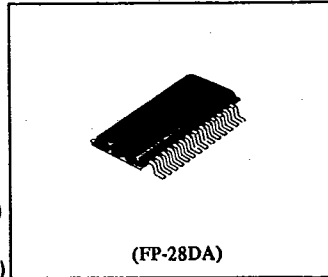


HN27C256FP Series

T-46-13-25

32768-word x 8-bit CMOS One Time Electrically Programmable ROM

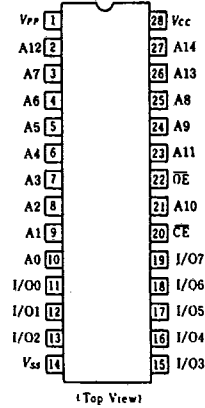
The HN27C256FP is a 32768-word by 8-bit one time electrically programmable ROM. Initially, all bits of the HN27C256FP are in the "1" State (Output High). Data is introduced by selectively programming "0" into the desired bit locations. This device is packaged in a 28 pin plastic flat package (SOP). Therefore, this device cannot be re-written.



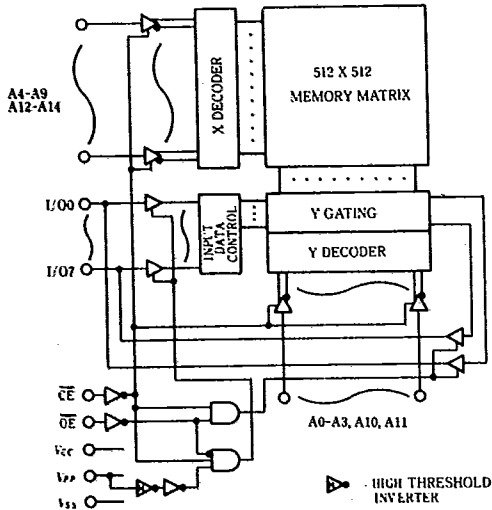
■ FEATURES

- Low Power Dissipation 40mW/MHz max. (Active Mode)
110μW max (Standby Mode)
- Access Time 250ns max. (HN27C256FP-25T)
300ns max. (HN27C256FP-30T)
- 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

■ PIN ARRANGEMENT



■ BLOCK DIAGRAM



HN27C256FP Series

■ MODE SELECTION

T-46-13-25

Mode	Pins	\overline{CE} (20)	\overline{OE} (22)	A9 (24)	V_{PP} (1)	V_{CC} (28)	I/O (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 : $12.0 \pm 0.5V$.

■ 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 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 $\leq 50ns$.

■ READ OPERATION

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

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}	$\overline{CE} = V_{CC} \pm 0.3V$	-	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}	$I_{OH} = -400 \mu A$	2.4	-	-	V
	V_{OH2}	$I_{OH} = -100 \mu A$	$V_{CC} - 0.7$	-	-	V

Notes) *1. -1.0V for pulse width $\leq 50ns$.
*2. $V_{CC} + 1.5V$ for pulse width $\leq 20ns$. If V_{IH} is over the specified maximum value, read operation cannot be guaranteed.



● AC CHARACTERISTICS ($T_a = 0$ to $+70^\circ\text{C}$, $V_{CC} = 5\text{V} \pm 5\%$, $V_{PP} = V_{CC}$)

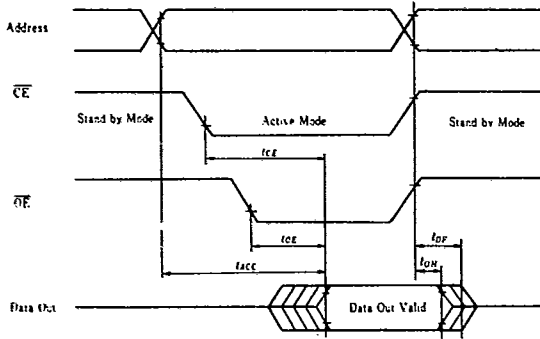
T-46-13-25

Parameter	Symbol	Test Condition	HN27C256FP-25T		HN27C256FP-30T		Unit
			Min	Max	Min	Max	
Address to Output Delay	t_{ACC}	$\overline{CE} = \overline{OE} = V_{IL}$	—	250	—	300	ns
\overline{CE} to Output Delay	t_{CE}	$\overline{OE} = V_{IL}$	—	250	—	300	ns
\overline{OE} to Output Delay	t_{OE}	$\overline{CE} = V_{IL}$	10	100	0	120	ns
\overline{OE} High to Output Float	t_{DF}	$\overline{CE} = V_{IL}$	0	60	0	105	ns
Address to Output Hold	t_{OH}	$\overline{CE} = \overline{OE} = V_{IL}$	0	—	0	—	ns

Note: t_{DF} is defined as 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: $\leq 20\text{ns}$
- Output load: 1 TTL Gate +100pF
- Reference level for measuring timing: 0.8V and 2.0V



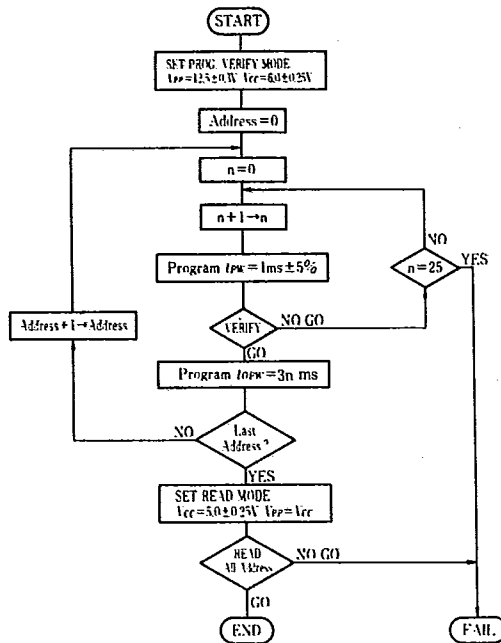
● CAPACITANCE ($T_a = 25^\circ\text{C}$, $f = 1\text{MHz}$)

Parameter	Symbol	Test Condition	min.	typ.	max.	Unit
Input Capacitance	C_{in}	$V_{in} = 0\text{V}$	—	4	6	pF
Output Capacitance	C_{out}	$V_{out} = 0\text{V}$	—	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 ($T_a=25^{\circ}C \pm 5^{\circ}C$, $V_{CC}=6V \pm 0.25V$, $V_{PP}=12.5V \pm 0.3V$)

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}	$I_{OH} = -400 \mu A$	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 $\leq 20ns$.
 *6. If V_{IH} is over the specified maximum value, programming operation cannot be guaranteed.



● AC PROGRAMMING CHARACTERISTICS ($T_a=25^{\circ}\text{C}\pm 5^{\circ}\text{C}$, $V_{CC}=6\text{V}\pm 0.25\text{V}$, $V_{PP}=12.5\text{V}\pm 0.3\text{V}$)

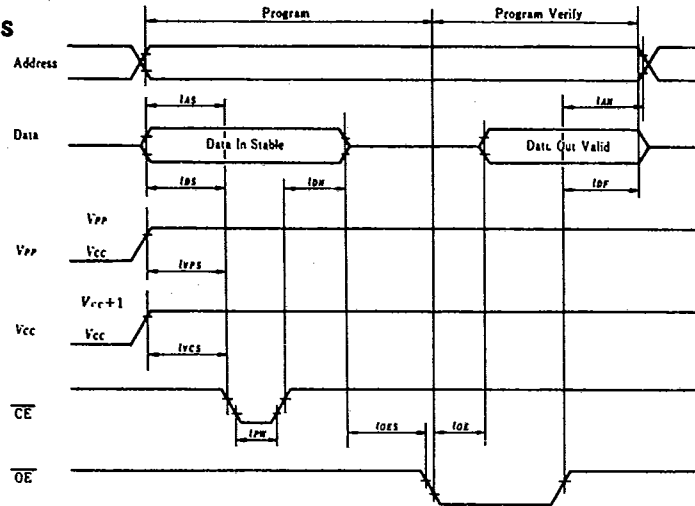
Parameter	Symbol	Test Condition	min.	typ.	max.	Unit
Address Setup Time	t_{AS}		2	—	—	μs
$\overline{\text{OE}}$ Setup Time	t_{OES}		2	—	—	μs
Data Setup Time	t_{DS}		2	—	—	μs
Address Hold Time	t_{AH}		0	—	—	μs
Data Hold Time	t_{DH}		2	—	—	μs
$\overline{\text{OE}}$ to Output Float Delay	t_{DF}^{*1}		0	—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

Notes: *1. t_{DF} is defined as the time at which the output achieves the open circuit condition and data is no longer driven.
*2. Refer to the programming flowchart for t_{OPW} .

● SWITCHING CHARACTERISTICS

TEST CONDITION

Input pulse level: 0.45V to 2.4V
Input rise and fall time: $\leq 20\text{ns}$
Reference level for measuring timing: 0.8V and 2V



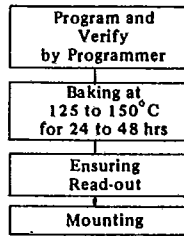
● HN27C256FP IDENTIFIER MODES

Identifier	Pins	A_0 (10)	I/O_7 (19)	I/O_8 (18)	I/O_9 (17)	I/O_{10} (16)	I/O_{11} (15)	I/O_{12} (13)	I/O_{13} (12)	I/O_{14} (11)	Hex Data
Manufacturer Code	V_{IL}	0	0	0	0	0	0	1	1	1	07
Device Code	V_{IH}	1	0	1	1	0	0	0	0	0	B0

Notes: 1. $A_0 = 12.0\text{V} \pm 0.5\text{V}$.
2. $A_1 - A_9, A_{10} - A_{14}, \overline{\text{CE}}, \overline{\text{OE}} = V_{IL}$.

■ RECOMMENDED SCREENING CONDITIONS

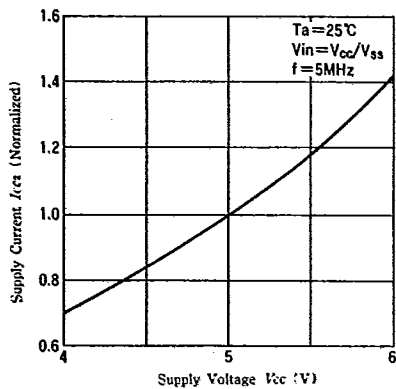
Before mounting, please make the screening (baking without bias) shown in the right.



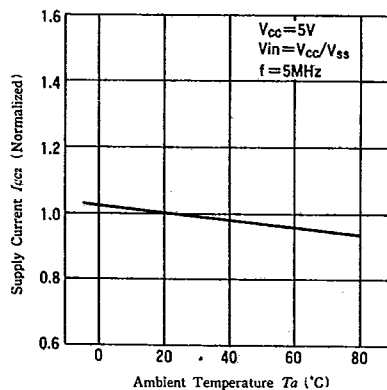
Recommended Screening conditions



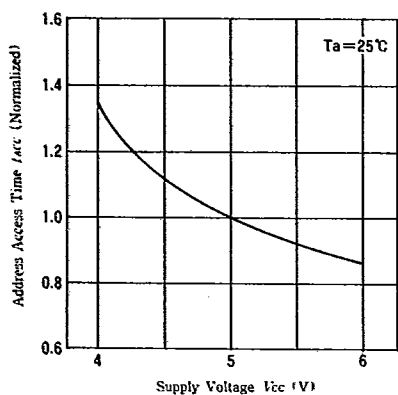
SUPPLY CURRENT vs. SUPPLY VOLTAGE



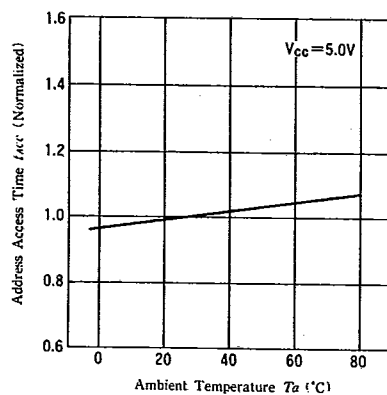
SUPPLY CURRENT vs. AMBIENT TEMPERATURE



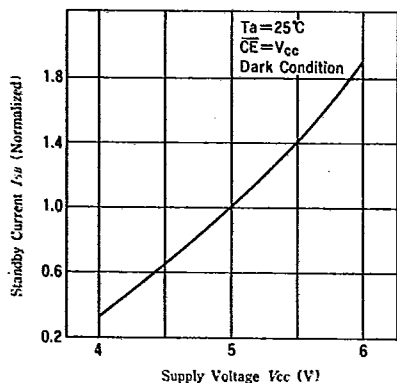
ADDRESS ACCESS TIME vs. SUPPLY VOLTAGE



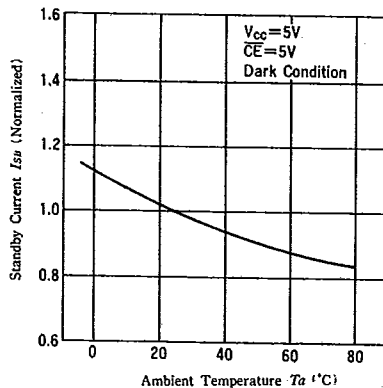
ADDRESS ACCESS TIME vs. AMBIENT TEMPERATURE



STANDBY CURRENT vs. SUPPLY VOLTAGE



STANDBY CURRENT vs. AMBIENT TEMPERATURE



* See Supply Voltage vs. Active Frequency, Access Time vs. Load Capacitance, and Output Current vs. Output Voltage (1), (2) of HN27C256G.

