R1LP0108E Series

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

R10DS0029EJ0100
Rev.1.00
2010.10.20

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 sTSOP.

Features

- Single 4.5~5.5V power supply
- Small stand-by current: 1µA (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

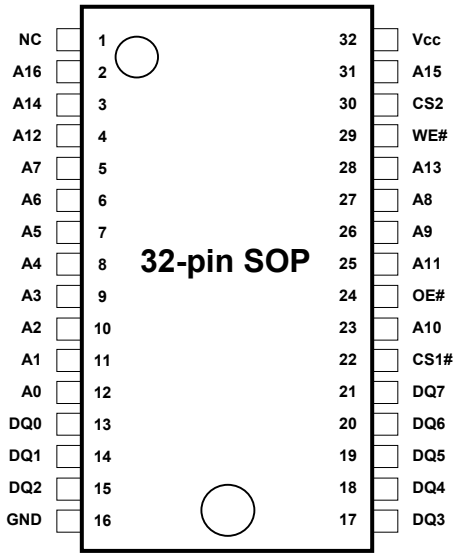
Ordering Information

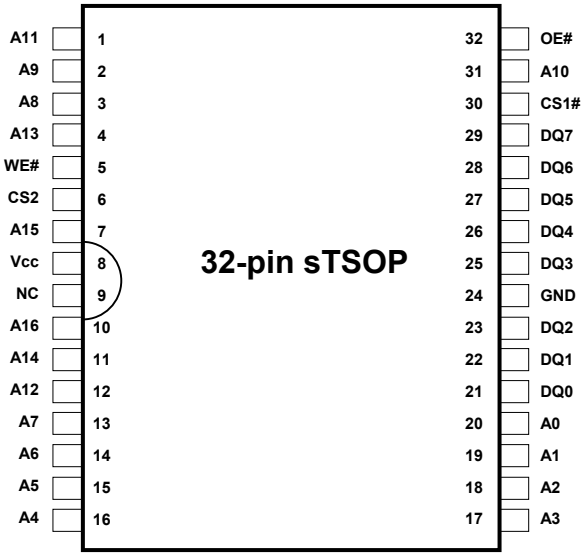
Type No.	Access time	Package
R1LP0108ESP-5S%	55 ns	525-mil 32-pin plastic SOP (normal-bend type) (32P2M)
R1LP0108ESP-7S%	70 ns	
R1LP0108ESA-5S%	55 ns	8mm×13.4mm 32-pin plastic sTSOP (normal-bend type) (32P3K)
R1LP0108ESA-7S%	70 ns	
R1LP0108ESF-5S%	55 ns	8mm×20mm 32-pin plastic TSOP (normal-bend type) (32P3H)
R1LP0108ESF-7S%	70 ns	
R1LP0108ESR-5S%	55 ns	8mm×20mm 32-pin plastic TSOP (reverse-bend type) (32P3H)
R1LP0108ESR-7S%	70 ns	

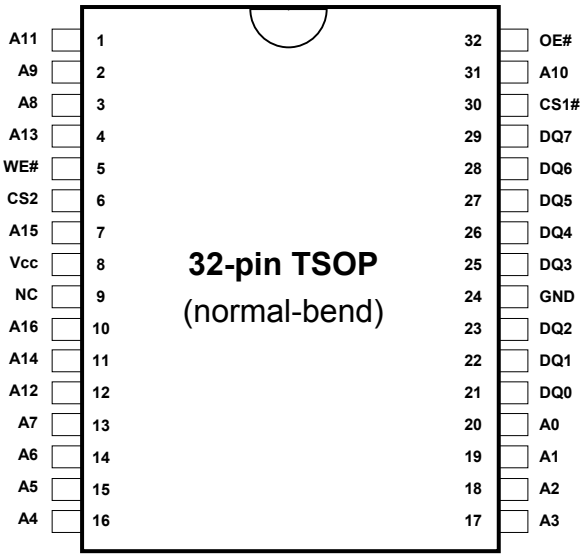
% - Temperature version; see table below

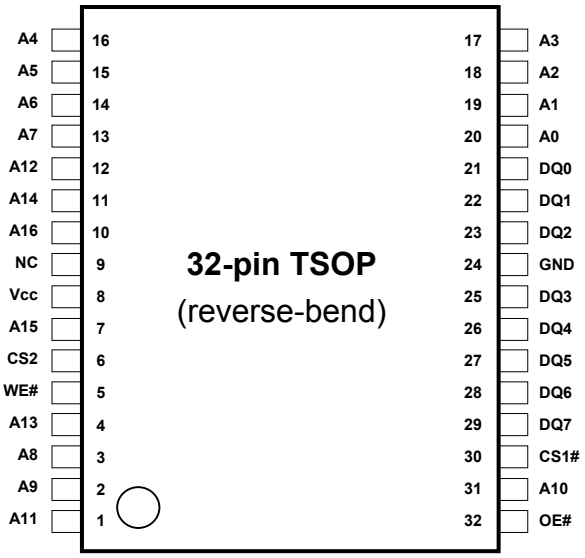
%	Temperature Range
R	0 ~ +70°C
I	-40 ~ +85°C

Pin Arrangement





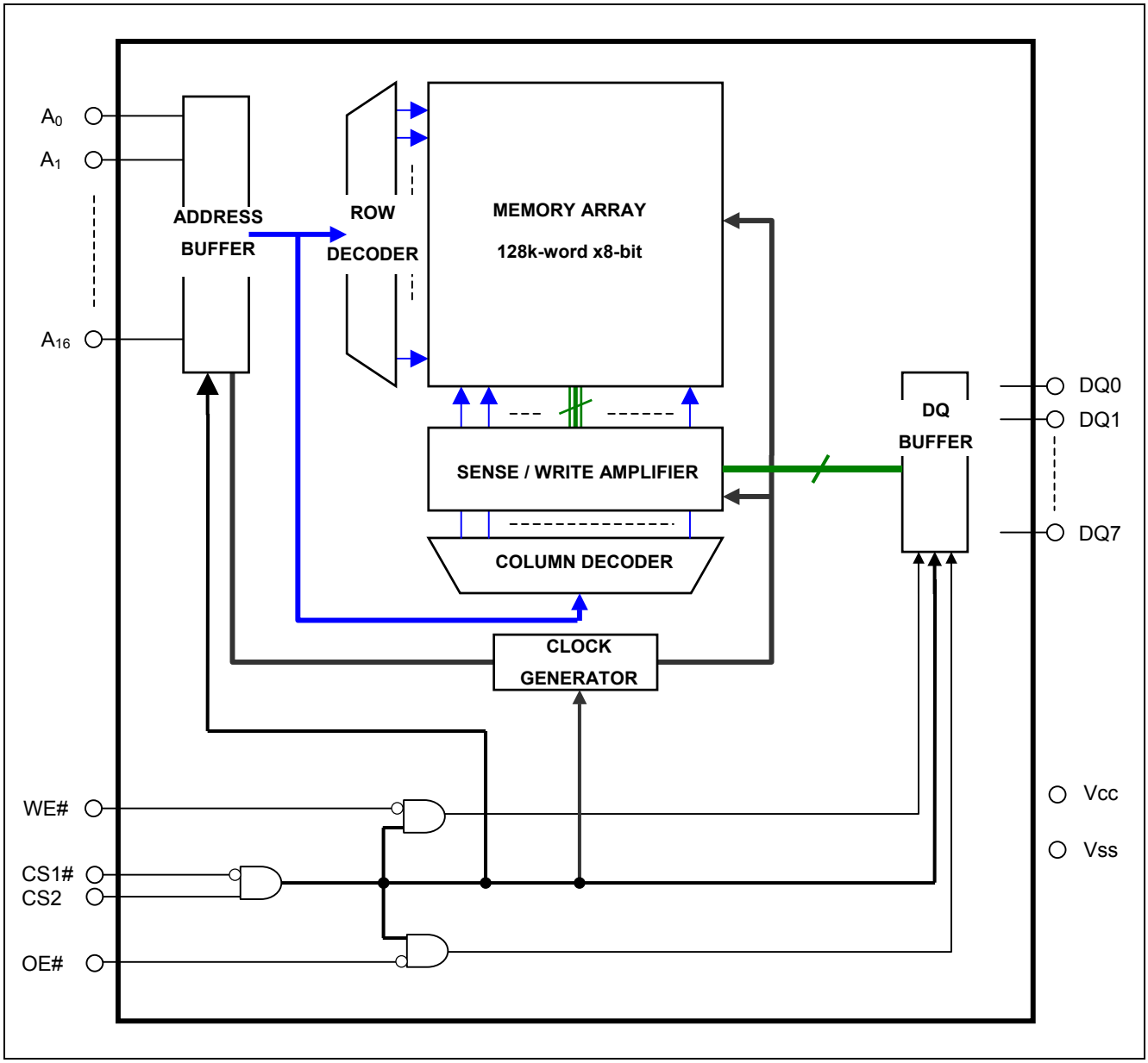




Pin Description

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 Vcc+0.3[*2]		V
Power dissipation	P_T	0.7		W
Operation temperature	Topr[*3]	R Ver.	0 to +70	°C
		I Ver.	-40 to +85	
Storage temperature range	Tstg	-65 to 150		°C
Storage temperature range under bias	Tbias[*3]	R Ver.	0 to +70	°C
		I Ver.	-40 to +85	

Note 1. –3.0V for pulse ≤ 30ns (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		Vcc	4.5	5.0	5.5	V	
		Vss	0	0	0	V	
Input high voltage		V_{IH}	2.2	-	Vcc+0.3	V	
Input low voltage		V_{IL}	-0.3	-	0.8	V	1
Ambient temperature range	R Ver.	Ta	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	$\lvert I_{LI} \rvert$	-	-	1	µA	Vin = Vss to Vcc	
Output leakage current	$\lvert I_{LO} \rvert$	-	-	1	µA	CS1# =V_{IH} or CS2 =V_{IL} or OE# =V_{IH}, VI/O =Vss to Vcc	
Average operating current	I_{CC1}	-	25	35	mA	Min. cycle, duty =100%, II/O = 0mA CS1# =V_{IL}, CS2 =V_{IH}, Others = V_{IH}/V_{IL}	
	I_{CC2}	-	2	5	mA	Cycle =1µs, duty =100%, II/O = 0mA CS1# ≤ 0.2V, CS2 ≥ Vcc-0.2V, V_{IH} ≥ Vcc-0.2V, V_{IL} ≤ 0.2V	
Standby current	I_{SB}	-	-	3	mA	"CS2 =V_{IL}" or "CS2 = V_{IH} and CS1# =V_{IH}", Others = Vss to Vcc	
Standby current	I_{SB1}	-	1*1	2	µA	~+25°C	Vin = Vss to Vcc (1) CS2 ≤ 0.2 or (2) CS1# ≥ Vcc-0.2V, CS2 ≥ Vcc-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}	Vcc - 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 (Ta= 25ºC), and not 100% tested.

Capacitance

(Vcc = 4.5V ~ 5V, f = 1MHz, Ta = 0 ~ +70°C / -40 ~ +85°C[*2])

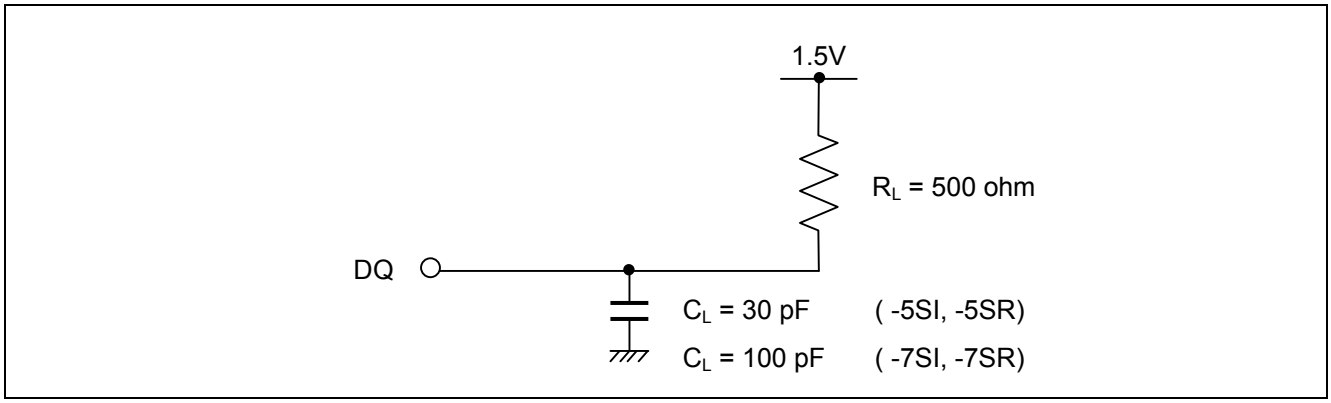
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions	Note
Input capacitance	C in	-	-	8	pF	Vin =0V	1
Input / output capacitance	$C_{I/O}$	-	-	10	pF	VI/O =0V	1

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 (Vcc = 4.5V ~ 5.5V, Ta = 0 ~ +70°C / -40 ~ +85°C[*1])

- Input pulse levels: VIL = 0.6V, VIH = 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**-5S*		R1LP0108E**-7S*		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

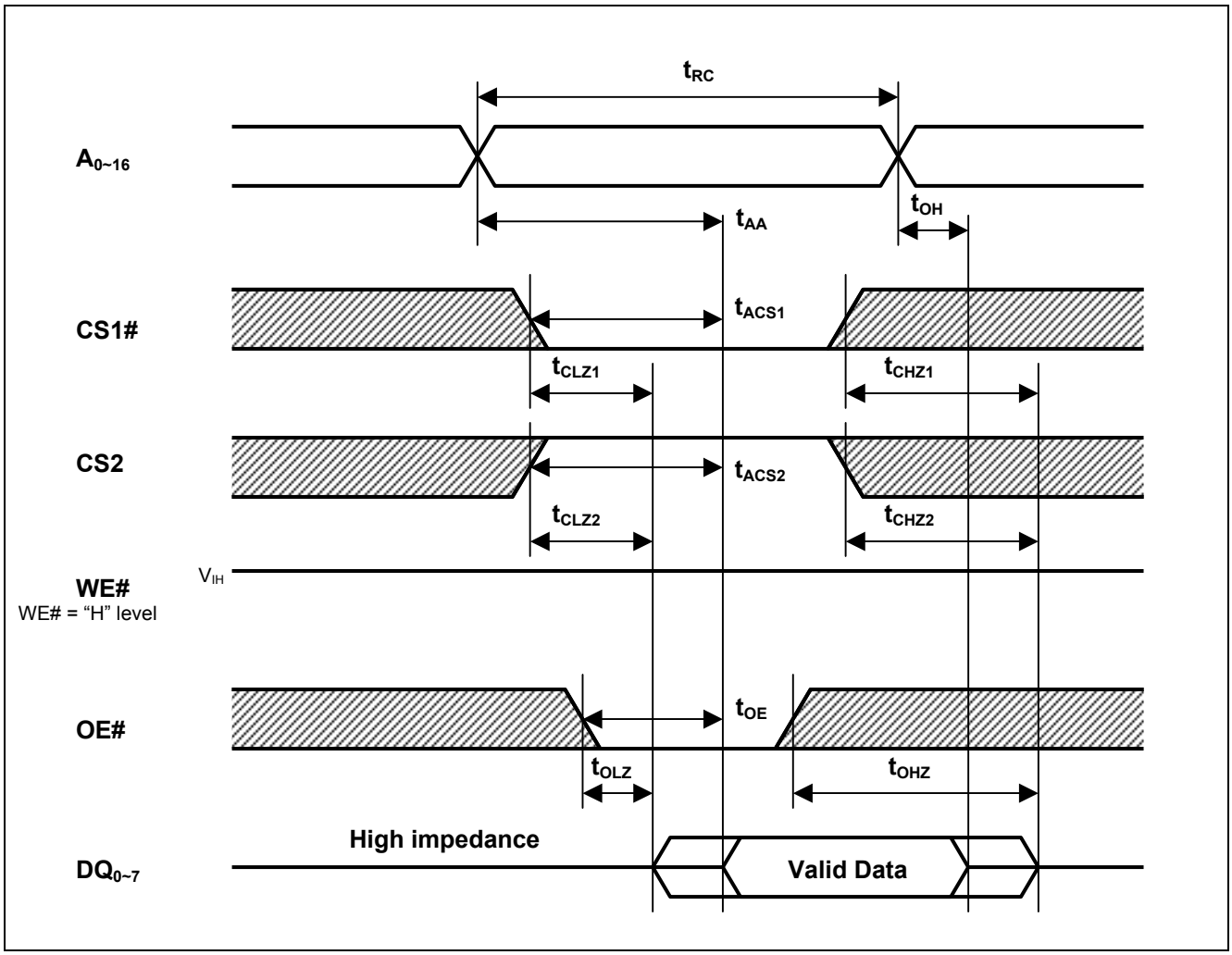
Write Cycle

Parameter	Symbol	R1LP0108E**-5S*		R1LP0108E**-7S*		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

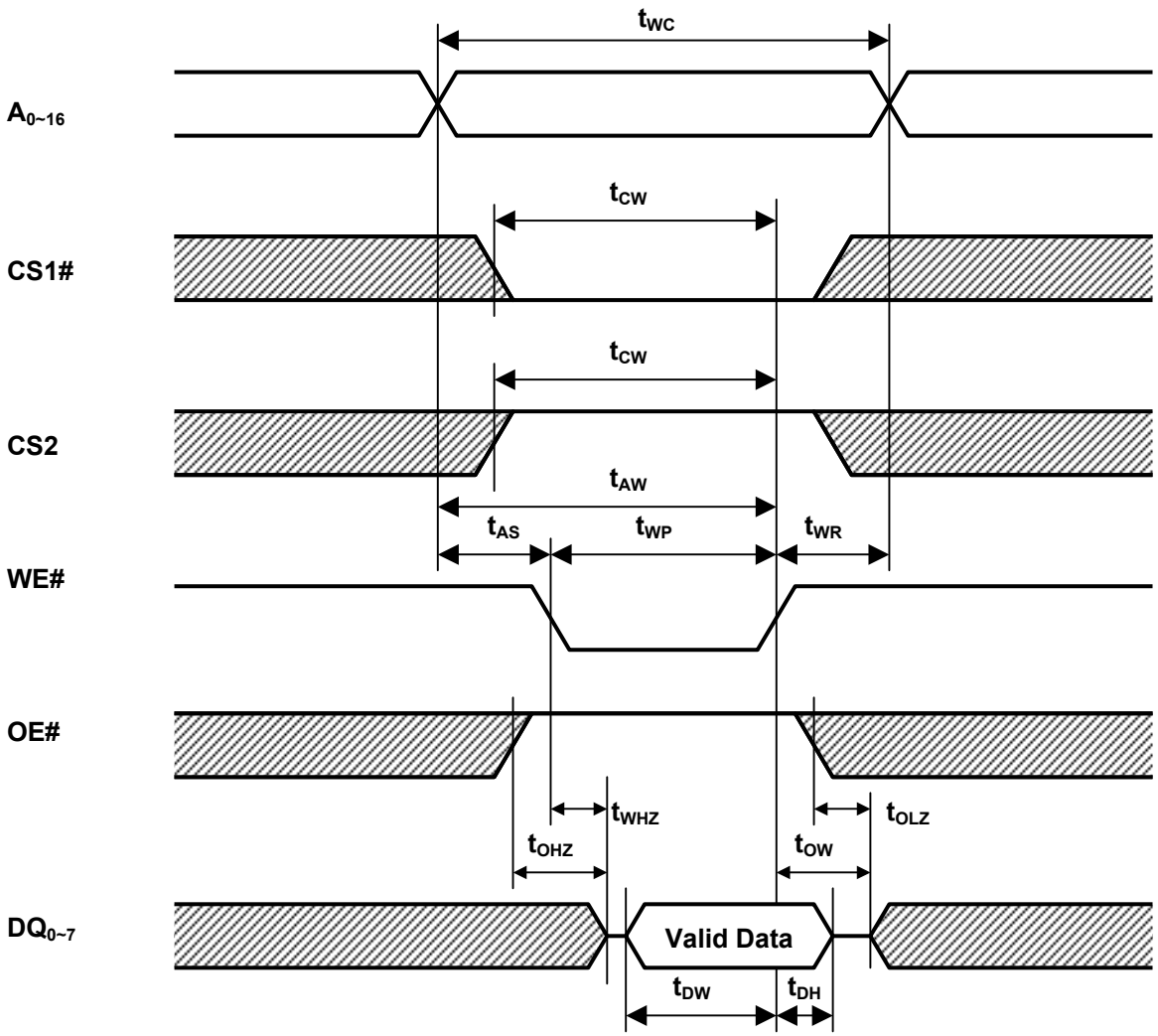
Note
1. t_{CHZ}, t_{OHZ} and t_{WHZ} are defined as the time at which the outputs achieve the open circuit conditions and are not referred to output voltage levels.
2. This parameter is sampled and not 100% tested.
3. At any given temperature and voltage condition, t_{HZ} max is less than t_{LZ} min both for a given device and from device to device.
4. 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.
5. t_{CW} is measured from the later of CS1# going low or CS2 going high to end of write.
6. t_{AS} is measured the address valid to the beginning of write.
7. t_{WR} is measured from the earliest of CS1# or WE# going high or CS2 going low to the end of write cycle.
8. Don't apply inverted phase signal externally when DQ pin is output mode.

Timing Waveforms

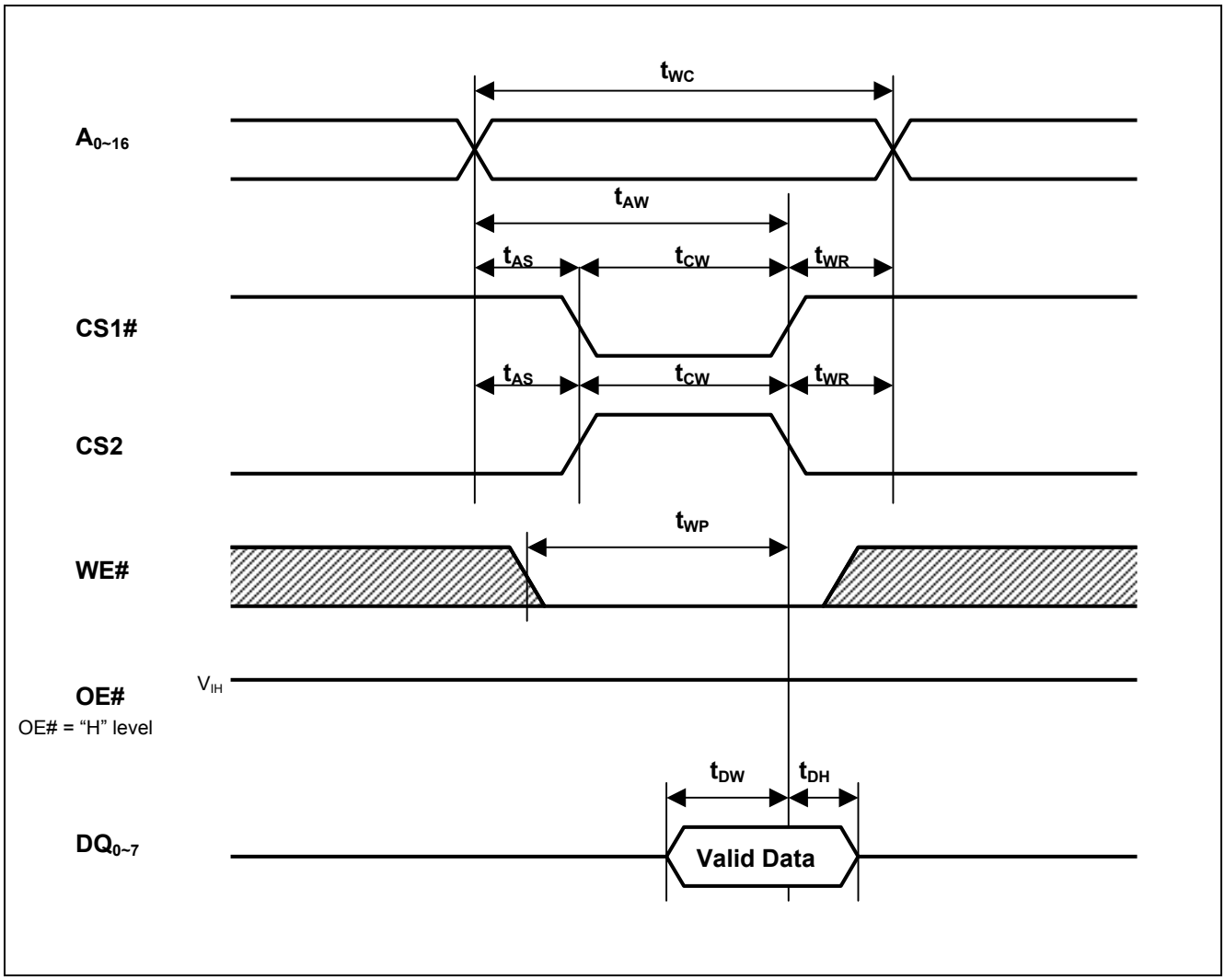
Read Cycle



Write Cycle (1) (WE# CLOCK)



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



Low Vcc Data Retention Characteristics

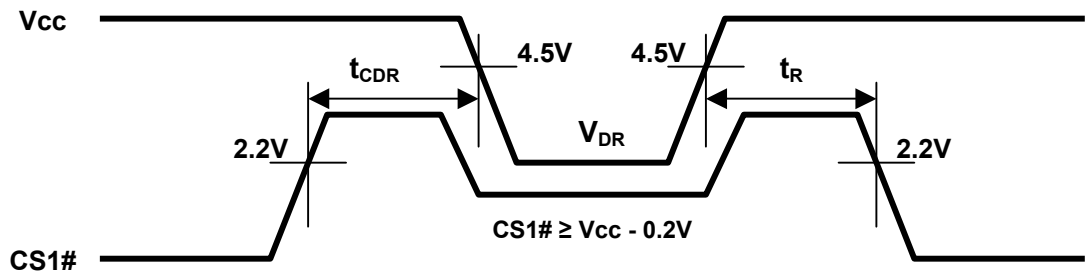
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions[*2]	
V_{CC} for data retention	V_{DR}	2.0	-	5.5	V	Vin ≥ 0V (1) 0V ≤ CS2 ≤ 0.2V or (2) CS1# ≥ Vcc-0.2V, CS2 ≥ Vcc-0.2V	
Data retention current	I_{CCDR}	-	1[*1]	2	μA	~+25°C	Vcc=3.0V, Vin ≥ 0V (1) 0V ≤ CS2 ≤ 0.2V or (2) CS1# ≥ Vcc-0.2V, CS2 ≥ Vcc-0.2V
		-	-	3	μA	~+40°C	
		-	-	8	μA	~+70°C	
		-	-	10	μA	~+85°C	
Chip deselect to data retention time	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 (Ta= 25ºC), and not 100% tested.

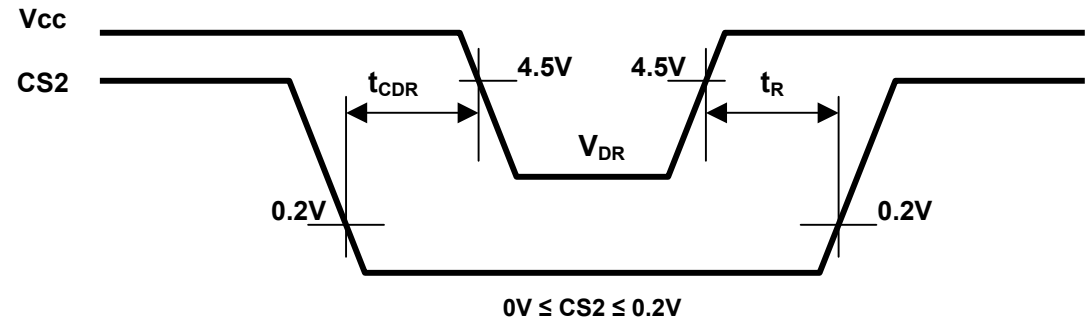
2. CS2 controls address buffer, WE# buffer, CS1# buffer, OE# buffer and Din buffer. If CS2 controls data retention mode, Vin levels (address, WE#, CS1#, OE#, DQ) can be in the high impedance state.
   If CS1# controls data retention mode, CS2 must be CS2 ≥ Vcc-0.2V or 0V ≤ CS2 ≤ 0.2V. The other input levels (address, WE# ,OE#, DQ) can be in the high impedance state.

Low Vcc Data Retention Timing Waveforms

(1) CS1# Controlled



(2) CS2 Controlled



Revision History	R1LP0108E Series Data Sheet

Rev.	Date	Description	
		Page	Summary
1.00	2010.10.20	-	First Edition issued

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Renesas Electronics America Inc.
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

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: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
7F, No. 363 Fu Shing North Road Taipei, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
1 harbourFront Avenue, #06-10, keppel Bay Tower, Singapore 098632
Tel: +65-6213-0200, Fax: +65-6278-8001

Renesas Electronics Malaysia Sdn.Bhd.
Unit 906, 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 Korea Co., Ltd.
11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

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