

# RMLV0808BGSB - 4S2

8Mb Advanced LPSRAM (1024k word × 8bit)

R10DS0232EJ0201  
Rev.2.01  
2020.02.20

## Description

The RMLV0808BGSB is a family of 8-Mbit static RAMs organized 1,048,576-word × 8-bit, fabricated by Renesas's high-performance Advanced LPSRAM technologies. The RMLV0808BGSB has realized higher density, higher performance and low power consumption. The RMLV0808BGSB offers low power standby power dissipation; therefore, it is suitable for battery backup systems. It is offered in 44pin TSOP (II).

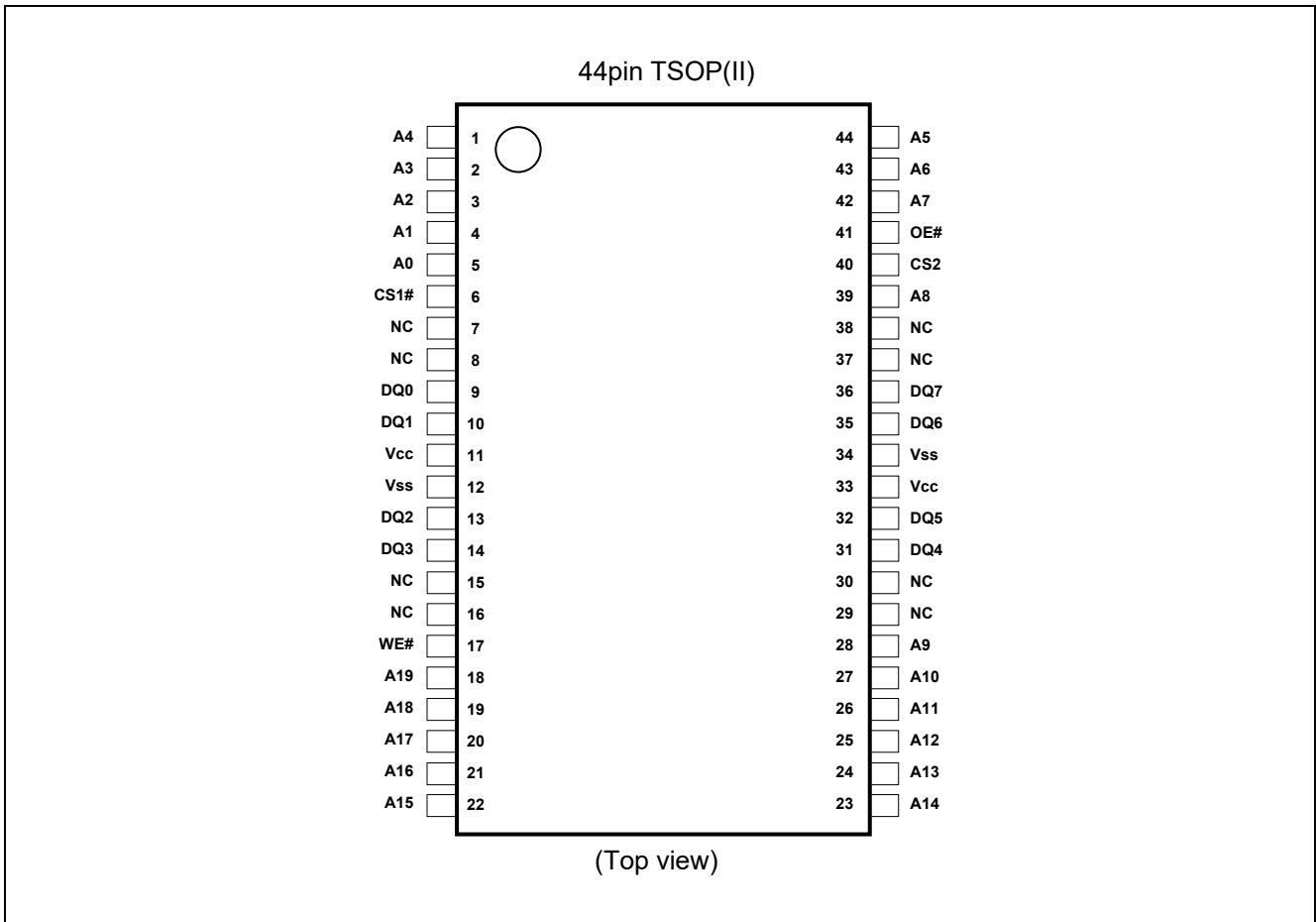
## Features

- Single 3V supply: 2.4V to 3.6V
- Access time:
  - Power supply voltage from 2.7V to 3.6V: 45ns (max.)
  - Power supply voltage from 2.4V to 2.7V: 55ns (max.)
- Current consumption:
  - Standby: 0.45μA (typ.)
- Equal access and cycle times
- Common data input and output
  - Three state output
- Directly TTL compatible
  - All inputs and outputs
- Battery backup operation

## Part Name Information

Part Name	Power supply	Access time	Temperature Range	Package
RMLV0808BGSB-4S2	2.7V to 3.6V	45 ns	-40 ~ +85°C	11.76mm×18.41mm 44pin plastic TSOP(II)
	2.4V to 2.7V	55 ns		

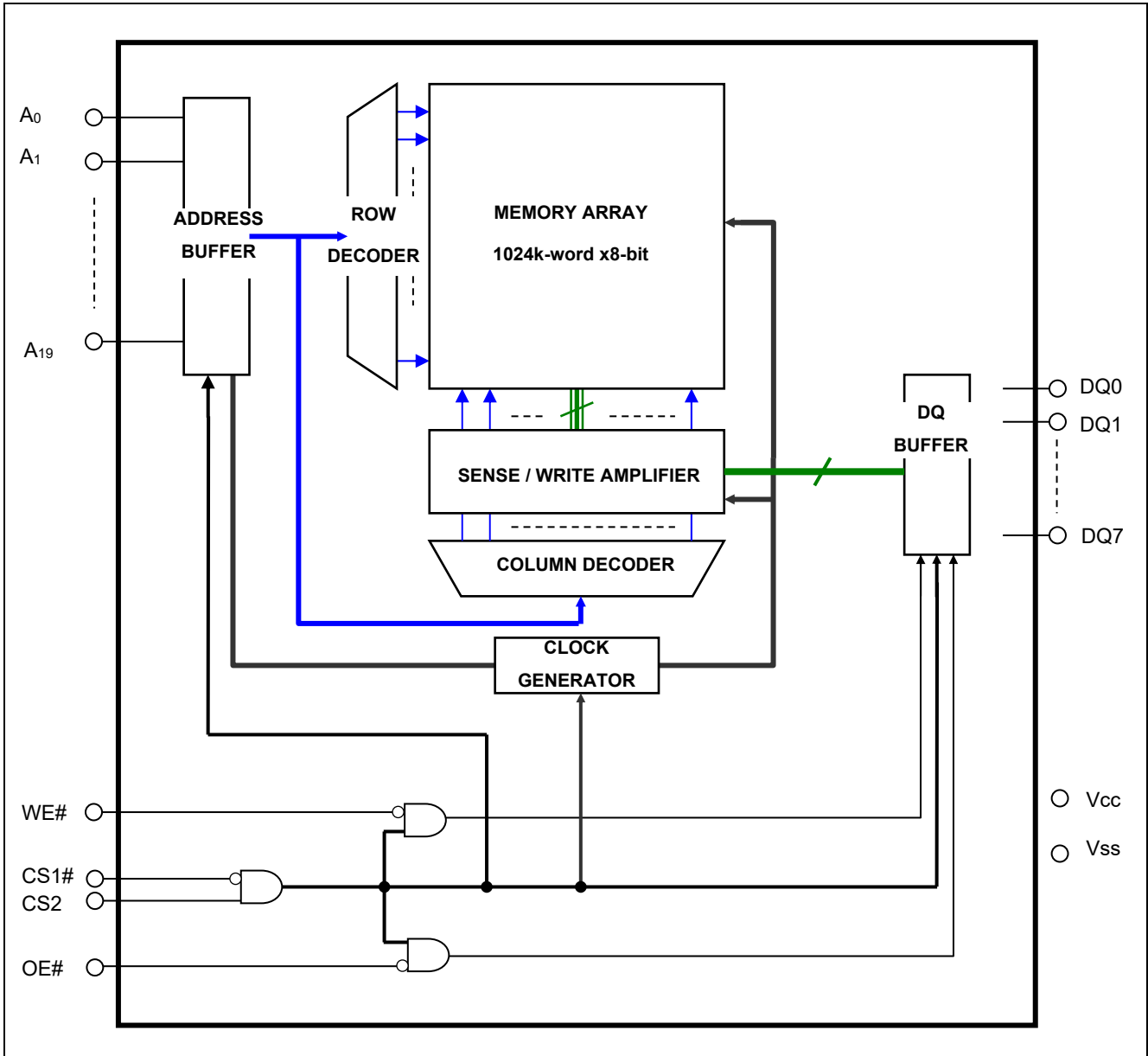
## Pin Arrangement



## Pin Description

Pin name	Function
V <sub>CC</sub>	Power supply
V <sub>SS</sub>	Ground
A0 to A19	Address input
DQ0 to DQ7	Data input/output
CS1#	Chip select 1
CS2	Chip select 2
OE#	Output enable
WE#	Write enable
NC	No connection

### Block Diagram



### Operation Table

CS1#	CS2	WE#	OE#	DQ0~7	Operation
H	X	X	X	High-Z	Stand-by
X	L	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<sub>IH</sub> L: V<sub>IL</sub> X: V<sub>IH</sub> or V<sub>IL</sub>

## Absolute Maximum Ratings

Parameter	Symbol	Value	unit
Power supply voltage relative to V <sub>SS</sub>	V <sub>CC</sub>	-0.5 to +4.6	V
Terminal voltage on any pin relative to V <sub>SS</sub>	V <sub>T</sub>	-0.5 <sup>2</sup> to V <sub>CC</sub> +0.3 <sup>3</sup>	V
Power dissipation	P <sub>T</sub>	0.7	W
Operation temperature	T <sub>opr</sub>	-40 to +85	°C
Storage temperature range	T <sub>stg</sub>	-65 to +150	°C
Storage temperature range under bias	T <sub>bias</sub>	-40 to +85	°C

Note 2. -3.0V for pulse ≤ 30ns (full width at half maximum)

3. Maximum voltage is +4.6V.

## DC Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions	Note
Supply voltage	V <sub>CC</sub>	2.4	3.0	3.6	V		
	V <sub>SS</sub>	0	0	0	V		
Input high voltage	V <sub>IH</sub>	2.0	—	V <sub>CC</sub> +0.2	V	V <sub>CC</sub> =2.4V to 2.7V	
		2.2	—	V <sub>CC</sub> +0.2	V	V <sub>CC</sub> =2.7V to 3.6V	
Input low voltage	V <sub>IL</sub>	-0.2	—	0.4	V	V <sub>CC</sub> =2.4V to 2.7V	4
		-0.2	—	0.6	V	V <sub>CC</sub> =2.7V to 3.6V	4
Ambient temperature range	T <sub>a</sub>	-40	—	+85	°C		

Note 4. -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	CS1# = V <sub>IH</sub> or CS2 = V <sub>IL</sub> or OE# = V <sub>IH</sub> or WE# = V <sub>IL</sub> , V <sub>I/O</sub> = V <sub>SS</sub> to V <sub>CC</sub>
Average operating current	I <sub>CC1</sub>	—	20 <sup>*5</sup>	25	mA	Cycle = 55ns, 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>
		—	25 <sup>*5</sup>	30	mA	Cycle = 45ns, 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>	—	1.5 <sup>*5</sup>	3	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>	—	—	0.3	mA	CS2 = V <sub>IL</sub> , Others = V <sub>SS</sub> to V <sub>CC</sub>
Standby current	I <sub>SB1</sub>	—	0.45 <sup>*5</sup>	2	μA	~+25°C
		—	0.6 <sup>*6</sup>	4	μA	~+40°C
		—	—	7	μA	~+70°C
		—	—	10	μA	~+85°C
Output high voltage	V <sub>OH</sub>	2.4	—	—	V	I <sub>OH</sub> = -1mA V <sub>CC</sub> ≥ 2.7V
	V <sub>OH2</sub>	2.0	—	—	V	I <sub>OH</sub> = -0.1mA
Output low voltage	V <sub>OL</sub>	—	—	0.4	V	I <sub>OL</sub> = 2mA V <sub>CC</sub> ≥ 2.7V
	V <sub>OL2</sub>	—	—	0.4	V	I <sub>OL</sub> = 0.1mA

Note 5. Typical parameter indicates the value for the center of distribution at 3.0V (T<sub>a</sub>=25°C), and not 100% tested.

Note 6. Typical parameter indicates the value for the center of distribution at 3.0V (T<sub>a</sub>=40°C), and not 100% tested.

## Capacitance

(Ta =25°C, f =1MHz)

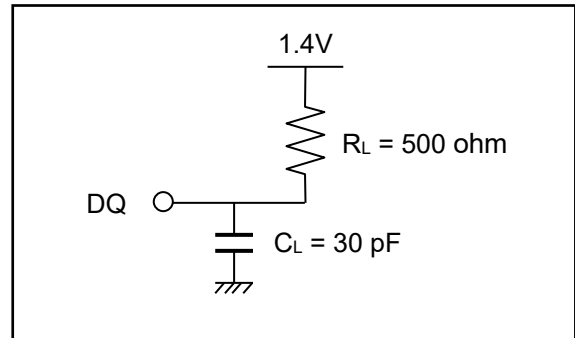
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions	Note
Input capacitance	C <sub>in</sub>	—	—	8	pF	V <sub>in</sub> =0V	7
Input / output capacitance	C <sub>I/O</sub>	—	—	10	pF	V <sub>I/O</sub> =0V	7

Note 7. This parameter is sampled and not 100% tested.

## AC Characteristics

Test Conditions (V<sub>cc</sub> = 2.4V ~ 3.6V, Ta = -40 ~ +85°C)

- Input pulse levels:
  - V<sub>IL</sub> = 0.4V, V<sub>IH</sub> = 2.4V (V<sub>cc</sub>=2.7V to 3.6V)
  - V<sub>IL</sub> = 0.4V, V<sub>IH</sub> = 2.2V (V<sub>cc</sub>=2.4V to 2.7V)
- Input rise and fall time: 5ns
- Input and output timing reference level: 1.4V
- Output load: See figures (Including scope and jig)



## Read Cycle

Parameter	Symbol	V <sub>cc</sub> =2.7V to 3.6V		V <sub>cc</sub> =2.4V to 2.7V		Unit	Note
		Min.	Max.	Min.	Max.		
Read cycle time	t <sub>RC</sub>	45	—	55	—	ns	
Address access time	t <sub>AA</sub>	—	45	—	55	ns	
Chip select access time	t <sub>ACS1</sub>	—	45	—	55	ns	
	t <sub>ACS2</sub>	—	45	—	55	ns	
Output enable to output valid	t <sub>OE</sub>	—	22	—	30	ns	
Output hold from address change	t <sub>OH</sub>	10	—	10	—	ns	
Chip select to output in low-Z	t <sub>CLZ1</sub>	10	—	10	—	ns	8,9
	t <sub>CLZ2</sub>	10	—	10	—	ns	8,9
Output enable to output in low-Z	t <sub>OLZ</sub>	5	—	5	—	ns	8,9
Chip deselect to output in high-Z	t <sub>CHZ1</sub>	0	18	0	20	ns	8,9,10
	t <sub>CHZ2</sub>	0	18	0	20	ns	8,9,10
Output disable to output in high-Z	t <sub>OHZ</sub>	0	18	0	20	ns	8,9,10

Note 8. This parameter is sampled and not 100% tested.

9. At any given temperature and voltage condition, t<sub>CHZ1</sub> max is less than t<sub>CLZ1</sub> min, t<sub>CHZ2</sub> max is less than t<sub>CLZ2</sub> min, and t<sub>OHZ</sub> max is less than t<sub>OLZ</sub> min, for any device.

10. t<sub>CHZ1</sub>, t<sub>CHZ2</sub> and t<sub>OHZ</sub> are defined as the time when the DQ pins enter a high-impedance state and are not referred to the DQ levels.

## Write Cycle

Parameter	Symbol	Vcc=2.7V to 3.6V		Vcc=2.4V to 2.7V		Unit	Note
		Min.	Max.	Min.	Max.		
Write cycle time	t <sub>WC</sub>	45	—	55	—	ns	
Address valid to write end	t <sub>AW</sub>	35	—	50	—	ns	
Chip select to write end	t <sub>CW</sub>	35	—	50	—	ns	
Write pulse width	t <sub>WP</sub>	35	—	40	—	ns	11
Address setup time to write start	t <sub>AS</sub>	0	—	0	—	ns	
Write recovery time from write end	t <sub>WR</sub>	0	—	0	—	ns	
Data to write time overlap	t <sub>DW</sub>	25	—	25	—	ns	
Data hold from write end	t <sub>DH</sub>	0	—	0	—	ns	
Output enable from write end	t <sub>OW</sub>	5	—	5	—	ns	12
Output disable to output in high-Z	t <sub>OHZ</sub>	0	18	0	20	ns	12,13
Write to output in high-Z	t <sub>WHZ</sub>	0	18	0	20	ns	12,13

Note 11. t<sub>WP</sub> is the interval between write start and write end.

A write starts when all of (CS1#), (WE#) and (CS2) become active.

A write is performed during the overlap of a low CS1#, a low WE# and a high CS2.

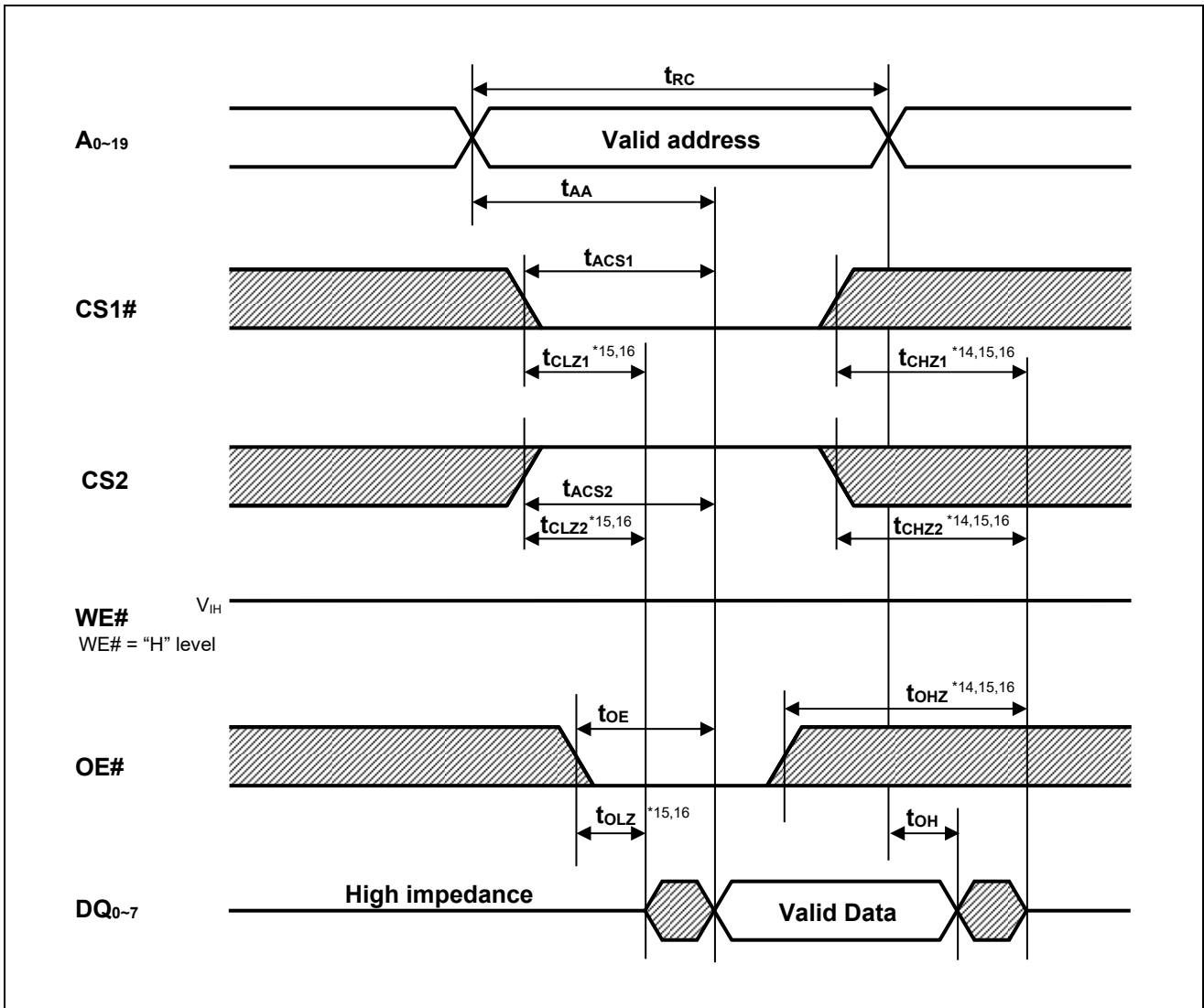
A write ends when any of (CS1#), (WE#) or (CS2) becomes inactive.

12. This parameter is sampled and not 100% tested.

13. t<sub>OHZ</sub> and t<sub>WHZ</sub> are defined as the time when the DQ pins enter a high-impedance state and are not referred to the DQ levels.

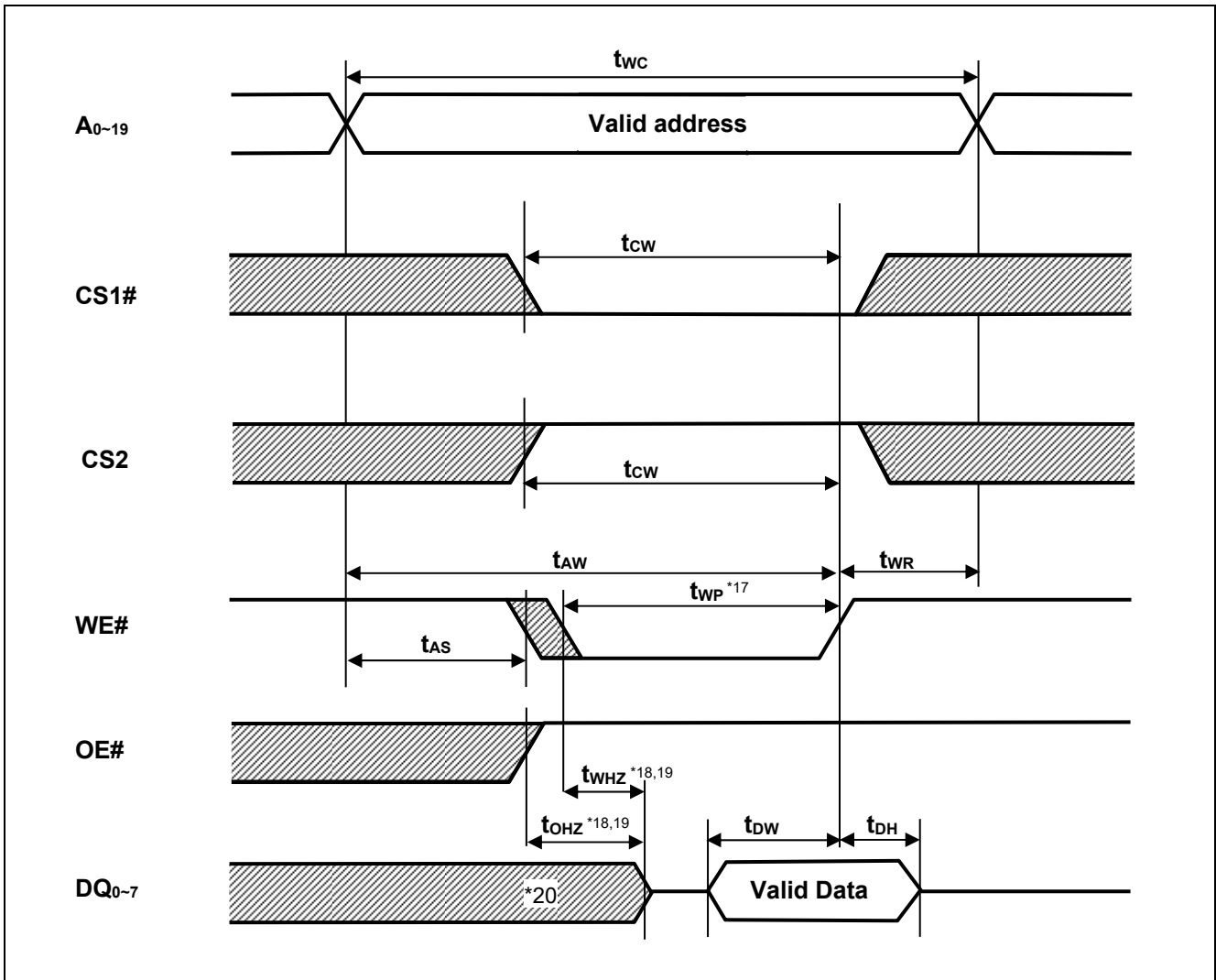
## Timing Waveforms

### Read Cycle



- Note 14.  $t_{CHZ1}$ ,  $t_{CHZ2}$  and  $t_{OHZ}$  are defined as the time when the DQ pins enter a high-impedance state and are not referred to the DQ levels.
15. This parameter is sampled and not 100% tested
16. At any given temperature and voltage condition,  $t_{CHZ1}$  max is less than  $t_{CLZ1}$  min,  $t_{CHZ2}$  max is less than  $t_{CLZ2}$  min, and  $t_{OHZ}$  max is less than  $t_{OLZ}$  min, for any device.

Write Cycle (1) (WE# CLOCK, OE#="H" while writing)



Note 17. t<sub>WP</sub> is the interval between write start and write end.

A write starts when all of (CS1#), (WE#) and (CS2) become active.

A write is performed during the overlap of a low CS1#, a low WE# and a high CS2.

A write ends when any of (CS1#), (WE#) or (CS2) becomes inactive.

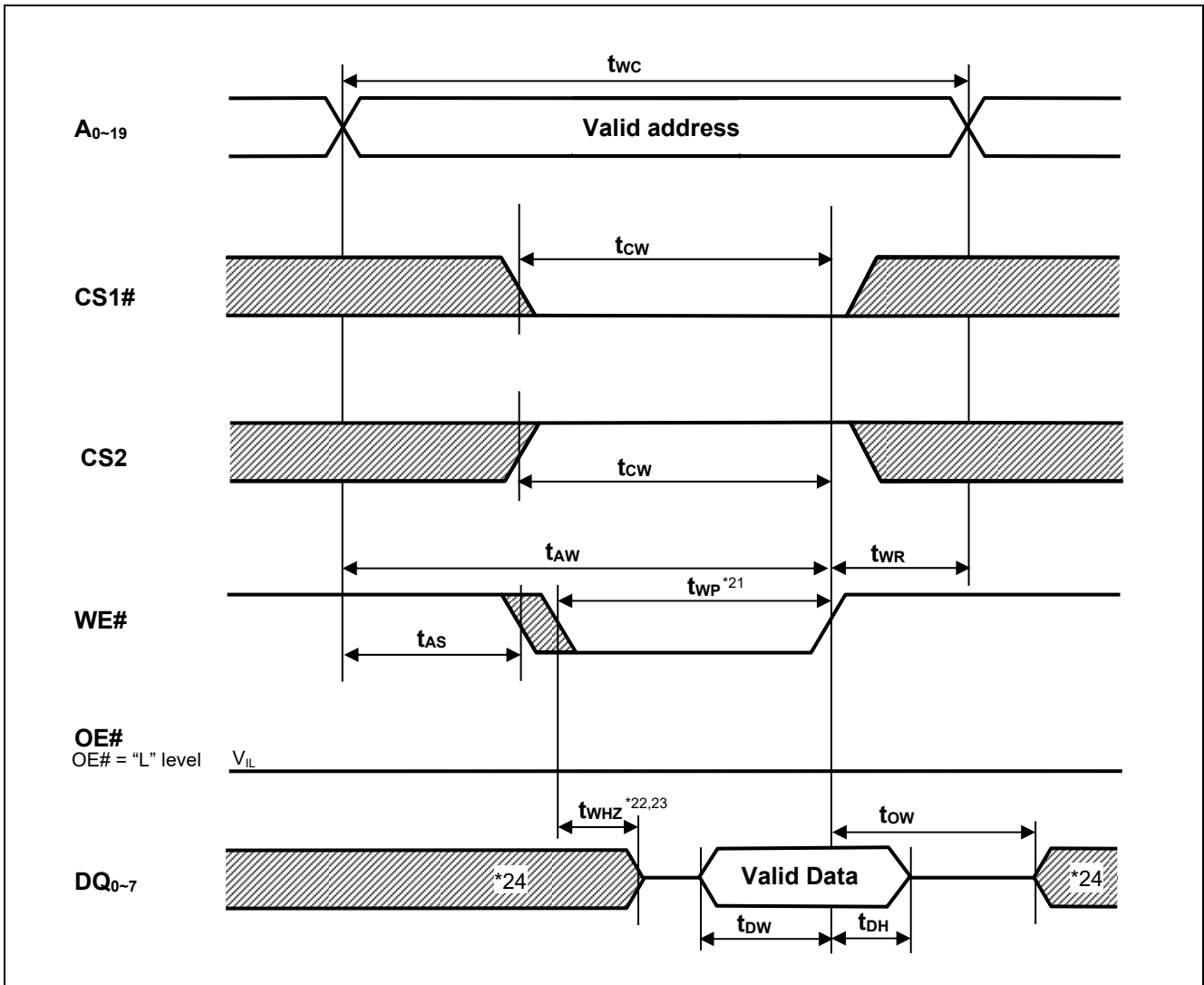
18. t<sub>OHZ</sub> and t<sub>WHZ</sub> are defined as the time when the DQ pins enter a high-impedance state and are not referred to the DQ levels.

19. This parameter is sampled and not 100% tested

20. During this period, DQ pins are in the output state so input signals must not be applied to the DQ pins.

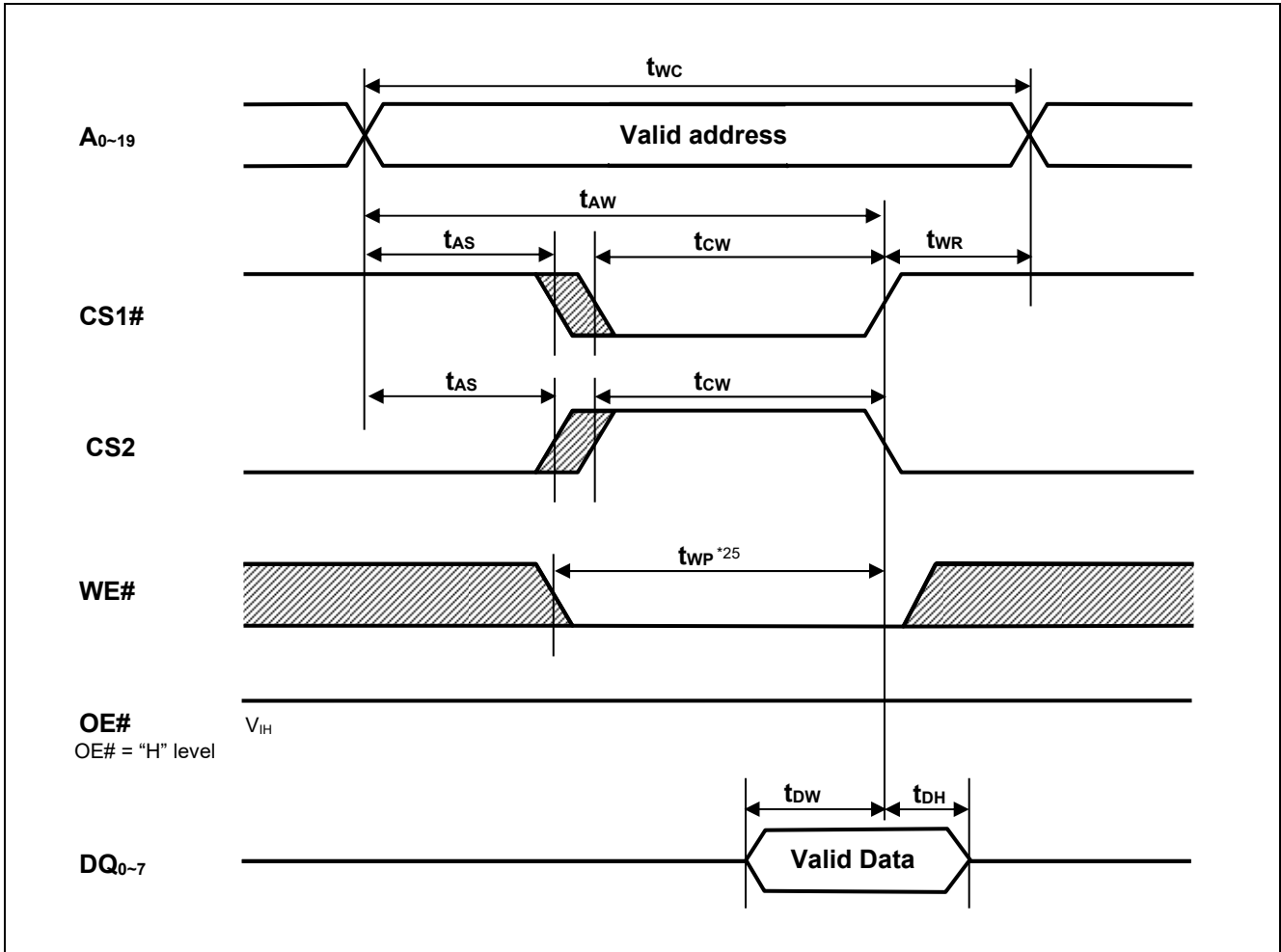


Write Cycle (2) (WE# CLOCK, OE# Low Fixed)



- Note 21.  $t_{WP}$  is the interval between write start and write end.  
 A write starts when all of (CS1#), (WE#) and (CS2) become active.  
 A write is performed during the overlap of a low CS1#, a low WE# and a high CS2.  
 A write ends when any of (CS1#), (WE#) or (CS2) becomes inactive.
22.  $t_{WHZ}$  is defined as the time when the DQ pins enter a high-impedance state and are not referred to the DQ levels.
23. This parameter is sampled and not 100% tested.
24. During this period, DQ pins are in the output state so input signals must not be applied to the DQ pins.

Write Cycle (3) (CS1#, CS2 CLOCK)



Note 25.  $t_{WP}$  is the interval between write start and write end.  
 A write starts when all of (CS1#), (WE#) and (CS2) become active.  
 A write is performed during the overlap of a low CS1#, a low WE# and a high CS2.  
 A write ends when any of (CS1#), (WE#) or (CS2) becomes inactive.

Low V<sub>CC</sub> Data Retention Characteristics

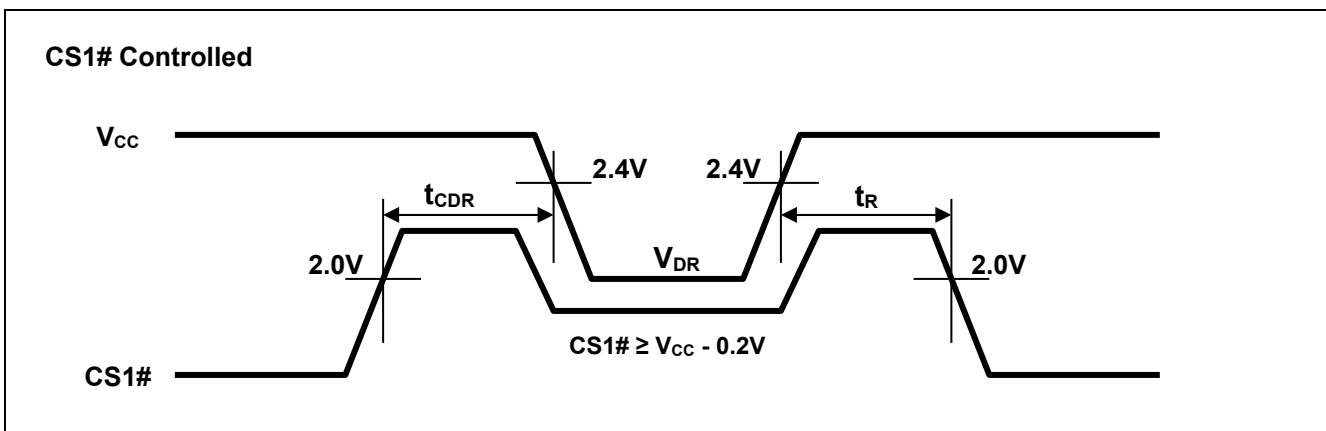
Parameter	Symbol	Min.	Typ.	Max.	Unit	Test conditions <sup>*28</sup>	
V <sub>CC</sub> for data retention	V <sub>DR</sub>	1.5	—	3.6	V	V <sub>in</sub> ≥ 0V, (1) CS2 ≤ 0.2V or (2) CS1# ≥ V <sub>CC</sub> -0.2V, CS2 ≥ V <sub>CC</sub> -0.2V	
Data retention current	I <sub>CCDR</sub>	—	0.45 <sup>*26</sup>	2	μA	~+25°C	V <sub>CC</sub> = 3.0V, V <sub>in</sub> ≥ 0V, (1) CS2 ≤ 0.2V or (2) CS1# ≥ V <sub>CC</sub> -0.2V, CS2 ≥ V <sub>CC</sub> -0.2V
		—	0.6 <sup>*27</sup>	4	μA	~+40°C	
		—	—	7	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 26. Typical parameter indicates the value for the center of distribution at 3.0V (T<sub>a</sub>=25°C), and not 100% tested.

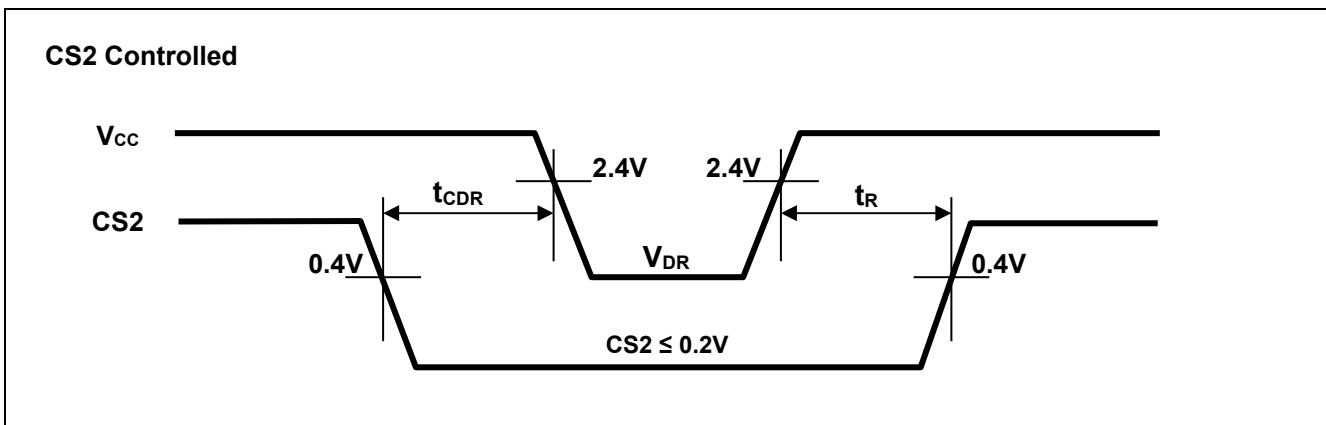
27. Typical parameter indicates the value for the center of distribution at 3.0V (T<sub>a</sub>=40°C), and not 100% tested.

28. CS2 controls address buffer, WE# buffer, CS1# buffer, OE# buffer and DQ 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 CS2 ≤ 0.2V. The other inputs levels (address, WE#, OE#, DQ) can be in the high-impedance state.

Low V<sub>CC</sub> Data Retention Timing Waveforms (CS1# controlled)



Low V<sub>CC</sub> Data Retention Timing Waveforms (CS2 controlled)



Revision History	RMLV0808BGSB Data Sheet
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Rev.	Date	Description	
		Page	Summary
1.00	2014.11.28	—	First Edition issued
2.00	2015.06.26	P.1, 4 P.2 P.4 P.11	Standby current $I_{SB1}$ : 25°C 0.6μA ->0.45μA (typ.), 40°C 2μA ->0.6μA (typ.) Modify Pin Arrangement : Add 1pin Mark Average operating current $I_{CC2}$ : 25°C 2mA ->1.5mA (typ.) Data retention current $I_{CCDR}$ : 25°C 0.6μA ->0.45μA (typ.), 40°C 2μA ->0.6μA (typ.)
2.01	2020.02.20	Last page	Updated the Notice to the latest version

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### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

### Contact Information

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### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

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