Dear Valued Customer

Doc. No.: 1023002
Issue date: Mrz 1.2023

Takashi Shimane
General Manager
WP Control Div.
ROHM Co., Ltd.

Notification of Product/Process Change

This is an announcement of change(s) to the process of the products currently supplied by ROHM Co., Ltd.

We request your acknowledgement of the receipt of this notification within the given period.

Please provide your your reply by Apr 1.2024

Title of change	LSI Adding LAPIS Miyagi as a new production site for 0.18um memory products as a part of BCP(3)	
Affected product(s)	Manufacturer part number	Customer part number
	See Attachment	See Attachment
Detailed description of change	Now	After
	・ROHM Co.,Ltd. Kyoto Plant 0.18um memory LSI product	・ROHM Co.,Ltd. Kyoto Plant 0.18um memory LSI product ・LAPIS Semiconductor Co.,Ltd. Miyagi plant 0.18um memory LSI product
Reason for change	Stabilization of supply through two production sites	
Anticipated impact on quality	No impacts on quality	
Identification of change	Traceable from the marking	

Planned first ship date : Mai 1.2024		Sample available schedule : Mrz 1.2023	
Attachements (data, report)	YES	1023002-1_PCN Detail, 1023002-2_4ME, 1023002-3_Rlbl	
Comments			

		Reply date	
Customer reply	☐ 1. Approved.	☐ 2. Accepted with conditions.	
Condition for approval / reason for rejection			
Comments			
Customer company name			
Customer signature		Department	
Customer signature		Department	

Electronics for the Future

No.1023002

LSI
Adding LAPIS Miyagi as a new production site for 0.18um memory products as a part of BCP (3)

1. Summary of the change
2. Summary of LAPIS Miyagi factory
3. Change point of 5M with the factory transferring
4. Investigation into the change in 5M (Wafer level)
5. Investigation into the change in 5M (Product level)
6. Summary

March 1, 2023
WP Control Div.
ROHM Co., Ltd.

1 . Summary of the change

•Issue Date:	March 1. 2023
•Doc. Number:	1023002
•Detailed description :	Additional Manufacturing Site for 0.18μm memory Wafer Process. For manufacturing backup and delivery consistency as a part of BCP, ROHM LSI division is introducing an additional manufacturing site for 0.18um memory process. The additional wafer fabrication located in Miyagi, Japan is already an existing supplier of other products. In addition, the chip size is the same as current products. There is no change in form, fit and function (finished goods dimensions) on all involved part numbers.
•Reason for change:	Continuity of supply.
•Qualification:	Refer attached.
•Schedule:	Sample available date: March 1, 2023 PCN Response required by: April 1, 2024 Proposed First Ship Date: May 1, 2024
•ROHM contact:	Contact your local ROHM Sales Office. Sample delivery timing will be subject to request date, sample quantity and special customer packing/label requirements.

2．Summary of LAPIS Miyagi factory（1/2）

2-1）Summary of LAPIS Miyagi factory

Company name : LAPIS Miyagi Co.,Ltd.
Location : 1,Okinodaira Ohira-mura
Kurokawa-gun, Miyagi

Started Operation : April 8, 1988
Production Item : Monolithic IC

Production Capacity : LSI 38,000 wafers/a month

2-2）LSI production

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

Start of production : December 2013
Production Volume : 9,6000 wafers
(As of Dec. 2021)

Smallest design rule : 0.13μm

2．Summary of Lapis Miyagi factory（2/2）

2-3）Environmental management（Clean room）

Item		Frequency	Method	Unit	Control	ROHM Kyoto (Existing)	LAPIS Miyagi (New)
						Result	Result
Temperature		Continuous monitoring	Thermometer	℃	22～24	22～24	22～24
Humidity		Continuous monitoring	Hygrometer	%	35～55	40～50	40～50
Area cleanliness	Passage	Continuous monitoring	Measured by Laser dust counter	pcs/cf	35（0.1μm）	Less than 10	Less than 10
	Operation	Continuous monitoring		pcs/cf	35（0.1μm）	Less than 10	Less than 10
	Mask	Continuous monitoring		pcs/cf	35（0.1μm）	Less than 10	Less than 10
Smallest design rule						0.13μm	0.13μm

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

3．Change point of 5M with the factory transferring （1/2）

3-1) Change point of 5M

5M		ROHM Kyoto (Existing)	LAPIS Miyagi (New)	Comparison
Man (Person)	–	The worker who was authorized in a license system in the company operate according to operating procedures.		Equal
Machine (Facilities)	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 the equipment	Cart/Robot cart	OHV (Overhead Hoist Vehicle)	Different ※1
Materials	Wafer	200mm Si wafer		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
Method	Measuring equipment	Equipment is calibrated in equal standard		Equal
	Management method	Conforming to measure administrative provision.		Equal

※1 OHV (Overhead Hoist Vehicle) is used for transferring wafers between equipment at the LAPIS Miyagi, while hand-pushed carts and trackless automatic transfer robots are used at ROHM Kyoto.

3．Change point of 5M with the factory transferring （2/2）

3-2）Change point of product process flow

Process		ROHM Kyoto (Existing)	LAPIS Miyagi (New)
Wafer process	LOCOS formation ⇩ GATE formation ⇩ Metalization ⇩ Passivation	ROHM Kyoto	LAPIS Miyagi
Assembly process	Wafer probe test ⇩ Dicing ⇩ Assembling	No change	
Inspection process	Final test	No change	

Only the wafer process is being changed. There is no change in the assembly and testing processes.

4．Investigation into the change in 5M（Wafer level）（1/2）

4-1）Process capability of main element characteristics

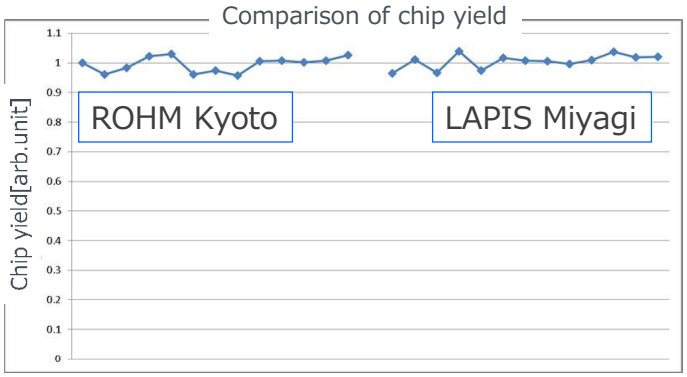
Process capability of 0.18μm memory ROHM Kyoto and Lapis Miyagi are as follows.
(Compared by main Tr characteristics)
The comparison is based on the 20 lots of mass production. It has a Cpk of 1.66 or higher.

Item	ROHM Kyoto (Existing)			LAPIS Miyagi (New)		
	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	0.6	2.22	2.11	0.33	4.02	3.78
VIA CR	0.4	2.07	2.04	0.44	1.88	1.86

4．Investigation into the change in 5M（Wafer level）（2/2）

4-2）Chip yield

Chip yield comparison between 0.18μm memory ROHM Kyoto and LAPIS Miyagi.
There is no difference in chip yield between the two lines.



4-3）Wafer Level Reliability Test Results

Results of wafer-level reliability evaluation of LAPIS Miyagi.

Reliability criteria have been met in the following items.

Test item	Test symbol	Evaluation criteria	Results judgement
Time Dependent Dielectric Breakdown	TDDB	Guarantee more than twenty years in actual use	Pass
Negative Bias Temperature Instability	NBTI		Pass
Hot Carrier Injection	HCI		Pass
Stressmigration	SM		Pass
Electromigration	EM		Pass

5．Investigation into the change in 5M（Product level）

5-1）Designs

Yield evaluation and characteristic evaluation are conducted for each product model, and compatibility is confirmed for all items.

5-2）QAT result

QAT results on other models in mass production at LAPIS Miyagi are shown below.
All tests met the standards.

Test item	Test symbol	Number of samples	Test condition	Test time	Results judgement
Dynamic Burn In	B/IN	3Lot × 77pcs TOTAL 231pcs	125℃、Vcc=MAX	2,000h	Pass
Pressure Cooker	PCT		121℃、100%RH、2atm	500h	Pass
Temperature Cycle	TCY		-65℃⇔150℃、30min	1,000cycle	Pass
Hightemperature Storage	HST		150℃	2,000h	Pass
High Acceleration Stress	HAST		130℃、Vcc=MAX、85%RH	200h	Pass

6. Summary

Based on the above evaluation and verification, ROHM has determined that ROHM Kyoto and LAPIS Miyagi can guarantee the same quality characteristics for 0.18μm memory models.

ROHM will apply changes to the applicable models for your company shortly after receiving your approval.

We appreciate your understanding and cooperation.

Electronics for the Future

Internal PN	Public (External) PN
BR24T02FVM-WBZGGTR	BR24T02FVM-WGTR
BR24T02FVM-WBZGTR	BR24T02FVM-WGTR
BR24T02FVM-WGTR	BR24T02FVM-WGTR
BR24T02FVM-WTR	BR24T02FVM-WTR
BR24T02NUX-WBZGTR	BR24T02NUX-WGTR
BR24T02NUX-WBZTR	BR24T02NUX-WTR
BR24T02NUX-WGTR	BR24T02NUX-WGTR
BR24T02NUX-WTR	BR24T02NUX-WTR
BR24T02FVM-WVPTR	BR24T02FVM-WTR
BR24T02FVJ-WBZE2	BR24T02FVJ-WE2
BR24T02FVJ-WE2	BR24T02FVJ-WE2
BR24T02FVM-WSTR	BR24T02FVM-WTR
BR24T02NUX-WBZSGTR	BR24T02NUX-WSGTR
BR24T02NUX-WSGTR	BR24T02NUX-WGTR
BR24T02F-WME2	BR24T02F-WE2
BR24T02F-WBZE2	BR24T02F-WE2
BR24T02F-WE2	BR24T02F-WE2
BR24T02FV-WBZE2	BR24T02FV-WE2
BR24T02FV-WE2	BR24T02FV-WE2
BR24T02FV-WSE2	BR24T02FV-WE2
BR24T02F-WSE2	BR24T02F-WE2
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BR24T04FVM-WBZGTR	BR24T04FVM-WGTR
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BR25A512F-3MGE2	BR25A512F-3MGE2
BR25A512FJ-3MGE2	BR25A512FJ-3MGE2
BR25G1MF-3GE2	BR25G1MF-3GE2
BR25G1MFJ-3GE2	BR25G1MFJ-3GE2
BR25G1MFJ-3SGE2	BR25G1MFJ-3GE2