

## *Self Qualification Report*

*TSSOP56 packages using:*

- NiPdAu preplated frames*
- Hysol QMI-519 die-attach*
- Nitto GE7470 plastic*

*assembled at*

*Philips Semiconductors Thailand  
and  
Philips Semiconductors Calamba*

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## 1. Introduction

In order to convert TSSOP56 packages to lead-free, the intention to change Philips' TSSOP56 packages into NiPdAu pre-plated leadframes in combination with Hysol QMI-519 die-attach and Nitto GE7470 plastic and has been announced via Correction CPCN 200305025C1, sent out on June 2<sup>nd</sup>, 2005.

The results of the 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 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 as required by J-STD 020C.

## 2. Constructional Details of Test vehicles

Lot	PST-1	PST-2	PST-3
Assy Site	PST	PST	PST
Package / Pin	TSSOP56	TSSOP56	TSSOP56
Outline	SOT364-1	SOT364-1	SOT364-1
Moulding compound	Nitto 7470	Nitto 7470	Nitto 7470
Die-Attach Adhesive	QMI-519	QMI-519	QMI-519
Pitch/ E or P	0.5 / P	0.5 / P	0.5 / P
Die Pad Size (mm)	2.60 x 4.00	2.60 x 4.00	2.60 x 4.00
Die Size (mm)	1.08 x 3.03	1.08 x 3.03	1.08 x 3.03
Vehicle name	PCA9504ADGGA	PCA9504ADGGA	PCA9504ADGGA
Wire diameter (µm)	25	25	25

Lot	PST-4	PST-5	PST-6
Assy Site	PST	PST	PST
Package / Pin	TSSOP56	TSSOP56	TSSOP56
Outline	SOT364-1	SOT364-1	SOT364-1
Moulding compound	Nitto 7470	Nitto 7470	Nitto 7470
Die-Attach Adhesive	QMI-519	QMI-519	QMI-519
Pitch/ E or P	0.5 / P	0.5 / P	0.5 / P
Die Pad Size (mm)	2.60 x 4.00	2.60 x 4.00	2.60 x 4.00
Die Size (mm)	1.26 x 2.29	1.26 x 2.29	1.26 x 2.29
Vehicle name	74LVT16646A	74LVT16646A	74LVT16646A
Wire diameter (µm)	20	20	20

<b>Lot</b>	<b>PSC-7</b>	<b>PSC-8</b>	<b>PSC-9</b>
Assy Site	PSC	PSC	PSC
Package / Pin	TSSOP56	TSSOP56	TSSOP56
Outline	SOT364-1	SOT364-1	SOT364-1
Moulding compound	Nitto 7470	Nitto 7470	Nitto 7470
Die-Attach Adhesive	QMI-519	QMI-519	QMI-519
Pitch/ E or P	0.5 / P	0.5 / P	0.5 / P
Die Pad Size (mm)	2.60 x 4.00	2.60 x 4.00	2.60 x 4.00
Die Size (mm)	1.08 x 3.03	1.08 x 3.03	1.08 x 3.03
Vehicle name	PCD9504ADGG	PCD9504ADGG	PCD9504ADGG
Wire diameter (µm)	25	25	25

<b>Lot</b>	<b>PSC-10</b>	<b>PSC-11</b>	<b>PSC-12</b>
Assy Site	PSC	PSC	PSC
Package / Pin	TSSOP56	TSSOP56	TSSOP56
Outline	SOT364-1	SOT364-1	SOT364-1
Moulding compound	Nitto 7470	Nitto 7470	Nitto 7470
Die-Attach Adhesive	QMI-519	QMI-519	QMI-519
Pitch/ E or P	0.5 / P	0.5 / P	0.5 / P
Die Pad Size (mm)	2.90 x 5.00	2.90 x 5.00	2.90 x 5.00
Die Size (mm)	2.53 x 3.73	2.53 x 3.73	2.53 x 3.73
Vehicle name	SC28L202	SC28L202	SC28L202
Wire diameter (µm)	25	25	25

### 3. Self-Qualification Results

**Table 1:** “Wet” Reliability Stress Tests

Package	Lot No.	Device	PCON 260 °C	PPOT			HAST		
				pcon	96 hrs	192 hrs	pcon	96 hrs	192 hrs
TSSOP56	PST-1	PCA9504ADGGA	L1	-	-	-	<b>0/45</b>	<b>0/45</b>	0/45
TSSOP56	PST-2	PCA9504ADGGA	L1	-	-	-	<b>0/45</b>	<b>0/45</b>	0/45
TSSOP56	PST-3	PCA9504ADGGA	L1	-	-	-	<b>0/45</b>	<b>0/45</b>	0/45
TSSOP56	PSC-7	PCD9504ADGG	L1	<b>0/77</b>	<b>0/77</b>	0/77	<b>0/45</b>	<b>0/45</b>	0/45
TSSOP56	PSC-8	PCD9504ADGG	L1	<b>0/77</b>	<b>0/77</b>	0/77	<b>0/45</b>	<b>0/45</b>	0/45
TSSOP56	PSC-9	PCD9504ADGG	L1	<b>0/77</b>	<b>0/77</b>	0/77	<b>0/45</b>	<b>0/45</b>	0/45
TSSOP56	PSC-10	SC28L202	L1	<b>0/77</b>	<b>0/77</b>	0/77	-	-	-
TSSOP56	PSC-11	SC28L202	L1	<b>0/77</b>	<b>0/76</b>	0/74	-	-	-
TSSOP56	PSC-12	SC28L202	L1	<b>0/77</b>	<b>0/71</b>	-	-	-	-

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

**Table 2:** "Dry" Reliability Stress Tests

Package	Lot No.	Device	PCON 260 °C	TMCL			HTSL 1000 hrs	
				Pcon	200 cyc	500 cyc		1000 cyc
TSSOP56	PST-1	PCA9504ADGGA	L1	<b>0/77</b>	<b>0/77</b>	0/77	-	<b>0/77</b>
TSSOP56	PST-2	PCA9504ADGGA	L1	<b>0/77</b>	<b>0/77</b>	0/77	-	<b>0/77</b>
TSSOP56	PST-3	PCA9504ADGGA	L1	<b>0/77</b>	<b>0/77</b>	0/77	-	<b>0/77</b>
TSSOP56	PST-4	74LVT16646A	L1	<b>0/77</b>	<b>0/77</b>	0/77	0/77	-
TSSOP56	PST-5	74LVT16646A	L1	<b>0/77</b>	<b>0/77</b>	0/77	0/77	-
TSSOP56	PST-6	74LVT16646A	L1	<b>0/77</b>	<b>0/77</b>	0/77	0/77	-
TSSOP56	PSC-7	PCD9504ADGG	L1	<b>0/77</b>	<b>0/77</b>	0/77	0/77	<b>0/77</b>
TSSOP56	PSC-8	PCD9504ADGG	L1	<b>0/77</b>	<b>0/77</b>	0/77	0/77	<b>0/77</b>
TSSOP56	PSC-9	PCD9504ADGG	L1	<b>0/77</b>	<b>0/77</b>	0/77	0/77	<b>0/77</b>
TSSOP56	PSC-10	SC28L202	L1	<b>0/77</b>	<b>0/77</b>	0/77	-	<b>0/77</b>
TSSOP56	PSC-11	SC28L202	L1	<b>0/77</b>	<b>0/77</b>	0/75	-	<b>0/77</b>
TSSOP56	PSC-12	SC28L202	L1	<b>0/77</b>	<b>0/77</b>	-	-	<b>0/77</b>

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

IC Manufacturing Operations Philips Semiconductors	<b>Self Qualification Report:</b> <b>NiPdAu/QMI519/7470 for TSSOP56 PSC / PST</b>	Document Number RNR-83-05/RdH/RdH-2078
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**Table 3: Construction Analysis**

Package	Lot No.	Device	Construction Analysis Tests								
			MSLA 260 °C	V/M	LFNH	SOLD See note	XRAY	SCAT	DISH	BP/BS	CROSS
TSSOP56	PST-1	PCA9504ADGGA	L1	0/15	0/9	4x0/11	0/10	0/10	0/5	0/5	0/10
TSSOP56	PST-2	PCA9504ADGGA	L1	0/15	0/9	4x0/11	0/10	0/10	0/5	0/5	0/10
TSSOP56	PST-3	PCA9504ADGGA	L1	0/15	0/9	4x0/11	0/10	0/10	0/5	0/5	0/10
TSSOP56	PSC-7	PCD9504ADGG	L1	0/45	0/5	-	0/22	0/22	0/3	0/5	0/3
TSSOP56	PSC-8	PCD9504ADGG	L1	-	-	-	-	-	-	-	-
TSSOP56	PSC-9	PCD9504ADGG	L1	-	-	-	-	-	-	-	-
TSSOP56	PSC-10	SC28L202	L1	0/15	0/5	-	0/22	0/22	0/3	0/5	0/3
TSSOP56	PSC-11	SC28L202	L1	-	-	-	-	-	-	-	-
TSSOP56	PSC-12	SC28L202	L1	-	-	-	-	-	-	-	-

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.

**Table 4: Additional tests for automotive.**

Package	Lot No.	Device	Construction Analysis Tests		
			BPT after TMCL 500c		
TSSOP56	PST-1	PCA9504ADGGA	0/5 (50 wires were tested)		
TSSOP56	PST-4	74LVT16646A	0/5 (50 wires were tested)		

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#### 4. Conclusion

An extensive qualification program has been executed to demonstrate that PSC and PST can assemble TSSOP56 packages in NiPdAu, QMI-519 and Nitto GE7470 plastic at a high quality and reliability level.

With the positive completion of the Qualification tests, the IC Manufacturing Operations of Philips Semiconductors announces the release of NiPdAu pre-plated leadframes for use in TSSOP56 assembled in PSC and PST.

#### 5. Implementation

Deliveries will start from October 2005 onwards.

#### 6. Document Revision Sheet

R E V I S I O N   S H E E T			
DATE yyyy/mm/dd	REV	DESCRIPTION	AUTHOR
2005-08-22	01	Self Qualification Results for NiPdAu pre-plated leadframes for TSSOP56 packages in PSC+PST, using QMI-519 and Nitto GE7470.	Rob de Heus