TOSHIBA

Leading Innovation

Change in Lead Frame Material

< Affected products: DIP package products of Discrete Division produced at Oita Operations >

Date: June 26, 2015

Toshiba Corporation
Semiconductor & Storage Products Company

◆Description of Change/ Product to be Affected

■Reason of change

As the current lead frame supplier, Panasonic, will discontinue the lead frame business, it has become necessary to change the supplier.

■Description of changes

- Change in lead frame supplier/manufacturing site and plating specification for DIP package products of Discrete Division produced at Oita Operations

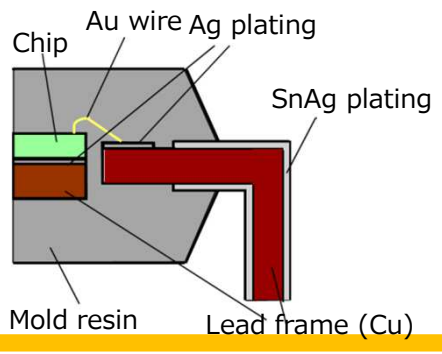
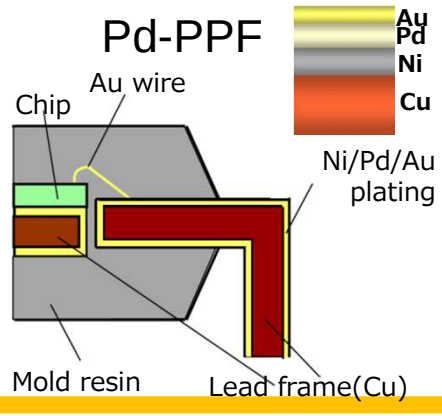
Change item	From	To
Lead frame supplier	Panasonic	Company A
Plating specification	SnAg-PPF	Pd-PPF

※**PPF =** Pre Plated Frame, which is a type of lead frame whose entire surface is plated at a time.

■Product to be affected

Category	Part number to be affected
Standard logic CMOS	See List of affected products

◆Changes in 5M1E

5M1E	From	To
Man	No change	
Machine	No change	
Measurement	No change	
Method	No change	
Material	No change in quality/property of materials Including lead frame	
Lead frame supplier	Panasonic	Company A
Plating specification	SnAg-PPF 	Pd-PPF 
Environment	No change	

Material (quality/properties) and shape of lead frame will be unchanged.

The supplier to be applied has track record in manufacturing of lead frames for SOP packages with Pd plating

◆ FMEA for Risk Analysis

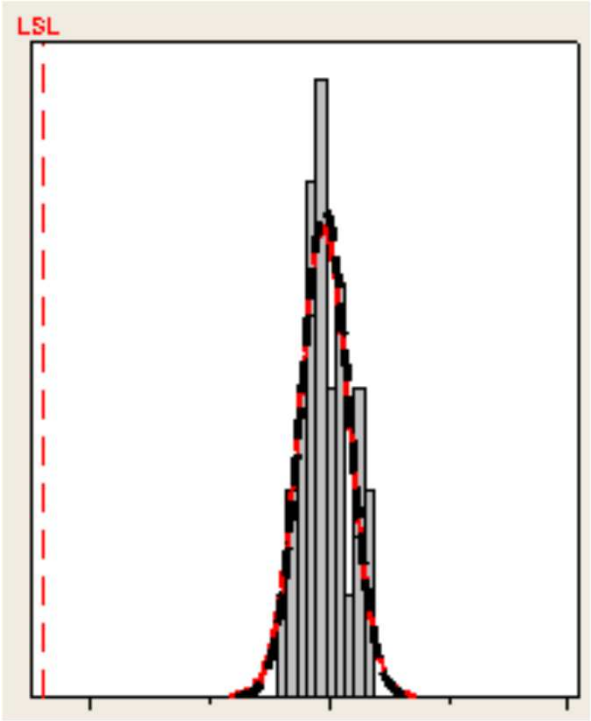
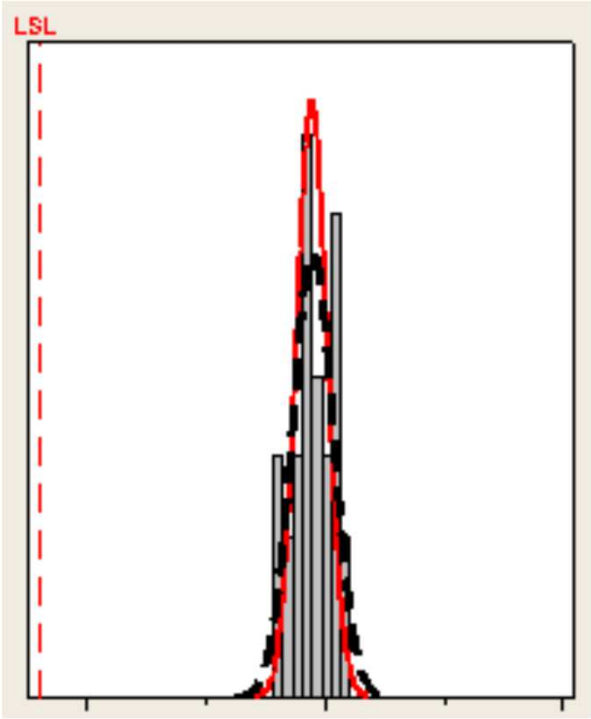
RPN is calculated based on scores of occurrence, severity and detection.

Items whose RPN is 105 or more have been subjected to unit evaluation.

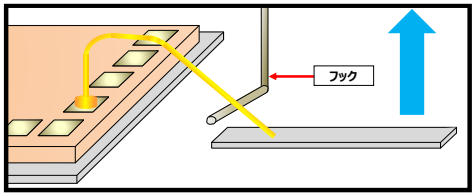
Change point/ novelty	Process	Failure mode	OCC	Failure effect	SEV	Detection method	DET	RPN	Actions taken
Change in lead frame supplier	Wire bonding	Poorly bonded wire on inner lead side	5	Electrical/DC failure	7	Discovered inside Toshiba (by IQC)	3	105	Check of bondability on inner lead side
	Wire bonding		5	Electrical/DC failure	7	Discovered inside Toshiba (by outgoing inspection/special inspection)	5	175	Reliability test (TCT,PCT,THB,HTS)
	-	Problem in mounting	5	Defect in mounted appearance/dimensions	7	Discovered at customer's site (by incoming/outgoing inspections)	7	245	Check of solderability
Change in plating specification	Wire bonding	Poorly bonded wire on inner lead side	5	Electrical/DC failure	7	Discovered inside Toshiba (by IQC)	3	105	Check of bondability on inner lead side
	Wire bonding		5	Electrical/DC failure	7	Discovered inside Toshiba (by outgoing inspection/special inspection)	5	175	Reliability test (TCT,PCT,THB,HTS)
	Lead trim & forming	Defect in trimmed/formed dimensions	10	Defect in mounted appearance/dimensions	7	Discovered inside Toshiba (by IQC)	3	210	Check of bending width
	-	Problem in mounting	5	Defect in mounted appearance/dimensions	7	Discovered at customer's site (by incoming/outgoing inspections)	7	245	Check of solderability

-Evaluation Data of Bondability on Inner Lead Side at Wire Bonding Process

Sample size：n＝8 wires×3ICs

	SnAg-PPF [current lead frame]	Pd-PPF [new lead frame]
Bonding strength	 Cpk：3.88	 Cpk：4.40

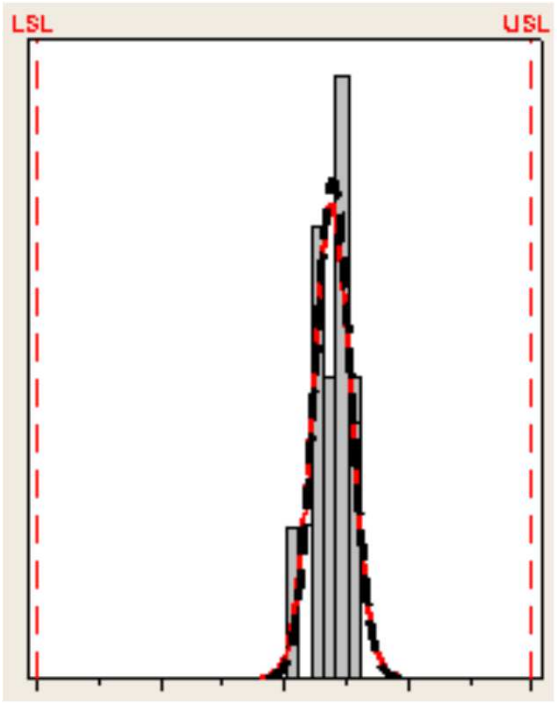
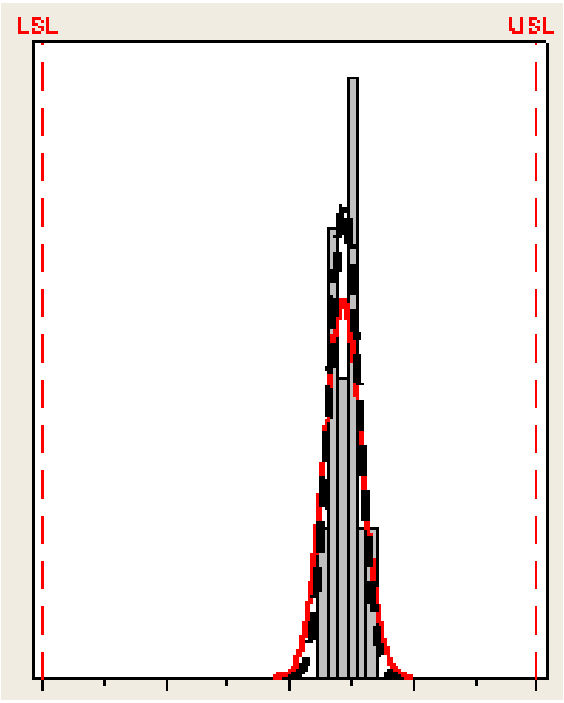
Measurement method



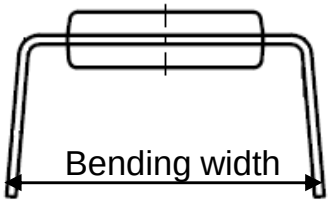
No problem without significant difference from the current lead frame

- Evaluation Data of Bending Width at Lead Trim & Forming Process

Sample size：n＝30 ICs

	SnAg-PPF [current lead frame]	Pd-PPF [new lead frame]
Bending width	 Cpk : 3.52	 Cpk : 3.42

Measurement site



No problem without significant difference from the current lead frame

- Reliability Test Result

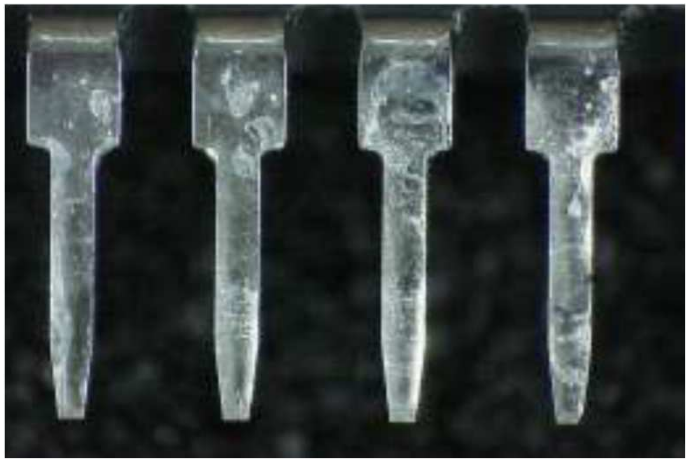
Test item	Test condition	Sample size	Read point	
				Test result (reject/gross)
Temperature cycle test (TCT)	-65℃～150℃	30pcs×3 leadframe lots	300 cycles	0 /30pcs×3 leadframe lots
Pressure cooker test (PCT)	Ta=127℃, RH=100% 0.25MPa(non-condensing)	30pcs×3 leadframe lots	120 hours	0 /30pcs×3 leadframe lots
Temperature Humidity Bias test (THB)	Ta=85℃, RH=85% Power supply voltage= Operation Max	30pcs×3 leadframe lots	1000 hours	0/30pcs×3 leadframe lots
High temperature storage (HTS)	Ta=150℃	30pcs×3 leadframe lots	1000 hours	0/30pcs×3 leadframe lots

*The following pre-treatment was performed:
solder dipping at 26degC for 10sec

No failure occurred.

- Solderability Test Data

Test item	Sample size	Test result (reject/gross)
Solderability	12pcs	0/12pcs

SnAg-PPF [current lead frame]	Pd-PPF [new lead frame]
	

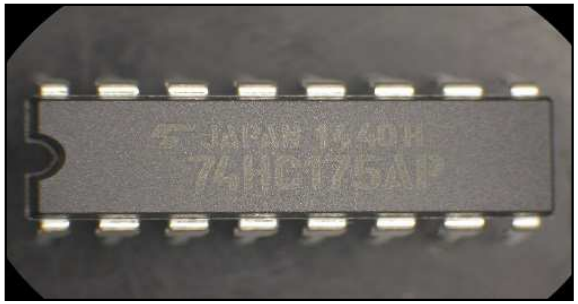
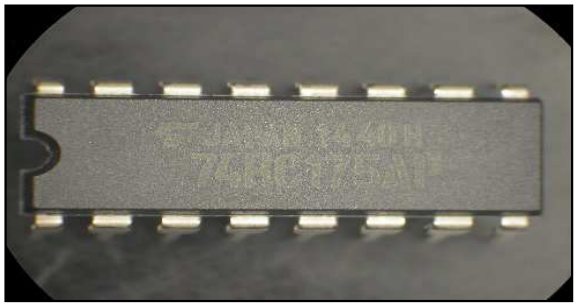
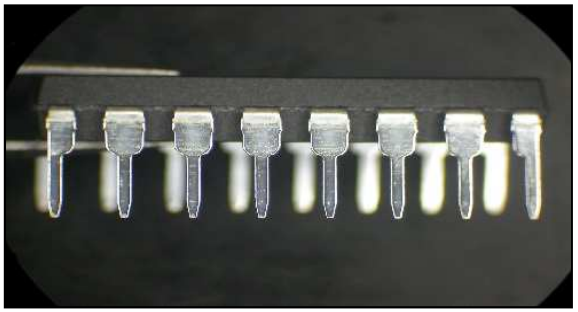
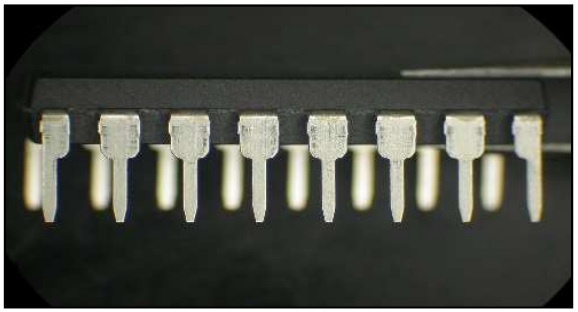
No problem without significant difference from the current lead frame

- Electrical Characteristics Comparison

DC characteristic		Symbol	Measurement conditions	Spec (Ta=25℃)				Average		Cpk		判定
				Min	Std	Max	Unit	Current frame	New frame	Current frame	New frame	
Input voltage	“H“ level	VIH	VCC=4.5V	3.15	-	-	V	OK	OK	-	-	OK
	“L” level	VIL	VCC=4.5V	-	-	1.35	V	OK	OK	-	-	OK
Output current	“H” level	IOH	VIN=VCCorGND VOH=4.18V VCC=4.5V	-	-	-4	mA	-7.205	-7.185	8.96	8.75	OK
	"L” level	IOL	VIN=VCCorGND VOL=0.26V VCC=4.5V	4	-	-	mA	6.915	6.976	4.61	4.42	OK
Input current		IIH	VIN=VCC VCC=6V	-0.1	-	0.1	μA	0.005	0.005	23.73	21.28	OK
		IIL	VIN=GND VCC=6V	-0.1	-	0.1	μA	-0.012	-0.012	6.75	8.44	OK
Static consumption current		ICC	VIN=VCCorGND VCC=6V	-	-	4	μA	0.004	0.004	***	***	OK

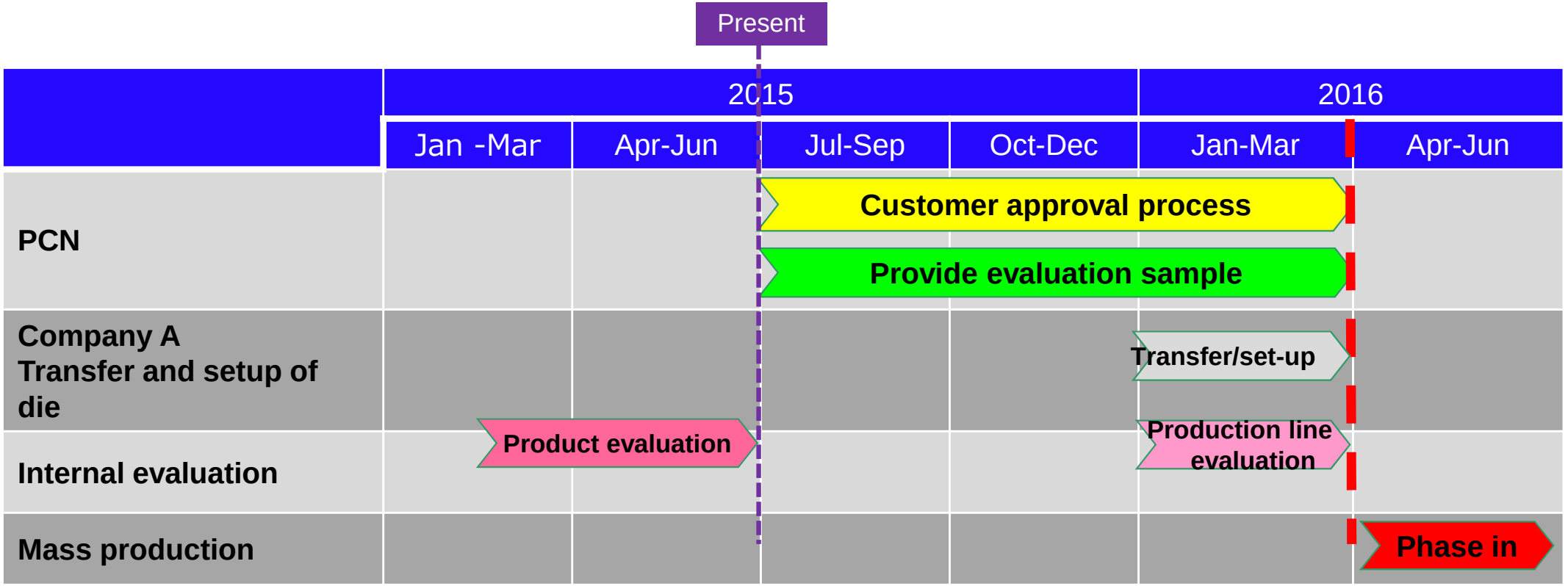
No problem in process capabilities without significant difference from the current lead frame

- Package Appearance Comparison

	SnAg-PPF [current lead frame]	Pd-PPF [new lead frame]
Top surface		
Lateral side		

No problem in marking visibility without significant difference from the current package
Slight difference in gloss of outer leads is due to difference in plating composition.

◆Changeover Schedule



◆Conclusion

< Request >

Toshiba has confirmed through the evaluations mentioned in this document that this lead frame change will cause no problem.

Therefore, you are kindly requested to internally review and consider approval for this change.

If you have requests for the relevant document/data or any questions, please inform our Sales representatives nearest you.

We would appreciate your understanding and cooperation.


TOSHIBA
Leading Innovation