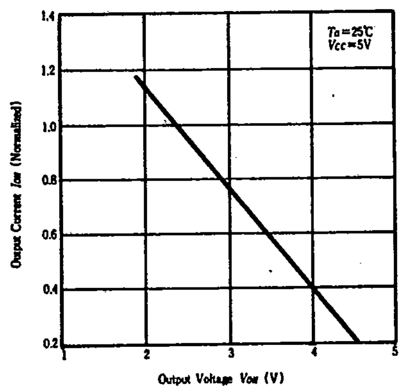
ACCESS TIME VS. SUPPLY VOLTAGE



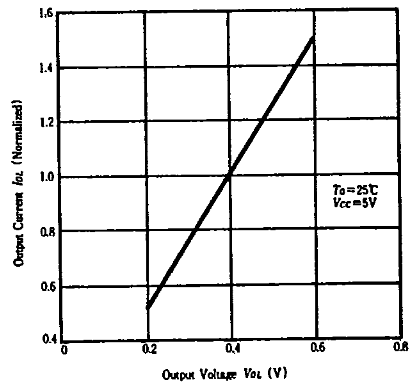
ACCESS TIME VS. AMBIENT TEMPERATURE



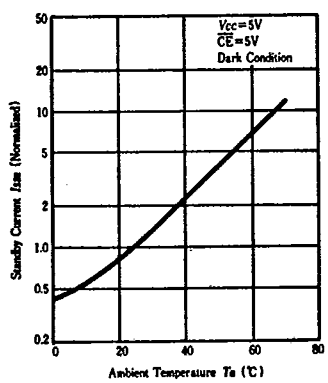
OUTPUT CURRENT VS. OUTPUT VOLTAGE



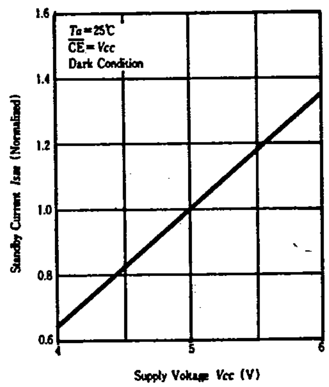
OUTPUT CURRENT VS. OUTPUT VOLTAGE



STANDBY CURRENT VS. AMBIENT TEMPERATURE



STANDBY CURRENT VS. SUPPLY VOLTAGE



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