

Low Latency High Bandwidth Memory

Introduction

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1. Low Latency High Bandwidth Memory

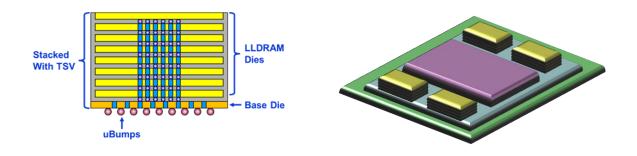
Renesas' Low Latency High Bandwidth Memory consists of multiple Renesas' original low latency memory dies and realizes high random-access rate and small data granularity as well as high bandwidth. By populating the stack memory along with your accelerator or processor in the same package, you can differentiate your systems with its performance improvement by keeping effective bandwidth high even at non-sequential memory access. The stack memory accelerates datacenter application such as artificial intelligence (Deep Learning, Convolutional Neural Network, etc.), Graph Analytics, Database, Sparse Matrix. It also fits network applications such as table lookup with high search rate, packet buffer, control memory in routers, switches etc.



2. Features

2.1 Stacked memory

Low Latency High Bandwidth Memory stacks 4 or 8 low latency DRAM dies through TSV and base die on logic process and realize 2304 [Gbps] with thousands of IOs keeping low latency DRAM features, high random access and small granularity. The stack memory is utilized integrating with customer's ASIC, GPU, CPU, NPU, FPGA, AI accelerator on silicon interposer in the same package and realizes near memory computing.



2.2 High Random-Access Rate and Small Data Granularity

Figure.1 shows a trend of DRAM's access rate and bandwidth. Standard DRAMs (DDR3, DDR4, GDDR6) have gradually been improving bandwidth, while the data granularity is getting bigger and bigger in figure.2. These trends would not be changed because standard DRAM has been focusing on bandwidth and density which are required from bigger volume applications in DRAM market. On the other side, there are some applications which are unable to achieve the performance with standard DRAM. It is because standard memory only allows sequential access to get maximum high bandwidth. To further improve performance of these applications, random access capability is getting critical. To meet the requirement from these applications, Renesas has been improving not only bandwidth but random access capability as well. Now, we achieved 16 billion random access per second and 16-Byte data granularity with stacking multiple low latency memory dies and realize high effective bandwidth regardless applications even sparse AI model, FFT, hash function for block chain in datacenter as well as packet classification of network.

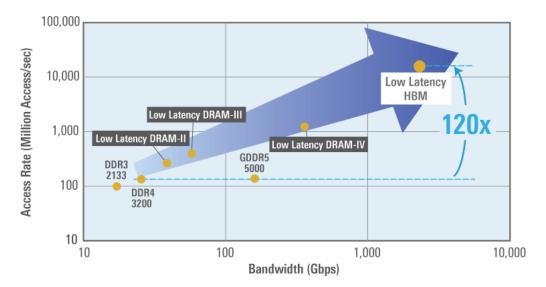


Figure.1

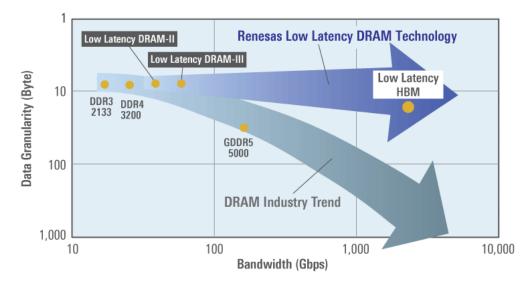
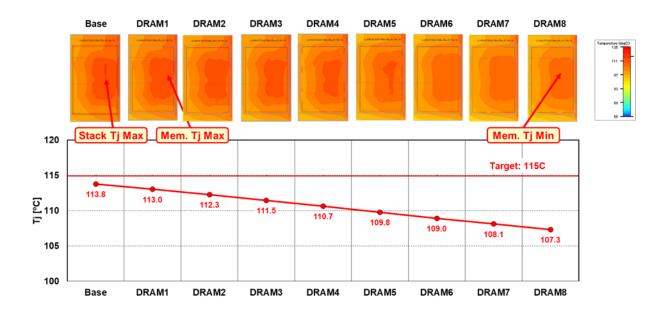


Figure.2

2.3 Guarantees Tjmax=115C

Renesas' low latency DRAM products have long history to meet severe high maximum temperature requirement with long life from network industry customers. The new stack memory also guarantees Tjmax=115°C and delivers realistic solutions to your package thermal problem. To help the problem, Renesas can operate user custom thermal simulation adapted user's environment such as power consumption of the processor, package size etc.



2.4 JEDEC Std. HBM-Like Interface

Low Latency HBM has two configurations. Config2 following JEDEC Std. HBM2 interface has the same number and location as that of HBM2 μ Bumps. Config 1 needs additional μ Bumps to achieve highest performance..

2.5 Ecosystem partner of PHY and Controller

Renesas has relationship with multiple PHY and Controller IP partners. Users can utilize their IP specialized Low Latency HBM for your ASIC, processor or accelerator. Even more partners are under discussing. For more information, please contact our representatives.

3. Line up

Density [Gb]	Config.	Burst Length	Clock Freq. [MHz]	Data Width	tRC [ns]	Access Rate [Maps]	Bandwidth [Gbps]	Data Granularity	VDDQ (I/O) [V]
	1	2	1,000	x 1,152	12.0	16,000	2,304	16Byte	1.0
9Gb/	1	2	1,000	X 1,152	12.0	16,000	2,304	Tobyte	1.2
18Gb	2	4	1,000	v 1 1E2	16.0	8,000	2 204	32Byte	1.0
	2	4	1,000	x 1,152	16.0	8,000	2,304	52byte	1.2

Website and Support

Renesas Electronics Website http://www.renesas.com/

Inquiries

<u>Low Latency High Bandwidth Memory Mailing List</u> (LowLatencyHBM@lm.renesas.com)

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Revision History

Description

Rev.	Date	Page	Summary
0.01	Jan. 29, 2019	-	Preliminary Release

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SALES OFFICES

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Renesas Electronics Corporation TOYOSU FORESIA, 3-2-24 Toyosu, Koto-ku, Tokyo 135-0061, Japan

Renesas Electronics America Inc. 1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A. Tel: +1-408-432-8888, Fax: +1-408-434-5351

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: +44-1628-651-700

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 Langae Road, Putuo District, Shanghai, 200333 P. R. China Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited

Unit 1601-1611, 16IF., 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

Indiranagar, Bangalore 560 038, India

Renesas Electronics India Pvt. Ltd. No.777C, 100 Feet Road, HAL 2nd Stage, Ind Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd. 17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea Tel: +82-2-558-3737, Fax: +82-2-558-5338