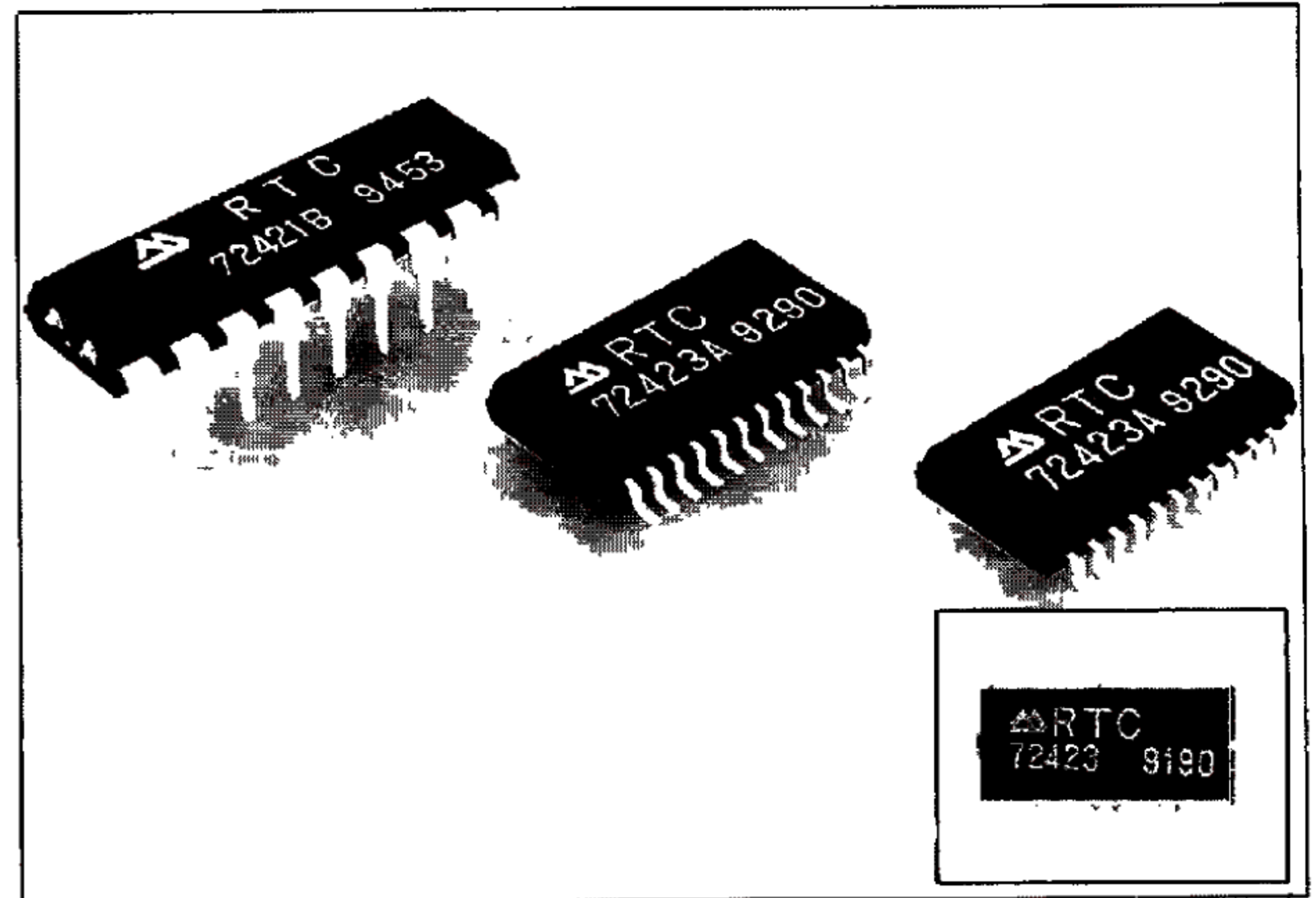


4-bit REAL TIME CLOCK MODULE

RTC-72421/72423

- The built-in quartz crystal makes regulation unnecessary and allows for easy design
- Direct bus-compatibility (120 ns. access time)
- ALE INPUT terminal available for 8048, 8051, and 8085 series
- Incorporates built-in Time (hour, minute, second), and Date (year, month, week, day) counters
- 12H/24H clock switchover function and automatic leap year setting
- Interrupt masking
- 30 seconds error adjustment function
- READ, WRITE, HOLD, STOP, RESET, and CHIP SELECT INPUTS
- Low current consumption and features a backup function



Specifications (characteristics)

Absolute Maximum Rating

Item	Symbol	Condition	Specifications	Unit
Power source voltage	V_{DD}	$T_a = 25^\circ\text{C}$	-0.3 to 7.0	V
Input and output voltage	$V_{I/O}$	$T_a = 25^\circ\text{C}$	GND -0.3 to $V_{DD} + 0.3$	V
Storage temperature	T_{STG}	RTC-72421	-55 to +85	$^\circ\text{C}$
		RTC-72423	-55 to +125	
Soldering condition	T_{SOL}	RTC-72421	Under 260°C within 10 sec (lead part) (package should be less than 150°C)	
		RTC-72423	Under 260°C within 10 sec × up to 2 times or under 230°C within 3 min	

Operating Range

Item	Symbol	Condition	Specifications	Unit
Operating voltage	V_{DD}		4.5 to 5.5	V
Operating temperature	T_{OPR}	RTC-72421	-10 to 70	$^\circ\text{C}$
		RTC-72423	-40 to 85	
Data holding voltage	V_{DH}		2.0 to 5.5	V
CSI data holding time	t_{CDR}	Refer to the data holding timing	2.0 MIN.	μs
Operation restoring time	t_R	Refer to the data holding timing	2.0 MIN.	μs

Frequency characteristics and current consumption characteristics

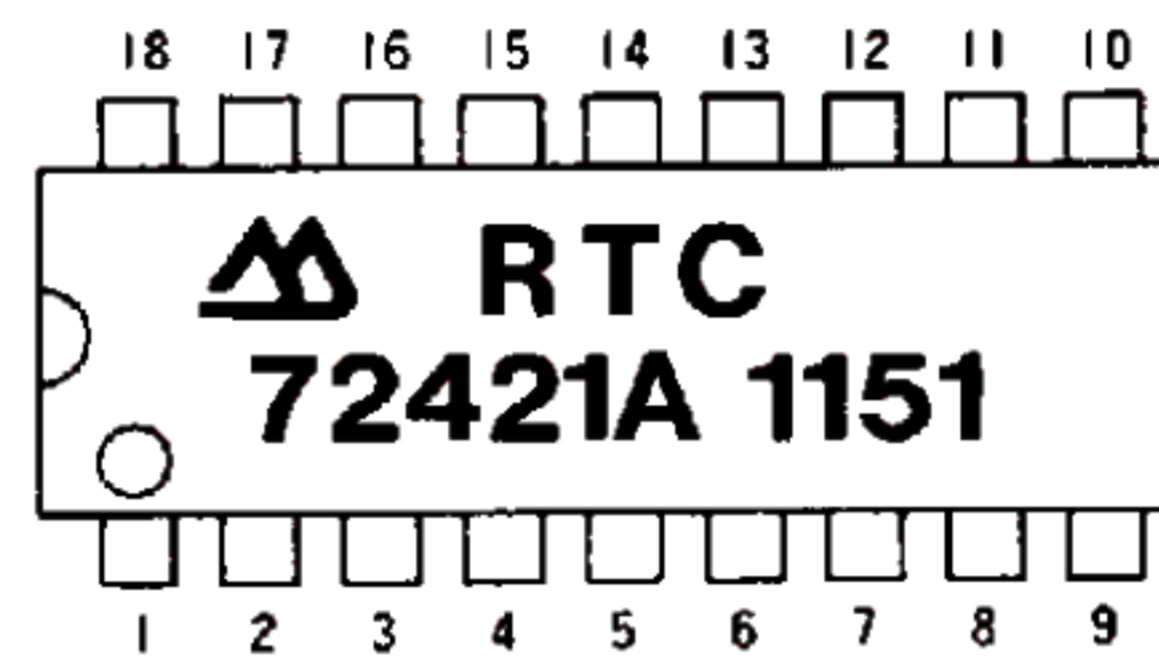
Item	Symbol	Condition	Specifications	Unit	
Frequency tolerance	$\Delta f/f_0$	$T_a = 25^\circ\text{C}$ $V_{DD} = 5\text{V}$	72421A	± 10	ppm
			72421B	± 50	
			72423A	± 20	
			72423	± 50	
Frequency temperature characteristics		-10 to +70°C (25°C reference temperature)	+10/-120		
Aging	f_a	$V_{DD} = 5\text{V}$, $T_a = 25^\circ\text{C}$, first year	± 5 MAX.	ppm/Y	
Shock resistance	S. R.	Drop test of 3 times on a hard board from 75cm height or 3000G × 0.3ms × 1/2 sine wave × 3 directions	± 10 MAX.	ppm	
Current consumption	I_{DD1}	$CS_1 = 0\text{V}$ $V_{DD} = 5\text{V}$	10 MAX.	μA	
	I_{DD2}	Exclude input/output current $V_{DD} = 2\text{V}$	5 MAX.		

Electrical Characteristics

Item	Symbol	Condition	MIN	TYP	MAX	Unit	Applicable terminal
"H" input voltage (1)	V_{IH1}		2.2	-	-	V	All inputs other than CS_1
"L" input voltage (1)	V_{IL1}		-	-	0.8	V	All inputs other than CS_1
Input leak current (1)	I_{LK1}	$V_1 = V_{DD}/OV$	-	-	± 1	μA	Input other than D_0 to D_3
Input leak current (2)	I_{LK2}		D_0 to D_3				
"L" output voltage (1)	V_{OL1}	$I_{OL} = 2.5\text{mA}$	-	-	0.4	V	D_0 to D_3
"H" output voltage	V_{OH}	$I_{OH} = -400\mu\text{A}$	2.4	-	-	V	D_0 to D_3
"L" output voltage (2)	V_{OL2}	$I_{OL} = 2.5\text{mA}$	-	-	0.4	V	STD.P
OFF leak current	I_{OFFLK}	$V_1 = V_{DD}/OV$	-	-	10	μA	
Input capacity	C_1	Input frequency 1MHz	-	10	-	pF	Input other than D_0 to D_3
			-	20	-		D_0 to D_3
"H" input voltage (2)	V_{IH2}	$V_{DD} = 2$ to 5.5V	$4/5V_{DD}$	-	-	V	CS_1
"L" input voltage (2)	V_{IL2}		-	-	$1/5V_{DD}$		

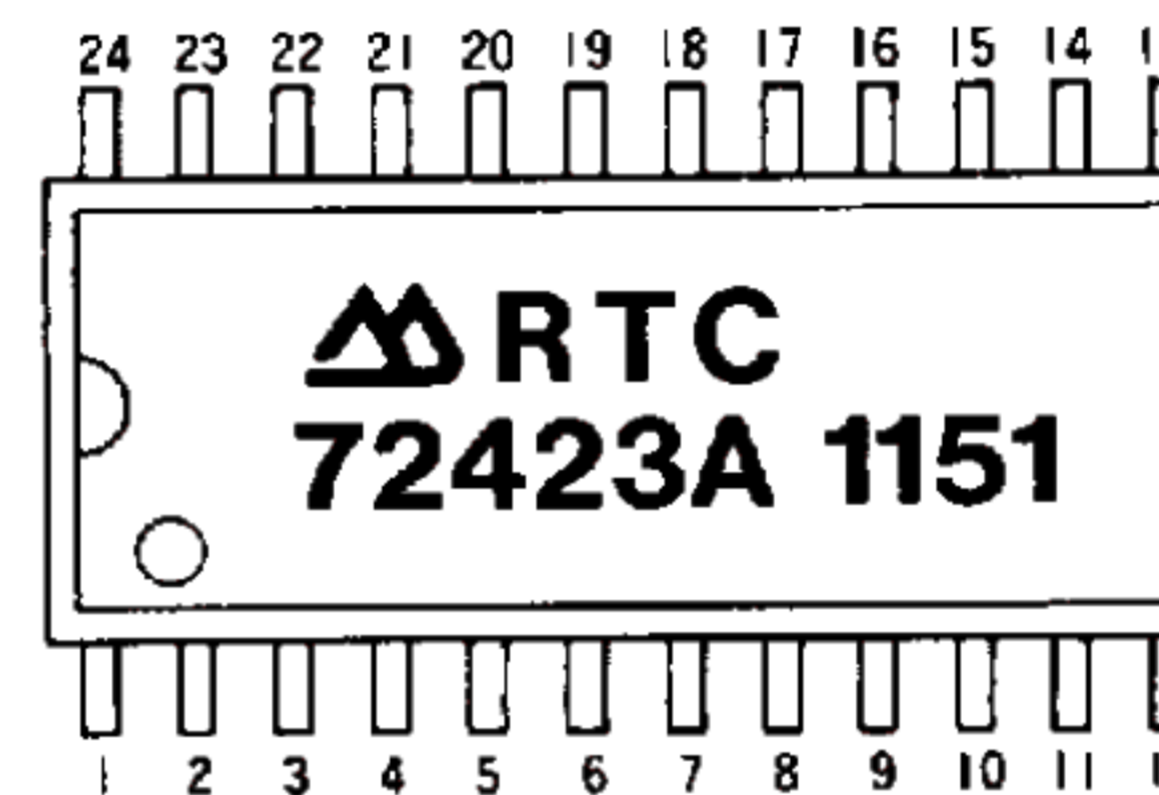
Terminal Connection

RTC-72421



1 STD P	18 V_{DD}
2 CS_0	17 (V_{DD})
3 ALE	16 (V_{DD})
4 A_0	15 CS_1
5 A_1	14 D_0
6 A_2	13 D_1
7 A_3	12 D_2
8 \overline{RD}	11 D_3
9 GND	10 WR

RTC-72423



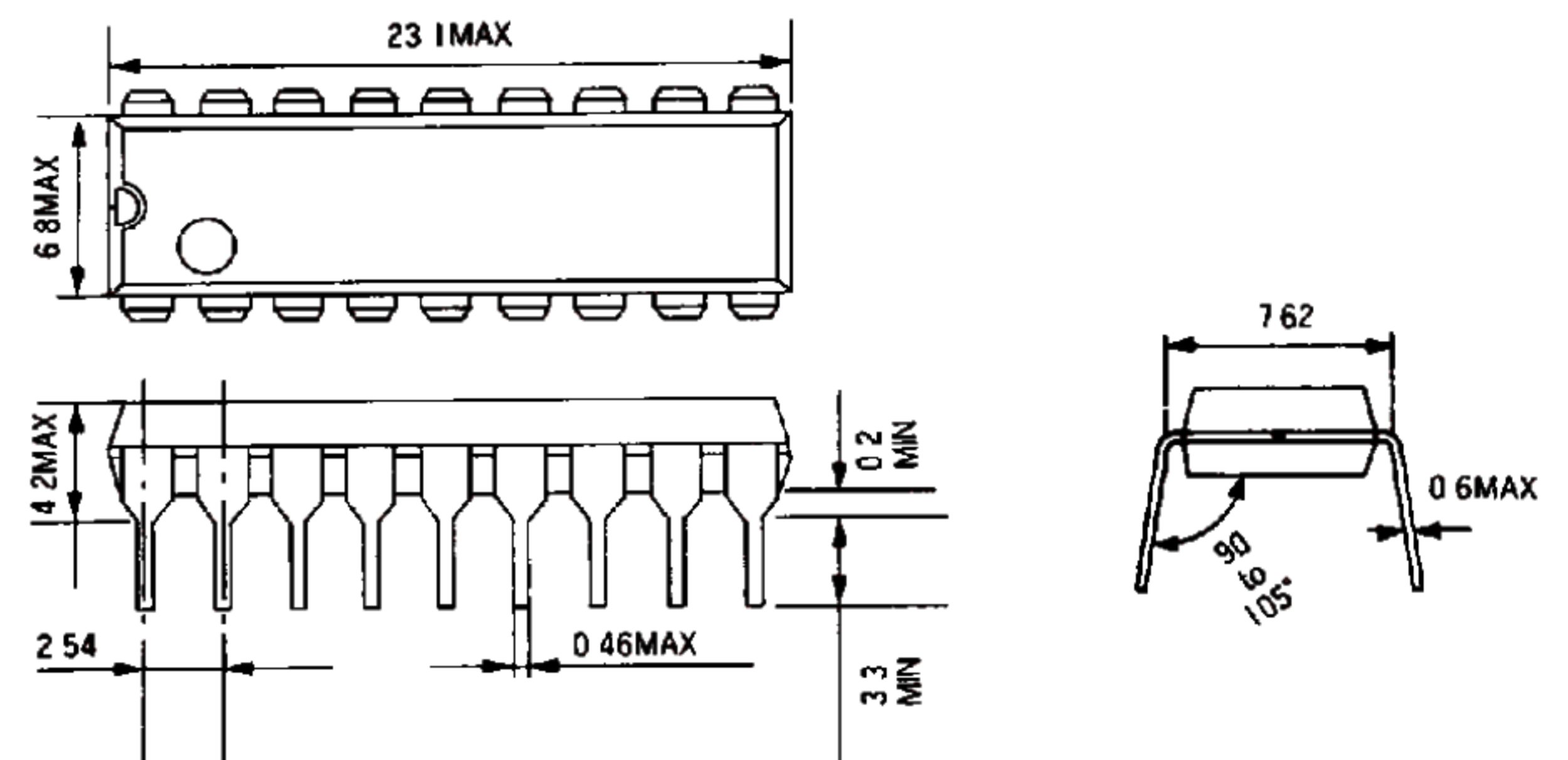
1 STD P	24 V_{DD}
2 CS_0	23 (V_{DD})
3 NC	22 (V_{DD})
4 ALE	21 NC
5 A_0	20 CS_1
6 NC	19 D_0
7 A_1	18 NC
8 NC	17 NC
9 A_2	16 D_1
10 A_3	15 D_2
11 \overline{RD}	14 D_3
12 GND	13 WR

- (V_{DD}) is to be same level of voltage as of V_{DD} . Do not connect it to any external terminals
- NC is not connected internally

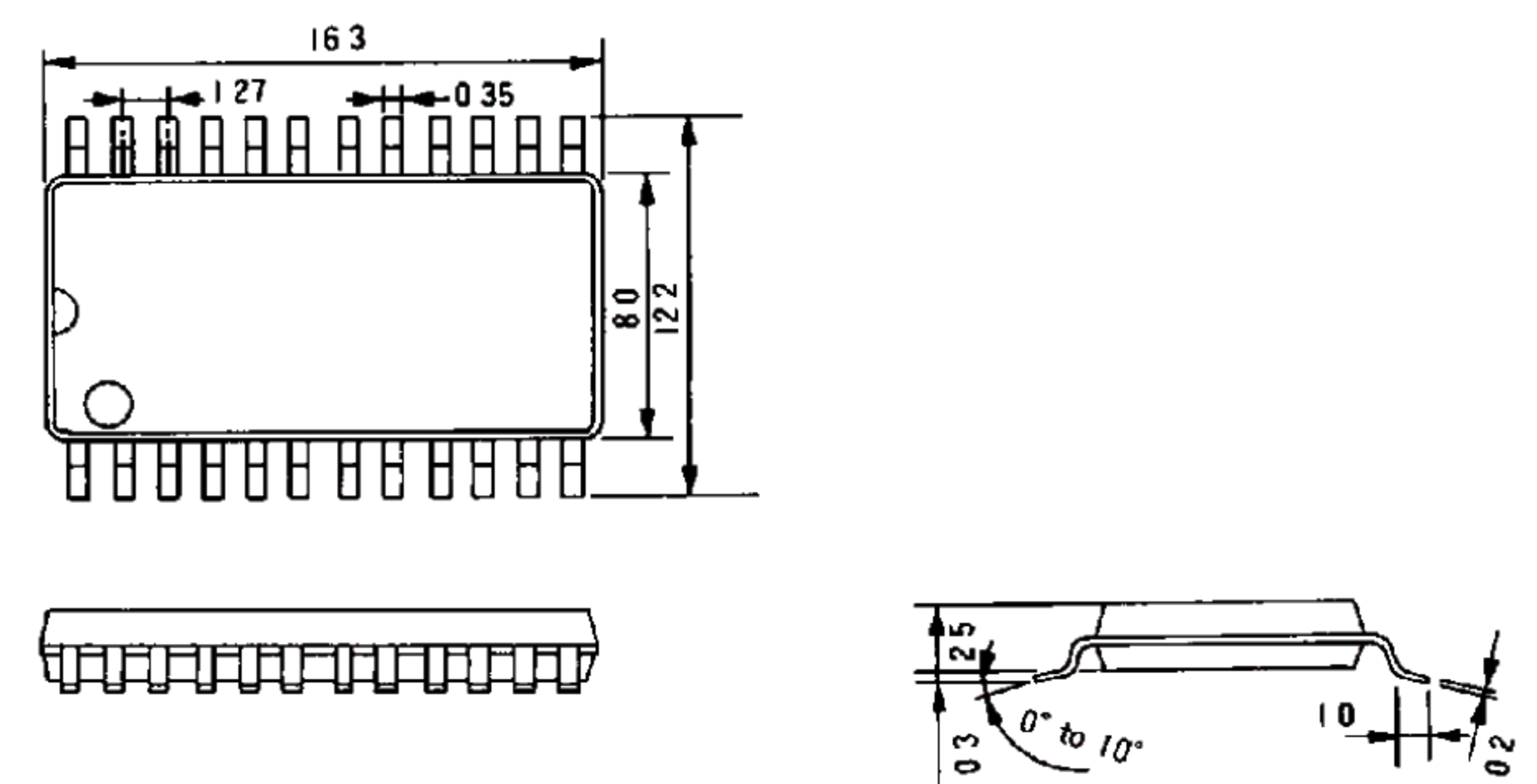
External Dimensions

(Unit: mm)

RTC-72421



RTC-72423



Function Table

Address	A ₃	A ₂	A ₁	A ₀	Register	Data				Count Value	Remarks
						D ₃	D ₂	D ₁	D ₀		
0	0	0	0	0	S ₁	S ₈	S ₄	S ₂	S ₁	0 to 9	1-second digit register
1	0	0	0	1	S ₁₀	*	S ₄₀	S ₂₀	S ₁₀	0 to 5	10-second digit register
2	0	0	1	0	M ₁	m ₈	m ₄	m ₂	m ₁	0 to 9	1-minute digit register
3	0	0	1	1	M ₁₀	*	m ₄₀	m ₂₀	m ₁₀	0 to 5	10-minute digit register
4	0	1	0	0	H ₁	h ₈	h ₄	h ₂	h ₁	0 to 9	1-hour digit register
5	0	1	0	1	H ₁₀	*	PM/AM	h ₂₀	h ₁₀	0 to 2 or 0 to 1	PM/AM, 10-hour digit register
6	0	1	1	0	D ₁	d ₈	d ₄	d ₂	d ₁	0 to 9	1-day digit register
7	0	1	1	1	D ₁₀	*	*	d ₂₀	d ₁₀	0 to 3	10-day digit register
8	1	0	0	0	MO ₁	mo ₈	mo ₄	mo ₂	mo ₁	0 to 9	1-month digit register
9	1	0	0	1	MO ₁₀	*	*	*	mo ₁₀	0 to 1	10-month digit register
A	1	0	1	0	Y ₁	y ₈	y ₄	y ₂	y ₁	0 to 9	1-year digit register
B	1	0	1	1	Y ₁₀	y ₈₀	y ₄₀	y ₂₀	y ₁₀	0 to 9	10-year digit register
C	1	1	0	0	W	*	w ₄	w ₂	w ₁	0 to 6	Week register
D	1	1	0	1	Reg D	30sec ADJ	IRQ FLAG	BUSY	HOLD	—	Control Register D
E	1	1	1	0	Reg E	t ₁	t ₀	ITRPT /STND	MASK	—	Control Register E
F	1	1	1	1	Reg F	TEST	24/12	STOP	REST	—	Control Register F

* 0 = "L" level, 1 = "H" level, REST = RESET ITRPT/STND = INTERRUPT/STANDARD

- 1) Bit * does not exist
- 2) Please mask AM/PM bit with 10's of hours operations.
- 3) Busy is read only. IRQ can only be set low ("0")

4)

Data Bit	PM/AM	ITRPT/STND	24/12
1	PM	ITRPT	24
0	AM	STND	12

- 5) TEST bit should be "0".

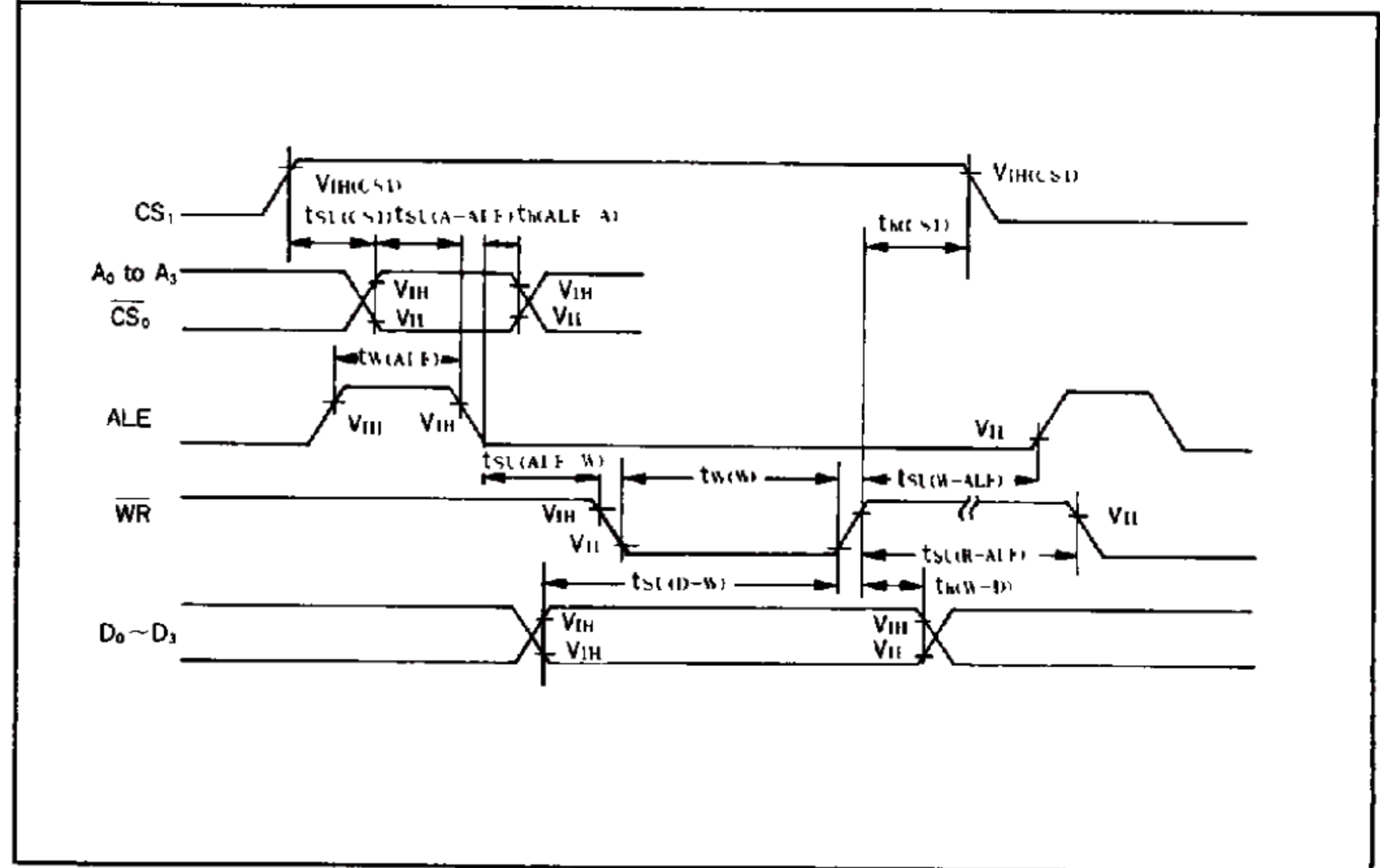
Switching Characteristics (with ALE)

(Please connect ALE to V_{DD} if the microprocessor does not have an ALE OUTPUT)

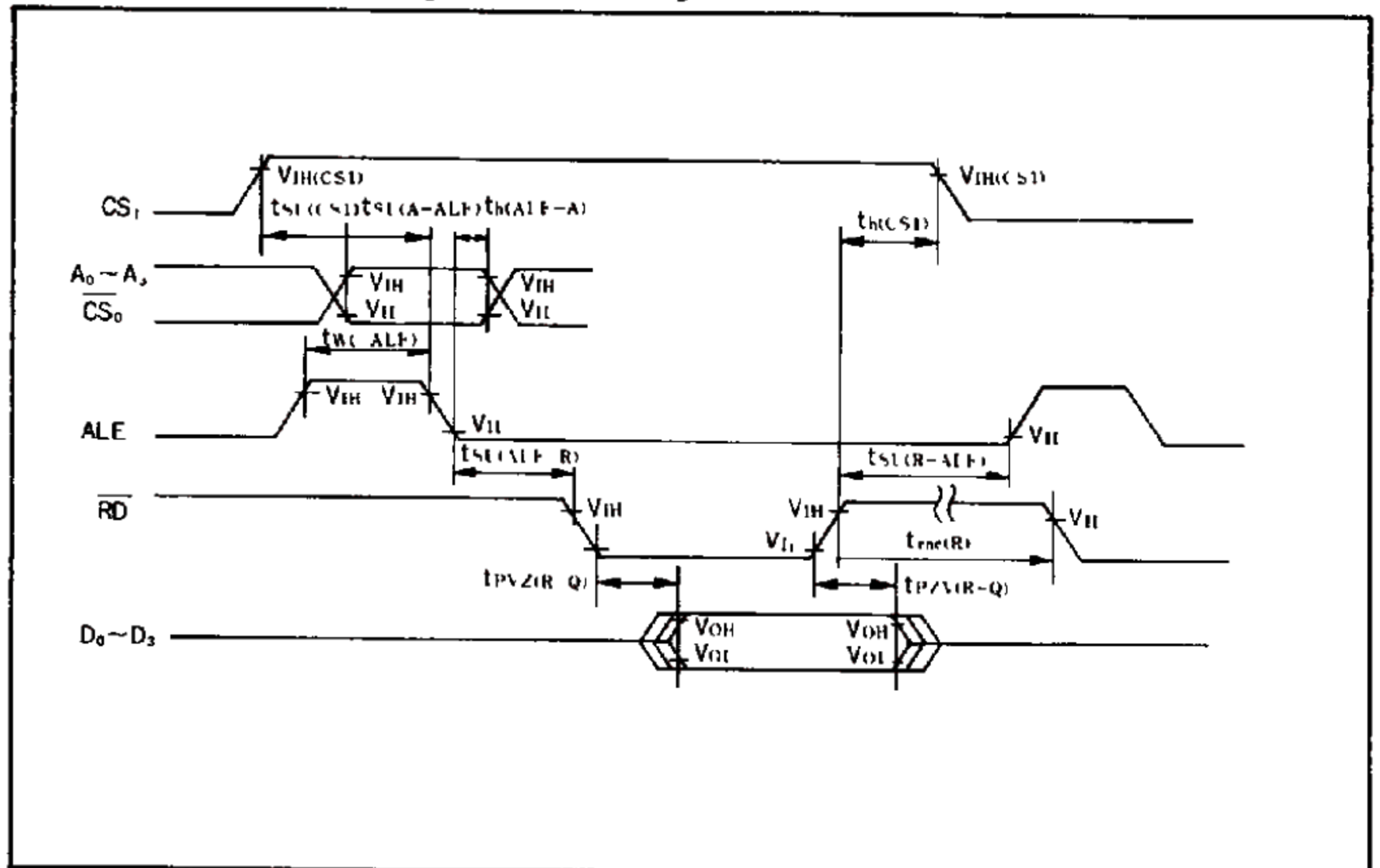
Item	Symbol	Condition	MIN	MAX	Unit
CS ₁ Set up Time	t _{SU(CS1)}		1000	—	ns
Address Set up Time Before ALE	t _{SU(A-ALE)}		50	—	
Address HOLD Time After ALE	t _{H(ALE-V)}		50	—	
ALE Pulse Width	t _{W(ALE)}		80	—	
ALE Set up Time Before WRITE	t _{SU(ALE-W)}		0	—	
ALE Set up Time Before READ	t _{SU(ALE-R)}		0	—	
ALE Set up Time After WRITE	t _{SU(W-ALE)}		50	—	
ALE Set up Time After READ	t _{SU(R-ALE)}		50	—	
WRITE Pulse Width	t _{W(W)}		120	—	
DATA delay Time After READ	t _{PVZ(R-Q)}	CL=150pF	—	120	
DATA Hold Time After READ	t _{PVZ(R-Q)}		0	70	
DATA Set up Time Before WRITE	t _{SU(D-W)}		80	—	
DATA Hold Time After WRITE	t _{H(W-D)}		10	—	
CS ₁ Hold Time	t _{H(CS1)}		1000	—	
READ/WRITE Recovery Time	t _{TR(R-W)}		200	—	

(V_{DD} = 5V ± 0.5V)

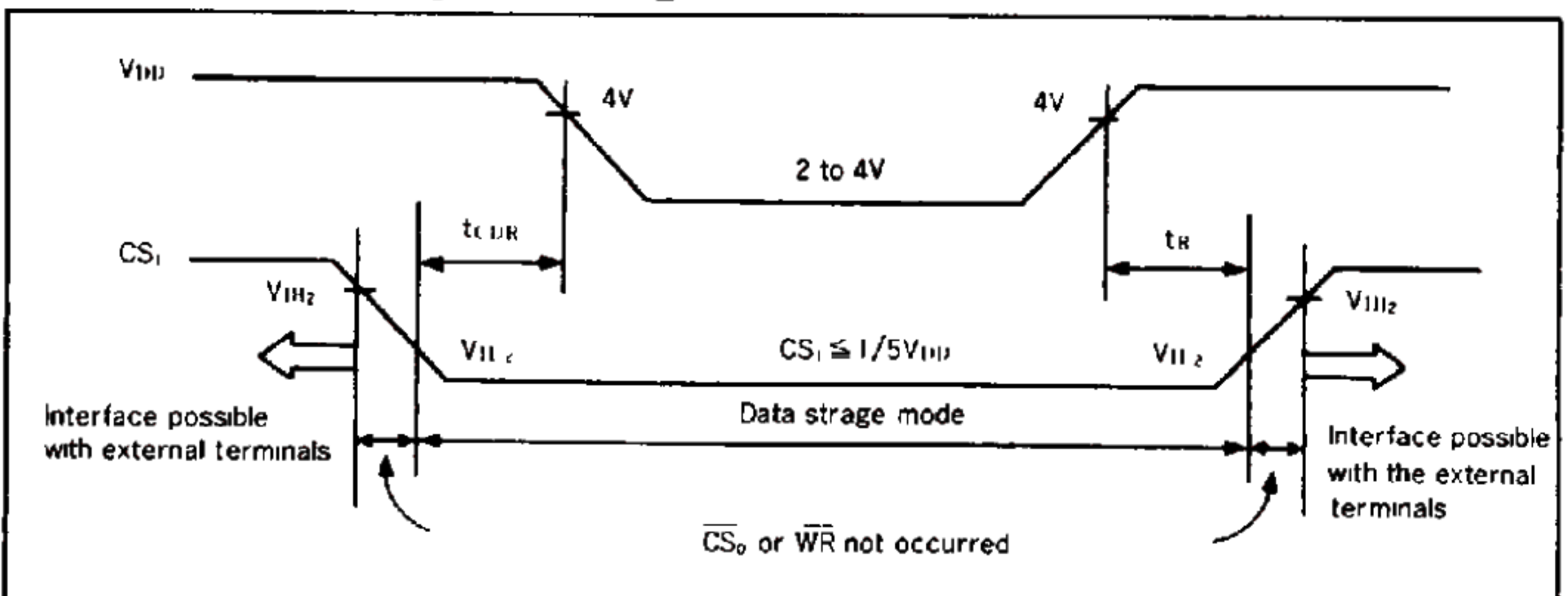
WRITE mode (with ALE)



READ mode (with ALE)



Data Holding Timing



Block Diagram

