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# R1LP0108E Series

1Mb Advanced LPSRAM (128k word x 8bit)

R10DS0151EJ0100  
Rev.1.00  
2013.6.21

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## Description

The R1LP0108E Series is a family of low voltage 1-Mbit static RAMs organized as 131,072-word by 8-bit, fabricated by Renesas's high-performance 0.15um CMOS and TFT technologies. The R1LP0108E Series has realized higher density, higher performance and low power consumption. The R1LP0108E Series is suitable for memory applications where a simple interfacing, battery operating and battery backup are the important design objectives. It has been packaged in 32-pin SOP, 32-pin TSOP and 32-pin sTSSOP.

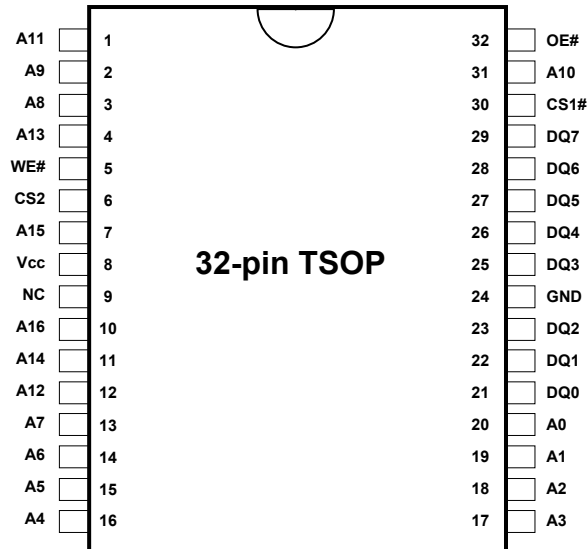
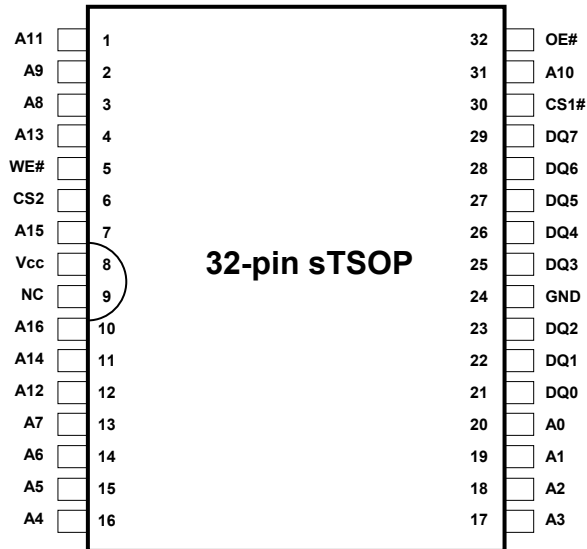
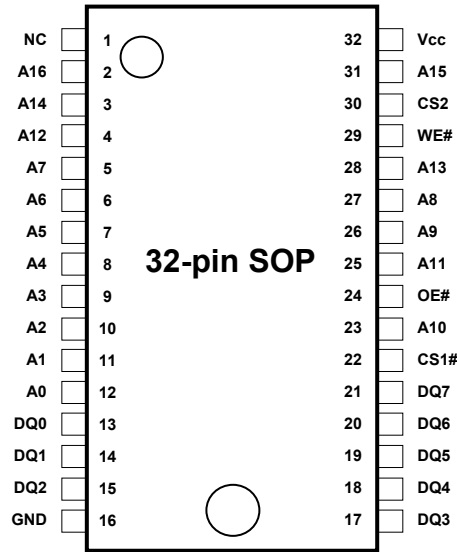
## Features

- Single 4.5~5.5V power supply
- Small stand-by current: 0.6μA (5.0V, typical)
- No clocks, No refresh
- All inputs and outputs are TTL compatible.
- Easy memory expansion by CS1# and CS2
- Common Data I/O
- Three-state outputs: OR-tie Capability
- OE# prevents data contention on the I/O bus

## Ordering Information

Orderable Part Name	Access time	Temperature Range	Package	Shipping Container	Quantity			
R1LP0108ESN-5SR#B*	55 ns	0 ~ +70°C	525-mil 32-pin plastic SOP	Tube	Max. 25pcs/Tube Max. 225pcs/Inner Bag Max. 900pcs/Inner Box			
R1LP0108ESN-5SI#B*		-40 ~ +85°C						
R1LP0108ESN-7SR#B*	70 ns	0 ~ +70°C						
R1LP0108ESN-7SI#B*		-40 ~ +85°C						
R1LP0108ESN-5SR#S*	55 ns	0 ~ +70°C	PRSP0032DF-A (32P2S-A)	Embossed tape	1000pcs/Reel			
R1LP0108ESN-5SI#S*		-40 ~ +85°C						
R1LP0108ESN-7SR#S*	70 ns	0 ~ +70°C						
R1LP0108ESN-7SI#S*		-40 ~ +85°C						
R1LP0108ESA-5SR#B*	55 ns	0 ~ +70°C				8mm×13.4mm 32-pin plastic sTSOP (normal-bend type)	Tray	Max. 234pcs/Tray Max. 1872pcs/Inner Box
R1LP0108ESA-5SI#B*		-40 ~ +85°C						
R1LP0108ESA-7SR#B*	70 ns	0 ~ +70°C						
R1LP0108ESA-7SI#B*		-40 ~ +85°C						
R1LP0108ESA-5SR#S*	55 ns	0 ~ +70°C	PTSA0032KB-A (32P3K-B)	Embossed tape	1000pcs/Reel			
R1LP0108ESA-5SI#S*		-40 ~ +85°C						
R1LP0108ESA-7SR#S*	70 ns	0 ~ +70°C						
R1LP0108ESA-7SI#S*		-40 ~ +85°C						
R1LP0108ESF-5SR#B*	55 ns	0 ~ +70°C				8mm×20mm 32-pin plastic TSOP (normal-bend type)	Tray	Max. 156pcs/Tray Max. 1248pcs/Inner Box
R1LP0108ESF-5SI#B*		-40 ~ +85°C						
R1LP0108ESF-7SR#B*	70 ns	0 ~ +70°C						
R1LP0108ESF-7SI#B*		-40 ~ +85°C						
R1LP0108ESF-5SR#S*	55 ns	0 ~ +70°C	PTSA0032KA-A (32P3H-E)	Embossed tape	1000pcs/Reel			
R1LP0108ESF-5SI#S*		-40 ~ +85°C						
R1LP0108ESF-7SR#S*	70 ns	0 ~ +70°C						
R1LP0108ESF-7SI#S*		-40 ~ +85°C						

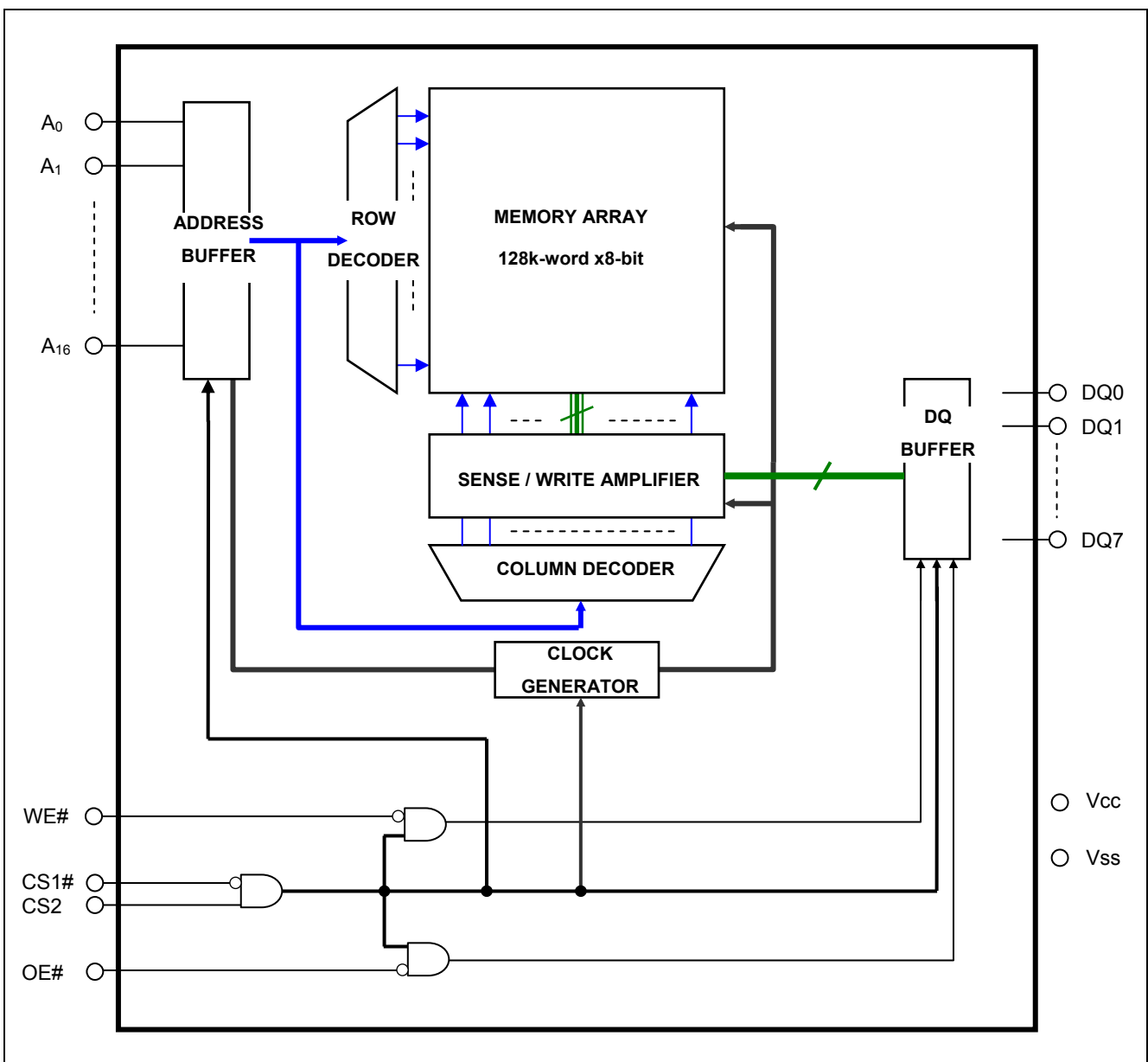
Pin Arrangement



### Pin Description

Pin name	Function
Vcc	Power supply
Vss	Ground
A0 to A16	Address input
DQ0 to DQ7	Data input/output
CS1#	Chip select 1
CS2	Chip select 2
WE#	Write enable
OE#	Output enable
NC	Non connection

### Block Diagram



## Operation Table

CS1#	CS2	WE#	OE#	DQ0~7	Operation
X	L	X	X	High-Z	Stand-by
H	X	X	X	High-Z	Stand-by
L	H	L	X	Din	Write
L	H	H	L	Dout	Read
L	H	H	H	High-Z	Output disable

Note 1. H:  $V_{IH}$  L:  $V_{IL}$  X:  $V_{IH}$  or  $V_{IL}$

## Absolute Maximum

Parameter	Symbol	Value	unit
Power supply voltage relative to Vss	Vcc	-0.3 to +7	V
Terminal voltage on any pin relative to Vss	$V_T$	$-0.3^{*1}$ to $V_{cc}+0.3^{*2}$	V
Power dissipation	$P_T$	0.7	W
Operation temperature	$T_{opr}^{*3}$	R Ver.	0 to +70
		I Ver.	-40 to +85
Storage temperature range	$T_{stg}$	-65 to 150	°C
Storage temperature range under bias	$T_{bias}^{*3}$	R Ver.	0 to +70
		I Ver.	-40 to +85

- Note
1. -3.0V for pulse  $\leq 30$ ns (full width at half maximum)
  2. Maximum voltage is +7V.
  3. Ambient temperature range depends on R/I-version. Please see table on page 1.

## DC Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note	
Supply voltage	V <sub>CC</sub>	4.5	5.0	5.5	V		
	V <sub>SS</sub>	0	0	0	V		
Input high voltage	V <sub>IH</sub>	2.2	-	V <sub>CC</sub> +0.3	V		
Input low voltage	V <sub>IL</sub>	-0.3	-	0.8	V	1	
Ambient temperature range	R Ver.	T <sub>a</sub>	0	-	+70	°C	2
	I Ver.		-40	-	+85	°C	2

- Note 1. -3.0V for pulse ≤ 30ns (full width at half maximum)  
 2. Ambient temperature range depends on R/I-version. Please see table on page 1.

## DC Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions	
Input leakage current	I <sub>LI</sub>	-	-	1	μA	V <sub>in</sub> = V <sub>SS</sub> to V <sub>CC</sub>	
Output leakage current	I <sub>LO</sub>	-	-	1	μA	CS1# = V <sub>IH</sub> or CS2 = V <sub>IL</sub> or OE# = V <sub>IH</sub> , V <sub>I/O</sub> = V <sub>SS</sub> to V <sub>CC</sub>	
Average operating current	I <sub>CC1</sub>	-	25	35	mA	Min. cycle, duty = 100%, I <sub>I/O</sub> = 0mA CS1# = V <sub>IL</sub> , CS2 = V <sub>IH</sub> , Others = V <sub>IH</sub> /V <sub>IL</sub>	
	I <sub>CC2</sub>	-	2	5	mA	Cycle = 1μs, duty = 100%, I <sub>I/O</sub> = 0mA CS1# ≤ 0.2V, CS2 ≥ V <sub>CC</sub> -0.2V, V <sub>IH</sub> ≥ V <sub>CC</sub> -0.2V, V <sub>IL</sub> ≤ 0.2V	
Standby current	I <sub>SB</sub>	-	-	3	mA	"CS2 = V <sub>IL</sub> " or "CS2 = V <sub>IH</sub> and CS1# = V <sub>IH</sub> ", Others = V <sub>SS</sub> to V <sub>CC</sub>	
Standby current	I <sub>SB1</sub>	-	0.6 <sup>*1</sup>	2	μA	~+25°C	V <sub>in</sub> = V <sub>SS</sub> to V <sub>CC</sub>  (1) CS2 ≤ 0.2 or (2) CS1# ≥ V <sub>CC</sub> -0.2V, CS2 ≥ V <sub>CC</sub> -0.2V
		-	-	3	μA	~+40°C	
		-	-	8	μA	~+70°C	
		-	-	10	μA	~+85°C	
Output high voltage	V <sub>OH</sub>	2.4	-	-	V	I <sub>OH</sub> = -1mA	
	V <sub>OH2</sub>	V <sub>CC</sub> - 0.5	-	-	V	I <sub>OH</sub> = -0.1mA	
Output low voltage	V <sub>OL</sub>	-	-	0.4	V	I <sub>OL</sub> = 2mA	

- Note 1. Typical parameter indicates the value for the center of distribution at 5.0V (T<sub>a</sub> = 25°C), and not 100% tested.

## Capacitance

(V<sub>CC</sub> = 4.5V ~ 5.5V, f = 1MHz, T<sub>a</sub> = 0 ~ +70°C / -40 ~ +85°C<sup>\*2</sup>)

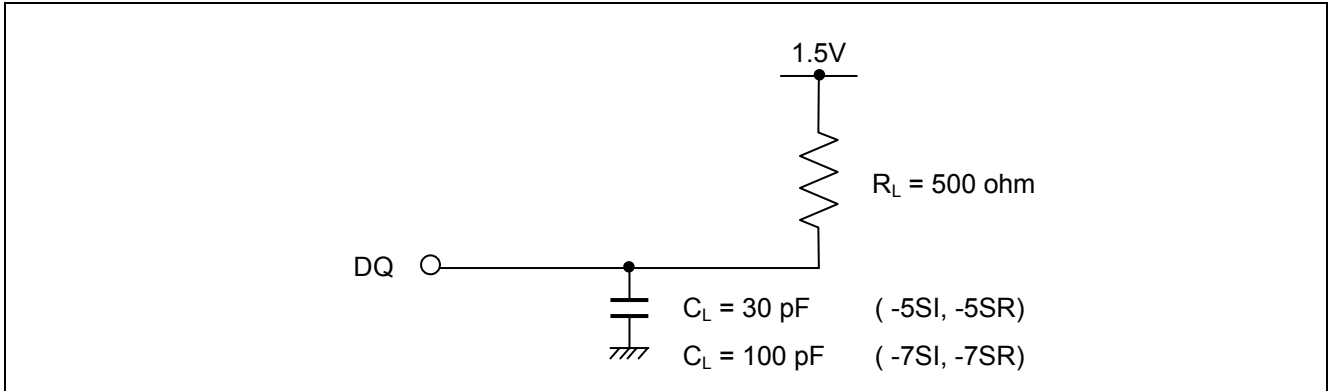
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions	Note
Input capacitance	C <sub>in</sub>	-	-	8	pF	V <sub>in</sub> = 0V	1
Input / output capacitance	C <sub>I/O</sub>	-	-	10	pF	V <sub>I/O</sub> = 0V	1

- Note 1. This parameter is sampled and not 100% tested.  
 2. Ambient temperature range depends on R/I-version. Please see table on page 1.

## AC Characteristics

Test Conditions ( $V_{CC} = 4.5V \sim 5.5V$ ,  $T_a = 0 \sim +70^{\circ}C / -40 \sim +85^{\circ}C^{*1}$ )

- Input pulse levels:  $V_{IL} = 0.6V$ ,  $V_{IH} = 2.4V$
- Input rise and fall time: 5ns
- Input and output timing reference level: 1.5V
- Output load: See figures (Including scope and jig)



Note 1. Ambient temperature range depends on R/I-version. Please see table on page 1.

## Read Cycle

Parameter	Symbol	R1LP0108E**-5**		R1LP0108E**-7**		Unit	Note
		Min.	Max.	Min.	Max.		
Read cycle time	$t_{RC}$	55	-	70	-	ns	
Address access time	$t_{AA}$	-	55	-	70	ns	
Chip select access time	$t_{ACS1}$	-	55	-	70	ns	
	$t_{ACS2}$	-	55	-	70	ns	
Output enable to output valid	$t_{OE}$	-	30	-	35	ns	
Output hold from address change	$t_{OH}$	5	-	10	-	ns	
Chip select to output in low-Z	$t_{CLZ1}$	5	-	10	-	ns	2,3
	$t_{CLZ2}$	5	-	10	-	ns	2,3
Output enable to output in low-Z	$t_{OLZ}$	5	-	5	-	ns	2,3
Chip deselect to output in high-Z	$t_{CHZ1}$	0	20	0	25	ns	1,2,3
	$t_{CHZ2}$	0	20	0	25	ns	1,2,3
Output disable to output in high-Z	$t_{OHZ}$	0	20	0	25	ns	1,2,3

## Write Cycle

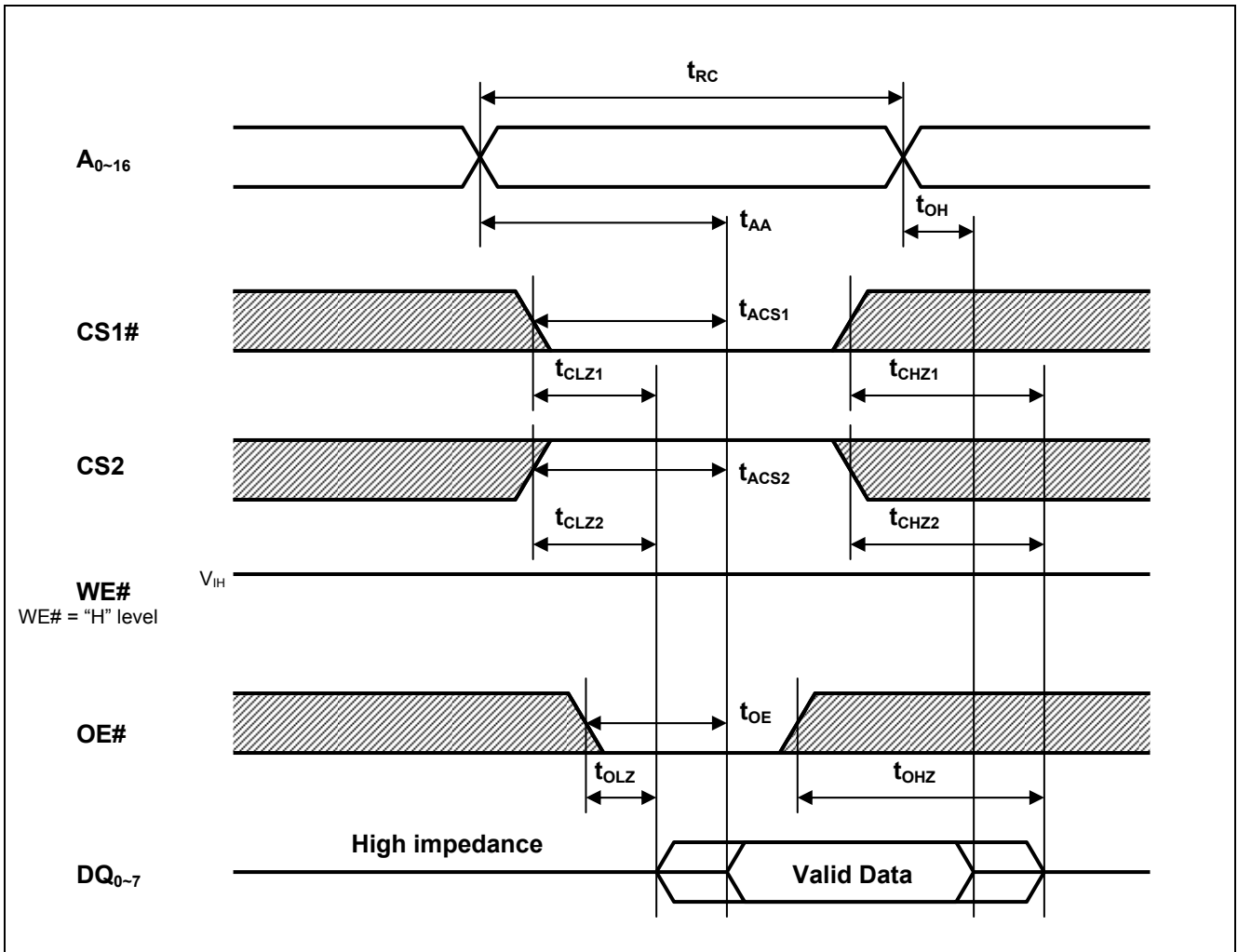
Parameter	Symbol	R1LP0108E**-5**		R1LP0108E**-7**		Unit	Note
		Min.	Max.	Min.	Max.		
Write cycle time	$t_{WC}$	55	-	70	-	ns	
Address valid to end of write	$t_{AW}$	50	-	55	-	ns	
Chip select to end of write	$t_{CW}$	50	-	55	-	ns	5
Write pulse width	$t_{WP}$	45	-	50	-	ns	4
Address setup time	$t_{AS}$	0	-	0	-	ns	6
Write recovery time	$t_{WR}$	0	-	0	-	ns	7
Data to write time overlap	$t_{DW}$	25	-	30	-	ns	
Data hold from write time	$t_{DH}$	0	-	0	-	ns	
Output enable from end of write	$t_{OW}$	5	-	5	-	ns	2
Output disable to output in high-Z	$t_{OHZ}$	0	20	0	25	ns	1,2
Write to output in high-Z	$t_{WHZ}$	0	20	0	25	ns	1,2

- Note
- $t_{CHZ}$ ,  $t_{OHZ}$  and  $t_{WHZ}$  are defined as the time at which the outputs achieve the open circuit conditions and are not referred to output voltage levels.
  - This parameter is sampled and not 100% tested.
  - At any given temperature and voltage condition,  $t_{HZ}$  max is less than  $t_{LZ}$  min both for a given device and from device to device.
  - A write occurs during the overlap of a low CS1#, a high CS2, a low WE#.
    - A write begins at the latest transition among CS1# going low, CS2 going high and WE# going low.
    - A write ends at the earliest transition among CS1# going high, CS2 going low and WE# going high.
    - $t_{WP}$  is measured from the beginning of write to the end of write.
  - $t_{CW}$  is measured from the later of CS1# going low or CS2 going high to end of write.
  - $t_{AS}$  is measured the address valid to the beginning of write.
  - $t_{WR}$  is measured from the earliest of CS1# or WE# going high or CS2 going low to the end of write cycle.
  - Don't apply inverted phase signal externally when DQ pin is output mode.

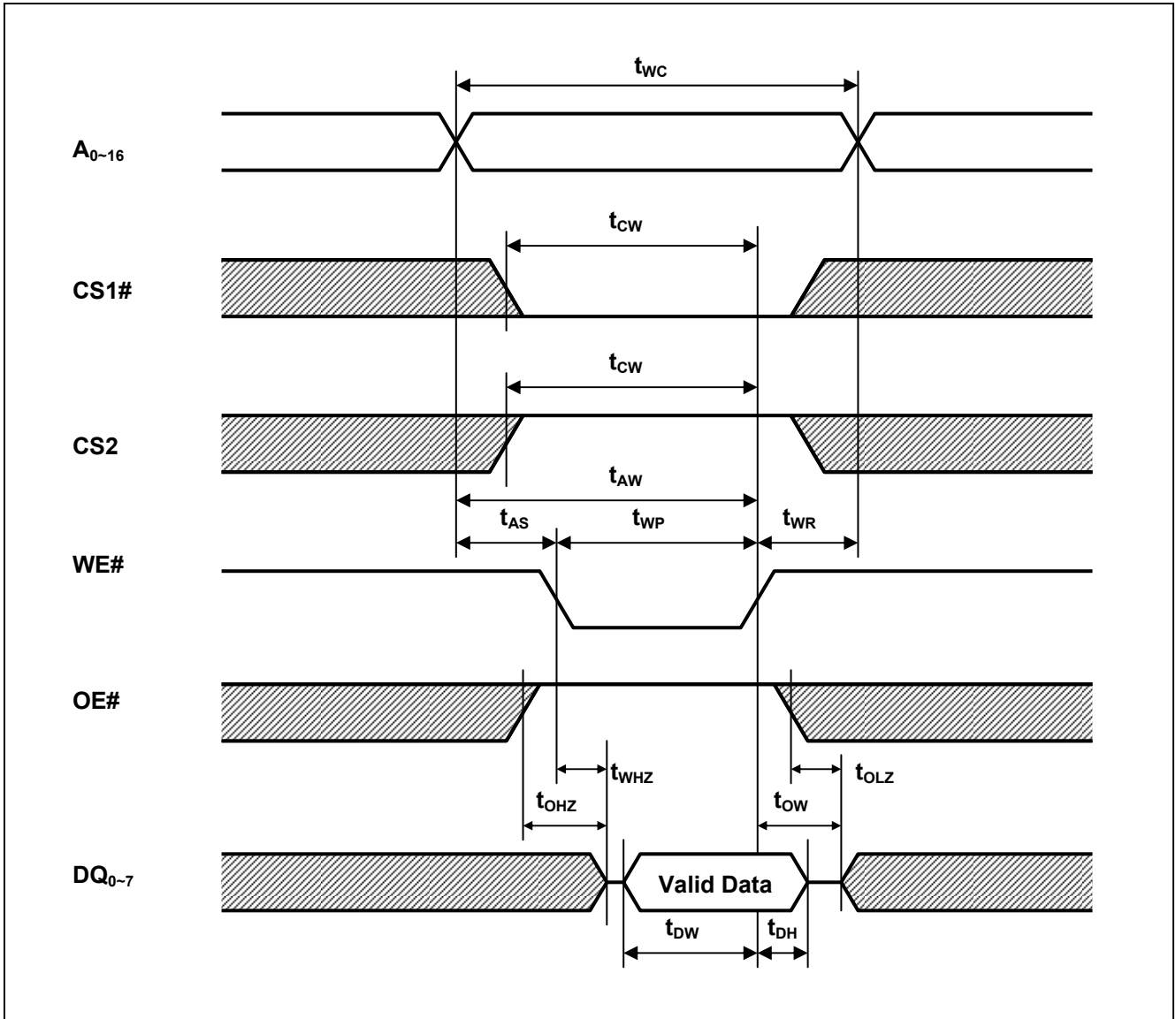


## Timing Waveforms

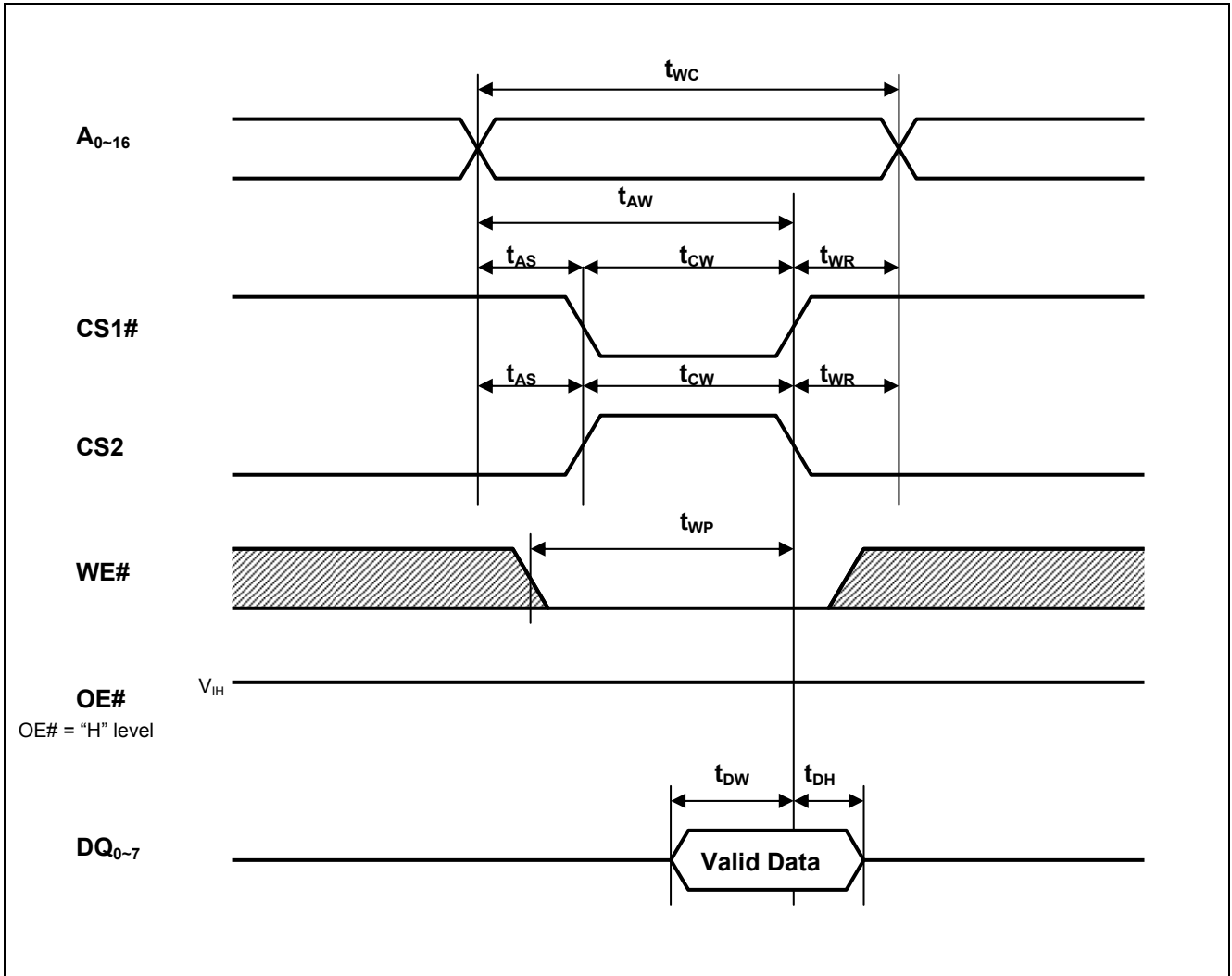
### Read Cycle



Write Cycle (1) (WE# CLOCK)



Write Cycle (2) (CS1#, CS2 CLOCK)

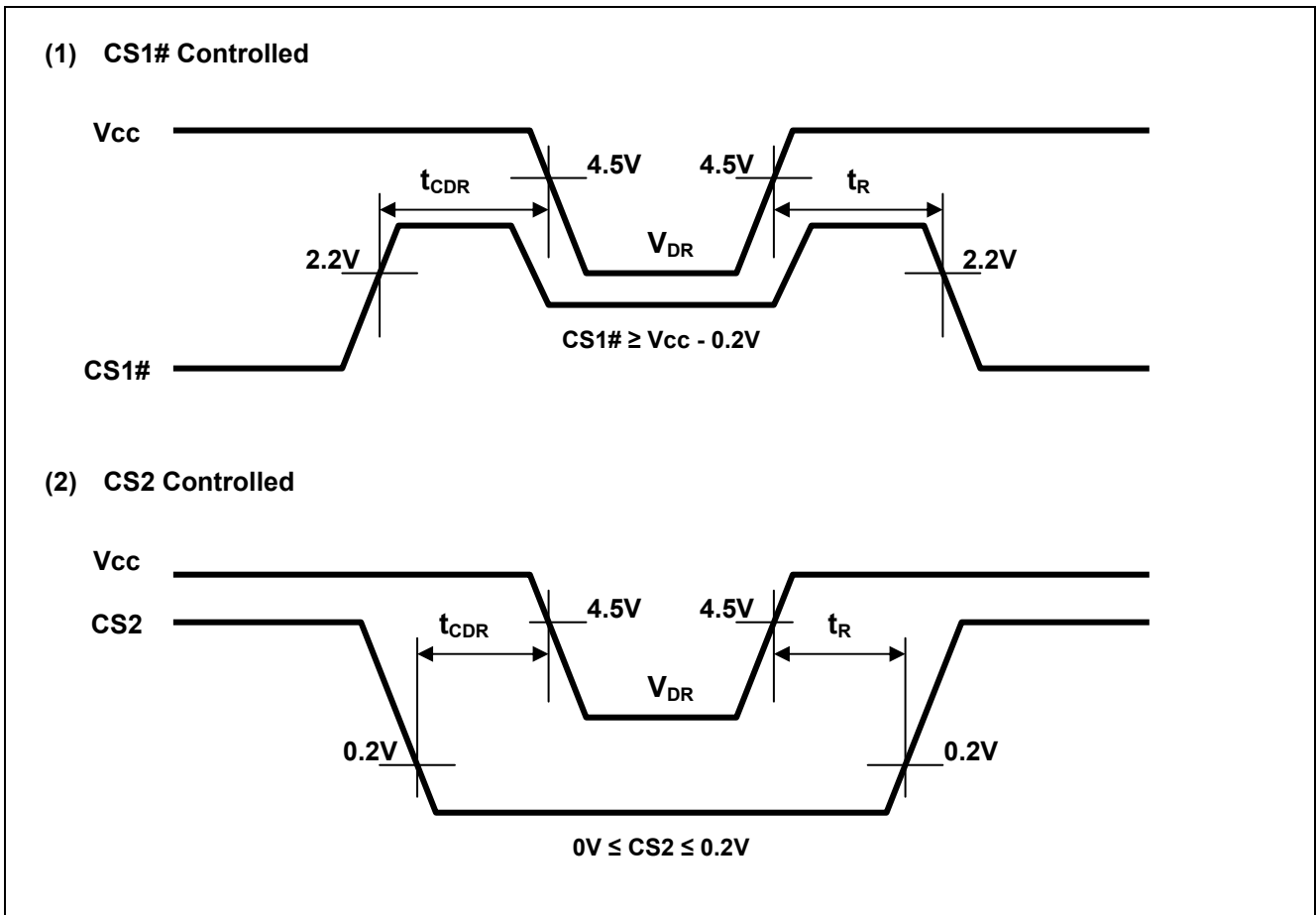


### Low Vcc Data Retention Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions <sup>2</sup>	
V <sub>CC</sub> for data retention	V <sub>DR</sub>	2.0	-	5.5	V	V <sub>in</sub> ≥ 0V (1) 0V ≤ CS2 ≤ 0.2V or (2) CS1# ≥ V <sub>CC</sub> -0.2V, CS2 ≥ V <sub>CC</sub> -0.2V	
Data retention current	I <sub>CCDR</sub>	-	0.6 <sup>*1</sup>	2	μA	~+25°C	V <sub>CC</sub> =3.0V, V <sub>in</sub> ≥ 0V  (1) 0V ≤ CS2 ≤ 0.2V or (2) CS1# ≥ V <sub>CC</sub> -0.2V, CS2 ≥ V <sub>CC</sub> -0.2V
		-	-	3	μA	~+40°C	
		-	-	8	μA	~+70°C	
		-	-	10	μA	~+85°C	
Chip deselect time to data retention	t <sub>CDR</sub>	0	-	-	ns	See retention waveform.	
Operation recovery time	t <sub>R</sub>	5	-	-	ms		

Note 1. Typical parameter indicates the value for the center of distribution at 3.0V (T<sub>a</sub>= 25°C), and not 100% tested.  
 2. CS2 controls address buffer, WE# buffer, CS1# buffer, OE# buffer and Din buffer. If CS2 controls data retention mode, V<sub>in</sub> levels (address, WE#, CS1#, OE#, DQ) can be in the high impedance state.  
 If CS1# controls data retention mode, CS2 must be CS2 ≥ V<sub>CC</sub>-0.2V or 0V ≤ CS2 ≤ 0.2V. The other input levels (address, WE#, OE#, DQ) can be in the high impedance state.

### Low Vcc Data Retention Timing Waveforms



Revision History	R1LP0108E Series Data Sheet
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Rev.	Date	Description	
		Page	Summary
1.00	2013.6.21	-	First Edition issued

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