To Our Valued Customers;

EOL plan of 16Mb SRAM: R1LV1616H Series
(Replacement with new products: RMLV1616A-U Series)

Affected Part Name:

R1LV1616HBG-4SI, R1LV1616HBG-5SI

R1LV1616HSA-4SI, R1LV1616HSA-5SI

Related Preceding Document :
End Of Life Notice
(Notification - [SAF-B-22-0002])
[10 June 2022]

November 7, 2022 No. CST-R2-AB318-A

Standard Products Department
Industrial Analog Division
IoT and Infrastructure Business Unit

Renesas Electronics Corporation

Contents

EOL plan of 16Mb SRAM: R1LV1616H Series

In the EOL notice [SAF-B-22-0002], issued on June 10, 2022, we announced the EOL of **R1LV1616H** series and introduced alternative products, **RMLV1616A-U** series. This document provides a detailed information of both product series.
We kindly ask for your understanding to determine suitable alternatives.

End Of Life Notice

SAF-B-22-0002

1. **Affected Orderable Part Name**

   Please refer to the next page.

2. **Background of EOL**

   Under the situation of strong demand, we are continuously working to improve the production efficiency of the entire factory and maximize the production quantity through investment.
   16Mb SRAM: R1LV1616H has become obsolete as a technology node in the factory and has to be excluded from the products that should be focused on, so we decided to discontinue production.

3. **EOL schedule**

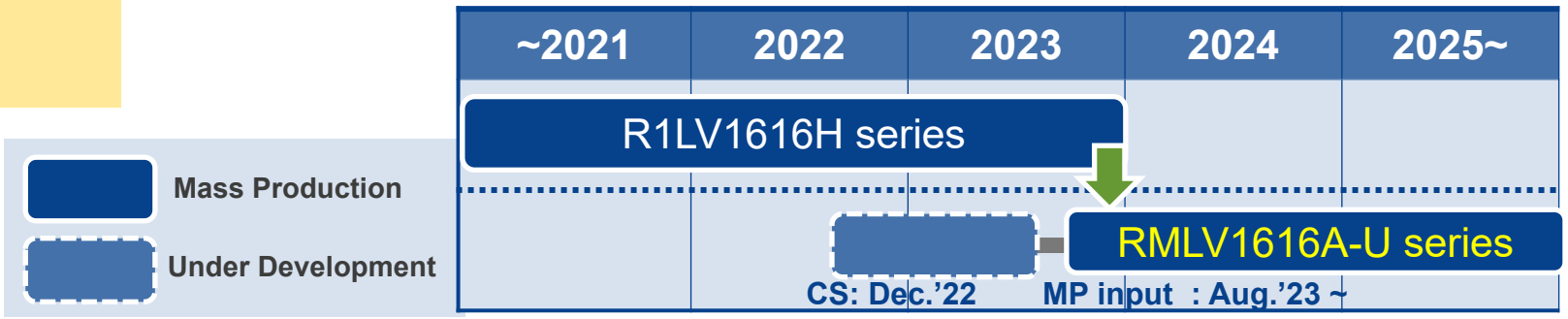
   Jun. 2022 EOL announcement
   Dec. 2022 LTB Order
   Dec. 2023 Last Time Shipment

16Mb SRAM：Affected Orderable Part Name & Alternative products

EOL products Orderable Part Name	Density (Mbit)	Package Type	Packing Type	Alternative products Orderable Part Name	Reference page
R1LV1616HBG-4SI#B0	16	48ball-FBGA	Tray	RMLV1616AGBG-4U2#AC0	pp.5-6, 9-13
R1LV1616HBG-4SI#S0	↑	↑	Tape & Reel	RMLV1616AGBG-4U2#KC0	pp.5-6, 9-13
R1LV1616HBG-5SI#B0	↑	↑	Tray	RMLV1616AGBG-5U2#AC0	pp.5-6, 9-13
R1LV1616HBG-5SI#S0	↑	↑	Tape & Reel	RMLV1616AGBG-5U2#KC0	pp.5-6, 9-13
R1LV1616HSA-4SI#B1	↑	48pin-TSOP(I)	Tray	RMLV1616AGSA-4U2#AA0	pp.7-8, 9-13
R1LV1616HSA-4SI#S1	↑	↑	Tape & Reel	RMLV1616AGSA-4U2#KA0	pp.7-8, 9-13
R1LV1616HSA-5SI#B1	↑	↑	Tray	RMLV1616AGSA-5U2#AA0	pp.7-8, 9-13
R1LV1616HSA-5SI#S1	↑	↑	Tape & Reel	RMLV1616AGSA-5U2#KA0	pp.7-8, 9-13

Alternative products are under development.
CS sample : Dec. 2022,
MP input start : Aug. 2023

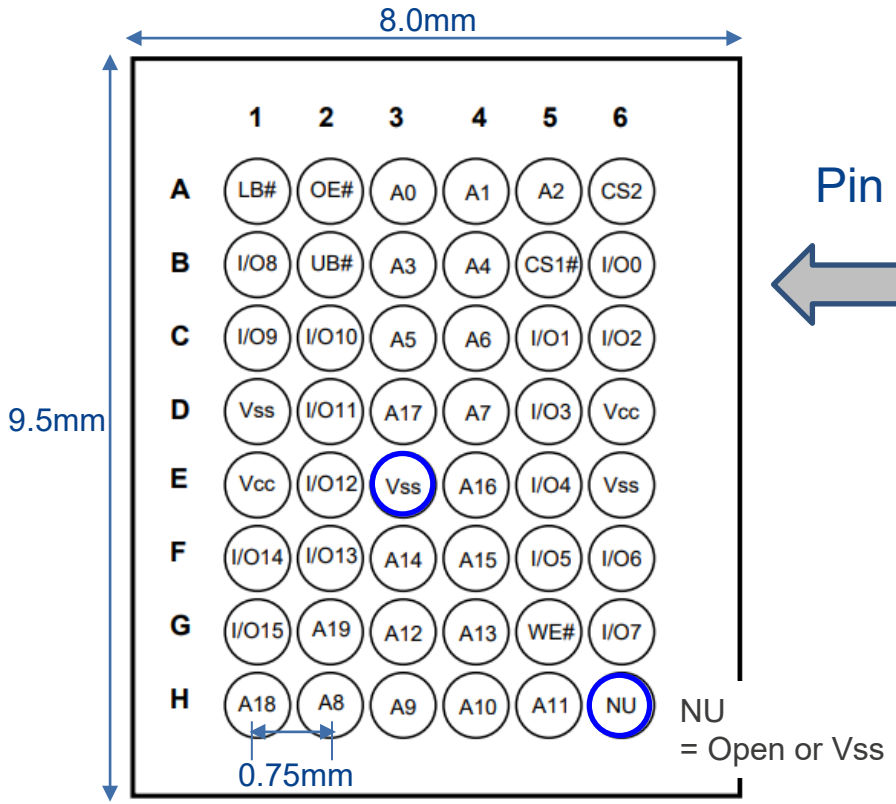
(Rescheduled CS shipment and MP input)



Pin Configuration & Package Outline comparison of 48ball-FBGA

While the package outline is smaller in the alternative product, the ball pitch and the pin configuration are unchanged.

(TOP VIEW)

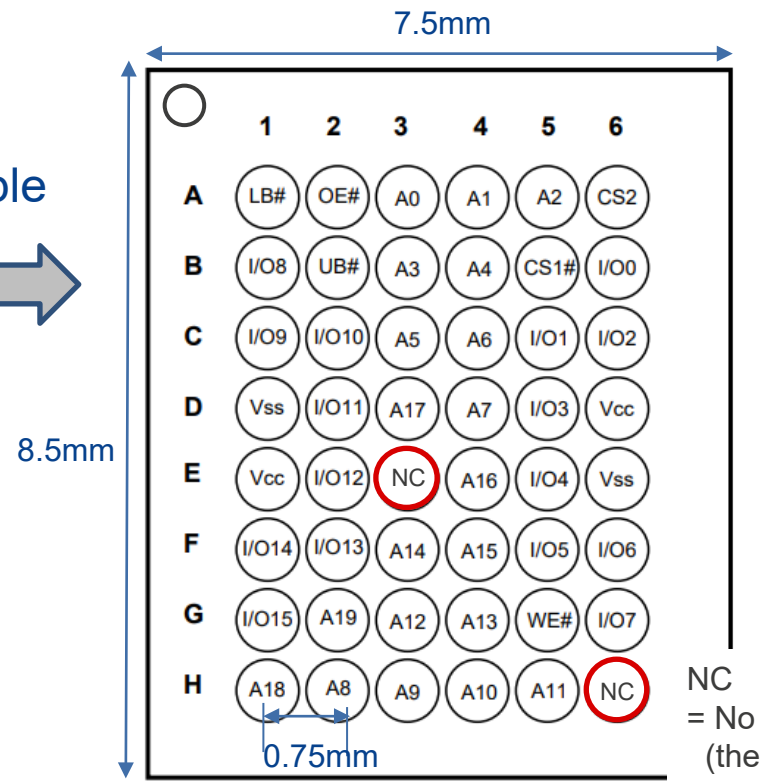


NU
= Open or Vss

R1LV1616HBG-4SI/5SI
(EOL product)

Pin compatible

(TOP VIEW)



NC
= No connection
(the pin is not internally connected to the die.)

RMLV1616AGBG-4U2/5U2
(Alternative product)

Package Outlines

R1LV1616HBG

PDF

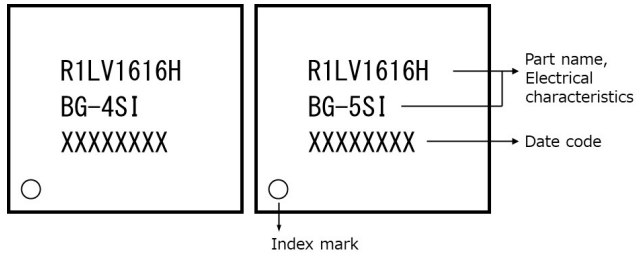
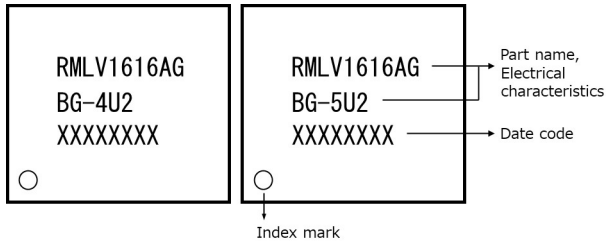
8x9.5mm

RMLV1616AGBG

PDF

7.5x8.5mm

Comparison table of 48ball-FBGA

Item		EOL products	Alternative products
Orderable part name		R1LV1616HBG-4SI#B0 (Tray packing)	RMLV1616AGBG-4U2#AC0 (Tray packing)
		R1LV1616HBG-4SI#S0 (Tape & Reel packing)	RMLV1616AGBG-4U2#KC0 (Tape & Reel packing)
		R1LV1616HBG-5SI#B0 (Tray packing)	RMLV1616AGBG-5U2#AC0 (Tray packing)
		R1LV1616HBG-5SI#S0 (Tape & Reel packing)	RMLV1616AGBG-5U2#KC0 (Tape & Reel packing)
Wafer Fab.		Naka (N3)	Saijo
Wafer Process		0.13um CMOS	0.11um Advanced
Assembly site		Amkor Technology Japan (Kumamoto)	←
JEITA Package Code		P-TFBGA48-8x9.5-0.75	P-TFBGA48-7.5x8.5-0.75
Package Dimensions		8.0 x 9.5mm	7.5 x 8.5mm
Ball Pitch		0.75mm	←
Ball Size		0.35mm	0.45mm
Package marking specification			
Assembly Material	Substrate material	Glass epoxy	Glass epoxy
	Solder ball	Sn-Ag-Cu	Sn-Ag-Cu
	Die bonding	Epoxy film	Epoxy paste
	Wire bonding	Au	Au
	Mold	Epoxy resin (Halogen-included)	Epoxy resin (Halogen-free)
Final test site		Powertech Technology Inc. (Taiwan)	←
Packing specification		Current specification for 8x9.5mm FBGA	Current specification for 7.5x8.5mm FBGA
Moisture-proof performance		MSL 3	←
Shipping label		Current specification	No change in format (Changes in orderable part name)

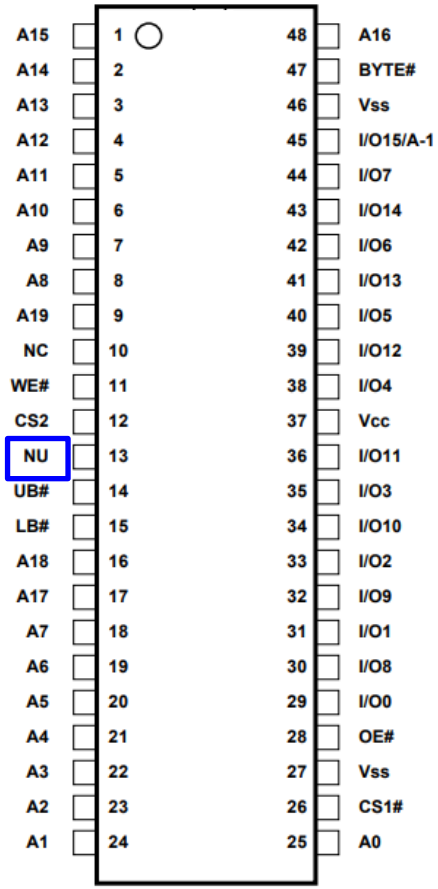
Note: Additional PCN

Regarding R1LV1616HBG-4SI/5SI, the substrate material (core material) will be changed before replaced with alternative products. Please refer to the following PCN published on Oct.7.

PCN (Substrate change)

Pin Configuration & Package Outline comparison of 48pin-TSOP(I)

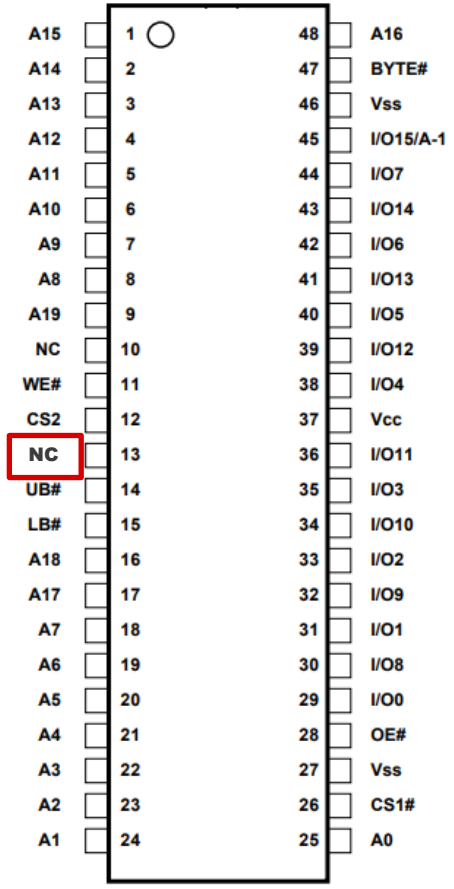
NU
= Open or Vss



R1LV1616HSA-4SI/5SI
(EOL product)

Pin compatible

NC
= No connection
(the pin is not internally connected to the die.)



RMLV1616AGSA-4U2/5U2
(Alternative product)

Package Outline

R1LV1616HSA

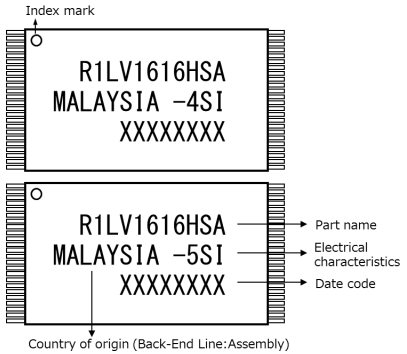
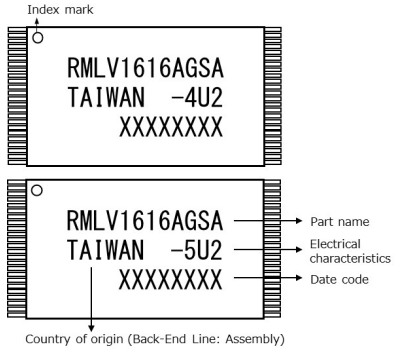
Assy Fab: Amkor
Malaysia

RMLV1616AGSA

Assy Fab: Greatek

(Package compatible)

Comparison table of 48pin-TSOP(I)

Item		EOL products	Alternative products
Orderable part name		R1LV1616HSA-4SI#B0 (Tray packing)	RMLV1616AGSA-4U2#AA0 (Tray packing)
		R1LV1616HSA-4SI#S0 (Tape & Reel packing)	RMLV1616AGSA-4U2#KA0 (Tape & Reel packing)
		R1LV1616HSA-5SI#B0 (Tray packing)	RMLV1616AGSA-5U2#AA0 (Tray packing)
		R1LV1616HSA-5SI#S0 (Tape & Reel packing)	RMLV1616AGSA-5U2#KA0 (Tape & Reel packing)
Wafer Fab.		Naka (N3)	Saijo
Wafer Process		0.13um CMOS	0.11um Advanced
Assembly site		Amkor Technology Malaysia Sdn. Bhd.	Greatek Electronics Inc.
JEITA Package Code		P-TSOP(1)48-12x18.4-0.50	←
Package marking specification			
Assembly Material	Lead frame material	Cu	Cu
	Lead plating	Sn (pure tin)	Sn (pure tin)
	Die bonding	Epoxy paste	Epoxy paste
	Wire bonding	Au	Au
	Mold	Epoxy resin (Halogen-free)	Epoxy resin (Halogen-free)
Final test site		Powertech Technology Inc. (Taiwan)	←
Packing specification		Current specification	←
Moisture-proof performance		MSL 3	←
Shipping label		Current specification	No change in format (Changes in orderable part name and country of origin)

Comparison of Electrical characteristics - DC(1)

Assures upward compatibility of DC/AC electrical characteristics.

Products

Item	EOL products	Alternative products
Orderable part name	R1LV1616HBG-4SI#B0/#S0	RMLV1616AGBG-4U2#AC0/#KC0
	R1LV1616HBG-5SI#B0/#S0	RMLV1616AGBG-5U2#AC0/#KC0
	R1LV1616HSA-4SI#B1/#S1	RMLV1616AGSA-4U2#AA0/#KA0
	R1LV1616HSA-5SI#B1/#S1	RMLV1616AGSA-5U2#AA0/#KA0

DC conditions

Item	Symbol	EOL product	Symbol	Alternative products
Supply voltage	Vcc	2.7V～3.6V	Vcc	2.7V～3.6V
Ambient temperature range	Ta	-40℃～85℃	Ta	-40℃～85℃
Input high voltage	VIH	2.2V(min.) / Vcc+0.3V(max.)	VIH	2.2V(min.) / Vcc+0.3V(max.)
Input low voltage	VIL	-0.3V(min.) / 0.6V(max.)	VIL	-0.3V(min.) / 0.6V(max.)

DC characteristics

Item	Symbol	EOL product		Symbol	Alternative products	
Operating Current	Icc1(READ, TTL, Min.Cycle)	35mA(max.) / 22mA(typ.)		Icc1(TTL, Min.Cycle)	35mA(max.) / 27mA(typ.)	
	Icc1(TTL, Min.Cycle)	50mA(max.) / 30mA(typ.)				
	Icc2(READ, TTL, Cycle=70ns)	8mA(max.) / 3mA(typ.)		-	-	
	Icc2(TTL, Cycle=70ns)	30mA(max.) / 20mA(typ.)				
	Icc3(MOS, Cycle=1us)	8mA(max.) / 3mA(typ.)		Icc2(MOS, Cycle=1us)	4mA(max.) / 1.6mA(typ.)	
Standby current	ISB(TTL)	0.5mA(max.) / 0.1mA(typ.)		ISB(TTL)	0.3mA(max.) / 0.1mA(typ.)	
	ISB1(MOS)	～25℃	NA (max.) / 0.5uA(typ.)	ISB1(MOS)	～25℃	3uA(max.) / 0.5uA(typ.)
		～40℃	NA (max.) / NA (typ.)		～40℃	5uA(max.) / 0.8uA(typ.)
		～70℃	NA (max.) / NA (typ.)		～70℃	6uA(max.) / 2uA(typ.)
		～85℃	8uA(max.) / NA (typ.)		～85℃	8uA(max.) / 4.5uA(typ.)
Output high voltage	VOH	IOH=-1mA	2.4V(min.)	VOH	IOH=-1mA	2.4V(min.)
		IOH=-0.1mA	Vcc-0.2V(min.)		IOH=-0.1mA	Vcc-0.2V(min.)
Output low voltage	VOL	IOL=2mA	0.4V(max.)	VOL	IOL=2mA	0.4V(max.)
		IOL=0.1mA	0.2V(max.)		IOL=0.1mA	0.2V(max.)

Comparison of Electrical characteristics - DC(2)

Assures upward compatibility of DC/AC electrical characteristics.

Products

Item	EOL products	Alternative products
Orderable part name	R1LV1616HBG-4SI#B0/#S0	RMLV1616AGBG-4U2#AC0/#KC0
	R1LV1616HBG-5SI#B0/#S0	RMLV1616AGBG-5U2#AC0/#KC0
	R1LV1616HSA-4SI#B1/#S1	RMLV1616AGSA-4U2#AA0/#KA0
	R1LV1616HSA-5SI#B1/#S1	RMLV1616AGSA-5U2#AA0/#KA0

Capacitance

Item	Symbol	EOL product	Symbol	Alternative products
Input capacitance	C in	8pF(max.)	C in	8pF(max.)
Input/Output capacitance	C I/O	10pF(max.)	C I/O	10pF(max.)

Data retention characteristics

Item	Symbol	EOL product		Symbol	Alternative products	
Vcc for data retention	VDR	1.5V(min.)		VDR	1.5V(min.)	
Data retention current	IccDR	~25℃	NA (max.) / 0.5uA(typ.)	IccDR	~25℃	3uA(max.) / 0.5uA(typ.)
		~40℃	NA (max.) / NA (typ.)		~40℃	5uA(max.) / 0.8uA(typ.)
		~70℃	NA (max.) / NA (typ.)		~70℃	6uA(max.) / 2uA(typ.)
		~85℃	8uA(max.) / NA (typ.)		~85℃	8uA(max.) / 4.5uA(typ.)
Chip deselect time to data retention	tCDR	0ns(min.)		tCDR	0ns(min.)	
Operation recovery time	tR	5ms(min.)		tR	5ms(min.)	

Comparison of Electrical characteristics - AC(1)

Assures upward compatibility of DC/AC electrical characteristics.

Products

Item	EOL products	Alternative products
Orderable part name	R1LV1616HBG-4SI#B0/#S0	RMLV1616AGBG-4U2#AC0/#KC0
	R1LV1616HBG-5SI#B0/#S0	RMLV1616AGBG-5U2#AC0/#KC0
	R1LV1616HSA-4SI#B1/#S1	RMLV1616AGSA-4U2#AA0/#KA0
	R1LV1616HSA-5SI#B1/#S1	RMLV1616AGSA-5U2#AA0/#KA0

AC characteristics
Read Cycle

Item	Symbol	EOL product		Symbol	Alternative products	
Read cycle time	tRC	4SI	45ns(min.)	tRC	4U2	45ns(min.)
		5SI	55ns(min.)		5U2	55ns(min.)
Address access time	tAA	4SI	45ns(max.)	tAA	4U2	45ns(max.)
		5SI	55ns(max.)		5U2	55ns(max.)
Chip select access time	tACS1 / tACS2	4SI	45ns(max.)	tACS1 / tACS2	4U2	45ns(max.)
		5SI	55ns(max.)		5U2	45ns(max.)
Output enable to output valid	tOE	4SI	30ns(max.)	tOE	4U2	22ns(max.)
		5SI	35ns(max.)		5U2	22ns(max.)
Output hold from address change	tOH	4SI	10ns(min.)	tOH	4U2	10ns(min.)
		5SI	10ns(min.)		5U2	10ns(min.)
LB#,UB# access time	tBA	4SI	45ns(max.)	tBA	4U2	45ns(max.)
		5SI	55ns(max.)		5U2	45ns(max.)
Chip select to output in low-Z	tCLZ1 / tCLZ2	4SI	10ns(min.)	tCLZ1 / tCLZ2	4U2	10ns(min.)
		5SI	10ns(min.)		5U2	10ns(min.)
LB#,UB# enable to low-Z	tBLZ	4SI	5ns(min.)	tBLZ	4U2	5ns(min.)
		5SI	5ns(min.)		5U2	5ns(min.)
Output enable to output in low-Z	tOLZ	4SI	5ns(min.)	tOLZ	4U2	5ns(min.)
		5SI	5ns(min.)		5U2	5ns(min.)
Chip deselect to output in high-Z	tCHZ1 / tCHZ2	4SI	0ns(min.) / 20ns(max.)	tCHZ1 / tCHZ2	4U2	0ns(min.) / 18ns(max.)
		5SI	0ns(min.) / 20ns(max.)		5U2	0ns(min.) / 18ns(max.)
LB#,UB# disable to high-Z	tBHZ	4SI	0ns(min.) / 15ns(max.)	tBHZ	4U2	0ns(min.) / 15ns(max.)
		5SI	0ns(min.) / 20ns(max.)		5U2	0ns(min.) / 18ns(max.)
Output disable to output in high-Z	tOHZ	4SI	0ns(min.) / 15ns(max.)	tOHZ	4U2	0ns(min.) / 15ns(max.)
		5SI	0ns(min.) / 20ns(max.)		5U2	0ns(min.) / 18ns(max.)

Comparison of Electrical characteristics - AC(2)

Assures upward compatibility of DC/AC electrical characteristics.

Products

Item	EOL products	Alternative products
Orderable part name	R1LV1616HBG-4SI#B0/#S0	RMLV1616AGBG-4U2#AC0/#KC0
	R1LV1616HBG-5SI#B0/#S0	RMLV1616AGBG-5U2#AC0/#KC0
	R1LV1616HSA-4SI#B1/#S1	RMLV1616AGSA-4U2#AA0/#KA0
	R1LV1616HSA-5SI#B1/#S1	RMLV1616AGSA-5U2#AA0/#KA0

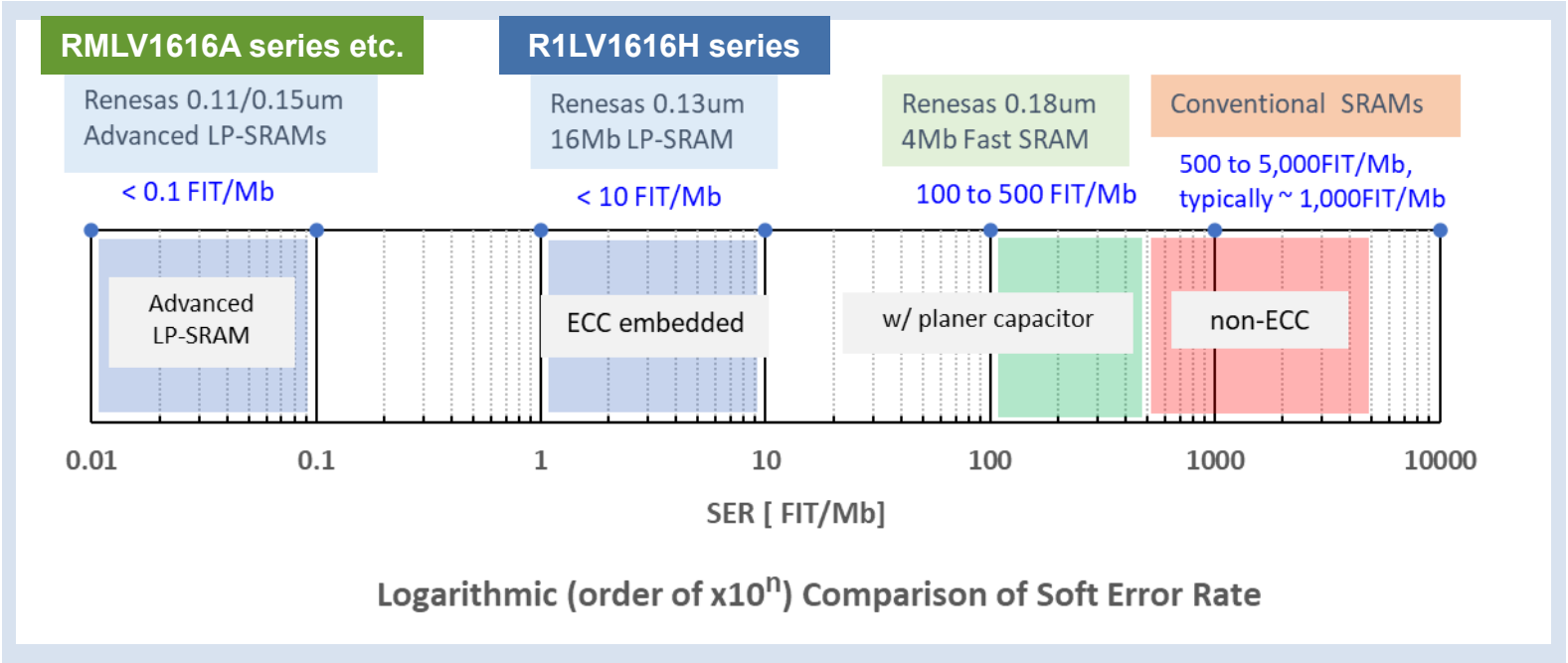
Write Cycle

Item	Symbol	EOL product		Symbol	Alternative products	
Write cycle time	tWC	4SI	45ns(min.)	tWC	4U2	45ns(min.)
		5SI	55ns(min.)		5U2	55ns(min.)
Address valid to end of write	tAW	4SI	45ns(min.)	tAW	4U2	35ns(min.)
		5SI	50ns(min.)		5U2	35ns(min.)
Chip selection to end of write	tCW	4SI	45ns(min.)	tCW	4U2	35ns(min.)
		5SI	50ns(min.)		5U2	35ns(min.)
Write pulse width	tWP	4SI	35ns(min.)	tWP	4U2	35ns(min.)
		5SI	40ns(min.)		5U2	35ns(min.)
LB#,UB# valid to end of write	tBW	4SI	45ns(min.)	tBW	4U2	35ns(min.)
		5SI	50ns(min.)		5U2	35ns(min.)
Address setup time	tAS	4SI	0ns(min.)	tAS	4U2	0ns(min.)
		5SI	0ns(min.)		5U2	0ns(min.)
Write recovery time	tWR	4SI	0ns(min.)	tWR	4U2	0ns(min.)
		5SI	0ns(min.)		5U2	0ns(min.)
Data to write time overlap	tDW	4SI	25ns(min.)	tDW	4U2	25ns(min.)
		5SI	25ns(min.)		5U2	25ns(min.)
Data hold from write time	tDH	4SI	0ns(min.)	tDH	4U2	0ns(min.)
		5SI	0ns(min.)		5U2	0ns(min.)
Output active from end of write	tOW	4SI	5ns(min.)	tOW	4U2	5ns(min.)
		5SI	5ns(min.)		5U2	5ns(min.)
Output disable to output in high-Z	tOHZ	4SI	0ns(min.) / 15ns(max.)	tOHZ	4U2	0ns(min.) / 15ns(max.)
		5SI	0ns(min.) / 20ns(max.)		5U2	0ns(min.) / 18ns(max.)
Write to output in high-Z	tWHZ	4SI	0ns(min.) / 15ns(max.)	tWHZ	4U2	0ns(min.) / 15ns(max.)
		5SI	0ns(min.) / 20ns(max.)		5U2	0ns(min.) / 18ns(max.)

Technology Comparison

Soft-error Countermeasures

Product Family	ECC embedded?	Countermeasure against soft error?	By what?	Soft error rate (Measured)	Differentiator
R1LV1616H series (0.13um CMOS 16Mb)	YES	YES	Embedded ECC	< 5.5 FIT/Mb	Single FIT/Mb: excellent soft error immunity in practical use
RMLV1616A-U series (0.11um Advanced 16Mb)	NO	YES	Soft-error immune process & device technology	< 0.04 FIT/Mb	Outstanding soft error immunity over ECC-embedded products



Logarithmic (order of $x10^n$) Comparison of Soft Error Rate

Revision History

Rev.	Date	Outline of changed content
Initial release	June 20, 2022	-
A	November 7, 2022	page 4：Changed schedule CS sample : Nov. 2022 ⇒ Dec. 2022 MP input start : Jan. 2023 ⇒ Aug. 2023 Page 6 : Posted additional PCN regarding FBGA package

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