SEIKO EPSON CORPORATION
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https://www.epson.com

December 17th, 2021

TO: Valued Customers

[Notice] Addition of IC packaging process

We would like to express our sincere appreciation for your continuous business relationship and support.
First of all, we sincerely apologize for inconvenience of not delivering our IC products as you requested because of rising prices or longer lead-time for procuring materials to be used with IC package due to very strong demand of semiconductor devices in worldwide. We have been approaching a variety of measures to reduce the risk of not delivering IC products.
We would like to hereby inform that we will add IC packaging factory of the applicable products as mentioned below. The background of the addition is that we utilize ASECL (please refer below) for our packaging process currently, and we are facing serious delivery problems due to their capacity limitation. To improve current situations quickly, we judged to utilize our own factory, SEP (please refer below) simultaneously. SEP produces some types of QFP and BGA products. For your information, we transferred our packaging process of your products from SEP to ASECL in 2018. After the addition of SEP as IC packaging factory, applicable products will be produced in ASECL or SEP flexibly depending on the capacity of ASECL and SEP. For smooth addition of our factory, we'd like to confine the applicable products to the products which can be produced by using the same materials and same conditions as SEP used to use before the transfer to ASECL in 2018.
We will continue to give top priority to maintain the quality of IC products and continuously supplying them to our customers. Your understanding and cooperation will be highly appreciated.

- **Applicable products:** Refer to the attached list
- **Details**

1) Addition of IC packaging factory:
   Current: Advanced Semiconductor Engineering, Inc. Chung-Li in Taiwan (ASECL)
   Addition: Singapore Epson Industrial Pte. Ltd. in Singapore (SEP)
2) Product number:
   To clarify the product's factory, the product number is changed for additional products. The details can be referred to the attached list.
3) Details of specification according to:
   - Product reliability, etc. is the same level as that of existing products
   - Materials to be used with the applicable products are the same as the materials of the products produced in SEP before the transfer to ASECL in 2018
4) Samples and Evaluation report:
   The quality of the IC products produced in SEP is equal to the goods produced in SEP before the transfer to ASECL in 2018. The sample and production data requests cannot be supported.
   *Environmental data can be updated if necessary.
5) Schedule:
   Shipping schedule might vary depends on ordered quantities or inventory conditions. Details will be informed by our sales representatives separately.
6) Request: If you have any questions about the Applicable Products, please inform our sales representatives by January 31st, 2022.

MPN Affected:
S1D13742F01A200 (QFP20) - product produced in 2 factories

Doc# G1_Q20_y21_ad_en

Assembly Factory Addition for Packaging Products

LQFP20-144pin（P-LQFP144-2020-0.50)

Seiko Epson Corporation
Microdevices Operations Division

Confidential Scope of disclosure： Valued customers

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- Production Site / Flow
- Structure

◆ Verification
- Verification Result of Differences
- Reliability Test Results
- List of Product's Comparison

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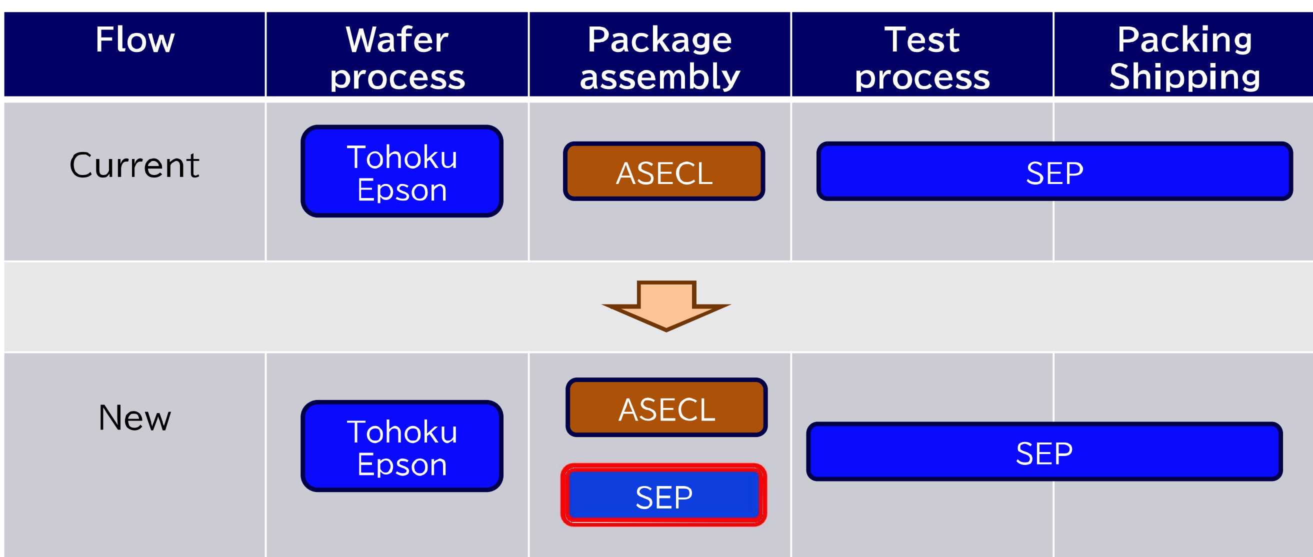
Description of Differences: Production Site/Flow



SEP (Singapore) : Singapore Epson Industrial Pte. Ltd.
ASECL (Taiwan) : Advanced Semiconductor Engineering, Inc. Chung-Li

- Package assembly factory(SEP) is added.
- Wafer process, Test process and Shipping site have no change.

Description of Differences: Structure

Item	Current (ASECL)	Addition (SEP)	Changing point	Reason
Lead frame	Cu frame	Cu frame	Dimension	Apply standard lead-frame with SEP
Mold Compound	EME-G600series Flammability: UL-94 V-0 Halogen free	CV8000series Flammability: UL-94 V-0 Halogen free	Material	Apply standard mold-compound with SEP
IC Chip Thickness	300um	400um	Thickness	Apply standard thickness and process condition with SEP

- Materials and conditions are applied to SEP’s standard.
- We will use the same materials and conditions as SEP used to use before the transfer to ASECL in 2018.

Verification: Verification Result of Differences

Item	Changing point	Concern point	Verification item	Result
Lead frame	Dimension	Dimensions /Tolerance	Measurement data	Pass
		Lead strength	Lead strength test	Pass
		Solderbility	Solderbility test	Pass
Mold Compound	Material	Reliability	Reliability test	Pass
IC Chip Thickness	Thickness	Reliability	Reliability test	Pass

- No issues were found during our verification.
- Package dimension has no change, thus your soldering's conditions don't need to change.

Verification: Reliability Test Results

Test Item	Test Condition	Sample size	Test Duration	Failure Count	Judge ment
High Temp with Bias Test	125℃, Absolute Maximum Rating Voltage	135	1,000 H	0	Pass
High Temp and High Humidity with Bias Test	85℃, 85%RH, Absolute Maximum Rating Voltage	135	1,000 H	0	Pass
High Temp storage Test	Ta=150℃	45	1,000 H	0	Pass
Temp cycle Test	-65℃~150℃ each more than 10 minute	45	200 cyc.	0	Pass
Pressure cooker Test	Ta=121℃, 100% 2.0E5 Pa	45	200 H	0	Pass
Resistance to soldering heat Test	Pre-Conditioning → Reflow 265℃	45	3 Times	0	Pass
Lead strength (Pull)	Tension 2.5N, 30sec	22	1 Time	0	Pass
Lead strength (Bending)	Bend 30°	22	2 Times	0	Pass
Solderability1	Steam aging 4h → Solder dipping 245℃, 5sec	22	1 Time	0	Pass
Solderability2	150℃,16h → Solder dipping 245℃, 5sec	22	1 Time	0	Pass

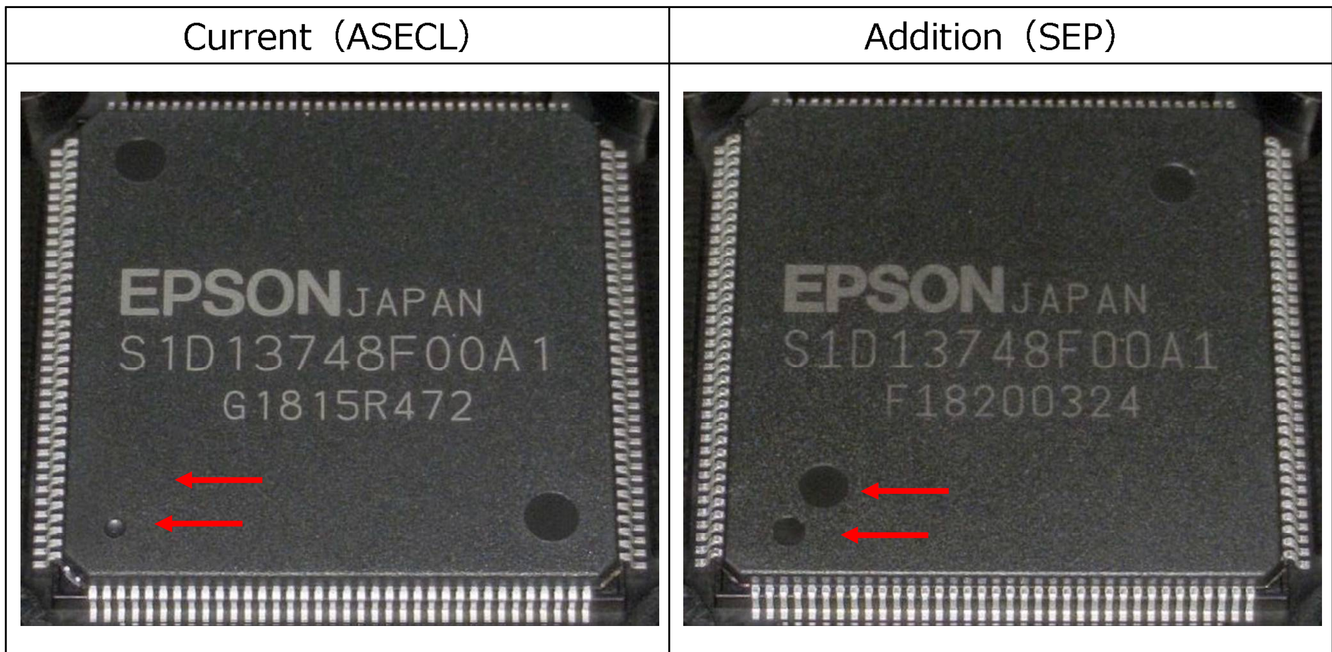
- The test performed in the same condition as for the existing parts. No issues were found at the reliability test.

Verification: List of Product’s Comparisons

Item	Contents	Page
Comparison of Appearance	Package Appearance	P8
Comparison of External dimension	Measurement points of dimension (drawing)	P9
	Measurement result of external dimension	P10
Comparison of Lead frame	X-ray photo	P11

- Comparison data and photos are shown on each page.
- Our common product of same package type are shown for your reference.

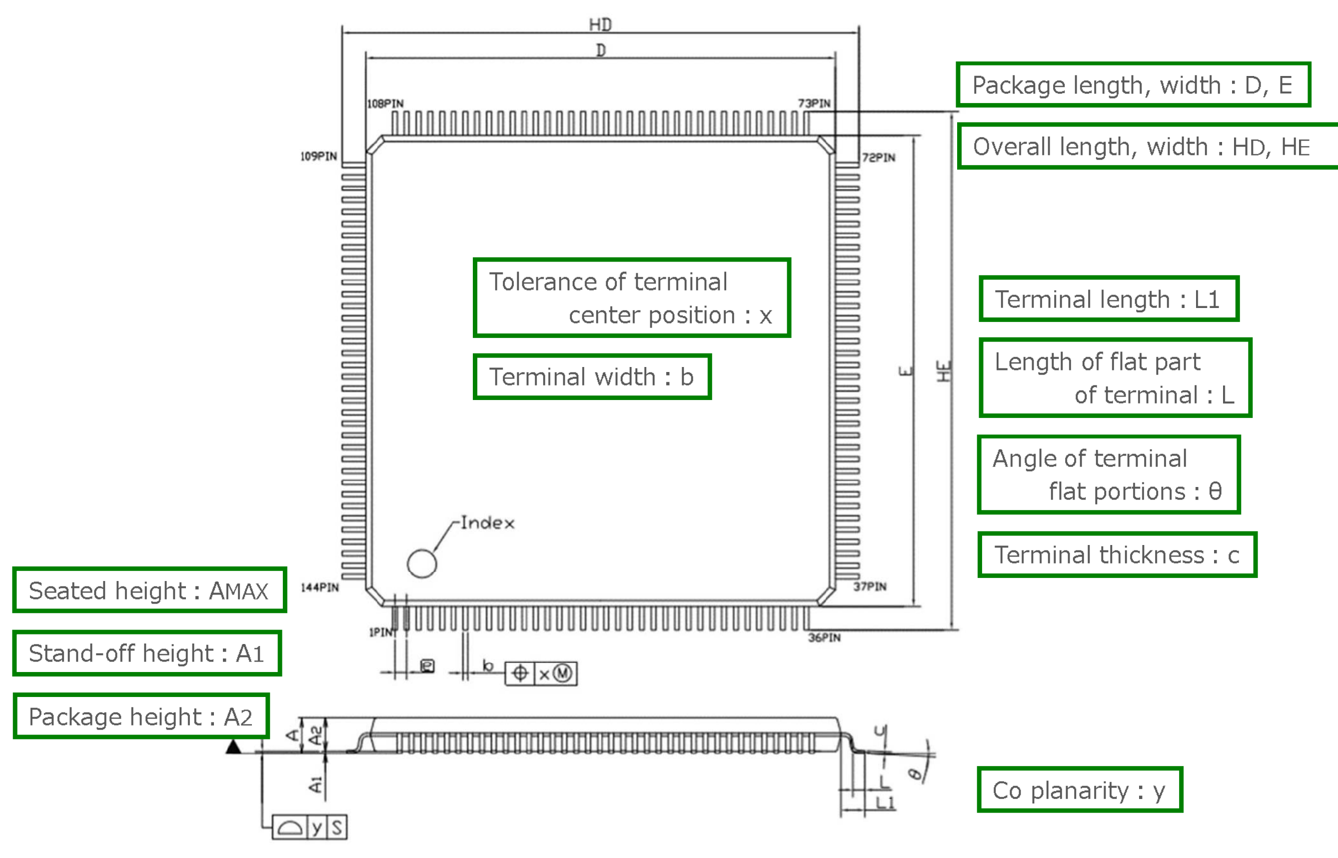
Verification: Comparison of Appearance



・External appearance is different at this position (←). However there are no change of external dimensions and tolerance.

*These are the pictures of Epson's general product for reference.

Verification: External Dimension



Verification: Measurement Results of External Dimension

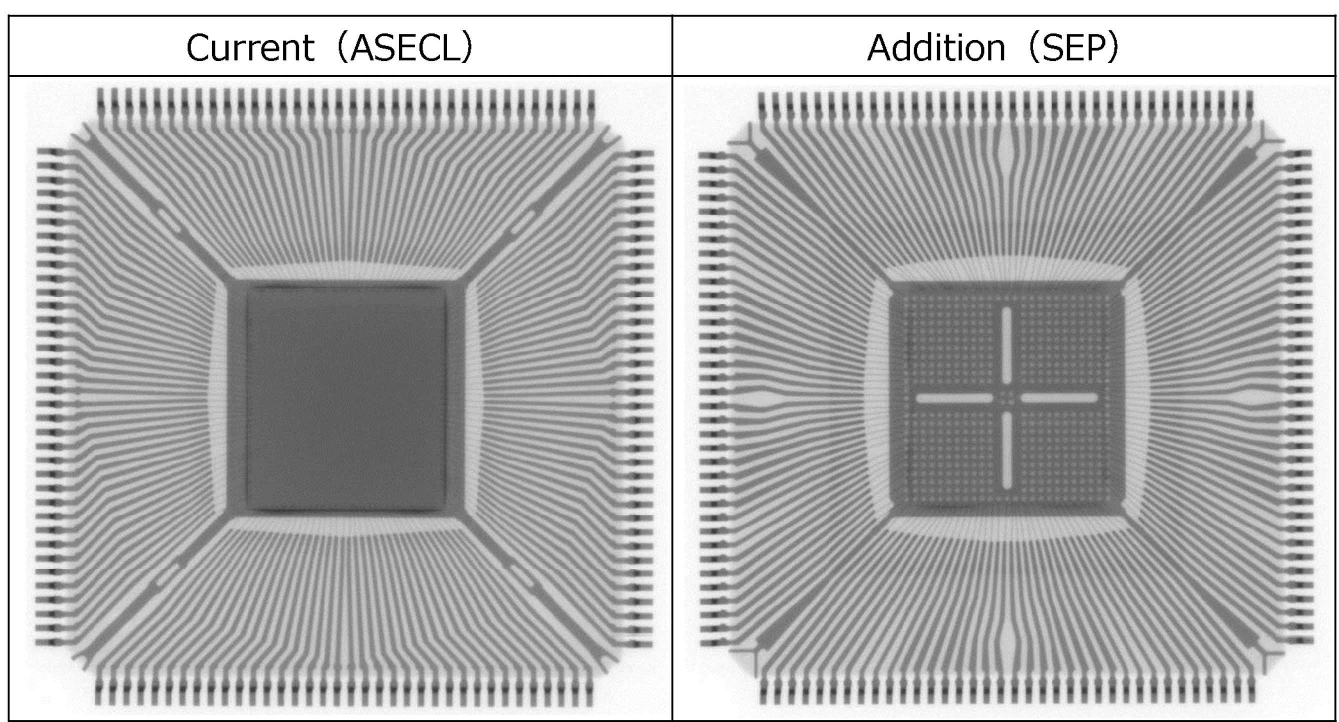
Unit: (mm)

Item / Spec.		Current (ASECL)		Addition (SEP)	
		Average	Cpk	Average	Cpk
E	20±0.1	20.009	9.21	20.030	4.63
D	20±0.1	20.009	10.40	20.031	5.17
H_E	22±0.4	21.997	18.32	21.984	15.84
H_D	22±0.4	21.998	25.09	21.994	49.95
A_{MAX}	Max 1.7	1.565	5.65	1.557	6.01
A1	0.1±0.1	0.091	6.60	0.086	10.55
A2	1.4±0.1	1.400	2.70	1.410	6.75
b	0.17～0.27	0.215	4.87	0.218	3.22
c	0.09～0.2	0.144	9.20	0.152	22.50
θ	0～10°	3.7°	2.41	4.0°	1.92
L	0.3～0.75	0.580	2.90	0.515	3.24
L1	1±0.2	0.992	5.24	0.980	4.94
x	Max 0.08	0.002	20.14	0.004	8.32
y	Max 0.08	0.027	5.32	0.017	9.39

・Each dimension shows more than Cpk1.67, thus it was judged as no problem.

Verification: Comparison of Lead frame (X-ray photo)

Current（ASECL)	Addition（SEP)



- Inner lead shape is different, but the reliability performance can keep same level.

*These are the pictures of Epson's general product for reference.

Summary of Verification Results

- **Lead frame**
  Material, External dimensions : No change
  Lead strength and Solderability : Equal to current parts.
- **Mold Compound Material**
  Performance of MSL : No change
  Heat resistance (UL-94 V-0): No change
  Halogen free compliance: No change
- **IC Chip Thickness**
  Change of IC chip thickness has no influence about IC chip reliability and quality.
- **Conclusion**
  The products which assembled in SEP can keep the same quality and reliability level as the existing products assembled in ASECL. They have no differences about your storage condition and handling conditions from the existing products.

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Doc# G1_Q15TQ15_y21_tr_en

Assembly Factory Change for Packaging Products

QFP15-100pin (P-LQFP100-1414-0.50)
QFP15-128pin (P-LQFP128-1414-0.40)
TQFP15-100pin (P-TQFP100-1414-0.50)
TQFP15-128pin (P-TQFP128-1414-0.40)

Seiko Epson Corporation
Microdevices Operations Division

Confidential Scope of disclosure : Valued customers

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Description of Differences: Production Site/Flow

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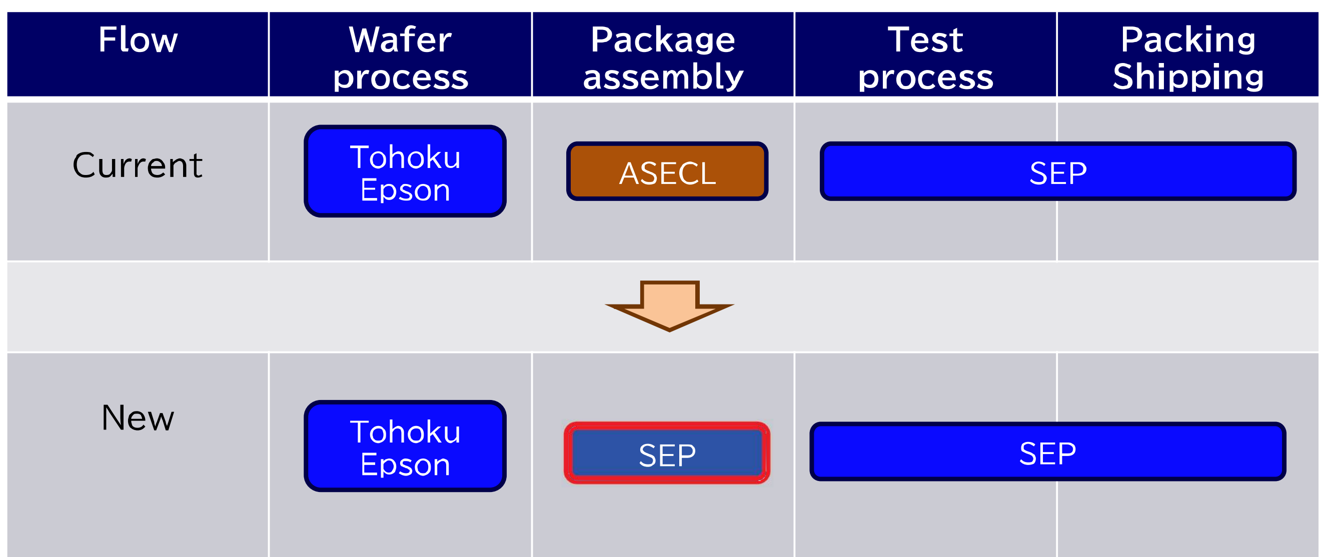

SEP (Singapore) ：Singapore Epson Industrial Pte. Ltd.
ASECL (Taiwan) ：Advanced Semiconductor Engineering, Inc. Chung-Li

- Package assembly factory(SEP) is changed to SEP.
- Wafer process, Test process and Shipping site have no change.

Description of Differences: Structure

Item	Current (ASECL)	New (SEP)	Changing point	Reason
Lead frame	Cu frame	Cu frame	Dimension	Apply standard lead-frame with SEP
Mold Compound	EME-G600series Flammability: UL-94 V-0 Halogen free	CV8000series Flammability: UL-94 V-0 Halogen free	Material	Apply standard mold-compound with SEP
IC Chip Thickness	LQFP: 300um TQFP: 178um	LQFP: 400um TQFP: 300um	Thickness	Apply standard thickness and process condition with SEP

- Materials and conditions are applied to SEP’s standard.
- We will use the same materials and conditions as SEP used to use before the transfer to ASECL in 2018.

Verification: Verification Result of Differences

Item	Changing point	Concern point	Verification item	Result
Lead frame	Dimension	Dimensions /Tolerance	Measurement data	Pass
		Lead strength	Lead strength test	Pass
		Solderbility	Solderbility test	Pass
Mold Compound	Material	Reliability	Reliability test	Pass
IC Chip Thickness	Thickness	Reliability	Reliability test	Pass

- No issues were found during our verification.
- Package dimension has no change, thus your soldering's conditions don't need to change.

Verification: Reliability Test Results

Test Item	Test Condition	Sample size	Test Duration	Failure Count	Judge ment
High Temp with Bias Test	125℃, Absolute Maximum Rating Voltage	135	1,000 H	0	Pass
High Temp and High Humidity with Bias Test	85℃, 85%RH, Absolute Maximum Rating Voltage	135	1,000 H	0	Pass
High Temp storage Test	Ta=150℃	45	1,000 H	0	Pass
Temp cycle Test	-65℃~150℃ each more than 10 minute	45	200 cyc.	0	Pass
Pressure cooker Test	Ta=121℃, 100% 2.0E5 Pa	45	200 H	0	Pass
Resistance to soldering heat Test	Pre-Conditioning → Reflow 265℃	45	3 Times	0	Pass
Lead strength (Pull)	Tension 2.5N, 30sec	22	1 Time	0	Pass
Lead strength (Bending)	Bend 30°	22	2 Times	0	Pass
Solderability1	Steam aging 4h → Solder dipping 245℃, 5sec	22	1 Time	0	Pass
Solderability2	150℃,16h → Solder dipping 245℃, 5sec	22	1 Time	0	Pass

- The test performed in the same condition as for the existing parts. No issues were found at the reliability test.

Verification: List of Product’s Comparisons

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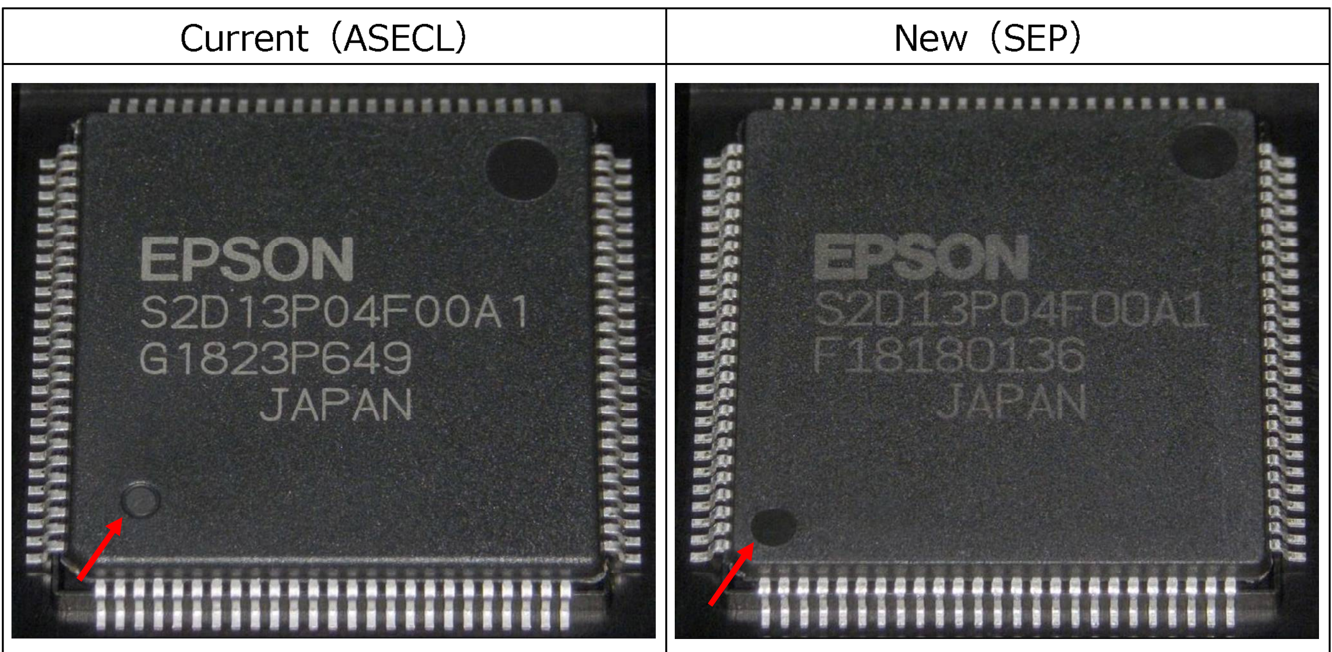
Comparison of Appearance	Package Appearance QFP15-100pin QFP15-128pin	 P8 P9
Comparison of External dimension	Measurement points of dimension (drawing) QFP15-100pin QFP15-128pin TQFP15-100pin TQFP15-128pin	 P10 P12 P14 P16
	Measurement result of external dimension QFP15-100pin QFP15-128pin TQFP15-100pin TQFP15-128pin	 P11 P13 P15 P17
Comparison of Lead frame	X-ray photo QFP15-100pin QFP15-128pin	 P18 P19

- Comparison data and photos are shown on each page.
- Our common product of same package type are shown for your reference.

Verification: Comparison of Appearance

P-LQFP100-1414-0.50(QFP15-100)

Current (ASECL)	New (SEP)

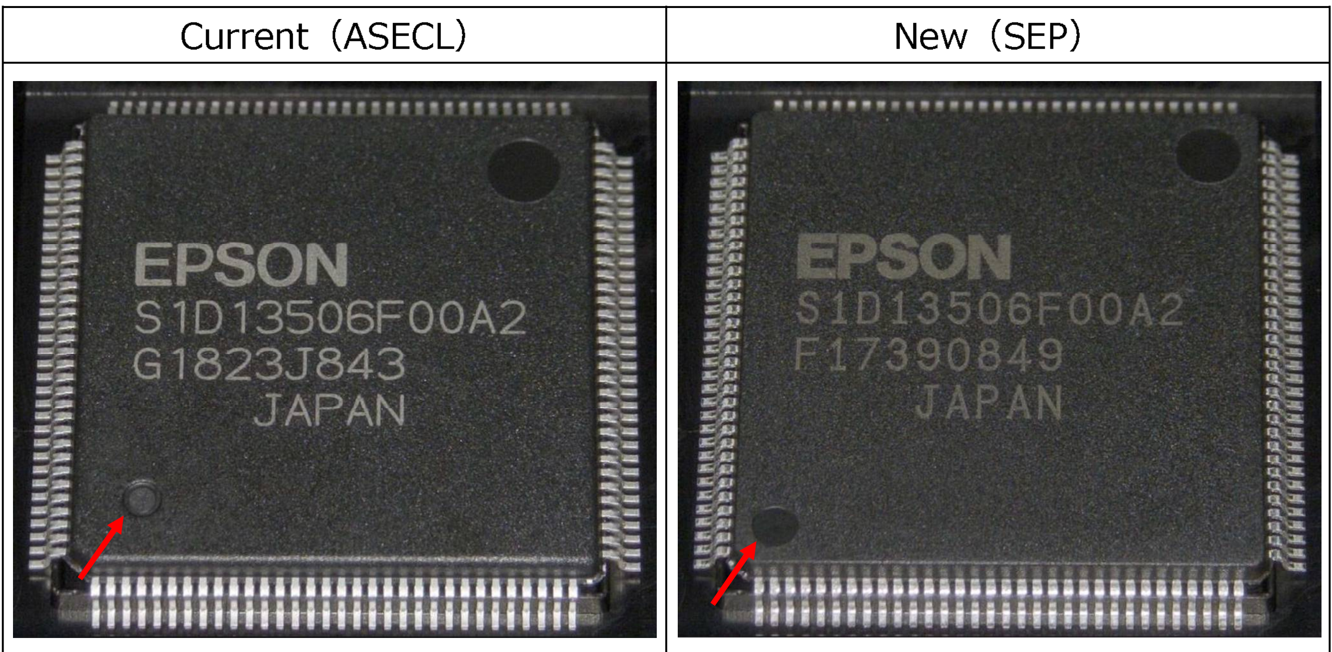


・External appearance is different at this position (→). However there are no change of external dimensions and tolerance.

*These are the pictures of Epson's general product for reference.

Verification: Comparison of Appearance

P-LQFP128-1414-0.40(QFP15-128)

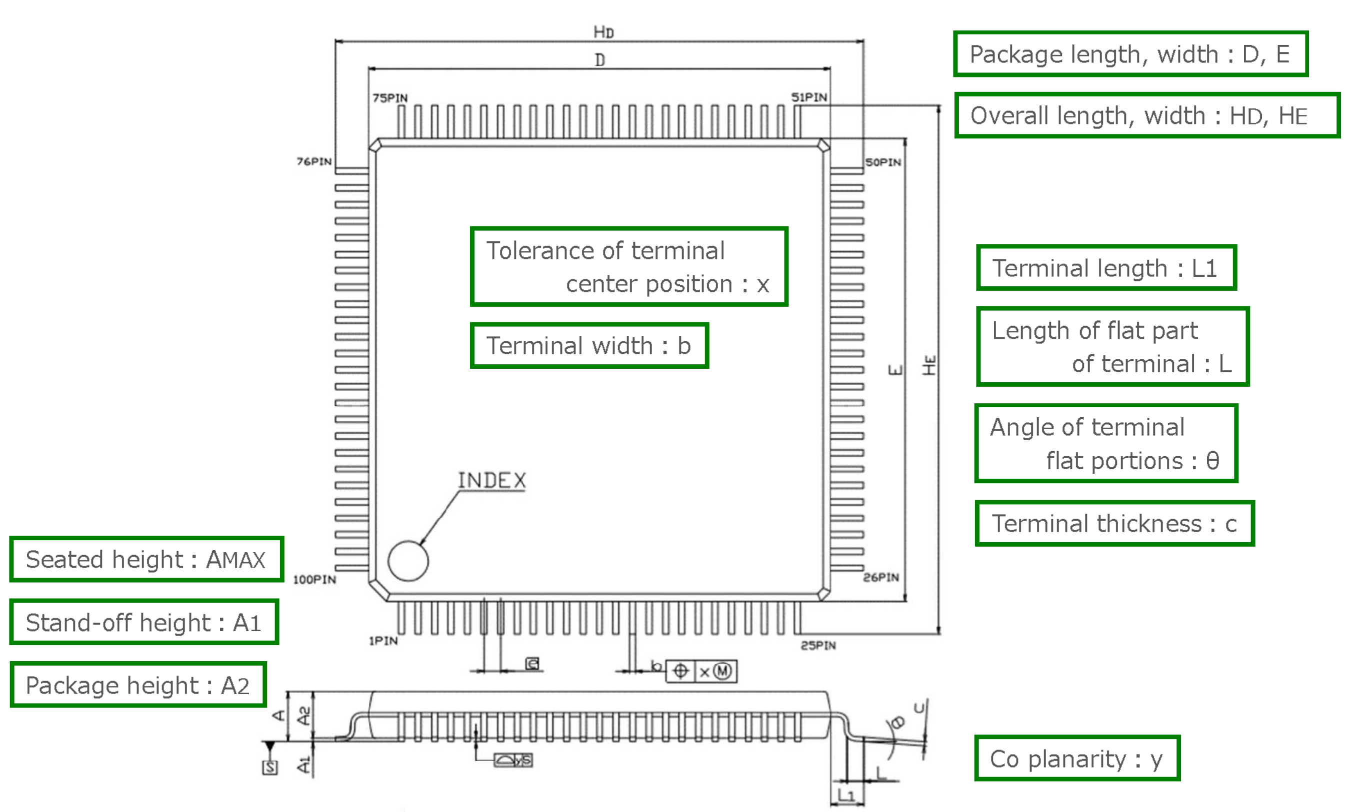


・External appearance is different at this position (→). However there are no change of external dimensions and tolerance.

*These are the pictures of Epson's general product for reference.

Verification: External Dimension

P-LQFP100-1414-0.50(QFP15-100)



Verification: Measurement Results of External Dimension

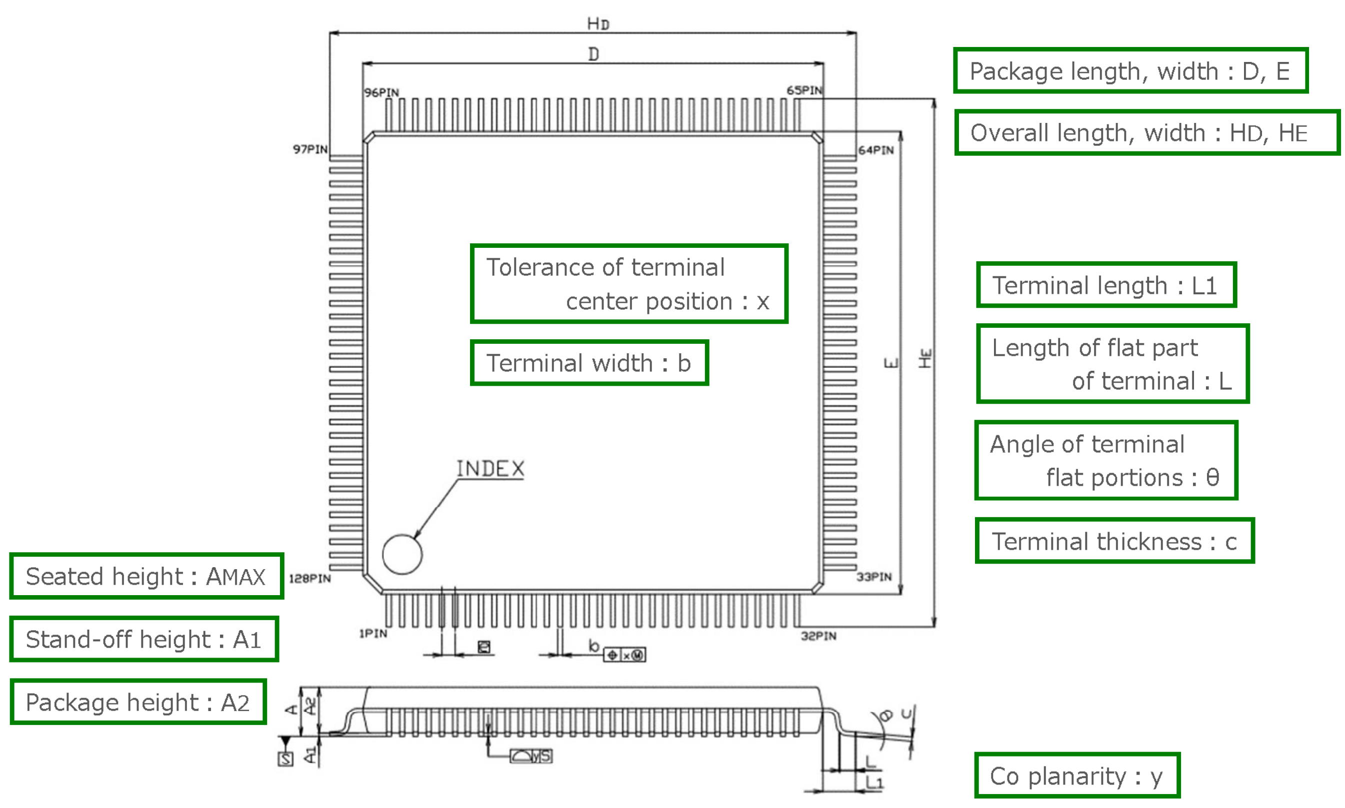
P-LQFP100-1414-0.50(QFP15-100) Unit: (mm)

Item / Spec.		Current (ASECL)		New (SEP)	
		Average	Cpk	Average	Cpk
E	14±0.1	14.011	5.78	14.020	6.92
D	14±0.1	14.010	9.79	14.021	2.34
HE	16±0.4	15.976	17.76	15.976	4.82
HD	16±0.4	15.993	11.61	15.993	8.01
AMAX	Max 1.7	1.523	7.33	1.548	7.59
A1	0.1±0.1	0.106	2.73	0.110	3.63
A2	1.4±0.1	1.390	4.71	1.399	3.72
b	0.17～0.27	0.194	4.63	0.187	2.65
c	0.09～0.2	0.143	15.06	0.143	6.96
θ	0～10°	7.022	3.52	7.262	10.15
L	0.3～0.75	0.567	8.48	0.582	7.97
L1	1±0.2	0.990	4.79	0.984	19.97
x	Max 0.08	0.003	17.97	0.001	9.49
y	Max 0.08	0.025	2.87	0.035	5.68

・Each dimension shows more than Cpk1.67, thus it was judged as no problem.

Verification: External Dimension

P-LQFP128-1414-0.40(QFP15-128)



Verification: Measurement Results of External Dimension

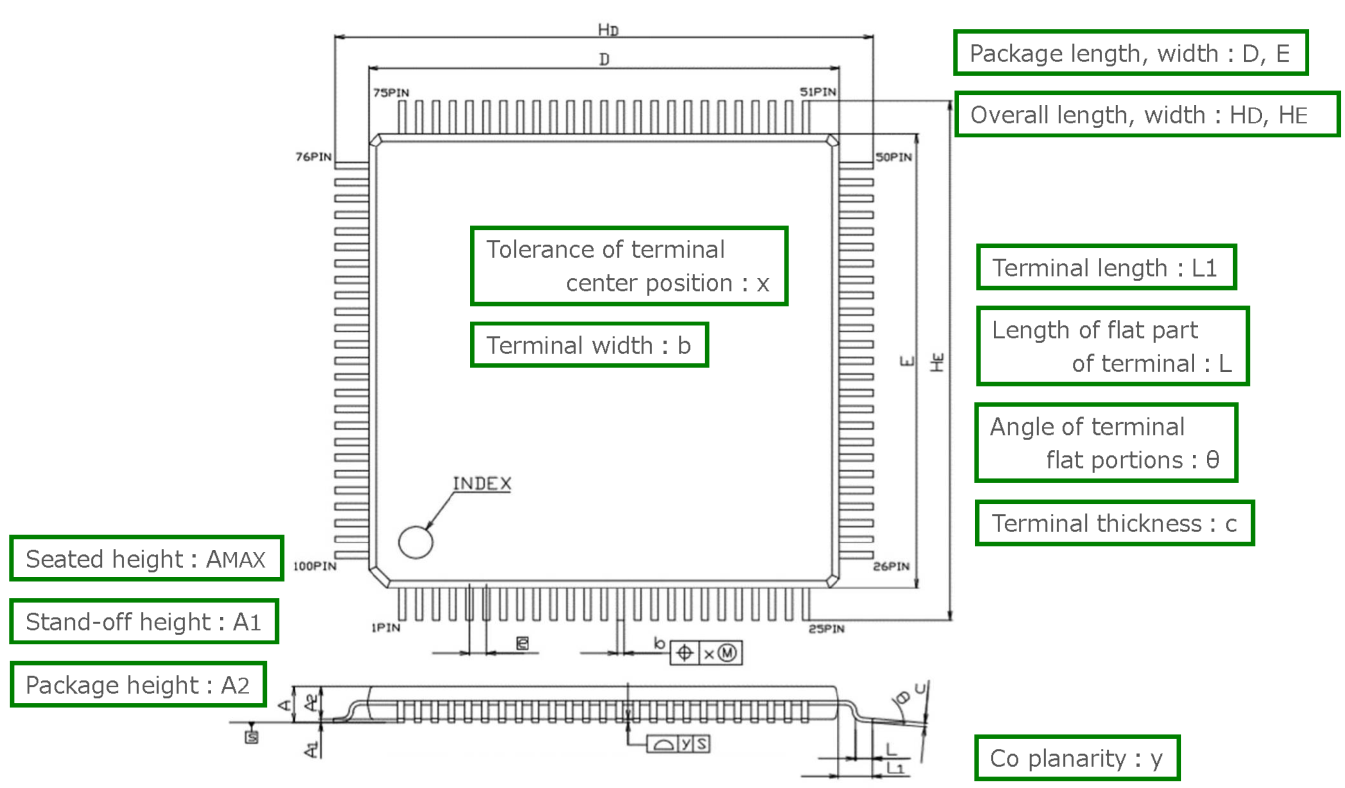
P-LQFP128-1414-0.40(QFP15-128) Unit: (mm)

Item / Spec.		Current (ASECL)		New (SEP)	
		Average	Cpk	Average	Cpk
E	14±0.1	13.958	6.94	14.023	6.09
D	14±0.1	13.957	2.32	14.030	2.06
H_E	16±0.4	16.009	40.66	15.970	25.35
H_D	16±0.4	16.002	42.52	15.991	16.77
A_{MAX}	Max 1.7	1.548	2.70	1.543	2.54
A1	0.1±0.1	0.081	6.41	0.060	2.37
A2	1.4±0.1	1.410	18.55	1.404	10.49
b	0.13～0.23	0.167	5.35	0.172	2.73
c	0.09～0.2	0.145	35.99	0.151	30.59
θ	0～10°	3.4°	2.10	6.5°	2.24
L	0.3～0.75	0.532	2.44	0.568	3.51
L1	1±0.2	1.023	5.51	0.979	3.19
x	Max 0.08	0.001	6.79	0.009	4.07
y	Max 0.08	0.015	3.64	0.026	1.94

・Each dimension shows more than Cpk1.67, thus it was judged as no problem.

Verification: External Dimension

P-TQFP100-1414-0.50(TQFP15-100)



Verification: Measurement Results of External Dimension

P-TQFP100-1414-0.50(TQFP15-100)

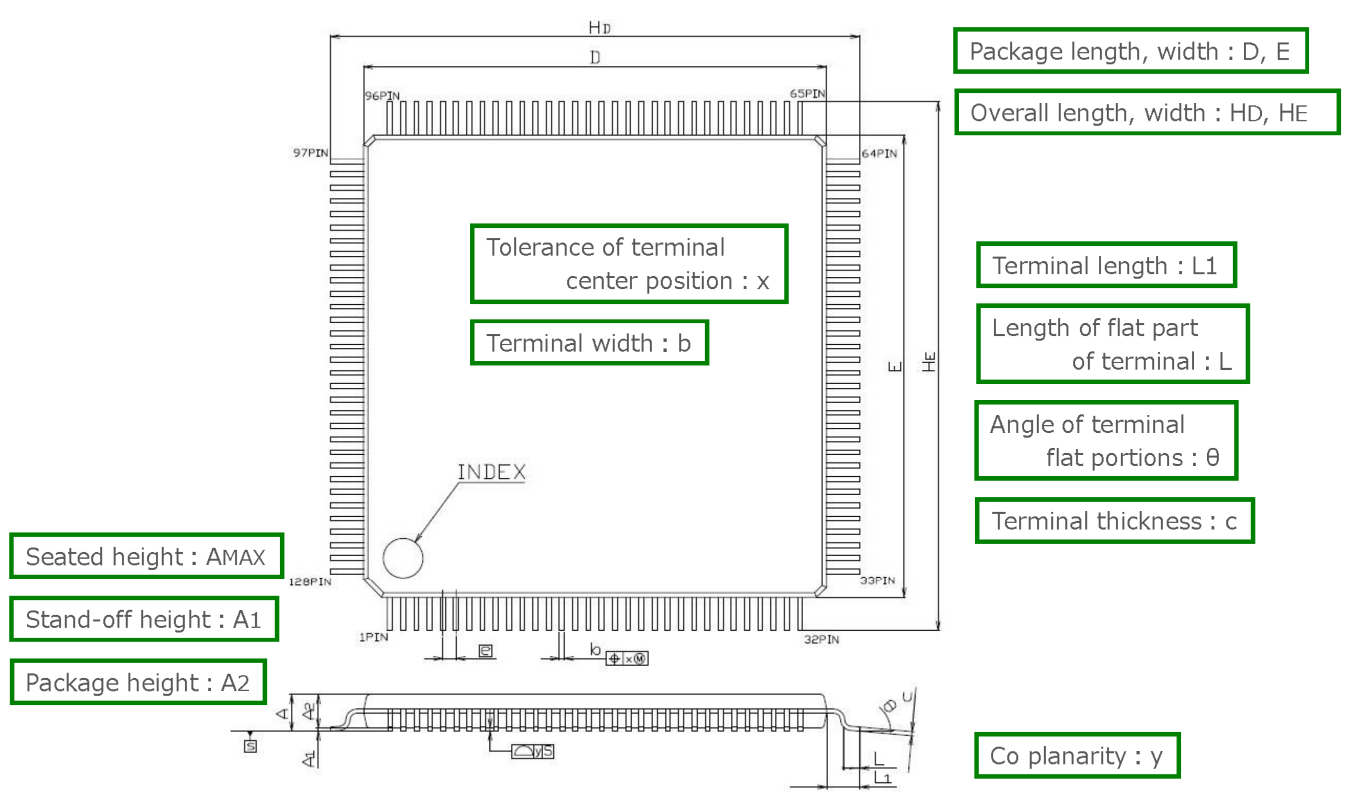
Unit（mm）

Item / Spec.		Current（ASECL）		New（SEP）	
		Average	Cpk	Average	Cpk
E	14±0.1	13.976	3.96	14.027	2.52
D	14±0.1	13.990	3.12	14.027	2.36
H_E	16±0.4	15.999	7.08	15.988	4.61
H_D	16±0.4	15.988	7.97	15.991	6.01
A_{MAX}	Max 1.2	1.102	4.01	1.151	2.16
A1	0.1±0.1	0.094	2.97	0.095	3.07
A2	1.0±0.1	1.015	6.78	1.005	4.48
b	0.13～0.27	0.222	3.05	0.205	7.69
c	0.09～0.2	0.144	4.82	0.147	3.83
θ	0～10°	3.5°	2.92	4.7°	2.82
L	0.3～0.75	0.457	3.90	0.500	2.98
L1	1±0.2	1.024	8.59	0.986	6.75
x	Max 0.08	0.002	8.68	0.003	13.53
y	Max 0.08	0.021	4.69	0.017	4.75

・Each dimension shows more than Cpk1.67, thus it was judged as no problem.

Verification: External Dimension

P-TQFP128-1414-0.40(TQFP15-128)



Verification: Measurement Results of External Dimension

P-TQFP128-1414-0.40(TQFP15-128) Unit（mm)

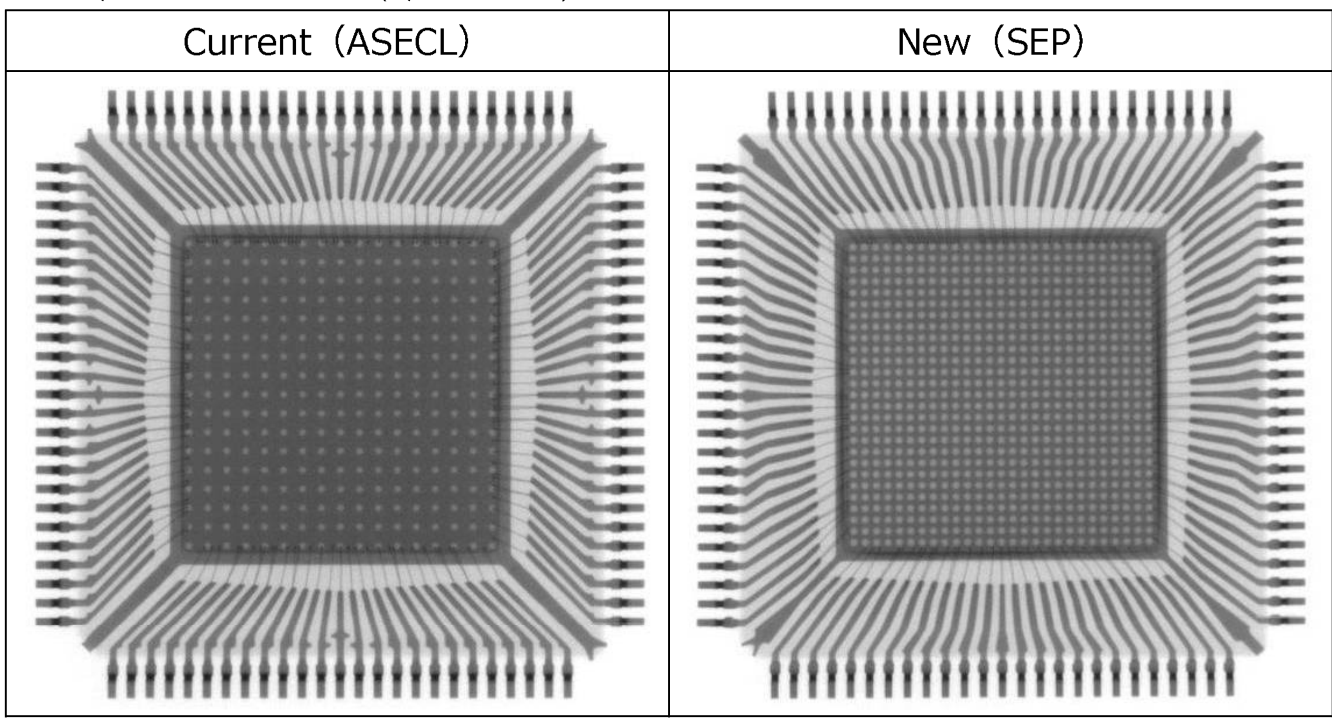
Item / Spec		Current（ASECL)		New（SEP)	
		Average	Cpk	Average	Cpk
E	14±0.1	13.988	3.32	14.033	3.54
D	14±0.1	13.983	3.88	14.032	5.54
HE	16±0.4	16.008	22.56	16.004	30.62
HD	16±0.4	16.004	37.91	16.007	15.10
AMAX	Max 1.2	1.147	11.82	1.181	10.97
A1	0.1±0.1	0.071	2.40	0.101	5.41
A2	1.0±0.1	1.003	6.89	1.007	11.83
b	0.13～0.23	0.167	2.37	0.168	2.90
c	0.09～0.2	0.142	11.88	0.140	10.74
θ	0～10°	3.4°	2.49	4.6°	3.29
L	0.3～0.75	0.501	3.58	0.500	2.82
L1	1±0.2	1.008	3.83	0.990	5.23
x	Max 0.08	0.002	17.13	0.007	4.17
y	Max 0.08	0.027	2.09	0.026	2.63

・Each dimension shows more than Cpk1.67, thus it was judged as no problem.

Verification: Comparison of Lead frame (X-ray photo)

P-LQFP100-1414-0.50(QFP15-100)

Current（ASECL)	New（SEP)



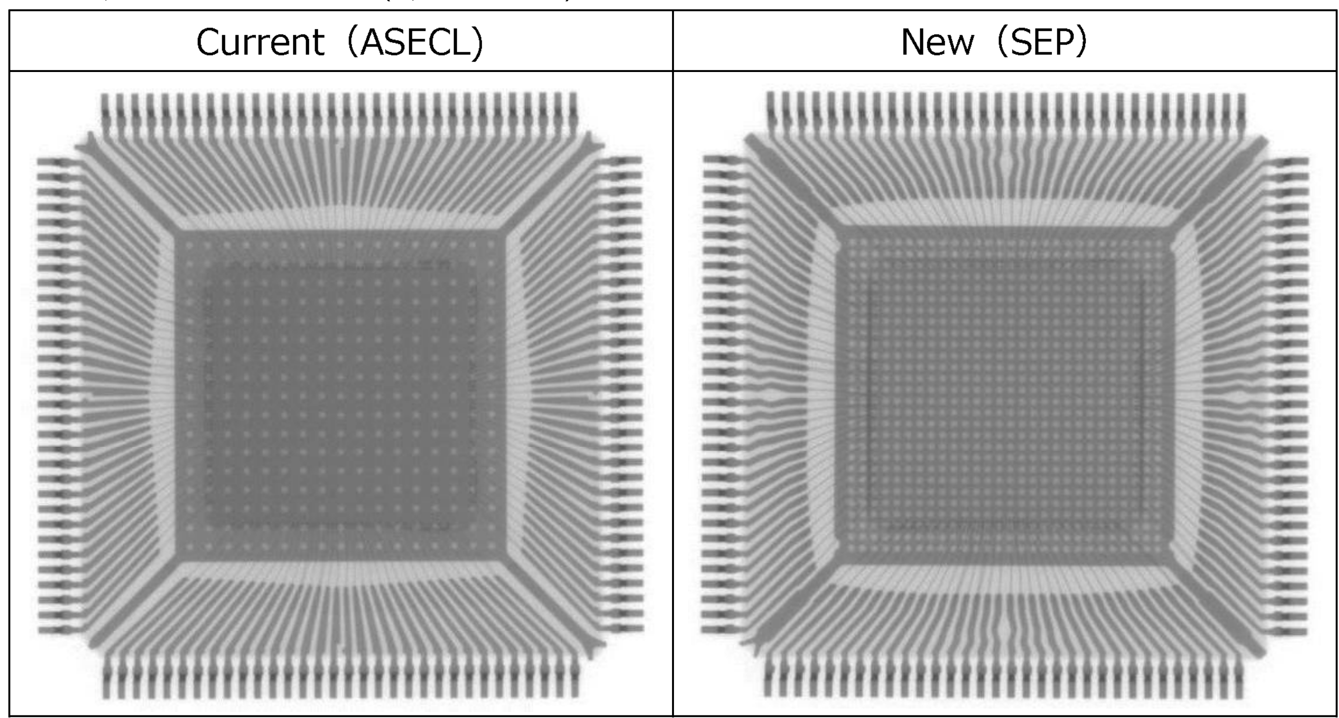
- Inner lead shape is different, but the reliability performance can keep same level.

*These are the pictures of Epson's general product for reference.

Verification: Comparison of Lead frame (X-ray photo)

P-LQFP128-1414-0.40(QFP15-128)

Current (ASECL)	New (SEP)



- Inner lead shape is different, but the reliability performance can keep same level.

*These are the pictures of Epson's general product for reference.

Summary of Verification Results

- **Lead frame**
  Material, External dimensions : No change
  Lead strength and Solderability : Equal to current parts.
- **Mold Compound Material**
  Performance of MSL : No change
  Heat resistance (UL-94 V-0): No change
  Halogen free compliance: No change
- **IC Chip Thickness**
  Change of IC chip thickness has no influence about IC chip reliability and quality.

- **Conclusion**
  The products which assembled in SEP can keep the same quality and reliability level as the existing products assembled in ASECL. They have no differences about your storage condition and handling conditions from the existing products.

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