

NEC

NEC Electronics Inc.

μ PD424263A/L, 42S4263A/L
262,144 x 16-Bit
Dynamic CMOS RAM

Description

The μ PD424263A/L and μ PD42S4263A/L are fast-page dynamic RAMs with the write-per-bit option, organized as 262,144 words by 16 bits, and designed to operate from a single power supply.

Optional features are power supply voltage (+5 V or +3.3 V) and a new refresh mode called "self-refresh."

μ PD	Options
424263A	+5 V
424263L	+3.3 V
42S4263A	+5 V; self-refresh mode
42S4263L	+3.3 V; self-refresh mode

Advanced polycide technology using stacked capacitors minimizes silicon area and provides high storage cell capacity, high performance, and high reliability. A single-transistor dynamic storage cell and CMOS circuitry throughout ensure minimum power dissipation, while an on-chip circuit internally generates the negative-voltage substrate bias—automatically and transparently.

The three-state I/O pins are controlled by $\overline{\text{UCAS}}$ and $\overline{\text{LCAS}}$ independent of $\overline{\text{RAS}}$. After a valid read or read-modify-write cycle, upper or lower byte data is held on the outputs by maintaining $\overline{\text{UCAS}}$ or $\overline{\text{LCAS}}$ low. Data outputs return to high impedance when either $\overline{\text{UCAS}}$ or $\overline{\text{LCAS}}$ goes high. Fast-page read and write cycles can be executed by cycling $\overline{\text{UCAS}}$ or $\overline{\text{LCAS}}$.

Refreshing may be accomplished by a $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ refresh cycle (CBR) that internally generates the refresh address. $\overline{\text{RAS}}$ -only refresh cycles will also refresh all memory locations.

The self-refresh mode is entered by holding $\overline{\text{RAS}}$ low for longer than 100 μ s during a CBR cycle. Detection of this long $\overline{\text{RAS}}$ time starts an internal oscillator that maintains data integrity without external clocking. The slow refresh reduces the data hold current to less than 200 microamperes. Self-refresh mode is used with microprocessors that have a "sleep mode" for low-power applications such as notebook PCs.

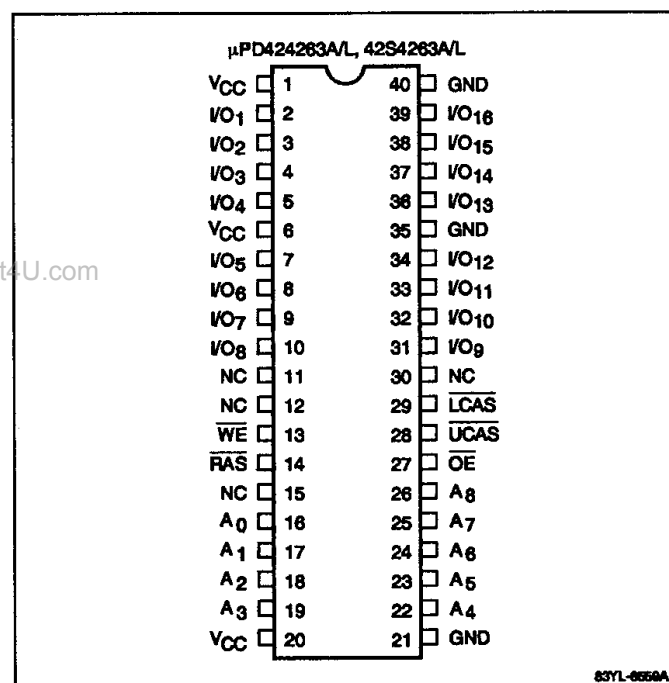
Features

- 262,144 by 16-bit organization
- Single power supply (+5-volt or +3.3-volt)
- Self-refresh option (slow internal automatic refresh)
- Fast-page option

- Byte read/write control with $\overline{\text{UCAS}}$ and $\overline{\text{LCAS}}$
- Write-per-bit option; independent write control on 16 I/O's
- Low power dissipation
- CAS before RAS refreshing
- On-chip substrate bias generator
- TTL-compatible inputs and outputs
- Nonlatched, three-state outputs
- Low input capacitance
- Multiplexed row and column addresses
- 512 refresh cycles every 8 ms
- 40-pin SOJ, 40-pin ZIP, and 44/40-pin TSOP plastic packaging

Pin Configurations

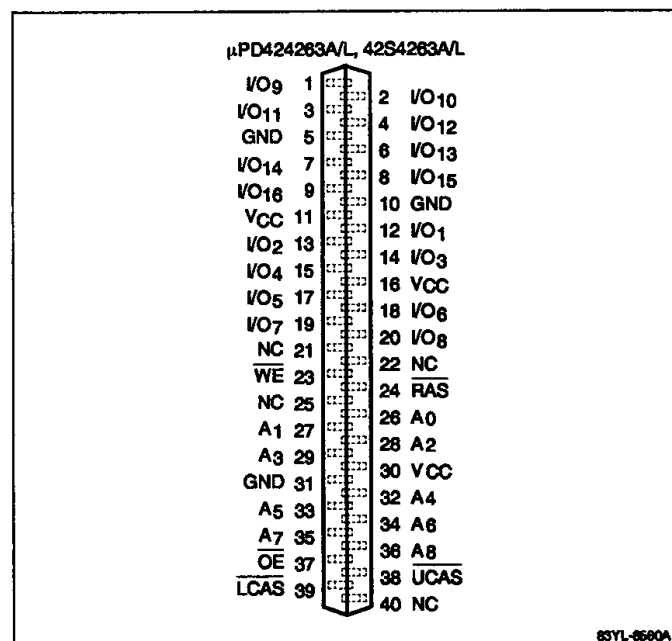
40-Pin Plastic SOJ



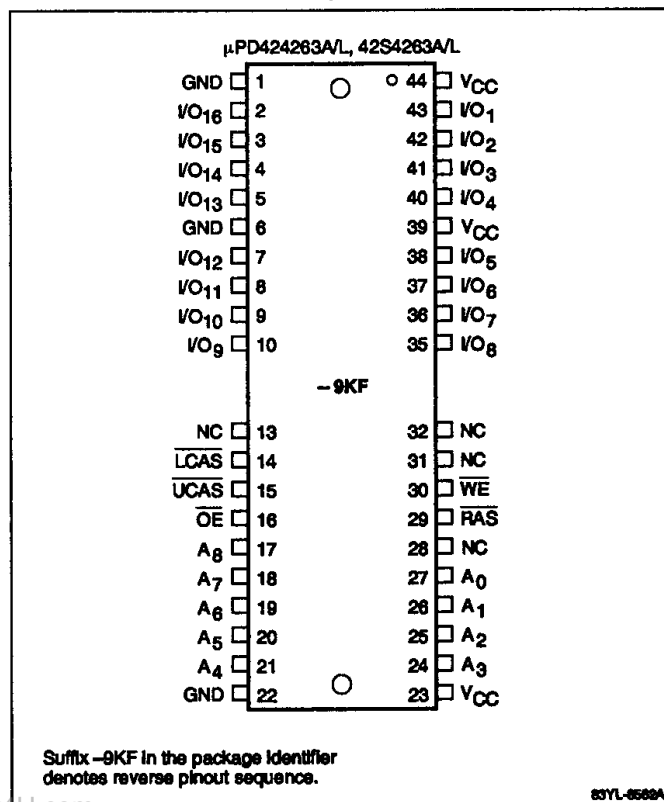
μ PD424263A/L, 42S4263A/L

Pin Configurations (cont)

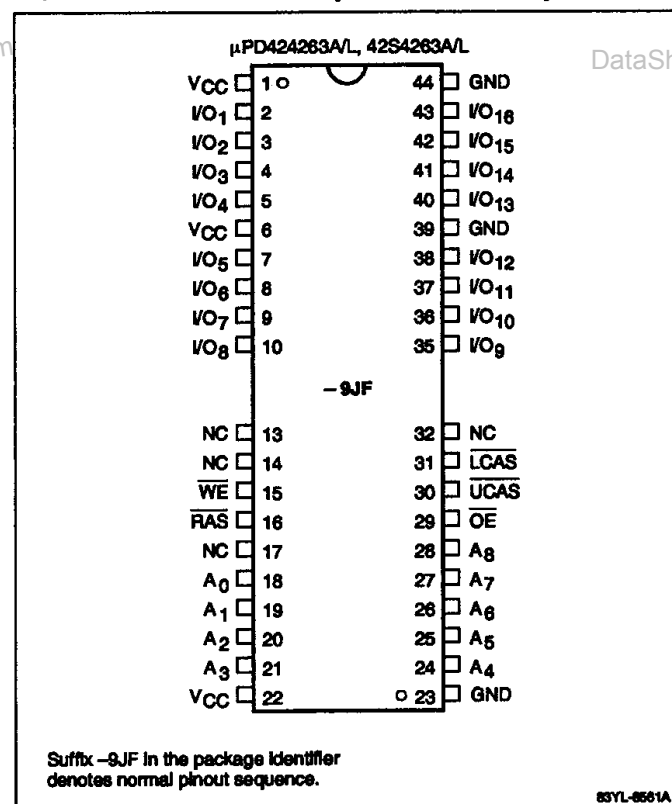
40-Pin Plastic ZIP



44/40-Pin Plastic TSOP (Reverse Pinouts)



44/40-Pin Plastic TSOP (Normal Pinouts)



Pin Identification

$A_0 - A_8$	Address Inputs
$I/O_1 - I/O_{16}$	Data inputs and outputs
$\overline{LCAS}, \overline{UCAS}$	Column address strobes
\overline{OE}	Output enable
\overline{RAS}	Row address strobe
\overline{WE}	Write enable
GND	Ground
V_{CC}	+5-volt or +3.3-volt power supply
NC	No connection

Ordering Information, μPD424263A (+ 5-volt power)

Part Number	$\overline{\text{RAS}}$ Access Time (max)	Fast-Page Cycle Time (max)	$\overline{\text{CAS}}$ Access Time (max)	Package
μPD424263ALE-60	60 ns	40 ns	20 ns	40-pin plastic SOJ
LE-70	70 ns	45 ns		
LE-80	80 ns	50 ns		
μPD424263AV-60	60 ns	40 ns	20 ns	40-pin plastic ZIP
V-70	70 ns	45 ns		
V-80	80 ns	50 ns		
μPD424263AG5-60	60 ns	40 ns	20 ns	44/40-pin plastic TSOP (normal pinouts)
G5-70	70 ns	45 ns		
G5-80	80 ns	50 ns		
μPD424263AG5M-60	60 ns	40 ns	20 ns	44/40-pin plastic TSOP (reverse pinouts)
G5M-70	70 ns	45 ns		
G5M-80	80 ns	50 ns		

Ordering Information, μPD424263L (+ 3.3-volt power)

Part Number	$\overline{\text{RAS}}$ Access Time (max)	Fast-Page Cycle Time (max)	$\overline{\text{CAS}}$ Access Time (max)	Package
μPD424263LLE-A60	60 ns	40 ns	20 ns	40-pin plastic SOJ
LE-A70	70 ns	45 ns		
LE-A80	80 ns	50 ns		
μPD424263LV-A60	60 ns	40 ns	20 ns	40-pin plastic ZIP
V-A70	70 ns	45 ns		
V-A80	80 ns	50 ns		
μPD424263LG5-A60	60 ns	40 ns	20 ns	44/40-pin plastic TSOP (normal pinouts)
G5-A70	70 ns	45 ns		
G5-A80	80 ns	50 ns		
μPD424263LG5M-A60	60 ns	40 ns	20 ns	44/40-pin plastic TSOP (reverse pinouts)
G5M-A70	70 ns	45 ns		
G5M-A80	80 ns	50 ns		

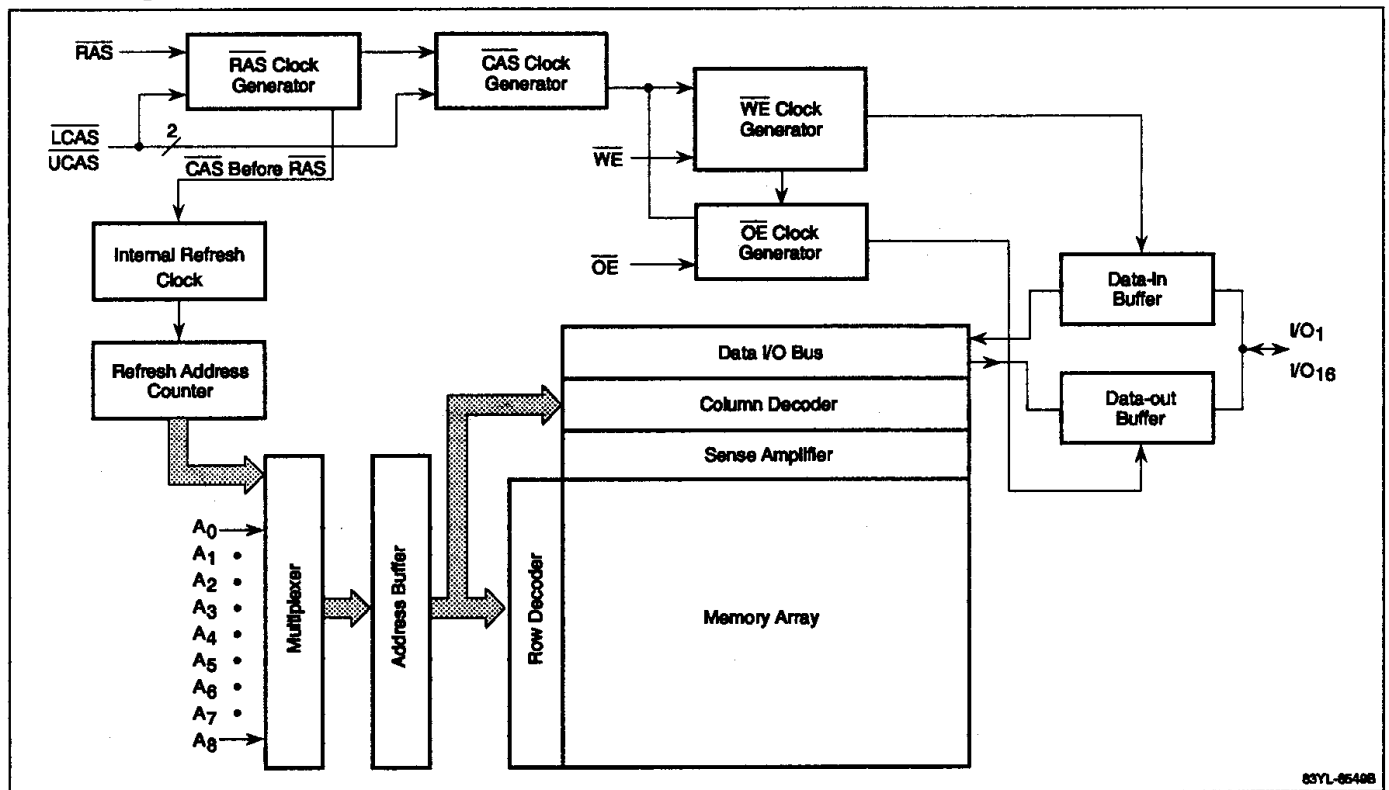
μ PD424263A/L, 42S4263A/L

Ordering Information, μ PD42S4263A (+ 5-volt power; self-refresh mode)

Part Number	RAS Access Time (max)	Fast-Page Cycle Time (max)	CAS Access Time (max)	Self-Refresh Current (max)	Package
μ PD42S4263ALE-60	60 ns	40 ns	20 ns	300 μ A	40-pin plastic SOJ
LE-70	70 ns	45 ns			
LE-80	80 ns	50 ns			
μ PD42S4263AV-60	60 ns	40 ns	20 ns	300 μ A	40-pin plastic ZIP
V-70	70 ns	45 ns			
V-80	80 ns	50 ns			
μ PD42S4263AG5-60	60 ns	40 ns	20 ns	300 μ A	44/40-pin plastic TSOP (normal pinouts)
G5-70	70 ns	45 ns			
G5-80	80 ns	50 ns			
μ PD42S4263AG5M-60	60 ns	40 ns	20 ns	300 μ A	44/40-pin plastic TSOP (reverse pinouts)
G5M-70	70 ns	45 ns			
G5M-80	80 ns	50 ns			

Ordering Information, μ PD42S4263L (+ 3.3-volt power; self-refresh mode)

Part Number	RAS Access Time (max)	Fast-Page Cycle Time (max)	CAS Access Time (max)	Self-Refresh Current (max)	Package
μ PD42S4263LLE-A60	60 ns	40 ns	20 ns	100 μ A	40-pin plastic SOJ
LE-A70	70 ns	45 ns			
LE-A80	80 ns	50 ns			
μ PD42S4263LV-A60	60 ns	40 ns	20 ns	100 μ A	40-pin plastic ZIP
V-A70	70 ns	45 ns			
V-A80	80 ns	50 ns			
μ PD42S4263LG5-A60	60 ns	40 ns	20 ns	100 μ A	44/40-pin plastic TSOP (normal pinouts)
G5-A70	70 ns	45 ns			
G5-A80	80 ns	50 ns			
μ PD42S4263LG5M-A60	60 ns	40 ns	20 ns	100 μ A	44/40-pin plastic TSOP (reverse pinouts)
G5M-A70	70 ns	45 ns			
G5M-A80	80 ns	50 ns			

Block Diagram**Truth Table**

Function	RAS	LCAS	UCAS	WE	OE	I/O ₁ - I/O ₈	I/O ₉ - I/O ₁₆
Standby	H	X	X	X	X	High-Z	High-Z
Refresh cycle	L	H	H	X	X	High-Z	High-Z
Byte read cycle	L	L	H	H	L	Data output	High-Z
	L	H	L	H	L	High-Z	Data output
Word read cycle	L	L	L	H	L	Data output	Data output
Byte write cycle	L	L	H	L	H	Data input	—
	L	H	L	L	H	—	Data input
Word write cycle	L	L	L	L	H	Data input	Data input
—	L	L	L	H	H	High-Z	High-Z

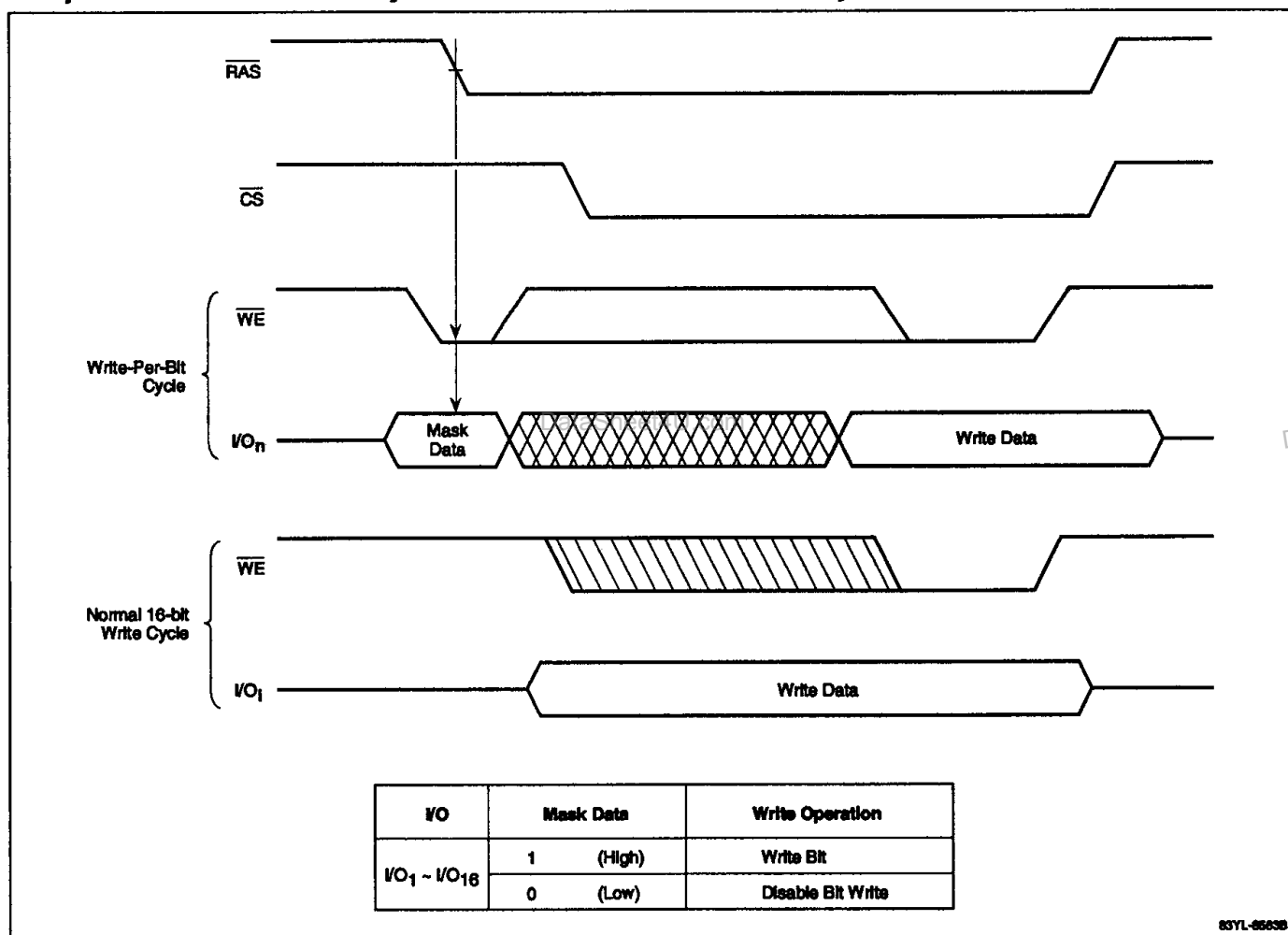
X = don't care.

μ PD424263A/L, 42S4263A/L

Write-Per-Bit Option

The write-per-bit option may be used to allow a write cycle to change any number of bits in the 16-bit word. The mask is loaded from the I/O lines at the falling edge of $\overline{\text{RAS}}$ if $\overline{\text{WE}} = V_{\text{IL}}$. If the I/O line is high, then the corresponding bit will be written when the write cycle executes. If the I/O line is low, the bit does not change. A mask loaded during fast-page operation will remain set and active for each write cycle that executes while $\overline{\text{RAS}}$ remains low. The mask may be changed only at the falling edge of $\overline{\text{RAS}}$.

Comparison of Write-Per-Bit Cycle Versus Standard 16-Bit Write Cycle



857L-0263B

Absolute Maximum Ratings

Voltage on any pin relative to GND	
5-volt devices	-1.0 to +7.0 V
3.3-volt devices	-0.5 to +4.6 V
Operating temperature, T_{OPR}	
	0 to +70°C
Storage temperature, T_{STG}	
	-55 to +125°C
Short-circuit output current, I_{OS}	
5-volt devices	50 mA
3.3-volt devices	20 mA
Power dissipation, P_D	
	1.0 W

Exposure to Absolute Maximum Ratings for extended periods may affect device reliability; exceeding the ratings could cause permanent damage. The device should be operated within the limits specified under DC and AC Characteristics.

Capacitance $T_A = 25^\circ\text{C}; f = 1 \text{ MHz}$

Parameter	Symbol	Max	Unit	Pins Under Test
Input capacitance	C_{I1}	5	pF	Addresses
	C_{I2}	7	pF	LCAS, UCAS, WE, OE, RAS
Input/output capacitance	C_O	7	pF	$I/O_1 - I/O_{16}$

Recommended Operating Conditions

Parameter	Symbol	5-Volt Devices			3.3-Volt Devices			Unit
		Min	Typ	Max	Min	Typ	Max	
Input voltage, high	V_{IH}	2.4		$V_{CC} + 1.0$	2.0		$V_{CC} + 0.3$	V
Input voltage, low	V_{IL}	-1.0		0.8	-0.5		0.8	V
Supply voltage	V_{CC}	4.5	5.0	5.5	3.0	3.3	3.6	V
Ambient temperature	T_A	0		+70	0		+70	°C

Self-Refresh Current $T_A = 0 \text{ to } +70^\circ\text{C}; V_{CC} = +5 \text{ V } \pm 10\% \text{ (42S4263A) or } +3.3 \text{ V } \pm 0.3 \text{ V (42S4263L)}$

Symbol	42S4263A	42S4263L	Conditions
I_{CC7}	300 μA max	100 μA max	I/O pins: $V_{IH} \geq V_{CC} - 0.2 \text{ V}; V_{IL} \leq 0.2 \text{ V}$ or open. Other input pins: $V_{IH} \geq V_{CC} - 0.2 \text{ V}; V_{IL} \leq 0.2 \text{ V}$ or open. $t_{RAS} \geq 100 \mu\text{s}$

μ PD424263A/L, 42S4263A/L

DC Characteristics; 5-Volt Devices

 $T_A = 0 \text{ to } +70^\circ\text{C}; V_{CC} = +5.0 \text{ V} \pm 10\%$

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Standby current	I_{CC2}			2.0	mA	$\overline{RAS} = \overline{CAS} \geq V_{IH} \text{ (min)}; I_O = 0 \text{ mA}$
				300	μA	$\overline{RAS} = \overline{CAS} \geq V_{CC} - 0.2 \text{ V}; I_O = 0 \text{ mA}$
Input leakage current	$I_{I(L)}$	-10		10	μA	$V_{IN} = 0 \text{ V to } V_{CC}; \text{ all other pins not under test} = 0 \text{ V}$
Output leakage current	$I_{O(L)}$	-10		10	μA	$D_{OUT} \text{ disabled}; V_{OUT} = 0 \text{ V to } V_{CC}$
Output voltage, low	V_{OL}			0.4	V	$I_{OL} = 4.2 \text{ mA}$
Output voltage, high	V_{OH}	2.4			V	$I_{OH} = -5 \text{ mA}$

DC Characteristics; 3.3-Volt Devices

 $T_A = 0 \text{ to } +70^\circ\text{C}; V_{CC} = +3.3 \text{ V} \pm 0.3 \text{ V}$

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Standby current	I_{CC2}			500	μA	$\overline{RAS} = \overline{CAS} \geq V_{IH} \text{ (min)}; I_O = 0 \text{ mA}$
				100	μA	$\overline{RAS} = \overline{CAS} \geq V_{CC} - 0.2 \text{ V}; I_O = 0 \text{ mA}$
Input leakage current	$I_{I(L)}$	-5		5	μA	$V_{IN} = 0 \text{ V to } V_{CC}; \text{ all other pins not under test} = 0 \text{ V}$
Output leakage current	$I_{O(L)}$	-5		5	μA	$D_{OUT} \text{ disabled}; V_{OUT} = 0 \text{ V to } V_{CC}$
Output voltage, low	V_{OL}			0.4	V	$I_{OL} = 2.0 \text{ mA}$
Output voltage, high	V_{OH}	2.4			V	$I_{OH} = -2.0 \text{ mA}$

AC Characteristics

 $T_A = 0 \text{ to } +70^\circ\text{C}$
 $\mu\text{PD424263A, 42S4263A}; V_{CC} = +5.0 \text{ V} \pm 10\%$
 $\mu\text{PD424263L, 42S4263L}; V_{CC} = +3.3 \text{ V} \pm 0.3 \text{ V}$

Parameter	Symbol	-60		-70		-80		Unit	Test Conditions
		Min	Max	Min	Max	Min	Max		
Operating current, average	$I_{CC1} (+5)$		140		130		120	mA	$\overline{RAS}, \overline{CAS} \text{ cycling}; t_{RC} = t_{RC} \text{ min (Note 5)}$
	$I_{CC1} (+3.3)$		130		120		110		
Operating current, RAS-only refresh cycle, average	$I_{CC3} (+5)$		140		130		120	mA	$\overline{RAS} \text{ cycling}; \overline{CAS} \geq V_{IH} \text{ min}; t_{RC} = t_{RC} \text{ min (Note 5)}$
	$I_{CC3} (+3.3)$		130		120		110		
Operating current, fast-page cycle, average	$I_{CC4} (+5)$		90		80		70	mA	$\overline{RAS} \leq V_{IL}; \overline{CAS} \text{ cycling}; t_{PC} = t_{PC} \text{ min (Note 5)}$
	$I_{CC4} (+3.3)$		90		80		70		
Operating current, CAS before RAS refresh cycle, average	$I_{CC5} (+5)$		140		130		120	mA	$\overline{RAS} \text{ cycling}; \overline{CAS} \leq V_{IL} \text{ max}; t_{RC} = t_{RC} \text{ min (Note 5)}$
	$I_{CC5} (+3.3)$		130		120		110		
Access time from column address	t_{AA}		30		35		40	ns	(Notes 3, 4, 7, 8)
Access time from CAS precharge (rising edge)	t_{ACP}		35		40		45	ns	(Notes 3, 4, 7, 8, 16)
Column address setup time	t_{ASC}	0		0		0		ns	
Row address setup time	t_{ASR}	0		0		0		ns	
Column address to \overline{WE} delay time	t_{AWD}	50		55		70		ns	(Note 14)

AC Characteristics (cont)

Parameter	Symbol	-60		-70		-80		Unit	Test Conditions
		Min	Max	Min	Max	Min	Max		
Access time from $\overline{\text{CAS}}$ (falling edge)	t_{CAC}		20		20		20	ns	(Notes 3, 4, 7, 8)
Column address hold time	t_{CAH}	15		15		15		ns	
$\overline{\text{CAS}}$ pulse width	t_{CAS}	20	10,000	20	10,000	20	10,000	ns	
$\overline{\text{CAS}}$ hold time for $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ refreshing	t_{CHR}	15		15		15		ns	(Note 15)
$\overline{\text{CAS}}$ hold time (CBR self-refresh mode)	t_{CHS}	-35		-40		-50		ns	For 42S4263A/L only
$\overline{\text{CAS}}$ to output in low-Z	t_{CLZ}	0		0		0		ns	(Notes 4, 7)
Fast-page $\overline{\text{CAS}}$ precharge time	t_{CP}	10		10		10		ns	
$\overline{\text{CAS}}$ precharge time	t_{CPN}	10		10		10		ns	
Fast-page $\overline{\text{CAS}}$ precharge to $\overline{\text{WE}}$ delay time	t_{CPWD}	55		60		75		ns	(Note 14)
$\overline{\text{CAS}}$ to $\overline{\text{RAS}}$ precharge time	t_{CRP}	10		10		10		ns	(Note 10)
$\overline{\text{CAS}}$ hold time	t_{CSH}	60		70		80		ns	
$\overline{\text{CAS}}$ setup time for $\overline{\text{CAS}}$ before $\overline{\text{RAS}}$ refresh cycle	t_{CSR}	5		5		5		ns	(Note 15)
$\overline{\text{CAS}}$ to $\overline{\text{WE}}$ delay	t_{CWD}	40		40		50		ns	(Note 14)
Write command referenced to $\overline{\text{CAS}}$ lead time	t_{CWL}	15		15		15		ns	
Data-in hold time	t_{DH}	15		15		15		ns	(Note 13)
Data-in setup time	t_{DS}	0		0		0		ns	(Note 13)
Masked write hold time referenced to $\overline{\text{RAS}}$	t_{MRH}	0		0		0		ns	
Access time from $\overline{\text{OE}}$	t_{OEA}		20		20		20	ns	(Notes 3, 4, 7, 8)
$\overline{\text{OE}}$ data delay time	t_{OED}	15		15		15		ns	
$\overline{\text{OE}}$ command hold time	t_{OEH}	0		0		0		ns	
$\overline{\text{OE}}$ to $\overline{\text{RAS}}$ inactive setup time	t_{OES}	0		0		0		ns	
Output turnoff delay from $\overline{\text{OE}}$	t_{OEZ}	0	15	0	15	0	15	ns	(Note 9)

μPD424263A/L, 42S4263A/L

AC Characteristics (cont)

Parameter	Symbol	-60		-70		-80		Unit	Test Conditions
		Min	Max	Min	Max	Min	Max		
Output disable from CAS high	t _{OFF}	0	15	0	15	0	20	ns	(Note 9)
OE to output in low-Z	t _{OLZ}	0		0		0		ns	(Notes 5, 7)
Fast-page read or write cycle time	t _{PC}	40		45		50		ns	(Note 6)
Fast-page read-modify-write cycle time with extended data output	t _{PRWC}	85		90		100		ns	(Note 6)
Access time from RAS	t _{RAC}		60		70		80	ns	(Notes 3, 4, 7, 8)
RAS to column address delay time	t _{RAD}	15	30	15	35	15	40	ns	(Note 8)
Row address hold time	t _{RAH}	10		10		10		ns	
Column address lead time referenced to RAS (rising edge)	t _{RAL}	30		35		40		ns	
RAS pulse width	t _{RAS}	60	10,000	70	10,000	80	10,000	ns	
Fast-page RAS pulse width	t _{RASP}	60	125,000	70	125,000	80	125,000	ns	
RAS pulse width (CBR self-refresh mode)	t _{RASS}	100		100		100		μs	For 42S4263A/L
Random read or write cycle time	t _{RC}	120		130		150		ns	(Note 6)
RAS to CAS delay time	t _{RCD}	20	40	20	50	20	60	ns	(Note 8)
Read command hold time referenced to CAS	t _{RCH}	0		0		0		ns	(Note 11)
Read command setup time	t _{RCS}	0		0		0		ns	
Refresh period	t _{REF}		8		8		8	ms	Addresses A ₀ - A ₈
RAS hold time referenced to CAS precharge	t _{RHCP}	35		40		45		ns	
RAS precharge time	t _{RP}	50		50		60		ns	
RAS precharge CAS hold time	t _{RPC}	0		0		0		ns	
RAS precharge time (CBR self-refresh mode)	t _{RPS}	120		130		150		ns	For 42S4263A/L
Read command hold time referenced to RAS	t _{RRH}	0		0		0		ns	(Note 11)

AC Characteristics (cont)

Parameter	Symbol	-60		-70		-80		Unit	Test Conditions
		Min	Max	Min	Max	Min	Max		
RAS hold time	t_{RSH}	20		20		25		ns	
Read-modify-write cycle time	t_{RWC}	165		175		200		ns	(Note 6)
RAS to \overline{WE} delay	t_{RWD}	80		90		105		ns	(Note 14)
Write command referenced to RAS lead time	t_{RWL}	20		20		20		ns	
Rise and fall times	t_T	3	50	3	50	3	50	ns	(Note 4)
Write-per-bit hold time	t_{WBH}	10		10		15		ns	
Write-per-bit setup time	t_{WBS}	0		0		0		ns	
Write command hold time	t_{WCH}	15		15		15		ns	(Note 12)
Write command setup time	t_{WCS}	0		0		0		ns	(Note 14)
Write mask data hold time	t_{WH}	10		10		15		ns	
Write command pulse width	t_{WP}	15		15		15		ns	(Note 12)
Write mask data setup time	t_{WS}	0		0		0		ns	

Notes:

- (1) All voltages are referenced to GND.
- (2) An initial pause of 100 μs is required after power-up, followed by any eight RAS cycles, before proper device operation is achieved.
- (3) Ac measurements assume $t_T = 5$ ns.
- (4) V_{IH} (min) and V_{IL} (max) are reference levels for measuring the timing of input signals. Transition times are measured between V_{IH} and V_{IL} .
- (5) I_{CC1} , I_{CC3} , I_{CC4} , and I_{CC5} depend on output loading and cycle rates. Specified values are obtained with the output open. I_{CC3} is measured assuming that all column address inputs are held at either a high level or a low level during RAS-only refresh cycles. I_{CC4} is measured assuming that all column address inputs are switched only once during each fast-page cycle.
- (6) The minimum specifications are used only to indicate the cycle time at which proper operation over the full temperature range ($T_A = 0$ to $+70^\circ\text{C}$) is assured.
- (7) Load = 2 TTL (-1 mA, +4 mA) loads and 100 pF. For 3.3-volt devices, $V_{OH} = 2.0$ volts and $V_{OL} = 0.8$ volt (ac reference levels)
- (8) If $t_{RCD} \leq t_{RCD}(\text{max})$ and $t_{RAD} \leq t_{RAD}(\text{max})$, access time is defined by $t_{RAC}(\text{max})$. If $t_{RCD} \geq t_{RCD}(\text{max})$, access time is defined by $t_{CAC}(\text{max})$; if $t_{RAD} \geq t_{RAD}(\text{max})$ access time is defined by $t_{AA}(\text{max})$.
- (9) $t_{OFF}(\text{max})$ and $t_{OEZ}(\text{max})$ define the time at which the outputs become open-circuit and are not referenced to V_{OH} or V_{OL} .
- (10) The t_{CRP} requirement should be applicable for RAS/CAS cycles preceded by any cycle.
- (11) Either t_{RRH} or t_{RCH} must be satisfied for a read cycle.
- (12) Parameter t_{WP} is applicable for a delayed write cycle such as a read-write/read-modify-write cycle. For early write cycles, both t_{WCS} and t_{WCH} must be met.
- (13) These parameters are referenced to the falling edge of one of the CAS signals for early write cycles and to the falling edge of \overline{WE} for delayed write or read-modify-write cycles.
- (14) t_{WCS} , t_{RWD} , t_{CWD} , t_{CPWD} and t_{AWD} are restrictive operating parameters in read-write/read-modify-write cycles only. If $t_{WCS} \geq t_{WCS}(\text{min})$, the cycle is an early write cycle and the data I/O pins will remain open-circuit throughout the entire cycle. If $t_{CWD} \geq t_{CWD}(\text{min})$, $t_{RWD} \geq t_{RWD}(\text{min})$, and $t_{AWD} \geq t_{AWD}(\text{min})$, then the cycle is a read-write cycle and the data I/O pins will contain data read from the selected cells. If neither of the above conditions is met, the condition of the data I/O pins (at access time and until CAS returns to V_{IH}) is indeterminate.
- (15) Holding \overline{LCAS} or \overline{UCAS} low prior to RAS going negative will initiate a CAS before RAS refresh cycle (t_{CSR} and t_{CHR} must be satisfied).
- (16) The first CAS falling edge is used as a reference for the start of t_{ACP} (CAS precharge access time).

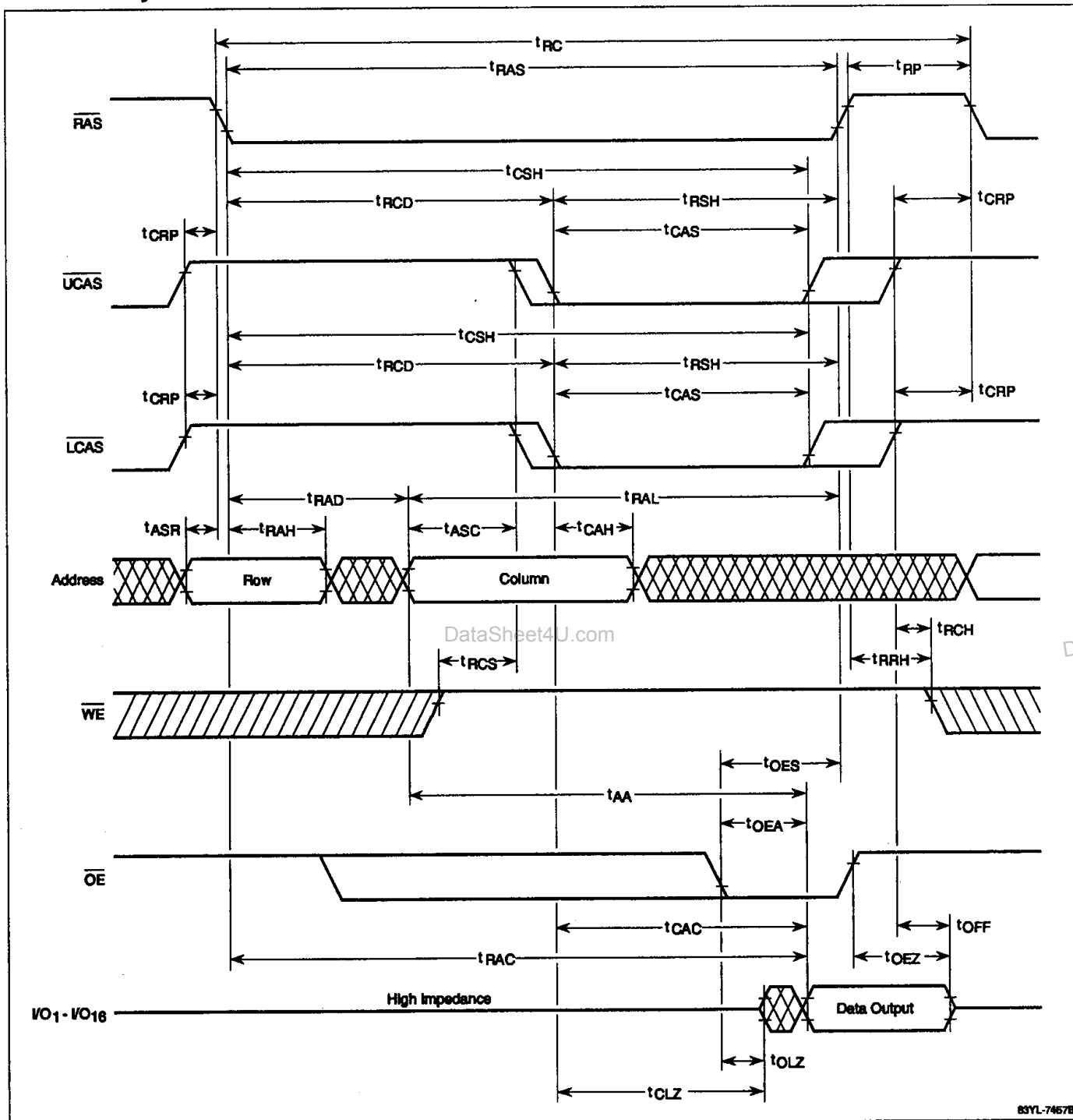
7d

7D -11

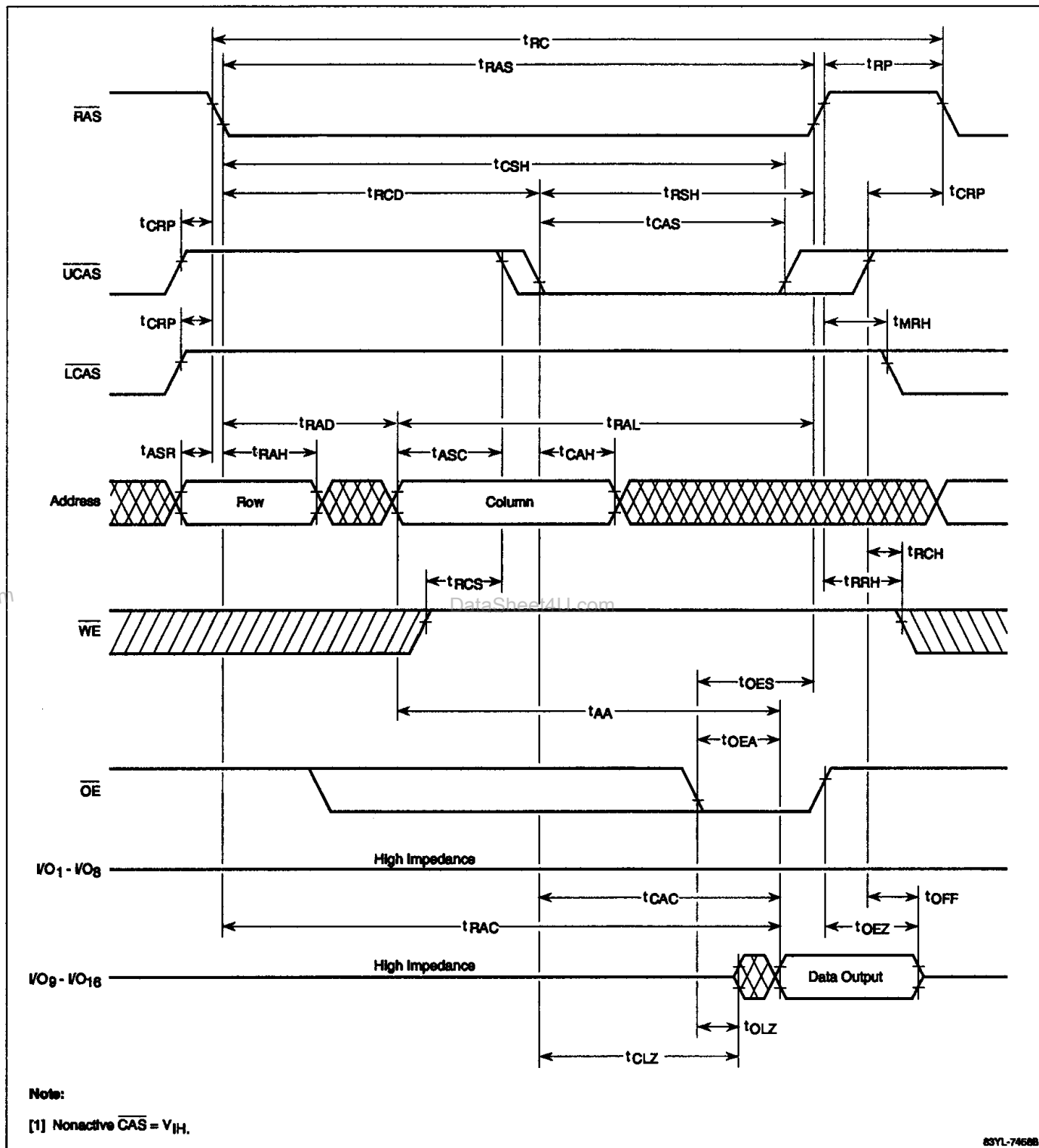
μPD424263A/L, 42S4263A/L

Timing Waveforms

Word Read Cycle



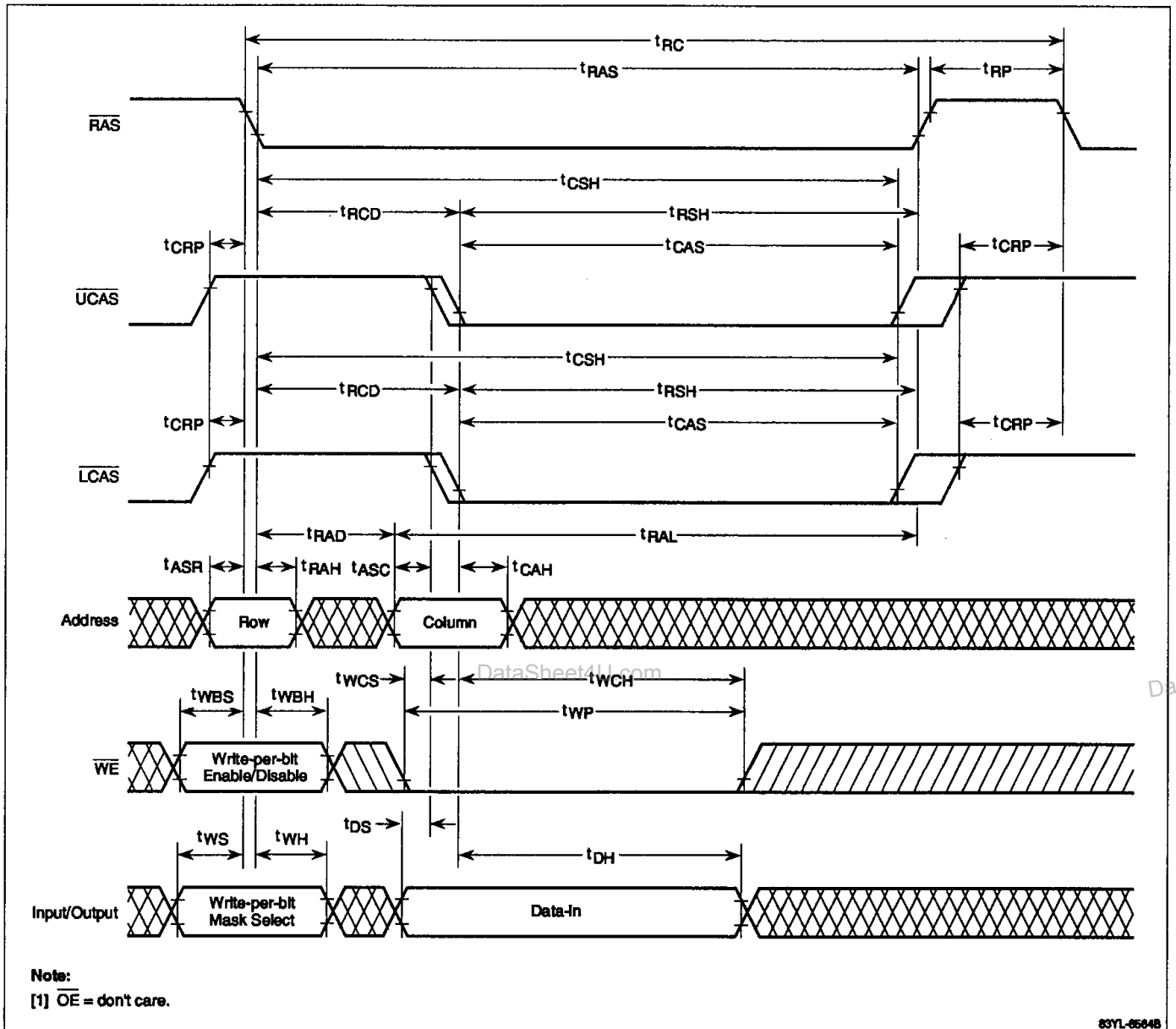
83YL-7467B

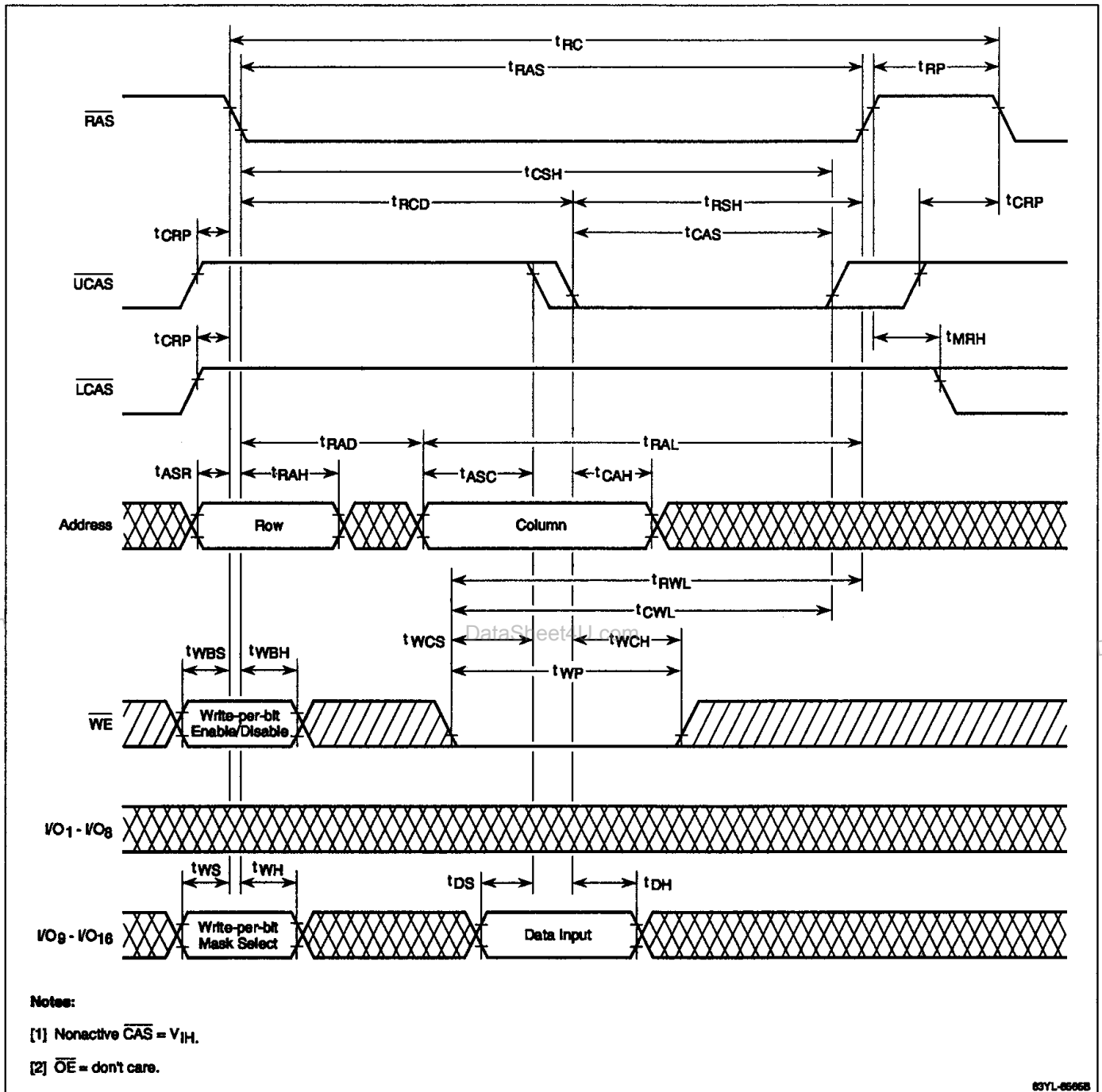
Timing Waveforms (cont)**Byte Read Cycle**

μPD424263A/L, 42S4263A/L

Timing Waveforms (cont)

Word Early-Write Cycle

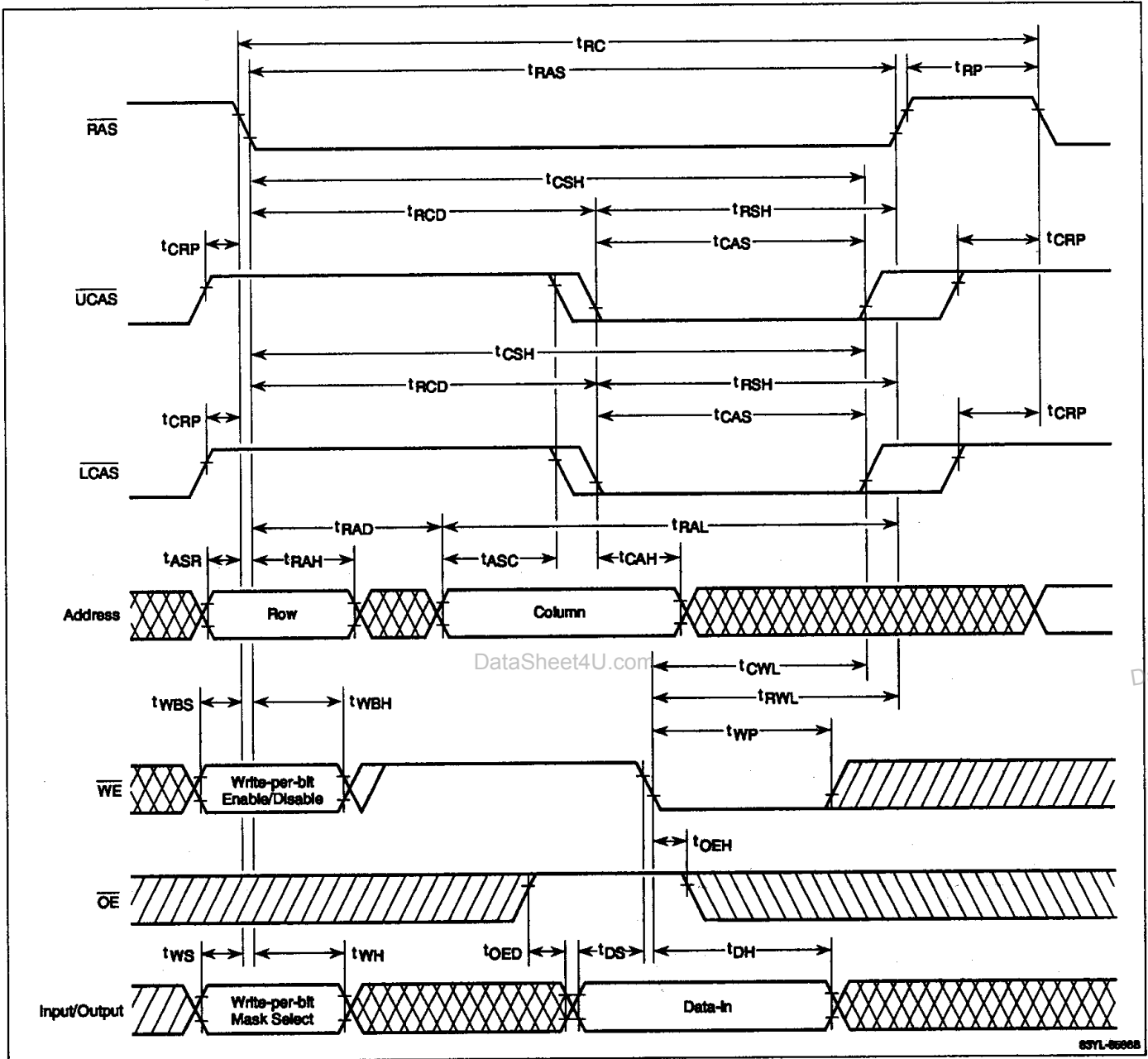


Timing Waveforms (cont)**Byte Early-Write Cycle**

μ PD424263A/L, 42S4263A/L

Timing Waveforms (cont)

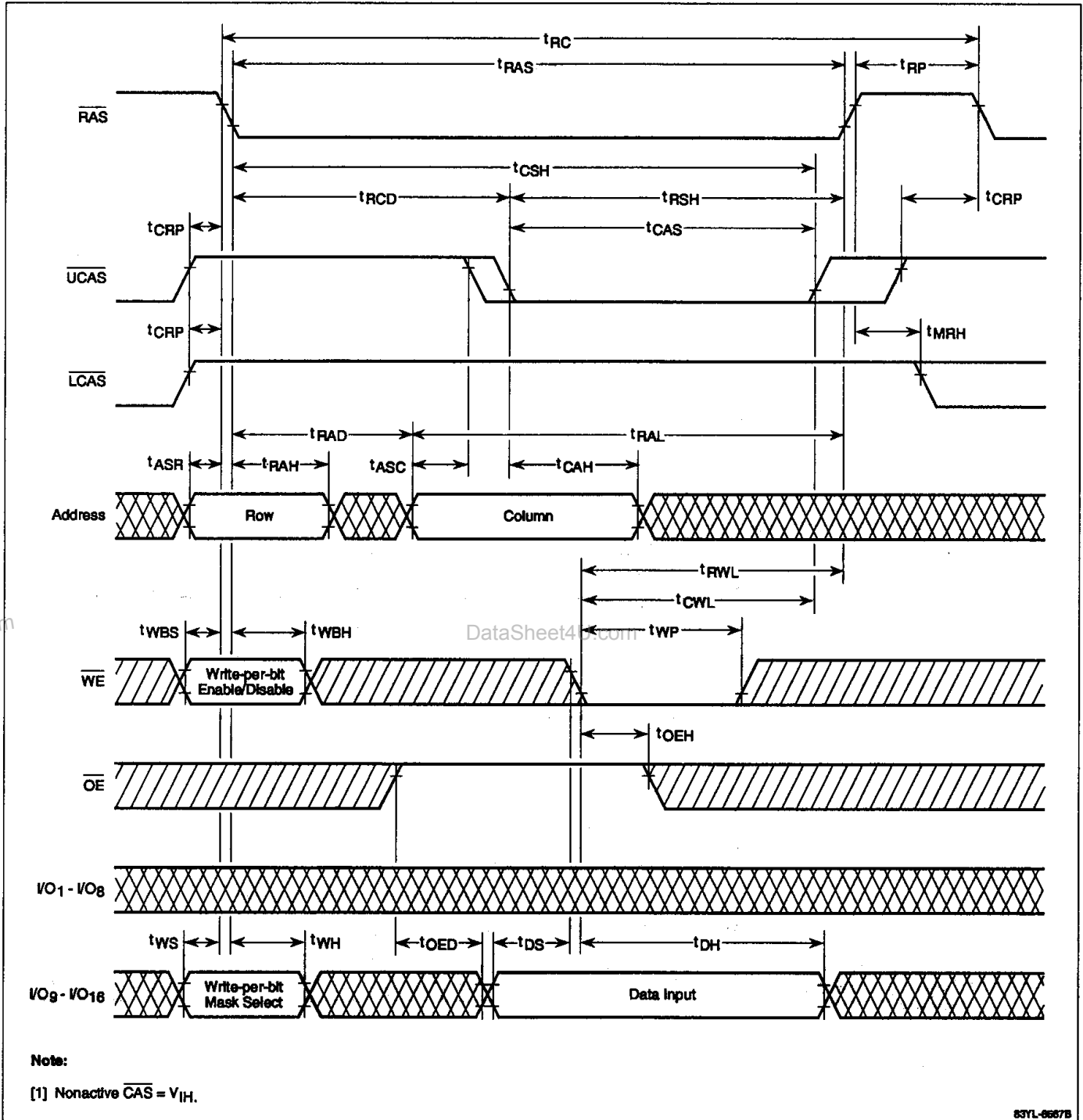
Word Late-Write Cycle



63YL-6668

Timing Waveforms (cont)

Byte Late-Write Cycle

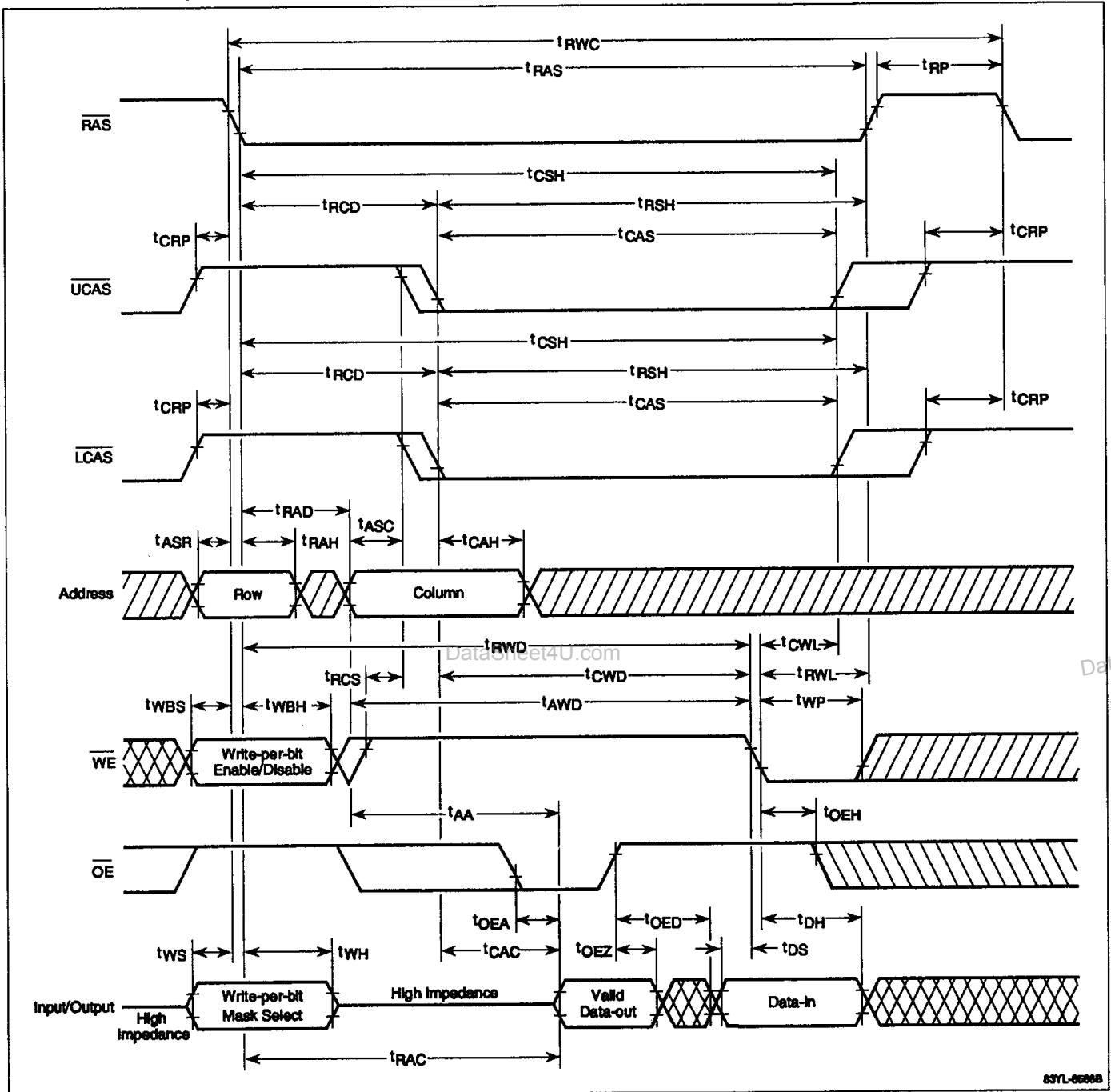


7d

7D-17

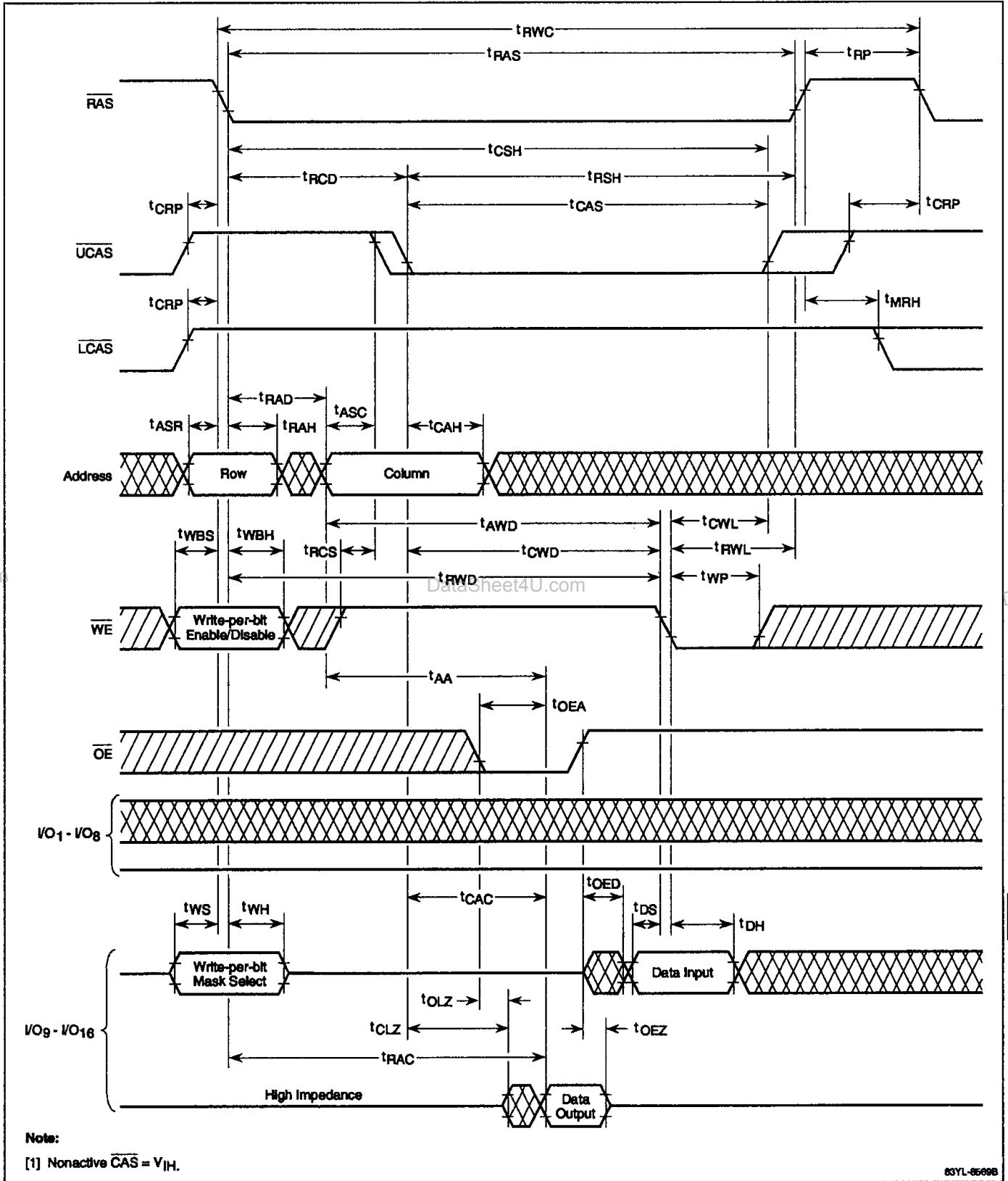
Timing Waveforms (cont)

Word Read-Modify-Write Cycle



Timing Waveforms (cont)

Byte Read-Modify-Write Cycle

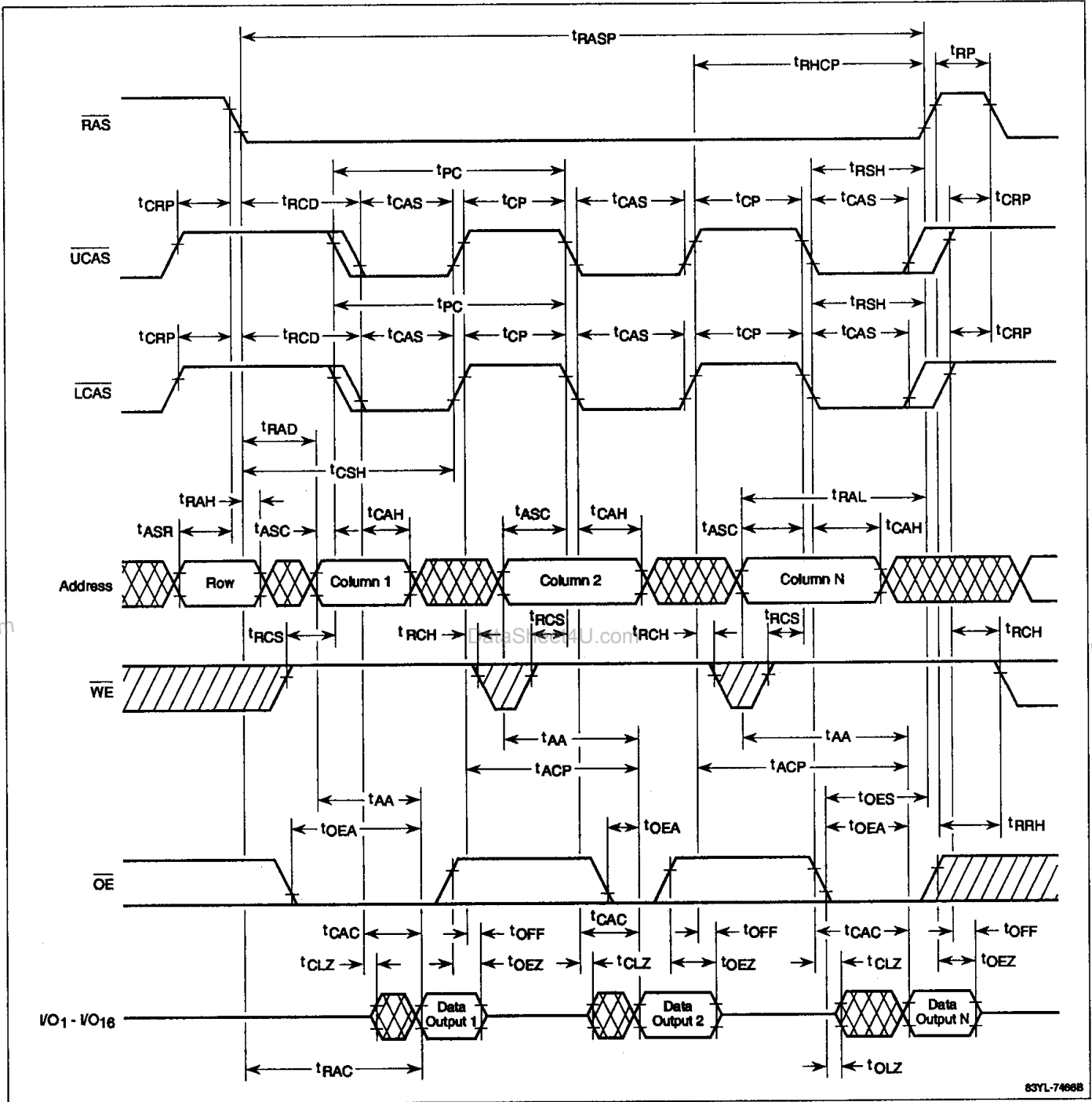


7d

7D-19

Timing Waveforms (cont)

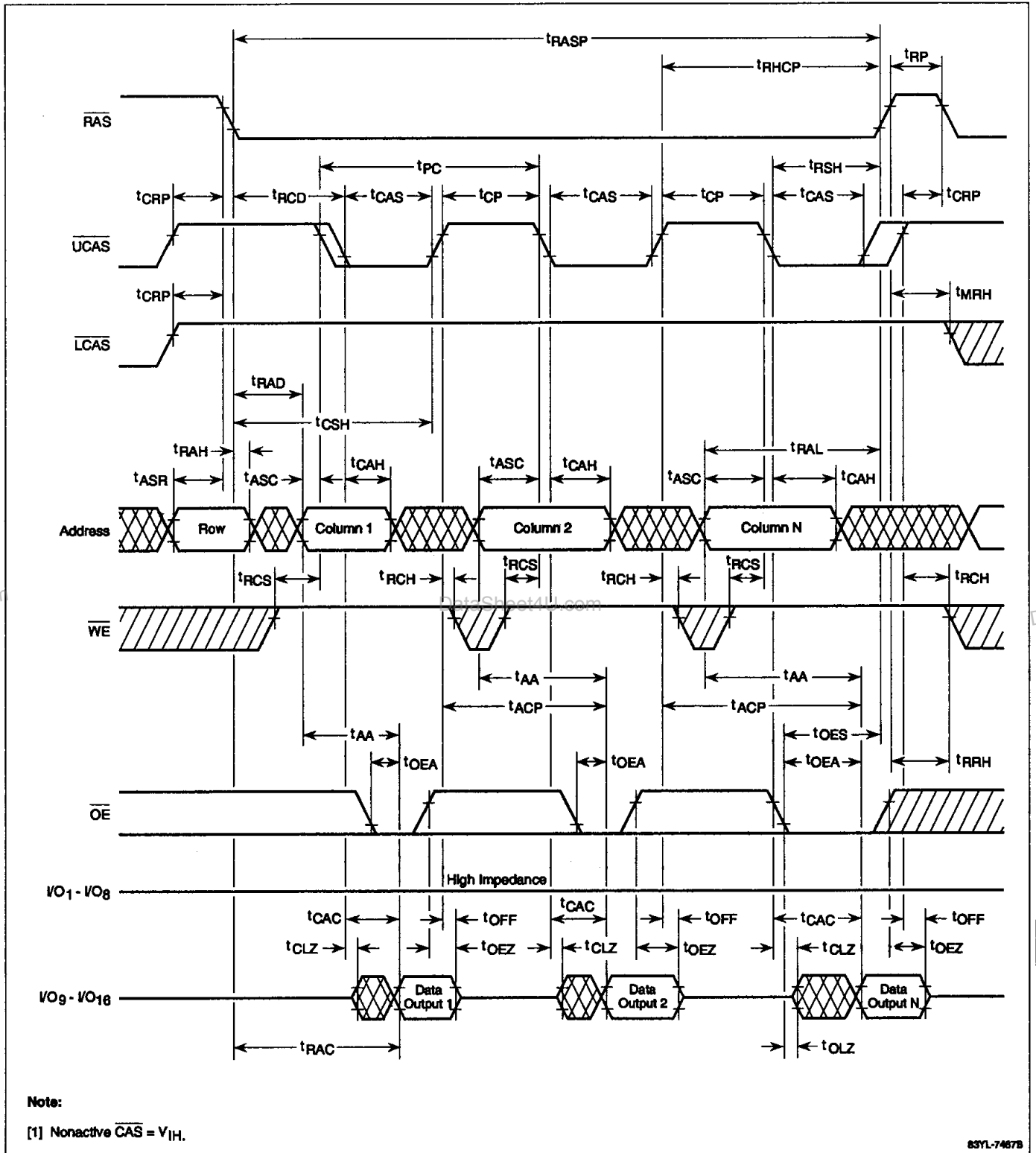
Word Fast-Page Read Cycle



83YL-7466B

Timing Waveforms (cont)

Byte Fast-Page Read Cycle

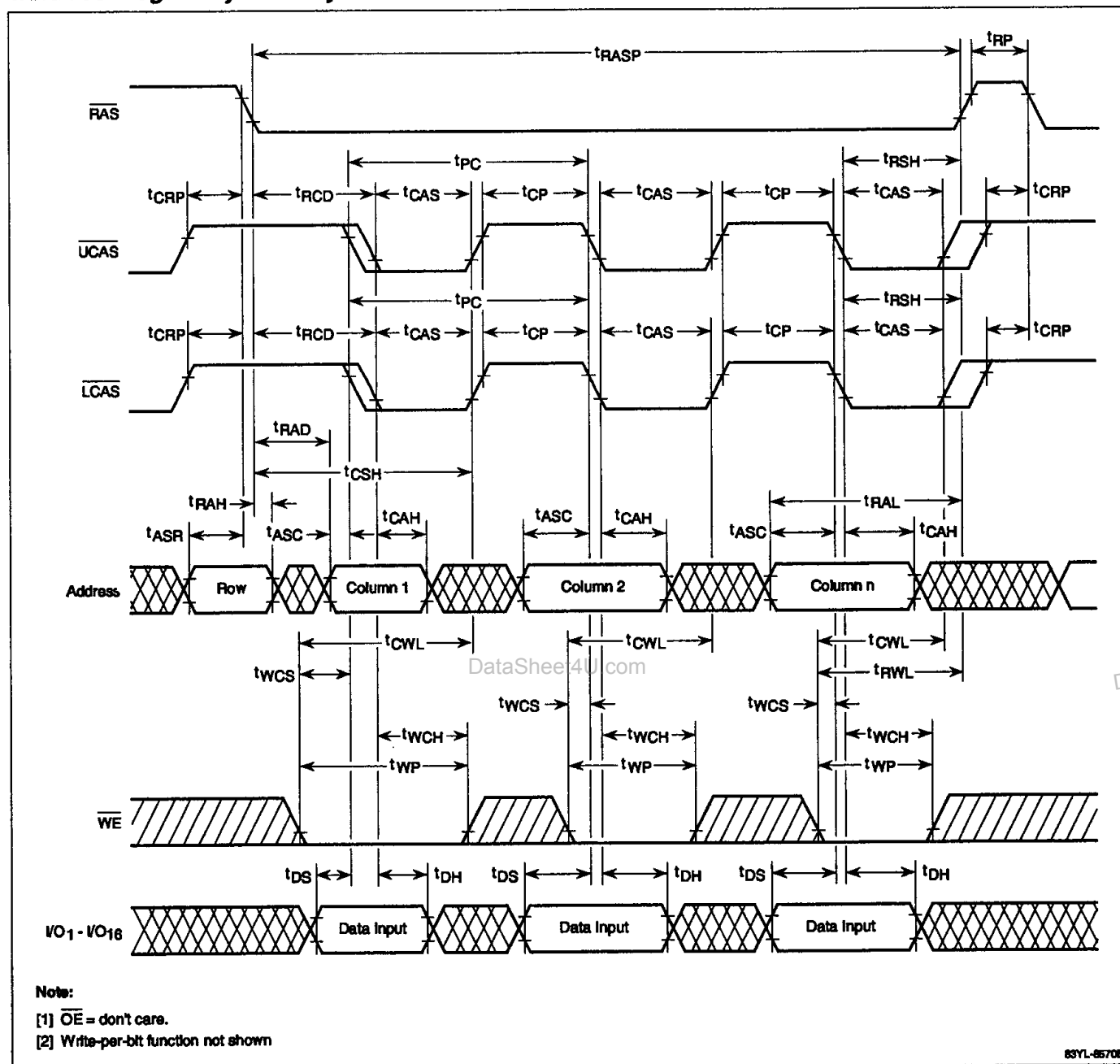


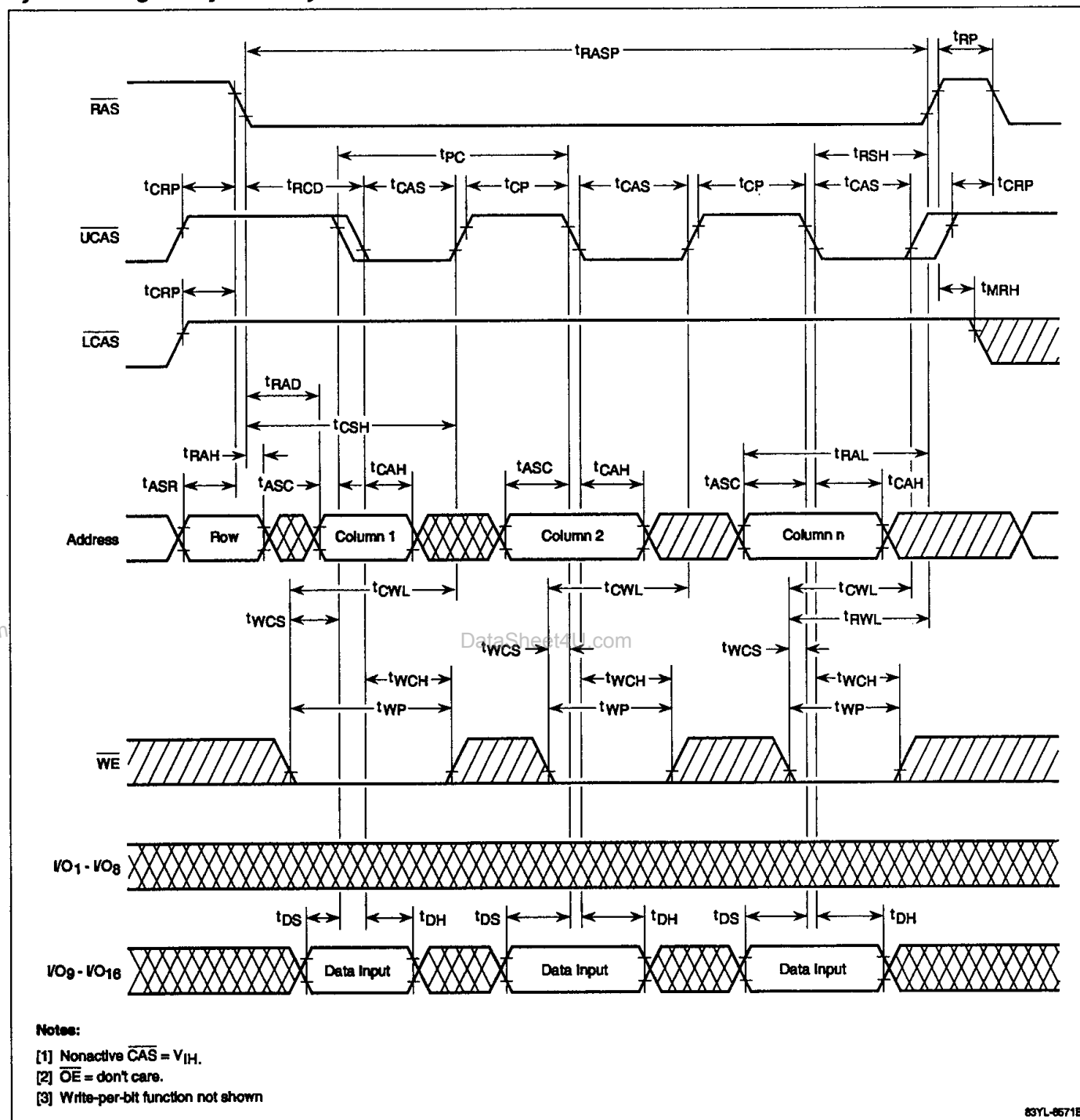
7d

7D-21

Timing Waveforms (cont)

Word Fast-Page Early-Write Cycle

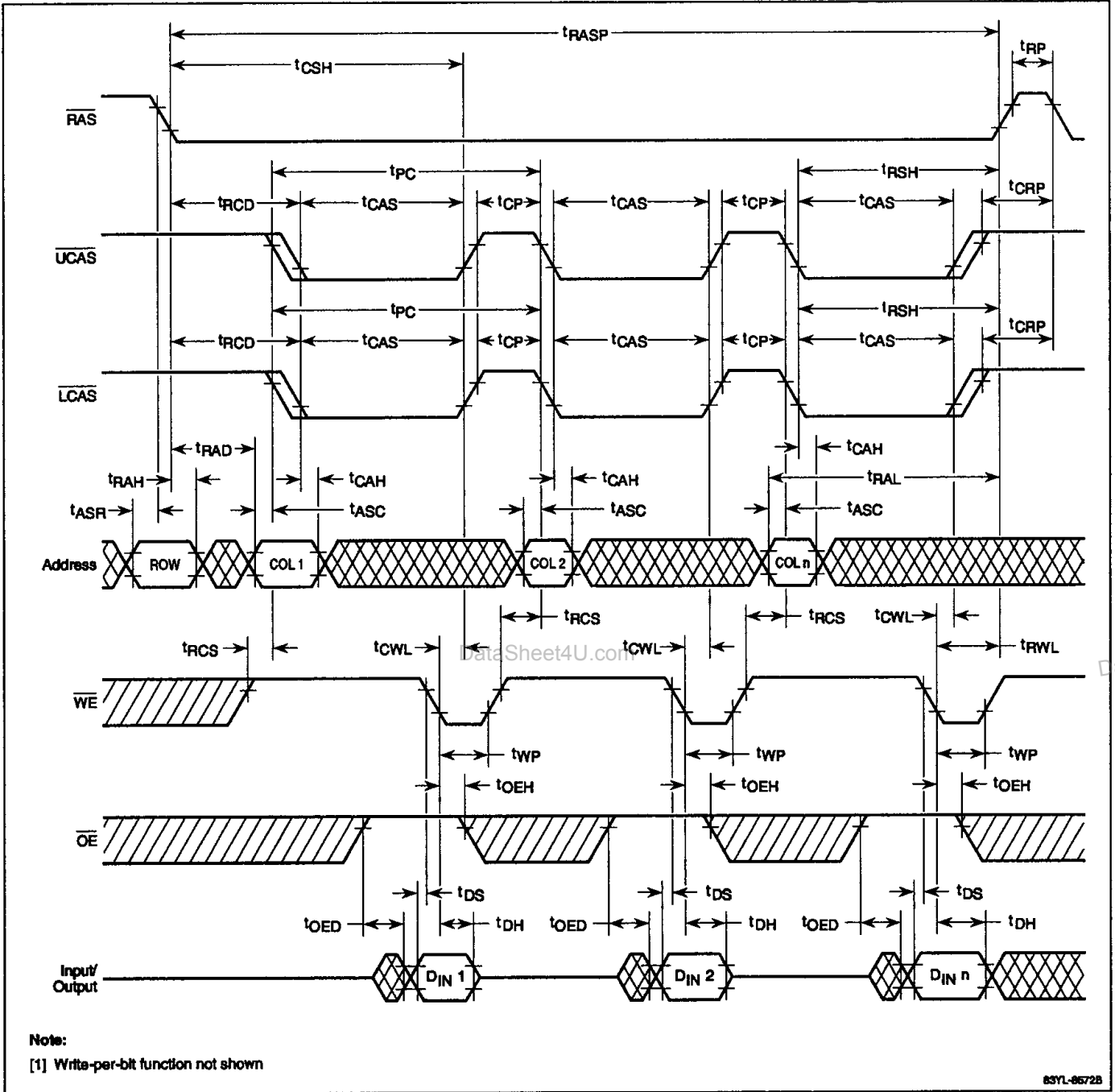


Timing Waveforms (cont)**Byte Fast-Page Early-Write Cycle**

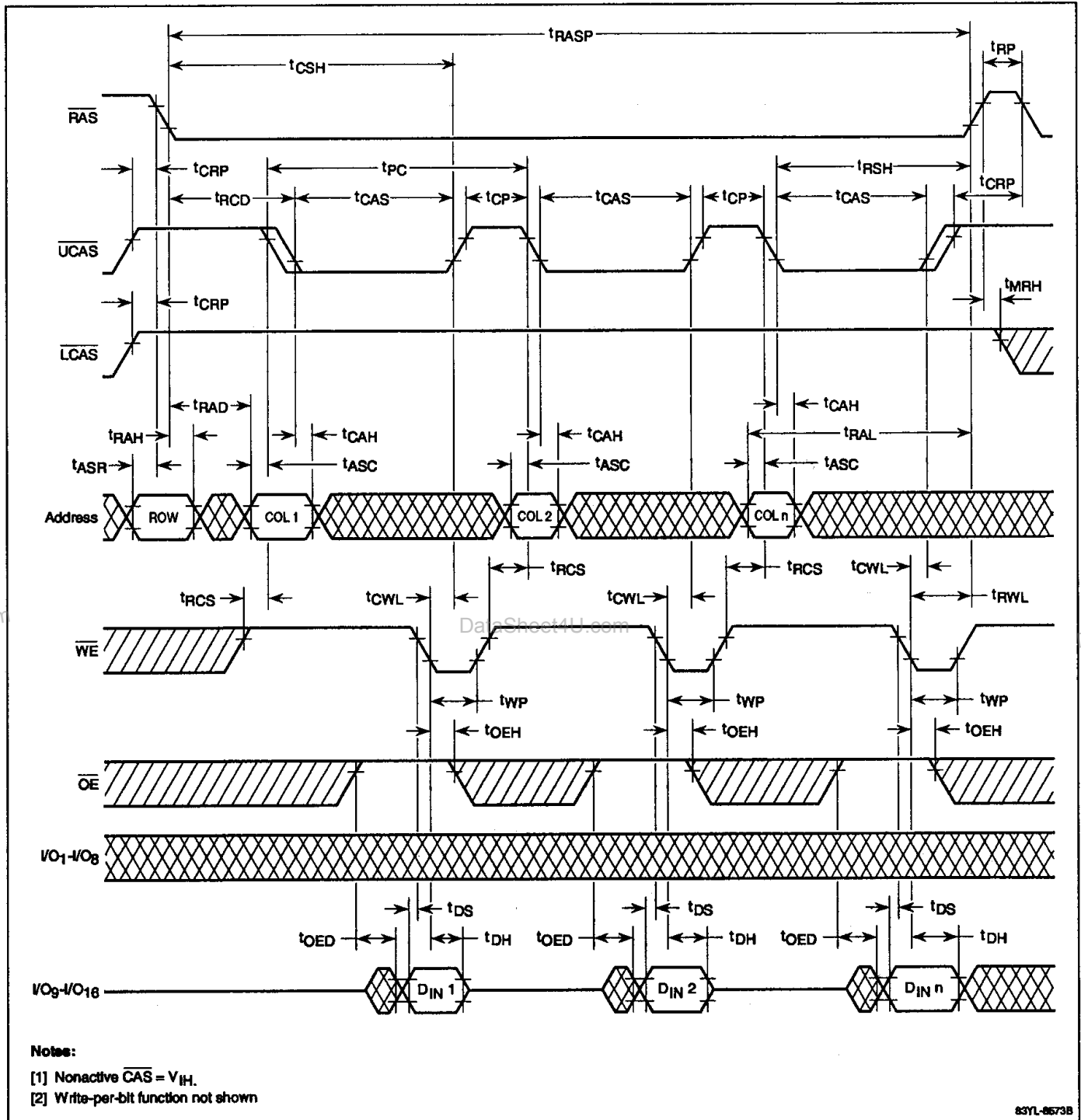
μPD424263A/L, 42S4263A/L

Timing Waveforms (cont)

Word Fast-Page Late-Write Cycle



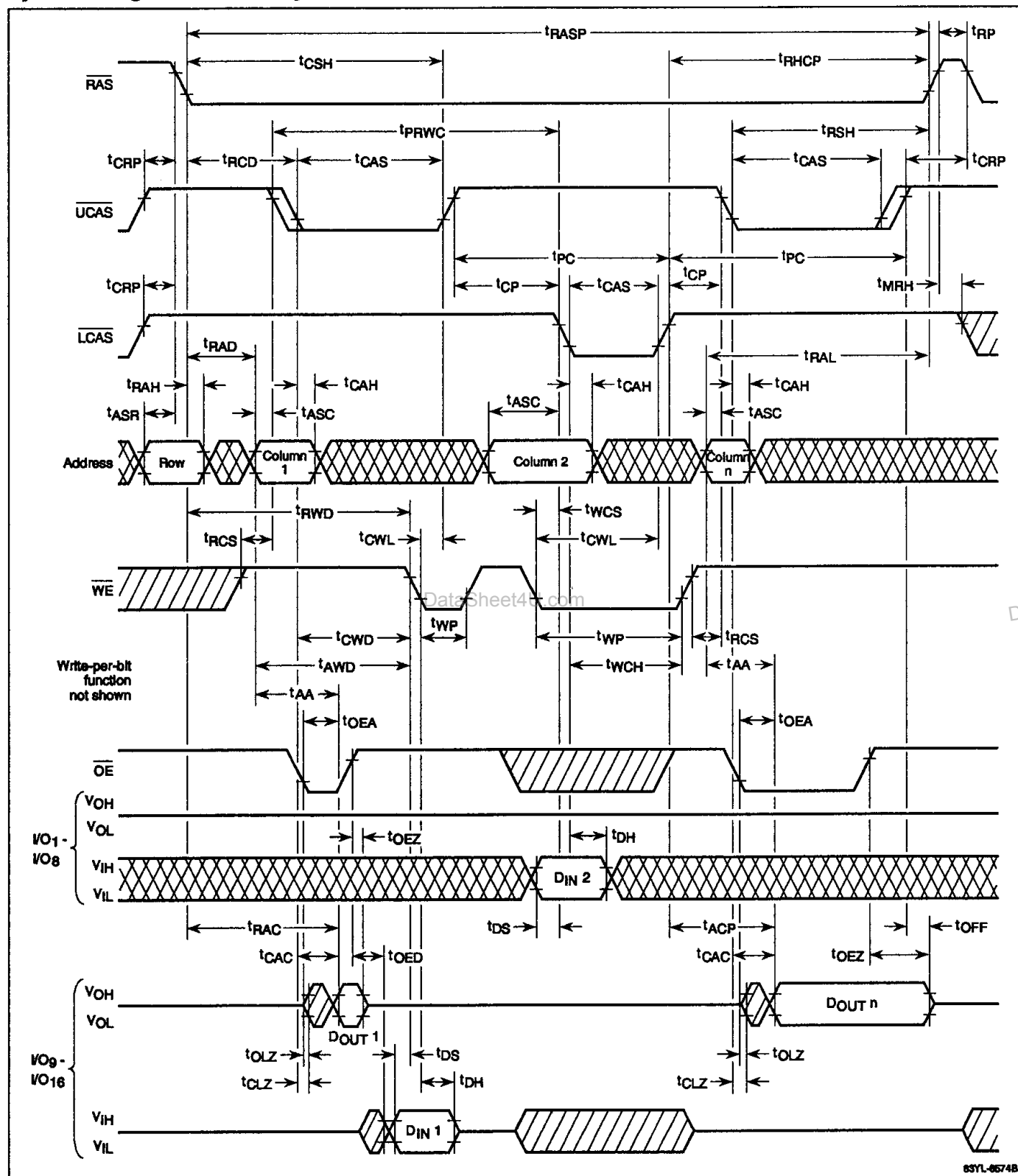
7D-24

Timing Waveforms (cont)**Byte Fast-Page Late-Write Cycle**

μPD424263A/L, 42S4263A/L

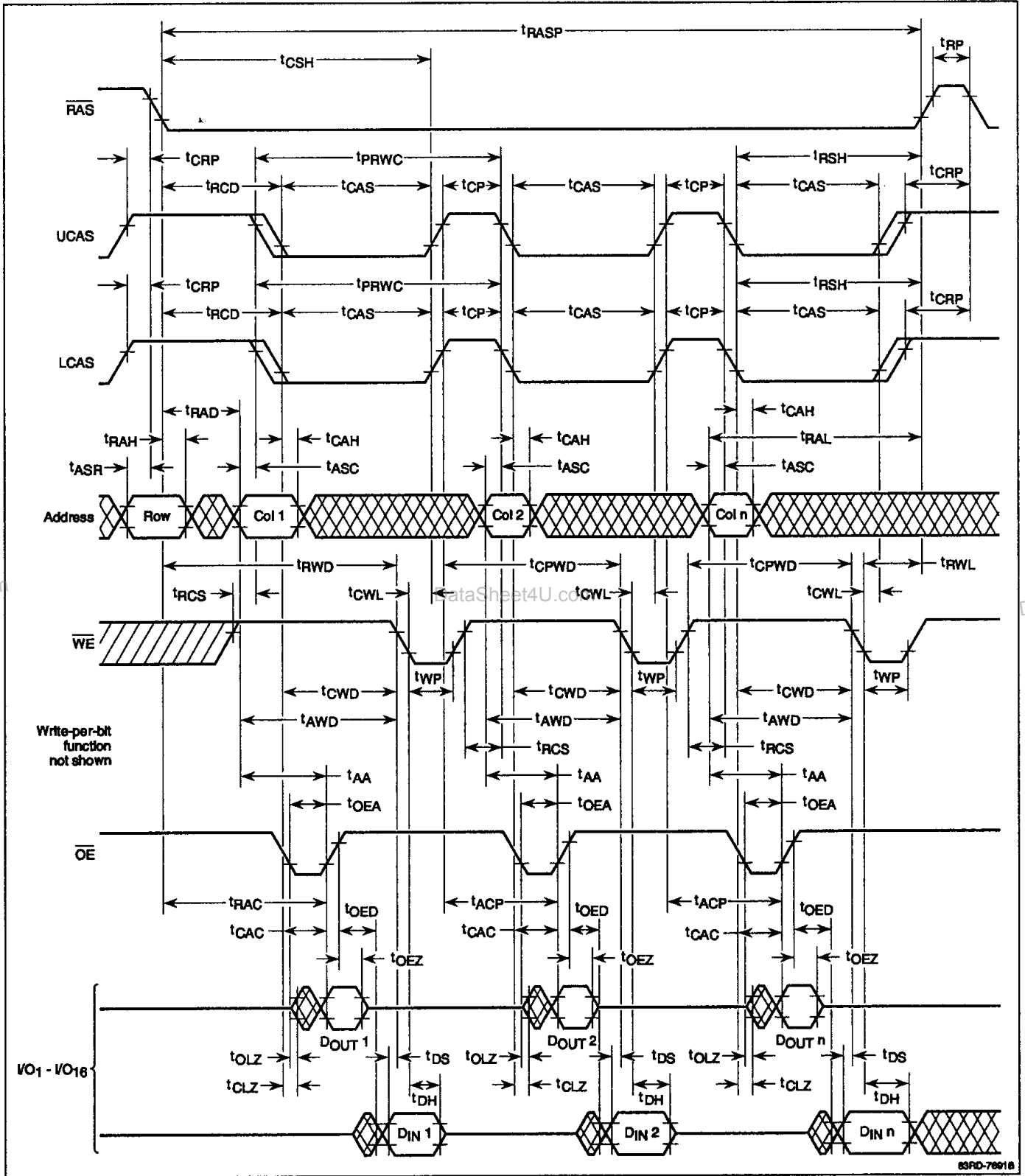
Timing Waveforms (cont)

Byte Fast-Page Read/Write Cycle



Timing Waveforms (cont)

Word Fast-Page Read-Modify-Write Cycle



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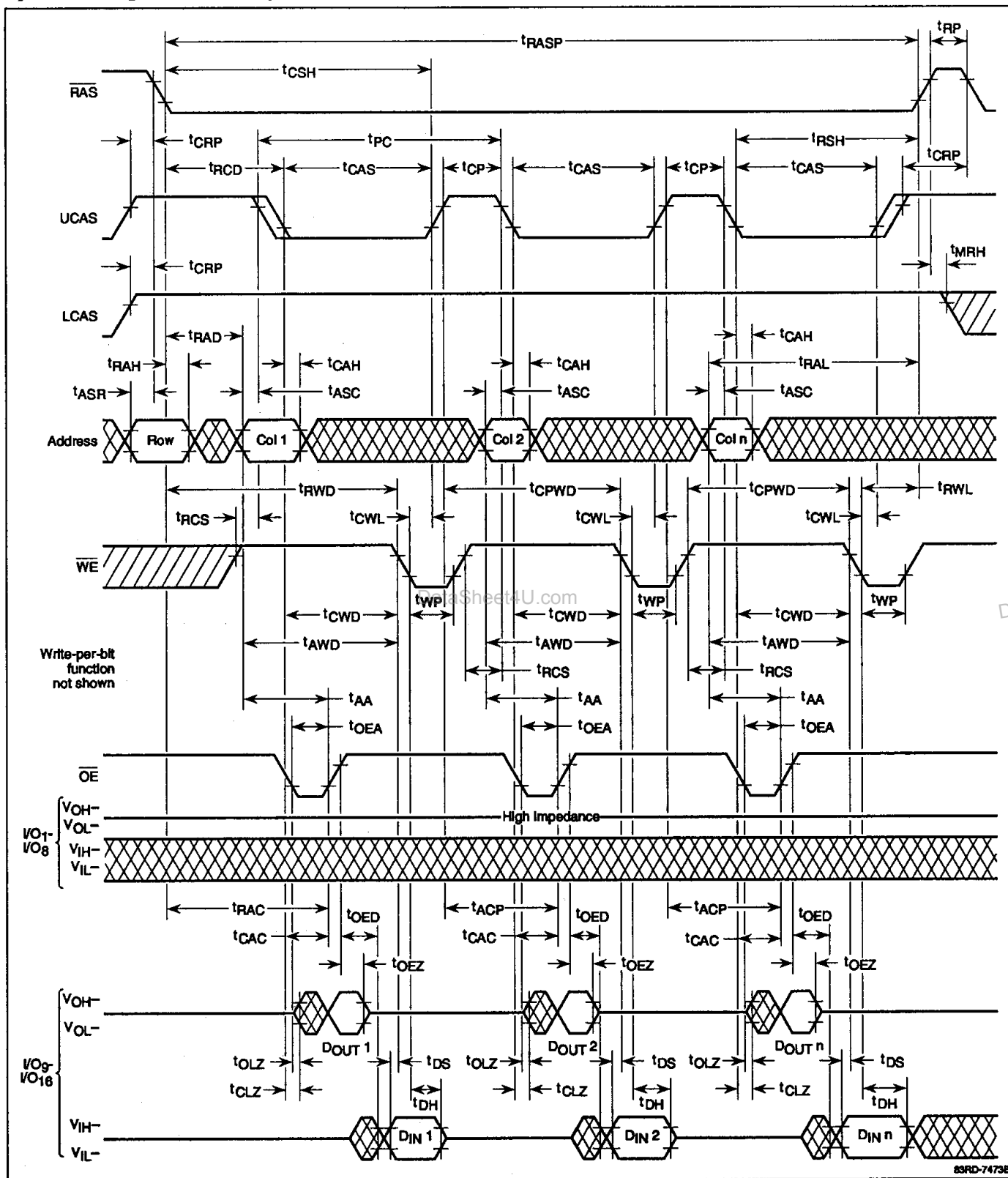
7d

7D-27

μPD424263A/L, 42S4263A/L

Timing Waveforms (cont)

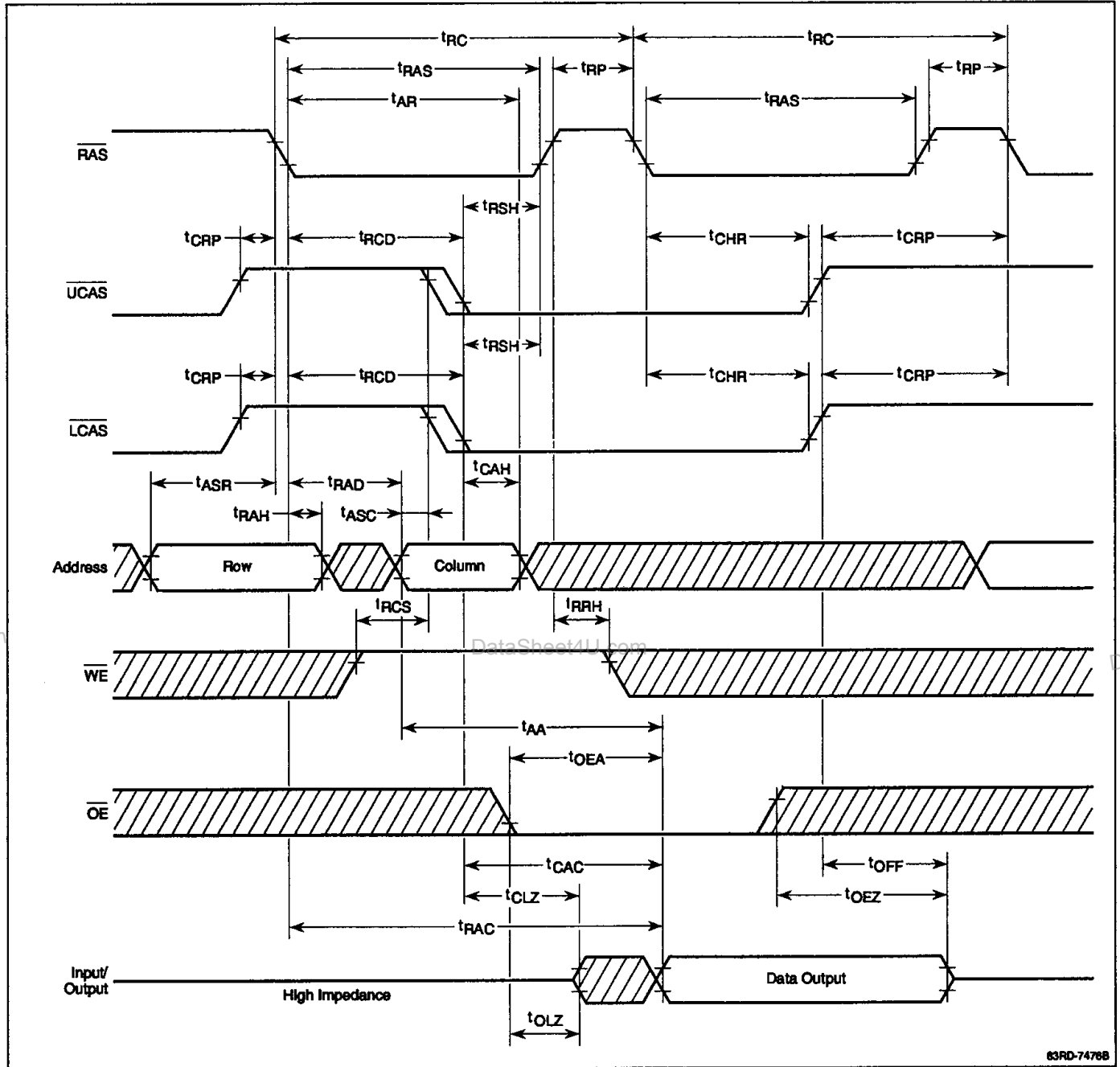
Byte Fast-Page Read-Modify-Write Cycle



83RD-7473B

Timing Waveforms (cont)

Hidden Refresh Cycle (Word Read Cycle)



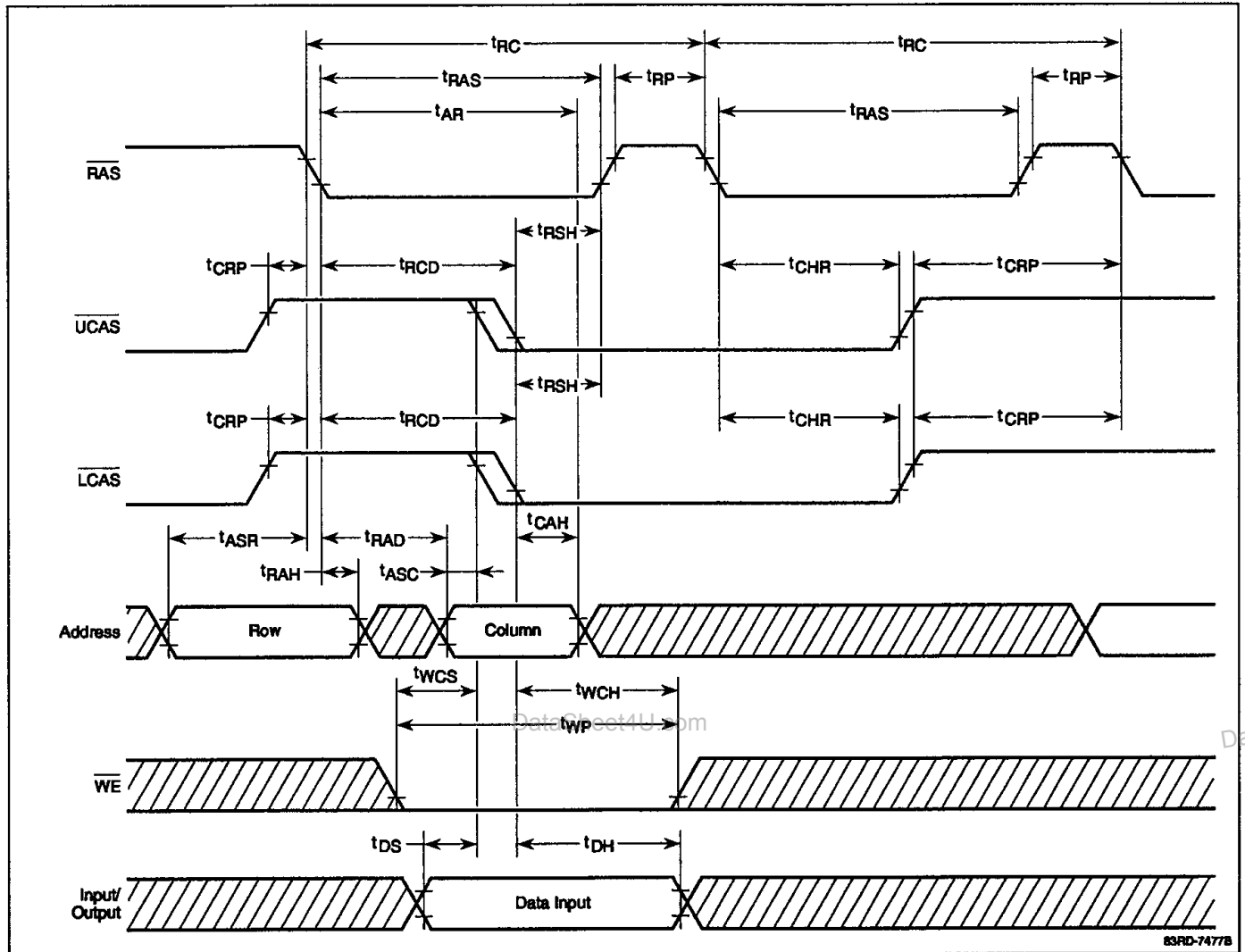
7d

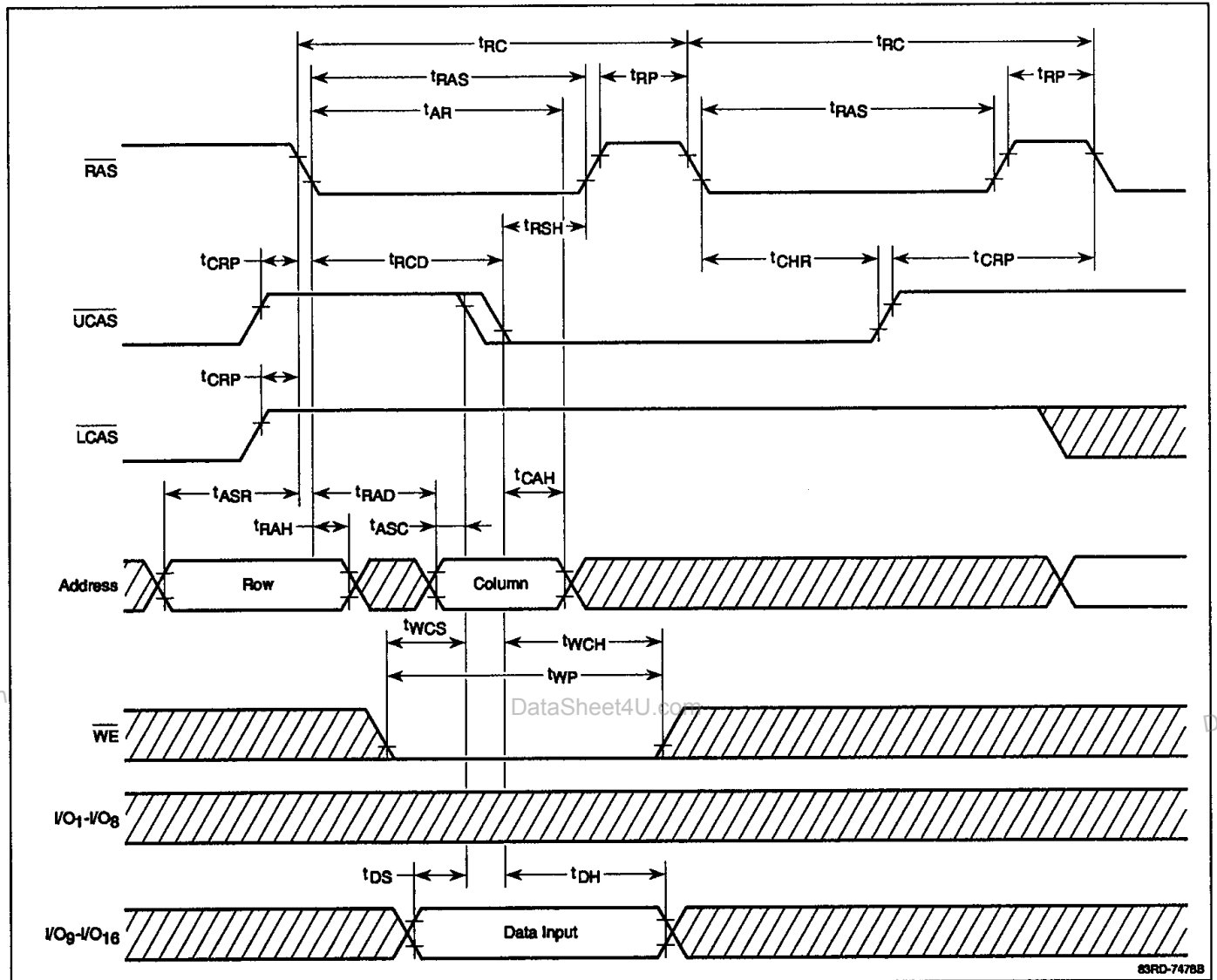
7D-29

μ PD424263A/L, 42S4263A/L

Timing Waveforms (cont)

Hidden Refresh Cycle (Word Write Cycle)

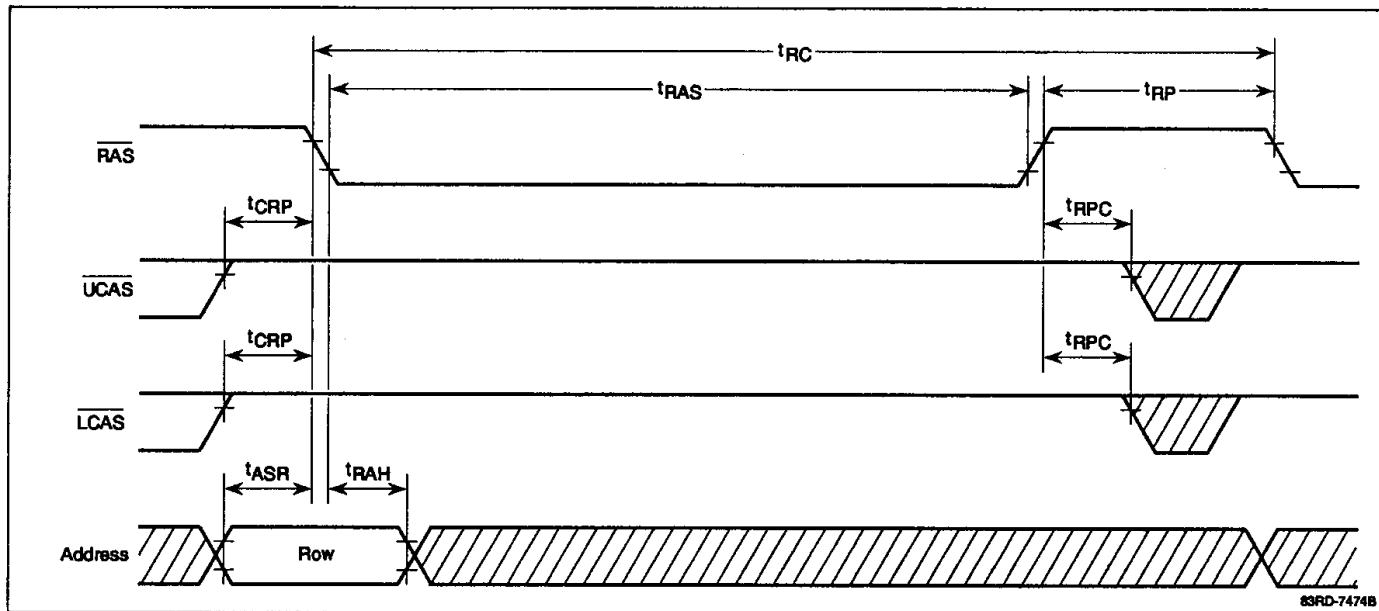


Timing Waveforms (cont)**Hidden Refresh Cycle (Byte Write Cycle)**

μPD424263A/L, 42S4263A/L

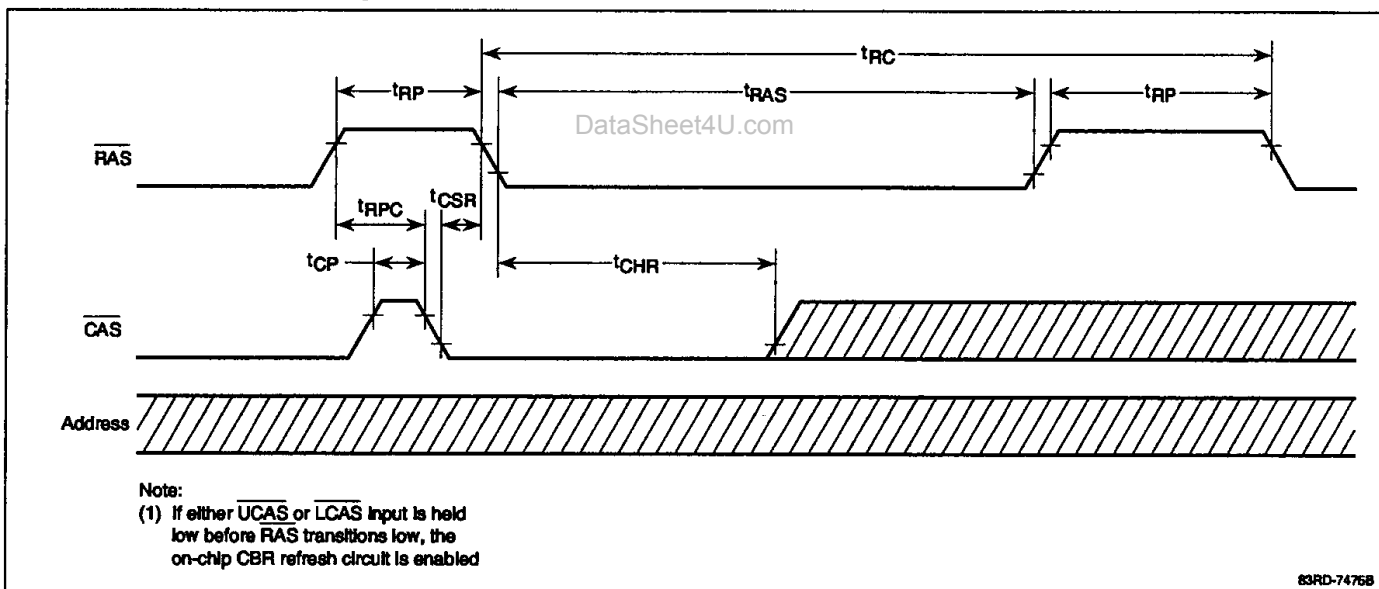
Timing Waveforms (cont)

RAS-Only Refresh Cycle



83RD-7474B

CAS Before RAS Refresh Cycle



Note:
(1) If either UCAS or LCAS input is held low before RAS transitions low, the on-chip CBR refresh circuit is enabled

83RD-7476B