



Dear Valued Customer

Doc. No.: 1022002
Issue date: Mrz 1.2022

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 reply by: Apr 1.2023

Title of change	LSI Adding Lapis Miyagi as a new production site for 0.18um memory products as a part of BCP(2)				
Affected product(s)	Manufacturer part number		Customer part number		
	See Attachment		See Attachment		
Detailed description of change	Now		After		
	<ul style="list-style-type: none"> •Rohm Kyoto factory 0.18um memory LSI product 		<ul style="list-style-type: none"> •Rohm Kyoto factory 0.18um memory LSI product •Lapis semiconductor Miyagi factory 0.18um memory LSI product 		
Reason for change	Establish multiple manufacturing resources for the stabilized product supply from the perspective of BCP				
Anticipated impact on quality	(form, fit, function, reliability) There are no issue on quality				
Identification of change	Traceable from the marking				
Planned first ship date :		Mai 1.2023		Sample available schedule : Mrz 1.2022	
Attachments (data, report)		YES	4M	4ME_1022002	Rlbl Rlbl_1022002
Comments					

		Reply date			
Customer reply	<input type="checkbox"/> 1. Approved. <input type="checkbox"/> 2. Accepted with conditions. <input type="checkbox"/> 3. Rejected.				
Condition for approval / reason for rejection					
Comments					
Customer company name					
Customer signature			Department		
Customer signature			Department		

Target PN List_1022002

WP Control Div.
March 1, 2021

#	ROHM Internal P/N	External P/N
1	BR24G32FVT-3ASGE2	BR24G32FVT-3AGE2
2	BR24G32FVT-3AGE2	BR24G32FVT-3AGE2
3	BR24G32FVM-3AGTTR	BR24G32FVM-3AGTTR
4	BR24G32NUX-3ATTR	BR24G32NUX-3ATTR
5	BR24G32F-3AGTE2	BR24G32F-3AGTE2
6	BR24G32FJ-3AGTE2	BR24G32FJ-3AGTE2
7	BR24G32FV-3AGTE2	BR24G32FV-3AGTE2
8	BR24T512FVT-3AME2	BR24T512FVT-3AME2
9	BR24G512FVT-3AGZE2	BR24G512FVT-3AGE2
10	BR24G512FVT-3ASGE2	BR24G512FVT-3AGE2
11	BR24G512FVT-3AGE2	BR24G512FVT-3AGE2
12	BR24T512F-3AM	BR24T512F-3AM
13	BR24T512F-3AME2	BR24T512F-3AME2
14	BR24T512FJ-3AM	BR24T512FJ-3AM
15	BR24T512FJ-3AME2	BR24T512FJ-3AME2
16	BR24G512F-3AGTE2	BR24G512F-3AGTE2
17	BR24G512FJ-3AGTSE2	BR24G512FJ-3AGTE2
18	BR24G512FJ-3AGTZE2	BR24G512FJ-3AGTE2
19	BR24G512FJ-3AGTE2	BR24G512FJ-3AGTE2
20	BR24G512FJ-3ASGNE2	BR24G512FJ-3AGE2
21	BR24T1MF-3AM	BR24T1MF-3AM
22	BR24T1MF-3AME2	BR24T1MF-3AME2
23	BR24G1MF-3AMGTE2	BR24G1MF-3AGTE2
24	BR24G1MF-AU3AE2	BR24G1MF-3AGTE2
25	BR24G1MF-3AGTE2	BR24G1MF-3AGTE2
26	BR24T1MFJ-3AM	BR24T1MFJ-3AM
27	BR24T1MFJ-3AME2	BR24T1MFJ-3AME2
28	BR24G1MFJ-3AGTSE2	BR24G1MFJ-3AGTE2
29	BR24G1MFJ-3AGTE2	BR24G1MFJ-3AGTE2
30	BR24T02FVM-WMGTR	BR24T02FVM-WMGTR
31	BR24T02FVM-WMTR	BR24T02FVM-WMTR
32	BR24T02NUX-WMGTR	BR24T02NUX-WMGTR
33	BR24T02NUX-WMTR	BR24T02NUX-WMTR
34	BR24G02FVT-3GZE2	BR24G02FVT-3GE2
35	BR24T02FJ-WBZZE2	BR24T02FJ-WBZZE2
36	BR24T02FJ-WBZE2	BR24T02FJ-WE2
37	BR24T02FJ-WBZSE2	BR24T02FJ-WE2
38	BR24T02FJ-WBZVPE2	BR24T02FJ-WE2
39	BR24T02FJ-WME2	BR24T02FJ-WE2
40	BR24T02FJ-WSE2	BR24T02FJ-WE2
41	BR24T02FJ-WZE2	BR24T02FJ-WE2
42	BR24T02FJ-WE2	BR24T02FJ-WE2
43	BR24T02FJ-WBZGE2	BR24T02FJ-WGE2
44	BR24T02FJ-WBZSGE2	BR24T02FJ-WGE2
45	BR24T02FJ-WSGE2	BR24T02FJ-WGE2
46	BR24T02FJ-WSGNE2	BR24T02FJ-WGE2
47	BR24T02FJ-WGE2	BR24T02FJ-WGE2
48	BR24T02FVT-WASE2	BR24T02FVT-WE2
49	BR24T02FVT-WBZE2	BR24T02FVT-WE2
50	BR24T02FVT-WSE2	BR24T02FVT-WE2
51	BR24T02FVT-WZE2	BR24T02FVT-WE2
52	BR24T02FVT-WE2	BR24T02FVT-WE2
53	BR24T02FVT-WBZGE2	BR24T02FVT-WGE2
54	BR24T02FVT-WBZSGE2	BR24T02FVT-WGE2
55	BR24T02FVT-WMGE2	BR24T02FVT-WGE2
56	BR24T02FVT-WSGE2	BR24T02FVT-WGE2

57	BR24T02FVT-WGE2	BR24T02FVT-WGE2
58	BR24T02FV-WBZGE2	BR24T02FV-WGE2
59	BR24T02FV-WSGE2	BR24T02FV-WGE2
60	BR24T02FV-WGE2	BR24T02FV-WGE2
61	BR24T02FV-WBZSE2	BR24T02FV-WSE2
62	BR24T02F-WBZGE2	BR24T02F-WGE2
63	BR24T02F-WMGE2	BR24T02F-WGE2
64	BR24T02F-WSGE2	BR24T02F-WGE2
65	BR24T02F-WGE2	BR24T02F-WGE2
66	BR24T02F-WBZSE2	BR24T02F-WSE2
67	VPM1RO-ZE2	VPM1RO-ZE2
68	VPM2RO-ZE2	VPM2RO-ZE2
69	BR24T04FVM-WMTR	BR24T04FVM-WMTR
70	BR24T04NUX-WMGTR	BR24T04NUX-WMGTR
71	BR24G04FVT-3GZE2	BR24G04FVT-3GE2
72	BR24G04TFJ-WBZE2	BR24G04TFJ-WE2
73	BR24T04FJ-WBZE2	BR24T04FJ-WE2
74	BR24T04FJ-WME2	BR24T04FJ-WE2
75	BR24T04FJ-WSE2	BR24T04FJ-WE2
76	BR24T04FJ-WE2	BR24T04FJ-WE2
77	BR24T04FJ-WSGE2	BR24T04FJ-WGE2
78	BR24T04FJ-WSGNE2	BR24T04FJ-WGE2
79	BR24T04FJ-WGE2	BR24T04FJ-WGE2
80	BR24T04FJ-WBZSE2	BR24T04FJ-WSE2
81	BR24T04FVT-WBZE2	BR24T04FVT-WE2
82	BR24T04FVT-WBZSE2	BR24T04FVT-WE2
83	BR24T04FVT-WME2	BR24T04FVT-WE2
84	BR24T04FVT-WSE2	BR24T04FVT-WE2
85	BR24T04FVT-WE2	BR24T04FVT-WE2
86	BR24T04FVT-WBZGE2	BR24T04FVT-WGE2
87	BR24T04FVT-WGZE2	BR24T04FVT-WGE2
88	BR24T04FVT-WSGE2	BR24T04FVT-WGE2
89	BR24T04FVT-WGE2	BR24T04FVT-WGE2
90	BR24T04FV-WBZE2	BR24T04FV-WE2
91	BR24T04FV-WME2	BR24T04FV-WE2
92	BR24T04FV-WSE2	BR24T04FV-WE2
93	BR24T04FV-WE2	BR24T04FV-WE2
94	BR24T04FV-WSGE2	BR24T04FV-WGE2
95	BR24T04FV-WGE2	BR24T04FV-WGE2
96	BR24T04FV-WBZSE2	BR24T04FV-WSE2
97	BR24T04F-WBZGE2	BR24T04F-WGE2
98	BR24T04F-WSGE2	BR24T04F-WGE2
99	BR24T04F-WGE2	BR24T04F-WGE2
100	BR24T04F-WBZSE2	BR24T04F-WSE2
101	BR24T04F-WBZSGE2	BR24T04F-WSGE2
102	BR24T08FVM-WMTR	BR24T08FVM-WMTR
103	BR24T08NUX-WMTR	BR24T08NUX-WMTR
104	BR24G08F-3GTS1E2	BR24G08F-3GTE2
105	BR24G08FJ-3GTZE2	BR24G08FJ-3GTE2
106	BR24G08FVT-3GZE2	BR24G08FVT-3GE2
107	BR24T08FJ-WBZE2	BR24T08FJ-WE2
108	BR24T08FJ-WME2	BR24T08FJ-WE2
109	BR24T08FJ-WSE2	BR24T08FJ-WE2
110	BR24T08FJ-WE2	BR24T08FJ-WE2
111	BR24T08FJ-WBZGE2	BR24T08FJ-WGE2
112	BR24T08FJ-WSGE2	BR24T08FJ-WGE2
113	BR24T08FJ-WSGNE2	BR24T08FJ-WGE2
114	BR24T08FJ-WGE2	BR24T08FJ-WGE2
115	BR24T08FJ-WBZSE2	BR24T08FJ-WSE2
116	BR24T08FVT-WBZE2	BR24T08FVT-WE2
117	BR24T08FVT-WBZSE2	BR24T08FVT-WE2
118	BR24T08FVT-WME2	BR24T08FVT-WE2
119	BR24T08FVT-WSE2	BR24T08FVT-WE2

120	BR24T08FVT-WE2	BR24T08FVT-WE2
121	BR24T08FVT-WBZGE2	BR24T08FVT-WGE2
122	BR24T08FVT-WBZSGE2	BR24T08FVT-WGE2
123	BR24T08FVT-WGZE2	BR24T08FVT-WGE2
124	BR24T08FVT-WSGE2	BR24T08FVT-WGE2
125	BR24T08FVT-WGE2	BR24T08FVT-WGE2
126	BR24T08FV-WSE2	BR24T08FV-WE2
127	BR24T08FV-WE2	BR24T08FV-WE2
128	BR24T08FV-WSGE2	BR24T08FV-WGE2
129	BR24T08FV-WGE2	BR24T08FV-WGE2
130	BR24T08F-WBZE2	BR24T08F-WE2
131	BR24T08F-WSE2	BR24T08F-WE2
132	BR24T08F-WE2	BR24T08F-WE2
133	BR24T08F-WBZGE2	BR24T08F-WGE2
134	BR24T08F-WSGE2	BR24T08F-WGE2
135	BR24T08F-WGE2	BR24T08F-WGE2
136	BR24T08F-WBZSE2	BR24T08F-WSE2
137	BR24T16FVM-WMGTR	BR24T16FVM-WMGTR
138	BR24T16FVM-WMTR	BR24T16FVM-WMTR
139	BR24T16NWX-WMGTR	BR24T16NWX-WMGTR
140	BR24G16FJ-3GTZE2	BR24G16FJ-3GTE2
141	BR24G16FVT-3GZE2	BR24G16FVT-3GE2
142	BR24G16TFJ-WBZE2	BR24G16TFJ-WBZE2
143	BR24T16FJ-WBZGE2	BR24T16FJ-WGE2
144	BR24T16FJ-WSGE2	BR24T16FJ-WGE2
145	BR24T16FJ-WSGNE2	BR24T16FJ-WGE2
146	BR24T16FJ-WGE2	BR24T16FJ-WGE2
147	BR24T16FJ-WBZSGE2	BR24T16FJ-WSGE2
148	BR24T16FVT-WBZE2	BR24T16FVT-WE2
149	BR24T16FVT-WBZSE2	BR24T16FVT-WE2
150	BR24T16FVT-WBZZE2	BR24T16FVT-WE2
151	BR24T16FVT-WME2	BR24T16FVT-WE2
152	BR24T16FVT-WSE2	BR24T16FVT-WE2
153	BR24T16FVT-WZE2	BR24T16FVT-WE2
154	BR24T16FVT-WE2	BR24T16FVT-WE2
155	BR24T16FVT-WBZGE2	BR24T16FVT-WGE2
156	BR24T16FVT-WBZSGE2	BR24T16FVT-WGE2
157	BR24T16FVT-WGZE2	BR24T16FVT-WGE2
158	BR24T16FVT-WSGE2	BR24T16FVT-WGE2
159	BR24T16FVT-WGE2	BR24T16FVT-WGE2
160	BR24T16FV-WBZE2	BR24T16FV-WE2
161	BR24T16FV-WME2	BR24T16FV-WE2
162	BR24T16FV-WSE2	BR24T16FV-WE2
163	BR24T16FV-WE2	BR24T16FV-WE2
164	BR24T16FV-WSGE2	BR24T16FV-WGE2
165	BR24T16FV-WGE2	BR24T16FV-WGE2
166	BR24T16F-WBZGE2	BR24T16F-WGE2
167	BR24T16F-WMGE2	BR24T16F-WGE2
168	BR24T16F-WSGE2	BR24T16F-WGE2
169	BR24T16F-WGE2	BR24T16F-WGE2
170	BR24T32FVM-WMTR	BR24T32FVM-WMTR
171	BR24G32FJ-3GTZE2	BR24G32FJ-3GTE2
172	BR24G32FVT-3GZE2	BR24G32FVT-3GE2
173	BR24T32FJ-WBZE2	BR24T32FJ-WE2
174	BR24T32FJ-WBZSE2	BR24T32FJ-WE2
175	BR24T32FJ-WBZZE2	BR24T32FJ-WE2
176	BR24T32FJ-WME2	BR24T32FJ-WE2
177	BR24T32FJ-WSE2	BR24T32FJ-WE2
178	BR24T32FJ-WE2	BR24T32FJ-WE2
179	BR24T32FJ-WBZGE2	BR24T32FJ-WGE2
180	BR24T32FJ-WBZSGE2	BR24T32FJ-WGE2
181	BR24T32FJ-WSGE2	BR24T32FJ-WGE2

182	BR24T32FJ-WSGNE2	BR24T32FJ-WGE2
183	BR24T32FJ-WGE2	BR24T32FJ-WGE2
184	BR24T32FVT-WBZE2	BR24T32FVT-WE2
185	BR24T32FVT-WBZSE2	BR24T32FVT-WE2
186	BR24T32FVT-WSE2	BR24T32FVT-WE2
187	BR24T32FVT-WZE2	BR24T32FVT-WE2
188	BR24T32FVT-WE2	BR24T32FVT-WE2
189	BR24T32FVT-WBZGE2	BR24T32FVT-WGE2
190	BR24T32FVT-WBZSGE2	BR24T32FVT-WGE2
191	BR24T32FVT-WSGE2	BR24T32FVT-WGE2
192	BR24T32FVT-WGE2	BR24T32FVT-WGE2
193	BR24T32FV-WBZE2	BR24T32FV-WE2
194	BR24T32FV-WME2	BR24T32FV-WE2
195	BR24T32FV-WSE2	BR24T32FV-WE2
196	BR24T32FV-WE2	BR24T32FV-WE2
197	BR24T32FV-WSGE2	BR24T32FV-WGE2
198	BR24T32FV-WGE2	BR24T32FV-WGE2
199	BR24T32F-WBZGE2	BR24T32F-WGE2
200	BR24T32F-WSGE2	BR24T32F-WGE2
201	BR24T32F-WGE2	BR24T32F-WGE2
202	BR24T64FVT-WME2	BR24T64FVT-WME2
203	BR24T64FVM-WMTR	BR24T64FVM-WMTR
204	BR24T64NWX-WMGTR	BR24T64NWX-WMGTR
205	BR24T64FJ-WME2	BR24T64FJ-WME2
206	BR24T64F-WME2	BR24T64F-WME2
207	BR24T128FVT-WME2	BR24T128FVT-WME2
208	BR24T128FVM-WMTR	BR24T128FVM-WMTR
209	BR24T128F-WME2	BR24T128F-WME2
210	BR24T256FVT-WME2	BR24T256FVT-WME2
211	BR24T256F-WME2	BR24T256F-WME2
212	BR25G256FVT-3SGE2	BR25G256FVT-3GE2
213	BR25G256FVT-3SGZE2	BR25G256FVT-3GE2
214	BR25G256FVT-3GE2	BR25G256FVT-3GE2
215	BR25G256F-3GE2	BR25G256F-3GE2
216	BR25G256FJ-3GE2	BR25G256FJ-3GE2
217	BR25G256FJ-3SGE2	BR25G256FJ-3GE2
218	BR25G256FJ-3GE2	BR25G256FJ-3GE2
219	BR25G512FVT-3GE2	BR25G512FVT-3GE2
220	BR25G512F-3GE2	BR25G512F-3GE2
221	BR25G512FJ-3GE2	BR25G512FJ-3GE2
222	BR25A1MF-3MGE2	BR25A1MF-3MGE2
223	BR25A1MFJ-3MGZE2	BR25A1MFJ-3MGE2
224	BR25A1MFJ-3MGE2	BR25A1MFJ-3MGE2

LSI Adding Lapis Miyagi as a new production site for 0.18um memory products as a part of BCP(2)



1. Summary of the change
2. Lapis Miyagi factory overview
3. 5M gap analysis
4. Investigation for the change point of 5M (process), reliability test result
5. Investigation for the change point of 5M (product), reliability test result
6. Summary

March 1, 2022
ROHM Co., Ltd.

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

1. Summary of the change

1-1) Purpose:

- To establish multiple manufacturing locations as a part of BCP (Business Continuity Plan) by transferring some production from Rohm Kyoto factory to Lapis Semiconductor Miyagi factory.

1-2) Contents:

- Add Lapis Miyagi factory as a second fab for 0.18um memory products.
Lapis Miyagi factory has produced products using the same line as that of Rohm Kyoto since 2013.
Quality and characteristics are guaranteed.
(The change is only for the frond end process and there will be no changes to the assembly site)

1-3) Schedule of change:

- Upon customer approval.
Once production is transferred, all production will be done at the new site only.

2. Lapis Miyagi factory overview



2-1) Lapis Miyagi

Company name : Lapis Semiconductor Co., Ltd.
Location : 1, Okinodaira Ohira-mura Kurokawa-gun, Miyagi
Establishment : April 8, 1988
Representative : Kazumasa Wakuno (President)
Production Item : Monolithic IC (LSI)
Employee : 257 (As of Dec,2021)

2-2) LSI production history of Rohm products

Start of production : Dec,2013
Production Volume : 96,000 wafers
(As of Dec,2021)
Smallest Design Rule : 0.13um

2. Lapis Miyagi factory overview

2-3) Environmental management (clean room)

Item		Frequency	Method	Unit	Management value	Rohm Kyoto factory (Existing)	Lapis Miyagi factory (New)
Temperature		Continuous Monitoring	Thermometer	℃	23±1	22~24	22~24
Humidity		Continuous Monitoring	Hygrometer	%	45±10	40~50	40~50
Cleanliness	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

In terms of environmental management (clean room), two factories are the same.

3. 5M gap analysis

5M		Rohm Kyoto factory	Lapis Miyagi factory	Comparison
Man	-	The operator will obtain an internal license and will operate according to the operation standard.		Equal
Machine	Equipment in use	No difference (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 materials 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 equipment depending on the wafer diameter, equipment is calibrated in equal standard such as precision and repeatability .		Equal
	Management method	Conforming to the measurement control spec		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.

4. 5M gap analysis (process)

5-1) Target process

Process		Existing	New
Wafer process	STI Gate Metallization Passivation	Rohm Kyoto factory	Lapis Miyagi factory
Assembly process	Wafer probe test Dicing Assy	No change	
Test process	Final test	No change	

The change is in the wafer process site only.
Assembly and Test location will not change.

4. 5M gap analysis (process)

5-2) Process capability comparison

Process capability of Rohm Kyoto factory was compared with Lapis Miyagi factory, on major processes primary characteristics. Cpk was higher than 1.66.

Item	Rohm Kyoto factory			Lapis Miyagi factory		
	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

4. 5M gap analysis (process)

5-3) Process capability of main element properties

Process capability of Rohm Kyoto factory was compared with Lapis Miyagi factory on main characteristics. Cpk was higher than 1.66.

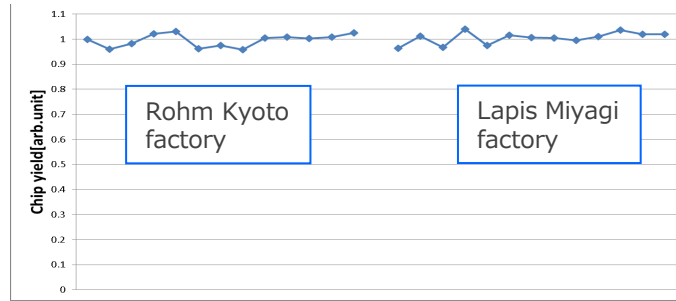
Item	Rohm Kyoto factory			Lapis Miyagi factory		
	σ	Cp	Cpk	σ	Cp	Cpk
NMOS Vth	0.02	1.86	1.81	0.02	1.82	1.74
PMOS Vth	0.02	1.86	1.79	0.02	1.96	1.72
Memory 1Vth	0.27	2.08	2.01	0.27	2.03	1.92
Memory 0Vth	0.27	1.82	1.79	0.22	2.25	2.25
CONT CR	0.60	2.22	2.11	0.33	4.02	3.78
VIA CR	0.40	2.07	2.04	0.44	1.88	1.86

n=20Lot each
25point/Lot

4. 5M gap analysis (process)

5-4) Chip yield(WA measurement)

We compared the Chip yield of Rohm Kyoto factory product with Lapis Miyagi factory product. There is no difference in CHIP yield of both lines on a monthly basis for the most recent year.



5-5) Wafer level reliability evaluation result

Wafer level reliability evaluation was performed.
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°C	Vccmax:5.5V	20years	Pass
Slow trap	NBTI	$\Delta I_{dsat} \geq 10\%$	150°C	Vccmax:5.5V	20years	Pass
Hot carrier	HCI	$\Delta I_{dsat} \geq 10\%$	Room temperature	Vccmax:5.5V	20years	Pass
Stress migration	SM	$\Delta R \geq 10\%$	150°C	-	20years	Pass
Electro migration	EM	$\Delta R \geq 10\%$	150°C	I=1mA/um	20years	Pass

5. 5M gap analysis (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°C/100%RH 2atm	500h	Pass
Temperature cycle test	TCY	77pcs×3		-65°C ⇔ 150°C	1000cyc	Pass
High temperature storage test	HST	77pcs×3		150°C	2000h	Pass
High acceleration stress test	HAST	77pcs×3		VDD/130°C 85%RH	200h	Pass
Dynamic burn in test	B/IN	77pcs×3		VDD/150°C	2000h	Pass
ESD test (Human body model)	HBM	3pcs	Over 2000V	100pF/1.5kohm	-	Pass
ESD test (Machine model)	MM	3pcs	Over 200V	200pF/0ohm	-	Pass

6. Summary



From the 5M gap analysis, Rohm concludes that the 0.18um memory product will have the same level of quality and characteristics with the addition of Lapis Miyagi factory to the existing Rohm Kyoto Fab for front-end fab process.

For the affected products, Rohm will make the change as soon as receiving approval from your company.





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Reliability evaluation result

Target line:0.18um memory line(BR0.18)

1. 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	TDDB	0.1% ^{defective rate}	150°C	Vccmax:5.5V	20years	Pass
Slow trap	NBTI	$\Delta I_{dsat} \geq 10\%$	150°C	Vccmax:5.5V	20years	Pass
Hot carrier	HCI	$\Delta I_{dsat} \geq 10\%$	Room temperature	Vccmax:5.5V	20years	Pass
Stress migration	SM	$\Delta R \geq 10\%$	150°C	-	20years	Pass
Electro migration	EM	$\Delta R \geq 10\%$	150°C	I=1mA/um	20years	Pass

2. 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°C/100%RH 2atm	500h	Pass
Temperature cycle test	TCY	77pcs×3		-65°C ⇔ 150°C	1000cyc	Pass
High temperature storage test	HST	77pcs×3		150°C	2000h	Pass
High acceleration stress test	HAST	77pcs×3		VDD/130°C 85%RH	200h	Pass
Dynamic burn in test	B/IN	77pcs×3		VDD/150°C	2000h	Pass
ESD test (Human body model)	HBM	3pcs	Over 2000V	100pF/1.5kohm	-	Pass
ESD test (Machine model)	MM	3pcs	Over 200V	200pF/0ohm	-	Pass