

Product Change Notice (PCN)

Subject: UV tape change & AL sputtering condition optimize for 1800V IGBT of 8inch unsawn wafer

Publication Date: 6/19/2023

Effective Date: 10/1/2023

Revision Description:

Initial release

Description of Change:

- A. Renesas will change the top-side UV tape of 8inch Unsawn wafer for IGBT from the same manufacturer. And Renesas will change the storage period to 6months, but the delivery specifications will be exchanged again. Please contact Renesas sales department for details on requesting delivery specifications.
- B. Renesas will optimize the wafer process of Al sputtering.

Affected Product List:

RBN100N180S2HFWA-80#FFO	RBN100N180S2HFWA-850#FFO	RBN100N180S2HFWA-8F0#FFO
RBN150N180S2HFWA-80#FFO	RBN150N180S2HFWA-850#FFO	RBN150N180S2HFWA-8F0#FFO
RBN200N180S2HFWA-80#FFO	RBN200N180S2HFWA-850#FFO	RBN200N180S2HFWA-8F0#FFO

Reason for Change:

Standardization and improvement productivity.

Impact on Fit, Form, Function, Quality & Reliability:

No impact on the function, quality & Reliability.

Please refer to "<Appendix> Supplementary material" for appearance and our evaluation results.

Product Identification:

Our production history data can be queried by using trace code of the product.

Qualification Status: N/A.

Sample Availability Date: N/A

Device Material Declaration: N/A.

Note:

1. Acknowledgement must be received by Renesas within 30 days or Renesas will consider the change as approved.
2. If timely acknowledgement is provided by Customer, then Customer shall have 90 days from the date of receipt of this PCN to make any objections to this PCN. If Customer fails to make objections to this PCN within 90 days of the receipt of the PCN then Renesas will consider the PCN changes as approved.
3. If customer cannot accept the PCN then customer must provide Renesas with a last time buy demand and purchase order.

For additional information regarding this notice, please contact your Renesas sales representative.

<APPENDIX>

SUPPLEMENTARY MATERIAL

- UV-TAPE CHANGE
- AL SPUTTERING OPTIMIZED

19TH, JUN. 2023

HV POWER DEVICE DESIGN DEPARTMENT
POWER SYSTEM BUSINESS DIVISION
AUTOMOTIVE SOLUTION BUSINESS UNIT
RENESAS ELECTRONICS CORPORATION

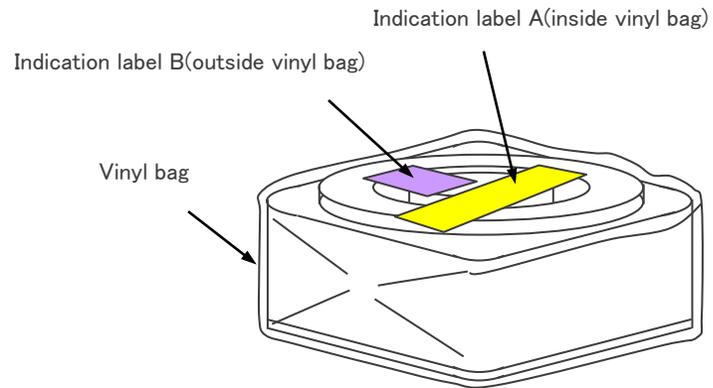
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PC-APW-A008A/E

UV TAPE CHANGE

EFFECTIVE DATE

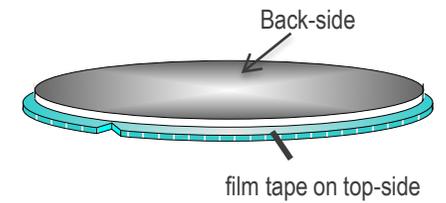
Shipments with a date after '23. 10. 01 on the Indication label A are UV tape changed products.



フローブ良品数	
1	-
2	-
3	-
4	-
5	-
6	172
7	172
8	173
9	174
10	173
11	173
12	172
13	169
14	170
15	169
16	-
17	-
18	-
19	-
20	-
21	-
22	-
23	-
24	-
25	-
計	1,717

品名 RBN150N180S2HFWA-80
LotNo. SFTV04200C
納入数量 1,717
梱包日 '23. 4. 05

CHANGING POINTS OF TOP-SIDE FILM TAPE

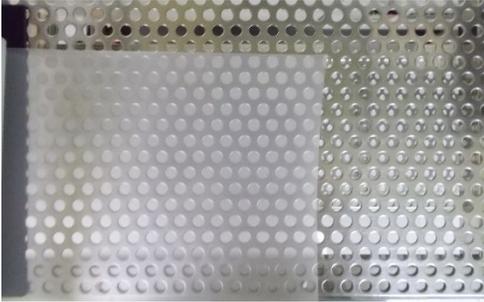
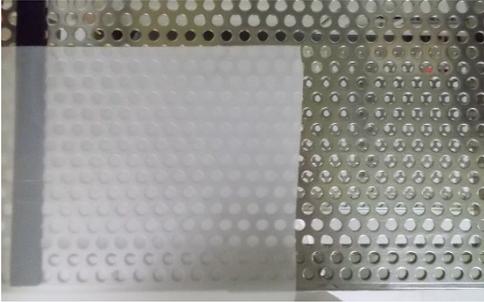
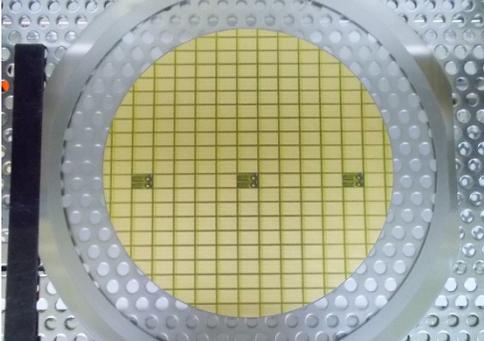
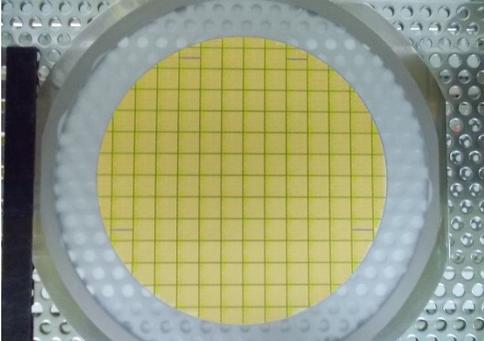
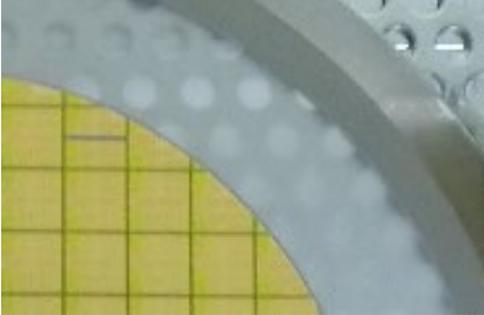


* Datasheet value

item	Current	New
Product	UV tape	←
Base film	Polyolefin	←
film thickness *	150um	130um
Adhesive layer	Acrylic adhesive	←
Color	White / high transparency	White / little transparency
Recommended storage period	Un-opened: 6months from packing date of label Opened: 7days from opened	6months from packing date of label

VISUAL

Note) Photo of wafers in Ring Cutting process (on Dicing frame)

item	Current	New
UV tape		
Wafer with UV tape <small>*Wafer/chip type is only example</small>		
Expansion of wafer edge and UV tape <small>*Wafer/chip type is only example</small>		

EVALUATION FOR 6 MONTHS

1. Purpose

In order to extend the storage period of Unsawn wafers according to the UV tape change, we have evaluated below item:

- a) Die bond ability
- b) Wire bonding strength

This time, we will report the results of 6 months.

2. Summary

There are no issue in this evaluation.

- a) OK (p.7-8)
- b) OK (p.9)

For detail, please find following pages.

Evaluation Sample: IGBT 1800V product

Sample#	#1	#2
Shipping form	Unsawn	←
Period	6months	←
Storage condition	w/ vinyl bag, un-opened	w/ vinyl bag, opened
Note	Standard shipment form for Unsawn-wafer	

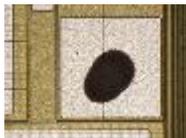
A) DIE CONDITION / BOND ABILITY (1/2)

- To check bond ability after die mount, we confirmed below items.

	Item	Judgement method	Sample qty	Result
i	Visual check for wafer	Check crack and paste residue after peeling film-tape by sight	1 wafer / each specs(#1, #2)	OK <i>No damage and visible residue</i>
ii	Visual check for ink mark	Check ink mark peeled off by sight	1 wafer / each specs(#1, #2)	OK <i>No damage for ink mark</i>
iii	Solder wettability	Check solder coating by sight	5 chip x 1 wafer / each specs(#1, #2)	OK <i>Coated full area</i>

**Note. i & ii are fully depended on film-tape spec.*

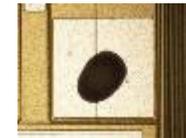
ii) Visual check for ink mark



Initial state (reference)



#1 Un-opened (6months)

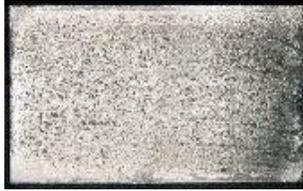


#2 Opened (6months)

Compared with reference, visual check after peeling film-tape is no damage for ink mark.

A) DIE CONDITION / BOND ABILITY (2/2)

iii) Solder wettability



Initial state (reference)



#1 Un-opened (6months)



#2 Opened (6months)

Coated all area and no abnormality compared to reference is confirmed for all spec.

- Result

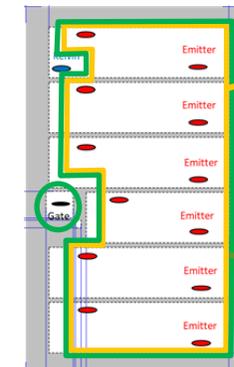
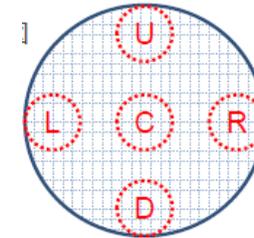
From i~iii results, die condition and bond ability after more than 6 months is no problem.

b) Wire Bonding Strength

Bonding 500um(Emitter pads) & 300um(Gate pad) Al wire and evaluated below items.

Item	Judgement method	Sample qty	Result
i	Visual check	5chips x 1wafer / each specs(#1, #2)	OK No abnormality
ii	Wire peel	5chips x13bonding wire (Emitter:12, Gate:1) n=65 x 1wafer / each specs(#1, #2)	OK No abnormality on pad
iii	Bonding shear	5chips x12bonding wire x 1wafer / each specs(#1, #2) n=60	OK No deterioration to initial value *Results are shown below

Evaluation chips in wafer(5chips)

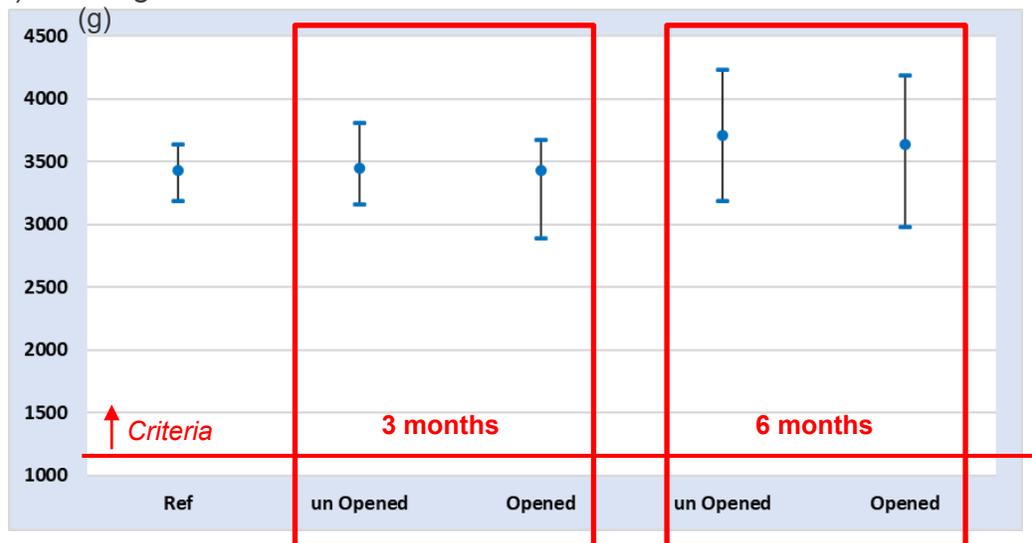


Bonding Shear test (n=12)
speed:100um/s
height:50um

Wire peel test (n=12+1)

* Chip image

iii) Bonding shear test results



- Result

From i~iii results, wire bonding strength after more than 6 months storage is no problem.

No deterioration to initial value compared to reference is confirmed for all spec.

AL SPUTTERING OPTIMIZATION

CHANGING POINTS & IMPACT OF AL SPUTTERING

■ Changing points

item	Current	New
Part	Emitter / Gate PAD	←
Material	AlSi	←
AL Thickness	5.5μm	←
Sputtering condition	-	Optimized (Standardization)
Appearance	-	Slightly brighter

■ Impact

item	Impact
Electrical characteristics	No impact
Reliability	No impact
Wire Bondability	No impact

DIFFERENCE BETWEEN EVALUATION SAMPLE AND TARGET PRODUCT

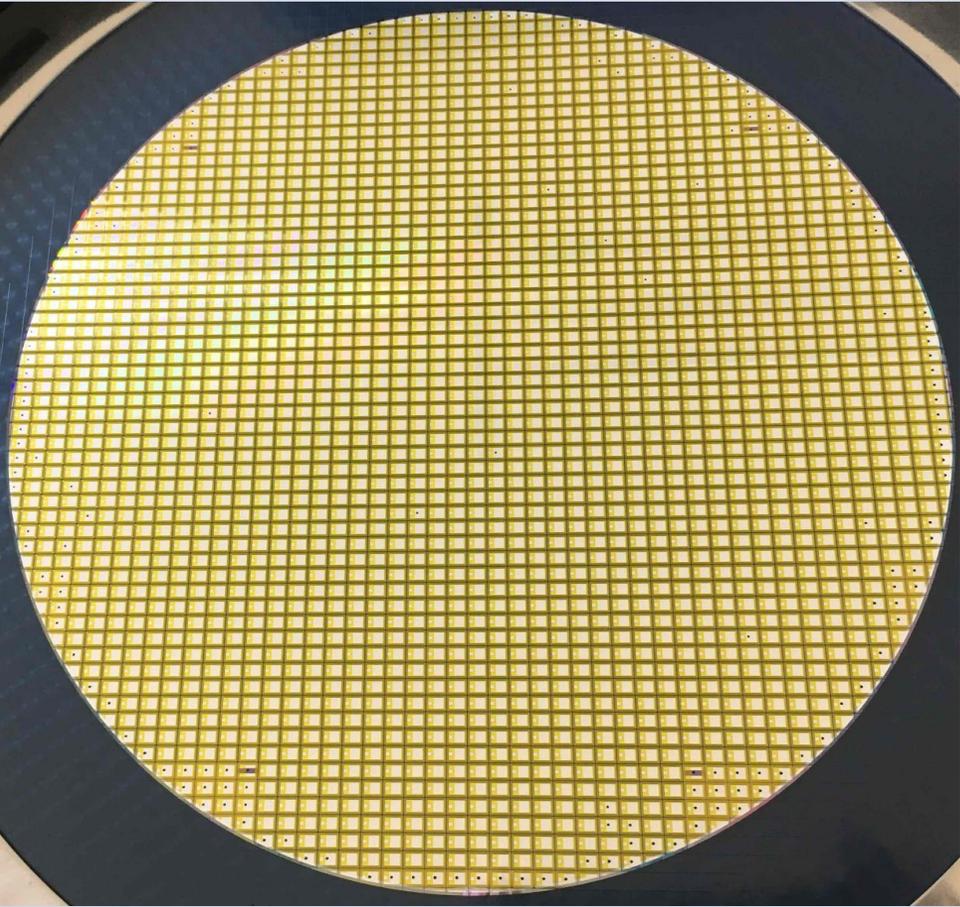
We use same AL process family sample as the target product for the evaluation sample. The table below shows difference between evaluation sample and target product.

Item		Evolution sample	Target product
Wafer process	Top side diffusion	RSMC saijo	←
	Pad material	AlSi	←
	Al thickness[um]	5.5	←
	Al Sputtering condition	Optimized condition	←
Maximum Rating VCE/IC		600V/30A	1800V/ 200A,150A,100A
Die size[mm2]		13	164.8, 129.69, 92.92

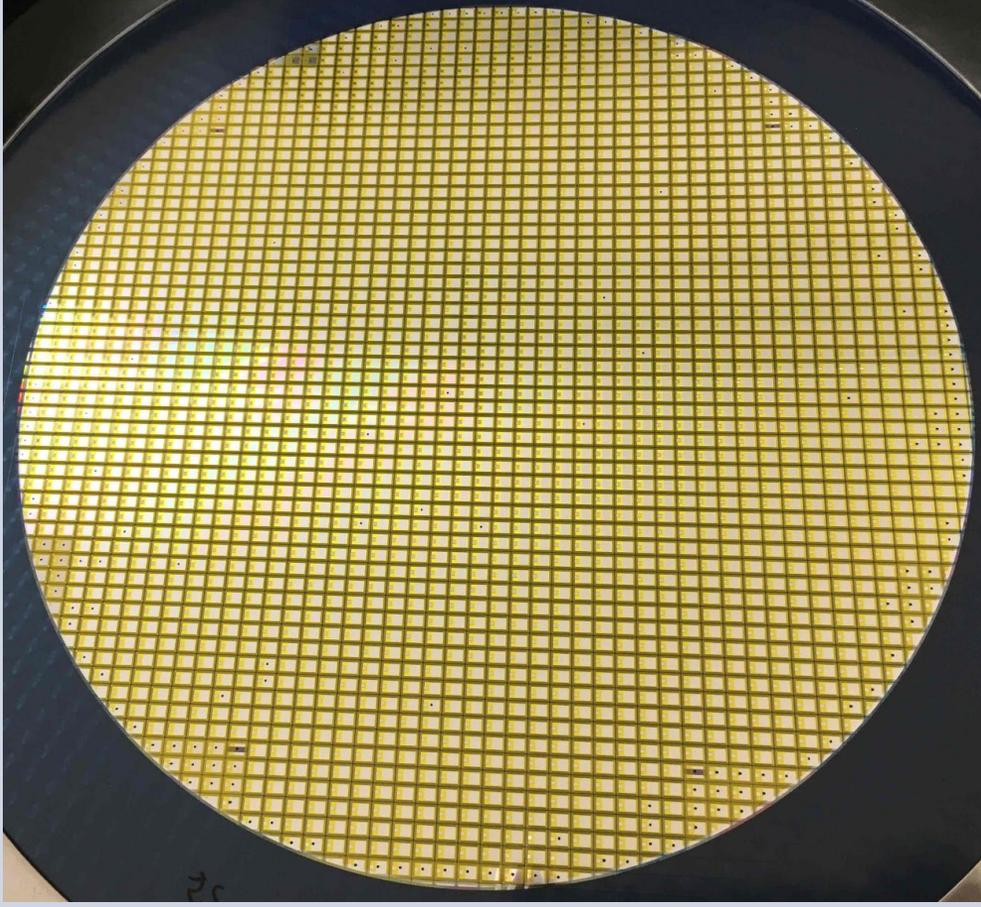
COMPARISON: WAFER APPEARANCE

Wafer appearance has no impact.

New process



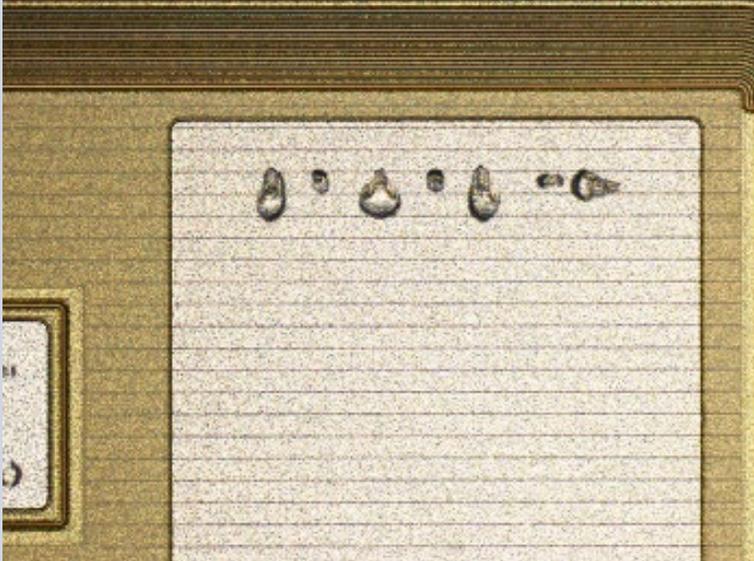
Current process



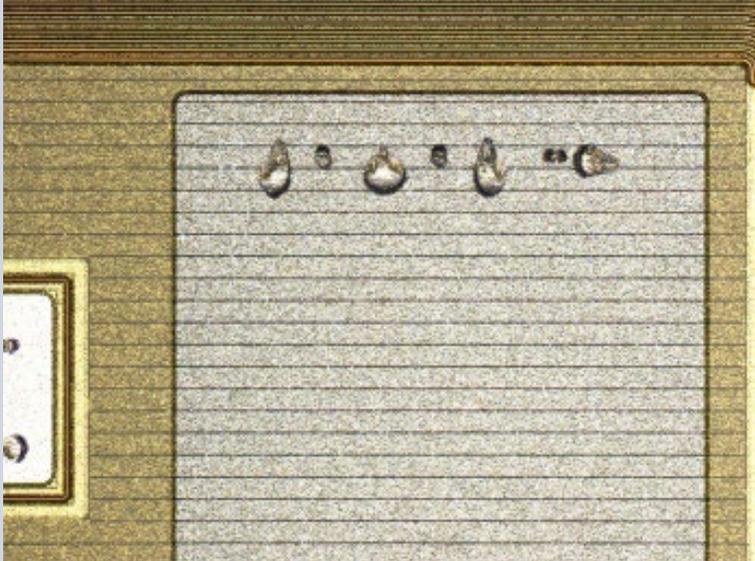
COMPARISON: EMITTER PAD APPEARANCE

The new process chip is slightly brighter for small difference in roughness, but it has no problems with characteristics.

New process



Current process



ELECTRICAL CHARACTERISTICS EVALUATION RESULT

- Confirmed reasonable matching to current process for DC characteristics.
Data below are measured values on a package configuration.
- Evaluation sample: RBN200N180S2HFWA

Test item	Test condition	Tj	Specification			New process				Current process				Difference*	Cp, Cpk	Judgement**
			Min	Typ	max	min	average	max	σ	min	average	max	σ			
ICES [μ A]	VCE=1800V, VGE=0	25	-	-	4	0.186	0.201	0.228	0.0133	0.101	0.167	0.200	0.0317	18.3%	95.49	OK
IGES(+) [nA]	VGE=+30V, VCE=0	25	-	-	600	0.06	1.867	7.87	1.7776	0.03	1.011	3.37	0.8419	84.7%	112.16	OK
IGES(-) [nA]	VGE=-30V, VCE=0	25	-	-	600	0.05	1.852	4.95	1.4954	0.02	1.038	2.65	0.8048	78.4%	134.16	OK
VGE(off) [V]	IC=30mA, VCE=10V	25	5.0	5.8	6.5	5.724	5.761	5.805	0.0236	5.808	5.842	5.876	0.0187	-1.4%	10.44	OK
VCE(sat) [A]	IC=200A, VGE=15V	25	-	1.60	1.90	1.639	1.645	1.648	0.0024	1.651	1.660	1.669	0.0059	-0.9%	35.45	OK

* Change rate of new process against current process typ.

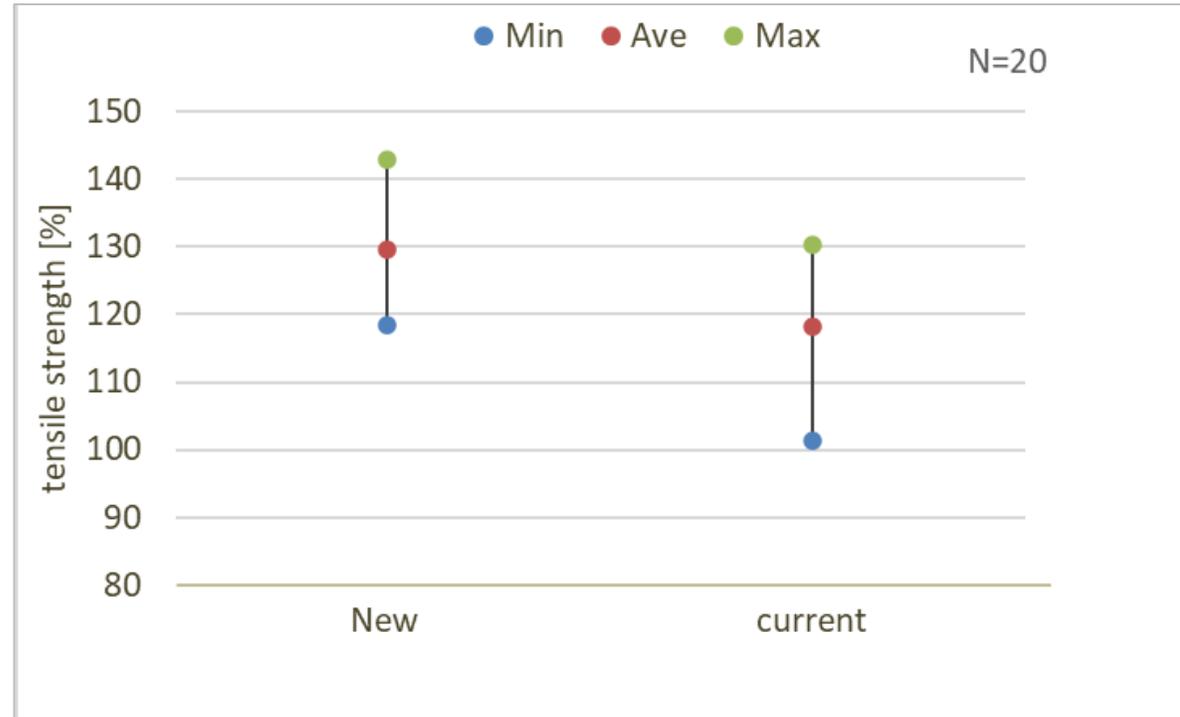
** judgement criteria is Cp, Cpk>1.33 and Difference < $\pm 5\%$ w/o leak current.

WIRE BONDING EVALUATION: PULL TEST

Compare tensile strength in the new and current process and confirm that there is no problem.

Test condition

- PKG:TO-3P
- Position: Emitter PAD
- AL wire: 500um
- n: 20pcs



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