HM624256A Series

262144-word × 4-bit High Speed CMOS Static RAM

HITACHI

Rev. 0.0
Dec. 1, 1995

Description

The Hitachi HM624256A is a high speed 1M Static RAM organized as 262,144-word × 4-bit. It realizes high speed access time (20/25/35 ns) and low power consumption, employing CMOS process technology and high speed circuit designing technology. It is most advantageous for the field where high speed and high density memory is required, such as the cache memory for main frame or 32-bit MPU. The HM624256A, packaged in a 400-mil plastic SOJ is available for high density mounting.

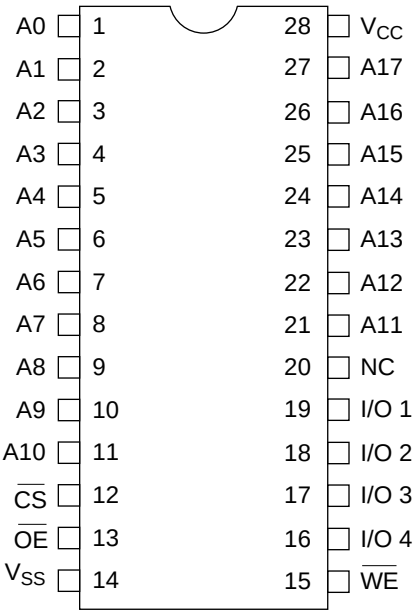
Features

- Single 5 V supply and high density 28-pin package (DIP and SOJ)
- High speed
  Access time: 20/25/35 ns (max)
- Low power dissipation
  Active mode: 350 mW (typ)
  Standby mode: 100 µW (typ)
- Completely static memory
  No clock or timing strobe required
- Equal access and cycle time
- Directly TTL compatible
  All inputs and outputs

Ordering Information

Type No.	Access Time	Package
HM624256AP-20	20 ns	400 mil 28-pin plastic DIP (DP-28C)
HM624256AP-25	25 ns	
HM624256AP-35	35 ns	
HM624256ALP-20	20 ns	
HM624256ALP-25	25 ns	
HM624256ALP-35	35 ns	
HM624256AJP-20	20 ns	400 mil 28-pin plastic SOJ (CP-28D)
HM624256AJP-25	25 ns	
HM624256AJP-35	35 ns	
HM624256ALJP-20	20 ns	
HM624256ALJP-25	25 ns	
HM624256ALJP-35	35 ns	

Pin Arrangement

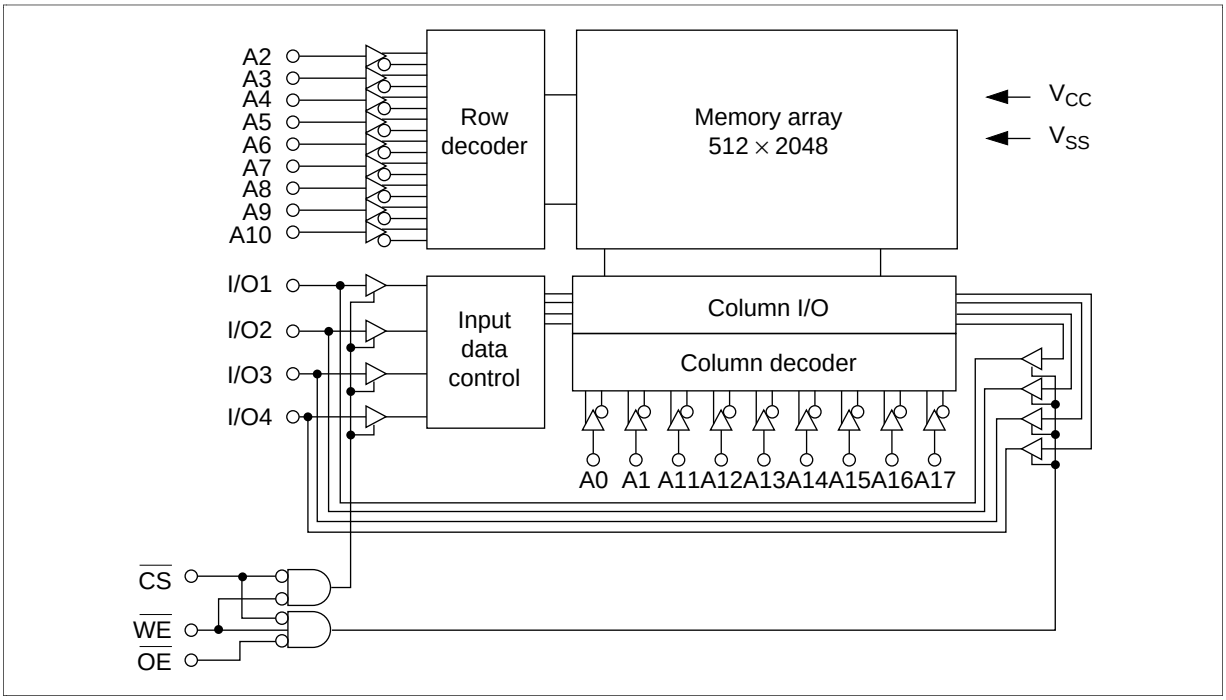


(Top view)

Pin Description

Pin Name	Function
A0 – A17	Address
I/O1 – I/O4	Input/output
$\overline{CS}$	Chip select
$\overline{OE}$	Output enable
$\overline{WE}$	Write enable
V_{CC}	Power supply
V_{SS}	Ground

Block Diagram



Function Table

$\overline{CS}$	$\overline{OE}$	$\overline{WE}$	Mode	V_{cc} Current	I/O Pin	Ref. Cycle
H	X	X	Not selected	I_{SB}, I_{SB1}	High-Z	—
L	L	H	Read	I_{CC}	Dout	Read cycle (1) – (3)
L	H	L	Write	I_{CC}	Din	Write cycle (1)
L	L	L	Write	I_{CC}	Din	Write cycle (2)

Note: X: H or L

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Voltage on any pin relative to V_{SS}	Vin	–0.5[*1] to +7.0	V
Power dissipation	P_T	1.0	W
Operating temperature range	Topr	0 to +70	°C
Storage temperature range	Tstg	–55 to +125	°C
Storage temperature range under bias	Tbias	–10 to +85	°C

Note: 1. Vin min = –2.0 V for pulse width ≤ 10 ns

Recommended DC Operating Conditions (Ta = 0 to +70°C)

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	V_{CC}	4.5	5.0	5.5	V
	V_{SS}	0	0	0	V
Input high (logic 1) voltage	V_{IH}	2.2	—	6.0	V
Input low (logic 0) voltage	V_{IL}	–0.5[*1]	—	0.8	V

Note: 1. V_{IL} min = –2.0 V for pulse width ≤ 10 ns

DC Characteristics (Ta = 0 to +70°C, V_{CC} = 5 V ± 10%, V_{SS} = 0 V)

		HM624256A-20			HM624256A-25/35				
Parameter	Symbol	Min	Typ[*1]	Max	Min	Typ[*1]	Max	Unit	Test Conditions
Input leakage current	$\|I_{LI}\|$	—	—	2.0	—	—	2.0	µA	V_{CC} = max Vin = V_{SS} to V_{CC}
Output leakage current	$\|I_{LO}\|$	—	—	2.0	—	—	2.0	µA	$\overline{CS}$ = V_{IH} $V_{I/O}$ = V_{SS} to V_{CC}
Operating power supply current	I_{CC}	—	—	150	—	—	120	mA	$\overline{CS}$ = V_{IL}, $I_{I/O}$ = 0 mA, min cycle
Standby power supply current	I_{SB}	—	—	60	—	—	40	mA	$\overline{CS}$ = V_{IH}, min cycle
Standby power supply current (1)	I_{SB1}	—	0.02	2.0	—	0.02	2.0	mA	$\overline{CS}$ ≥ V_{CC} – 0.2 V 0 V ≤ Vin ≤ 0.2 V or Vin ≥ V_{CC} – 0.2 V
	I_{SB1}[*2]	—	—	100[*2]	—	—	100[*2]	µA	
Output low voltage	V_{OL}	—	—	0.4	—	—	0.4	V	I_{OL} = 8 mA
Output high voltage	V_{OH}	2.4	—	—	2.4	—	—	V	I_{OH} = –4 mA

Notes: 1. Typical values are at V_{CC} = 5.0 V, Ta = +25°C and not guaranteed.
2. L-version

Capacitance (Ta = 25°C, f = 1 MHz)

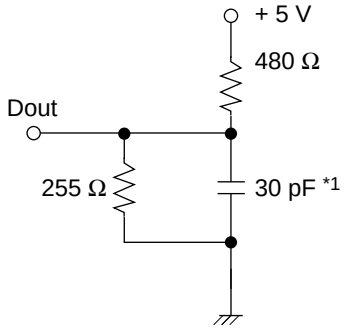
Parameter	Symbol	Min	Max	Unit	Test Conditions
Input capacitance	Cin	—	5[*2]	pF	Vin = 0 V
		—	6[*3]	pF	
Input/output capacitance	$C_{I/O}$	—	8	pF	$V_{I/O}$ = 0 V

Notes: 1. This parameter is sampled and not 100% tested.
2. SOJ package
3. DIP package

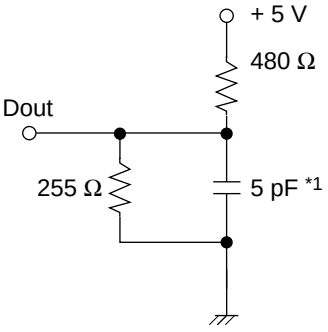
AC Characteristics (Ta = 0 to +70°C, V_{CC} = 5 V ± 10%, unless otherwise noted.)

Test Conditions

- Input pulse levels: 0V to 3.0 V
- Input rise and fall time: 4 ns
- Input timing reference levels: 1.5 V
- Output timing reference levels: 1.5 V
- Output load: See figures



Output load (A)



Output load (B)
(For t_{CHZ}, t_{OHZ}, t_{CLZ}, t_{OLZ}, t_{WHZ} and t_{OW})

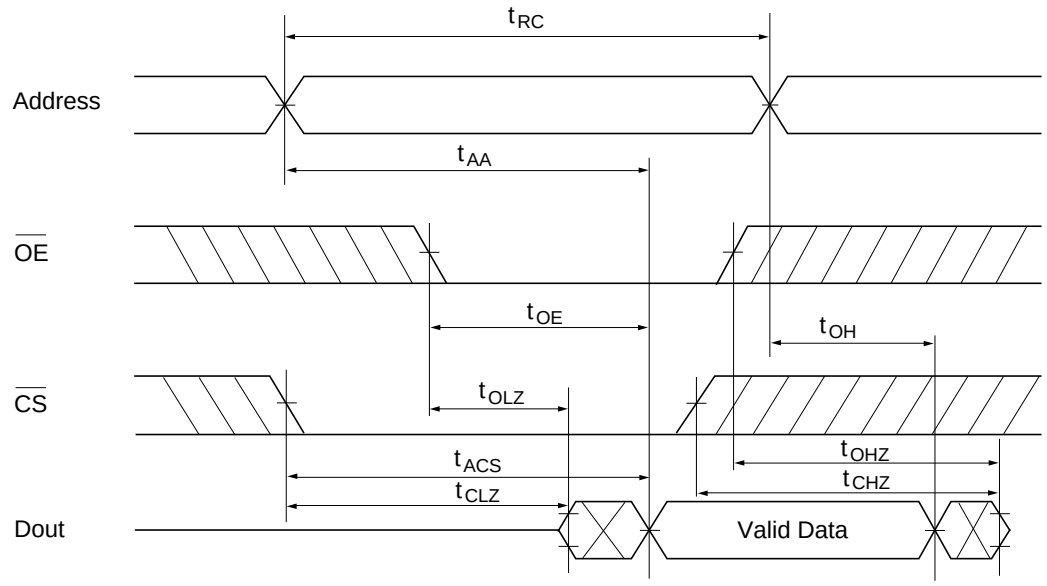
Note: 1. Including scope and jig

Read Cycle

		HM624256A-20		HM624256A-25		HM624256A-35		
Parameter	**Symbol**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Unit**
Read cycle time	t_{RC}	20	—	25	—	35	—	ns
Address access time	t_{AA}	—	20	—	25	—	35	ns
Chip select access time	t_{ACS}	—	20	—	25	—	35	ns
Chip selection to output in low-Z	t_{CLZ} *1	5	—	5	—	5	—	ns
Output enable to output valid	t_{OE}	—	10	—	12	—	15	ns
Output enable to output in low-Z	t_{OLZ} *1	0	—	0	—	0	—	ns
Chip deselection to output in high-Z	t_{CHZ} *1	0	10	0	12	0	15	ns
Chip disable to output in high-Z	t_{OHZ} *1	0	10	0	10	0	10	ns
Output hold from address change	t_{OH}	5	—	5	—	5	—	ns
Chip selection to power up time	t_{PU}	0	—	0	—	0	—	ns
Chip deselection to power down time	t_{PD}	—	12	—	15	—	25	ns

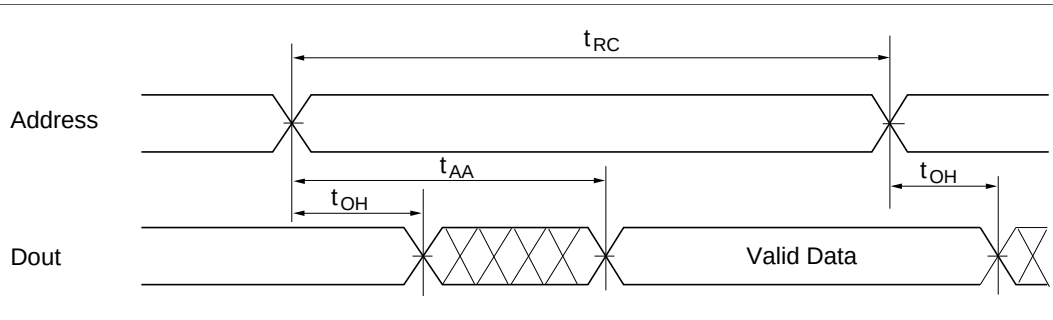
Notes: 1. Transition is measured ±200 mV from steady state voltage with Load (B). This parameter is sampled not 100% tested.

Read Timing Waveform (1)[*1] ($\overline{WE}$ = V_{IH})

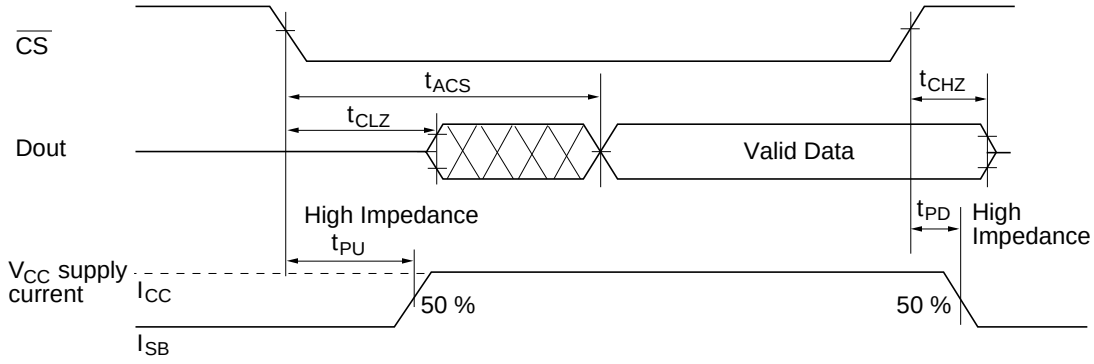


Notes: 1. Transition is measured ±200 mV from state voltage with Load (B). This parameter is sampled and not 100% tested.

Read Timing Waveform (2) ($\overline{WE}$ = V_{IH}, $\overline{CS}$ = V_{IL}, $\overline{OE}$ = V_{IL})



Read Timing Waveform (3)[*1, *2] ($\overline{WE}$ = V_{IH}, $\overline{OE}$ = V_{IL})



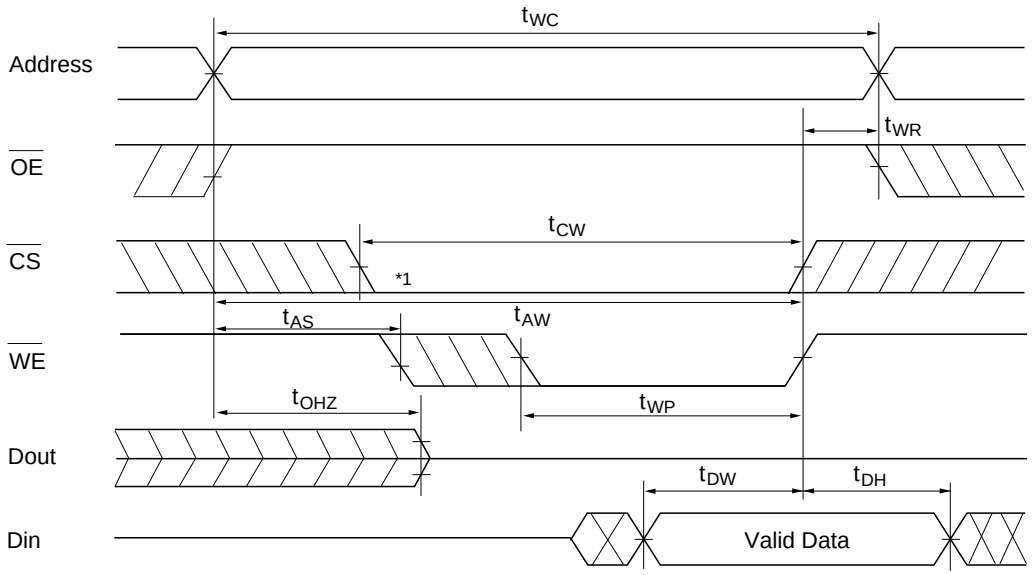
Notes: 1. Transition is measured ±200 mV from steady state voltage with Load (B). This parameter is sampled and not 100% tested.
2. Device is continuously selected, $\overline{CS}$ = V_{IL}.

Write Cycle

		HM624256A-20		HM624256A-25		HM624256A-35		
Parameter	**Symbol**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Unit**
Write cycle time	t_{WC}	20	—	25	—	35	—	ns
Chip selection to end of write	t_{CW}	15	—	17	—	25	—	ns
Address valid to end of write	t_{AW}	16	—	20	—	30	—	ns
Address setup time	t_{AS}	0	—	0	—	0	—	ns
Write pulse width	t_{WP}[*2]	15	—	17	—	25	—	ns
Write recovery time	t_{WR}[*3]	0	—	0	—	0	—	ns
Output disable to output in high-Z	t_{OHZ}[*4]	0	10	0	10	0	10	ns
Write to output in high-Z	t_{WHZ}[*4]	0	12	0	15	0	15	ns
Data to write time overlap	t_{DW}	12	—	15	—	20	—	ns
Data hold from write time	t_{DH}[*5]	0	—	0	—	0	—	ns
Output active from end of write	t_{OW}[*1]	0	—	0	—	0	—	ns

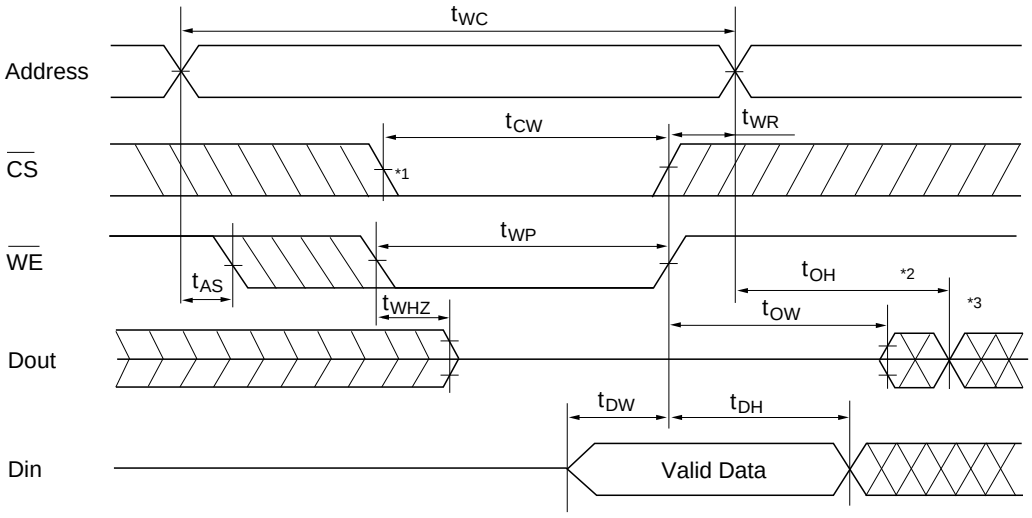
Notes: 1. Transition is measured ±200 mV from steady state voltage with Load (B). This parameter is sampled and not 100% tested.
2. A write occurs during the overlap (t_{WP}) of a low $\overline{CS}$ and a low $\overline{WE}$.
3. t_{WR} is measured from the earlier of $\overline{CS}$ or $\overline{WE}$ going high to the end of write cycle.
4. During this period, I/O pins are in the output state so that the input signals of opposite phase to the outputs must not be applied.
5. If $\overline{CS}$ is low during this period, I/O pins are in the output state. Then the data input signals of opposite phase to the outputs must not be applied to them.

Write Timing Waveform (1)



Notes: 1. If the $\overline{CS}$ low transition occurs simultaneously with the $\overline{WE}$ low transition or after the $\overline{WE}$ transition, output remain in a high impedance state.

Write Timing Waveform (2) ($\overline{OE}$ Low Fixed)



Notes: 1. If the $\overline{CS}$ low transition occurs simultaneously with the $\overline{WE}$ low transitions or after the $\overline{WE}$ transition, output remain in a high impedance state.
2. Dout is the same phase of write data of this write cycle.
3. Dout is the read data of next address.

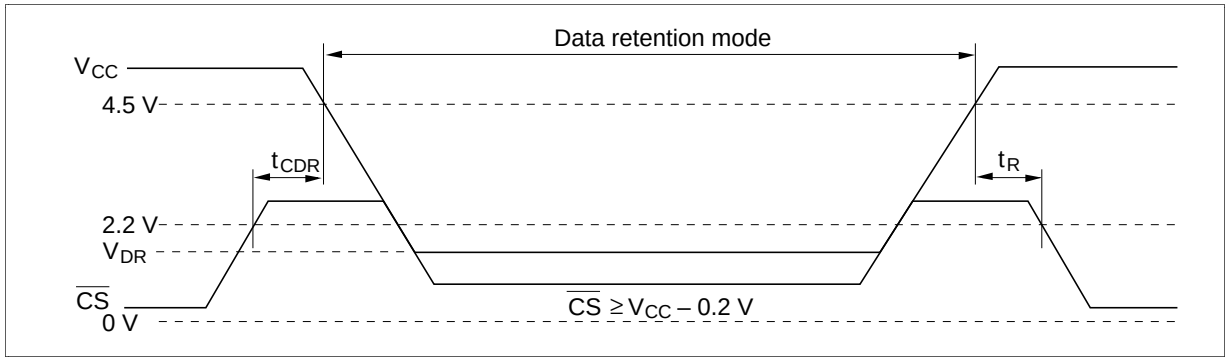
Low V_{CC} Date Retention Characteristics (Ta = 0 to +70°C)

This characteristics is guaranteed only for L-version.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
V_{CC} for data retention	V_{DR}	2.0	—	—	V	$\overline{CS} \geq V_{CC} - 0.2$ V, Vin $\geq V_{CC} - 0.2$ V or 0 V ≤ Vin ≤ 0.2 V
Data retention current	I_{CCDR}	—	2	50*1	µA	
Chip deselect to data retention time	t_{CDR}	0	—	—	ns	
Operation recovery time	t_R	5	—	—	ms	

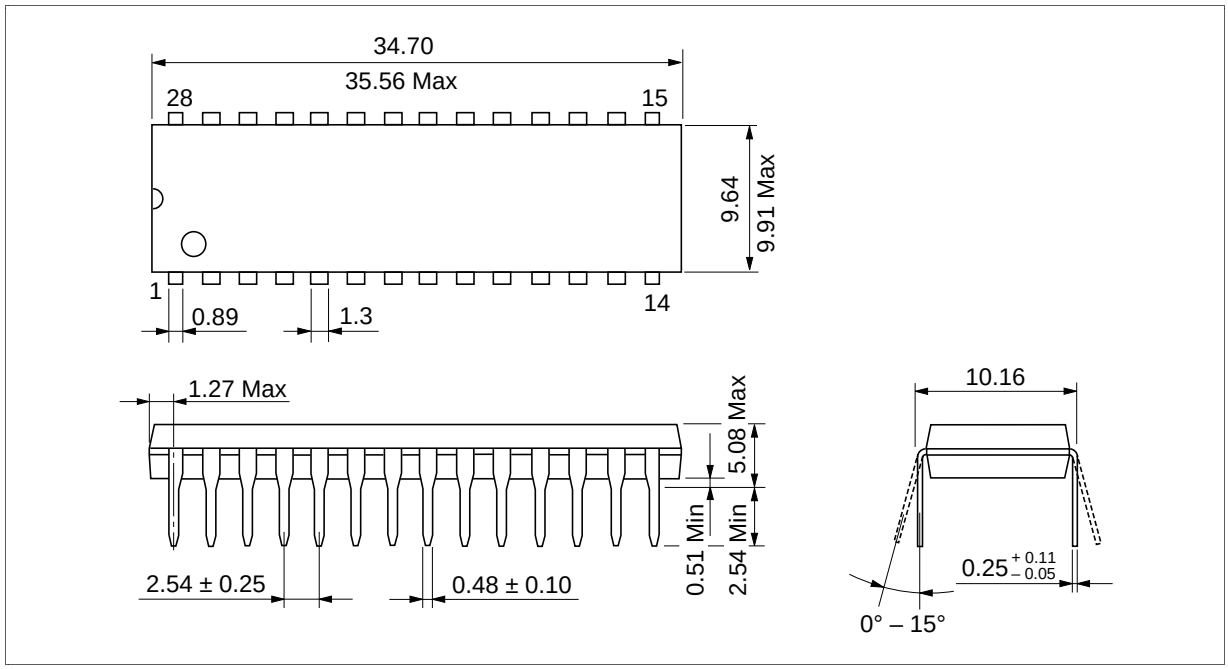
Note: 1. V_{CC} = 3.0 V

Low V_{CC} Data Retention Timing Waveform



Package Dimensions

HM624256AP/ALP Series (DP-28C) Unit: mm



HM624256AJP/ALJP Series (CP-28D) Unit: mm