

### Features

- Operating voltage: 2.7V~5.5V
- Low power consumption
  - Operation: 25mA max. ( $V_{CC}=5V$ )  
10mA max. ( $V_{CC}=3V$ )
  - Standby: 60 $\mu$ A max. ( $V_{CC}=5V$ )  
20 $\mu$ A max. ( $V_{CC}=3V$ )
- Access time: 90ns max. ( $V_{CC}=5V$ )  
250ns max. ( $V_{CC}=3V$ )
- 512K×8-bit of mask ROM
- Mask option: chip enable  $CE/\overline{CE}$ , and output enable  $OE/\overline{OE}/NC$
- TTL compatible inputs and outputs
- Tristate outputs
- Fully static operation
- 32-pin DIP/SOP package

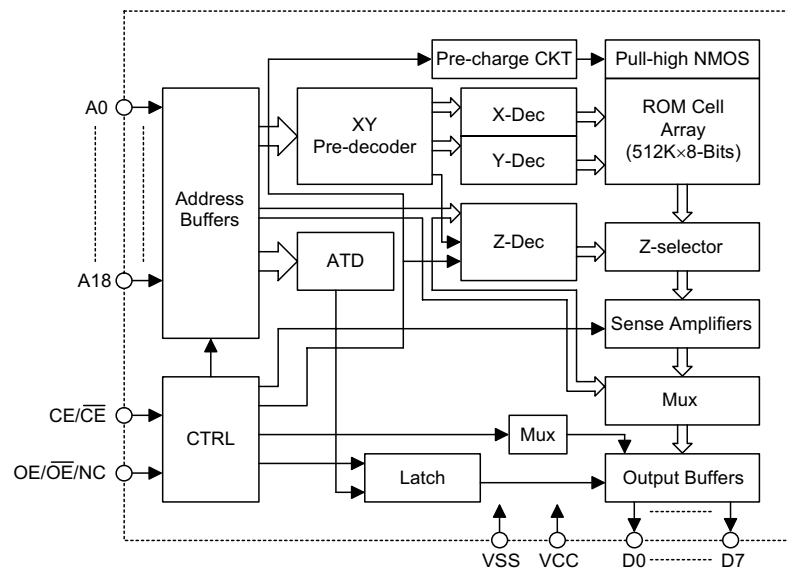
### General Description

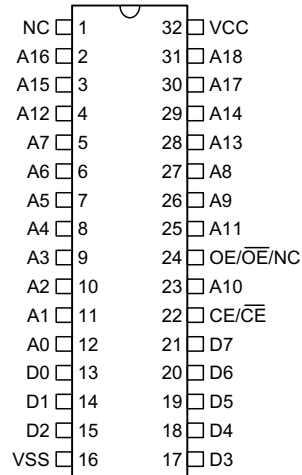
The HT23C040H is a read-only memory with high performance CMOS storage device whose 4096K of memory is arranged into 512K word by 8 bits.

For application flexibility, the chip enable and output enable control pins can be selected as active high or active low. This flexibility not only allows easy interface with most microprocessors, but also eliminates bus conten-

tion in multiple bus microprocessor systems. An additional feature of the HT23C040H is its ability to enter the standby mode whenever the chip enable ( $CE/\overline{CE}$ ) is inactive, thus reducing current consumption to below 60 $\mu$ A. The combination of these functions makes the chip suitable for high density low power memory applications.

### Block Diagram



**Pin Assignment**


**HT23C040H**  
**- 32 DIP-A/SOP-A**

**Pin Description**

Pin Name	I/O	Description
NC	—	No connection
A0~A18	I	Address inputs
D0~D7	O	Data outputs
VSS	—	Negative power supply, ground
CE/CE	I	Chip enable/Output enable input
OE/OE/NC	I	Output enable input
VCC	—	Positive power supply

**Absolute Maximum Ratings**

Supply Voltage .....-0.3V to 6V	Storage Temperature .....-50°C to 125°C
Input Voltage.....-0.3V to V <sub>CC</sub> +0.3V	Operating Temperature.....-40°C to 85°C

Note: These are stress ratings only. Stresses exceeding the range specified under "Absolute Maximum Ratings" may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

**D.C. Characteristics**
 $T_a = -40^{\circ}\text{C to } 85^{\circ}\text{C}$ 

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
		V <sub>CC</sub>	Conditions				
<b>Supply voltage: 4.5V~5.5V</b>							
V <sub>CC</sub>	Operating Voltage	—	—	4.5	—	5.5	V
I <sub>CC1</sub>	Operating Current	5V	O/P No load, f=5MHz	—	—	25	mA
V <sub>IL1</sub>	Input Low Voltage	5V	—	V <sub>SS</sub>	—	0.8	V
V <sub>IH1</sub>	Input High Voltage	5V	—	2.2	—	V <sub>CC</sub>	V
V <sub>OL1</sub>	Output Low Voltage	5V	I <sub>OL</sub> =3.2mA	—	—	0.4	V
V <sub>OH1</sub>	Output High Voltage	5V	I <sub>OH</sub> =-1mA	2.4	—	V <sub>CC</sub>	V
I <sub>LI</sub>	Input Leakage Current	5V	V <sub>IN</sub> =0 to V <sub>CC</sub>	—	—	10	μA
I <sub>LO</sub>	Output Leakage Current	5V	V <sub>OUT</sub> =0 to V <sub>CC</sub>	—	—	10	μA
I <sub>STB1</sub>	Standby Current	5V	CE=V <sub>IL</sub> , $\overline{\text{CE}}=V_{IH}$	—	—	1.5	mA
I <sub>STB2</sub>	Standby Current	5V	CE≤0.2V CE≥V <sub>CC</sub> -0.2V	—	—	60	μA
C <sub>IN</sub>	Input Capacitance (See note)	—	f=1MHz	—	—	10	pF
C <sub>OUT</sub>	Output Capacitance (See note)	—	f=1MHz	—	—	10	pF
<b>Supply voltage: 2.7V~3.3V</b>							
V <sub>CC</sub>	Operating Voltage	—	—	2.7	—	3.3	V
I <sub>CC2</sub>	Operating Current	3V	O/P No load, f=5MHz	—	—	10	mA
V <sub>IL2</sub>	Input Low Voltage	3V	—	V <sub>SS</sub>	—	0.4	V
V <sub>IH2</sub>	Input High Voltage	3V	—	1.5	—	V <sub>CC</sub>	V
V <sub>OL2</sub>	Output Low Voltage	3V	I <sub>OL</sub> =2mA	—	—	0.4	V
V <sub>OH2</sub>	Output High Voltage	3V	I <sub>OH</sub> =-0.6mA	1.5	—	V <sub>CC</sub>	V
I <sub>LI</sub>	Input Leakage Current	3V	V <sub>IN</sub> =0 to V <sub>CC</sub>	—	—	10	μA
I <sub>LO</sub>	Output Leakage Current	3V	V <sub>OUT</sub> =0 to V <sub>CC</sub>	—	—	10	μA
C <sub>IN</sub>	Input Capacitance (See Note)	—	f=1MHz	—	—	10	pF
C <sub>OUT</sub>	Output Capacitance (See Note)	—	f=1MHz	—	—	10	pF

Note: These parameters are periodically sampled but not 100% tested.

**A.C. Characteristics**
 $T_a = -40^{\circ}\text{C to } 85^{\circ}\text{C}$ 

Symbol	Parameter	3V±10%		5V±10%		Unit
		Min.	Max.	Min.	Max.	
t <sub>CYC</sub>	Cycle Time	200	—	90	—	ns
t <sub>AA</sub>	Address Access Time	—	250	—	90	ns
t <sub>ACE</sub>	Chip Enable Access Time	—	250	—	90	ns
t <sub>AOE</sub>	Output Enable Access Time	—	150	—	60	ns
t <sub>OH</sub>	Output Hold Time	—	—	7.5	—	ns
t <sub>OD</sub>	Output Disable Time (See Note)	—	—	—	60	ns
t <sub>OE</sub>	Output Enable Time (See Note)	—	—	7.5	—	ns

Note: These parameters are periodically sampled but not 100% tested.

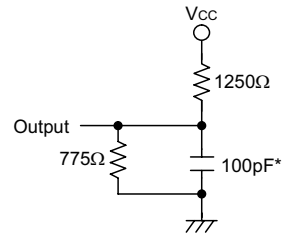
**A.C. test condition**

Output load: see figure right

Input rise and fall time: 10ns

Input pulse levels: 0.4V to 2.4V

Input and output timing reference levels:  
 0.8V and 2.0V ( $V_{CC}=5V$ )  
 1.5V ( $V_{CC}=3V$ )



\* Including scope and jig

Output load circuit

**Functional Description**

The HT23C040H has two modes, namely data read mode and standby mode, controlled by  $\overline{CE}/\overline{CE}$  and  $\overline{OE}/\overline{OE}/\overline{NC}$  inputs.

• Standby mode

The HT23C040H offers lower current consumption, controlled by the chip enable input ( $\overline{CE}/\overline{CE}$ ). When a low/high level is applied to the  $\overline{CE}/\overline{CE}$  input regardless of the output enable ( $\overline{OE}/\overline{OE}/\overline{NC}$ ) states the chip will enter the standby mode.

• Data read mode

When both the chip enable ( $\overline{CE}/\overline{CE}$ ) and the output enable ( $\overline{OE}/\overline{OE}/\overline{NC}$ ) are active, the chip is in data read mode. Otherwise, active  $\overline{CE}/\overline{CE}$  and inactive  $\overline{OE}/\overline{OE}/\overline{NC}$  result in deselect mode. The output will remain in Hi-Z state.

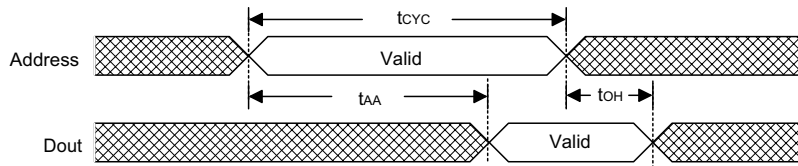
**Operation truth table**

Mode	$\overline{CE}/\overline{CE}$	$\overline{OE}/\overline{OE}$	A0~A18	D0~D7
Read	H/L	H/L	Valid	Data Out
Deselect	H/L	L/H	X	High Z
Standby	L/H	X	X	High Z

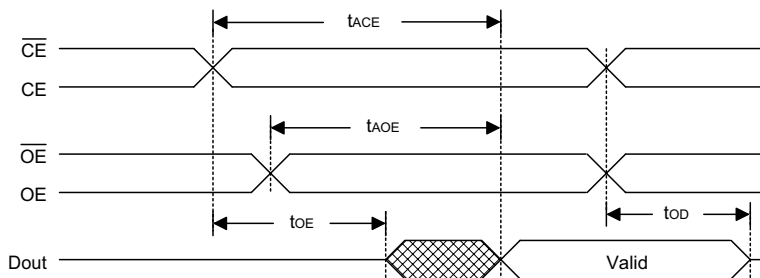
Note: H= $V_{IH}$ , L= $V_{IL}$ , X= $V_{IH}$  or  $V_{IL}$

**Timing Diagrams**

• Propagation delay due to address ( $\overline{CE}/\overline{CE}$  and  $\overline{OE}/\overline{OE}$  are active)

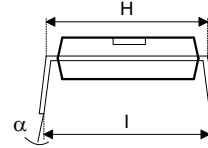
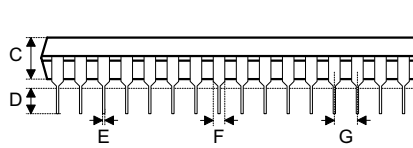
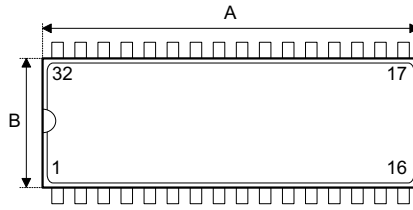


• Propagation delay due to chip and output enable (address valid)



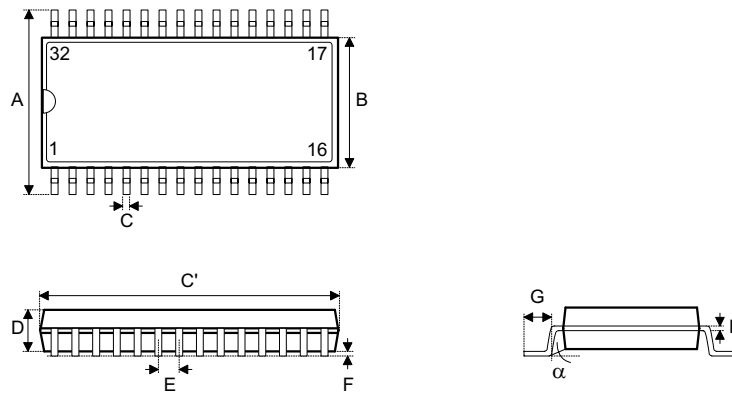
**Package Information**

32-pin DIP (600mil) outline dimensions



Symbol	Dimensions in mil		
	Min.	Nom.	Max.
A	1635	—	1665
B	535	—	555
C	145	—	155
D	125	—	145
E	16	—	20
F	50	—	70
G	—	100	—
H	595	—	615
I	635	—	670
$\alpha$	0°	—	15°

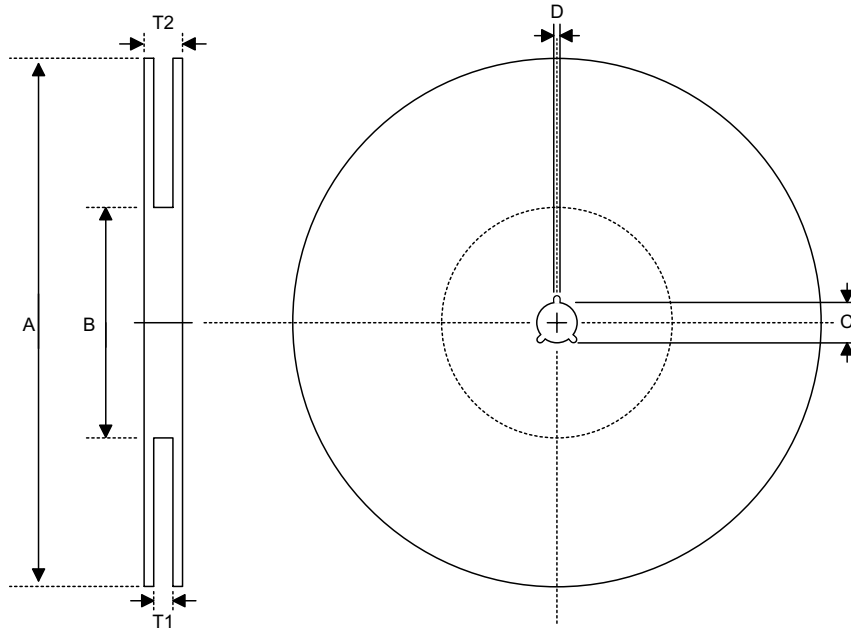
**32-pin SOP (450mil) outline dimensions**



Symbol	Dimensions in mil		
	Min.	Nom.	Max.
A	543	—	557
B	440	—	450
C	14	—	20
C'	—	—	817
D	100	—	112
E	—	50	—
F	4	—	—
G	32	—	38
H	4	—	12
α	0°	—	10°

**Product Tape and Reel Specifications**

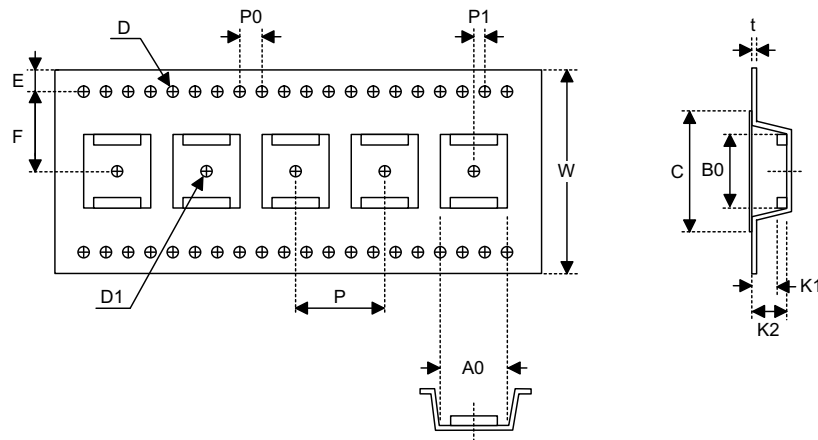
**Reel dimensions**



SOP 32W

Symbol	Description	Dimensions in mm
A	Reel Outer Diameter	330±1.0
B	Reel Inner Diameter	100±0.1
C	Spindle Hole Diameter	13.0+0.5 -0.2
D	Key Slit Width	2.0±0.5
T1	Space Between Flange	32.8+0.3 -0.2
T2	Reel Thickness	38.2+0.2

Carrier tape dimensions



SOP 32W

Symbol	Description	Dimensions in mm
W	Carrier Tape Width	32.0+0.3 -0.1
P	Cavity Pitch	16.0±0.1
E	Perforation Position	1.75±0.1
F	Cavity to Perforation (Width Direction)	14.2±0.1
D	Perforation Diameter	1.55+0.1
D1	Cavity Hole Diameter	2.0+0.25
P0	Perforation Pitch	4.0±0.1
P1	Cavity to Perforation (Length Direction)	2.0±0.1
A0	Cavity Length	14.7±0.1
B0	Cavity Width	20.9±0.1
K1	Cavity Depth	3.0±0.1
K2	Cavity Depth	3.4±0.1
t	Carrier Tape Thickness	0.35±0.05
C	Cover Tape Width	25.5



**Holtek Semiconductor Inc. (Headquarters)**

No.3, Creation Rd. II, Science-based Industrial Park, Hsinchu, Taiwan  
Tel: 886-3-563-1999  
Fax: 886-3-563-1189  
<http://www.holtek.com.tw>

**Holtek Semiconductor Inc. (Sales Office)**

11F, No.576, Sec.7 Chung Hsiao E. Rd., Taipei, Taiwan  
Tel: 886-2-2782-9635  
Fax: 886-2-2782-9636  
Fax: 886-2-2782-7128 (International sales hotline)

**Holtek Semiconductor (Shanghai) Inc.**

7th Floor, Building 2, No.889, Yi Shan Rd., Shanghai, China  
Tel: 021-6485-5560  
Fax: 021-6485-0313  
<http://www.holtek.com.cn>

**Holtek Semiconductor (Hong Kong) Ltd.**

Block A, 3/F, Tin On Industrial Building, 777-779 Cheung Sha Wan Rd., Kowloon, Hong Kong  
Tel: 852-2-745-8288  
Fax: 852-2-742-8657

**Holmate Semiconductor, Inc.**

46712 Fremont Blvd., Fremont, CA 94538  
Tel: 510-252-9880  
Fax: 510-252-9885  
<http://www.holmate.com>

Copyright © 2002 by HOLTEK SEMICONDUCTOR INC.

The information appearing in this Data Sheet is believed to be accurate at the time of publication. However, Holtek assumes no responsibility arising from the use of the specifications described. The applications mentioned herein are used solely for the purpose of illustration and Holtek makes no warranty or representation that such applications will be suitable without further modification, nor recommends the use of its products for application that may present a risk to human life due to malfunction or otherwise. Holtek's products are not authorized for use as critical components in life support devices or systems. Holtek reserves the right to alter its products without prior notification. For the most up-to-date information, please visit our web site at <http://www.holtek.com.tw>.