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Product/Process Change Notification
PCN#: 1020006

This is an announcement of change to products which are currently supplied by ROHM.
ROHM sincerely requires acknowledgment of receipt of this notification within 30 days of the date of this notice. Lack of acknowledgment of this notice within 30 days constitutes acceptance of the change.
Your understanding and cooperation would be highly appreciated.

Issue Date: July 14, 2020

Title of change	
LSI: Adds the Lapis Miyagi as a newly manufacturing site for 0.18um memory products as a part of BCP	
Identification of change	
Can be identified by the mark	
Detailed description of change	
Before	After
Rohm Kyoto LSI 0.18um memory product	Rohm Kyoto LSI 0.18um memory product Lapis Miyagi LSI 0.18um memory product
Affected product(s)	
Manufacture part number	Customer part number
Attached	
Reason for change	
Stabilization of capacity	
Anticipated impact on form, fit, function, quality or reliability	
None	
Planned date for change	
November 1, 2021	
Qualification plan schedule, results and samples	
If required, please contact your local ROHM sales office.	
Comments	
Supplier contact	

After acknowledgement of the customer, lack of additional response within 90 day period constitutes acceptance of the change according to JEDEC Standard J-STD-046.



LSI:Adds the Lapis Miyagi as a newly manufacturing site for 0.18um memory products as a part of BCP

1. Summary of the change
2. Summary of LAPIS Miyagi factory
3. Quality management System
4. Change point of 5M with the factory transferring
5. Investigation for the change point of 5M (process), Reliability evaluation result
6. Investigation for the change point of 5M (product), Reliability evaluation result
7. Summary

14th July 2020
ROHM Co., Ltd.

Takashi Shimane / Division Manager / WP Control Div. WP Production Headquarters

1 . Summary of the change



1-1) Purpose of change

- Establish multiple manufacturing resources for the stabilized product supply by transferring some products from Rohm Kyoto to LAPIS Miyagi factory.

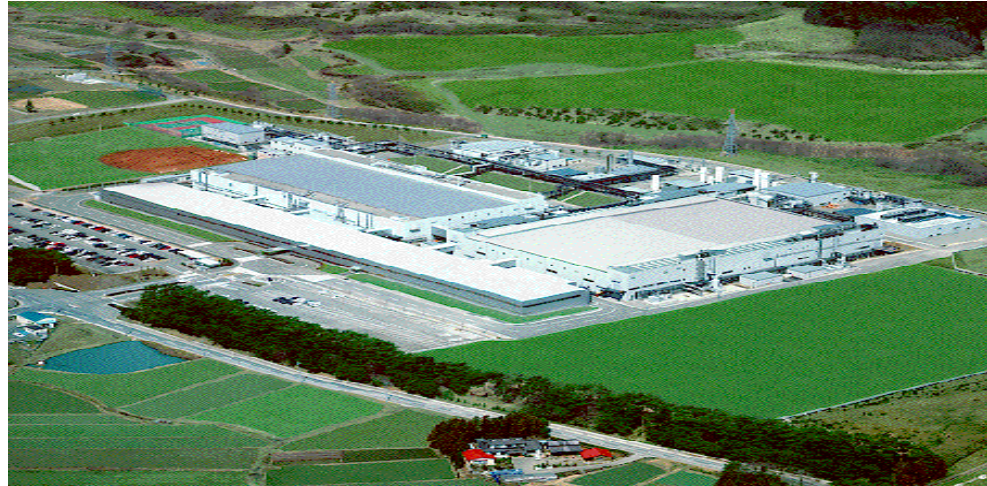
1-2) Contents of change

- Add Lapis Miyagi factory for application of 0.18um memory product of the wafer process producing. The quality characteristics are guaranteed by LAPIS Miyagi, which has produced products from 2013 in the same line as that of Rohm Kyoto.
(There is not a change about the assembly factory after the wafer process shipment)

1-3) Schedule of change

- We plan to change it immediately after your approval acquisition, because LAPIS Miyagi factory has mass-produced from 2013.
It becomes the intensive production in LAPIS Miyagi after approval from the viewpoint of production efficiency.

2. Summary of LAPIS Miyagi factory



2-1) LAPIS Miyagi factory summary

Company name : LAPIS Semiconductor Miyagi Co., Ltd.

Location : 1, Okinodaira Ohira-mura Kurokawa-gun, Miyagi

Establishment : 8/4/1988

Representative : Naotaka Fujita (President)

Production item : Monolithic IC (LSI)

Production Capacity : LSI 25,000~35,000 wafers(200mm)/ a month

Employee : 229

2-2) LSI 0.18 μ m PRODUCTION RESULTS

(Transferred products of the wafer process producing in Rohm Kyoto factory to LAPIS Miyagi factory)

START OF PRODUCTION : Dec. 2013

PRODUCTION VOLUME : 79,000wafers

Smallest Design Rule : 0.13 μ m

2. Summary of LAPIS Miyagi factory

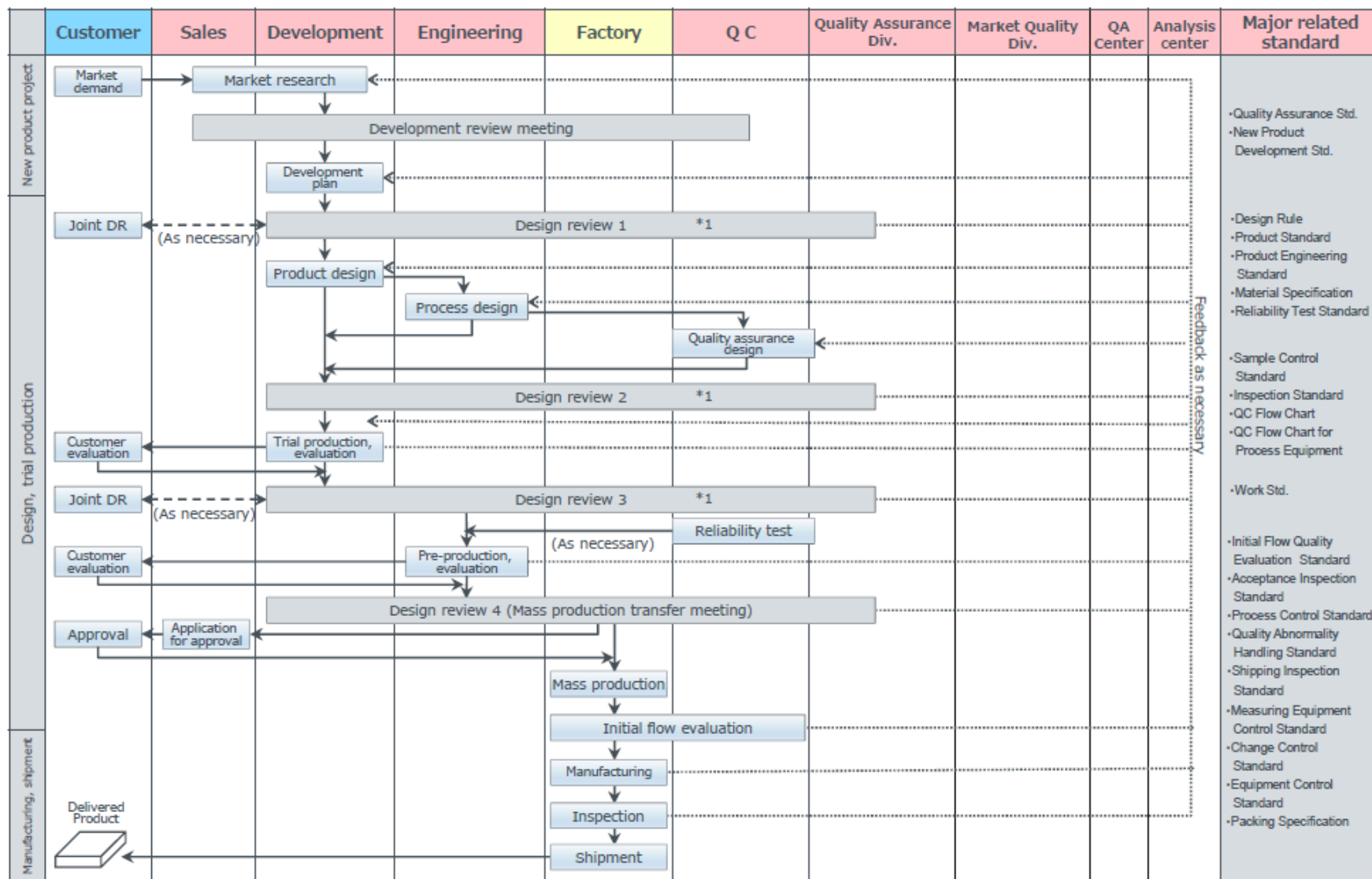


2-3) Environmental management (clean room)

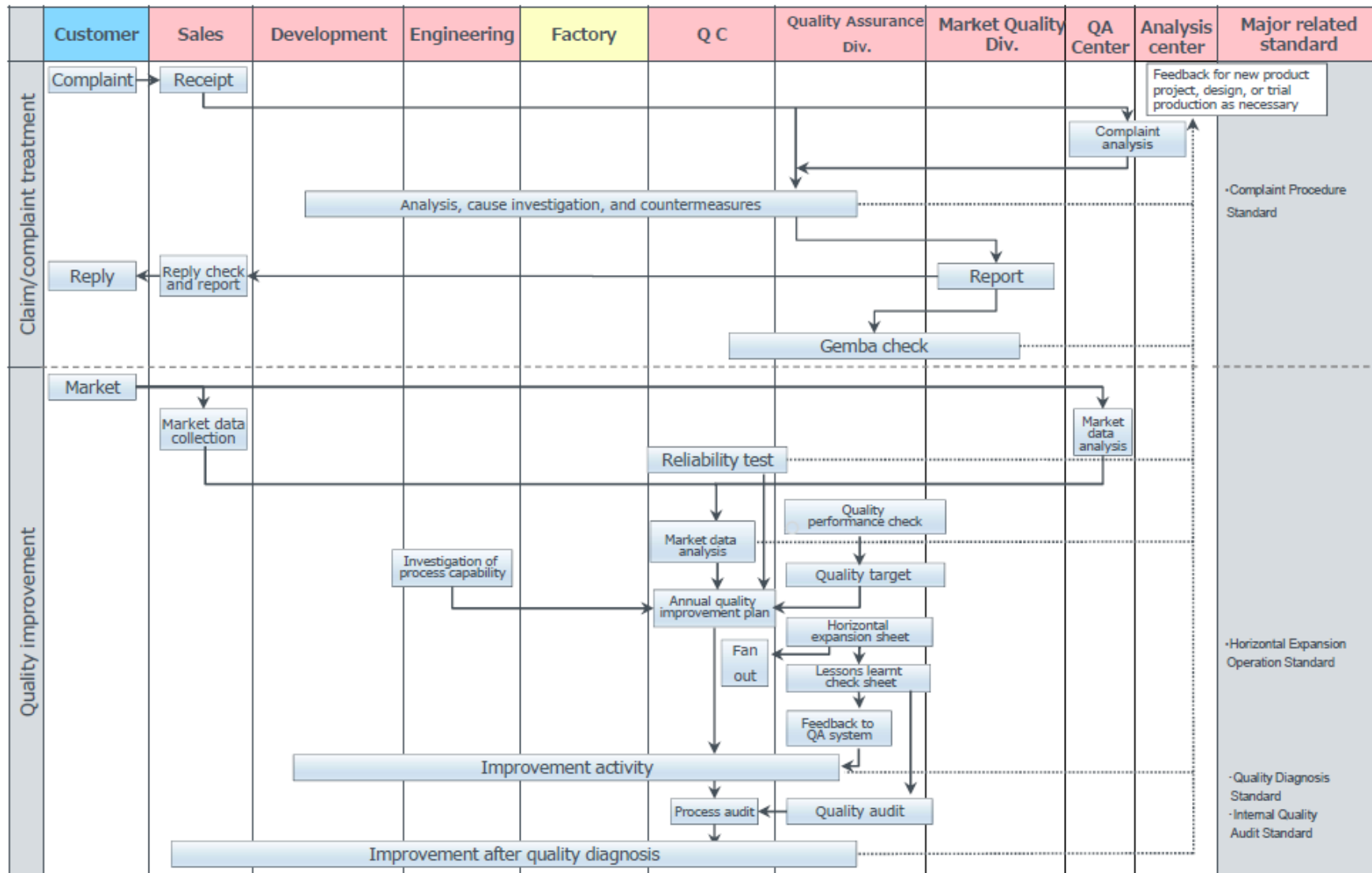
ITEM		FREQUENCY	METHOD	UNIT	Management Value	Rohm Kyoto (Existing)	LAPIS Miyagi (New)
Temperature		Continuous Monitoring	Thermometer	℃	23±1	22～24	22～24
Humidity		Continuous Monitoring	Hygrometer	%	45±10	40～50	40～50
Cleanlines s	Passage Area	Continuous Monitoring	Measure by Laser Dust Counter	pcs/cf	35 (0.1um)	Less than 10	Less than 10
	Operation Area	Continuous Monitoring		pcs/cf	35 (0.1um)	Less than 10	Less than 10
	MASK Area	Continuous Monitoring		pcs/cf	35 (0.1um)	Less than 10	Less than 10
Smallest Design Rule (um)						0.13	0.13

There is no difference about the environmental management (clean room) between the factories.

3. Quality assurance system(1/2)



3 . Quality assurance system(2/2)



There is no change about Quality assurance System

4. Change point of 5M with the factory transferring



5M		Rohm Kyoto	LAPIS Miyagi	Comparison
Man	-	The worker who was authorized in a license system in the company operate according to operating procedures.		Equal
Machine	Equipment in use	Existing device (the same method)		Equal
	Factory management contents	Conforming to QC chart.		Equal
	Management method	In accordance with facilities QC chart, carrying out SPC management.		Equal
	Transport between equipments	Cart / Robot Cart	OHV(Overhead Hoist Vehicle)	Different ※1
Materials	Wafer	200mm Si wafers		Equal
	Others	same thing is used by centralized supply system.		Equal
Method	Processing condition	Conforming to QC chart.		Equal
	Treatment of the control limits out	Conforming to quality abnormality measures rule.		Equal
	Inspection contents	Conforming to inspection standard.		Equal
Measurement	Measuring equipment ※2	Although there is difference in the device by the wafer diameter, equipment is calibrated in equal standard such as precision and repeatability .		Equal
	Management method	Conforming to measure administrative provision.		Equal

※1 About the Transport between equipments, Rohm Kyoto line uses a cart or automatic robot cart but LAPIS Miyagi line uses OHV(Overhead Hoist Vehicle).

And the wafer storing container is changed to FOUP (Front Opening Unified Pod) from BOX type.

The tolerance for the floating dust greatly improves.

※2 The measuring equipment refers to the equipment of the film thickness, Electric characteristic, Dimensions, Resistivity, Reflectance, Refractive index and Particle.

5. Investigation for the change point of 5M (process)



5-1) Target process

Process		Existing	New
Wafer Process	STI GATE Metalization Passivation	Rohm Kyoto	LAPIS Miyagi
Assembly Process	Wafer Probe Test Dicing Assy	No Change	
Test Process	Final Test	No Change	

It is only wafer process to perform change application this time.
Assembly and Test process does not have the change.

5. Investigation for the change point of 5M (process)



5-2) Process capability of primary characteristics of main process

We compared the process capability of Rohm Kyoto with LAPIS Miyagi referring to primary characteristic of main processes.
it has more than Cpk1.66 and does not have any problem.

	Rohm Kyoto			LAPIS Miyagi		
Item	σ	Cp	Cpk	σ	Cp	Cpk
GATE Oxide Thickness	2.53	2.63	2.14	3.23	2.06	1.81
GATE POLY size	0.006	1.73	1.68	0.005	2.14	1.93
CONT size	0.004	2.21	2.03	0.003	2.50	2.14
1 st Metal size	0.004	2.02	1.77	0.004	2.20	2.18

n=20Lot each
25point/Lot

5. Investigation for the change point of 5M (process)



5-3) Process capability of main element properties

We compared the process capability of Rohm Kyoto with LAPIS Miyagi referring to characteristic of main elements.

it has more than Cpk1.66 and does not have any problem.

	Rohm Kyoto			LAPIS Miyagi		
Item	σ	Cp	Cpk	σ	Cp	Cpk
NMOS Vth	0.02	1.86	1.81	0.02	1.82	1.74
PMOS Vth	0.02	1.86	1.79	0.02	1.96	1.72
Memory 1Vth	0.27	2.08	2.01	0.27	2.03	1.92
Memory 0Vth	0.27	1.82	1.79	0.22	2.25	2.25
CONT CR	0.60	2.22	2.11	0.33	4.02	3.78
VIA CR	0.40	2.07	2.04	0.44	1.88	1.86

n=20Lot each
25point/Lot

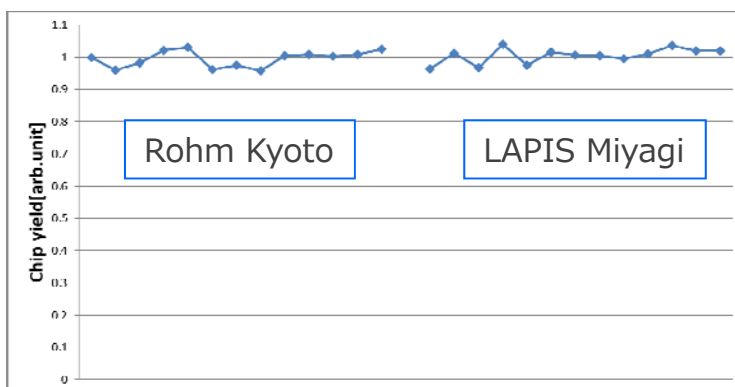
5. Investigation for the change point of 5M (process)



5-4) CHIP Yield(WA measurement)

We compared the CHIP yield of Rohm Kyoto product with LAPIS Miyagi product.

There is no difference in CHIP yield of both lines on a monthly basis for the most recent year.



5-5) Reliability evaluation result of the wafer level

We show the reliability evaluation result of the wafer level at 0.18um memory line as follows.

All tests satisfy a criterion and do not have any problem.

Test Item	Test symbol	Evaluation Criteria				Results judgment
		judgment	Temperature	Voltage/Current	life	
Gate oxide film	TDDDB	0.1%defective rate	150℃	Vccmax:5.5V	20years	Pass
Slow trap	NBTI	$\Delta I_{dsat} \geq 10\%$	25℃	Vccmax:5.5V	20years	Pass
Hot carrier	HCI	$\Delta I_{dsat} \geq 10\%$	150℃	Vccmax:5.5V	20years	Pass
Stress migration	SM	$\Delta R \geq 10\%$	150℃	-	20years	Pass
Electro migration	EM	$\Delta R \geq 10\%$	150℃	I=1mA/um	20years	Pass

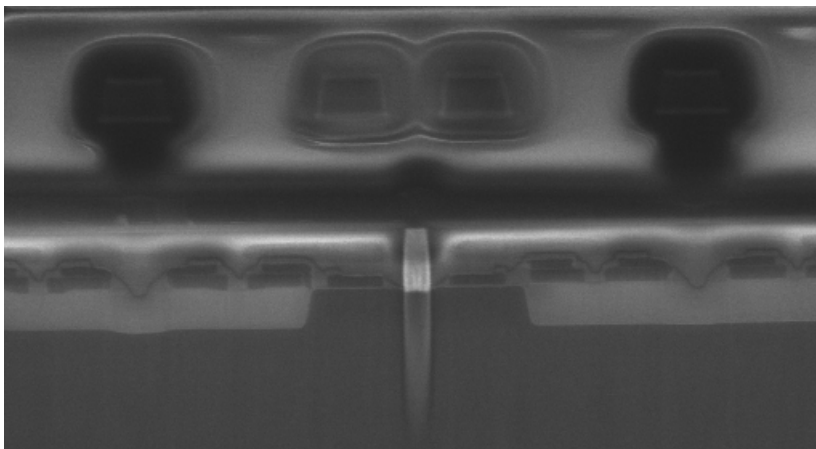
5. Investigation for the change point of 5M (process)



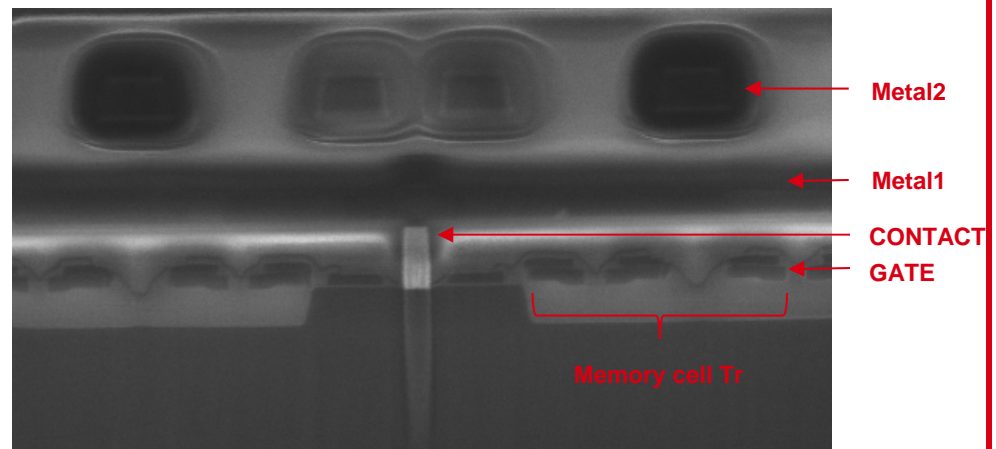
5-6) Cross sectional structure evaluation

The wiring structure of each sample of Rohm Kyoto/LAPIS Miyagi were observed by using FIB. There is not the difference in structure between Rohm Kyoto/LAPIS Miyagi .

Rohm Kyoto



LAPIS Miyagi



6. Investigation for the change point of 5M (product)



6-1) QAT(Quality Approval Test) result

We show the result of the QAT that were executed on the other product at LAPIS Miyagi line, as follows.
All test results satisfy a criterion and do not have any problem.

Test Item	Test symbol	The number of samples	Evaluation Criteria	Test condition	Test time /cycles	Results judgment
Pressure Cooker test	PCT	77pcs×3	Need to clear the spec of specifications and standard of shipment by the FT measurement after the test.	121℃/100%RH 2atm	500h	Pass
Temperature cycle test	TCY	77pcs×3		-65℃ ⇔ 150℃	1000cyc	Pass
High Temperature Storage test	HST	77pcs×3		150℃	2000h	Pass
High Acceleration Stress test	HAST	77pcs×3		VDD/130℃/ 85%RH	200h	Pass
Dynamic Burn in test	B/IN	77pcs×3		VDD/150℃	2000h	Pass
ESD Test (HumanBodyModel)	HBM	3pcs	Over 2000V	100pF/1.5kohm	-	Pass
ESD Test (Machine Model)	MM	3pcs	Over 200V	200pF/0ohm	-	Pass

7. Summary



From the above evaluation and inspection,
We judge the quality characteristic of the front-end
0.18um memory products in Kyoto is equal
even if the Lapis Miyagi factory is added,
and We have pushed forward product transference.

About the product for your company, we are going to
change it immediately after the approval acquisition.

We would like your confirmation.



	完成品形名
	Part Number
0.18um 汎用メモリ製品 BR24G02-3シリーズ	BR24G02F-3GT
	BR24G02F-3GTE2
	BR24G02F-3GTS1E2
	BR24G02F-3GTSE2
	BR24G02FJ-3GT
	BR24G02FJ-3GTE2
	BR24G02FJ-3GTS1E2
	BR24G02FJ-3GTSE2
0.18um memory product BR24G02-3series	BR24G02FJ-3GTZE2
	BR24G02FJ-3NE2
	BR24G02FJ-3NS1E2
	BR24G02FJ-3NSE2
	BR24G02FV-3GTE2
	BR24G02FVJ-3GTE2
	BR24G02FVM-3GTRTR
	BR24G02FVM-3GTTR
	BR24G02FVT-3GE2
	BR24G02FVT-3GS1E2
	BR24G02FVT-3GSE2
	BR24G02FVT-3NE2
	BR24G02FVT-3NS1E2
	BR24G02FVT-3NSE2
	BR24G02NUX-3BTR
	BR24G02NUX-3BXTTR
	BR24G02NUX-3STTR
	BR24G02NUX-3TRTR
	BR24G02NUX-3TS1TR
	BR24G02NUX-3TTR
	BR24G02TFJ-WBZE2
	BR24G02TFJ-WE2

	完成品形名
	Part Number
0.18um 汎用メモリ製品 BR24G04-3シリーズ	BR24G04F-3GT
	BR24G04F-3GTE2
	BR24G04F-3GTS1E2
	BR24G04F-3SGTE2
	BR24G04FJ-3GT
	BR24G04FJ-3GTE2
	BR24G04FJ-3GTS1E2
	BR24G04FJ-3GTSE2
0.18um memory product BR24G04-3series	BR24G04FJ-3GTZE2
	BR24G04FV-3GTE2
	BR24G04FVJ-3GTE2
	BR24G04FVM-3GTSTR
	BR24G04FVM-3GTTR
	BR24G04FVT-3GE2
	BR24G04FVT-3GS1E2
	BR24G04FVT-3SGE2
	BR24G04NUX-3TTR
	BR24G04TFJ-WE2

	完成品形名
	Part Number
0.18um 汎用メモリ製品 BR24G08-3シリーズ	BR24G08F-3GTE2
	BR24G08FJ-3GTE2
	BR24G08FJ-3GTS1E2
	BR24G08FJ-3GTSE2
	BR24G08FJ-3NE2
	BR24G08FJ-3NS1E2
	BR24G08FJ-3NSE2
	BR24G08FV-3GTE2
0.18um memory product BR24G08-3series	BR24G08FVJ-3GTE2
	BR24G08FVM-3GTTR
	BR24G08FVT-3GE2
	BR24G08FVT-3GS1E2
	BR24G08FVT-3GSE2
	BR24G08FVT-3NE2
	BR24G08FVT-3NS1E2
	BR24G08FVT-3NSE2
	BR24G08NUX-3TS1TR
	BR24G08NUX-3TTR

	完成品形名
	Part Number
0.18um 汎用メモリ製品 BR24G16-3シリーズ	BR24G16F-3GT
	BR24G16F-3GTE2
	BR24G16F-3GTSE2
	BR24G16FJ-3GT
	BR24G16FJ-3GTE2
	BR24G16FJ-3GTSE2
	BR24G16FJ-3NE2
	BR24G16FJ-3NSE2
0.18um memory product BR24G16-3series	BR24G16FV-3GTE2
	BR24G16FVJ-3GTE2
	BR24G16FVM-3GTSTR
	BR24G16FVM-3GTTR
	BR24G16FVT-3GE2
	BR24G16FVT-3GSE2
	BR24G16FVT-3NE2
	BR24G16FVT-3NSE2
	BR24G16NUX-3BXTTR
	BR24G16NUX-3STTR
	BR24G16NUX-3TTR
	BR24G16TFJ-WE2

	完成品形名
	Part Number
0.18um 汎用メモリ製品 BR24G32-3シリーズ	BR24G32-3Z
	BR24G32F-3GTE2
	BR24G32F-3GTSE2
	BR24G32FJ-3GT
	BR24G32FJ-3GTE2
	BR24G32FJ-3GTSE2
	BR24G32FJ-3NE2
	BR24G32FJ-3NSE2
0.18um memory product BR24G32-3series	BR24G32FV-3GTE2
	BR24G32FVJ-3GTE2
	BR24G32FVM-3GTTR
	BR24G32FVT-3GE2
	BR24G32FVT-3GSE2
	BR24G32FVT-3NSE2
	BR24G32NUX-306CTR
	BR24G32NUX-3BTR
	BR24G32NUX-3BXTTR
	BR24G32NUX-3TSTR
	BR24G32NUX-3TTR

	完成品形名
	Part Number
0.18um 汎用メモリ製品 BR24G64-3シリーズ	BR24G64F-3GTE2
	BR24G64F-3GTSE2
	BR24G64FJ-3GT
	BR24G64FJ-3GTE2
	BR24G64FJ-3GTSE2
	BR24G64FV-3GTE2
	BR24G64FVJ-3GTE2
	BR24G64FVM-3GTTR
0.18um memory product BR24G64-3series	BR24G64FVT-3GE2
	BR24G64FVT-3GSE2
	BR24G64NUX-3TSTR
	BR24G64NUX-3TTR

	完成品形名
	Part Number
0.18um 汎用メモリ製品 BR24G128-3シリーズ	BR24G128F-3GT
	BR24G128F-3GTE2
	BR24G128F-3GTSE2
	BR24G128FJ-3GT
	BR24G128FJ-3GTE2
	BR24G128FJ-3GTSE2
	BR24G128FJ-3M5GTE2
	BR24G128FV-3GTE2
0.18um memory product BR24G128-3series	BR24G128FVJ-3GTE2
	BR24G128FVM-3GTTR
	BR24G128FVT-3GE2
	BR24G128FVT-3GE2
	BR24G128FVT-3GSE2
	BR24G128FVT-3GSE2
	BR24G128NUX-3TSTR
	BR24G128NUX-3TTR
	BR24G128TFJ-WE2

	完成品形名
	Part Number
0.18um 汎用メモリ製品 BR24G256-3シリーズ	BR24G256F-3GT
	BR24G256F-3GTE2
	BR24G256F-3GTSE2
	BR24G256FJ-3GT
	BR24G256FJ-3GTE2
	BR24G256FJ-3GTSE2
	BR24G256FJ-3GTSZE2
	BR24G256FJ-3NE2
0.18um memory product BR24G256-3series	BR24G256FJ-3NSE2
	BR24G256FV-3GTE2
	BR24G256FVT-3GE2
	BR24G256FVT-3GSE2
	BR24G256FVT-3NE2
	BR24G256FVT-3NSE2
	BR24G256TFJ-WBZE2
	BR24G256TFJ-WE2
	BR24G256TFJ-WZAE2