

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.

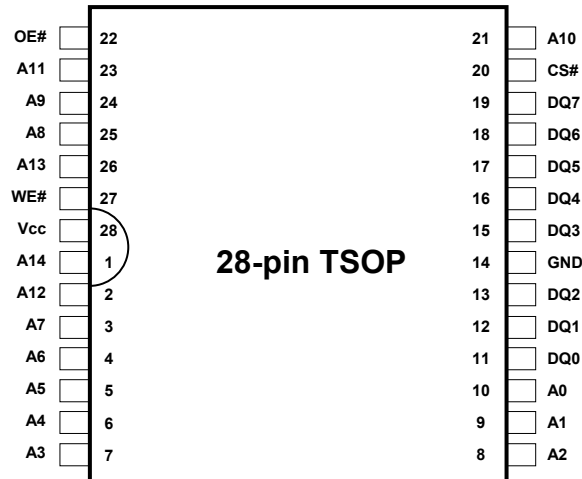
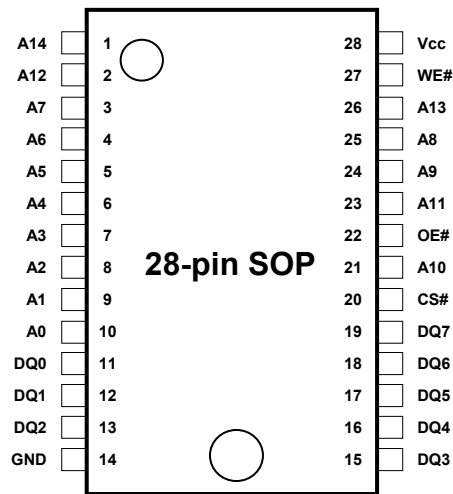
Features

- 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

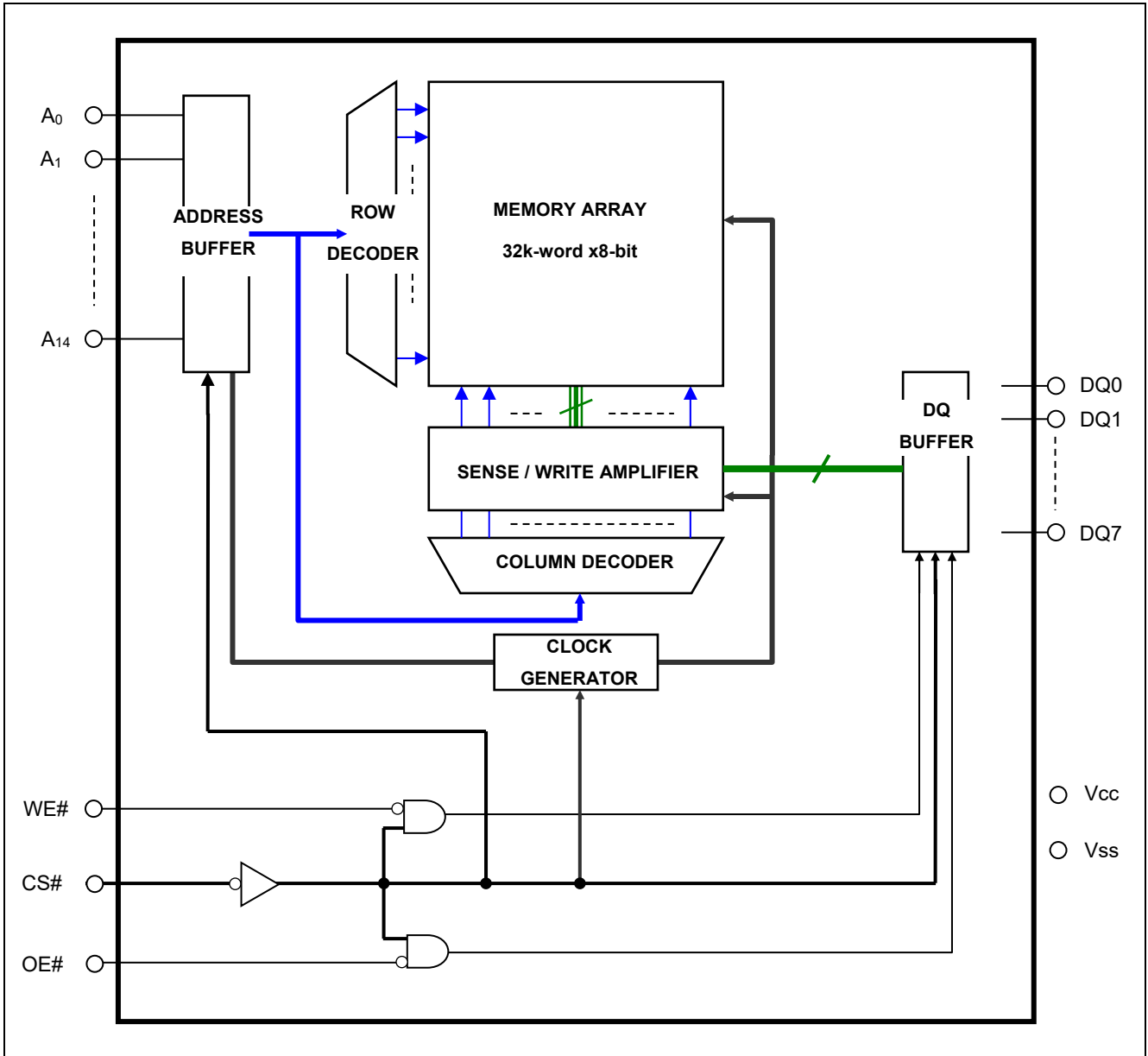
Pin Arrangement



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 ≤ 30 ns (full width at half maximum)
 2. Maximum voltage is +7.0V.

DC Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply voltage	V _{CC}	4.5	5.0	5.5	V	
	V _{SS}	0	0	0	V	
Input high voltage	V _{IH}	2.2	-	V _{CC} +0.3	V	
Input low voltage	V _{IL}	-0.3	-	0.8	V	1
Ambient temperature range	T _a	-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 _{LI}	-	-	1	μA	V _{in} = V _{SS} to V _{CC}	
Output leakage current	I _{LO}	-	-	1	μA	CS# = V _{IH} or OE# = V _{IH} , V _{I/O} = V _{SS} to V _{CC}	
Average operating current	I _{CC1}	-	25	35	mA	Min. cycle, duty = 100%, I _{I/O} = 0mA, CS# = V _{IL} , Others = V _{IH} /V _{IL}	
	I _{CC2}	-	2	4	mA	Cycle = 1μs, duty = 100%, I _{I/O} = 0mA, CS# ≤ 0.2V, V _{IH} ≥ V _{CC} -0.2V, V _{IL} ≤ 0.2V	
Standby current	I _{SB}	-	-	3	mA	CS# = V _{IH} , Others = V _{SS} to V _{CC}	
Standby current	I _{SB1}	-	0.6 ^{*1}	2	μA	~+25°C	V _{in} = V _{SS} to V _{CC} , CS# ≥ V _{CC} -0.2V
		-	-	3	μA	~+40°C	
		-	-	8	μA	~+70°C	
		-	-	10	μA	~+85°C	
Output high voltage	V _{OH}	2.4	-	-	V	I _{OH} = -1mA	
	V _{OH2}	V _{CC} - 0.5	-	-	V	I _{OH} = -0.1mA	
Output low voltage	V _{OL}	-	-	0.4	V	I _{OL} = 2mA	

Note 1. Typical parameter indicates the value for the center of distribution at 5.0V (T_a = 25°C), and not 100% tested.

Capacitance

(V_{CC} = 4.5V ~ 5.5V, f = 1MHz, T_a = -40 ~ +85°C)

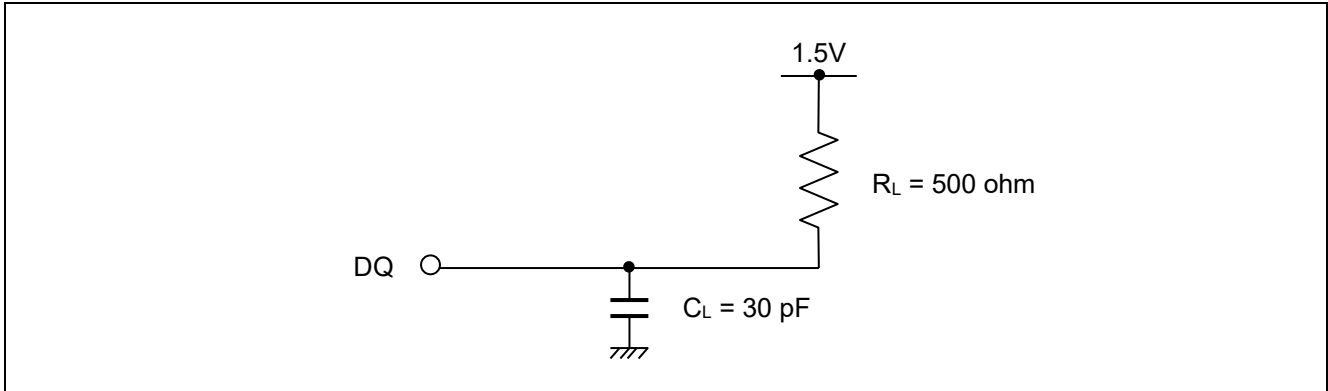
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions	Note
Input capacitance	C _{in}	-	-	6	pF	V _{in} = 0V	1
Input / output capacitance	C _{I/O}	-	-	8	pF	V _{I/O} = 0V	1

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

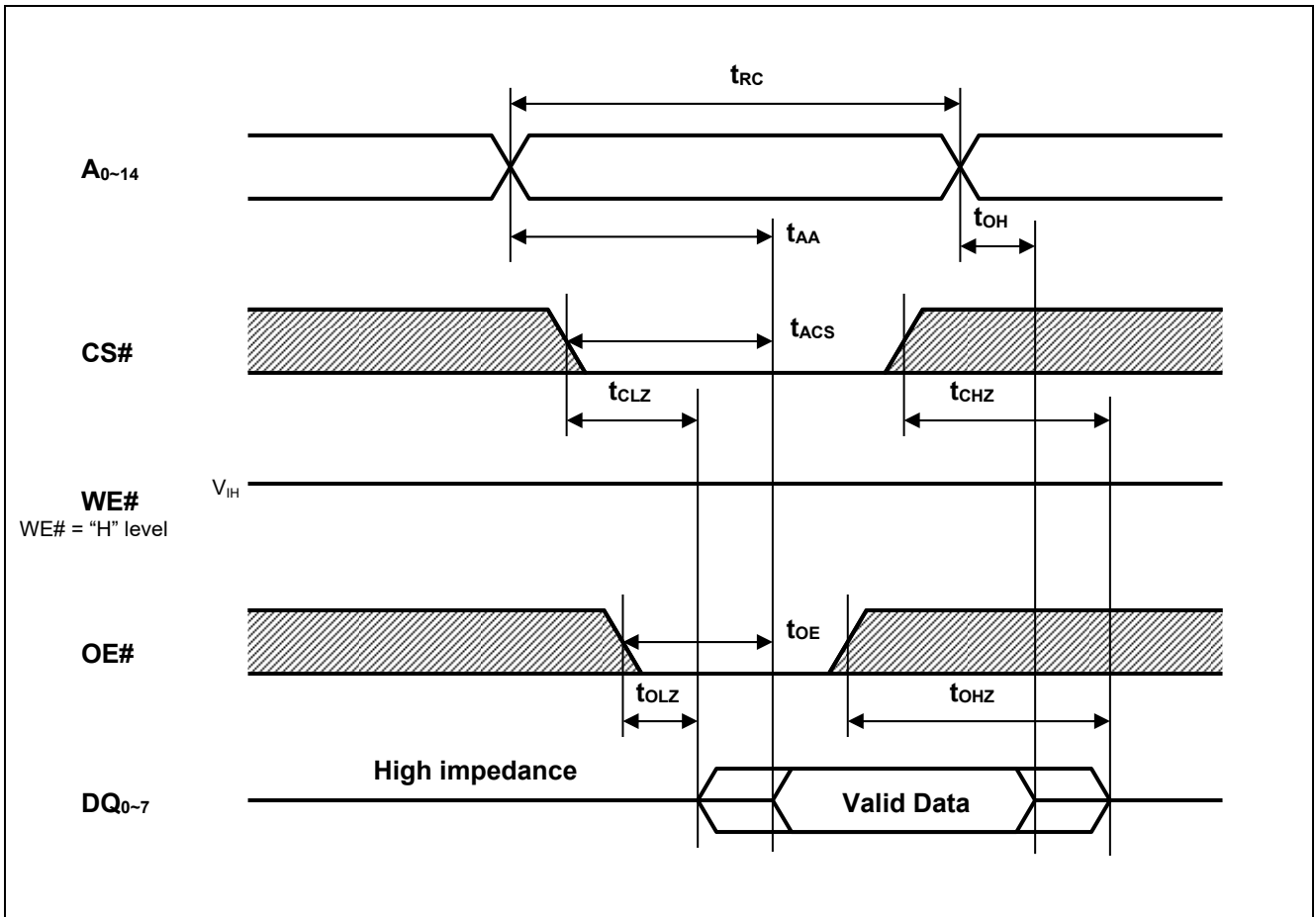
Write Cycle

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

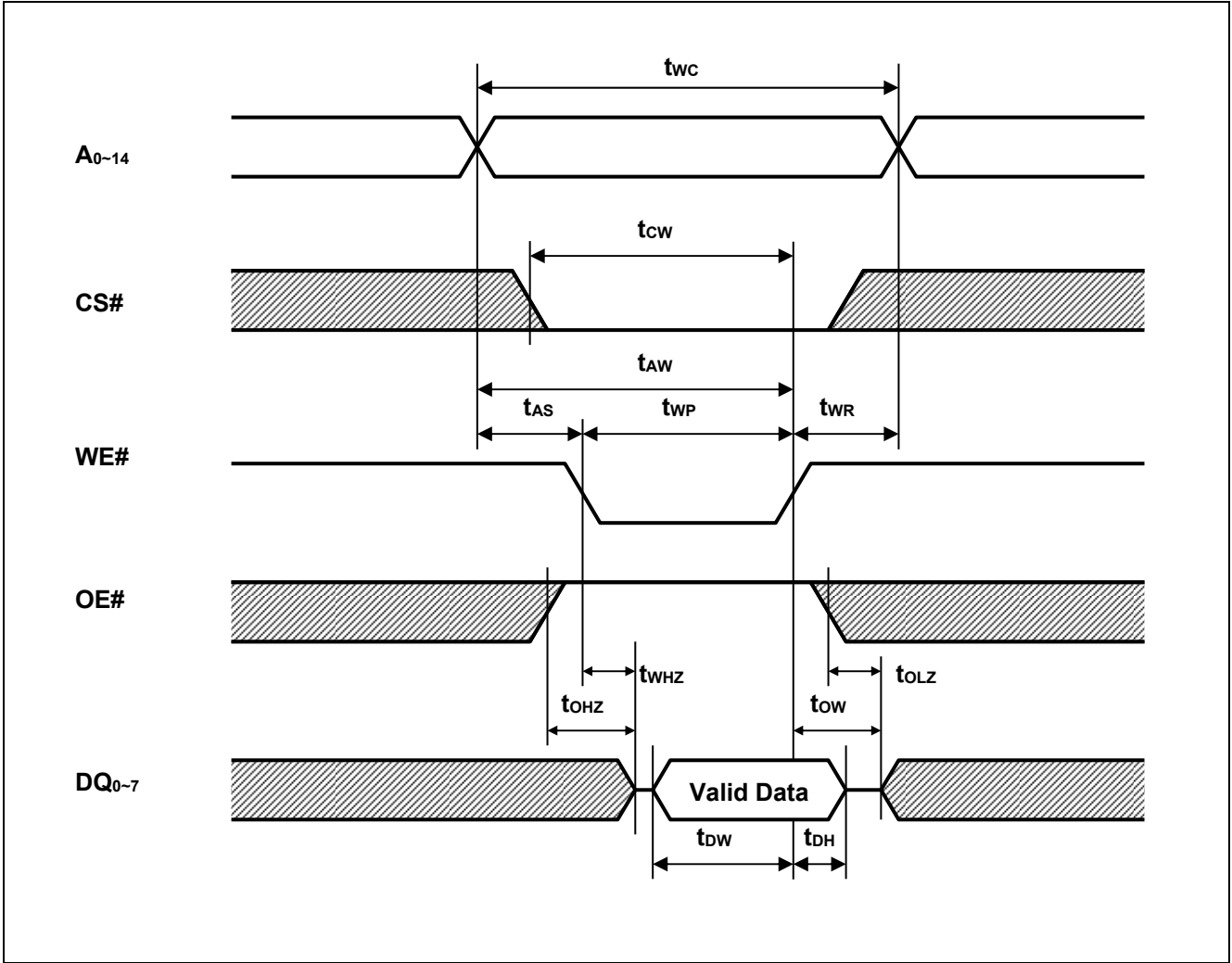
- Note
- t_{CHZ} , t_{OHZ} and t_{WHZ} are defined as the time at which the outputs achieve the open circuit conditions and are not referred to output voltage levels.
 - This parameter is sampled and not 100% tested.
 - At any given temperature and voltage condition, t_{HZ} max is less than t_{LZ} min 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

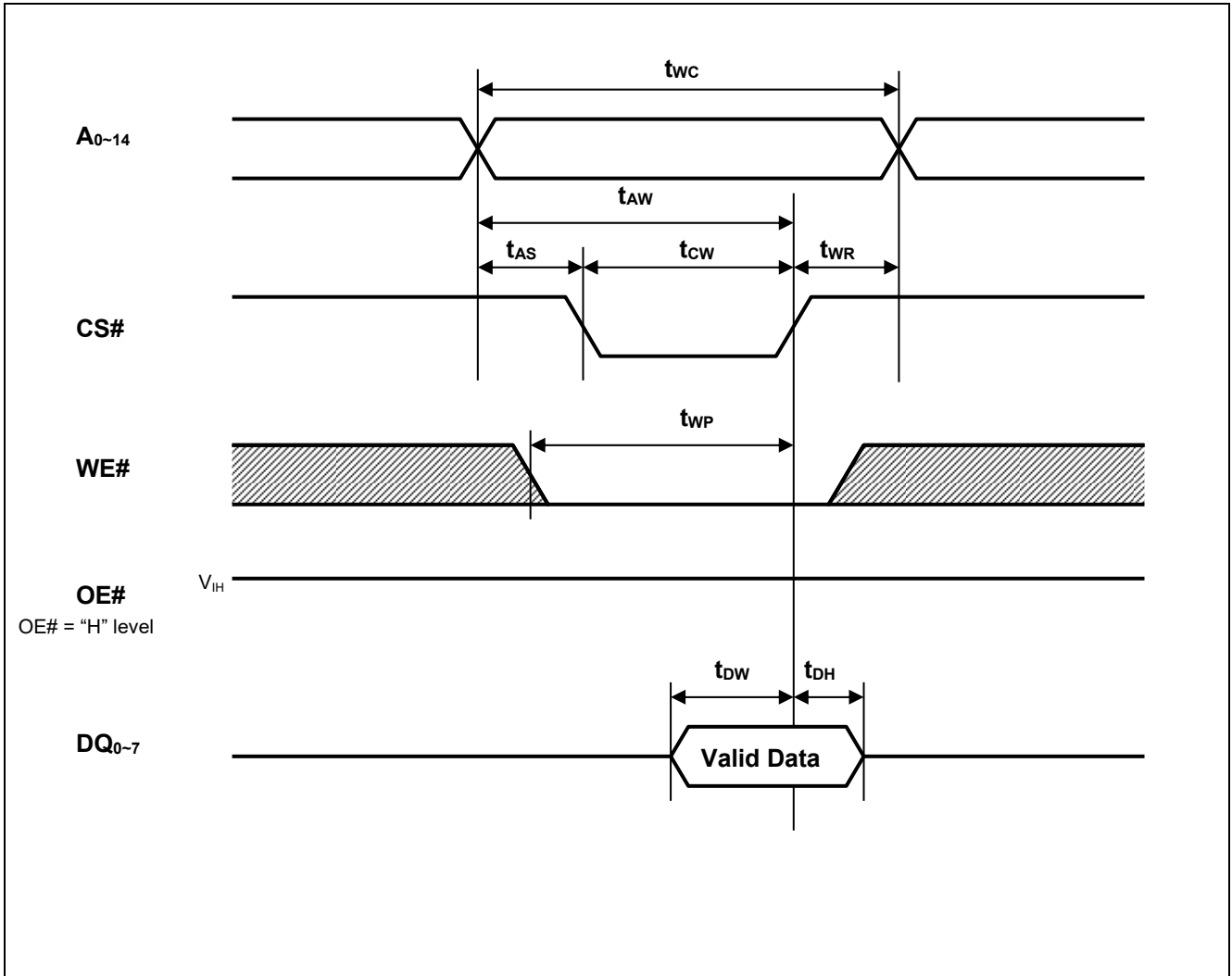
Read Cycle



Write Cycle (1) (WE# CLOCK)



Write Cycle (2) (CS# CLOCK)

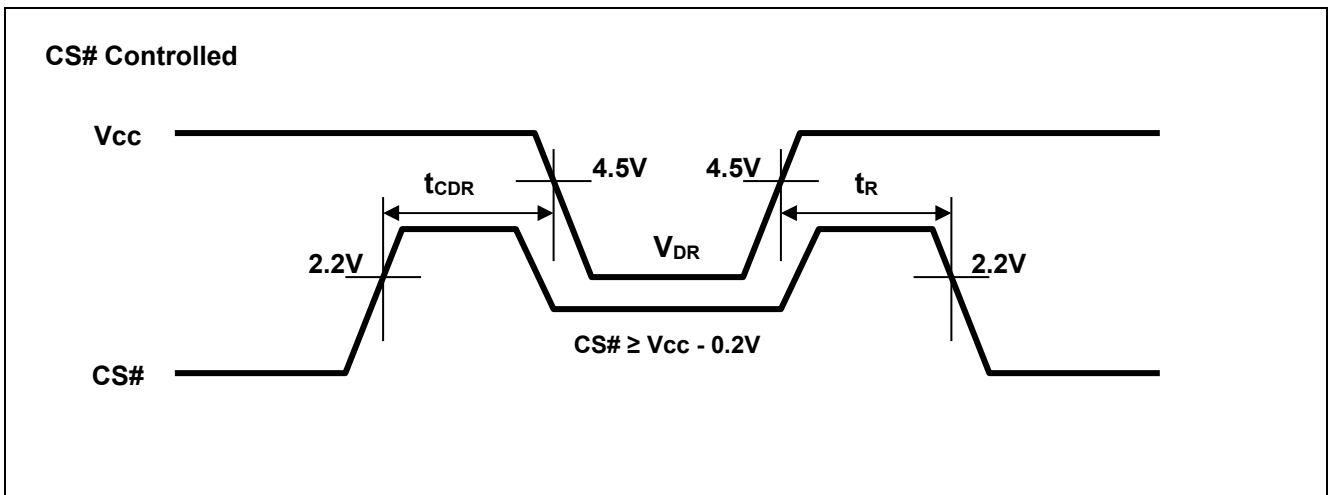


Low Vcc Data Retention Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions ²	
V _{CC} for data retention	V _{DR}	2.0	-	5.5	V	V _{in} ≥ 0V, CS# ≥ V _{CC} -0.2V	
Data retention current	I _{CCDR}	-	0.6 ^{*1}	2	μA	~+25°C	V _{CC} =3.0V, V _{in} ≥ 0V, CS# ≥ V _{CC} -0.2V
		-	-	3	μA	~+40°C	
		-	-	8	μA	~+70°C	
		-	-	10	μA	~+85°C	
Chip deselect time to data retention	t _{CDR}	0	-	-	ns	See retention waveform.	
Operation recovery time	t _R	5	-	-	ms		

- Note
1. Typical parameter indicates the value for the center of distribution at 3.0V (T_a= 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_{in} 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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Renesas Electronics America Inc.

2801 Scott Boulevard Santa Clara, CA 95050-2549, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited

9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH

Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.

Room 1709, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100191, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.

Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, P. R. China 200333
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited

Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852-2886-9022

Renesas Electronics Taiwan Co., Ltd.

13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886-2-8175-9670

Renesas Electronics Singapore Pte. Ltd.

80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.

Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.

No.777C, 100 Feet Road, HAL II Stage, Indiranagar, Bangalore, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.

12F., 234 Teheran-ro, Gangnam-Gu, Seoul, 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141