STMicroelectronics

Lead-free Solutions

The Ecopack working group has selected 3 technologies (NiPdAu, Pure Sn and SnAgCu Ball) to match the different technical and quality requirements and cover the full spectrum of packages. The Conversion program applies both to internal and subcontractor production lines.

NiPdAu: This technology is well known on the market and several billions of parts have been already shipped by the semiconductor industry. ST already qualified it in 1996. It is also known as PPF (Pre-Plated Frame). The NiPdAu technology is the preferred choice of ST each time it is technically feasible. Beside the change of lead frame, a change in materials (glue and molding compound) may occur to meet the higher soldering temperature constraints required for lead-free soldering.

The NiPdAu technology will be used for most of Signal SMD packages: SO, TSSOP, L/TQFP with few exceptions such as SMD packages with soft solder die attach, PLCC (due to the particular shape of the leads), TSOP (alloy 42), few L/TQFP, Exposed pad packages.

Pure Tin (Sn): This technology is also a very common Lead-free solution used by semiconductor manufacturers. There are 2 sub-processes: Dipping and Post-plating (Matt Sn). This technology is selected by ST for all other leadframe-based packages which are not eligible for NiPdAu.

The Pure Tin technology will be used for: Power SMD packages, Insertion packages, PLCC, TSOP.

SnAgCu ball: This ternary alloy is an improved composition, derived from SnAgCu alloy. SAC + is the material chosen for the balls of all "Ball Grid Arrays" (BGA) and balls and bumps of Flip-Chips (currently using PbSn). Its melting point is 217°C and its composition close to the one of the most common solder pastes. It is the preferred alloy selected by the large majority of semiconductors companies and subcontractors.

Packages	Pb-Based	Lead-Free
Lead frame based	SnPb Dipping	Tin (Sn) Dipping
	SnPb Post plating	Matte Tin (Sn) Post-plating
		NiPdAu Pre-plating
		SnBi

Packages	Pb-Based	Lead-Free
Ball Grid Array		SAC+
Bumps for FlipChip		SnAg Gold bumps
Die bonding in power packages		Exempted
Glass sealing in frit seal packages		

Alloys and packages

	Alloys used in	
Packages	**ST Production lines**	**Subcontractors lines**
Power SMD	Matte Sn post plated coating	X
Signal SMD	NiPdAu pre plated coating Matte Sn post plated coating	Sn, SnBi post plated coating
Insertion package	Matte Sn post plated coating	Sn, SnAgCu coating by dipping
BGA	SAC+ solder balls	SAC+ solder balls

(*) SnAgCu metallurgy or its derivatives

	Packages	
Alloys	**ST Production lines**	**Subcontractors lines**
Matte Sn post plated coating	Power SMD	X
	Insertion package	Insertion package
	Signal SMD	Signal SMD
NiPdAu pre platted coating	Signal SMD	X
SnBi post plated coating	X	Signal SMD
Sn coating by dipping	Insertion package	Insertion package
SnAgCu coating by dipping	X	Insertion package
SAC+ solder balls	BGA	BGA

Conversion Roadmap

This table indicates the forecasted completion date of the conversion program for volume production. Deliveries to the market may be delayed because of inventories and work in progress.

	COMPLETION PERIOD
BGA Big	Q4 '05
BGA Small	Switched
CDIP	Switched
Diodes	Switched
DPAK	switched
HiQuad	Switched
Metal Cans	Switched
PDIPs	Switched
PLCCs	Switched
PSO	Switched
QFN	Switched
SMA/B/C	Switched
SO Narrow *	Switched
SO Wide	Switched
SOD/SOTs	Switched
SPAK	Switched
SSOP	Switched
TO202	Switched
TO220 D2PAK	Starting W30 (Clip** mounting: switched)

TO220 D2PAK	Starting W30 (Clip** mounting: switched)
TO220 Full Pack	Switched
TO220 PWR	Switched
TO220 Triacs	Switched
TO247	Switched
TO92	Switched
TOP3	Switched
LQFP Opto	Switched
TQFP Large	Switched
T & L QFPs Small	Switched
P & L QFPs Large	Switched
TSOP	Switched
TSSOPs	Switched
Watts	Switched
Zeropower	Switched
Subsystems	< Q4 '05

* Sub : OK in pure Tin waiting for NiPdAu in Q2'05
** Clip mounting: Triacs, SCRs
Sub = Subcontractor

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ST Mission: to offer strategic independence to our partners worldwide, as a profitable and viable broad range semiconductor supplier.

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