

Self Qualification Results

NiPdAu lead- free solution of

- *SO8/14/16/20/24/28/32 assembled in Philips Semiconductors Thailand which were not notified in previous phases.*
 - *TSSOP20 assembled in Philips Semiconductors Calamba.*
 - *SSOP48/56 assembled in Philips Semiconductors Thailand.*
 - *SSOP14/16/20 assembled in Philips Semiconductors Thailand.*
 - *SSOP20 assembled in Philips Semiconductors Calamba.*
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Assembly & Test Organization Philips Semiconductors	Self Qualification Results: NiPdAu SO8/14/16/20/24/28/32, TSSOP20, SSOP14/16/20/48/56, PST and PSC	Document Number RNR-83-04/RdH/RdH-2031
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1. Introduction

The intention of the change to lead-free packages from Philips has been announced in the Advance CPCN for Pb-free, issued in May 2003, CPCN # 200305025.

The final CPCN will be issued in different phases, each phase showing qualification results of a certain group of packages.

This self qualification report presents an overview of the qualification data completed to release the following packages in NiPdAu :

- SO8/14/16/20/24/28/32 assembled in Philips Semiconductors Thailand which were not notified in previous phases.
- TSSOP20 assembled in Philips Semiconductors Calamba.
- SSOP48/56 assembled in Philips Semiconductors Thailand.
- SSOP14/16/20 assembled in Philips Semiconductors Thailand.
- SSOP20 assembled in Philips Semiconductors Calamba.

In order to validate assembly quality and reliability, a self-qualification program has been performed for above mentioned packages.

The results of this qualification demonstrate that Philips Semiconductors can achieve distinctive assembly quality with equal or better product quality and reliability when compared to the lead-tin plated versions of these products.

With the introduction of NiPdAu as lead-free solution, the Bill of Materials (BoM) of the mentioned packages is fully compliant to the RoHS legislation requirements.

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2. Assembly Facilities

PST

Philips Semiconductors Thailand has been in operation in Bangkok Thailand since 1974. With a current workforce of approximately 3,800 personnel and its 60,000 square meter site, PST is capable of assembly and test of a wide range of DIP, SILP, SO, T/SSOP, IC Module and Contactless Module packages. Testing for QFP and PLCC is also available at PST.

PST obtained ISO9001 certification in 1991, ISO14001 certification and the internal Philips Quality Award (PQA-90) in 1996, and QS9000 certification in 1997. A strong emphasis on quality improvement programs has also resulted in PST receiving the Golden Pentastar Award from Chrysler Corporation. In August 2003, PST was ISO/TS 16949 2002 certified.

PSC

Philips Semiconductors Calamba is a new, state-of-art facility for the assembly and testing of IC's located at the Light Industry and Science Park II in Calamba. The plant occupies an area of 85,000 square meters of land. Construction of the first phase with a floor area of 17,900 square meters was completed in 1998, while the second phase is already in construction.

Package family portfolio and test capabilities of PSC consists of SSOP/TSSOP, QFP, HVQFN and LF/TFBGA. Philips Semiconductors Calamba successfully passed certification to the QS9000 standard, while ISO 14001 certification was achieved in March 2000.

3. Materials selection background

NiPdAu pre-plated leadframes

main characteristics :

- good solderability with lead-containing and lead free solders
- good solder joint reliability
- used in high volume
- offered by major lead frame suppliers
- non whisker-sensitive technology

NiPdAu pre-plated leadframes are chosen as alternative lead-free solution and will be applied in SO, SSOP and TSSOP packages. Initially just for in-house assembly, later also at subcontractors delivering to Philips.

Untill subcontractors can offer NiPdAu, their packages will be in matte Sn.

In the long term roadmap, the part of NiPdAu might be increased to other families.

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4. Constructional Details of Test vehicles

Group 2 : SO14-16-20 not notified in previous phases

Lot	PST-2-08	PST-2-09	PST-2-11	PST-2-12
Assy Site	PST	PST	PST	PST
Package / Pin	SO16	SO16	SO14	SO14
Outline	SOT162-1	SOT162-1	SOT108-1	SOT108-1
Moulding compound	6210	6210	6210	6210
Die-Attach Adhesive	84-1LMISR4	84-1LMISR4	84-1LMISR4	84-1LMISR4
Chipcoat	NO	NO	YES	YES
Pitch/ E or P	1.27/P	1.27/P	1.27/ P	1.27/ P
Die Pad Size (mm)	4.20x5.20	3.20x4.00	2.30x5.40	2.30x5.40
Die Size (mm)	3.49x4.02	2.36x3.51	2.06x4.98	2.06x4.98
Vehicle name	CE1460 D C	SAA6579T/V1	PCA82C252T/N3	PCA82C252T/N3
Subpack old	SOT162AH14	SOT162AH13	SOT108AJ17C	SOT108AJ17C

Lot	PST-2-13	PST-2-14	PST-2-15	PST-2-16
Assy Site	PST	PST	PST	PST
Package / Pin	SO16	SO16	SO16	SO14
Outline	SOT109-1	SOT109-1	SOT109-1	SOT108-1
Moulding compound	6210	6210	6210	6210
Die-Attach Adhesive	84-1LMISR4	84-1LMISR4	84-1LMISR4	84-1LMISR4
Pitch/ E or P	1.27/ P	1.27/ P	1.27/ P	1.27/ P
Die Pad Size (mm)	2.20x3.20	2.20x3.20	2.20x4.40	2.30x5.40
Die Size (mm)	1.83x2.92	1.83x2.92	1.95x3.18	2.00x3.63
Vehicle name	TDA8559T/N1	TDA8559T/N1	HEF4795BT	AU5783D
Subpack old	SOT109AJ21	SOT109AJ21	SOT109AJ20	SOT108AJ17

Lot	PST-2-17
Assy Site	PST
Package / Pin	SO14
Outline	SOT108-1
Moulding compound	6210
Die-Attach Adhesive	84-1LMISR4
Pitch/ E or P	1.27/ P
Die Pad Size (mm)	2.30x5.40
Die Size (mm)	2.00x3.63
Vehicle name	AU5783D
Subpack old	SOT108AJ17

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Group 3 : SO8-24-28-32

Lot	PST-3-01	PST-3-02	PST-3-03	PST-3-04
Assy Site	PST	PST	PST	PST
Package / Pin	SO8	SO8	SO8	SO24
Outline	SOT96-1	SOT96-1	SOT96-1	SOT137-1
Moulding compound	6210	6210	6210	MP8000
Die-Attach Adhesive	84-1LMISR4	84-1LMISR4	71-1-D	8390P
Pitch/ E or P	1.27/P	1.27/P	1.27/P	1.27/P
Die Pad Size (mm)	2.10x3.20	2.50x4.42	2.10x2.60	3.20x4.00
Die Size (mm)	1.78x2.79	1.80x1.00	1.10x0.79	1.56x2.05
Vehicle name	PCA82C250T/N4	PHK04P02T	LM358DM	74LVC4245AD
Subpack old	SOT96AJ23	SOT96AJ30	SOT96AJ26	SOT137AM9

Lot	PST-3-05	PST-3-06	PST-3-07	PST-3-08
Assy Site	PST	PST	PST	PST
Package / Pin	SO24	SO28	SO28	SO32
Outline	SOT137-1	SOT136-1	SOT136-1	SOT287-1
Moulding compound	MP8000	MP8000	MP8000	MP8000
Die-Attach Adhesive	8390P	8390P	8390P	8390P
Pitch/ E or P	1.27/P	1.27/P	1.27/P	1.27/P
Die Pad Size (mm)	5.20x6.20	3.20x4.00	4.20x5.20	5.20x6.20
Die Size (mm)	2.74x4.50	1.47x1.30	2.72x2.72	3.35x5.22
Vehicle name	TEA0675T/V2	74BT899 DB	CE1710DA	TEA6360T/V2
Subpack old	SOT137AM22	SOT136AM23	SOT136AM17	SOT287BK2

Lot	PST-3-09	PST-3-10	PST-3-11	PST-3-12
Assy Site	PST	PST	PST	PST
Package / Pin	SO28	SO8	SO8	SO8
Outline	SOT136-1	SOT96-1	SOT96-1	SOT96-1
Moulding compound	MP8000	6210	6210	6210
Die-Attach Adhesive	8390P	84-1LMISR4	71-1-D	84-1LMISR4
Chipcoat	YES	YES	NO	NO
Pitch/ E or P	1.27/P	1.27/P	1.27/P	1.27/P
Die Pad Size (mm)	4.20x5.20	2.10x3.20	2.30x3.85	2.50x4.42
Die Size (mm)	3.07x3.94	1.78x2.79	2.01x3.01	1.30x3.90
Vehicle name	TDA3613T/N2	PCA82C250T/N4	CE1676D	PHK12NQ3LT
Subpack old	SOT136AM31C	SOT96AJ23C	SOT96AJ28	SOT96AJ30

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Lot	PST-3-13
Assy Site	PST
Package / Pin	SO8
Outline	SOT96-1
Moulding compound	6210
Die-Attach Adhesive	84-1LMISR4
Pitch/ E or P	1.27/P
Die Pad Size (mm)	2.10x3.20
Die Size (mm)	1.78x2.79
Vehicle name	PCA82C250T/N4
Subpack old	SOT96AJ23

Group 4 : SSOP14-16-20

Lot	PST-4-01	PST-4-02	PST-4-03	PST-4-04
Assy Site	PST	PST	PST	PST
Package / Pin	SSOP14	SSOP16	SSOP16	SSOP20
Outline	SOT337-1	SOT338-1	SOT369-1	SOT266-1
Moulding compound	MP8000	MP8000	MP8000	MP8000
Die-Attach Adhesive	8390P	8390P	8390P	8390P
Pitch/ E or P	0.65/P	0.65/P	0.65/P	0.65/P
Die Pad Size (mm)	1.78x1.78	2.10x2.29	2.40x3.80	3.20x4.00
Die Size (mm)	0.68x0.71	0.74x0.94	2.06x3.58	2.44x2.70
Vehicle name	74LVC32ADB	74LVC138ADB	TSA5526AM/C2	SA575DKD
Subpack old	SOT337BC2	SOT338BC2	SOT369CB5	SOT266CH4

Lot	PST-4-05
Assy Site	PST
Package / Pin	SSOP20
Outline	SOT339-1
Moulding compound	MP8000
Die-Attach Adhesive	8390P
Pitch/ E or P	0.65/P
Die Pad Size (mm)	3.20x4.00
Die Size (mm)	1.88x2.84
Vehicle name	TEA1404TS/N2
Subpack old	SOT339BC5

PSC-4-01	PSC-4-02
PSC	PSC
SSOP20	SSOP24 (*)
SOT339-1	SOT340-1
MP8000	MP8000
8390P	8390P
0.65/P	0.65/P
2.40x2.70	2.70x3.50
0.705x0.96	2.52x1.85
74HC574DB	TDA5737M/C1
SOT339DC3	SOT340CC3

(*) = additional vehicle to support PSC's SSOP20

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Group 5 : SSOP48-56

Lot	PST-5-01	PST-5-02	PST-5-03
Assy Site	PST	PST	PST
Package / Pin	SSOP48	SSOP56	SSOP56
Outline	SOT370-1	SOT371-1	SOT371-1
Moulding compound	MP8000	MP8000	MP8000
Die-Attach Adhesive	8390P	8390P	8390P
Pitch/ E or P	0.65/P	0.65/P	0.65/P
Die Pad Size (mm)	2.60x3.20	2.60x4.00	2.60x4.00
Die Size (mm)	1.25x2.21	1.75x2.97	1.75x2.97
Vehicle name	PDI1284P11DL	74ALVT16601DL	74ALVT16601DL
Subpack old	SOT370DB2	SOT371DB3	SOT371DB3

Group 6 : TSSOP20 from PSC

Lot	PSC-6-01	PSC-6-02
Assy Site	PSC	PSC
Package / Pin	TSSOP20	TSSOP20
Outline	SOT360-1	SOT360-1
Moulding compound	MP8000	MP8000
Die-Attach Adhesive	8390P	8390P
Pitch/ E or P	0.65/P	0.65/P
Die Pad Size (mm)	2.40x2.70	2.75x4.00
Die Size (mm)	0.82x0.90	1.36x1.45
Vehicle name	74LVC244APW	74LVC574APW
Subpack old	SOT360CC2	SOT360CC4

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5. Reliability Test Program

An extensive qualification program has been executed to demonstrate that PST and PSC can assemble lead-free NiPdAu packages with a high quality and reliability.

5.1 Reliability Test Descriptions

In this section the reliability tests are described in detail. These tests are stated in Philips Semiconductors' General Quality Specification (SNW-FQ-611) and the Plastic Package Qualification Guideline (SNW-FA-04-07). AEC_Q100 is used as a guideline for specific automotive products.

Pcon – Preconditioning

SMD Qualification samples for PPOT, HAST/THBS and TMCL undergo SMD reflow preconditioning before reliability test is performed. This preconditioning is performed in accordance with the latest revision of the IPC/JEDEC J-STD-020B specification, as described in Philips Semiconductors specification SNW-FQ-225A. SMD Packages are preconditioned to the appropriate MSL level. Peak temperature applied is 255-260°C.

PPOT – Pressure Pot Test

Pressure Pot Test – autoclave (121°C, 100%R.H., 96 hrs release time point), unbiased with Pcon. This test is particularly suitable to evaluate the moisture resistance of the package.

HAST – Highly Accelerated Stress Test

Highly Accelerated Stress Test (130°C/85% R.H., 96 hrs release time point), with electrical bias and Pcon. This test stresses both the electrical endurance of the design/process, as well as the resistance to moisture of the package.

THBS – Temperature Humidity Bias Stress

Temperature Humidity Bias Stress (85°C/85% R.H., 1000 hrs release time point), with electrical bias and Pcon. This test stresses both the electrical endurance of the design/process, as well as the resistance to moisture of the package. This test is sometimes done instead of HAST.

TMCL – Temperature Cycling

Temperature Cycling (air to air -65°C ⇔ +150°C, 500 cyc release point) with Pcon. This test is aimed at the mechanical integrity of the whole product, under the severe circumstances of rapid changes in temperature.

HTSL – High Temperature Storage Life

High Temperature Storage Life (150°C, 1000 hrs release time point). This test evaluates the reliability of the product after long term storage.

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5.2 Construction Analysis Tests Descriptions

In addition to the reliability evaluation, qualification lots will be subjected to Construction Analysis and Moisture Sensitivity Level assessment testing per the following test methods :

- Visual/Mechanical Inspection (V/M) SNW-FQ-612B
- Lead Finish Inspection (LFNH) Local document
- Moisture Sensitivity Level Assessment SNW-FQ-225B
- X-Ray Inspection (X-RAY) SNW-FQ-312
- SCAT Inspection (SCAT) SNW-FQ-311
- Die Shear Testing (DISH) SNW-FQ-322
- Bond Pull Testing (BPT) SNW-FQ-322
- Bond Shear Testing (BST) SNW-FQ-322
- Cross Section Inspection (CROSS) SNW-FQ-314
- Solderability Inspection (SOLD) SNW-FQ-221

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5.3 Summary of Solder Joint Reliability Tests for lead-free, leadframe based packages.

Variants included in the Investigation

- SMD packages with gull wing and J-leads (SO.....,VSO, QFP.....,PLCC.....)
- Lead frame material : Copper-alloy (mainly) and FeNi42 .
- Terminal finish : Matte Tin 100 , NiPdAu (only for Copper alloy)

- 2 layer FR4 board, (CE 5004)
- Reflow soldering : SnPb36Ag2 and SnAg 3.8Cu0.7
- Wave soldering with SnPb38Bi2 and SnAg3.8Cu0.7

- Temperature Cycling -40°C/125°C according to IEC60068-2-14.
- Electrical test (Daisy Chain) at around 2k intervals and visual inspection.

Conclusions

- No rejects up to 2000 cycles for all combinations.
- Mean time to failure over 6600 cycles except for FeNi based VSO56 and HTQFP100.
- Reflow solder : No significant difference in failure times/fracture modes between SnPb paste and SnAgCu paste.
- Wave solder : No significant difference in failure times/fracture modes between SnPb solder and SnAgCu solder.
- High profile packages / lead forms show less degradation due to a better compliancy.

Remarks

- All package variants applied with lead-containing and lead-free soldering process
- Weibull graphs are shown in the E3 presentation which can be found on the Pb-free CPCN website
.: http://www.semiconductors.philips.com/acrobat/other/green_roadmap/e3_presentation.pdf

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5.4 Self-qualification results NiPdAu packages

Table 1.1 : Reliability Tests NiPdAu SO14/16

Package	Lot No.	Device	PPOT			HAST			TMCL			HTSL	
			Pcon	96 hrs	192 hrs	pcon	96 hrs	192 hrs	Pcon	200c	500c	1000h	2000h
SO16	PST-2-08	CE1460 D C	L3	0/77	-	-	-	-	L3	0/77	-	0/77	-
SO16	PST-2-09	SAA6579T/V1	L1	0/77	-	L1	0/45	0/45	L1	0/77	0/77	0/77	0/77
SO14	PST-2-11	PCA82C252T/N3	L2	0/77	-	-	-	-	L2	0/77	-	0/77	-
SO14	PST-2-12	PCA82C252T/N3	L2	0/77	-	-	-	-	L2	0/77	-	0/77	-
SO16	PST-2-13	TDA8559T	L2	0/77	0/77	L2	0/45	0/45	L2	0/77	0/77	0/77	0/77
SO16	PST-2-14	TDA8559T	L2	0/77	0/77	L2	0/45	0/45	L2	0/77	0/77	0/77	0/77
SO16	PST-2-15	HEF4795BT	L3	0/77	-	-	-	-	L3	0/77	-	0/77	-
SO14	PST-2-16	AU5783D	L3	0/77	-	-	-	-	L3	0/77	-	0/77	-
SO14	PST-2-17	AU5783D	L3	0/77	-	-	-	-	L3	0/77	-	0/77	-

Reliability qualification requirements time points are shown in **bold**, additional points are for engineering evaluation.

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Table 1.2 : Reliability Tests NiPdAu SO8/24/28/32

Package	Lot No.	Device	PPOT			HAST			TMCL			HTSL	
			Pcon	96 hrs	192 hrs	pcon	96 hrs	192 hrs	Pcon	200c	500c	1000h	2000h
SO8	PST-3-01	PCA82C250T/N4	-	-	-	L1	0/45	0/45	L1	0/77	0/77	0/77	0/77
SO8	PST-3-02	PHK04P02T	L1	0/77	-	-	-	-	L1	0/77	-	0/77	-
SO8	PST-3-03	LM358DM	L1	0/77	-	-	-	-	L1	0/77	-	0/77	-
SO24	PST-3-04	74LVC4245AD	L1	0/77	-	-	-	-	L1	0/77	-	0/77	-
SO24	PST-3-05	TEA0675T/V2	L3	0/77	0/77	L3	0/45	0/45	L3	0/77	0/77	0/77	-
SO28	PST-3-06	74BT899 DB	L1	0/77	-	-	-	-	L1	0/77	-	0/77	-
SO28	PST-3-07	CE1710DA	L3	0/77	-	-	-	-	L3	0/77	-	0/77	-
SO32	PST-3-08	TEA6360T/V2	L1 See note	0/77	-	-	-	-	L1	0/77	-	0/77	-
SO28	PST-3-09	TDA3613T/N2	L1	0/77	-	-	-	-	L1	0/77	-	0/77	-
SO8	PST-3-10	PCA82C250T/N4	L1	0/77	-	-	-	-	-	-	-	-	-
SO8	PST-3-11	CE1676D	L1	0/77	-	-	-	-	L1	0/77	-	0/77	-
SO8	PST-3-12	PHK12NQ03LT	L1	0/77	-	-	-	-	L1	0/77	-	0/77	-
SO8	PST-3-13	PCA82C250T/N4	L1	0/77	-	-	-	-	-	-	-	-	-

Reliability qualification requirements time points are shown in **bold**, additional points are for engineering evaluation.

Note : SO32 (JEDEC large body) reflow temperature is 245°C , all others (JEDEC small body) subjected to 255-260 °C.

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Table 1.3 : Reliability Tests NiPdAu SSOP and TSSOP

Package	Lot No.	Device	PPOT			HAST			TMCL			HTSL	
			Pcon	96 hrs	192 hrs	pcon	96 hrs	192 hrs	Pcon	200c	500c	1000h	2000h
SSOP14	PST-4-01	74LVC32ADB	L1	0/77	-	-	-	-	L1	0/77	-	0/77	-
SSOP16	PST-4-02	74LVC138ADB	L1	0/77	-	-	-	-	L1	0/77	-	0/77	-
SSOP16	PST-4-03	TSA5526AM/C2	L1	0/77	-	-	-	-	L1	0/77	-	0/77	-
SSOP20	PST-4-04	SA575DKD	L1	0/77	-	-	-	-	L1	0/77	-	0/77	-
SSOP20	PST-4-05	TEA1404TS/N2	L1	0/77	-	-	-	-	L1	0/77	-	0/77	-
SSOP20	PSC-4-01	74HC574DB	L1	0/77	0/77	L1	0/45	45	L1	0/77	0/77	0/77	-
SSOP24	PSC-4-02	TDA5737M/C1	L1	0/77	0/77	-	-	-	L1	0/77	77	0/77	-
SSOP48	PST-5-01	PDI1284P11DL	L1	0/77	-	-	-	-	L1	0/77	0/77	0/77	-
SSOP56	PST-5-02	74ALVT16601DL	L1	0/77	0/77	L1	0/45	0/45	L1	0/77	0/77	0/77	-
SSOP56	PST-5-03	74ALVT16601DL	L1	0/77	0/77	L1	0/45	0/45	L1	0/77	0/77	0/77	-
TSSOP20	PSC-6-01	74LVC244APW	L1	0/77	0/77	-	-	-	L1	0/77	0/77	0/77	-
TSSOP20	PSC-6-02	74LVC574APW	L1	0/77	0/77	L1	0/45	-	L1	0/77	0/77	0/77	-

Reliability qualification requirements time points are shown in **bold**, additional points are for engineering evaluation.

Yellow = ongoing to extended readpoint

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Table 2.1 : Construction Analysis tests NiPdAu SO14/16

Package	Lot No.	Device	Construction Analysis Tests								
			MSLA 260°C	V/M	LFNH	SOLD See note	XRAY	SCAT	DISH	BP/BS	CROSS
SO16	PST-2-08	CE1460 D C	L3	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO16	PST-2-09	SAA6579T/V1	L2	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO14	PST-2-11	PCA82C252T/N3	L2	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO14	PST-2-12	PCA82C252T/N3	L2	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO16	PST-2-13	TDA8559T	L2	-	-	-	-	-	-	-	-
SO16	PST-2-14	TDA8559T	L2	-	-	-	-	-	-	-	-
SO16	PST-2-15	HEF4795BT	L3	-	-	-	-	-	-	-	-
SO14	PST-2-16	AU5783D	L3	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO14	PST-2-17	AU5783D	L3	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3

Note:

11 parts tested in SnPb solder after 8h steam age, 5 sec, 215 °C
11 parts tested in SnPb solder after 16h dry-bake, 5 sec, 215 °C
11 parts tested in SAC solder after 8h steam age, 3 sec, 245 °C
11 parts tested in SAC solder after 16h dry-bake, 3 sec, 245 °C
RMA flux used for all tests.

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Table 2.2 : Construction Analysis tests NiPdAu SO8/24/28/32

Package	Lot No.	Device	Construction Analysis Tests								
			MSLA 260°C	V/M	LFNH	SOLD See note 1	XRAY	SCAT	DISH	BP/BS	CROSS
SO8	PST-3-01	PCA82C250T/N4	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO8	PST-3-02	PHK04P02T	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO8	PST-3-03	LM358DM	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO24	PST-3-04	74LVC4245AD	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO24	PST-3-05	TEA0675T/V2	L3	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO28	PST-3-06	74BT899 DB	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO28	PST-3-07	CE1710DA	L3	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO32(note 2)	PST-3-08	TEA6360T/V2	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SO28	PST-3-09	TDA3613T/N2	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
S08	PST-3-10	PCA82C250T/N4	L1	-	-	-	-	-	-	-	-
SO8	PST-3-11	CE1676D	L1	-	-	-	-	-	-	-	-
SO8	PST-3-12	PHK12NQ03LT	L1	-	-	-	-	-	-	-	-
S08	PST-3-13	PCA82C250T/N4	L1	-	-	-	-	-	-	-	-

Note 1:

11 parts tested in SnPb solder after 8h steam age, 5 sec, 215 °C
11 parts tested in SnPb solder after 16h dry-bake, 5 sec, 215 °C
11 parts tested in SAC solder after 8h steam age, 3 sec, 245 °C
11 parts tested in SAC solder after 16h dry-bake, 3 sec, 245 °C
RMA flux used for all tests.

Note 2 : SO32 (JEDEC large body) reflow temperature is 245°C , all others (JEDEC small body) subjected to 255-260 °C.

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Table 2.3 : Construction Analysis tests NiPdAu SSOP and TSSOP

Package	Lot No.	Device	Construction Analysis Tests								
			MSLA 260°C	V/M	LFNH	SOLD See note	XRAY	SCAT	DISH	BP/BS	CROSS
SSOP14	PST-4-01	74LVC32ADB	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SSOP16	PST-4-02	74LVC138ADB	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SSOP16	PST-4-03	TSA5526AM/C2	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SSOP20	PST-4-04	SA575DKD	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SSOP20	PST-4-05	TEA1404TS/N2	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SSOP20	PSC-4-01	74HC574DB	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SSOP24	PSC-4-02	TDA5737M/C1	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SSOP48	PST-5-01	PDI1284P11DL	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SSOP56	PST-5-02	74ALVT16601DL	L2	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
SSOP56	PST-5-03	74ALVT16601DL	L2	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
TSSOP20	PSC-6-01	74LVC244APW	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3
TSSOP20	PSC-6-02	74LVC574APW	L1	0/15	0/9	4x 0/11	0/8	0/8	0/3	0/3	0/3

Note:

11 parts tested in SnPb solder after 8h steam age, 5 sec, 215 °C
11 parts tested in SnPb solder after 16h dry-bake, 5 sec, 215 °C
11 parts tested in SAC solder after 8h steam age, 3 sec, 245 °C
11 parts tested in SAC solder after 16h dry-bake, 3 sec, 245 °C
RMA flux used for all tests.

Assembly & Test Organization Philips Semiconductors	Self Qualification Results: NiPdAu SO8/14/16/20/24/28/32, TSSOP20, SSOP14/16/20/48/56, PST and PSC	Document Number RNR-83-04/RdH/RdH-2031
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Table 3: *Construction Analysis tests NiPdAu, additional tests for automotive.*

	Lot		Construction Analysis Tests		
Package	No.	Device	BPT after TMCL 500c		
S08	PST-3-01	PCA82C250T/N4	0/5		

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6. Conclusion

An extensive qualification program has been executed to demonstrate that PST and PSC can assemble SO, SSOP and TSSOP packages in NiPdAu pre-plated lead-frames at a high quality and reliability level.

With the positive completion of the Qualification tests, the Assembly and Test Organization Philips Semiconductors announces the release of NiPdAu pre-plated leadframes for use in SO14/16/20 assembled in PST, TSSOP20 assembled at PSC, SSOP48/56 assembled at PST and SSOP14/16/20 assembled in PST+PSC, via final CPCN 20030525F supplement 3.

7. Implementation

Deliveries will start from August 2004 onwards.

8. Document Revision Sheet

R E V I S I O N S H E E T			
DATE yyyy/mm/dd	REV	DESCRIPTION	AUTHOR
2004-05-13	01	Self Qualification Results phase 4 for Lead (Pb) free lead-finish of leadframe-based IC packages. SO8/14/16/20/24/28/32 at PST which were not notified in previous phases, TSSOP20 at PSC, SSOP48/56 at PST and SSOP14/16/20 at PST+PSC.	Rob de Heus