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Product/Process Change Notification
PCN#: 1021007

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: October 1, 2021

Title of change	
LSI Additional 300mm front-end process for 0.35um BiCDMOS line (2)	
Identification of change	
Traceable from the marking	
Detailed description of change	
Before	After
Rohm Hamamatsu 8inch (200mm) Wafer	Rohm Hamamatsu 8inch (200mm) Wafer Rohm Hamamatsu 12inch (300mm) Wafer
Affected product(s)	
Manufacuture part number	Customer part number
BD9E102FJ-GE2 & BD61251FV-E2	
Reason for change	
Stabilization of supply through additional 300mm wafers.	
Anticipated impact on form, fit, function, quality or reliability	
None	
Planned date for change	
October 1, 2022	
Qualification plan schedule, results and samples	
If required, pleaes 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.

No.1021007

Additional 300mm front-end process for 0.35µm BiCDMOS line

1. Summary of the change
2. Summary of Rohm Hamamatsu factory
3. Quality management System
4. Change point of 5M with the factory transferring
5. Investigation into the change in 5M (process)
6. Investigation into the change in 5M (product)
7. Summary

October 1, 2021
ROHM Co., Ltd.
Takashi Shimane / Division Manager / WP Control Div.
WP Production Headquarters

1. Summary of the change

1-1) Contents of change

・Add 300mm to the 200mm diameter of silicon wafers produced in the front-end process.
The production location is the same: Hamamatsu.
The quality characteristics are guaranteed by an evaluation and inspection about 5M.
(There is not a change about the assembly factory after the wafer process shipment)

1-2) Purpose of change

・Establish multiple manufacturing resources for the stabilized product supply by adding 300mm line to 200mm 0.35um BiCDMOS line.
The materials and the equipment to use for both lines are same specifications.

1-3) Schedule of change

・We plan to change it immediately after your approval acquisition, because 300mm process in Rohm Hamamatsu factory has mass-produced from July 2010, and there are many track records of 0.35um BiCDMOS lines.

2. Summary of Rohm Hamamatsu factory

2-1) Rohm Hamamatsu factory summary

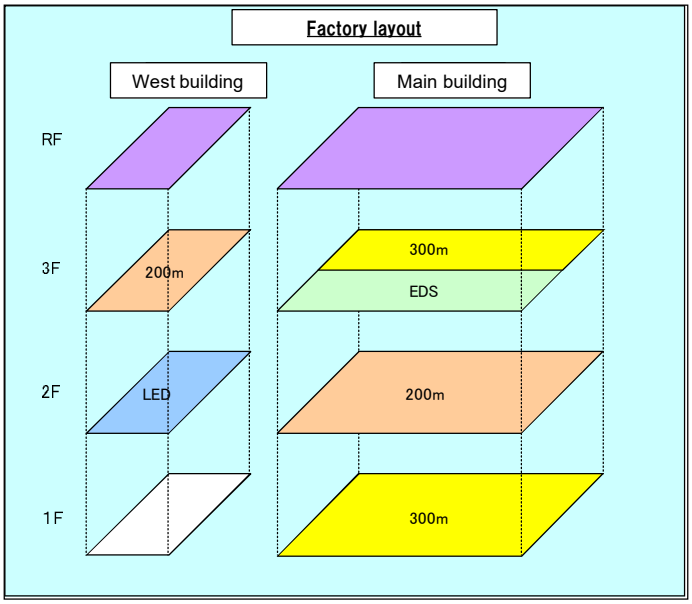
Company name	:	Rohm Hamamatsu Co., Ltd.
Location	:	Sanwa-cho Minami-Ku Hamamatsu
Establishment	:	1999
Representative	:	Hidekazu Eguchi (President)
Site area	:	62,000 m^2
Production item	:	Semiconductor element (LSI•LED)
Production capacity	:	LSI 44,000wafers(200mm)/ a month
Employee	:	231 (at June 2021)

2-2) 0.35μm BiCDMOS production results

		200mm	300mm
Start of production	:	March 2008	July 2010
Production volume	:	7,400M	1,200M

(We produced it by the same flow as that of a product applied for this time.)

2-3) Factory layout



The second floor : for a main process of 200mm line

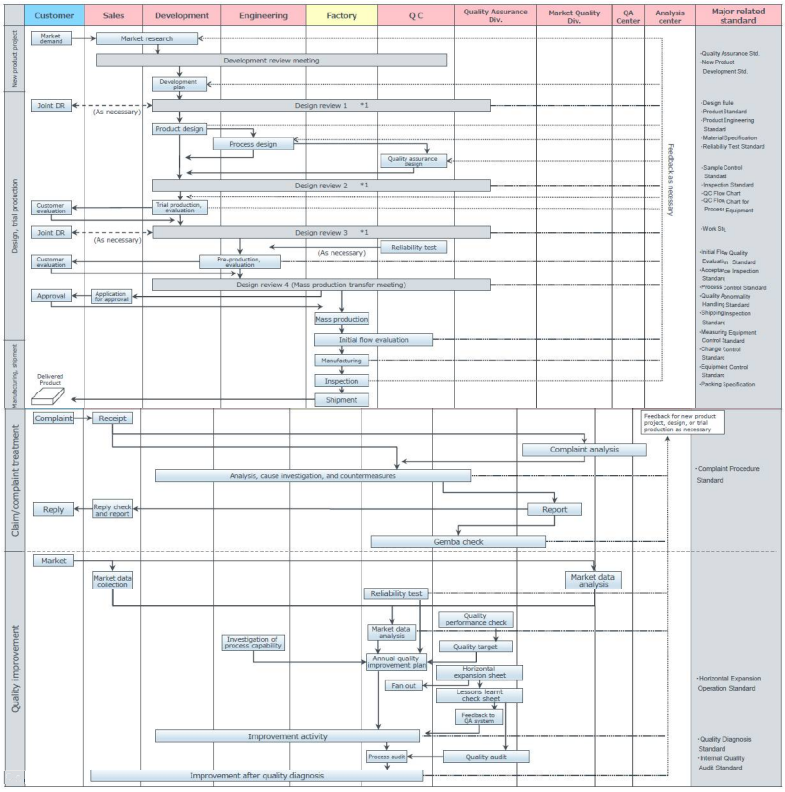
The first floor : for a main process of 300mm line

2-4) Environmental management (clean room)

Item		Frequency	Method	Unit	Management value	Rohm Hamamatsu 200mm (Existing)	Rohm Hamamatsu 300mm (Addition)
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)						0.35	0.09

There is no difference about the environmental management (clean room) between the factories.
About the UPW, main solution and gas, the same thing is used for 200mm and 300mm by centralized supply system.

3. Quality management System



There is no change about
Quality management System

4. Change point of 5M with the factory transferring

5M		200mm	300mm	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 equipment	Cart / Robot Cart	OHV(Overhead Hoist Vehicle)	Different ※1
Materials	Wafer	200mm Si wafers	300mm Si wafers	Different ※2
	Others	same thing is used by centralized supply system.		Equal
Method	Processing condition	Conforming to BD0.35 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 ※3	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 See the next page.
※2 It is a change only for the wafer diameter. The equal precision, manufacturer and specification are used.
※3 The measuring equipment refers to the equipment of the film thickness, Electric characteristic, Dimensions, Resistivity, Reflectance, Refractive index and Particle.

Transport between equipment

About the Transport between equipment, 200mm line uses a cart or automatic robot cart but 300mm line uses OHV(Overhead Hoist Vehicle).

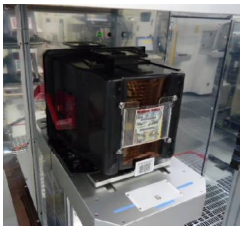
And the wafer storing container is changed to FOUP (Front Opening Unified Pod) from BOX type.

The tolerance for the floating dust greatly improves.

Cart for 200mm line

Robot Cart for 200mm line

Automatic Transportation for 300mm line



FOUP for 300mm line

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

5-1) Target process

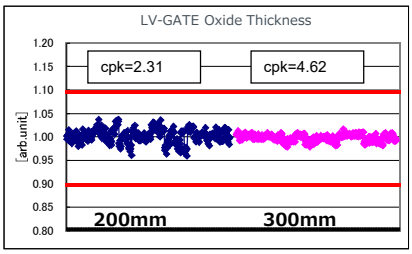
Process		Existing	Addition
Wafer process	LOCOS Gate Metalization Passivation	**Rohm Hamamatsu** **200mm**	**Rohm Hamamatsu** **300mm**
Assembly process	Wafer probe test Dicing Assy	No change (there is not the change of appearance, marking and so on. Wafer diameter and lot number of the wafer process are able to trace from Marking number.)	
Test process	Final test	No change	

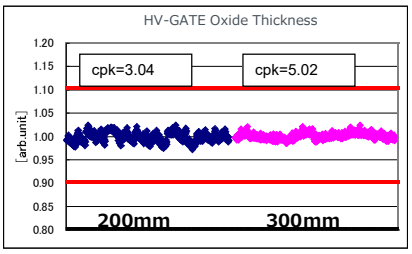
It is only wafer process to perform change application this time.

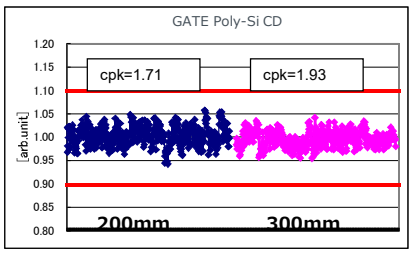
Assembly and Test process does not have the change.

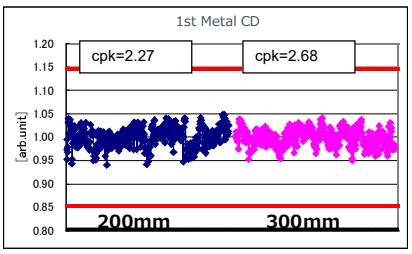
5-2) Process capability of primary characteristics of main process

We compared the process capability of 200mm/300mm processes
referring to primary characteristics of main processes.









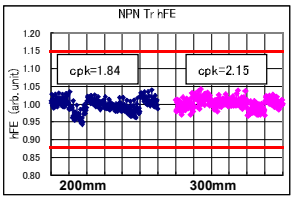
n=50LOT each
9point/LOT

There are enough Process capabilities in each processes.

5-3) Process capability of main element characteristics

We compared the process capability of 0.35μm BiCDMOS 300mm product with 200mm product referring to characteristics of main elements.

(NPN Tr)



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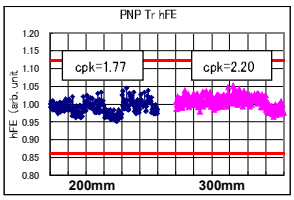
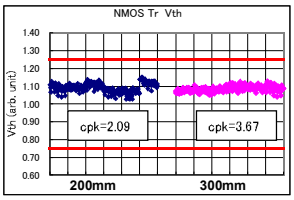
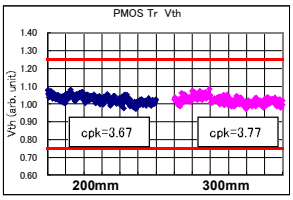


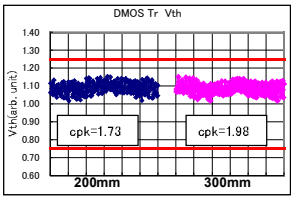
(NMOS Tr)



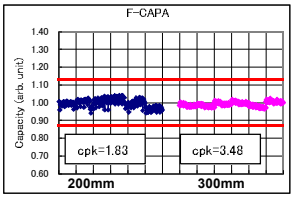
(PMOS Tr)



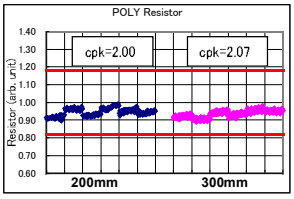
(DMOS Tr)



(CAPA)



(R POLY)



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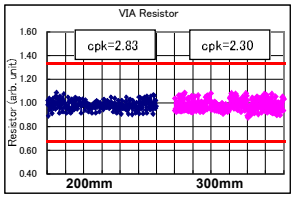
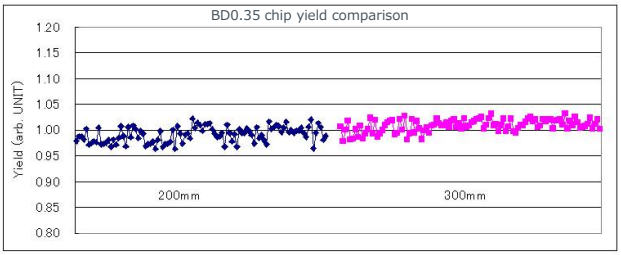


n=5LOT each
45point/LOT

There is not the difference in electrical characteristics between 200mm/300mm.

5-4) Chip yield (Wafer measurement)

We compared the chip yield of 300mm product with 200mm product of 0.35μm BiCDMOS.
By the comparison of 100lot before and after the transfer about the device which was already transferred, the CHIP yield of both lines does not have the difference.



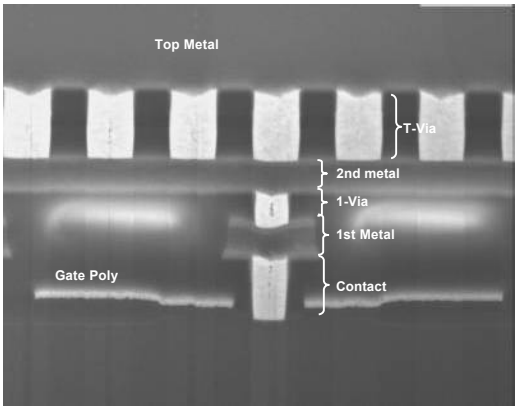
5-5) Reliability evaluation result of the wafer level

We show the reliability evaluation result of the wafer level at 300mm line as follows.
All tests satisfy a criterion and do not have any problem.

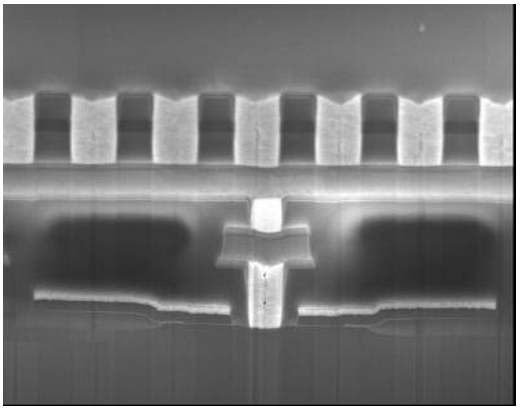
Test item	Test symbol	Evaluation criteria	Results judgment
Gate oxide film	TDDB	Guarantee more than twenty years in actual use	Pass
Slow trap	NBTI		Pass
Hot carrier	HCI		Pass
Stress migration	SM		Pass
Electro migration	EM		Pass

5-6) Cross sectional structure evaluation

The wiring structure of each sample of 200mm/300mm were observed by using FIB.
There is not the difference in structure between 200mm/300mm.



200mm Sample



300mm Sample

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

6-1) Design evaluation

We plan to perform an yield evaluation and a characteristic evaluation.

(It will be reported at later date.)

6-2) QAT result

We show the result of the QAT that were executed at 300mm 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
Temperature Humidity Bias test	THB	77pcs×3	Need to clear the spec of specifications and standard of shipment by the FT measurement after the test.	VDD/85℃/85%RH	2000h	Pass
Pressure Cooker test	PCT	77pcs×3		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 (Human Body Model)	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 is equal
even if 300mm is added to the 200mm of the BiCDMOS 0.35μm wafer production line in Rohm Hamamatsu factory,
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.