Features

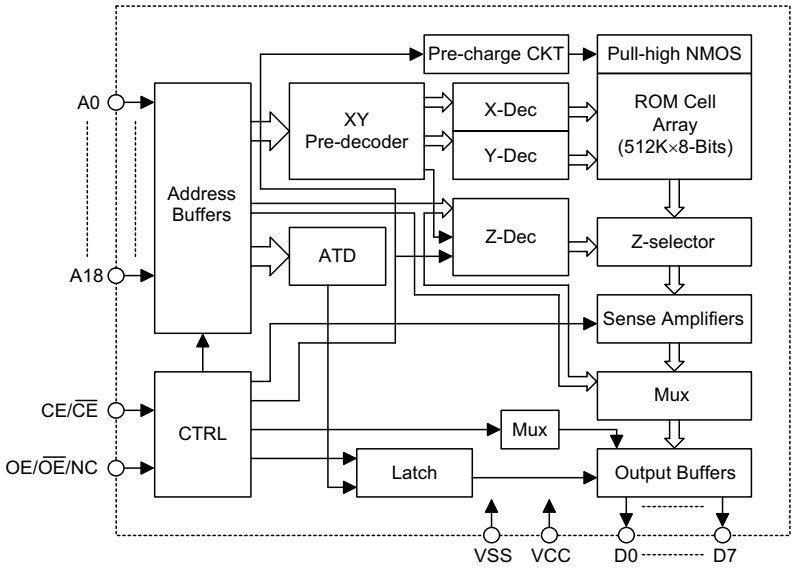
- Operating voltage: 2.7V~5.5V
- Low power consumption
  - Operation: 25mA max. (V_{CC}=5V)
    10mA max. (V_{CC}=3V)
  - Standby: 60μA max. (V_{CC}=5V)
    20μA max. (V_{CC}=3V)
- Access time: 90ns max. (V_{CC}=5V)
  250ns max. (V_{CC}=3V)
- 512K×8-bit of mask ROM
- Mask option: chip enable CE/$\overline{CE}$,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

General Description

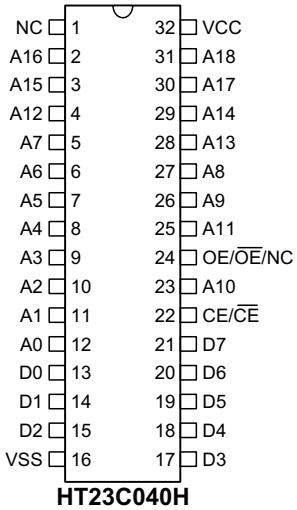
The HT23C040H is a read-only memory with high performance CMOS storage device whose 4096K of memory is arranged into 512K word by 8 bits.

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 contention 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 60μA. 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/$\overline{CE}$	I	Chip enable/Output enable input
OE/$\overline{OE}$/NC	I	Output enable input
VCC	—	Positive power supply

Absolute Maximum Ratings

Supply Voltage .....–0.3V to 6V

Input Voltage.....–0.3V to V_{CC}+0.3V

Storage Temperature .....–50°C to 125°C

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°C to 85°C

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

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

A.C. Characteristics

T_a=–40°C to 85°C

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

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

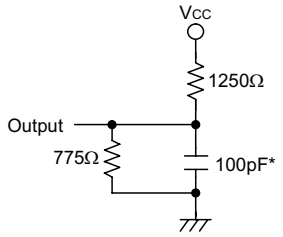
A.C. test condition

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 CE/$\overline{CE}$ and OE/$\overline{OE}$/NC inputs.

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

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

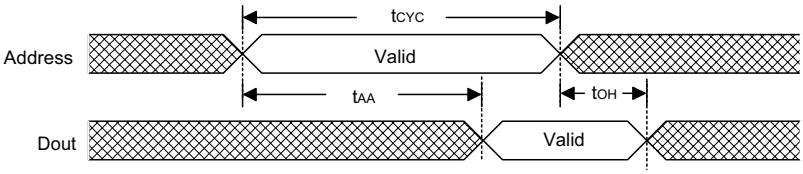
Operation truth table

Mode	CE/$\overline{CE}$	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

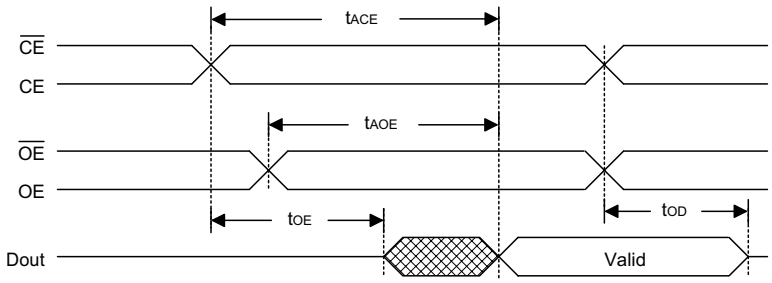
Note: H=V_{IH}, L=V_{IL}, X=V_{IH} or V_{IL}

Timing Diagrams

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

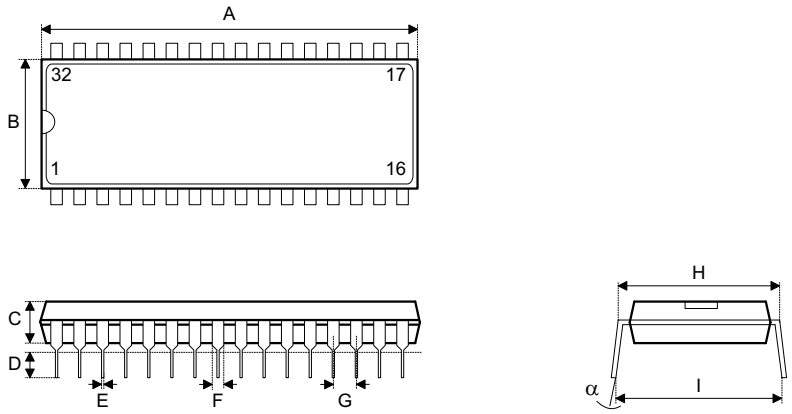


- Propagation delay due to chip and output enable (address valid)



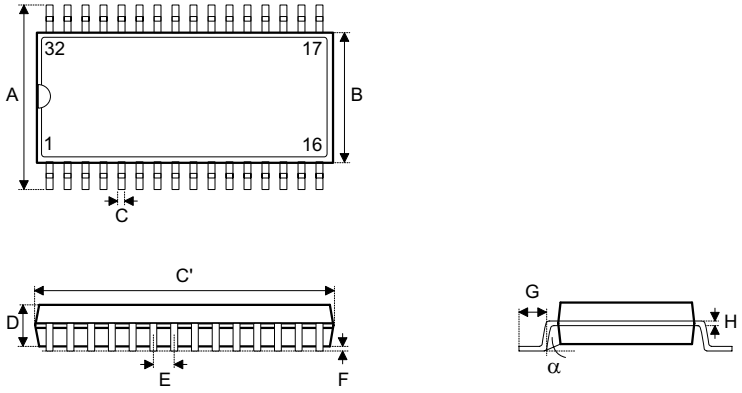
Package Information

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
α	0°	—	15°

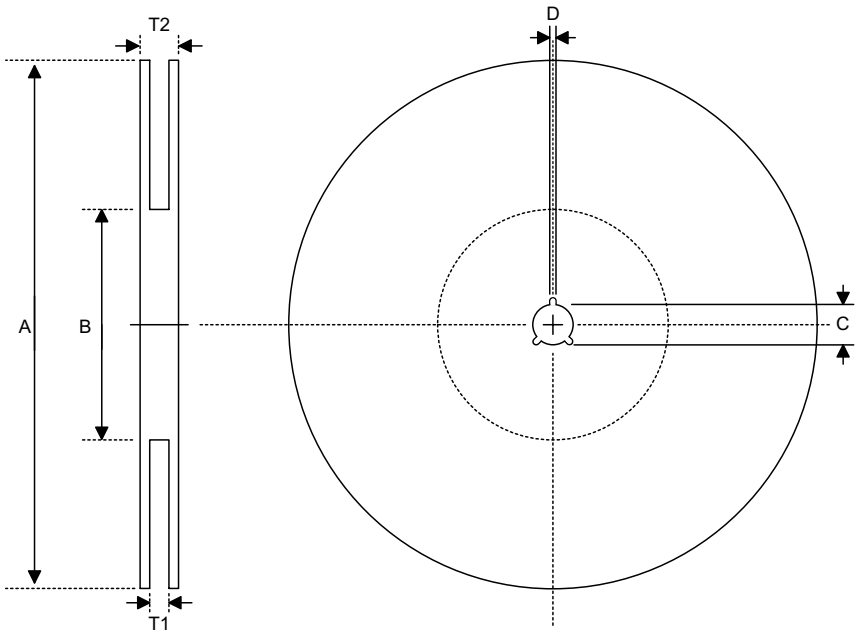
32-pin SOP (450mil) outline dimensions



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

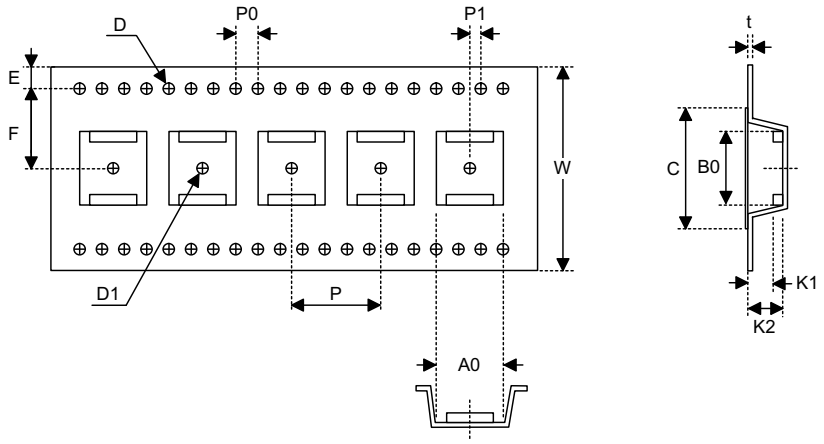
Reel dimensions



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 Park, Hsinchu, Taiwan
Tel: 886-3-563-1999
Fax: 886-3-563-1189
http://www.holtek.com.tw

Holtek Semiconductor Inc. (Taipei Sales Office)
4F-2, No. 3-2, YuanQu St., Nankang Software Park, Taipei 115, Taiwan
Tel: 886-2-2655-7070
Fax: 886-2-2655-7373
Fax: 886-2-2655-7383 (International sales hotline)

Holtek Semiconductor Inc. (Shanghai Sales Office)
7th Floor, Building 2, No.889, Yi Shan Rd., Shanghai, China 200233
Tel: 021-6485-5560
Fax: 021-6485-0313
http://www.holtek.com.cn

Holtek Semiconductor Inc. (Shenzhen Sales Office)
43F, SEG Plaza, Shen Nan Zhong Road, Shenzhen, China 518031
Tel: 0755-8346-5589
Fax: 0755-8346-5590
ISDN: 0755-8346-5591

Holtek Semiconductor Inc. (Beijing Sales Office)
Suite 1721, Jinyu Tower, A129 West Xuan Wu Men Street, Xicheng District, Beijing, China 100031
Tel: 010-6641-0030, 6641-7751, 6641-7752
Fax: 010-6641-0125

Holmate Semiconductor, Inc. (North America Sales Office)
46712 Fremont Blvd., Fremont, CA 94538
Tel: 510-252-9880
Fax: 510-252-9885
http://www.holmate.com