

## *Self Qualification Plan*

*Qualification of :*

*NiPdAu pre-plated leadframes, Green Molding Compound and Green Die-Attach*

*for SSOP, TSSOP and HTSSOP packages*

*assembled in Subcontractor Amkor Technologies Philippines*

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## 1. Introduction

Throughout the electronics industry, the desire for Pb-free ( Pb = lead ) and green components is a hot topic. Customers and manufacturers alike are keen to ensure that new regulations in Europe, the US and Far East are complied with, sooner rather than later :

- In Europe, a EU directive on Restrictions on the use of Hazardous Substances (RoHS) requires the elimination of lead in electronics by July 1<sup>st</sup>, 2006.
- In Japan, electronic waste and recycling laws oblige manufacturers to eliminate or recover their waste products containing lead
- In the United States, laws banning or restricting the use of lead are already in place for many products and there is an increasing demand for a ban.

As a temporary solution, Philips has offered ATP's SSOP and (H)TSSOP packages in matte Sn + postbake, please see final CPCN 20030525F supplement 3 and 4.

However, the final lead-free solution in ATP is NiPdAu, in-line with Philips in-house production materials.

This self-qualification plan presents an overview of the qualification test to qualify the following material changes:

### SSOP family :

NiPdAu pre-plated leadframes + Ablestik Ablebond 8290 die-attach + Sumitomo EMEG600 mold compound

### TSSOP + HTSSOP family:

NiPdAu pre-plated leadframes + Ablestik Ablebond 8290 die-attach + Sumitomo EMEG700 mold compound

All qualification tests will be done per J-STD 020C conditions, using 260 °C only.

With the introduction of above mentioned materials, these packages fully comply to the RoHS 2006 legislations and also fulfils the future legislation on banning of Halogenes and Antimony Oxides. Combination of the new die-attach glues and the new molding compounds improves the package quality, especially towards the higher reflow temperatures which are required for leadfree soldering.

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## 2. Assembly Facilities

### *AMKOR Technologies Philippines (ATP)*

AMKOR is one of Philips preferred subcontractors and is established in 1968. Amkor has grown to be a world-class leader in integrated circuit (IC) packaging, assembly and test services. AMKOR has assembly factories in Korea (ATK), Taiwan (ATT), China (ATC) and the Philippines (ATP). Package family portfolio of AMKOR/ANAM consists of amongst others DIP, SO, SSOP, PLCC, QFP, (LF)BGA and CSP. AMKOR is certified SAC level 1.

## 3. Material details

### 3.1 NiPdAu pre-plated leadframes

main characteristics :

- good solderability with SnPb and Pb free solders
- good solder joint reliability
- used in high volume
- offered by major lead frame suppliers
- whisker free

NiPdAu pre-plated leadframes are chosen as alternative Pb-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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### 3.2 Molding Compounds

EMEG600 and EMEG700 are SiO<sub>2</sub> filled epoxy moulding compounds designed for improved JEDEC moisturizing performance and HTSL performance. In Table 1 the properties of EMEG600 and EMEG700 are compared to the reference materials MP8000 and KMC184.

**Table 1:** Manufacturers Typical Properties of MP8000/KMC and G600/G700

<b>Molding Compound Properties</b>	<b>Current Production MP8000 NITTO</b>	<b>Current Production KMC184 SHIN-ETSU</b>	<b>Planned Change EMEG600 SUMITOMO</b>	<b>Planned Change EMEG700 SUMITOMO</b>
Resin type	epoxy cresol novalac	epoxy cresol novalac	multi aromatic epoxy	multi aromatic epoxy
Hardener type	phenol novalac	phenol novalac	multi aromatic	multi aromatic
Filler type (%)	75	81	86	84
Flame-retardant system	brominated epoxy + antimony oxide	brominated epoxy + antimony oxide	none	none
Antimony oxide	yes	yes	no	no
T <sub>g</sub> (°C)	140	160	135	130
Specific gravity	1.88	1.89	1.99	1.95
α <sub>1</sub> (ppm/°C)	16.1	13	10	12
α <sub>2</sub> (ppm/°C)	64.7	59	39	49
Flexural strength @RT (N/mm <sup>2</sup> )	140	120	185	170
Flexural modulus @RT (N/mm <sup>2</sup> )	12200	12300	24000	19000
Flexural strength @240°C (N/mm <sup>2</sup> )	20	16/17	21@260°C	21
Flexural modulus @240°C (N/mm <sup>2</sup> )	1000	1200	720@260°C	600
Dielectric Constant at 1MHz	3.8	3.9	4.0	4.2
Dissipation Factor at 1MHz	0.8	0.007	0.005	0.01
Volume Resistivity at 150°C (Ωm)	7X10 <sup>12</sup>	3X10 <sup>12</sup>	> 1X10 <sup>12</sup>	1X10 <sup>12</sup>
Thermal Conductivity (W/mK)	0.75	0.63	0.92	0.88
UL94-V0 Flammability	1/8"	1/8"	1/8"	1/8"
Oxygen index	38	<35	53	35
Polymer mass (%)	22	25	11-15	15-17

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### 3.3 Die Attach Glues

Ablebond 8290 is a silver filled die-attach glue, designed for improved JEDEC moisturizing performance. In Table 2 the properties of Ablebond 8290 is compared to the reference materials Ablebond 84-1LMISR4 and Ablebond 8390.

**Table 2:** Manufacturers Typical Properties of Ablebond 84-LMISR4/8390 and Ablebond 8290.

<b>Die Attach Properties</b>	<b>Current Production Ablebond 84-1LMISR4 ABLESTIK</b>	<b>Current Production Ablebond 8390 ABLESTIK</b>	<b>Planned Change Ablebond 8290 ABLESTIK</b>
Adhesive Type	Epoxy	Epoxy	Epoxy
Filler	Silver	Silver	Silver
Viscosity @ 25°C	8,000 cps	9,800 cps	9,000 cps
Thixotropic Index	5.6	4.5	5.3
Volume Resistivity	0.0001 Ω-cm	0.002 Ω-cm	0.008 Ω-cm
Thermal Conductivity @ 121°C	2.5 W/m <sup>2</sup> K	1.0 W/m <sup>2</sup> K	1.1 W/m <sup>2</sup> K
Glass Transition Temp	120°C	60°C	38°C
Coefficient of Thermal Expansion - Below Tg - Above Tg	40 ppm/°C 150 ppm/°C	83 ppm/°C 165 ppm/°C	81 ppm/°C 181 ppm/°C
Ionic Data - Chlorine - Sodium - Potassium	< 5 ppm < 3 ppm < 1 ppm	< 1 ppm < 3 ppm < 1 ppm	< 19 ppm < 12 ppm < 1 ppm
Water Extract - Conductivity - pH	13 μmhos/cm 6.0	70 μmhos/cm 7.4	
Storage Life	1 year at -40°C	1 year at -40°C	1 year at -40°C

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#### 4. Constructional Details of Test vehicles

##### 4.1 SSOP packages

Lot	ATP-2-01	ATP-13-01	ATP-13-02	ATP-2-02
Assy Site	ATP	ATP	ATP	ATP
Package / Pin	SSOP16	SSOP16	SSOP16	SSOP20
Outline	SOT338-1	SOT519-1	SOT519-1	SOT339-1
Moulding compound	G600	G600	G600	G600
Die-Attach Adhesive	8290	8290	8290	8290
Pitch/ E or P	0.65 / P	0.635 / P	0.635 / P	0.65 / P
Die Pad Size (mm)	3.3 x 3.3	2.44 x 3.3	2.44 x 3.3	3.0 x 3.0
Die Size (mm)	1.14 x 1.45	1.99 x 2.58	1.99 x 2.58	0.095 x 1.205
Vehicle name	74LV4051DB	CD8453DS	CD8453DS	74HC574DB
Subpack old	SOT338AA1	SOT519AA1	SOT519AA1	SOT339AA1

Lot	ATP-3-01	ATP-3-02	ATP-4-01	ATP-4-02
Assy Site	ATP	ATP	ATP	ATP
Package / Pin	SSOP24	SSOP24	SSOP28	SSOP28
Outline	SOT340-1	SOT340-1	SOT341-1	SOT341-1
Moulding compound	G600	G600	G600	G600
Die-Attach Adhesive	8290	8290	8290	8290
Pitch/ E or P	0.65 / P	0.65 / P	0.65 / P	0.65 / P
Die Pad Size (mm)	3.9 x 5.9	3.9 x 5.9	3.5 x 3.5	3.5 x 3.5
Die Size (mm)	2.77 x 4.76	2.77 x 4.76	1.69 x 1.88	1.69 x 1.88
Vehicle name	TEA5880TS/N1	TEA5880TS/N1	TDA6502ATS/C1	TDA6502ATS/C1
Subpack old	SOT340GA7	SOT340GA7	SOT341GA1	SOT341GA1

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#### 4.2 TSSOP packages in 3 x 3 body-size

Lot	ATP-5-04	ATP-5-05	ATP-5-06
Assy Site	ATP	ATP	ATP
Package / Pin	TSSOP8	TSSOP8	TSSOP8
Outline	SOT505-1	SOT505-2	SOT505-2
Moulding compound	G700	G700	G700
Die-Attach Adhesive	8290	8290	8290
Pitch/ E or P/ isol or gnd	0.65 / P/ isolated	0.65 / P/isolated	0.65 / P/isolated
Die Pad Size (mm)	1.73 x 2.39	1.1 x 1.25	1.1 x 1.25
Die Size (mm)	0.60 x 0.68	0.575 x 0.48	0.535 x 0.43
Vehicle name	GTL2002DP	74HC3G14DP	74HCT2G125DP
Subpack old	SOT505CA2	SOT505DD6	SOT505DD6

Lot	ATP-6-01	ATP-6-02	ATP-6-03
Assy Site	ATP	ATP	ATP
Package / Pin	TSSOP10	TSSOP10	TSSOP10
Outline	SOT552-1	SOT552-1	SOT552-1
Moulding compound	G700	G700	G700
Die-Attach Adhesive	8290	8290	8290
Pitch/ E or P/ isol or gnd	0.65 / P/ grounded	0.65 / P/ grounded	0.65 / P/ grounded
Die Pad Size (mm)	1.73 x 2.39	1.73 x 2.39	1.73 x 2.39
Die Size (mm)	1.06 x 0.94	1.06 x 0.94	1.06 x 0.94
Vehicle name	OM5968TT/C1	OM5968TT/C1	OM5968TT/C1
Subpack old	SOT552AA2	SOT552AA2	SOT552AA2

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### 4.3 TSSOP packages in 4.4 mm wide bodysize

Lot	ATP-1-01	ATP-1-02	ATP-1-03	ATP-1-04
Assy Site	ATP	ATP	ATP	ATP
Package / Pin	TSSOP16 (6-rows)	TSSOP16 (7-rows)	TSSOP20	TSSOP20
Outline	SOT403-1	SOT403-1	SOT360-1	SOT360-1
Moulding compound	G700	G700	G700	G700
Die-Attach Adhesive	8290	8290	8290	8290
Pitch/ E or P	0.65 / P	0.65 / P	0.65 / P	0.65 / P
Die Pad Size (mm)	3.0 x 3.0	3.0 x 3.0	3.0 x 4.2	3.0 x 4.2
Die Size (mm)	1.20 x 1.53	1.20 x 1.53	1.48 x 1.79	1.48 x 1.79
Vehicle name	74LV4060PW	74LV4060PW	74LV574PW	74LV574PW
Subpack old	SOT403AA1	SOT403AA1	SOT360AA1	SOT360AA1

Lot	ATP-14-01	ATP-14-02	ATP-14-03
Assy Site	ATP	ATP	ATP
Package / Pin	HTSSOP20	HTSSOP20	HTSSOP20
Outline	SOT527-1	SOT527-1	SOT527-1
Moulding compound	G700	G700	G700
Die-Attach Adhesive	8290	8290	8290
Chipcoat	n.a.	n.a.	n.a.
Pitch/ E or P	0.65 / P	0.65 / P	0.65 / P
Die Pad Size (mm)	3.0 x 4.2	3.0 x 4.2	3.0 x 4.2
Die Size (mm)	2.13 x 2.72	2.13 x 2.72	2.13 x 2.72
Vehicle name	TDA1517ATW/N1	TDA1517ATW/N1	TDA1517ATW/N1
Subpack old	SOT527CA3	SOT527CA3	SOT527CA3

Lot	ATP-8-01	ATP-8-02	ATP-8-03	ATP-8-04
Assy Site	ATP	ATP	ATP	ATP
Package / Pin	TSSOP28	TSSOP28	TSSOP28	TSSOP28
Outline	SOT361-1	SOT361-1	SOT361-1	SOT361-1
Moulding compound	G700	G700	G700	G700
Die-Attach Adhesive	8290	8290	8290	8290
Pitch/ E or P	0.65 / P	0.65 / P	0.65 / P	0.65 / P
Die Pad Size (mm)	3.0 x 3.5	3.0 x 3.5	3.0 x 3.5	3.0 x 5.5
Die Size (mm)	2.27 x 2.65	2.27 x 2.65	2.27 x 2.65	2.65 x 3.67
Vehicle name	PDIUSB12PW	PDIUSB12PW	PDIUSB12PW	P89LPC932BDH
Subpack old	SOT361AA1	SOT361AA1	SOT361AA1	SOT361AC2

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Lot	ATP-8-05	ATP-7-01	ATP-7-02	ATP-7-03
Assy Site	ATP	ATP	ATP	ATP
Package / Pin	TSSOP28	TSSOP38	TSSOP38	TSSOP38
Outline	SOT361-1	SOT510-1	SOT510-1	SOT510-1
Moulding compound	G700	G700	G700	G700
Die-Attach Adhesive	8290	8290	8290	8290
Pitch/ E or P	0.65 / P	0.5 / E	0.5 / E	0.5 / E
Die Pad Size (mm)	3.0 x 5.5	3.0 x 3.5	3.0 x 3.5	3.0 x 4.5
Die Size (mm)	2.65 x 3.67	2.09 x 2.35	2.09 x 2.35	2.38 x 3.10
Vehicle name	P89LPC932BDH	TDA6650TT/C1	TDA6650TT/C1	P87C54X2BDH
Subpack old	SOT361AC2	SOT510BA3	SOT510BA3	SOT510BB4

Lot	ATP-9-01	ATP-9-02	ATP-11-01
Assy Site	ATP	ATP	ATP
Package / Pin	TSSOP48	TSSOP48	TSSOP56
Outline	SOT480-1	SOT480-1	SOT481-1
Moulding compound	G700	G700	G700
Die-Attach Adhesive	8290	8290	8290
Pitch/ E or P	0.4 / E	0.4 / E	0.4 / E
Die Pad Size (mm)	1.8 x 3.5	1.8 x 3.5	1.41 x 3.27
Die Size (mm)	1.0 x 2.47	1.0 x 2.47	0.86 x 2.44
Vehicle name	PCKV857DGV	PCKV857DGV	74ALVCHT16835DGV
Subpack old	SOT480BA2	SOT480BA2	SOT481BB2

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#### 4.4 TSSOP packages in 6.1 mm wide bodysize

Lot	ATP-10-01	ATP-10-02	ATP-10-03
Assy Site	ATP	ATP	ATP
Package / Pin	TSSOP32	TSSOP32	TSSOP32
Outline	SOT487-1	SOT487-1	SOT487-1
Moulding compound	G700	G700	G700
Die-Attach Adhesive	8290	8290	8290
Pitch/ E or P	0.65 / E	0.65 / E	0.65 / E
Die Pad Size (mm)	3.0 x 3.0	3.0 x 3.0	3.0 x 3.0
Die Size (mm)	1.94 x 1.78	1.94 x 1.78	1.94 x 1.78
Vehicle name	TUN2000TT/C4	TUN2000TT/C4	TUN2000TT/C4
Subpack old	SOT487AD1	SOT487AD1	SOT487AD1

Lot	ATP-12-01	ATP-12-02	ATP-12-03
Assy Site	ATP	ATP	ATP
Package / Pin	TSSOP64	TSSOP80	TSSOP80
Outline	SOT646-1	SOT647-1	SOT647-1
Moulding compound	G700	G700	G700
Die-Attach Adhesive	8290	8290	8290
Pitch/ E or P	0.5 / E	0.4 / E	0.4 / E
Die Pad Size (mm)	3.0 x 6.5	1.4 x 4.3	1.4 x 4.3
Die Size (mm)	1.07 x 4.22	0.81 x 3.7	0.81 x 3.7
Vehicle name	GTL1655DGG	74ALVCHS16830DGB	74ALVCHS16830DGB
Subpack old	SOT646AA2	SOT647BA2	SOT647BA2

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## 5. Reliability Test Program

A qualification program will be executed to demonstrate Amkor can assemble:

- SSOP packages with a high quality and reliability, using NiPdAu leadframes, Sumitomo G600 molding compound and Ablestik 8290 die-attach glue.
- TSSOP+HTSSOP packages with a high quality and reliability, using NiPdAu leadframes, Sumitomo G700 molding compound and Ablestik 8290 die-attach glue.

The reliability qualification test matrix can be found in Section 6.

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.

### 5.1 Reliability Test Details

#### *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-020C specification, as described in Philips Semiconductors specification SNW-FQ-225A. SMD Packages are preconditioned to the appropriate MSL level using 260 °C reflow temperature only.

#### *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. Abbreviations used in the tables:

- 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

## 6. Self-qualification plan.

**Table 3: “Wet” Reliability Stress Tests SSOP packages**

Package	Lot No.	Device	MSL Level	PPOT			HAST			THBS	
				pcon	<b>96 hrs</b>	192 hrs	pcon	<b>90/96 hrs</b>	180/192 hrs	pcon	<b>1000 hrs</b>
SSOP16	ATP-2-01	74LV4051DB		<b>77</b>	<b>77</b>	<b>77</b>	45	45	45	-	-
SSOP16	ATP-13-01	CD8453DS		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-
SSOP16	ATP-13-02	CD8453DS		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-
SSOP20	ATP-2-02	74HC574DB		-	-	-	45	45	45	-	-
SSOP24	ATP-3-01	TEA5880TS/N1		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-
SSOP24	ATP-3-02	TEA5880TS/N1		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-
SSOP28	ATP-4-01	TDA6502ATS/C1		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-
SSOP28	ATP-4-02	TDA6502ATS/C1		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-

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

**Table 4: “Dry” Reliability Stress Tests SSOP packages**

Package	Lot No.	Device	MSL Level	TMCL				HTSL
				Pcon	<b>200 cyc</b>	500 cyc	1000 cyc	<b>1000 hrs</b>
SSOP16	ATP-2-01	74LV4051DB		<b>77</b>	<b>77</b>	-	-	<b>77</b>
SSOP16	ATP-13-01	CD8453DS		<b>77</b>	<b>77</b>	<b>77</b>	-	-
SSOP16	ATP-13-02	CD8453DS		<b>77</b>	<b>77</b>	-	-	-
SSOP24	ATP-3-01	TEA5880TS/N1		<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>
SSOP24	ATP-3-02	TEA5880TS/N1		<b>77</b>	<b>77</b>	-	-	<b>77</b>
SSOP28	ATP-4-01	TDA6502ATS/C1		<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	-
SSOP28	ATP-4-02	TDA6502ATS/C1		<b>77</b>	<b>77</b>	-	-	-

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

**Table 5: Construction Analysis for SSOP packages**

Package	Lot No.	Device	Construction Analysis Tests								
			MSLA Pb-free	V/M	LFNH	SOLD	XRAY	SCAT	DISH	BP/BS	CROSS
SSOP16	ATP-2-01	74LV4051DB	14	15	3	44	8	8	3	3	3
SSOP16	ATP-13-01	CD8453DS	14	15	3	44	8	8	3	3	3
SSOP16	ATP-13-02	CD8453DS	14	15	3	44	8	8	3	3	3
SSOP24	ATP-3-01	TEA5880TS/N1	14	15	3	44	8	8	3	3	3
SSOP24	ATP-3-02	TEA5880TS/N1	14	15	3	44	8	8	3	3	3
SSOP28	ATP-4-01	TDA6502ATS/C1	14	15	3	44	8	8	3	3	3
SSOP28	ATP-4-02	TDA6502ATS/C1	14	-	-	-	-	-	-	-	-

**Table 6: Additional tests.**

Package	Lot No.	Device	Construction Analysis Tests		
			BPT after TMCL 500c	Glue-ability for wave-soldering	
SSOP16	ATP-13-01	CD8453DS	5	-	
SSOP24	ATP-3-01	TEA5880TS/N1	5	-	
SSOP28	ATP-4-01	TDA6502ATS/C1		5	

**Table 7: "Wet" Reliability Stress Tests TSSOP packages in 3 x3 mm bodysize**

Package	Lot No.	Device	MSL Level	PPOT			HAST			THBS	
				pcon	96 hrs	192 hrs	pcon	90/96 hrs	180/192 hrs	pcon	1000 hrs
TSSOP8	ATP-5-04	GTL2002DP		<b>77</b>	<b>77</b>	-	-	-	-	-	-
TSSOP8	ATP-5-05	74HC3G14DP		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-
TSSOP8	ATP-5-06	74HCT2G125DP		<b>77</b>	<b>77</b>	<b>77</b>					
TSSOP10	ATP-6-01	OM5968TT/C1		-	-	-	45	45	45	-	-
TSSOP10	ATP-6-02	OM5968TT/C1		-	-	-	45	45	45	-	-
TSSOP10	ATP-6-03	OM5968TT/C1		-	-	-	45	45	45	-	-

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

**Table 8: "Dry" Reliability Stress Tests TSSOP packages in 3 x3 mm bodysize**

Package	Lot No.	Device	MSL Level	TMCL				HTSL 1000 hrs
				Pcon	200 cyc	500 cyc	1000 cyc	
TSSOP8	ATP-5-04	GTL2002DP		<b>77</b>	<b>77</b>	<b>77</b>	-	-
TSSOP8	ATP-5-05	74HC3G14DP		<b>77</b>	<b>77</b>	<b>77</b>		
TSSOP8	ATP-5-06	74HCT2G125DP		<b>77</b>	<b>77</b>	<b>77</b>		
TSSOP10	ATP-6-01	OM5968TT/C1		<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	-
TSSOP10	ATP-6-02	OM5968TT/C1		<b>77</b>	<b>77</b>	-	-	-
TSSOP10	ATP-6-03	OM5968TT/C1		<b>77</b>	<b>77</b>	-	-	-

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

**Table 9:** Construction Analysis for TSSOP packages in 3 x3 mm bodysize

Package	Lot No.	Device	Construction Analysis Tests								
			MSLA Pb-free	V/M	LFNH	SOLD	XRAY	SCAT	DISH	BP/BS	CROSS
TSSOP8	ATP-5-04	GTL2002DP	14	-	-	-	-	-	-	-	-
TSSOP8	ATP-5-05	74HC3G14DP	14	15	3	44	8	8	3	3	3
TSSOP8	ATP-5-06	74HCT2G125DP	14	15	3	44	8	8	3	3	3
TSSOP10	ATP-6-01	OM5968TT/C1	14	15	3	44	8	8	3	3	3
TSSOP10	ATP-6-02	OM5968TT/C1	14	15	3	44	8	8	3	3	3
TSSOP10	ATP-6-03	OM5968TT/C1	14	15	3	44	8	8	3	3	3

**Table 10:** Additional tests.

Package	Lot No.	Device	Construction Analysis Tests		
			BPT after TMCL 500c		
TSSOP10	ATP-6-01	OM5968TT/C1	5		

**Table 11:** "Wet" Reliability Stress Tests TSSOP packages in 4.4 mm body-width

Package	Lot No.	Device	MSL Level	PPOT			HAST			THBS	
				pcon	<b>96 hrs</b>	192 hrs	pcon	<b>90/96 hrs</b>	180/192 hrs	pcon	<b>1000 hrs</b>
TSSOP16	ATP-1-01	74LV4060PW		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-
TSSOP16	ATP-1-02	74LV4060PW		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-
TSSOP20	ATP-1-03	74LV574PW		-	-	-	45	45	45	-	-
TSSOP20	ATP-1-04	74LV574PW		-	-	-	45	45	45	-	-
HTSSOP20	ATP-14-01	TDA1517ATW/N1		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-
HTSSOP20	ATP-14-02	TDA1517ATW/N1		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-
HTSSOP20	ATP-14-03	TDA1517ATW/N1		<b>77</b>	<b>77</b>	-	-	-	-	-	-
TSSOP28	ATP-8-01	PDIUSB12PW		-	-	-	45	45	45	-	-
TSSOP28	ATP-8-02	PDIUSB12PW		-	-	-	45	45	45	-	-
TSSOP28	ATP-8-03	PDIUSB12PW		-	-	-	45	45	45	-	-
TSSOP28	ATP-8-04	P89LPC932BDH		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-
TSSOP28	ATP-8-05	P89LPC932BDH		<b>77</b>	<b>77</b>	-	-	-	-	-	-
TSSOP38	ATP-7-01	TDA6650TT/C1		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-
TSSOP38	ATP-7-02	TDA6650TT/C1		<b>77</b>	<b>77</b>	-	-	-	-	-	-
TSSOP38	ATP-7-03	P87C54X2BDH		<b>77</b>	<b>77</b>	-	-	-	-	-	-
TSSOP48	ATP-9-01	PCKV857DGV		<b>77</b>	<b>77</b>	-	-	-	-	-	-
TSSOP48	ATP-9-02	PCKV857DGV		<b>77</b>	<b>77</b>	-	-	-	-	-	-
TSSOP56	ATP-11-01	74ALVCHT16835DGV		<b>77</b>	<b>77</b>	<b>77</b>	-	-	-	-	-

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

**Table 12:** “Dry” Reliability Stress Tests TSSOP packages in 4.4 mm body-width

Package	Lot No.	Device	MSL Level	TMCL				HTSL 1000 hrs
				Pcon	200 cyc	500 cyc	1000 cyc	
TSSOP16	ATP-1-01	74LV4060PW		<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	-
TSSOP16	ATP-1-02	74LV4060PW		<b>77</b>	<b>77</b>	<b>77</b>	-	-
TSSOP20	ATP-1-03	74LV574PW		<b>77</b>	<b>77</b>	<b>77</b>	-	<b>77</b>
TSSOP20	ATP-1-04	74LV574PW		<b>77</b>	<b>77</b>	<b>77</b>	-	<b>77</b>
HTSSOP20	ATP-14-01	TDA1517ATW/N1		<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>
HTSSOP20	ATP-14-02	TDA1517ATW/N1		<b>77</b>	<b>77</b>	-	-	-
HTSSOP20	ATP-14-03	TDA1517ATW/N1		<b>77</b>	<b>77</b>	-	-	-
TSSOP28	ATP-8-01	PDIUSB12PW		<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	-
TSSOP28	ATP-8-02	PDIUSB12PW		<b>77</b>	<b>77</b>	-	-	-
TSSOP28	ATP-8-03	PDIUSB12PW		<b>77</b>	<b>77</b>	-	-	-
TSSOP28	ATP-8-04	P89LPC932BDH		<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	-
TSSOP28	ATP-8-05	P89LPC932BDH		<b>77</b>	<b>77</b>	-	-	-
TSSOP38	ATP-7-01	TDA6650TT/C1		<b>77</b>	<b>77</b>	-	-	<b>77</b>
TSSOP38	ATP-7-02	TDA6650TT/C1		<b>77</b>	<b>77</b>	-	-	<b>77</b>
TSSOP38	ATP-7-03	P87C54X2BDH		<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	-
TSSOP48	ATP-9-01	PCKV857DGV		<b>77</b>	<b>77</b>	-	-	-
TSSOP48	ATP-9-02	PCKV857DGV		<b>77</b>	<b>77</b>	-	-	-
TSSOP56	ATP-11-01	74ALVCHT16835DGV		<b>77</b>	<b>77</b>	-	-	-

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

**Table 13:** Construction Analysis for TSSOP packages in 4.4 mm body-width

Package	Lot No.	Device	Construction Analysis Tests								
			MSLA Pb-free	V/M	LFNH	SOLD	XRAY	SCAT	DISH	BP/BS	CROSS
TSSOP16	ATP-1-01	74LV4060PW	14	15	3	44	8	8	3	3	3
TSSOP16	ATP-1-02	74LV4060PW	14	15	3	44	8	8	3	3	3
TSSOP20	ATP-1-03	74LV574PW	14	15	3	44	8	8	3	3	3
TSSOP20	ATP-1-04	74LV574PW	14	15	3	44	8	8	3	3	3
HTSSOP20	ATP-14-01	TDA1517ATW/N1	14	15	3	44	8	8	3	3	3
HTSSOP20	ATP-14-02	TDA1517ATW/N1	14	15	3	44	8	8	3	3	3
HTSSOP20	ATP-14-03	TDA1517ATW/N1	14	15	3	44	8	8	3	3	3
TSSOP28	ATP-8-01	PDIUSB12PW	14	15	3	44	8	8	3	3	3
TSSOP28	ATP-8-02	PDIUSB12PW	14	15	3	44	8	8	3	3	3
TSSOP28	ATP-8-03	PDIUSB12PW	14	-	-	-	-	-	-	-	-
TSSOP28	ATP-8-04	P89LPC932BDH	14	15	3	44	8	8	3	3	3
TSSOP28	ATP-8-05	P89LPC932BDH	14	15	3	44	8	8	3	3	3
TSSOP38	ATP-7-01	TDA6650TT/C1	14	15	3	44	8	8	3	3	3
TSSOP38	ATP-7-02	TDA6650TT/C1	14	15	3	44	8	8	3	3	3
TSSOP38	ATP-7-03	P87C54X2BDH	14	15	3	44	8	8	3	3	3
TSSOP48	ATP-9-01	PCKV857DGV	14	15	3	44	8	8	3	3	3
TSSOP48	ATP-9-02	PCKV857DGV	14	15	3	44	8	8	3	3	3
TSSOP56	ATP-11-01	74ALVCHT16835DGV	14	-	-	-	-	-	-	-	-

**Table 14:** *Additional tests.*

Package	Lot No.	Device	Construction Analysis Tests		
			BPT after TMCL 500c		
TSSOP16	ATP-1-01	74LV4060PW	5		
TSSOP16	ATP-1-02	74LV4060PW	5		
TSSOP20	ATP-1-03	74LV574PW	5		
TSSOP38	ATP-7-03	P87C54X2BDH	5		

**Table 15:** *“Wet” Reliability Stress Tests TSSOP packages in 6.1 mm body-width*

Package	Lot No.	Device	MSL Level	PPOT			HAST			THBS	
				pcon	96 hrs	192 hrs	pcon	90/96 hrs	180/192 hrs	pcon	1000 hrs
TSSOP32	ATP-10-01	TUN2000TT/C4		-	-	-	45	45	45	-	-
TSSOP32	ATP-10-02	TUN2000TT/C4		-	-	-	45	45	45	-	-
TSSOP32	ATP-10-03	TUN2000TT/C4		-	-	-	45	45	45	-	-
TSSOP64	ATP-12-01	GTL1655DGG		<b>77</b>	<b>77</b>	-	-	-	-	-	-
TSSOP80	ATP-12-02	74ALVCHS16830DGB		-	-	-	45	45	45	-	-
TSSOP80	ATP-12-03	74ALVCHS16830DGB		-	-	-	45	45	45	-	-

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

**Table 16** "Dry" Reliability Stress Tests TSSOP packages in 6.1 mm body-width

Package	Lot No.	Device	MSL Level	TMCL				HTSL 1000 hrs
				Pcon	200 cyc	500 cyc	1000 cyc	
TSSOP32	ATP-10-01	TUN2000TT/C4		<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>
TSSOP32	ATP-10-02	TUN2000TT/C4		<b>77</b>	<b>77</b>	<b>77</b>	-	<b>77</b>
TSSOP32	ATP-10-03	TUN2000TT/C4		<b>77</b>	<b>77</b>	-	-	<b>77</b>
TSSOP64	ATP-12-01	GTL1655DGG		<b>77</b>	<b>77</b>	<b>77</b>	<b>77</b>	-
TSSOP80	ATP-12-02	74ALVCHS16830DGB		<b>77</b>	<b>77</b>	-	-	-
TSSOP80	ATP-12-03	74ALVCHS16830DGB		<b>77</b>	<b>77</b>	<b>77</b>	-	-

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

**Table 17:** Construction Analysis for TSSOP packages in 6.1 mm body-width

Package	Lot No.	Device	Construction Analysis Tests								
			MSLA Pb-free	V/M	LFNH	SOLD	XRAY	SCAT	DISH	BP/BS	CROSS
TSSOP32	ATP-10-01	TUN2000TT/C4	14	15	3	44	8	8	3	3	3
TSSOP32	ATP-10-02	TUN2000TT/C4	14	15	3	44	8	8	3	3	3
TSSOP32	ATP-10-03	TUN2000TT/C4	14	15	3	44	8	8	3	3	3
TSSOP64	ATP-12-01	GTL1655DGG	14	-	-	-	-	-	-	-	-
TSSOP80	ATP-12-02	74ALVCHS16830DGB	14	15	3	44	8	8	3	3	3
TSSOP80	ATP-12-03	74ALVCHS16830DGB	14	15	3	44	8	8	3	3	3

ssembly & Test Organization Philips Semiconductors	<b>Self Qualification Plan:</b> <b>NiPdAu &amp; green BoM for SSOP &amp; (H)TSSOP at ATP</b>	Document Number RNR-83-04/RdH/RdH-2080
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**Table 18:** *Additional tests.*

Package	Lot No.	Device	Construction Analysis Tests	
			BPT after TMCL 500c	Glue-ability for wave-soldering
TSSOP64	ATP-12-01	GTL1655DGG	5	-
TSSOP32	ATP-10-01	TUN2000TT/C4		5

Assembly & Test Organization Philips Semiconductors	<b>Self Qualification Plan: NiPdAu &amp; green BoM for SSOP &amp; (H)TSSOP at ATP</b>	Document Number RNR-83-04/RdH/RdH-2080
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## 7. Conclusion

An extensive qualification program will be executed to demonstrate that:

- ATP can assemble SSOP packages using NiPdAu pre-plated leadframes & Ablestik 8290 die-attach & Sumitomo G600 mold compound, with a high quality and reliability, under leadfree (260°C) soldering conditions.
- ATP can assemble (H)TSSOP packages using NiPdAu pre-plated leadframes & Ablestik 8290 die-attach & Sumitomo G700 mold compound, with a high quality and reliability, under leadfree (260°C) soldering conditions.

With the positive completion of the Qualification tests, the Assembly and Test Organization Philips Semiconductors announces the release of:

- Sumitomo G600 moulding compound for SSOP packages assembled in ATP.
- Sumitomo G700 moulding compound for (H)TSSOP packages assembled in ATP.
- Ablestik 8290 die-attach glue for SSOP & (H)TSSOP packages assembled in ATP.
- NiPdAu pre-plated leadframes for SSOP & (H)TSSOP packages assembled in ATP.

## 8. Implementation

Tentative date of implementation is from March 2005 onwards, depending on package type.

## 9. Document Revision Sheet

R E V I S I O N   S H E E T			
DATE yyyy/mm/dd	REV	DESCRIPTION	AUTHOR
2004-10-01	01	Self Qualification Plan for NiPdAu pre-plated leadframes + Ablestik 8290 die-attach + Sumitomo G600/G700 mold compounds for SSOP&(H)TSSOP packages in ATP.	Rob de Heus
2004-11-12	02	TSSOP8 SOT530 taken out.	Rob de Heus