NEC

MOS INTEGRATED CIRCUIT

μPD434008AL

4M-BIT CMOS FAST SRAM
512K-WORD BY 8-BIT

Description

The μPD434008AL is a high speed, low power, 4,194,304 bits (524,288 words by 8 bits) CMOS static RAM.

Operating supply voltage is 3.3 V ± 0.3 V.

The μPD434008AL is packaged in 36-pin plastic SOJ.

Features

- 524,288 words by 8 bits organization
- Fast access time : 15, 17, 20 ns (MAX.)
- Output Enable input for easy application
- Single +3.3 V power supply

Ordering Information

Part number	Package	Access time ns (MAX.)	Supply current mA (MAX.)	
			At operating	At standby
μPD434008ALLE-A15	36-pin plastic SOJ (10.16 mm (400))	15	150	5
μPD434008ALLE-A17		17	140	
μPD434008ALLE-A20		20	130	

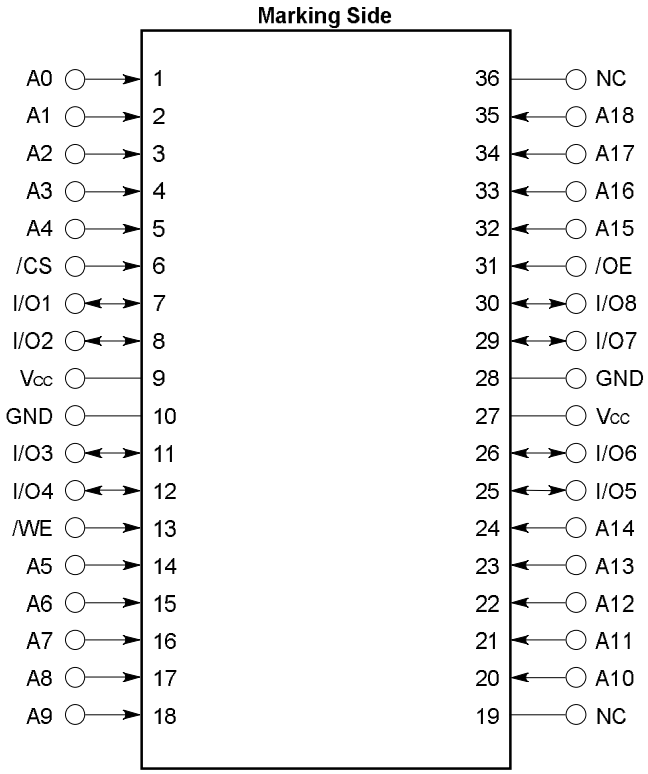
Document No. M12227EJ6V0DS00 (6th edition)
Date Published October 2002 NS CP(K)
Printed in Japan

The mark ★ shows major revised points.

Pin Configuration

/xxx indicates active low signal.

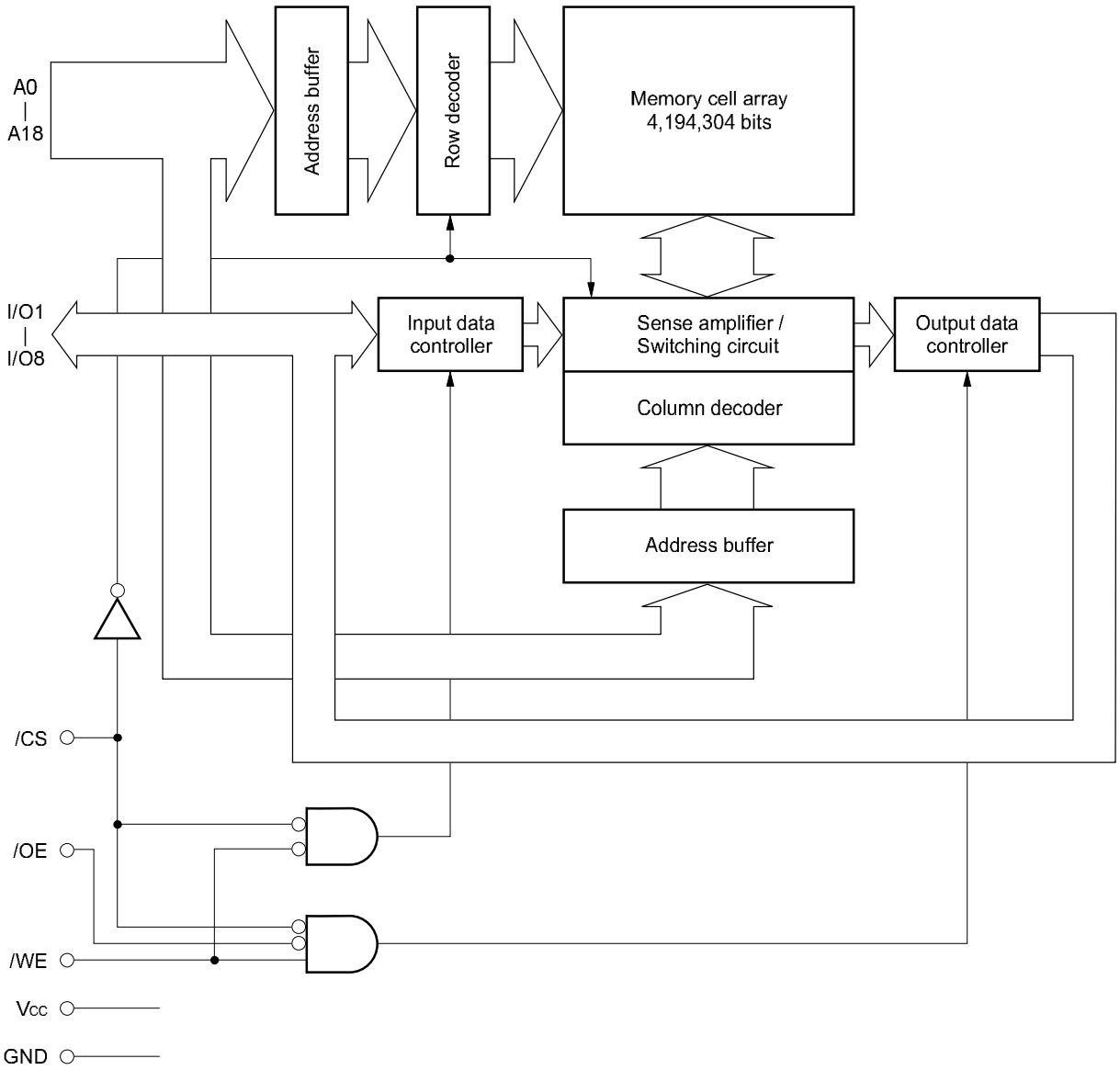
36-pin plastic SOJ (10.16 mm (400))



A0 to A18	:	Address Inputs
I/O1 to I/O8	:	Data Inputs / Outputs
/CS	:	Chip Select
/WE	:	Write Enable
/OE	:	Output Enable
Vcc	:	Power supply
GND	:	Ground
NC	:	No connection

Remark Refer to **Package Drawing** for the 1-pin index mark.

Block Diagram



Truth Table

/CS	/OE	/WE	Mode	I/O	Supply current
H	×	×	Not selected	High-Z	I_{SB}
L	L	H	Read	D_{OUT}	I_{CC}
L	×	L	Write	D_{IN}	
L	H	H	Output disable	High-Z	

Remark × : Don't care

Electrical Specifications

Absolute Maximum Ratings

Parameter	Symbol	Condition	Rating	Unit
Supply voltage	V_{CC}		–0.5 Note to +4.6	V
Input / Output voltage	V_T		–0.5 Note to +4.6	V
Operating ambient temperature	T_A		0 to 70	°C
Storage temperature	T_{stg}		–55 to +125	°C

Note –2.0 V (MIN.) (pulse width : 2 ns)

Caution Exposing the device to stress above those listed in Absolute Maximum Rating could cause permanent damage. The device is not meant to be operated under conditions outside the limits described in the operational section of this specification. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Supply voltage	V_{CC}		3.0	3.3	3.6	V
High level input voltage	V_{IH}		2.2		V_{CC}+0.3	V
Low level input voltage	V_{IL}		–0.3 Note		+0.8	V
Operating ambient temperature	T_A		0		70	°C

Note –2.0 V (MIN.) (pulse width : 2 ns)

DC Characteristics (Recommended Operating Conditions Unless Otherwise Noted)

Parameter	Symbol	Test condition		MIN.	TYP.	MAX.	Unit
Input leakage current	I_{LI}	V_{IN} = 0 V to V_{CC}		–2		+2	μA
Output leakage current	I_{LO}	$V_{I/O}$ = 0 V to V_{CC}, /CS = V_{IH} or /OE = V_{IH} or /WE = V_{IL}		–2		+2	μA
Operating supply current	I_{CC}	/CS = V_{IL},	Cycle time : 15 ns			150	mA
		$I_{I/O}$ = 0 mA,	Cycle time : 17 ns			140	
		Minimum cycle time	Cycle time : 20 ns			130	
Standby supply current	I_{SB}	/CS = V_{IH}, V_{IN} = V_{IH} or V_{IL}				50	mA
	I_{SB1}	/CS ≥ V_{CC} – 0.2 V, V_{IN} ≤ 0.2 V or V_{IN} ≥ V_{CC} – 0.2 V				5	
High level output voltage	V_{OH}	I_{OH} = –4.0 mA		2.4			V
Low level output voltage	V_{OL}	I_{OL} = +8.0 mA				0.4	V

Remark V_{IN} : Input voltage

$V_{I/O}$: Input / Output voltage

Capacitance (T_A = 25 °C, f = 1 MHz)

Parameter	Symbol	Test condition	MIN.	TYP.	MAX.	Unit
Input capacitance	C_{IN}	V_{IN} = 0 V			6	pF
Input / Output capacitance	$C_{I/O}$	$V_{I/O}$ = 0 V			10	pF

Remarks 1. V_{IN} : Input voltage

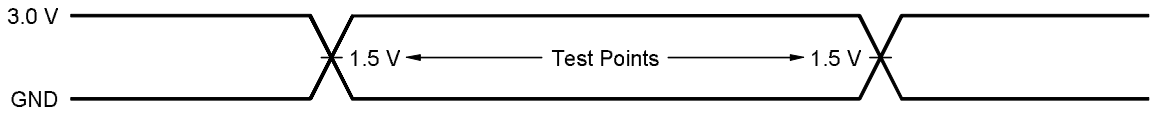
$V_{I/O}$: Input / Output voltage

2. These parameters are periodically sampled and not 100% tested.

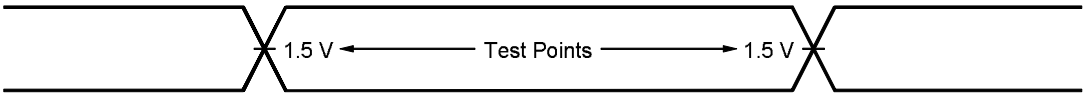
AC Characteristics (Recommended Operating Conditions Unless Otherwise Noted)

AC Test Conditions

Input Waveform (Rise and Fall Time ≤ 3 ns)



Output Waveform



Output Load

AC characteristics directed with the note should be measured with the output load shown in **Figure 1** or **Figure 2**.

Figure 1

(for t_{AA}, t_{ACS}, t_{OE}, t_{OH})

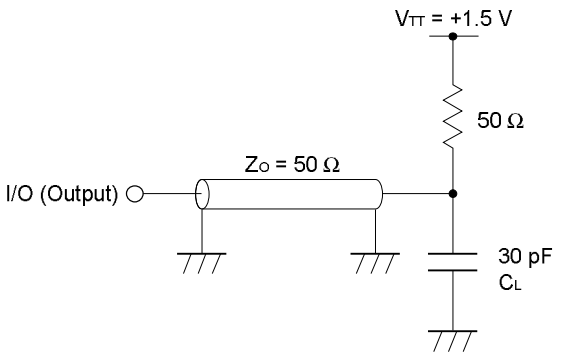
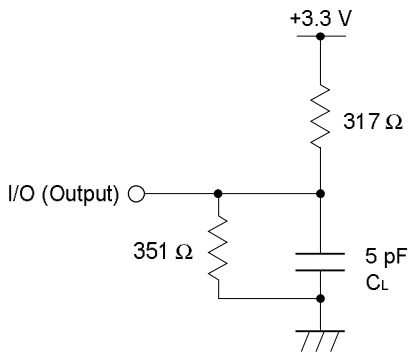


Figure 2

(for t_{CLZ}, t_{OLZ}, t_{CHZ}, t_{OHZ}, t_{WHZ}, t_{OW})



Remark C_L includes capacitances of the probe and jig, and stray capacitances.

Read Cycle

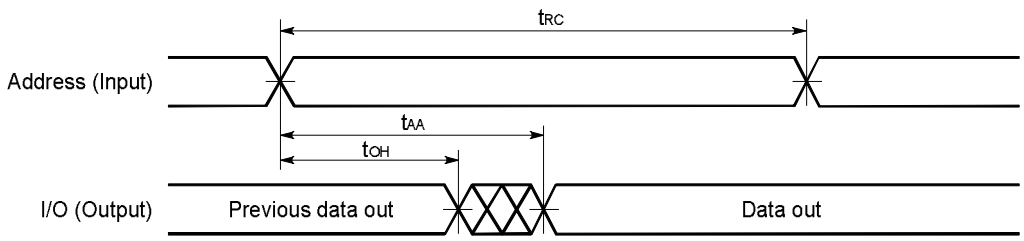
Parameter	Symbol	-A15		-A17		-A20		Unit	Notes
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
Read cycle time	t_{RC}	15		17		20		ns	
Address access time	t_{AA}		15		17		20	ns	1
/CS access time	t_{ACS}		15		17		20	ns	
/OE access time	t_{OE}		7		8		10	ns	
Output hold from address change	t_{OH}	3		3		3		ns	
/CS to output in low impedance	t_{CLZ}	3		3		3		ns	2, 3
/OE to output in low impedance	t_{OLZ}	0		0		0		ns	
/CS to output in high impedance	t_{CHZ}		7		8		8	ns	
/OE to output hold in high impedance	t_{OHZ}		7		8		8	ns	

Notes 1. See the output load shown in **Figure 1**.

2. Transition is measured at ± 200 mV from steady-state voltage with the output load shown in **Figure 2**.

3. These parameters are periodically sampled and not 100% tested.

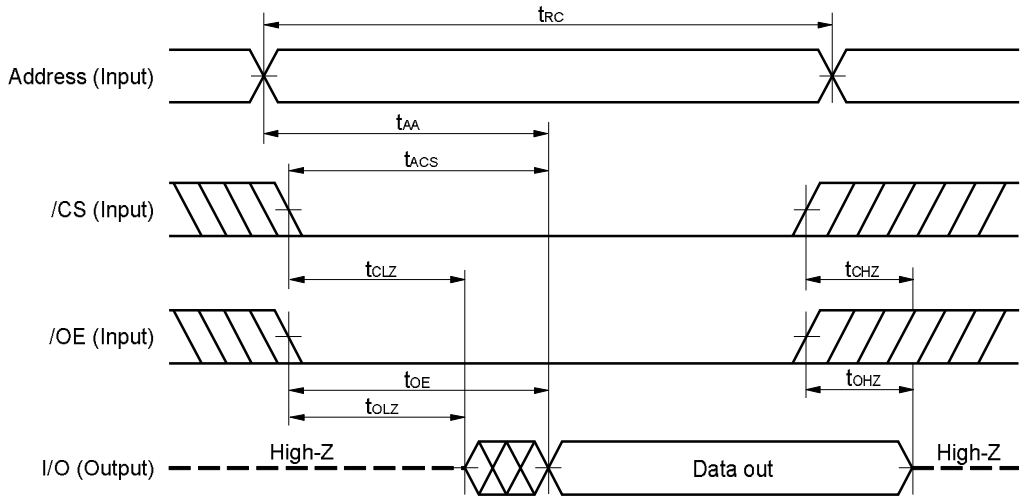
Read Cycle Timing Chart 1 (Address Access)



Remarks 1. In read cycle, /WE should be fixed to high level.

2. /CS = /OE = V_{IL}

Read Cycle Timing Chart 2 (/CS Access)



Caution Address valid prior to or coincident with /CS low level input.

Remark In read cycle, /WE should be fixed to high level.

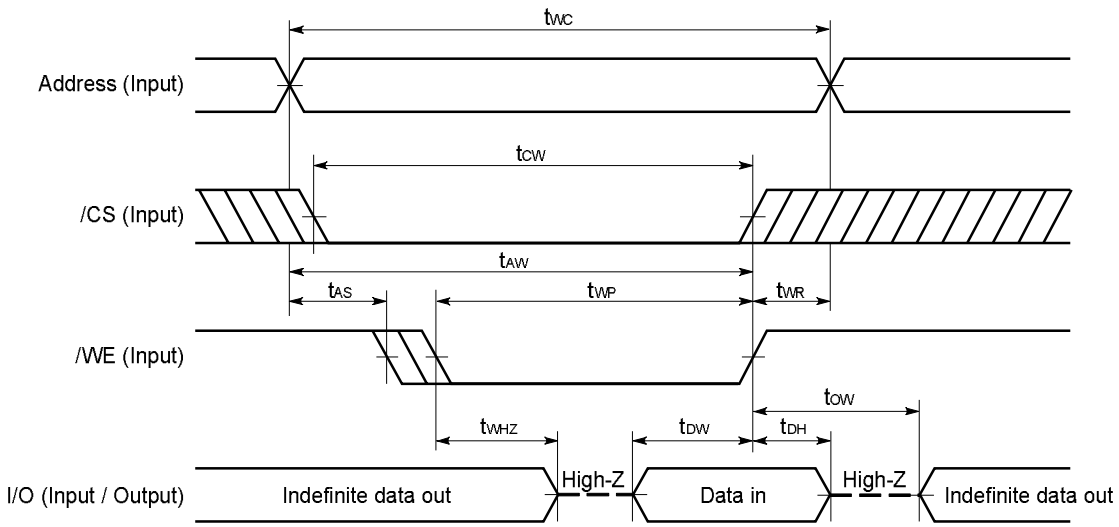
Write Cycle

Parameter	Symbol	-A15		-A17		-A20		Unit	Notes
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
Write cycle time	t_{WC}	15		17		20		ns	
/CS to end of write	t_{CW}	10		11		12		ns	
Address valid to end of write	t_{AW}	10		11		12		ns	
Write pulse width	t_{WP}	10		11		12		ns	
Data valid to end of write	t_{DW}	7		8		9		ns	
Data hold time	t_{DH}	0		0		0		ns	
Address setup time	t_{AS}	0		0		0		ns	
Write recovery time	t_{WR}	1		1		1		ns	
/WE to output in high impedance	t_{WHZ}		7		8		8	ns	1, 2
Output active from end of write	t_{OW}	3		3		3		ns	

Notes 1. Transition is measured at ±200 mV from steady-state voltage with the output load shown in **Figure 2**.

2. These parameters are periodically sampled and not 100% tested.

Write Cycle Timing Chart 1 (/WE Controlled)



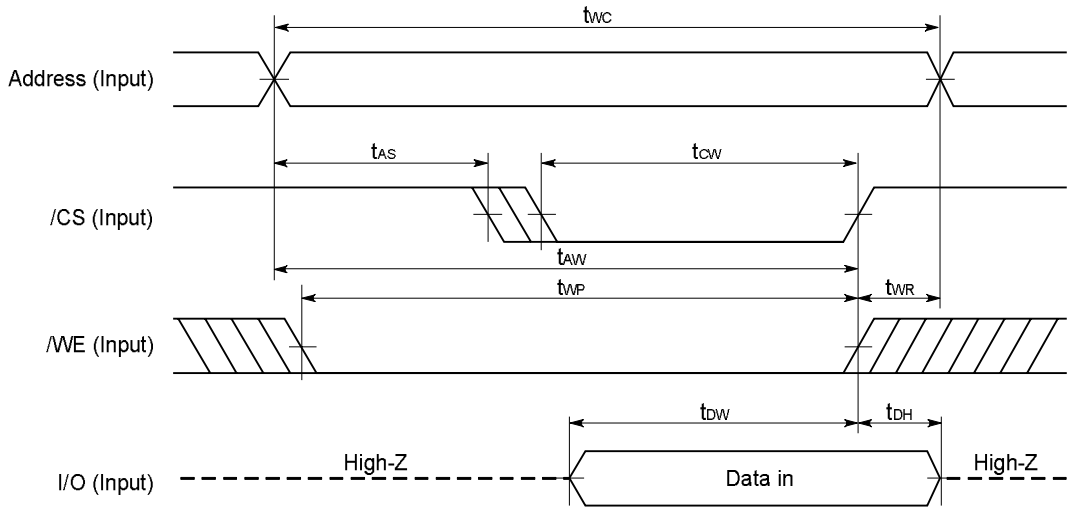
Caution /CS or /WE should be fixed to high level during address transition.

Remarks 1. Write operation is done during the overlap time of a low level /CS and a low level /WE.

2. During t_{WHZ}, I/O pins are in the output state, therefore the input signals must not be applied to the output.

3. When /WE is at low level, the I/O pins are always high impedance. When /WE is at high level, read operation is executed. Therefore /OE should be at high level to make the I/O pins high impedance.

Write Cycle Timing Chart 2 (/CS Controlled)

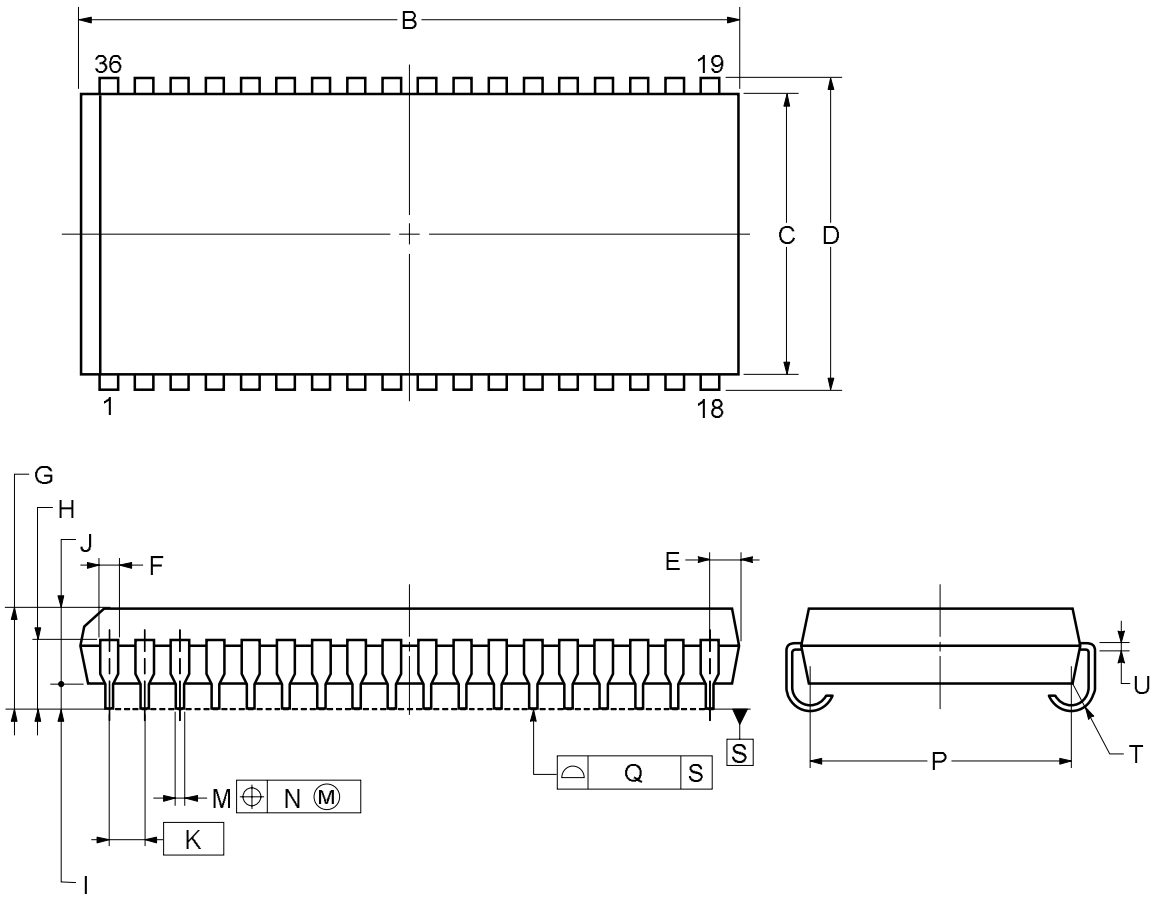


Caution /CS or /WE should be fixed to high level during address transition.

Remark Write operation is done during the overlap time of a low level /CS and a low level /WE.

Package Drawing

36-PIN PLASTIC SOJ (10.16mm (400))



NOTE

Each lead centerline is located within 0.12 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
B	23.6±0.20
C	10.16±0.1
D	11.18±0.2
E	1.005±0.1
F	0.74
G	3.5±0.2
H	2.545±0.2
I	0.8 MIN.
J	2.6
K	1.27 (T.P.)
M	$0.42^{+0.08}_{-0.07}$
N	0.12
P	9.4±0.20
Q	0.1
T	R 0.85
U	$0.22^{+0.08}_{-0.07}$

P36LE-400A-2

Recommended Soldering Conditions

Please consult with our sales offices for soldering conditions of the μPD434008AL.

Type of Surface Mount Device

μPD434008ALLE : 36-pin plastic SOJ (10.16 mm (400))

Revision History

Edition/ Date	Page		Type of revision	Location	Description (Previous edition → This edition)
	This edition	Previous edition			
6th edition/ Oct. 2002	p.15	p.15	Modification	NOTES FOR CMOS DEVICES	②HANDLING OF UNUSED INPUT PINS FOR CMOS

[MEMO]

NOTES FOR CMOS DEVICES

① PRECAUTION AGAINST ESD FOR SEMICONDUCTORS

Note:

Strong electric field, when exposed to a MOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred. Environmental control must be adequate. When it is dry, humidifier should be used. It is recommended to avoid using insulators that easily build static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work bench and floor should be grounded. The operator should be grounded using wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions need to be taken for PW boards with semiconductor devices on it.

★ ### ② HANDLING OF THE APPLIED WAVEFORM OF INPUT PINS AND THE UNUSED INPUT PINS FOR CMOS

Note:

Input levels of CMOS devices must be fixed. CMOS devices behave differently than Bipolar or NMOS devices. For CMOS devices, through-current may flow inside and cause malfunction if a middle-level input due to noise etc. is applied to an input pin. Therefore, when the input waveform is fixed, and also when the waveform changes, it is recommended to use the CMOS device under AC test conditions. For unused input pins in particular, CMOS devices should not be operated in a state where nothing is connected, so input levels of CMOS devices must be fixed to high or low by using pull-up or pull-down circuitry. Each unused pin should be connected to V_{DD} or GND with a resistor, if it is considered to have a possibility of being an output pin. All handling related to the unused pins must be judged device by device and related specifications governing the devices.

③ STATUS BEFORE INITIALIZATION OF MOS DEVICES

Note:

Power-on does not necessarily define initial status of MOS device. Production process of MOS does not define the initial operation status of the device. Immediately after the power source is turned ON, the devices with reset function have not yet been initialized. Hence, power-on does not guarantee out-pin levels, I/O settings or contents of registers. Device is not initialized until the reset signal is received. Reset operation must be executed immediately after power-on for devices having reset function.

- **The information in this document is current as of October, 2002. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
- NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
- NEC semiconductor products are classified into the following three quality grades:
  "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product before using it in a particular application.

  "Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

  "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

  "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

  The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.

  (Note)

  (1) "NEC" as used in this statement means NEC Corporation and also includes its majority-owned subsidiaries.

  (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00. 4