

TOSHIBA CORPORATION
Semiconductor & Storage Products Company
Oita Operations

3500, Matsuoka Oita City OITA 870-0197, JAPAN
PHONE: +81-97-524-6091
FACSIMILE: +81-97-524-6287

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.

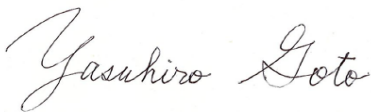
If you have any questions or inquiry regarding this change, please inform our Sales representatives nearest you.

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 Affected : 361 part types (See Attached list of affected products)

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.

Notice of Approval (For customer use)

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 :

PKG	product
DIP14	TC4011BP(N,F)
DIP14	TC4013BP(N,F)
DIP14	TC4030BP(N,F)
DIP14	TC4066BP(N,F)
DIP14	TC4071BP(N,F)
DIP14	TC74AC393P(F)
DIP14	TC74AC86P(F)
DIP14	TC74ACT08P(F)
DIP14	TC74HC00AP(F)
DIP14	TC74HC02AP(F)
DIP14	TC74HC04AP(F)
DIP14	TC74HC05AP(F)
DIP14	TC74HC07AP(F)
DIP14	TC74HC08AP(F)
DIP14	TC74HC10AP(F)
DIP14	TC74HC125AP(F)
DIP14	TC74HC132AP(F)
DIP14	TC74HC14AP(F)
DIP14	TC74HC27AP(F)
DIP14	TC74HC4024AP(F)
DIP14	TC74HC4066AP(F)
DIP14	TC74HC4072AP(F)
DIP14	TC74HC74AP(F)
DIP14	TC74HC86AP(F)
DIP14	TC74HCT00AP(F)
DIP14	TC74HCT04AP(F)
DIP14	TC4001BP(N,F)
DIP14	TC4024BP(N,F)
DIP14	TC4069UBP(N,F)
DIP14	TC4081BP(N,F)
DIP14	TC4093BP(N,F)
DIP14	TC4584BP(N,F)
DIP14	TC74AC00P(F)
DIP14	TC74AC02P(F)
DIP14	TC74AC04P(F)
DIP14	TC74AC05P(F)
DIP14	TC74AC08P(F)
DIP14	TC74AC10P(F)
DIP14	TC74AC11P(F)
DIP14	TC74AC14P(F)
DIP14	TC74AC164P(F)
DIP14	TC74AC20P(F)
DIP14	TC74AC32P(F)
DIP14	TC74AC74P(F)
DIP14	TC74ACT00P(F)
DIP14	TC74ACT164P(F)
DIP14	TC74ACT32P(F)
DIP14	TC74ACT74P(F)

DIP14	TC74HC03AP(F)
DIP14	TC74HC107AP(F)
DIP14	TC74HC11AP(F)
DIP14	TC74HC126AP(F)
DIP14	TC74HC164AP(F)
DIP14	TC74HC20AP(F)
DIP14	TC74HC21AP(F)
DIP14	TC74HC280AP(F)
DIP14	TC74HC30AP(F)
DIP14	TC74HC32AP(F)
DIP14	TC74HC393AP(F)
DIP14	TC74HC4002AP(F)
DIP14	TC74HC4075AP(F)
DIP14	TC74HC4078AP(F)
DIP14	TC74HC7266AP(F)
DIP14	TC74HCT08AP(F)
DIP14	TC74HCT32AP(F)
DIP14	TC74HCT7007AP(F)
DIP14	TC74HCT74AP(F)
DIP14	TC74HCT86AP(F)
DIP14	TC74HCU04AP(F)
DIP14	T3L07P(F)
DIP14	TC74AC125P(F)
DIP14	TC74AC280P(F)
DIP14	TC74ACT02P(F)
DIP14	TC74ACT04P(F)
DIP14	TC74ACT14P(F)
DIP14	TC74ACT86P(F)
DIP14	TC74HCT02AP(F)
DIP14	TC74AC126P(F)
DIP14	T3G30P(F)
DIP14	TC4011BP(N,TAKAM,F)
DIP14	TC4001BP(TB,N,F)
DIP14	TC4011BP(TB,N,F)
DIP14	TC4013BP(TB,N,F)
DIP14	TC4024BP(TB,N,F)
DIP14	TC4030BP(TB,N,F)
DIP14	TC4071BP(TB,N,F)
DIP14	TC4093BP(TB,N,F)
DIP14	TC4584BP(TB,N,F)
DIP14	TC74HC00AP(TB,F)
DIP14	TC74HC04AP(TB,F)
DIP14	TC74HC14AP(TB,F)
DIP14	TC4081BP(TB,N,F)
DIP14	T3L07P(PP,F)
DIP14	TC74AC32P(PP,F)
DIP14	TC74HC00AP(PP,F)
DIP14	TC74HC02AP(PP,F)
DIP14	TC74HC04AP(PP,F)
DIP14	TC74HC08AP(PP,F)
DIP14	TC74HC10AP(PP,F)

DIP14	TC74HC132AP(PP,F)
DIP14	TC74HC14AP(PP,F)
DIP14	TC74HC164AP(PP,F)
DIP14	TC74HC21AP(PP,F)
DIP14	TC74HC32AP(PP,F)
DIP14	TC74HC74AP(PP,F)
DIP14	TC74HC4024AP(TB,F)
DIP14	TC4069UBP(PP,N,F)
DIP14	TC74HC00AP(P,F)
DIP14	TC74HC393AP(TB,F)
DIP14	TC74HC74AP(P,F)
DIP14	TC74HC11AP(PP,F)
DIP14	TC74HC4002AP(PP,F)
DIP14	TC74VHC9125P(K,F)
DIP14	TC74VHC9125P(PPK,F)
DIP14	TC74VHC9126P(K,F)
DIP14	TC74VHC9126P(PPK,F)
DIP14	TC74HC4066AP(PP,F)
DIP14	TC74VHC02P(F)
DIP14	TC74VHC08P(F)
DIP14	TC74VHC08P(PP,F)
DIP14	TC74VHC14P(F)
DIP14	TC74VHC14P(PP,F)
DIP14	TC74VHC32P(F)
DIP14	TC74VHC32P(PP,F)
DIP14	TC74VHC74P(F)
DIP14	TC74VHC74P(PP,F)
DIP14	TC74VHC132P(F)
DIP14	TC74HC4075AP(W,F)
DIP14	TC4093BP(PP,N,F)
DIP14	TC4584BP(PP,N,F)
DIP16	TC4017BP(N,F)
DIP16	TC4040BP(N,F)
DIP16	TC4049BP(N,F)
DIP16	TC4050BP(N,F)
DIP16	TC4053BP(N,F)
DIP16	TC4538BP(N,F)
DIP16	TC74AC175P(F)
DIP16	TC74HC123AP(NEW,F)
DIP16	TC74HC133AP(F)
DIP16	TC74HC138AP(F)
DIP16	TC74HC151AP(F)
DIP16	TC74HC163AP(F)
DIP16	TC74HC165AP(F)
DIP16	TC74HC191AP(F)
DIP16	TC74HC238AP(F)
DIP16	TC74HC279AP(F)
DIP16	TC74HC283AP(F)
DIP16	TC74HC367AP(F)
DIP16	TC74HC390AP(F)
DIP16	TC74HC40103AP(F)

DIP16	TC74HC40105AP(F)
DIP16	TC74HC4051AP(F)
DIP16	TC74HC4052AP(F)
DIP16	TC74HC4053AP(F)
DIP16	TC74HC4060AP(F)
DIP16	TC74HC4094AP(F)
DIP16	TC74HC423AP(NEW,F)
DIP16	TC74HC4511AP(F)
DIP16	TC74HC4538AP(F)
DIP16	TC74HC590AP(F)
DIP16	TC74HC595AP(F)
DIP16	TC74HC597AP(F)
DIP16	TC74HC670AP(F)
DIP16	TC4044BP(N,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)
DIP16	TC74HC4017AP(F)
DIP16	TC74HC4020AP(F)
DIP16	TC74HC4040AP(F)
DIP16	TC74HC4049AP(F)

DIP16	TC74HC4050AP(F)
DIP16	TC74HC42AP(F)
DIP16	TC74HC4520AP(F)
DIP16	TC74HC85AP(F)
DIP16	TC74HCT138AP(F)
DIP16	TC74HCT157AP(F)
DIP16	TC4520BP(N,F)
DIP16	TC74AC109P(F)
DIP16	TC74AC112P(F)
DIP16	TC74AC157P(F)
DIP16	TC74AC174P(F)
DIP16	TC74AC257P(F)
DIP16	TC74AC258P(F)
DIP16	TC74AC283P(F)
DIP16	TC74AC367P(F)
DIP16	TC74AC390P(F)
DIP16	TC74ACT139P(F)
DIP16	TC74ACT151P(F)
DIP16	TC74ACT157P(F)
DIP16	TC74ACT161P(F)
DIP16	TC74ACT163P(F)
DIP16	TC74ACT174P(F)
DIP16	TC74ACT257P(F)
DIP16	TC74HC112AP(F)
DIP16	TC74HC153AP(F)
DIP16	TC74HC158AP(F)
DIP16	TC74HC193AP(F)
DIP16	TC74HC237AP(F)
DIP16	TC74HC251AP(F)
DIP16	TC74HC257AP(F)
DIP16	TC74HC259AP(F)
DIP16	TC74HC368AP(F)
DIP16	TC74HC375AP(F)
DIP16	TC74HC40102AP(F)
DIP16	TC74HC4028AP(F)
DIP16	TC74HC592AP(F)
DIP16	TC74HC7292AP(F)
DIP16	TC74HCT139AP(F)
DIP16	TC74HCT174AP(F)
DIP16	TC74ACT153P(F)
DIP16	TC74ACT175P(F)
DIP16	TC4049BP(TB,N,F)
DIP16	TC4050BP(TB,N,F)
DIP16	TC4021BP(TB,N,F)
DIP16	TC4040BP(TB,N,F)
DIP16	TC4053BP(TB,N,F)
DIP16	TC4512BP(TB,N,F)
DIP16	TC4538BP(TB,N,F)
DIP16	TC74HC138AP(TB,F)
DIP16	TC74HC158AP(TB,F)
DIP16	TC74HC251AP(TB,F)

DIP16	TC74HC4060AP(TB,F)
DIP16	TC74AC138P(PP,F)
DIP16	TC74HC138AP(PP,F)
DIP16	TC74HC165AP(PP,F)
DIP16	TC74HC174AP(PP,F)
DIP16	TC74HC175AP(PP,F)
DIP16	TC74HC238AP(PP,F)
DIP16	TC74HC4017AP(PP,F)
DIP16	TC74HC4020AP(PP,F)
DIP16	TC74HC4049AP(PP,F)
DIP16	TC74HC4538AP(PP,F)
DIP16	TC74HC590AP(PP,F)
DIP16	TC74HC7292AP(PP,F)
DIP16	TC4027BP(TB,N,F)
DIP16	TC74HC365AP(TB,F)
DIP16	TC74HC123AP(PPNE,F)
DIP16	TC74HC165AP(TB,F)
DIP16	TC74HC4052AP(TB,F)
DIP16	TC4521BP(TB,N,F)
DIP16	TC74HC123AP(TBNEWF)
DIP16	TC74VHC138P(F)
DIP16	TC74VHC138P(PP,F)
DIP16	TC74HC253AP(TB,F)
DIP16	TC74AC139P(TB,F)
DIP16	TC4512BP(TB,N,W,F)
DIP16	TC4538BP(TB,N,W,F)
DIP16	TC74HC112AP(W,F)
DIP16	TC74HC161AP(W,F)
DIP16	TC74HC221AP(PPNE,F)
SLIM220	TC74HC244AP(F)
SLIM220	TC74HC273AP(F)
SLIM220	TC74HC374AP(F)
SLIM220	TC74HC540AP(F)
SLIM220	TC74HC541AP(F)
SLIM220	TC74HC564AP(F)
SLIM220	TC74HC688AP(F)
SLIM220	T3G26P(F)
SLIM220	T3G27P(F)
SLIM220	TC74AC240P(F)
SLIM220	TC74AC244P(F)
SLIM220	TC74AC245P(F)
SLIM220	TC74AC273P(F)
SLIM220	TC74AC373P(F)
SLIM220	TC74AC541P(F)
SLIM220	TC74ACT240P(F)
SLIM220	TC74ACT245P(F)
SLIM220	TC74ACT374P(F)
SLIM220	TC74ACT541P(F)
SLIM220	TC74ACT574P(F)
SLIM220	TC74HC240AP(F)
SLIM220	TC74HC245AP(F)

SLIM220	TC74HC373AP(F)
SLIM220	TC74HC573AP(F)
SLIM220	TC74HC574AP(F)
SLIM220	TC74HC640AP(F)
SLIM220	TC74HCT240AP(F)
SLIM220	TC74HCT244AP(F)
SLIM220	TC74HCT245AP(F)
SLIM220	TC74HCT273AP(F)
SLIM220	TC74HCT373AP(F)
SLIM220	TC74HCT374AP(F)
SLIM220	TC74HCT541AP(F)
SLIM220	TC74HCT574AP(F)
SLIM220	TC74AC299P(F)
SLIM220	TC74AC374P(F)
SLIM220	TC74AC377P(F)
SLIM220	TC74AC521P(F)
SLIM220	TC74AC534P(F)
SLIM220	TC74AC540P(F)
SLIM220	TC74AC573P(F)
SLIM220	TC74AC574P(F)
SLIM220	TC74AC640P(F)
SLIM220	TC74ACT244P(F)
SLIM220	TC74ACT273P(F)
SLIM220	TC74ACT373P(F)
SLIM220	TC74ACT540P(F)
SLIM220	TC74ACT573P(F)
SLIM220	TC74ACT640P(F)
SLIM220	TC74HC241AP(F)
SLIM220	TC74HC299AP(F)
SLIM220	TC74HC377AP(F)
SLIM220	TC74HC697AP(F)
SLIM220	TC74HC7240AP(F)
SLIM220	TC74HC7244AP(F)
SLIM220	TC74HCT540AP(F)
SLIM220	TC74HCT573AP(F)
SLIM220	TC74HCT688AP(F)
SLIM220	TC74ACT299P(F)
SLIM220	TC74ACT521P(F)
SLIM220	TC74HC273AP(TB,F)
SLIM220	TC74HC573AP(TB,F)
SLIM220	TC74HC574AP(TB,F)
SLIM220	TC74HC541AP(TB,F)
SLIM220	TC74HC240AP(PP,F)
SLIM220	TC74HC244AP(PP,F)
SLIM220	TC74HC273AP(PP,F)
SLIM220	TC74HC540AP(PP,F)
SLIM220	TC74HC541AP(PP,F)
SLIM220	TC74HC573AP(PP,F)
SLIM220	TC74HC574AP(PP,F)
SLIM220	TC74HC7240AP(PP,F)
SLIM220	TC74HC7244AP(PP,F)

SLIM220	TC74HC245AP(PP,F)
SLIM220	TC74HC244AP(TB,F)
SLIM220	TC74HC373AP(TB,F)
SLIM220	TC74HC374AP(TB,F)
SLIM220	TC74HC574AP(P,F)
SLIM220	TC74AC273P(PP,F)
SLIM220	TC74HCT540AP(PP,F)

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>Chip, Au wire, Ag plating, SnAg plating, Mold resin, Lead frame (Cu)</p>	<p>Pd-PPF</p> <p>Chip, Au wire, Ni/Pd/Au plating, Mold resin, Lead frame (Cu)</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

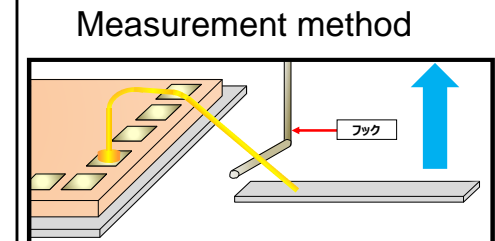
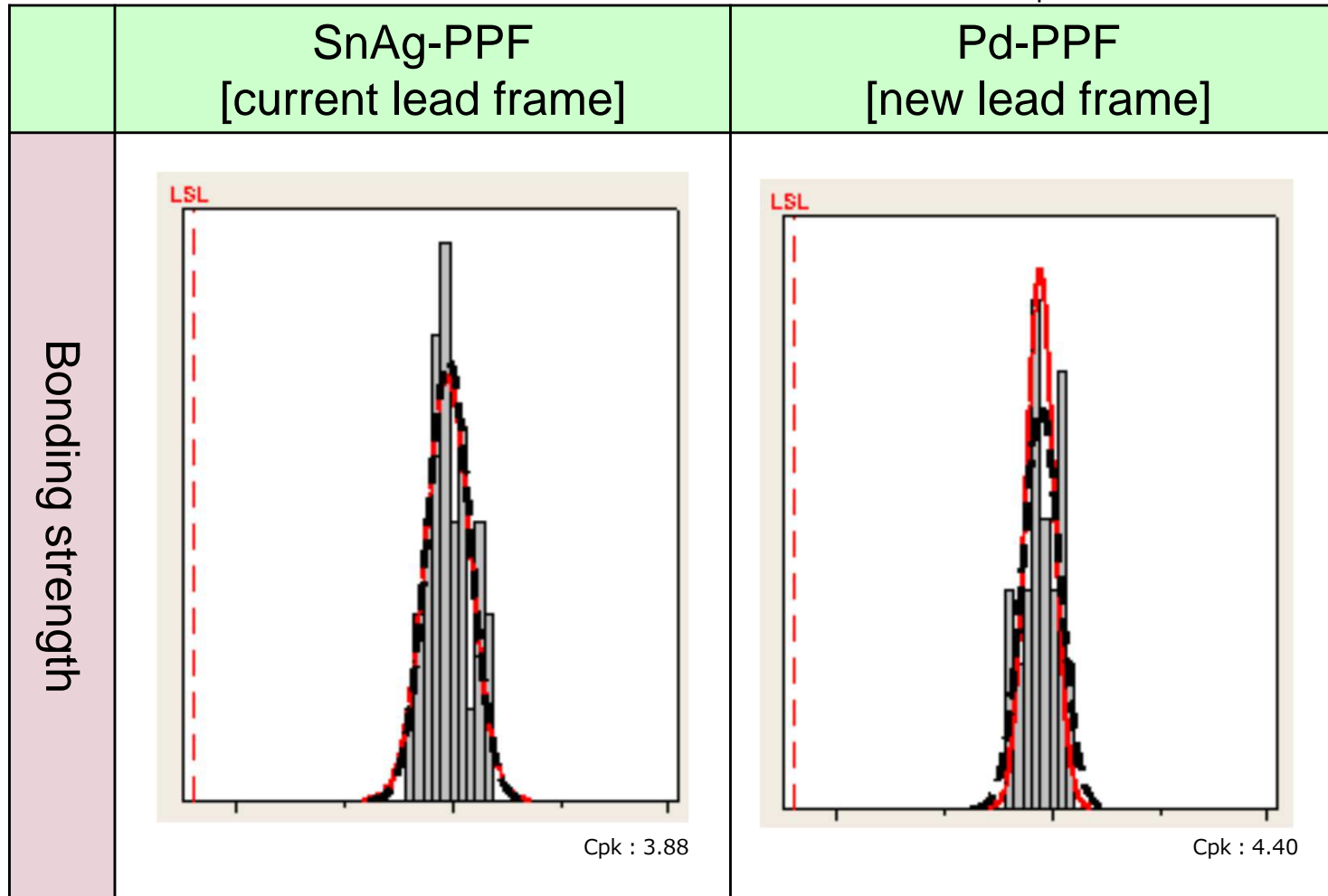
RPN is calculated based on scores of occurrence, severity and detection.

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

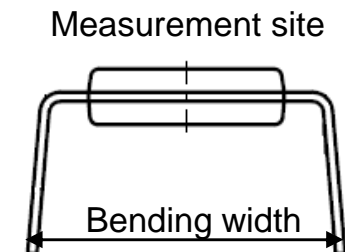
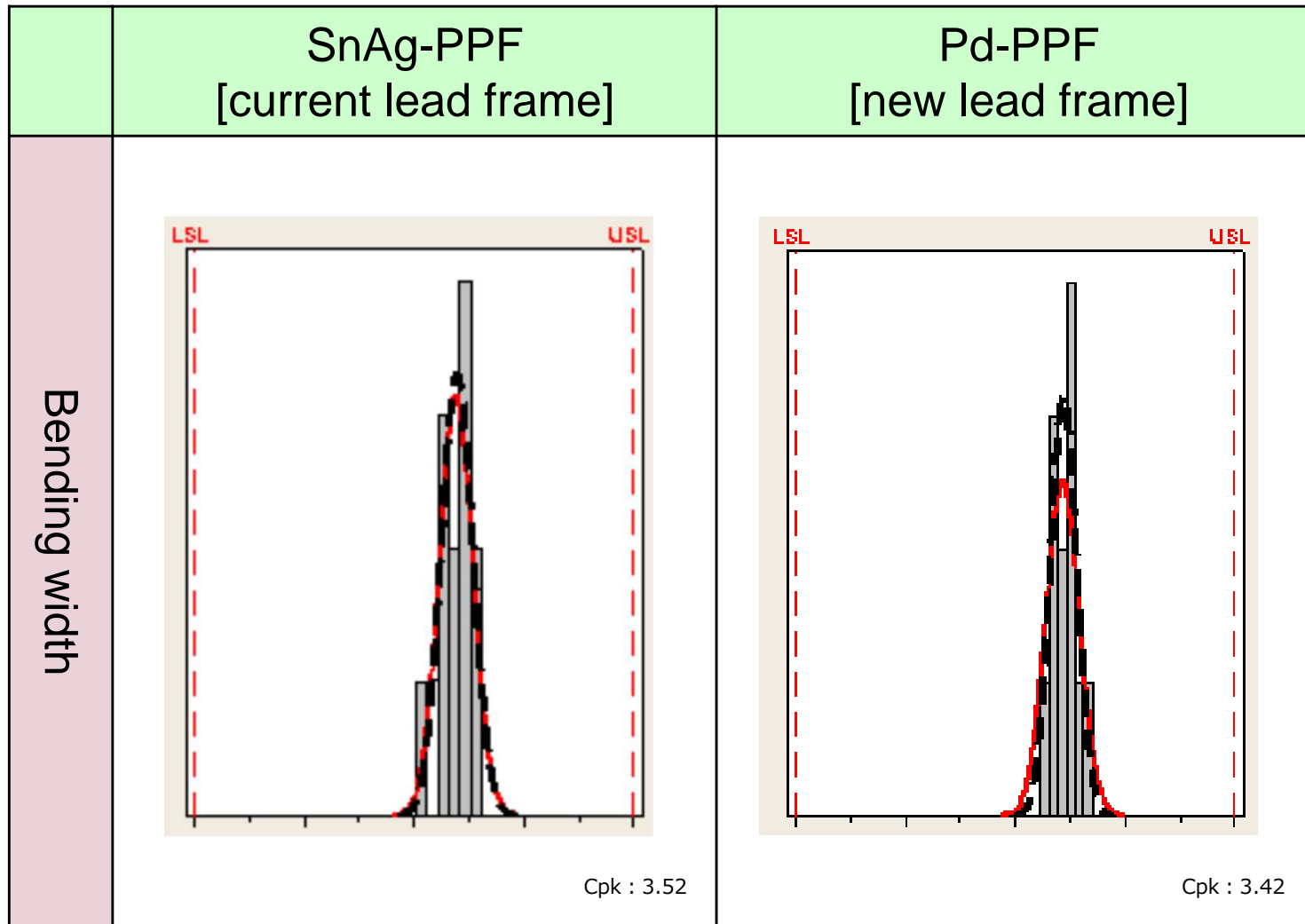
Sample size : n = 8 wires × 3ICs



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

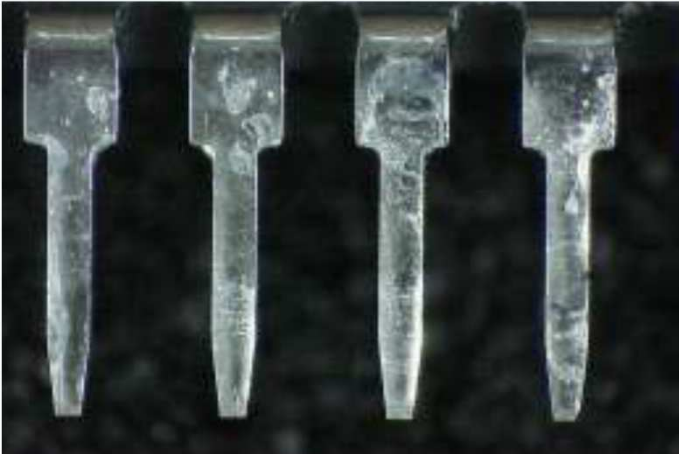

Test item	Test condition	Sample size	Read point
			Test result (reject/gross)
Temperature cycle test (TCT)	-65°C~150°C	30pcs×3 leadframe lots	300 cycles
			0/30pcs×3 leadframe lots
Pressure cooker test (PCT)	Ta=127°C, RH=100% 0.25MPa(non-condensing)	30pcs×3 leadframe lots	120 hours
			0/30pcs×3 leadframe 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]
	



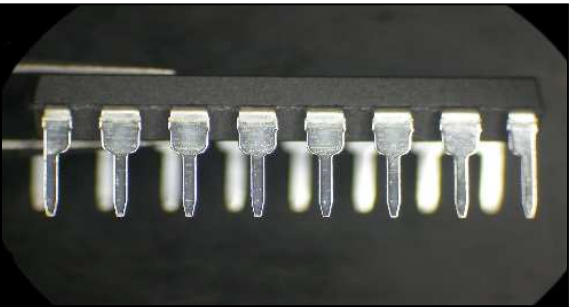
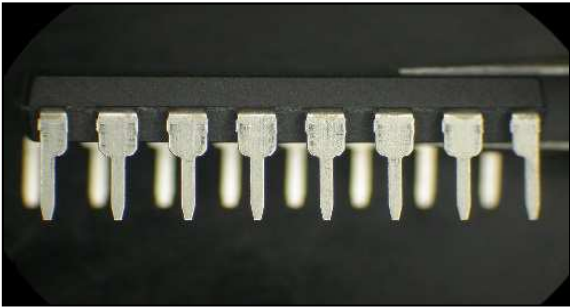
No problem without significant difference from the current lead frame

- 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		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

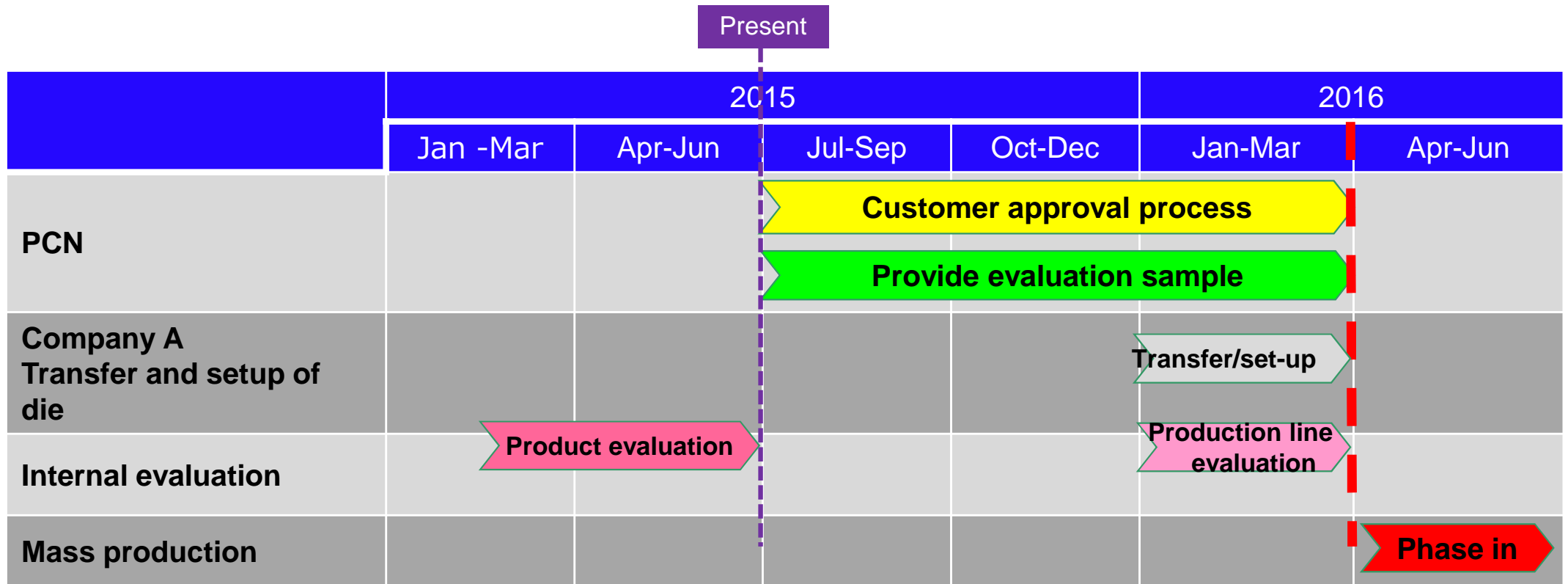
No problem in process capabilities without significant difference from the current lead frame

- 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 >>>