

TOSHIBA CORPORATION

Semiconductor & Storage Products Company
Oita Operations

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Date: June 26, 2015

Ref. No.: 0-HKN-15-00035E

Dear Sir/ Madam:

Notification of Change in Lead Frame Material of DIP Package

We greatly appreciate your continued business.

This is to notify you of our plan to change lead frame material for our products supplied to you.

Full details of the planned change are given in the following page.


If you have any questions or inquiry regarding this change, please inform our Sales representatives nearest you.

We appreciate your understanding and cooperation.

Yours faithfully,

Prepared by D. Kataoka

Approved by:



Y. Goto, Manager,

Quality Assurance Group

Quality Assurance Dept.

Oita Operations

Semiconductor & Storage Products Company

TOSHIBA Corporation

Details on Change in Lead Frame Material

1. Product to be : 361 part types (See Attached list of affected products)

Affected

2. Description of Change : - Change in lead frame supplier
From Panasonic Corporation To Company A
- Change in plating specification
From SnAg- PPF To Pd-PPF
3. Reason of Change : Panasonic Corporation will discontinue its lead frame business.
4. Scheduled Date of Change : Shipment of modified lot will start in April 2016.
5. Remarks : If you have any questions or requests regarding this change, please inform our Sales representatives nearest you.

Please check the appropriate box and fill in the form below.

< Change in Lead Frame Material of DIP Package: Ref. No.: 0-HKN-15-00035E >

- We approve the above change.
- We approve the above change with the following conditions.
- We disapprove the above change for the following reasons.

[Specify the conditions/ reasons]

Date :

Company :

Department :

Approved by :

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	<p>SnAg-PPF</p>	<p>Pd-PPF</p>
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

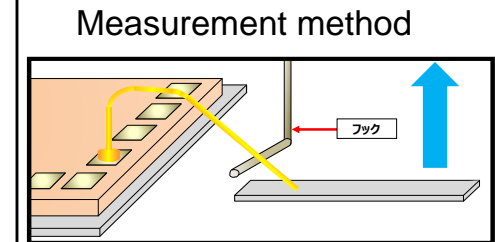
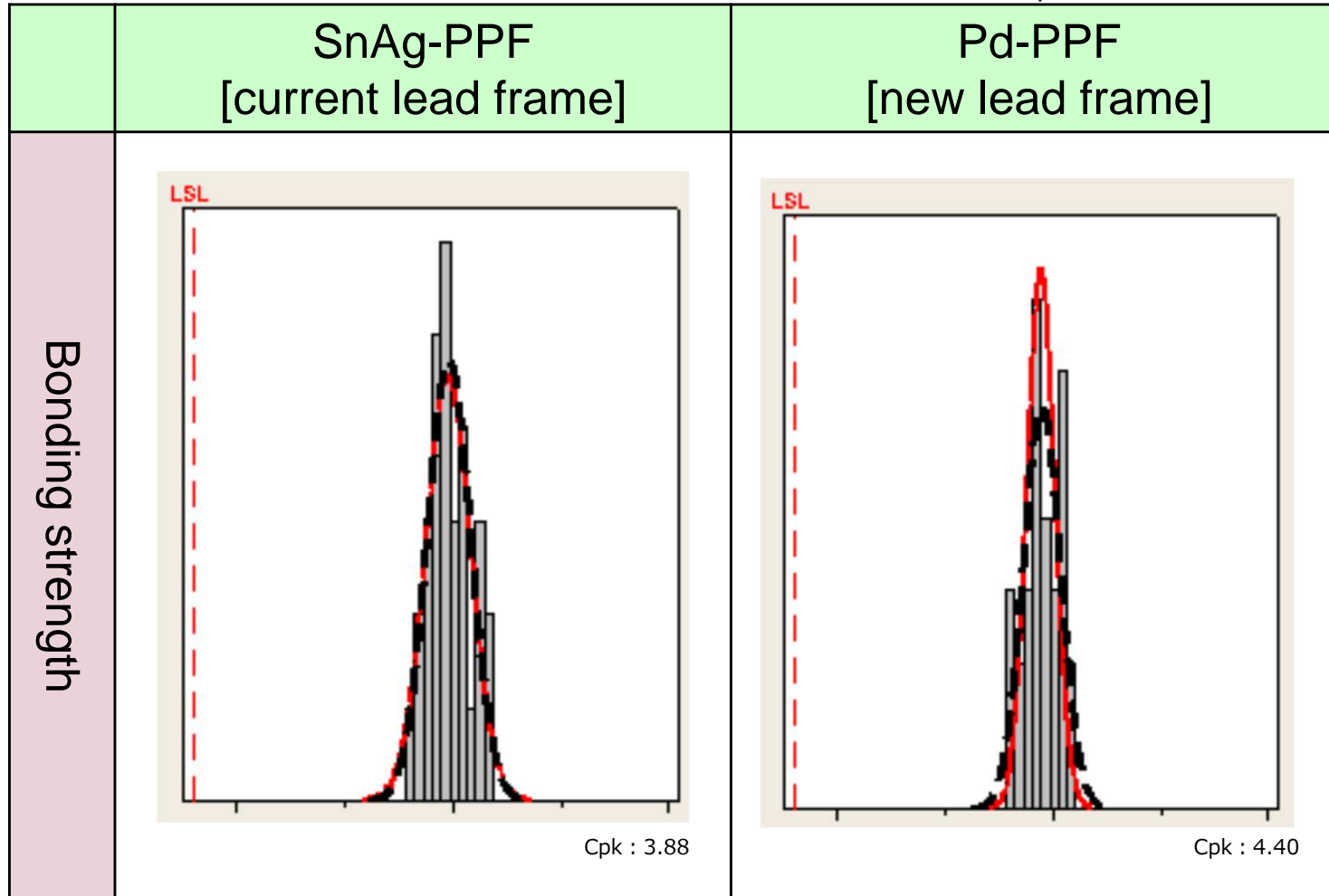
RPN is calculated based on scores of occurrence, severity and detection.

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		5	Electrical/DC failure	7	Discovered inside Toshiba (by IQC)	3	105	Check of bondability on inner lead side
	Wire bonding	Poorly bonded wire on inner lead side	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		5	Electrical/DC failure	7	Discovered inside Toshiba (by IQC)	3	105	Check of bondability on inner lead side
	Wire bonding	Poorly bonded wire on inner lead side	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

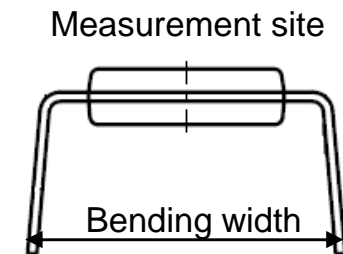
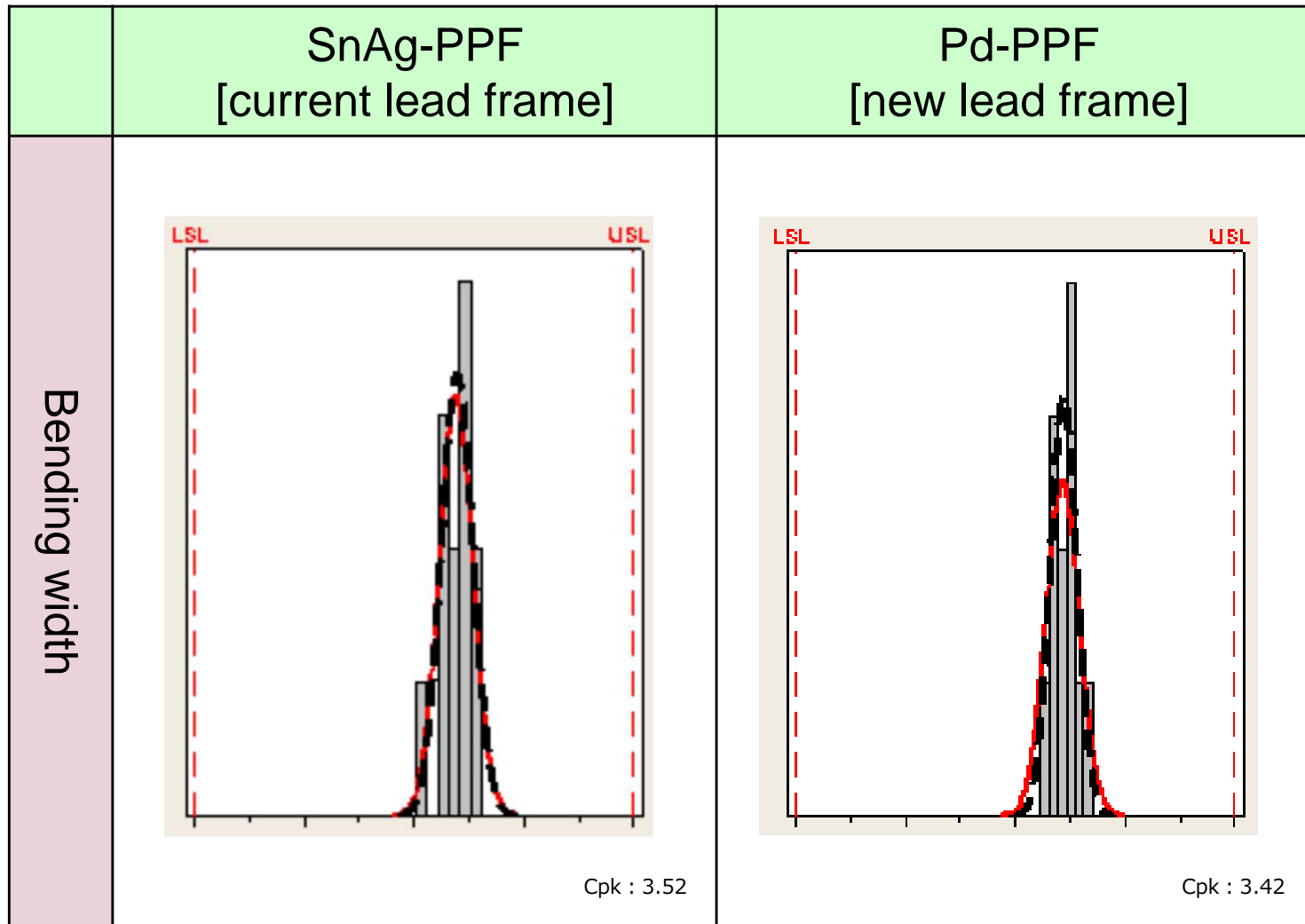
Sample size : n = 8 wires × 3 ICs



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



No problem without significant difference from the current lead frame

- Reliability Test Result

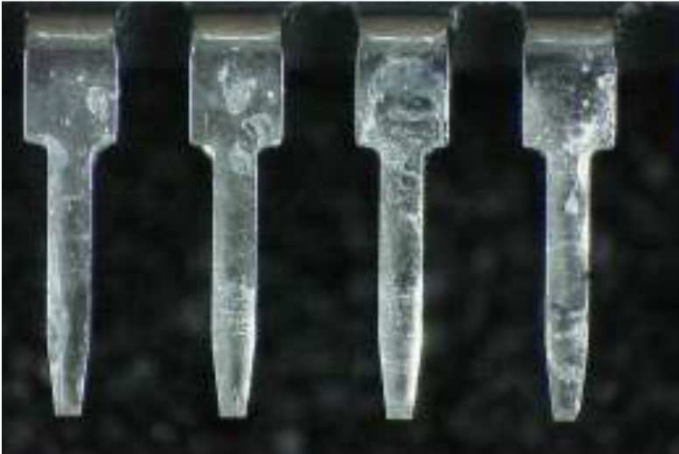

Test item	Test condition	Sample size	Read point
			Test result (reject/gross)
Temperature cycle test (TCT)	-65°C~150°C	30pcs×3 leadframe lots	300 cycles
			0/30pcs×3 leadframe lots
Pressure cooker test (PCT)	Ta=127°C, RH=100% 0.25MPa(non-condensing)	30pcs×3 leadframe lots	120 hours
			0/30pcs×3 leadframe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



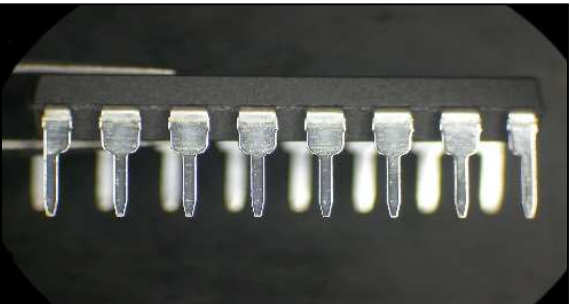
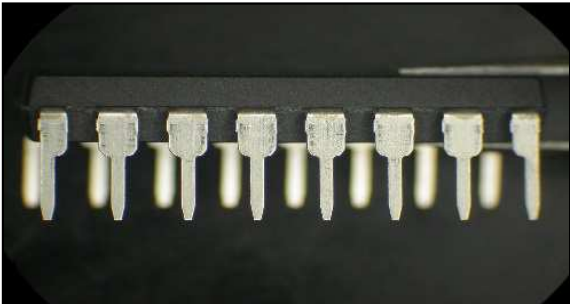
No problem without significant difference from the current lead frame

- Electrical Characteristics Comparison

DC characteristic		Symbol	Measurement conditions	Spec (Ta=25°C)				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		I _{IH}	VIN=VCC VCC=6V	-0.1	-	0.1	μA	0.005	0.005	23.73	21.28	OK
		I _{IL}	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

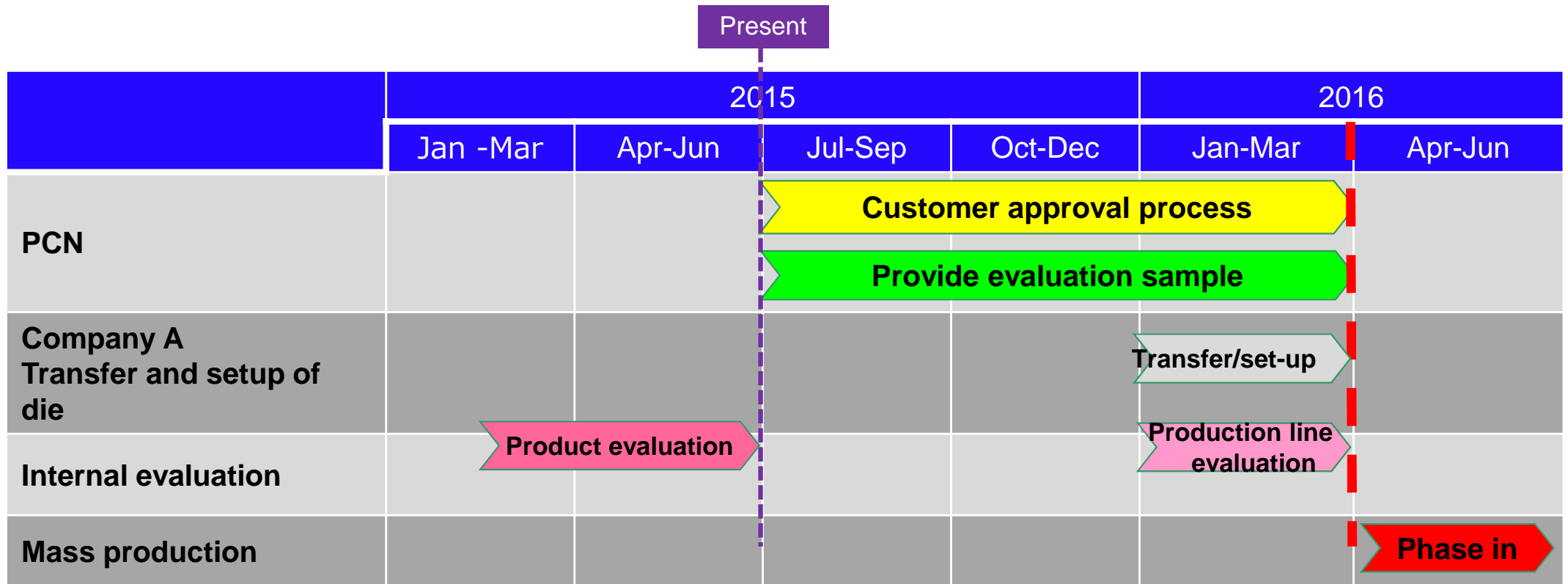
No problem in process capabilities without significant difference from the current lead frame

- 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

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PKG	product	PKG	product
DIP14	TC4011BP(N,F)	DIP16	TC74HC4017AP(F)
DIP14	TC4013BP(N,F)	DIP16	TC74HC4020AP(F)
DIP14	TC4030BP(N,F)	DIP16	TC74HC4040AP(F)
DIP14	TC4066BP(N,F)	DIP16	TC74HC4049AP(F)
DIP14	TC4071BP(N,F)	DIP16	TC74HC4050AP(F)
DIP14	TC74AC393P(F)	DIP16	TC74HC42AP(F)
DIP14	TC74AC86P(F)	DIP16	TC74HC4520AP(F)
DIP14	TC74ACT08P(F)	DIP16	TC74HC85AP(F)
DIP14	TC74HC00AP(F)	DIP16	TC74HCT138AP(F)
DIP14	TC74HC02AP(F)	DIP16	TC74HCT157AP(F)
DIP14	TC74HC04AP(F)	DIP16	TC4520BP(N,F)
DIP14	TC74HC05AP(F)	DIP16	TC74AC109P(F)
DIP14	TC74HC07AP(F)	DIP16	TC74AC112P(F)
DIP14	TC74HC08AP(F)	DIP16	TC74AC157P(F)
DIP14	TC74HC10AP(F)	DIP16	TC74AC174P(F)
DIP14	TC74HC125AP(F)	DIP16	TC74AC257P(F)
DIP14	TC74HC132AP(F)	DIP16	TC74AC258P(F)
DIP14	TC74HC14AP(F)	DIP16	TC74AC283P(F)
DIP14	TC74HC27AP(F)	DIP16	TC74AC367P(F)
DIP14	TC74HC4024AP(F)	DIP16	TC74AC390P(F)
DIP14	TC74HC4066AP(F)	DIP16	TC74ACT139P(F)
DIP14	TC74HC4072AP(F)	DIP16	TC74ACT151P(F)
DIP14	TC74HC74AP(F)	DIP16	TC74ACT157P(F)
DIP14	TC74HC86AP(F)	DIP16	TC74ACT161P(F)
DIP14	TC74HCT00AP(F)	DIP16	TC74ACT163P(F)
DIP14	TC74HCT04AP(F)	DIP16	TC74ACT174P(F)
DIP14	TC4001BP(N,F)	DIP16	TC74ACT257P(F)
DIP14	TC4024BP(N,F)	DIP16	TC74HC112AP(F)
DIP14	TC4069UBP(N,F)	DIP16	TC74HC153AP(F)
DIP14	TC4081BP(N,F)	DIP16	TC74HC158AP(F)
DIP14	TC4093BP(N,F)	DIP16	TC74HC193AP(F)
DIP14	TC4584BP(N,F)	DIP16	TC74HC237AP(F)
DIP14	TC74AC00P(F)	DIP16	TC74HC251AP(F)
DIP14	TC74AC02P(F)	DIP16	TC74HC257AP(F)
DIP14	TC74AC04P(F)	DIP16	TC74HC259AP(F)
DIP14	TC74AC05P(F)	DIP16	TC74HC368AP(F)
DIP14	TC74AC08P(F)	DIP16	TC74HC375AP(F)
DIP14	TC74AC10P(F)	DIP16	TC74HC40102AP(F)
DIP14	TC74AC11P(F)	DIP16	TC74HC4028AP(F)
DIP14	TC74AC14P(F)	DIP16	TC74HC592AP(F)
DIP14	TC74AC164P(F)	DIP16	TC74HC7292AP(F)
DIP14	TC74AC20P(F)	DIP16	TC74HCT139AP(F)
DIP14	TC74AC32P(F)	DIP16	TC74HCT174AP(F)
DIP14	TC74AC74P(F)	DIP16	TC74ACT153P(F)
DIP14	TC74ACT00P(F)	DIP16	TC74ACT175P(F)
DIP14	TC74ACT164P(F)	DIP16	TC4049BP(TB,N,F)
DIP14	TC74ACT32P(F)	DIP16	TC4050BP(TB,N,F)

DIP14	TC74ACT74P(F)	DIP16	TC4021BP(TB,N,F)
DIP14	TC74HC03AP(F)	DIP16	TC4040BP(TB,N,F)
DIP14	TC74HC107AP(F)	DIP16	TC4053BP(TB,N,F)
DIP14	TC74HC11AP(F)	DIP16	TC4512BP(TB,N,F)
DIP14	TC74HC126AP(F)	DIP16	TC4538BP(TB,N,F)
DIP14	TC74HC164AP(F)	DIP16	TC74HC138AP(TB,F)
DIP14	TC74HC20AP(F)	DIP16	TC74HC158AP(TB,F)
DIP14	TC74HC21AP(F)	DIP16	TC74HC251AP(TB,F)
DIP14	TC74HC280AP(F)	DIP16	TC74HC4060AP(TB,F)
DIP14	TC74HC30AP(F)	DIP16	TC74AC138P(PP,F)
DIP14	TC74HC32AP(F)	DIP16	TC74HC138AP(PP,F)
DIP14	TC74HC393AP(F)	DIP16	TC74HC165AP(PP,F)
DIP14	TC74HC4002AP(F)	DIP16	TC74HC174AP(PP,F)
DIP14	TC74HC4075AP(F)	DIP16	TC74HC175AP(PP,F)
DIP14	TC74HC4078AP(F)	DIP16	TC74HC238AP(PP,F)
DIP14	TC74HC7266AP(F)	DIP16	TC74HC4017AP(PP,F)
DIP14	TC74HCT08AP(F)	DIP16	TC74HC4020AP(PP,F)
DIP14	TC74HCT32AP(F)	DIP16	TC74HC4049AP(PP,F)
DIP14	TC74HCT7007AP(F)	DIP16	TC74HC4538AP(PP,F)
DIP14	TC74HCT74AP(F)	DIP16	TC74HC590AP(PP,F)
DIP14	TC74HCT86AP(F)	DIP16	TC74HC7292AP(PP,F)
DIP14	TC74HCU04AP(F)	DIP16	TC4027BP(TB,N,F)
DIP14	T3L07P(F)	DIP16	TC74HC365AP(TB,F)
DIP14	TC74AC125P(F)	DIP16	TC74HC123AP(PPNE,F)
DIP14	TC74AC280P(F)	DIP16	TC74HC165AP(TB,F)
DIP14	TC74ACT02P(F)	DIP16	TC74HC4052AP(TB,F)
DIP14	TC74ACT04P(F)	DIP16	TC4521BP(TB,N,F)
DIP14	TC74ACT14P(F)	DIP16	TC74HC123AP(TBNEWF)
DIP14	TC74ACT86P(F)	DIP16	TC74VHC138P(F)
DIP14	TC74HCT02AP(F)	DIP16	TC74VHC138P(PP,F)
DIP14	TC74AC126P(F)	DIP16	TC74HC253AP(TB,F)
DIP14	T3G30P(F)	DIP16	TC74AC139P(TB,F)
DIP14	TC4011BP(N,TAKAM,F)	DIP16	TC4512BP(TB,N,W,F)
DIP14	TC4001BP(TB,N,F)	DIP16	TC4538BP(TB,N,W,F)
DIP14	TC4011BP(TB,N,F)	DIP16	TC74HC112AP(W,F)
DIP14	TC4013BP(TB,N,F)	DIP16	TC74HC161AP(W,F)
DIP14	TC4024BP(TB,N,F)	DIP16	TC74HC221AP(PPNE,F)
DIP14	TC4030BP(TB,N,F)	SLIM220	TC74HC244AP(F)
DIP14	TC4071BP(TB,N,F)	SLIM220	TC74HC273AP(F)
DIP14	TC4093BP(TB,N,F)	SLIM220	TC74HC374AP(F)
DIP14	TC4584BP(TB,N,F)	SLIM220	TC74HC540AP(F)
DIP14	TC74HC00AP(TB,F)	SLIM220	TC74HC541AP(F)
DIP14	TC74HC04AP(TB,F)	SLIM220	TC74HC564AP(F)
DIP14	TC74HC14AP(TB,F)	SLIM220	TC74HC688AP(F)
DIP14	TC4081BP(TB,N,F)	SLIM220	T3G26P(F)
DIP14	T3L07P(PP,F)	SLIM220	T3G27P(F)
DIP14	TC74AC32P(PP,F)	SLIM220	TC74AC240P(F)
DIP14	TC74HC00AP(PP,F)	SLIM220	TC74AC244P(F)
DIP14	TC74HC02AP(PP,F)	SLIM220	TC74AC245P(F)
DIP14	TC74HC04AP(PP,F)	SLIM220	TC74AC273P(F)

DIP14	TC74HC08AP(PP,F)	SLIM220	TC74AC373P(F)
DIP14	TC74HC10AP(PP,F)	SLIM220	TC74AC541P(F)
DIP14	TC74HC132AP(PP,F)	SLIM220	TC74ACT240P(F)
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DIP14	TC74HC4024AP(TB,F)	SLIM220	TC74HC245AP(F)
DIP14	TC4069UBP(PP,N,F)	SLIM220	TC74HC373AP(F)
DIP14	TC74HC00AP(P,F)	SLIM220	TC74HC573AP(F)
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DIP14	TC74VHC32P(PP,F)	SLIM220	TC74AC540P(F)
DIP14	TC74VHC74P(F)	SLIM220	TC74AC573P(F)
DIP14	TC74VHC74P(PP,F)	SLIM220	TC74AC574P(F)
DIP14	TC74VHC132P(F)	SLIM220	TC74AC640P(F)
DIP14	TC74HC4075AP(W,F)	SLIM220	TC74ACT244P(F)
DIP14	TC4093BP(PP,N,F)	SLIM220	TC74ACT273P(F)
DIP14	TC4584BP(PP,N,F)	SLIM220	TC74ACT373P(F)
DIP16	TC4017BP(N,F)	SLIM220	TC74ACT540P(F)
DIP16	TC4040BP(N,F)	SLIM220	TC74ACT573P(F)
DIP16	TC4049BP(N,F)	SLIM220	TC74ACT640P(F)
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DIP16	TC74AC175P(F)	SLIM220	TC74HC697AP(F)
DIP16	TC74HC123AP(NEW,F)	SLIM220	TC74HC7240AP(F)
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DIP16	TC74HC138AP(F)	SLIM220	TC74HCT540AP(F)
DIP16	TC74HC151AP(F)	SLIM220	TC74HCT573AP(F)
DIP16	TC74HC163AP(F)	SLIM220	TC74HCT688AP(F)
DIP16	TC74HC165AP(F)	SLIM220	TC74ACT299P(F)
DIP16	TC74HC191AP(F)	SLIM220	TC74ACT521P(F)
DIP16	TC74HC238AP(F)	SLIM220	TC74HC273AP(TB,F)
DIP16	TC74HC279AP(F)	SLIM220	TC74HC573AP(TB,F)
DIP16	TC74HC283AP(F)	SLIM220	TC74HC574AP(TB,F)

DIP16	TC74HC367AP(F)	SLIM220	TC74HC541AP(TB,F)
DIP16	TC74HC390AP(F)	SLIM220	TC74HC240AP(PP,F)
DIP16	TC74HC40103AP(F)	SLIM220	TC74HC244AP(PP,F)
DIP16	TC74HC40105AP(F)	SLIM220	TC74HC273AP(PP,F)
DIP16	TC74HC4051AP(F)	SLIM220	TC74HC540AP(PP,F)
DIP16	TC74HC4052AP(F)	SLIM220	TC74HC541AP(PP,F)
DIP16	TC74HC4053AP(F)	SLIM220	TC74HC573AP(PP,F)
DIP16	TC74HC4060AP(F)	SLIM220	TC74HC574AP(PP,F)
DIP16	TC74HC4094AP(F)	SLIM220	TC74HC7240AP(PP,F)
DIP16	TC74HC423AP(NEW,F)	SLIM220	TC74HC7244AP(PP,F)
DIP16	TC74HC4511AP(F)	SLIM220	TC74HC245AP(PP,F)
DIP16	TC74HC4538AP(F)	SLIM220	TC74HC244AP(TB,F)
DIP16	TC74HC590AP(F)	SLIM220	TC74HC373AP(TB,F)
DIP16	TC74HC595AP(F)	SLIM220	TC74HC374AP(TB,F)
DIP16	TC74HC597AP(F)	SLIM220	TC74HC574AP(P,F)
DIP16	TC74HC670AP(F)	SLIM220	TC74AC273P(PP,F)
DIP16	TC4044BP(N,F)	SLIM220	TC74HCT540AP(PP,F)
DIP16	TC4512BP(N,F)		
DIP16	TC4015BP(N,F)		
DIP16	TC4020BP(N,F)		
DIP16	TC4021BP(N,F)		
DIP16	TC4027BP(N,F)		
DIP16	TC4028BP(N,F)		
DIP16	TC4051BP(N,F)		
DIP16	TC4052BP(N,F)		
DIP16	TC4094BP(N,F)		
DIP16	TC4511BP(N,F)		
DIP16	TC4521BP(N,F)		
DIP16	TC74AC138P(F)		
DIP16	TC74AC139P(F)		
DIP16	TC74AC151P(F)		
DIP16	TC74AC153P(F)		
DIP16	TC74AC161P(F)		
DIP16	TC74AC163P(F)		
DIP16	TC74AC166P(F)		
DIP16	TC74ACT138P(F)		
DIP16	TC74HC109AP(F)		
DIP16	TC74HC139AP(F)		
DIP16	TC74HC148AP(F)		
DIP16	TC74HC155AP(F)		
DIP16	TC74HC157AP(F)		
DIP16	TC74HC161AP(F)		
DIP16	TC74HC166AP(F)		
DIP16	TC74HC173AP(F)		
DIP16	TC74HC174AP(F)		
DIP16	TC74HC175AP(F)		
DIP16	TC74HC221AP(NEW,F)		
DIP16	TC74HC253AP(F)		
DIP16	TC74HC365AP(F)		
DIP16	TC74HC366AP(F)		