

**ROHM Co., Ltd.**

21 Saiin Mizosaki-cho, Ukyo-ku, Kyoto 615-8585 Japan
TEL: +81-75-311-2121 FAX: +81-75-315-0172
<http://www.rohm.com>

Product/Process Change Notification
PCN#: 102100A

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: 1st Sep.2021

Title of change	
Addition of Wide frame assembly line (High Efficiency Production Line) for HTSOP-J8 (LSI).	
Identification of change	
The product can be identified as new product name	
Detailed description of change	
Before	After
Semi wide production line (Present production line)	Wide frame production line (High Efficiency Production Line)
Affected product(s)	
Manufacture part number	Customer part number
Reason for change	
Increasing the demand of the semiconductor products in the world, the production capacity in ROHM has been higher operation rate so far. To strengthen the production and supply ability, Rohm will add HTSOP-J8 high efficiency production line using higher number of products per frame.	
Anticipated impact on form, fit, function, quality or reliability	
There are no issue on quality based on attached report.	
Planned date for change	
1st Sep. 2022	
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.



Addition of Wide frame assembly line (High Efficiency Production Line) for HTSOP-J8 (LSI)

1st Sep 2021
AP production Headquarters
LSI Engineering Div.

Addition of Wide frame assembly line (High Efficiency Production Line) for HTSOP-J8 (LSI)



<Contents>

1. Background
2. 4M comparison
3. Package outer & inner comparison
4. How to identify new product
5. Process flow comparison
6. Material comparison
7. Verification of changing points
8. Process evaluation results
9. Comparison of process evaluation result
10. Comparison of characteristics
11. Quality assurance test results
12. Summery


1. Background

<Background>

Fortunately, we received many orders for HTSOP-J8. So the production load factor is increasing. We will build a high efficiency line to provide stable production support.

<Purpose>

To increase production capacity and keep stable production support, add HTSOP-J8 high efficiency production line using higher number of products per frame.

Current line's Package name	Assy line	Test line		Package name After changing	Assy line	Test line
HTSOP-J8	Semi wide product line (Current Production line)	Current Test line		HTSOP-J8	Semi wide product line (Current Production line) High efficiency Production line	Current Test line (No change)

<Changing Schedule>

After getting approval from customers, apply this changing.

2. 4M comparison



Highly efficiency production line's equipment type(Same method)
and materials are changed from current production line.

			Semi wide production line (Current production line)	Highly efficiency production line	Changing point	Verification
Package name			HTSOP-J8	HTSOP-J8	None	No change
Device			Please refer device list	New device name	Yes	Add U or V word
Factory	Assy	Factory	Rohm Philippine (REPI)	Same as current	None	Factory has not been changed
		Country	Philippine	Same as current		
		Employee	4,000 people	Same as current		
		Clean level	Please refer below	Same as current		
		(DB~WB)	Class 10,000	Same as current		
		(Mold)	Class 10,000	Same as current		
	Test	Factory	Rohm Philippine (REPI)	Same as current	None	Same TEST process line
		Country	Philippine	Same as current		
Man	Assy	Operator certified as an automotive grade by Rohm		Same as current	None	Operator has not been changed
	Test	Operator certified as an automotive grade by Rohm		Same as current		
Machine	Assy	Die bonding	Full auto die bonder machine	Same as current	Yes	Machine type of each process is different from current one but same method/grade as current one and full auto. No problem.
		Wire bonding	Full auto wire bonder machine	Same as current		
		Mold press	Full auto mold press	Same as current		
		Damper cut	Full auto damper cut machine	Same as current		
		Plating	Full auto plating machine	Same as current		
		Marking	Full auto laser marking machine	Same as current		
		Lead forming	Full auto lead forming machine	Same as current		
	Test	Handler	Full auto handler	Same as current	None	Same TEST process line
		Tester	Full auto tester	Same as current		
	Taping	Full auto taping machine		Same as current		
Method	Assy	Process flow	Rohm automotive production line	Same as current	None	All process is same method.
		Die bonding	Solder bonding/Ag paste dispense method	Same as current		
		Wire bonding	Ultra sonic with thermal compression method	Same as current		
		Mold press	Transfer mold method	Same as current		
		Plating	Electro plating method	Same as current		
	Test	Socket contact method		Same as current	None	Test line isn't changed
Material			Please refer attachment	Please refer attachment	Yes	Please refer attachment

2. 4M comparison



<Device name comparison >

Current semi wide production line and Highly efficiently production line will have different device name.
The character U or V is added to the device name of Highly efficiently production line.

	Semi wide production line (Current production line)	Highly efficiency production line	Changing point	Verification
Device	BD00FC0EEFJ-ME2	BD00FC0UEFJ-ME2	Yes	Add U or V character

2. 4M comparison



<Material comparison>

Lead frame (strip size only), die attach material, mold resin material is changed.

		Semi wide production line (Current production line)	Highly efficiency production line	Changing point	Verification
Lead frame	Strip Size	190.8mm x 43 mm	269.5mm x 83mm	Yes	Please check attachment
	Inner design	Depends on device	Same as current	None	Only strip size is changed. Base metal material, surface plating, inner design isn't changed
	Base metal material	Cu alloy	Cu alloy	None	
	Surface plating	Ag spot plating	Ag spot plating	None	
Die attach material		Ag paste type A	Ag paste type B	Yes	Please check attachment
		Solder type A	Solder type A	None	No change
Wire material		Au/Cu	Au/Cu	None	No change
Mold resin material		Halogen Free Epoxy resin type A	Halogen Free Epoxy resin type B	Yes	Please check attachment
Outer plating material		100%Sn	100%Sn	None	No change
Marking		Laser marking	Laser marking	None	Marking words, font type/size are no change
Emboss tape		Rohm standard emboss tape	Rohm standard emboss tape	None	No change
Shipping reel		Rohm standard reel	Rohm standard reel	None	No change
Packing material for shipping		Rohm standard cardboard	Rohm standard cardboard	None	No change

3. Package outer & inner comparison



Package outer, marking spec, inner design is no change.

Item	Semi wide production line (Current production line)	Higher efficiency production line
Outer		<p>※This picture's marking is different because of dummy sample. Mass production sample is no change</p>
Inner (X-ray)		

4. How to identify semi wide line / high efficiency line products



It is possible to identify current semi wide line products or high efficiency line products by the characters in the 1-pin mark on the product surface.

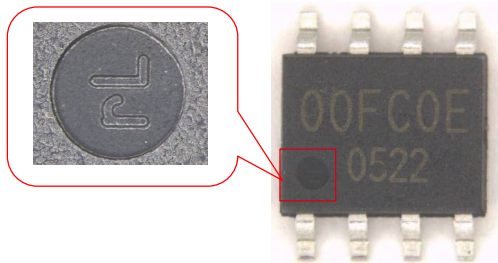
How to identify current semi wide line products / high efficiency line products

It can be identified by the 1-pin mark on the surface of product.

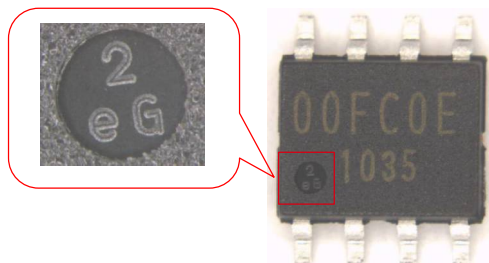
- current line products : 2 characters
- high efficiency line products : 3 characters

<example (device: BD00FC0EEFJ-ME2) >

<Semi wide production line products (Current) >

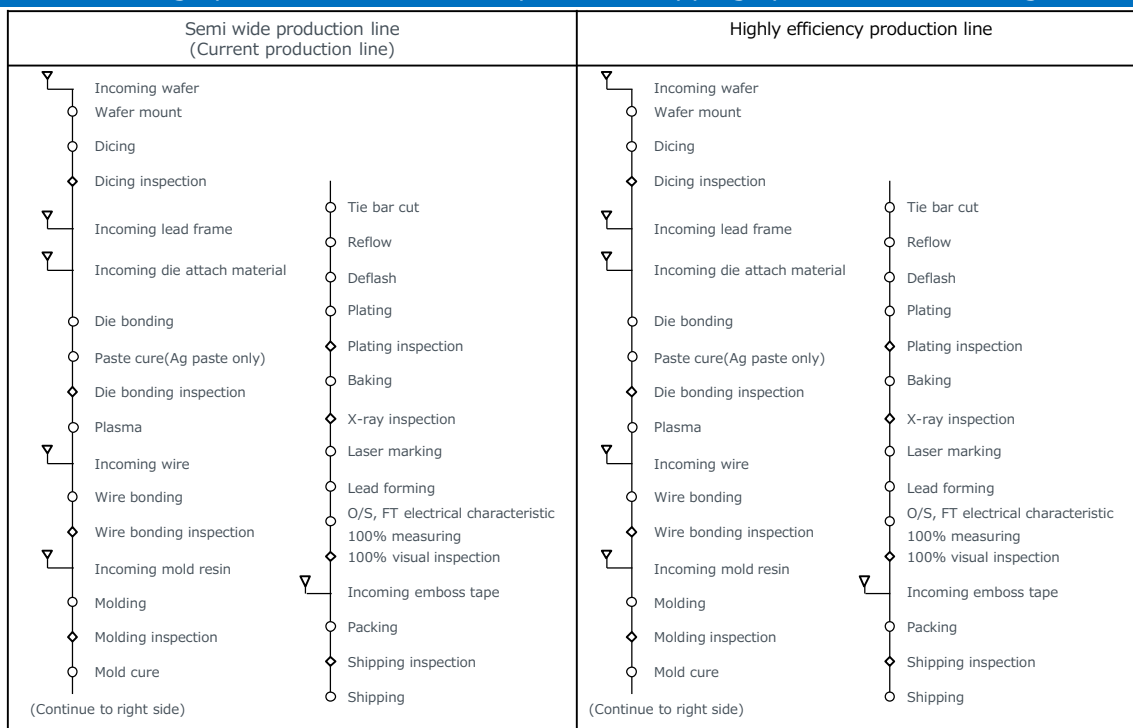


< high efficiency line products >



5. Process flow comparison


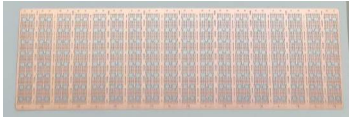
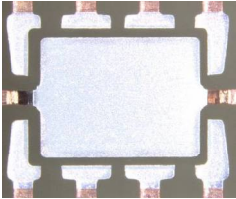
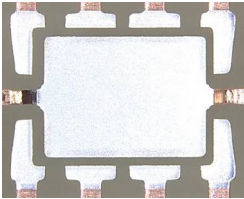
No change process flow. And test process, shipping spec is also no change.



6. Material comparison

<Lead frame comparison>

Only lead frame strip size is changed. Inner design and plating spec are no change. Regarding verification results for lead frame strip size change, please refer attachment.

Item	Semi wide production line (Current production line)	Highly efficiency production line
Package	HTSOP-J8	HTSOP-J8
Factory	Philippine (REPI)	Philippine (REPI)
Lead frame strip size	 Strip size: 190.8mm x 43 mm	 Strip size: 269.5mm x 83mm
Lead frame material (Base metal/Surface plating)	Cu alloy / Ag spo plating	
Inner design		

6. Material comparison

<Die attach material (Ag paste) >

To reduce thermal stress at Reflow process, lower elastic modulus paste has been selected for highly efficiency production line. Regarding verification results for die bonding/wire bonding, please refer attachment.

Item			Semi wide production line (Current)	Highly efficiency production line	Changing point	Concerned point
Main material			Epoxy	Epoxy/Acrl	Yes	Degas make lead frame surface Dirty.
Ag filler contents	%		75.0	76.5	Yes	1 st open because wire bonding force is reduced by soft die attach paste.
Electrical resistance	$\Omega \cdot \text{cm}$		$\sigma \times 10^{-4}$	$5\sigma \times 10^{-3} \Omega \cdot \text{cm}$	Yes	Over electrical characteristics spec by electrical conductivity change
Viscosity	s		19 (2.5rpm)	12 (5rpm)	Yes	•Lead short by paste bridge caused by paste scatter or stringy paste. •Thermal shut down by paste/ lead frame delamination caused by thin paste thickness.
Tg	Pa · s		110	28	Yes	•Thermal shut down by paste/ lead frame delamination caused by increasing thermal expand coefficient.
Thermal expand coefficient	$\alpha 1$	ppm	50	86	Yes	•Over electrical characteristics spec by thermal stress change.
	$\alpha 2$	ppm	95	200		
Elastic modulus	RT	MPa	11500	2800	Yes	1 st open because wire bonding force is reduced by soft die attach paste.
Thermal conductivity	W/mK		1.5	2.0	Yes	Over electrical characteristics spec by thermal conductivity change.
Chloride ion contents	ppm		6	<5	Yes	Corrosion risk become low so no problem.

6. Material comparison



<Mold resin material>

To reduce reflow stress, low elastic modulus/low water absorption mold resin is selected for highly efficiency production line. Regarding verification results for resin injection in mold process, please refer attachment.

item			Semi wide production line (Current)	Highly efficiency Production line	Changing point	Concerned point
Main material			Epoxy	Epoxy	None	No change
Filler type			Silica	Silica	None	No change
Spiral flow	cm		105	110	Yes	Breakdown by void
Gel time (175℃)	s		45	35	Yes	Break down by void or wire open by wire sweep because resin gel time is short.
Tg	℃		130	125	Yes	Thermal shut down by paste/leadframe delamination because increasing α2 resin.
Thermal Expand coefficient	α1	ppm	9.0	9.0	None	No change
	α2	ppm	37	38	Yes	Thermal shut down by paste/ lead frame delamination caused by increasing thermal expand coefficient.
Bending Elastic Modulus	RT	MPa	24000	23500	Yes	Die crack by FT Force or pick up in taping
	260℃	MPa	800	600		
Bending Strength	RT	GPa	180	160		
	260℃	GPa	20	16		
Water absorption	Boil	wt%	0.14	0.13	Yes	Reflow stress become lower. No problem
Electrical conductivity		μS/cm	<80	<150	Yes	Over electrical characteristics spec by Electrical conductivity change.
Chloride ion contents		ppm	<30	<20	Yes	Corrosion risk become low so no problem.

6. Material comparison



<Lead frame change>

Based on DRBFM and process evaluation item,
the result is no problem. For details, please refer attachment.

Changing point	Concerned point	Evaluation item	Pn/N	Results	Judgment	Page
Strip size change 190.8mm x 43 mm →269.5mm x 83mm	1 st /2 nd open by weak lead frame clamp at wire bonding process.	• Wire bonding process margin evaluation	0/30 wires	1 st ball/2 nd bonding is No problem in production Margin.	Pass	p.16
	Easy to deform lead frame, and caused solder mount NG by leak mold resin to heatsink	• Outer dimension measurement	0/10 pcs	Cpk>1.67 and no problem	Pass	p.20
	Sn plating thickness become over spec	• Sn plating thickness measurement	0/60 leads	Cpk>1.67 and no problem	Pass	p.19
	Void is occurred because mold injection time is longer and resin become harder.	• Mold margin evaluation	-	No void in production margin	Pass	p.17
	Wire sweep is occurred because mold injection time is longer and resin become harder.	• Mold margin evaluation	-	No wire sweep in production margin	Pass	p.17

7. Verification of changing points



<Die attach material change>

Based on DRBFM and process evaluation item,
the result is no problem. For details, please refer attachment.

Changing point	Concerned point	Evaluation item	Pn/N	Results	Judgment	Page
Epoxy →Epoxy/Acryl change	Degas make lead frame surface dirty, and paste/lead frame Delamination is occurred.	•MSL	0/24pcs	No delamination	Pass	p.25
	Degas make lead frame surface dirty, and caused wire open	•MSL	0/24pcs	No delamination	Pass	p.25
Elastic modulus lower 11500→2800MPa	1 st open because wire bonding force is reduced by soft die attach paste.	•Wire bonding margin evaluation (1 st ball shear strength check)	0/30 wires	1 st ball shear strength is no problem in production margin	Pass	p.16
Increase electrical resistance $\sigma \times 10^{-1} \Omega \cdot \text{cm}$ → $5 \sigma \times 10^{-2} \Omega \cdot \text{cm}$	Over electrical characteristics spec by electrical conductivity change	•Electrical characteristic measurement	0/100 (Representative device)	Cpk>1.67 measured by representative device. Objected Device will be measured by evaluation lot.	Pass	p.22
Tg lower (-82℃) /Increase thermal expand coefficient ($\alpha 1$:72%, $\alpha 2$:111% up)	Thermal shut down by paste/lead frame delamination caused by increasing thermal expand coefficient.	•MSL	0/24pcs	No delamination	Pass	p.25
	Over electrical characteristics spec by thermal stress change.	•Electrical characteristic measurement	0/100 (Representative device)	Cpk>1.67 measured by representative device. Objected Device will be measured by evaluation lot.	Pass	p.22
Increase thermal conductivity	Over thermal characteristics Spec by thermal conductivity change	•Thermal resistance Measurement comparison (Current production line vs highly efficient production line)	-	According to representative device, thermal resistance of higher efficient production line is 2.8℃/W higher than current one. Objected device will be measured by evaluation lot.	Pass	p.24
Viscosity change	Lead short by paste bridge caused by paste scatter or stringy paste.	•Die bonding margin evaluation	-	No paste scatter or stringy paste in production margin	Pass	p.15
	Thermal shut down by paste/lead frame delamination caused by thin paste thickness	•MSL	0/24pcs	No delamination	Pass	p.25

7. Verification of changing points



<Mold resin change>

Based on DRBFM and process evaluation item,
the result is no problem. For details, please refer attachment.

Changing point	Concerned point	Evaluation item	Pn/N	Results	Judgment	Page
Increase thermal expand coefficient $\alpha 2$: 2.7% up	Thermal shut down by paste/lead frame delamination caused by increasing thermal expand coefficient.	•MSL	0/24pcs	No delamination	Pass	p.25
	Over electrical characteristics spec by electrical conductivity change	•Electrical characteristic Measurement	0/100 (Representative device)	Cpk>1.67 measured by representative device. Objected device will be measured by evaluation lot.	Pass	p.22
Spiral flow 4.8% longer	Breakdown by void	•Mold margin evaluation	-	No void in production margin	Pass	p.17
Gel time 29% shorter	Break down by void or wire open by wire sweep because resin gel time is short.	•Mold margin evaluation	-	No void/wire sweep NG in production margin	Pass	p.17
Lower Tg t→ t-5℃	Thermal shut down by paste/lead frame delamination because increasing $\alpha 2$ region.	•MSL	0/24pcs	No delamination	Pass	p.25
Lower bending elastic modulus 25℃: 2.1% down 260℃:33.3% down	Die crack by FT Force or pick up in taping	•SAT evaluation On chip	0/24pcs	No die cracks	Pass	p.21
Lower water absorption 7.7% down	Thermal shut down by paste/lead frame delamination caused by water distribution in product.	•MSL	0/24pcs	No delamination	Pass	p.25
Higher electrical conductivity	Over electrical characteristics spec by Electrical conductivity change.	•Electrical characteristic Measurement	0/100 (Representative device)	Cpk>1.67 measured by representative device. Objected device will be measured by evaluation lot.	Pass	p.22

8. Process evaluation results

<Die bonding evaluation>

To verify paste viscosity change, conduct Die bonding margin evaluation. Paste spread•height is no problem and no stringy paste/paste scattering is occurred. There is no problem.

【Evaluation contents】

Package: HTSOP-J8 (High efficiency production line)

Device: Dummy chip (Chip size: 2.7x2.1x0.3tmm [MAX chip size])

【Judgment standard】

•Paste spread: $\geq 60\%$ of chip side











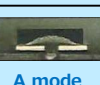









•Paste height: (Chip size t, Paste height x)

A mode: $x < 1/2t$, B mode: $1/2t < x < 2/3t$, C mode: $2/3t < x$

【Evaluation condition】

Dispense pressure (MPa)					
-100	-50	Center	+50	+100	+150
1	2	3	4	5	6

Production control

Condition	1	2	3	4	5	6
Paste appearance	Can't dispense C mode	 A mode	 A mode	 A mode	 A mode	 A mode
Paste Spread		 A mode	 A mode	 A mode	 A mode	 A mode
Paste height (Chip X)		 A mode	 A mode	 A mode	 A mode	 A mode
Paste height (Chip Y)		 A mode	 A mode	 A mode	 B mode	 C mode

8. Process evaluation results

<Wire bonding 1st bonding evaluation>

To verify lower elastic modulus paste, conduct 1st bonding margin evaluation.
Ball shear strength・ball appearance are no problem and No under PAD is occurred.

【Evaluation contents】

Package : HTSOP-J8 (High efficiency production line)

Wire: Auφ30μm Evaluation Qty : N=30 balls

【Judgment standard】

- Ball appearance: No decentering or smash ball
- Ball size/thickness: 75±5μm/15±5μm
- Ball shear strength: ≥200 mN and exist Au residue or Al slide trace
- No under pad crack

【Evaluation condition】

		USG Current (mA)				
		-20	-10	Center	+10	+20
Force	+5	6				7
	-5		2		3	
	Center			1		
	+5		5		4	
	+10	9				8

Production
control

Condition		1	2	3	4	5	6	7	8	9	
Ball appearance	Size	x	75.3	73.7	74.7	77.0	74.7	73.3	77.7	81.7	74.0
		y	76.0	73.3	75.7	77.3	75.0	73.3	77.7	81.0	75.0
	Thickness	t	18.0	20.7	17.3	15.7	18.3	20.7	15.7	13.0	19.7
	Appearance										
Ball shear	Strength (mN)	Average	452.8	468.5	457.0	460.0	448.3	447.9	448.5	472.8	444.1
		Max	460.7	501.5	485.1	488.9	463.6	469.4	488.6	510.4	470.2
		Min	438.8	421.4	424.5	431.8	428.8	427.7	77.7	416.5	402.1
Mode											
Under pad	Appearance										
	Pn/N		0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30	0/30
Judgment		OK	OK	OK	OK	OK	OK	OK	OK	NG	OK

8. Process evaluation results

<Wire bonding 2nd bonding evaluation>

To verify lead frame strip size changing effect, conduct 2nd bonding margin evaluation. Pull strength•peel test are no problem.

【Evaluation contents】

Package : HTSOP-J8 (High efficiency production line)

Wire: Auφ30um Evaluation Qty : N=30 wires

【Judgment standard】

- Appearance : No peeled off
- Peel test : Exist crescent residue
- Pull strength : ≥ 40 mN

【Evaluation condition】

		USG Current (mA)				
Force		-20	-10	Center	+10	+20
	+5	6				7
	-5		2		3	
	Center			1		
	+5		5		4	
	+10	9				8

Production control

Condition	1	2	3	4	5	6	7	8	9
Appearance									
Peel test									
Pull strength(mN)	Average	122.6	123.5	120.7	123.2	121.5	126.0	123.1	120.7
	Max	133.6	150.8	143.5	142.5	133.3	141.6	146.4	147
	Min	112.0	107.9	104.3	103.9	111.1	111.4	104.6	106.1
Judgment	OK	OK	OK	OK	OK	OK	OK	OK	OK

8. Process evaluation result

<Mold evaluation>

To verify lead frame strip size and short gel time/spiral flow mold resin, conduct injection speed/pressure margin evaluation. Wire sweep/void are no problem.

【Evaluation contents】










Package : HTSOP-J8 (High efficiency production line) Wire: Auφ25μm

Evaluation Qty : N=576pcs










【Judgment standard】

•Wire sweep ≤10%

•Void ≤0.5mm

		Transfer speed / mm/sec				
		0.10	0.25	0.50	0.75	1.00
Prunger Pressure / kN	15.0					
		9.5%				7.1%
	17.5					
			5.0%		5.9%	
	19.7					
				7.0%		
22.5						
			8.6%		6.2%	
25.0						
		13.7%				8.1%

Production control

		2nd Transfer speed / mm/sec				
		0.10	0.25	0.50	0.75	1.00
Prunger Pressure / kN	15.0					
	17.5					
	19.7					
22.5						
25.0						

Production control

8. Process evaluation results

<Sn plating thickness measurement>

To verify lead frame strip size, conduct Sn plating thickness measurement.
Sn plating thickness is Cpk > 1.67 and no problem.

【Evaluation contents】

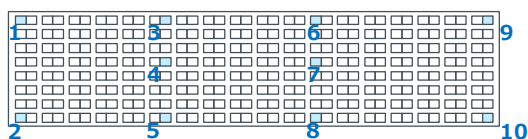
Package : HTSOP-J8 (High efficiency production line)
Evaluation Qty : 60 leads (10 pcs×6 leads/pc)

【Judgment standard】

Plating thickness: 8~20 μm

【Sampling point】

Please refer sampling location below.



【Result】

(Unit: μm)

	Sampling point										Total	Cpk
	1	2	3	4	5	6	7	8	9	10		
Average	12.1	12.1	11.5	11.9	10.9	11.9	12.1	11.0	12.0	12.0	11.8	1.72
Max	12.7	13.1	12.3	12.2	11.7	12.7	12.9	12.2	12.9	12.9	13.1	
Min	11.0	10.5	10.7	11.4	10.2	11.1	11.4	10.1	11.5	11.0	10.1	
σ	0.70	0.97	0.57	0.33	0.55	0.71	0.49	0.72	0.50	0.60	0.73	

8. Process evaluation results

<Solder wettability evaluation>

Zero cross time was under 3.0s, so there is no problem with the solder wettability.

【Evaluation contents】

Package : HTSOP-J8 (High efficiency production line)

Method : Meniscograph method

(Solder Bath:Sn-3Ag-0.5Cu, 245°C)

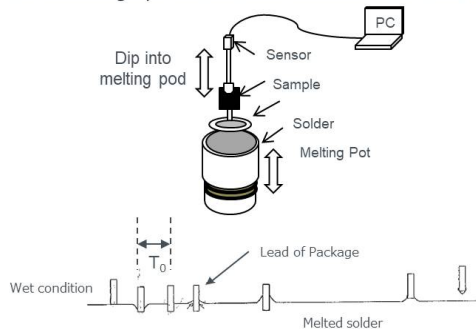
Qty : 5 pcs

【Judgement standard】

Zero cross time(T_0) $\leq 3s$ (EIAJ ED-4701/303)

[Solder wettability test]

Use Meniscograph method and measure zero cross time.



【Evaluation result】

(unit : s)

	1	2	3	4	5	Ave.	Max.	Min.	Judgement
Zero cross time T_0 [s]	2.0	2.0	1.9	2.1	2.3	2.1	2.3	1.9	PASS

8. Process evaluation results

<Outer dimension measurement>

To verify lead frame strip size, conduct outer dimension measurement.
Cpk > 1.67 and no problem.

【Evaluation contents】

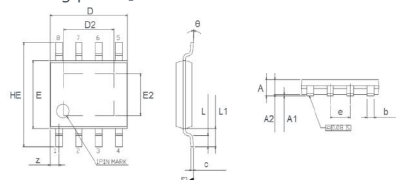
Package : HTSOP-J8

Evaluation Qty : 10 pcs

【Judgment standard】

Cpk ≥ 1.67 for each dimension

【Measuring points】



<Current production line>

	A	A1	A2	D	D2	HE	E	E2	b	c	e	L	L1	z	θ
	1.0 Max.	0.08±0.08	0.85±0.05	4.9±0.1	(3.2)	6.0±0.2	3.9±0.1	(2.4)	0.42 +0.05/-0.04	0.17 +0.05/-0.03	1.27	0.65±0.15	1.05±0.2	0.545	4°+6°/-4°
Ave.	0.98	0.12	0.86	4.95	3.11	6.00	3.89	2.33	0.41	0.17	1.27	0.59	1.07	0.56	3.28
Max.	0.98	0.13	0.86	5.04	3.14	6.02	3.90	2.37	0.42	0.17	1.28	0.61	1.12	0.58	3.56
Min.	0.97	0.11	0.84	4.87	3.08	5.98	3.87	2.25	0.40	0.16	1.26	0.58	1.05	0.52	3.08
σ	0.00	0.01	0.01	0.06	0.02	0.01	0.01	0.03	0.01	0.01	0.00	0.01	0.02	0.02	0.15
Cpk	1.80	2.20	2.16	1.80	-	7.22	2.77	-	1.97	1.69	-	3.82	2.95	-	7.12

(unit : mm)

<High efficiency production line>

	A	A1	A2	D	D2	HE	E	E2	b	c	e	L	L1	z	θ
	1.0 Max.	0.08±0.08	0.85±0.05	4.9±0.1	(3.2)	6.0±0.2	3.9±0.1	(2.4)	0.42 +0.05/-0.04	0.17 +0.05/-0.03	1.27	0.65±0.15	1.05±0.2	0.545	4°+6°/-4°
Ave.	0.95	0.13	0.85	5.03	3.17	6.02	3.87	2.39	0.41	0.16	1.27	0.66	1.08	0.61	3.50
Max.	0.96	0.14	0.86	5.07	3.22	6.04	3.88	2.41	0.42	0.17	1.28	0.69	1.11	0.66	4.06
Min.	0.93	0.12	0.84	5.00	3.15	6.00	3.85	2.36	0.41	0.16	1.26	0.64	1.06	0.55	2.93
σ	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.02	0.02	0.03	0.40
Cpk	1.82	2.09	2.22	3.24	-	5.14	2.47	-	2.98	1.75	-	2.37	3.10	-	2.90

(unit : mm)

8. Process evaluation results

<SAT evaluation on chip surface>

As a result of the SAT evaluation on chip surface, we have confirmed that there is no problem with the low elasticity of the mold resin.

【Judgement contents】

Package : current semi wide line/high efficiency line

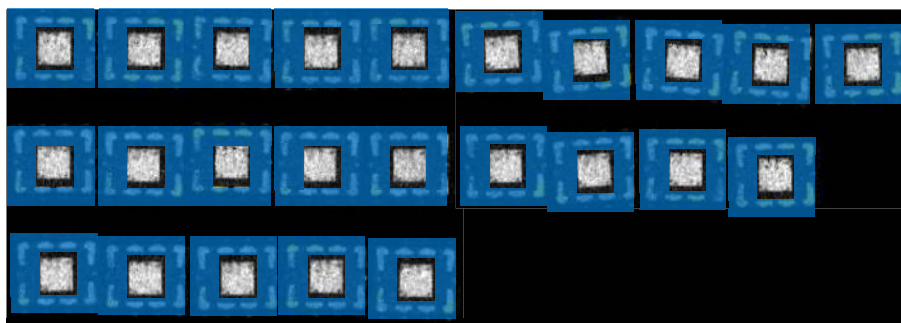
Device : representative model

Qty : N=24pcs

【Judgement standard】

•appearance : No pellet crack

【SAT result】



8. Process evaluation results



<Electrical characteristic measurement>

To verify mold/die attach paste change, conduct important electrical characteristic measurement (Output voltage) by representative device. Cpk > 1.67 and no problem.

【Evaluation contents】

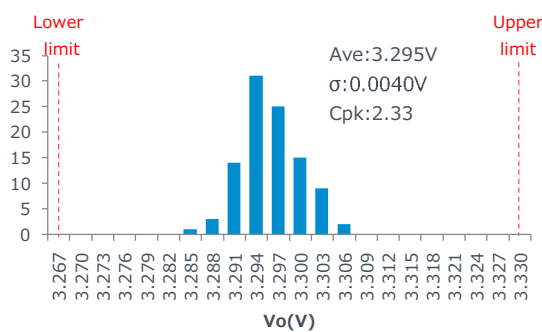
Package : HTSOP-J8

Device : BD33FC0EEFJ-M

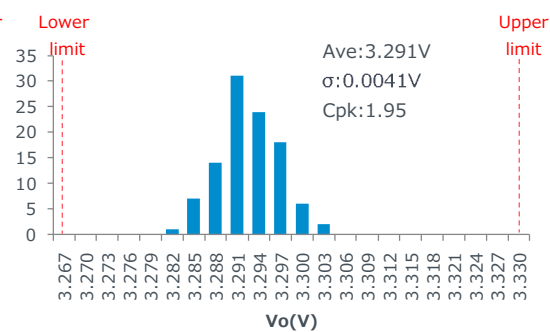
Judgment standard : $3.3 \pm 1\%$ V, and Cpk ≥ 1.67

Measurement Qty : N=100pcs

<Current production line's product output voltage>



< High efficiency production line's product output voltage >



8. Process evaluation results



<Thermal resistance measurement>

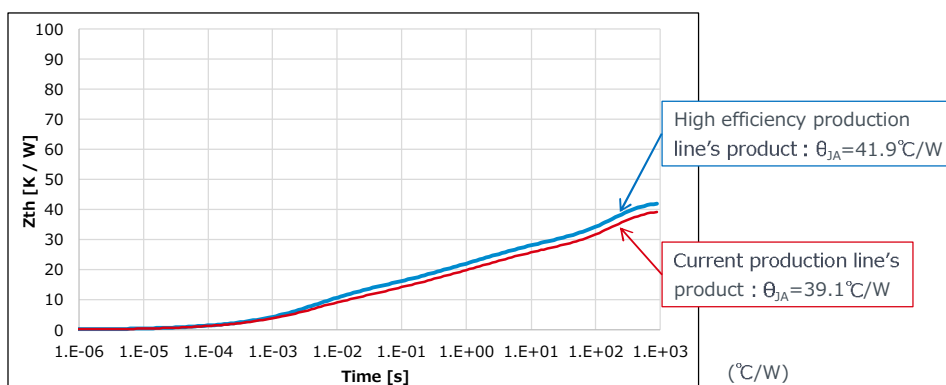
To verify die attach paste change, compare current production line's product with highly efficiency production line's one about thermal resistance by representative device. Thermal resistance of highly efficiency production line's product is about 2.8°C/W higher than current production line's one. Objected devices will be measured by evaluation lot.

【Measuring condition】

Package : HTSOP-J8
Device : BD50HA3EEFJ
Measuring machine : T3Ster (MentorGraphics)
Environment : JESD51-2A
Substrate : Rohm 4 layers substrate

Substrate information
Rohm 4 layers substrate
: FR4(Glass epoxy) substrate
114.3mm×76.2mm×1.6mm
1st layer: Copper foil, land pattern+wiring for measuring
2nd, 3rd, backside layer: Copper foil, 74.2mm×74.2mm

【Result】



8. Process evaluation results

<MSL>

To verify mold/die attach paste change, conduct MSL test by following JEDEC. No delamination is found and no problem.

【Evaluation contents】

Package : HTSOP-J8 (High efficiency production line)
Device : BD4271EFJ-C
Evaluation Qty : N=24pcs

【Pre-condition】

MSL	JEDEC LEVEL 1
Drying	125°C 24h
Moisture	85°C 85% 168h
Reflow	Pb free profile (260°C) 3 times

【Judgment standard】 IPC/JEDEC J-STD-020E

	Judgment standard/ Evidence of judgment standard	JEDEC Table No.
Chip (surface)	No delamination /To avoid wire open	6.2.1.1a
Island (Surface)	No delamination at down bonding area/To avoid wire open ※Objected devices are not applicable because of no down bonding.	6.2.1.1b
Paste/Island Interface	Delamination area < 50% in initial condition and no change after MSL. ("High heat radiation" or "Ohmic contact at chip backside" device is applicable) /To avoid heat radiation grade down or non-ohmic contact.	6.2.1.1d
Inner lead (Surface)	Delamination area < 100%. If 100% delamination is found, conduct quality assurance Test and judge by electrical characteristic/To avoid wire open	6.2.1.1e

【Result】

Measuring point	Chip (Surface)	Island (Surface)	Paste/Island Interface	Judgment
Pn/N	0/24	0/24	0/24	Pass

8. Process evaluation results

We conducted reliability test based on JEDEC. There is no problem.

【Evaluation contents】

Package : HTSOP-J8 (High efficiency production line)

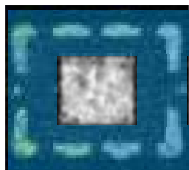
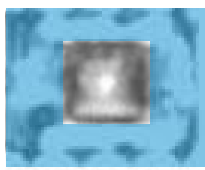

Device : BD4271EFJ-C

Evaluation Qty : N=24pcs

【Judgment standard】

IPC/JEDEC J-STD-020E

【Result】

Chip (surface)	Paste-Island interface	Inner lead (surface)
		
0/24	0/24	0/24

9. Comparison of process evaluation result



Compared current production line and high efficiency production line, each process is equivalent.

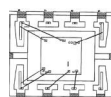
■ Evaluation device information

• Device name : BD00FC0EEFJ-ME2

• Chip size: 1.81x1.91x0.30mm

• Wire: Au28 um (the wire layout is shown on the right)

<Wire layout>



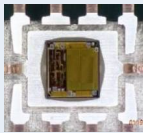
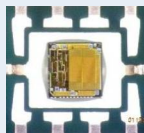
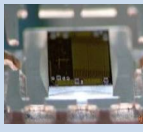
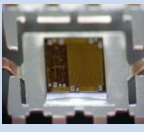


Pn : the number of defects

Process	Check item	Judgement standard	Qty	Evaluation result (Pn/n)		Judgement	item
				Semi wide production line (Current)	High efficiency line		
Die bonding	Paste spread/scatter	≥60%/side, No scatter	288 pcs	0/288pcs	0/288pcs	Pass	P.28
	Paste height	≤two-thirds of die height	288 pcs	0/288pcs	0/288pcs	Pass	
	Hajiki test	≥80% Si chip residue	30pcs	0/30pcs	0/30pcs	Pass	
Wire bonding	Ball size	Within ROHM standard (X, Y: 60±10um Z: 14±5um)	30 wire	0/30 wire	0/30 wire	Pass	P.29
	Ball shear test	Strength: ≥300mN exist Au residue or Al slide trace	30 wire	Cpk=1.81	Cpk=1.85	Pass	
	appearance/ no crack under PAD	No decentering or smash ball /no crack under PAD	30 wire	0/30 wire	0/30 wire	Pass	
	2 nd pull strength	≥0.06N	30 wire	Cpk=1.70	Cpk=1.72	Pass	P.30
	2 nd appearance/peel test	No peeled off and exist crescent residue	30 wire	0/30 wire	0/30 wire	Pass	
Mold	Wire sweep	≤ 10%	15pcs	Cpk=2.14	Cpk=3.30	Pass	P.31
	Inner void	Void ≤ 0.5mm	288pcs	0/288pcs	0/288pcs	Pass	
Plating	Plating thickness	8~20 um	60 lead	Cpk=1.73	Cpk=1.78	Pass	P.32
	Solder wettability test	Zero cross time ≤ 0.3s	5pcs	0/5pcs	0/5pcs	Pass	
Lead forming	Appearance	Based on visual inspection criteria	100pcs	0/100pcs	0/100pcs	Pass	P.33

9. Comparison of process evaluation result

<DB process>


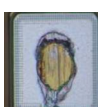
The results show that appearance and bonding strength are equivalent.

Check item	Judgement standard	result		judgement
		Semi wide production line (Curent)	High efficiency production line	
Paste spread/scatter	$\geq 60\%$ /side, No scatter	 Pn/N = 0/288 pcs	 Pn/N = 0/288 pcs	Pass
Paste height	\leq two-thirds of die height	 Pn/N = 0/288 pcs	 Pn/N = 0/288 pcs	Pass
Hajiki test	$\geq 80\%$ Si chip residue	 Pn/N = 0/30 pcs	 Pn/N = 0/30 pcs	Pass

9. Comparison of process evaluation result

<WB process (1)>

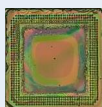
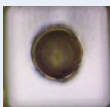
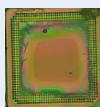
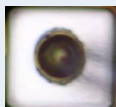


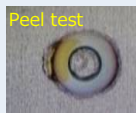
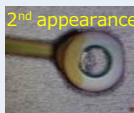
The results show that ball size and ball shear strength are equivalent.

Check item	Judgement standard	result								Judgement
		Semi wide production line (Current)				High efficiency production line				
Ball size	•X, Y: 60±10um •Z: 14±5um		X	Y	Z		X	Y	Z	pass
		Ave	62.1	62.4	14.0	Ave	61.8	61.4	15.1	
		MAX	65.0	65.1	15.8	MAX	63.6	63.5	16.1	
		MIN	59.0	60.0	12.8	MIN	59.8	59.1	14.2	
		σ	1.1	1.1	0.92	σ	1.1	1.1	0.7	
		Cpk	2.39	2.30	1.81	Cpk	2.48	2.60	1.85	
Pn/N = 0/30 wire [um]					Pn/N = 0/30 wire [um]					
Ball shear test	Strength: ≥300mN exist Au residue or Al slide trace		Strength [N]	Shear mode			Strength [N]	Shear mode		pass
		Ave	0.43		Ave	0.42				
		MAX	0.49		MAX	0.48				
		MIN	0.38		MIN	0.38				
		σ	0.02		σ	0.02				
		Cpk	1.81		Cpk	1.85				
Pn/N = 0/30 wire				Pn/N = 0/30 wire						

9. Comparison of process evaluation result

<WB process (2)>

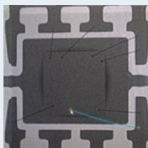
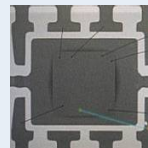
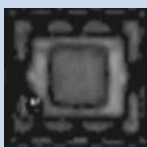

The results show that no crack under PADs and wire appearance/pull strength are equivalent.

Check item	Judgement standard	result		Judgement																								
		Semi wide production line (Current)	High efficiency production line																									
Appearance no crack under PAD	No decentering or smash ball /no crack under PAD	<div></div> <div>No decentering/smash No crack under PAD Pn/N = 0/30 wire</div>	<div></div> <div>No decentering/smash No crack under PAD Pn/N = 0/30 wire</div>	Pass																								
2 nd pull strength	≥0.06N	<table border="1"><thead><tr><th></th><th>strength[N]</th></tr></thead><tbody><tr><td>Ave</td><td>0.13</td></tr><tr><td>Max</td><td>0.14</td></tr><tr><td>Min</td><td>0.09</td></tr><tr><td>σ</td><td>0.013</td></tr><tr><td>Cpk</td><td>1.70</td></tr></tbody></table> <div>Pn/N = 0/30 wire</div>		strength[N]	Ave	0.13	Max	0.14	Min	0.09	σ	0.013	Cpk	1.70	<table border="1"><thead><tr><th></th><th>strength[N]</th></tr></thead><tbody><tr><td>Ave</td><td>0.09</td></tr><tr><td>Max</td><td>0.10</td></tr><tr><td>Min</td><td>0.08</td></tr><tr><td>σ</td><td>0.010</td></tr><tr><td>Cpk</td><td>1.72</td></tr></tbody></table> <div>Pn/N = 0/30 wire</div>		strength[N]	Ave	0.09	Max	0.10	Min	0.08	σ	0.010	Cpk	1.72	Pass
	strength[N]																											
Ave	0.13																											
Max	0.14																											
Min	0.09																											
σ	0.013																											
Cpk	1.70																											
	strength[N]																											
Ave	0.09																											
Max	0.10																											
Min	0.08																											
σ	0.010																											
Cpk	1.72																											
2 nd appearance peel test	No peeled off and exist crescent residue	<div></div> <div>No peeled off exist crescent residue Pn/N = 0/30 wire</div>	<div></div> <div>No peeled off exist crescent residue Pn/N = 0/30 wire</div>	Pass																								

9. Comparison of process evaluation result

<Mold process >

The results show that MOLD process is equivalent.

Check item	Judgement standard	result		Judgement																				
		Semi wide production line (Current)	High efficiency production line																					
Wire sweep	≤ 10%	<table><tr><td>Ave</td><td>2.00</td></tr><tr><td>Max</td><td>4.70</td></tr><tr><td>Min</td><td>0.50</td></tr><tr><td>σ</td><td>1.2</td></tr><tr><td>Cpk</td><td>2.14</td></tr></table> <div><p>[%]</p><p>Pn/N = 0/15 pcs</p></div>	Ave	2.00	Max	4.70	Min	0.50	σ	1.2	Cpk	2.14	<table><tr><td>Ave</td><td>1.93</td></tr><tr><td>Max</td><td>3.20</td></tr><tr><td>Min</td><td>0.30</td></tr><tr><td>σ</td><td>0.81</td></tr><tr><td>Cpk</td><td>3.30</td></tr></table> <div><p>[%]</p><p>Pn/N = 0/15 pcs</p></div>	Ave	1.93	Max	3.20	Min	0.30	σ	0.81	Cpk	3.30	Pass
Ave	2.00																							
Max	4.70																							
Min	0.50																							
σ	1.2																							
Cpk	2.14																							
Ave	1.93																							
Max	3.20																							
Min	0.30																							
σ	0.81																							
Cpk	3.30																							
Inner void	Void ≤ 0.5mm	<div><p>No inner void</p><p>Pn/N = 0/288 pcs</p></div>	<div><p>No inner void</p><p>Pn/N = 0/288 pcs</p></div>	Pass																				

9. Comparison of process evaluation result



<Plating process>

The results show that plating thickness and solder wettability are equivalent.

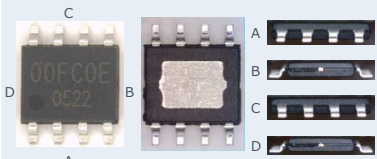
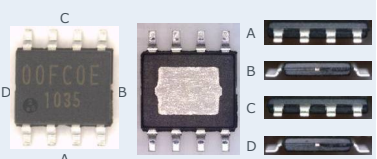
Check item	Judgement standard	result				Judgement																																				
		Semi wide production line (Current)		High efficiency production line																																						
Plating thickness	8~20 um	<table><tr><td>Ave</td><td>13.2</td></tr><tr><td>Max</td><td>15.19</td></tr><tr><td>Min</td><td>11.36</td></tr><tr><td>σ</td><td>1.0</td></tr><tr><td>Cpk</td><td>1.73</td></tr></table>		Ave	13.2	Max	15.19	Min	11.36	σ	1.0	Cpk	1.73	<table><tr><td>Ave</td><td>11.04</td></tr><tr><td>Max</td><td>12.18</td></tr><tr><td>Min</td><td>10.07</td></tr><tr><td>σ</td><td>0.57</td></tr><tr><td>Cpk</td><td>1.78</td></tr></table>		Ave	11.04	Max	12.18	Min	10.07	σ	0.57	Cpk	1.78	Pass																
		Ave	13.2																																							
Max	15.19																																									
Min	11.36																																									
σ	1.0																																									
Cpk	1.73																																									
Ave	11.04																																									
Max	12.18																																									
Min	10.07																																									
σ	0.57																																									
Cpk	1.78																																									
[um] Pn/N = 0/60 lead		[um] Pn/N = 0/60 lead																																								
Solder wettability test	Zero cross time ≤ 0.3s (EIAJ ED-4701/303)	<table><tr><td>No.</td><td>Zero cross time</td></tr><tr><td>1</td><td>2.03</td></tr><tr><td>2</td><td>2.16</td></tr><tr><td>3</td><td>2.06</td></tr><tr><td>4</td><td>1.97</td></tr><tr><td>5</td><td>2.16</td></tr><tr><td>Ave</td><td>2.07</td></tr><tr><td>Max</td><td>2.16</td></tr><tr><td>Min</td><td>1.70</td></tr></table>		No.	Zero cross time	1	2.03	2	2.16	3	2.06	4	1.97	5	2.16	Ave	2.07	Max	2.16	Min	1.70	<table><tr><td>No.</td><td>Zero cross time</td></tr><tr><td>1</td><td>2.21</td></tr><tr><td>2</td><td>1.85</td></tr><tr><td>3</td><td>2.26</td></tr><tr><td>4</td><td>1.70</td></tr><tr><td>5</td><td>1.86</td></tr><tr><td>Ave</td><td>1.98</td></tr><tr><td>Max</td><td>2.26</td></tr><tr><td>Min</td><td>1.70</td></tr></table>		No.	Zero cross time	1	2.21	2	1.85	3	2.26	4	1.70	5	1.86	Ave	1.98	Max	2.26	Min	1.70	Pass
		No.	Zero cross time																																							
1	2.03																																									
2	2.16																																									
3	2.06																																									
4	1.97																																									
5	2.16																																									
Ave	2.07																																									
Max	2.16																																									
Min	1.70																																									
No.	Zero cross time																																									
1	2.21																																									
2	1.85																																									
3	2.26																																									
4	1.70																																									
5	1.86																																									
Ave	1.98																																									
Max	2.26																																									
Min	1.70																																									
[s] Pn/N = 0/5 pcs		[s] Pn/N = 0/5 pcs																																								

9. Comparison of process evaluation result



<Lead forming process>

The results show that product appearance is equivalent.

Check item	Judgement standard	result		Judgement
		Semi wide production line (Current)	High efficiency production line	
Appearance	Appearance criteria (crack, marking identification, no lead deformation)	 <p>Top Back side Side</p> <p>No appearance defects (Pn/N = 0/100 pcs)</p>	 <p>Top Back side Side</p> <p>No appearance defects (Pn/N = 0/100 pcs)</p>	Pass

10. Comparison of characteristics

<Selecting Device for Electrical and heat radiation characteristic evaluation >

The following device are selected in consideration of their electrical and heat radiation characteristics.

1. Electrical characteristic

Due to change mold materials, check if the stress change on the chip affects the electrical characteristics.

【Key factors】

- Device with high stress on the chip
→ Large chip size
- Device with high sensitivity to stress
→ LDO regulator device

➡ **<Representative device>**
BD00FC0EEFJ-ME2

2. Heat radiation characteristic

Check the impact of changes in Ag-paste on the heat radiation characteristic

【key factors】

- Chip size
→ Max/Min size device are selected
- Device with high sensitivity heat generation
→ LDO and swithing regulator device

➡ **< Representative device >**
BD00FC0EEFJ-ME2
BD33IA5EEFJ-ME2
BD90620EFJ-CE2

10. Comparison of characteristics

<Stress simulation analysis for the relationship between chip size and the stress>

As a result of this simulation, the stress on the chip due to the mold resin change decreased for each chip size, so the effect on the electrical characteristics considered to be small.

【Simulation contents】

Package : current line/high efficiency line
Device : see figure at right
analysis soft : midasNFX (linear model)
analysis condition : 175℃→25℃

Application	LDO regulator		Switching regulator
Device	BD33IA5EEFJ-ME2	BD00FC0EEFJ-ME2	BD90620EFJ-CE2
Chip size	0.80mm x 0.75mm	1.81mm x 1.91mm	2.80mm x 2.00mm
Simulation model (1/4 model)			

Device name	BD33IA5EEFJ-ME2	BD00FC0EEFJ-M	BD90620EFJ-CE2
Chip size	0.80mm x 0.75mm	1.81mm x 1.91mm	2.80mm x 2.00mm
High efficiency production line	 Max stress:263.3MPa	 Max stress :328.7MPa	 Max stress :344.1MPa
Semi wide production line (Current)	 Max stress :282.2MPa	 Max stress :342.2MPa	 Max stress :357.7MPa
Stress reduction rate	▲6.7%	▲3.9%	▲3.6%



The larger the chip size, the more stress on the chip.
High efficiency line products reduce the stress on the chip due to the difference in hardness of the mold resin.

10. Comparison of characteristics

< Electrical characteristics of BD00FC0EEFJ-ME2 >

For following device, all of the important factors of electrical characteristics are satisfied $Cpk > 1.67$.
The results show that current/high efficiency line products are equivalent

■ Evaluation condition

- Device : BD00FC0EEFJ-ME2 (LDO regulator)
- Qty : Current production line : N=278 pcs, high efficiency production line : N=5697 pcs

Measurement items	spec			result				Judgement
				σ		Cpk		
	Min	Typ.	Max	Current line	High efficiency line	Current line	High efficiency line	
Shutdown current [uA]	-	0	5	0.019	0.011	6.02	14.24	Pass
Bias current [mA]	-	0.5	2.5	0.0084	0.0094	6.32	6.51	Pass
Output voltage (VCC=4V)[V]	Vo×0.99	Vo	Vo×1.01	0.0050	0.0043	3.43	4.22	Pass
Output voltage (VCC=36V)[V]	Vo×0.99	Vo	Vo×1.01	0.0050	0.0047	4.35	4.59	Pass
Input/output voltage difference[mV]	-	300	500	0.0046	0.0032	2.91	5.30	Pass
Input stability [mV]	-	20	80	0.8	0.9	4.61	3.90	Pass
Output stability[mV]	-	30	60	1.8	1.8	2.22	3.21	Pass
EN bias current[uA]	-	25	50	0.36	0.40	3.83	3.63	Pass

10. Comparison of characteristics

< Comparison of thermal resistance >

Compare current production line with high efficiency production line by 3 different chip size devices about thermal resistance. High efficiency production line's sample is max 2.5°C/W higher than current production line. Please cooperate to judge this effect for customer's application.

【Measuring condition】

Package : HTSOP-J8 current semi wide production line with high efficiency production line

Device : Please refer below

Measuring tool : T3Ster(MentorGraphics)

Standard : JESD51-2A

Board : Rohm 4-layers board

Substrate's information

Rohm 4-layers substrate: FR4(Glass epoxy) board

114.3mm×76.2mm×1.6mm

Surface copper layer land pattern+wiring for measure

2nd /3rd /Backside copper layer 74.2mm×74.2mm

Device	Chip size	Difference of thermal resistance (current production line with high efficiency production line)
BD33IA5EEFJ-ME2	0.80mm × 0.75mm	△2.0°C/W
BD00FC0EEFJ-ME2	1.81mm × 1.91mm	△2.1°C/W
BD90620EFJ-CE2	2.80mm × 2.00mm	△2.2°C/W

Measurement variation is ≤10%, Max 2.5°C/W.

11. Quality assurance test results



We conducted reliability test based on AEC-Q100. There is no problem.

<Sample>

Package : HTSOP-J8 (High efficiency production line)

Device : BD4271EFJ-C

Pre-condition : MSL1 (125°C/24h ⇒ 85°C/85% 168h ⇒ Reflow 260°C peak (3 times))

<Result>

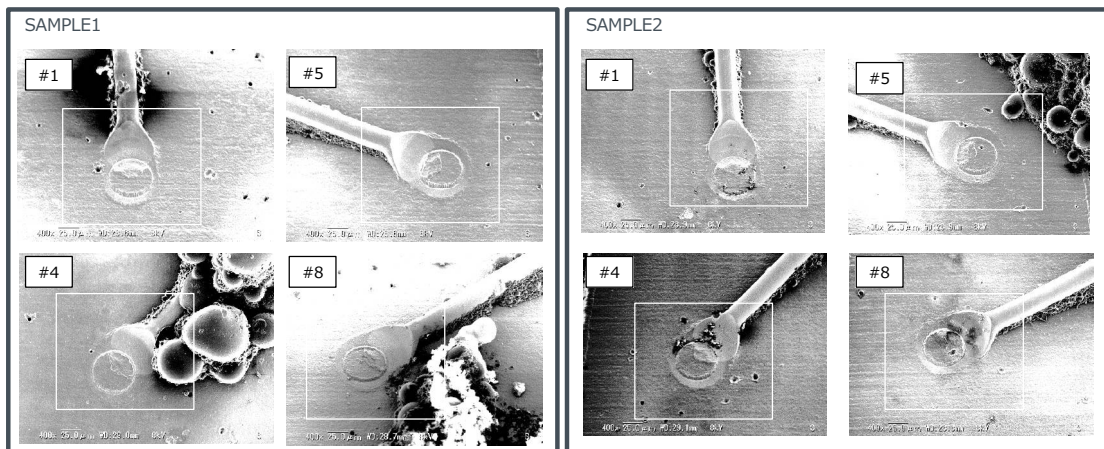
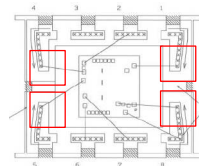
Item	Condition	Result	Analysis of good sample	Analysis item
TC	-65°C⇔150°C 500cyc	0/22	0/2	Passivation crack, Wire crack
PCT	121°C 100% 2atm 192h	0/22	0/2	Al PAD corrosion
HAST	130°C 85% w/bias 192h	0/22	0/2	Al PAD corrosion
HST	150°C 2000 h	0/22	0/2	Wire open by kirkendal void

11. Quality assurance test results

<TC 500cyc Analysis of good sample (1)>

TC 500cyc, there are no crack at 2nd bond. There is no problem.

- Judgment standard : No crack at 2nd bond position
- Number of samples : N=2pcs
- Method : Mold opening ⇒ SEM (×400)

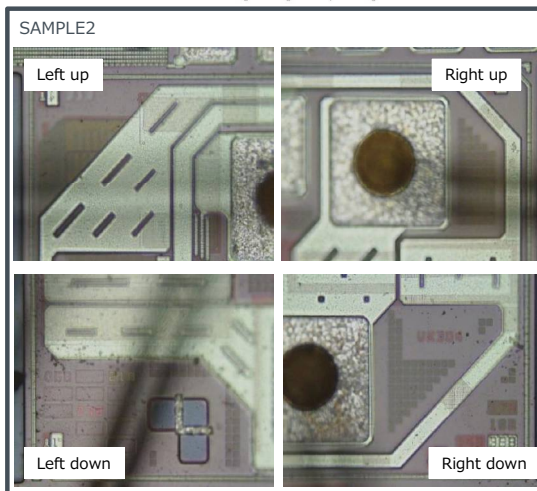
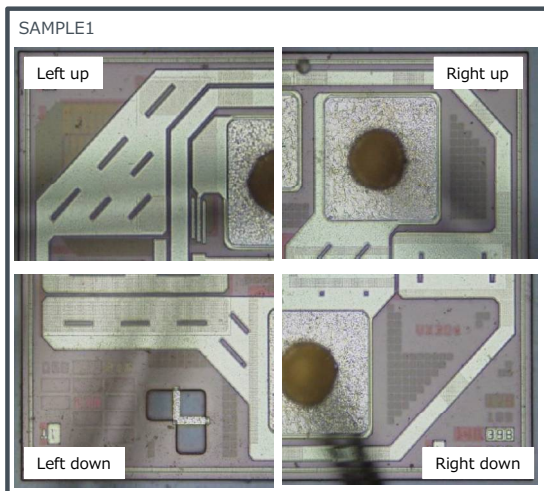
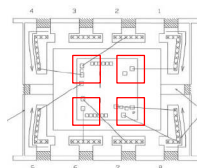


11. Quality assurance test results

<TC 500cyc Analysis of good sample (2)>

TC 500cyc, there are no passivation crack. There is no problem.

- Judgment standard : No passivation crack
- Number of samples : N=2pcs
- Method : Mold opening ⇒ Microscope (×200)



11. Quality assurance test results

<PCT 192h Analysis of good sample (1)>

PCT192h, there are no PAD corrosion. There is no problem.

- Judgment standard : No PAD corrosion
- Number of samples : N=2pcs
- Method : Mold opening ⇒ Microscope (×200)

Picture	PAD			
SAMPLE1	①	②	③	④
	⑤	⑥	⑦	⑧
SAMPLE2	①	②	③	④
	⑤	⑥	⑦	⑧

11. Quality assurance test results

<PCT 192 h Analysis of good sample (2)>

PCT192h, WB share test is no problem.

- Judgment standard : Above 200mN (Share strength), with Au remain or Al slide.
- Number of samples : N=2pcs
- Method : Mold opening ⇒ Microscope (×200)

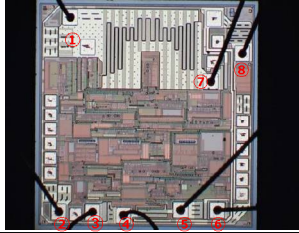
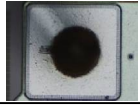
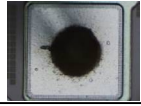
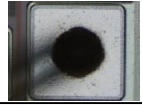
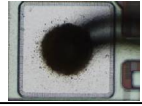
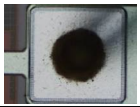
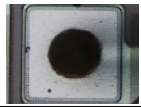
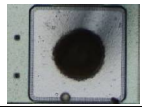
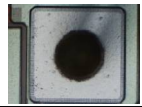
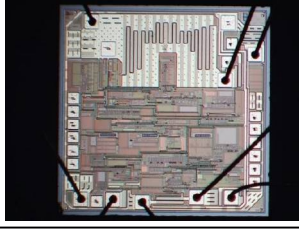
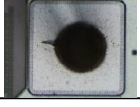
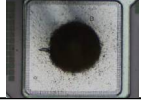
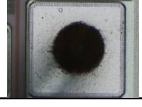
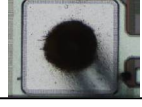
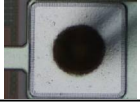
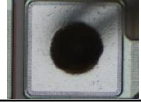
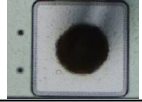
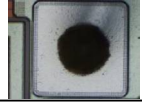
Picture	PAD			
SAMPLE1 	① 324.7mN 	② 354.2mN 	③ 366.5mN 	④ 348.7mN
	⑤ 341.1mN 	⑥ 314.1mN 	⑦ 365.6mN 	⑧ 346.6mN
SAMPLE2 	① 347.6mN 	② 359.7mN 	③ 361.8mN 	④ 353.9mN
	⑤ 384.3mN 	⑥ 340.3mN 	⑦ 372.2mN 	⑧ 368.4mN

11. Quality assurance test results

<HAST 192 h Analysis of good sample (1)>

HAST192h, there are no PAD corrosion. There is no problem.

- Judgment standard : No PAD corrosion
- Number of samples : N=2pcs
- Method : Mold opening ⇒ Microscope (×200)

Picture (IC)	PAD			
SAMPLE1 	① 	② 	③ 	④ 
	⑤ 	⑥ 	⑦ 	⑧ 
SAMPLE2 	① 	② 	③ 	④ 
	⑤ 	⑥ 	⑦ 	⑧ 

11. Quality assurance test results

<HAST 192 h Analysis of good sample (2)>

HAST192h, WB share test is no problem.

- Judgment standard : Above 200mN (Share strength), with Au remain or Al slide.
- Number of samples : N=2pcs
- Method : Mold opening ⇒ Microscope (×200)

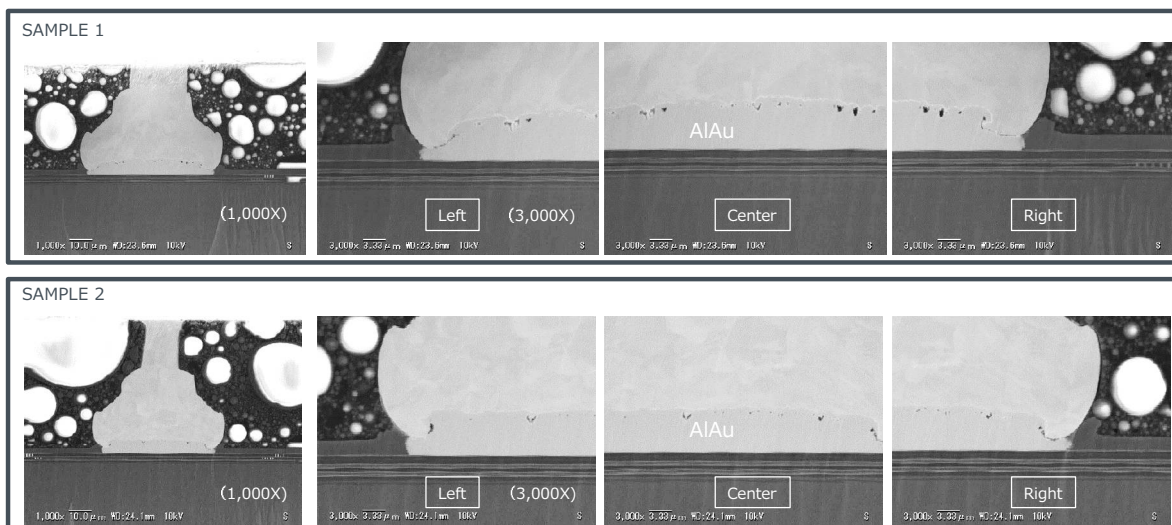
Picture (IC)	PAD			
SAMPLE1 	① 324.7mN 	② 354.2mN 	③ 366.5mN 	④ 348.7mN
	⑤ 341.1mN 	⑥ 314.1mN 	⑦ 365.6mN 	⑧ 346.6mN
SAMPLE2 	① 347.6mN 	② 359.7mN 	③ 361.8mN 	④ 353.9mN
	⑤ 384.3mN 	⑥ 340.3mN 	⑦ 372.2mN 	⑧ 368.4mN

11. Quality assurance test results

<HST 2000 h Analysis of good sample >

HST2000h, there are no crack by kirkendal void. There is no problem.

- Judgment standard : No crack by kirkendal void
- Number of samples : N=2pcs
- Method : cross section polishing ⇒ SEM (×1000)



12. Summary



- To increase production capacity, add HTSOP-J8 high efficiency production line using higher number of products per frame.
- Based on DRBFM, check risk and list up process evaluation/Quality assurance test items. All results are no problem. Electrical characteristics is also no problem.



Addition of Wide frame assembly
line (High Efficiency Production
102100A

Rohm Internal P/N
BD42530EFJ-CE2
BD9G401EFJ-ME2
BD90620EFJ-CE2
BD450M2EFJ-CE2
BD450M2WEFJ-CE2
BD733L2EFJ-CE2
BD750L2EFJ-CE2
BD33IA5MEFJ-ME2
BD33IC0MEFJ-ME2
BD18IA5MEFJ-ME2
BD90640EFJ-CE2
BD90610EFJ-CE2
BD4269EFJ-CE2
BD12IA5MEFJ-ME2
BD90525EFJ-CE2
BD33HA5MEFJ-ME2
BD00IA5MEFJ-ME2
BD00IC0MEFJ-ME2
BD50GC0MEFJ-ME2
BD10IC0MEFJ-ME2
BD820F50EFJ-CE2
BD18IC0MEFJ-ME2
BD433M2WEFJ-CE2
BD9G201EFJ-ME2
BD90571EFJ-CE2
BD433M2EFJ-CE2
BD00HA5MEFJ-ME2
BD12IC0MEFJ-ME2
BD30IA5MEFJ-ME2
BD50HA5MEFJ-ME2
BD15IA5MEFJ-ME2
BD33HA3MEFJ-ME2
BD10IA5MEFJ-ME2
BD70GA3MEFJ-ME2
BD1HD500EFJ-CE2
BD50GA3MEFJ-ME2
BD8374EFJ-ME2

BD00FA1WEFJ-E2
BD33GC0MEFJ-ME2
BD9G201EFJ-LBE2
BD33GA5MEFJ-ME2
BD18HA5MEFJ-ME2
BD00GA3MEFJ-ME2
BD00GA5MEFJ-ME2
BD33IC0MEFJ-CE2
BD33HC5MEFJ-ME2
BD50HC0MEFJ-CE2
BD00GC0MEFJ-ME2
BD00HC0MEFJ-ME2
BD9G500EFJ-LAE2
BD9322EFJ-E2
BD7F200EFJ-LBE2
BD8372EFJ-ME2
BD50GA5MEFJ-ME2
BD15IC0MEFJ-ME2
BD7J200EFJ-LBE2
BD18HC5MEFJ-ME2
BD62120AEFJ-E2
BD50HC5WEFJ-E2
BD78306EFJ-ME2
BD9327EFJ-E2
BD25IC0MEFJ-ME2
BD10IC0WEFJ-E2
BD33GA3MEFJ-ME2
BD18GC0WEFJ-E2
BD30IA5WEFJ-E2
BD33HC5MEFJ-LBH2
BD90GC0MEFJ-ME2
BD80GA3MEFJ-ME2
BDJ0GA5MEFJ-ME2
BD1482EFJ-E2
BD9E300EFJ-LBH2
BD90522EFJ-CE2
BD00HC5MEFJ-ME2
BD33HC0MEFJ-ME2
BD00IC0MEFJ-LBH2
BD9E301EFJ-LBH2
BD18IA5MEFJ-LBH2
BD00GC0MEFJ-LBH2
BD30HC5MEFJ-LBH2

BD18HA3MEFJ-LBH2
BD9E303EFJ-LBH2
BD00HC5MEFJ-LBH2