

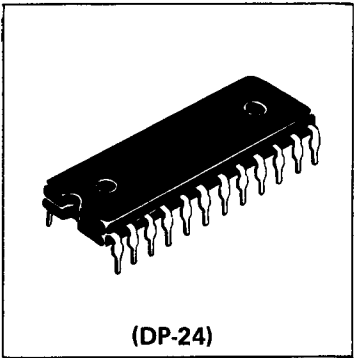
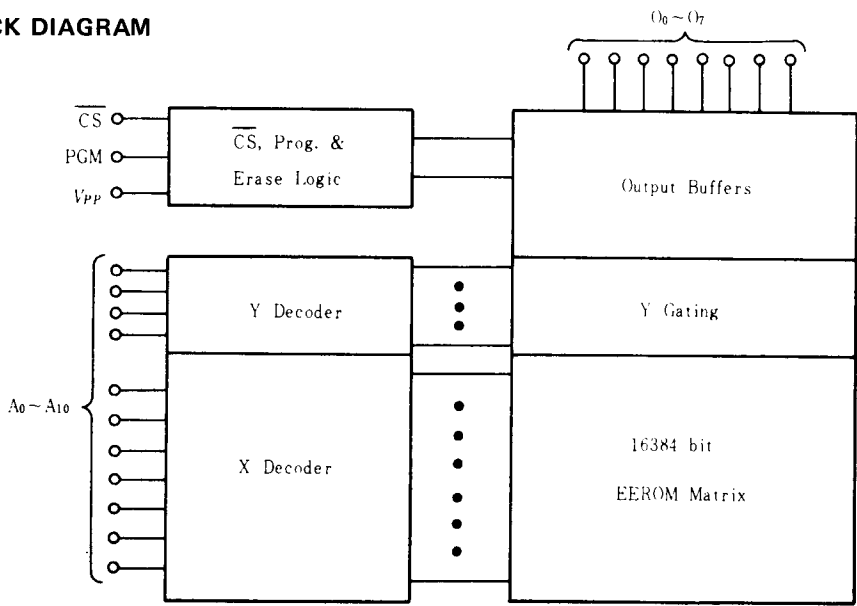
HN48016P

2048-word X 8-bit Electrically Erasable and Programmable ROM

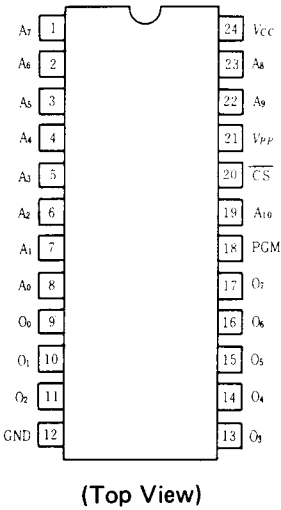
This device operates from a single power supply and features fast single address location programming. All the words are erased by one TTL level pulse. Erasing the bit pattern and programming new pattern can be made within 22 seconds.

- FEATURES
- Single Power Supply +5V±5%
 - Simple Programming Program voltage: +25V DC.
Program with one 10ms pulse.
 - Electrically Erasing Erase Voltage: +25V DC.
Erase all words with one 1sec pulse.
 - Fully Static No clocks required.
 - Inputs and Outputs TTL compative during read, program and erase mode.
 - Fully Decoded On-Chip Address Decode.
 - Access Time 350ns Max.
 - Low Power Dissipation 300mW Max.
 - Three State Output OR-Tie Capability
 - Pin-out Compatible with Intel 2716.

■ BLOCK DIAGRAM



■ PIN ARRANGEMENT



■ MODE SELECTION

Pins \ Mode	PGM (18)	CS (20)	VPP (21)	VCC (24)	OUTPUTS (8~11, 13~17)
READ	V _{IL}	V _{IL}	+5	+5	D _{OUT}
DESELECT	Don't Care	V _{IH}	+5	+5	High Z
PROGRAM	Pulsed V _{IL} to V _{IH}	V _{IH}	+25	+5	D _{IN}
PROGRAM VERIFY	V _{IL}	V _{IL}	+25	+5	D _{OUT}
ERASE	Pulsed V _{IL} to V _{IH}	V _{IL}	+25	+5	

■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
All Inputs and Output Voltage	V_{IN}, V_{out}	-0.3 to $V_{CC} + 0.3$ or $V_{PP} + 0.3$	V
V_{CC} Voltage	V_{CC}	-0.3 to $+7.0$	V
V_{PP} Voltage	V_{PP}	-0.3 to $+28$	V
Operating Temperature Range	T_{opr}	0 to $+70$	°C
Storage Temperature Range	T_{stg}	-65 to $+125$	°C

■ READ OPERATION

- DC and Operating Characteristics ($V_{CC} = 5V \pm 5\%$, $V_{PP} = V_{CC} \pm 0.6V^*$, $T_a = 0$ to $+70^\circ C$)

Parameter	Symbol	Test Condition	min.	typ.	max.	Unit
Input Leakage Current	I_{LI}	$V_{IN} = 5.25V$	—	—	10	μA
Output Leakage Current	I_{LO}	$V_{OUT} = 5.25V$	—	—	10	μA
V_{CC} Current	I_{CC1}	$\overline{CS} = V_{IH}/V_{IL}$	—	32	50	mA
V_{PP} Current	I_{PP1}	$V_{PP} = 5.85V$	—	4	7	mA
Input Voltage	V_{IL}		-0.1	—	0.8	V
	V_{IH}		2.0	—	—	V
Output Voltage	V_{OL}	$I_{OL} = 1.6mA$	—	—	0.4	V
	V_{OH}	$I_{OH} = -100 \mu A$	2.4	—	—	V

- * The tolerance of 0.6V allows the use of a driver circuit for switching the V_{PP} supply pin from V_{CC} in read to 25V for programming.

- AC Characteristics ($V_{CC} = 5V \pm 5\%$, $V_{PP} = V_{CC} \pm 0.6V$, $T_a = 0$ to $+70^\circ C$)

Parameter	Symbol	Test Condition	min.	typ.	max.	Unit
Address to Output Delay	t_{ACC}	PGM = $\overline{CS} = V_{IL}$	—	200	350	ns
Chip Select to Output Delay	t_{CO}	PGM = V_{IL}	—	70	150	ns
Chip Deselect to Output Float	t_{DF}		0	40	100	ns
Address to Output Hold	t_{OH}	PGM = $\overline{CS} = V_{IL}$	10	—	—	ns

● Test Condition

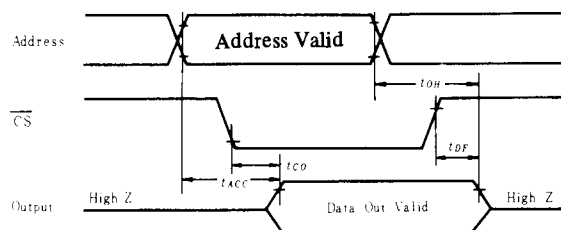
Input pulse levels; 0.8V to 2.0V

Input rise and fall time; 20ns

Output load; 1TTL Gate + 100 pF

Reference level for Measuring Timing; Inputs 1V and 1.8V

Outputs 0.8V and 2.0V



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

Parameter	Symbol	Test Condition	typ.	max.	Unit
Input Capacitance	C_{IN}	$V_{IN} = 0\text{V}$	—	7.5	pF
Output Capacitance	C_{OUT}	$V_{OUT} = 0\text{V}$	—	15	pF

■ **PROGRAM OPERATION**

● **DC Programming Characteristics** ($V_{CC} = 5\text{V} \pm 5\%$, $V_{PP} = 25\text{V} \pm 1\text{V}$, $T_a = 25^\circ\text{C} \pm 5^\circ\text{C}$)

Parameter	Symbol	Test Condition	min.	typ.	max.	Unit
Input Leakage Current	I_{LI}	$V_{IN} = 5.25\text{V}$	—	—	10	μA
V_{CC} Supply Current	I_{CC2}		—	32	50	mA
V_{PP} Supply Current	I_{PP2}		—	10	20	mA
Input Voltage	V_{IL}		-0.1	—	0.8	V
	V_{IH}		2.0	—	—	V

● **AC Programming Characteristics** ($V_{CC} = 5\text{V} \pm 5\%$, $V_{PP} = 25\text{V} \pm 1\text{V}$, $T_a = 25^\circ\text{C} \pm 5^\circ\text{C}$)

Parameter	Symbol	Test Condition	min.	typ.	max.	Unit
Address Setup Time	t_{AS}		2	—	—	μs
$\overline{\text{CS}}$ Setup Time	t_{CSS}		2	—	—	μs
Data Setup Time	t_{DS}		2	—	—	μs
Address Hold Time	t_{AH}		2*	—	—	μs
$\overline{\text{CS}}$ Hold Time	t_{CSH}		7	—	—	μs
Data Hold Time	t_{DH}		2	—	—	μs
Chip Deselect to Output Float Delay	t_{DF}		0	40	100	ns
Chip Select to Output Delay	t_{CO}		—	70	150	ns
Program Pulse Width	t_{PW}		10	—	—	ms
Program Pulse Rise Time	t_{PRT}		5	—	—	ns
Program Pulse Fall Time	t_{PFT}		5	—	—	ns

* If the mode changes from program mode to program verify mode sequentially (in the same address), t_{AH} must be larger than $t_{CSH} + t_{CO}$.

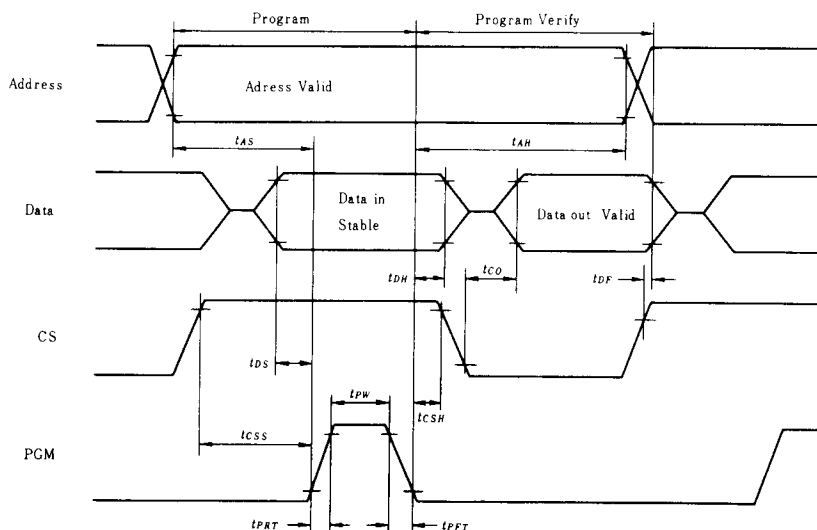
● **Test Condition**

Input pulse levels; 0.8V to 2.0V

Input rise and fall time; 20ns (10% to 90%)

Reference level for Measuring Timing; Input 1V and 1.8V

Output 0.8V and 2.0V



■ ERASE OPERATION

- **DC Erasing Characteristics** ($V_{CC} = 5V \pm 5\%$, $V_{PP} = 25V \pm 1V$, $T_a = 25^\circ C \pm 5^\circ C$)

Parameter	Symbol	Test Condition	min.	typ.	max.	Unit
Input Leakage Current	I_{LI}	$V_{IN} = 5.25V$	—	—	10	μA
V_{CC} Supply Current	I_{CC3}		—	32	50	mA
V_{PP} Supply Current	I_{PP3}		—	10	20	mA
Input Voltage	V_{IL}		-0.1	—	0.8	V
	V_{IH}		2.0	—	—	V

- **AC Erasing Characteristics** ($V_{CC} = 5V \pm 5\%$, $V_{PP} = 25V \pm 1V$, $T_a = 25^\circ C \pm 5^\circ C$)

Parameter	Symbol	Test Condition	min.	typ.	max.	Unit
CS Setup Time	t_{ECSS}		2	—	—	μs
PGM to Output Delay	t_{EO}		7	—	—	μs
Erase Pulse Width	t_{EW}		1000	—	—	ms
Erase Pulse Rise Time	t_{ERT}		5	—	—	ns
Erase Pulse Fall Time	t_{EFT}		5	—	—	ns

● Test Condition

Input pulse levels; 0.8V to 2.0V

Input rise and fall time; 20ns (10% to 90%)

Reference level for Measuring Timing; Input 1V and 1.8V

Output 0.8V and 2.0V

