

# R1LP5256E Series

256Kb Advanced LPSRAM (32k word x 8bit)

R10DS0268EJ0100  
Rev.1.00  
2017.1.27

## Description

The R1LP5256E Series is a family of low voltage 256-Kbit static RAMs organized as 32,768-word by 8-bit, fabricated by Renesas's high-performance 0.15um CMOS and TFT technologies. The R1LP5256E Series has realized higher density, higher performance and low power consumption. The R1LP5256E 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 28-pin SOP and 28-pin TSOP.

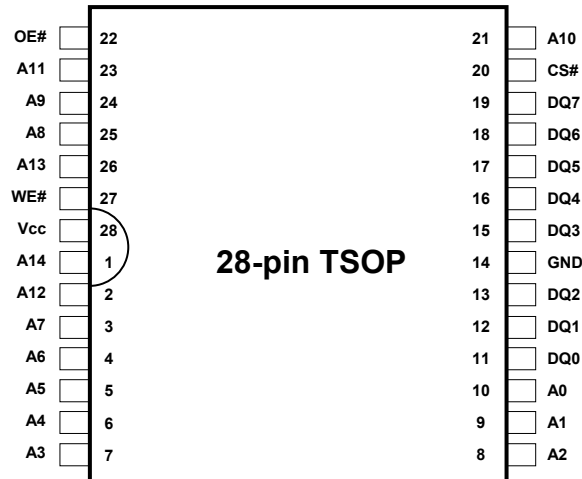
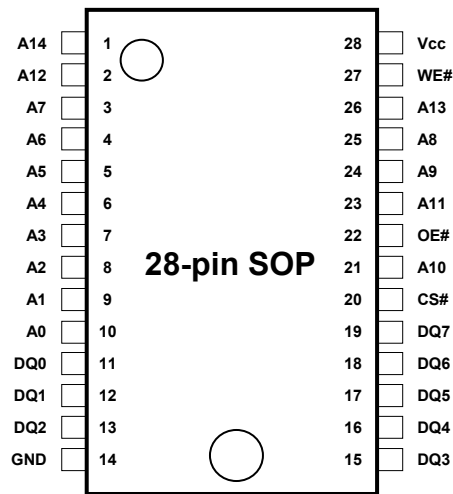
## Features

- Single 4.5V~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 CS#
- 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
R1LP5256ESP-5SI#B0	55 ns	-40 ~ +85°C	450-mil 28-pin plastic SOP	Tube (Magazine)
R1LP5256ESP-5SI#S0				Embossed tape
R1LP5256ESA-5SI#B1			8mm×13.4mm 28-pin plastic TSOP	Tray
R1LP5256ESA-5SI#S1				Embossed tape

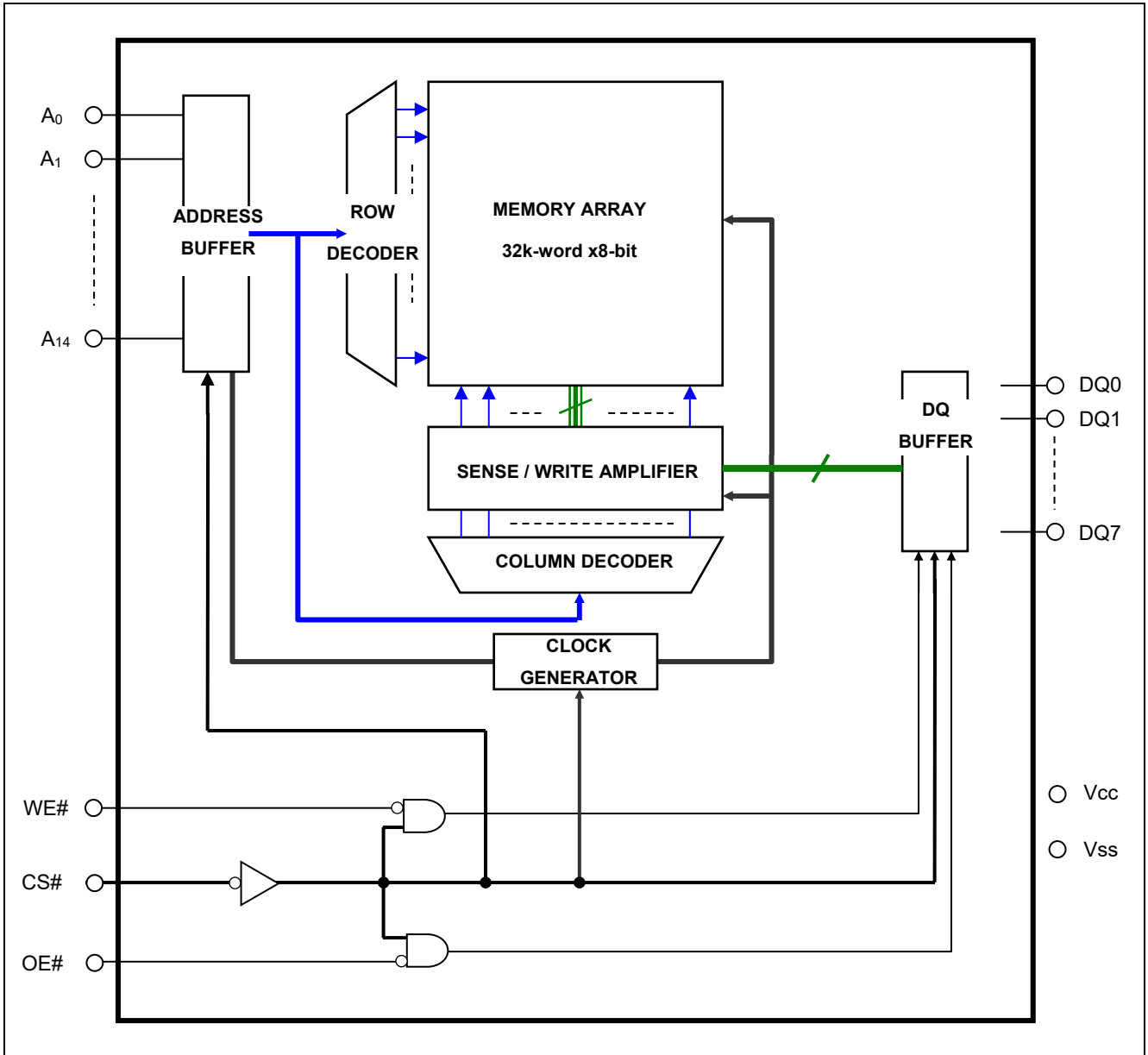
## Pin Arrangement



## Pin Description

Pin name	Function
Vcc	Power supply
Vss (GND)	Ground
A0 to A14	Address input
DQ0 to DQ7	Data input/output
CS#	Chip select
WE#	Write enable
OE#	Output enable

### Block Diagram



## Operation Table

CS#	WE#	OE#	DQ0~7	Operation
H	X	X	High-Z	Stand-by
L	L	X	Din	Write
L	H	L	Dout	Read
L	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 +7.0	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	Topr	-40 to +85	°C
Storage temperature range	Tstg	-65 to 150	°C
Storage temperature range under bias	Tbias	-40 to +85	°C

Note 1. -3.0V for pulse  $\leq$  30ns (full width at half maximum)  
 2. Maximum voltage is +7.0V.

## 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	T <sub>a</sub>	-40	-	+85	°C	

Note 1. -3.0V for pulse ≤ 30ns (full width at half maximum)

## 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	CS# = V <sub>IH</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, CS# = V <sub>IL</sub> , Others = V <sub>IH</sub> /V <sub>IL</sub>	
	I <sub>CC2</sub>	-	2	4	mA	Cycle = 1μs, duty = 100%, I <sub>I/O</sub> = 0mA, CS# ≤ 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	CS# = 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> , CS# ≥ 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> = -40 ~ +85°C)

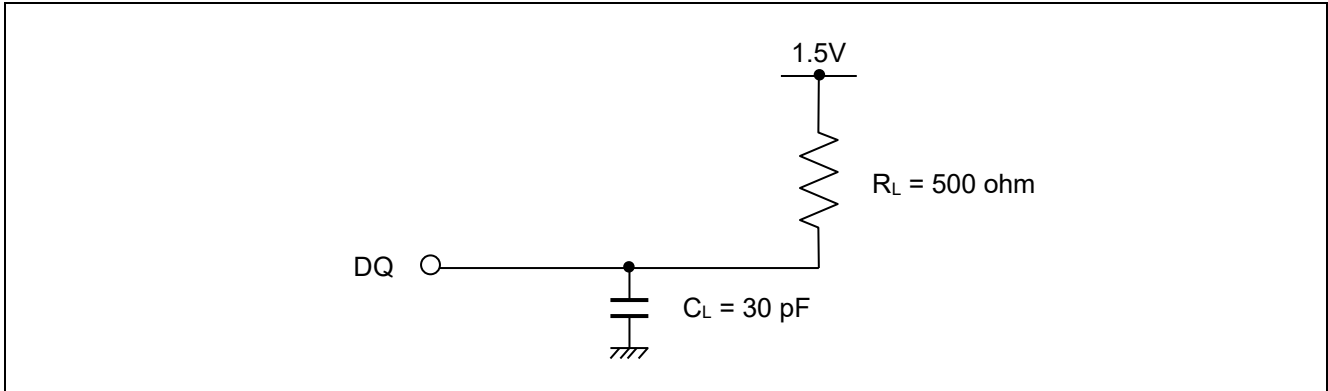
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions	Note
Input capacitance	C <sub>in</sub>	-	-	6	pF	V <sub>in</sub> = 0V	1
Input / output capacitance	C <sub>I/O</sub>	-	-	8	pF	V <sub>I/O</sub> = 0V	1

Note 1. This parameter is sampled and not 100% tested.

## AC Characteristics

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

- 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)



**Read Cycle**

Parameter	Symbol	Min.	Max.	Unit	Note
Read cycle time	$t_{RC}$	55	-	ns	
Address access time	$t_{AA}$	-	55	ns	
Chip select access time	$t_{ACS}$	-	55	ns	
Output enable to output valid	$t_{OE}$	-	30	ns	
Output hold from address change	$t_{OH}$	10	-	ns	
Chip select to output in low-Z	$t_{CLZ}$	5	-	ns	2,3
Output enable to output in low-Z	$t_{OLZ}$	5	-	ns	2,3
Chip deselect to output in high-Z	$t_{CHZ}$	0	20	ns	1,2,3
Output disable to output in high-Z	$t_{OHZ}$	0	20	ns	1,2,3

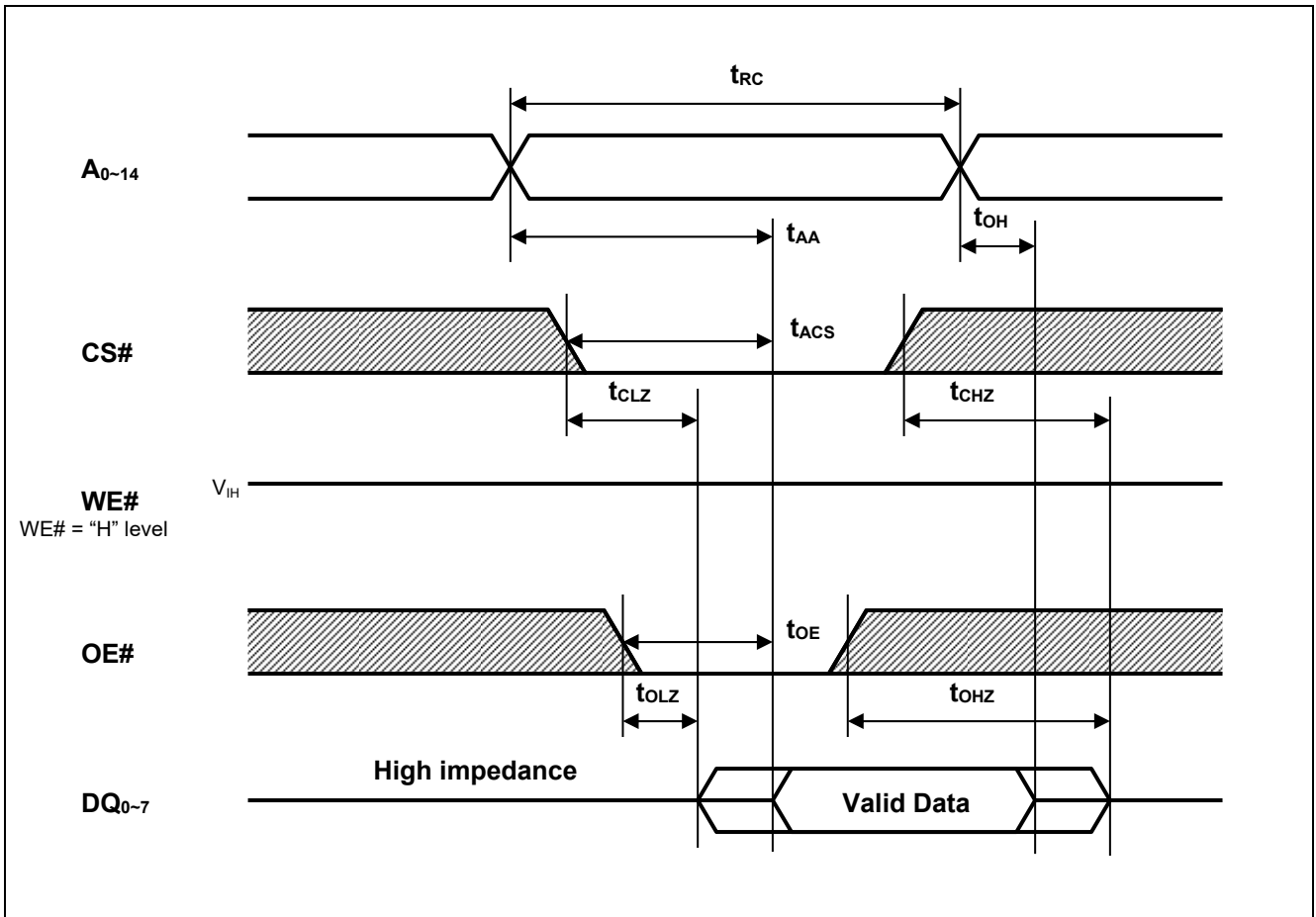
**Write Cycle**

Parameter	Symbol	Min.	Max.	Unit	Note
Write cycle time	$t_{WC}$	55	-	ns	
Address valid to end of write	$t_{AW}$	50	-	ns	
Chip select to end of write	$t_{CW}$	50	-	ns	5
Write pulse width	$t_{WP}$	40	-	ns	4
Address setup time	$t_{AS}$	0	-	ns	6
Write recovery time	$t_{WR}$	0	-	ns	7
Data to write time overlap	$t_{DW}$	25	-	ns	
Data hold from write time	$t_{DH}$	0	-	ns	
Output enable from end of write	$t_{OW}$	5	-	ns	2
Output disable to output in high-Z	$t_{OHZ}$	0	20	ns	1,2
Write to output in high-Z	$t_{WHZ}$	0	20	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 CS#, a low WE#.
    - A write begins at the latest transition among CS# going low and WE# going low.
    - A write ends at the earliest transition among CS# going high 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 CS# going low to end of write.
  - $t_{AS}$  is measured the address valid to the beginning of write.
  - $t_{WR}$  is measured from the earliest of CS# or WE# going high to the end of write cycle.
  - Don't apply inverted phase signal externally when DQ pin is output mode.

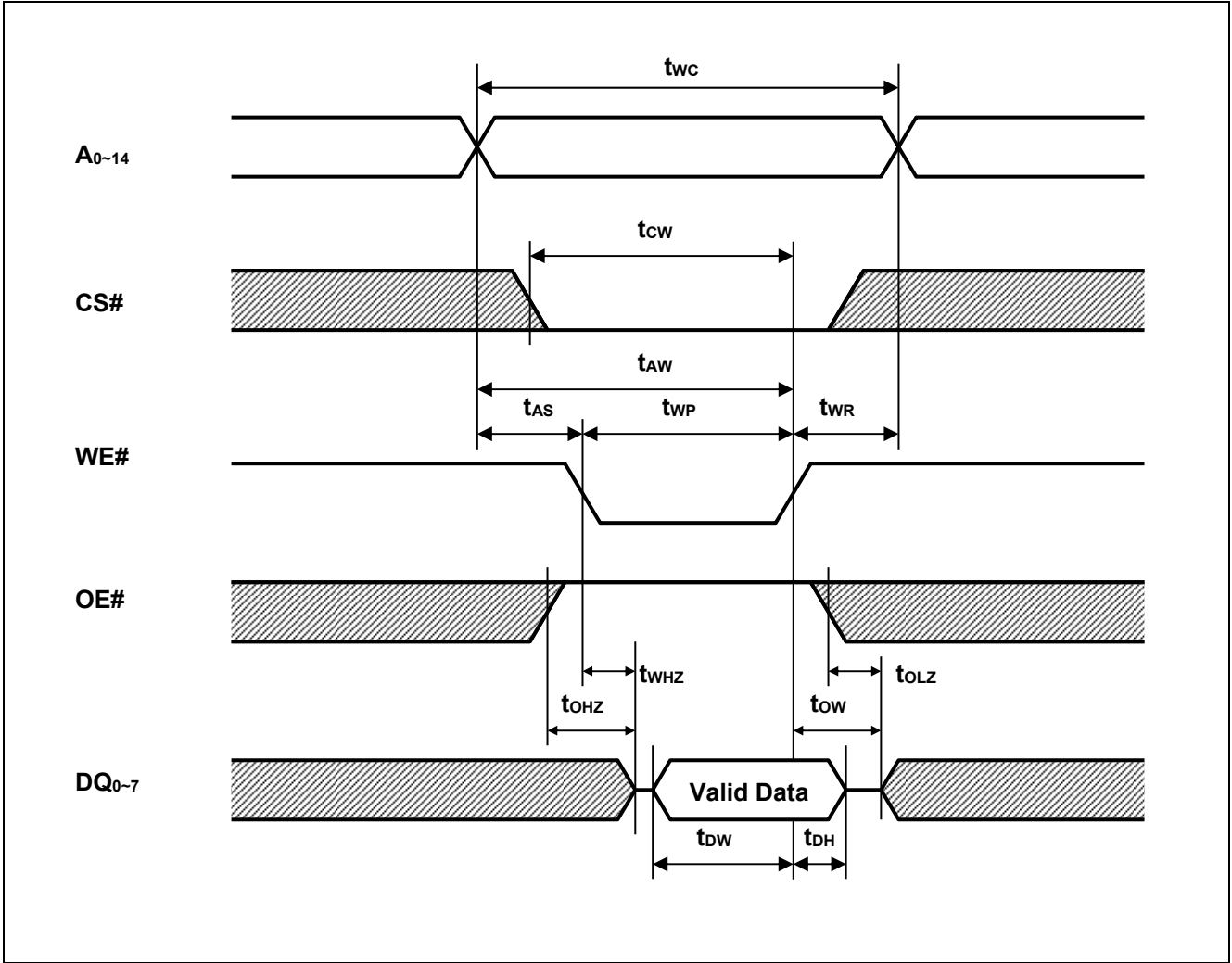
## Timing Waveforms

### Read Cycle

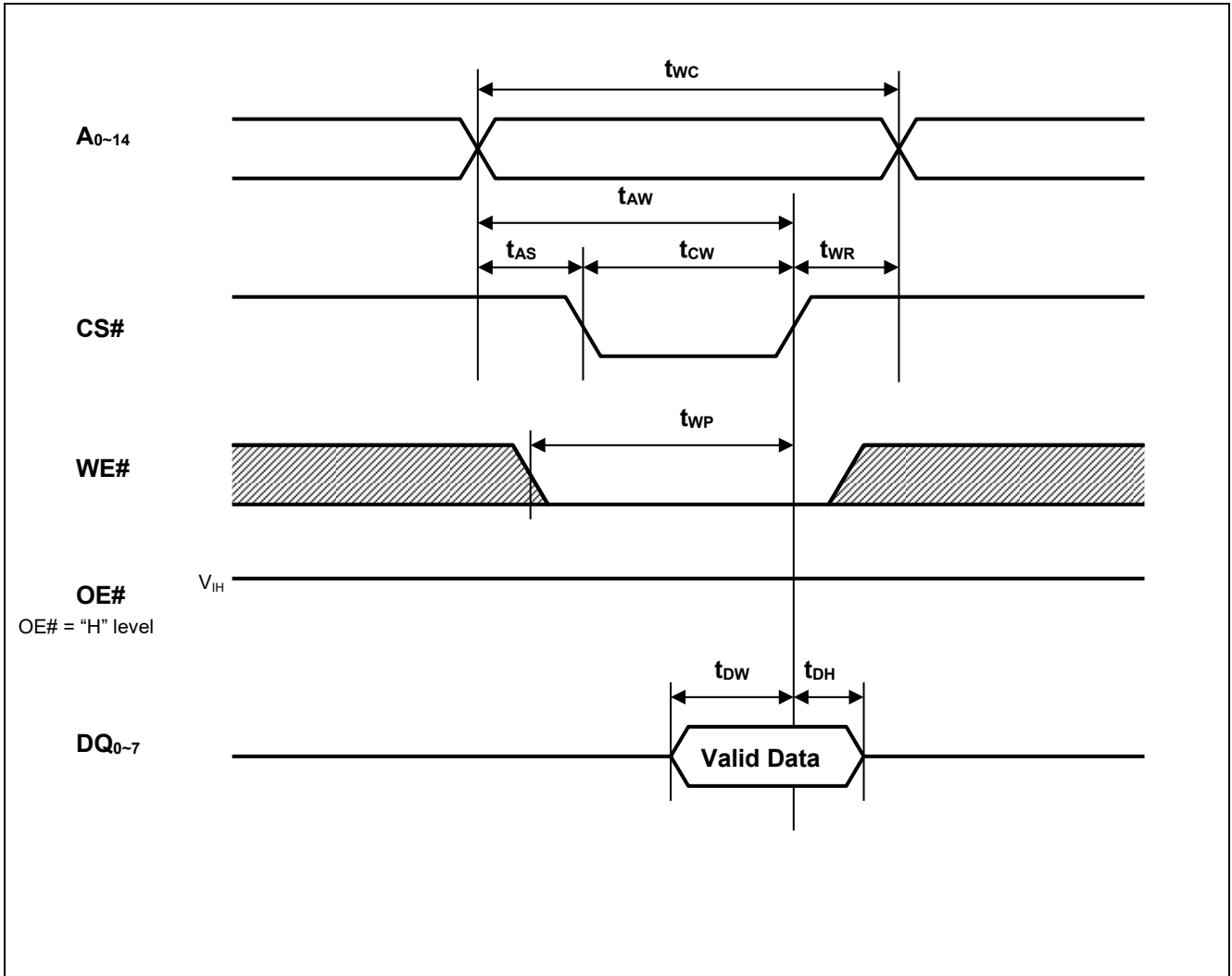




Write Cycle (1) (WE# CLOCK)



Write Cycle (2) (CS# CLOCK)

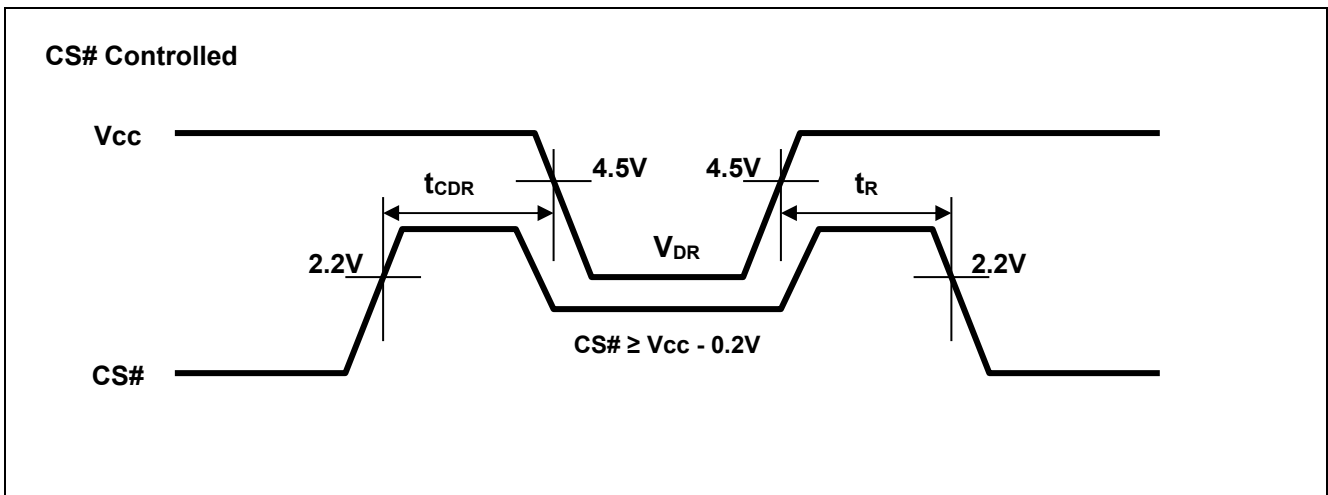


### Low Vcc Data Retention Characteristics

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, CS# ≥ 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, CS# ≥ 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. CS# controls address buffer, WE# buffer, OE# buffer and Din buffer. If CS# controls data retention mode, V<sub>in</sub> levels (address, WE#, OE#, DQ) can be in the high impedance state.

### Low Vcc Data Retention Timing Waveforms



Revision History	R1LP5256E Series Data Sheet
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Rev.	Date	Description	
		Page	Summary
1.00	2017.1.27	-	First Edition issued

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