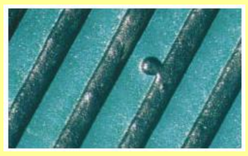
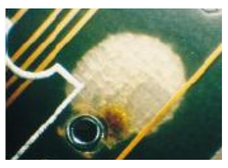
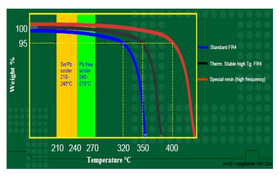
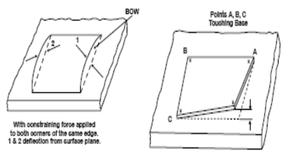
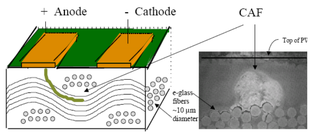
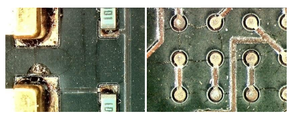
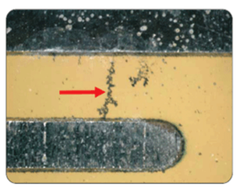
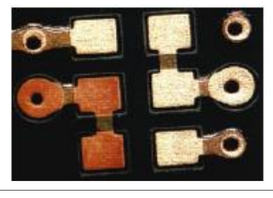
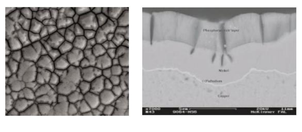
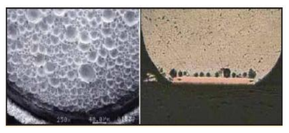
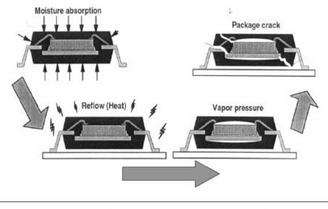
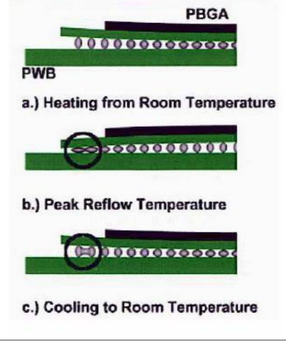
EDM Electronic Design & Manufacturing

imec aspire invent achieve

sirris driving industry by technology

PCB/PBA Failure Modes part 1

Ref.	Failure mechanisms	Critical elements
I	**PCB failure mechanisms**	Heat, humidity, mechanical load, contamination
I.1	**General quality issues** 	Drive for low cost
I.2	**Laminate related**	
I.2.1	Via cracking during soldering 	PCB thickness, via drill size, plating quality, laminate properties, number of heat excursions, peak temperature
I.2.2	Delamination during soldering 	Laminate properties, moisture, number of heat excursions, peak temperature
I.2.3	Degradation of laminate during soldering 	Laminate properties, number of heat excursions, peak temperature
I.2.4	Bow and Twist during soldering 	Design: symmetry of build-up, moisture, PCB quality
I.2.5	Conductive Anodic Filament 	Laminate properties, drilling quality, humidity, design: spacing, DC voltage
I.2.6	Laminate cracking 	Lead-free compatible laminate properties, working conditions
I.3	**Solderable finish**	Process quality
I.3.1	**Lead-free HASL**	
I.3.1.1	Solderability	HASL thickness
I.3.1.2	SIR (Surface Insulation Resistance) and corrosion 	HASL flux residus: cleaning quality, solder mask design
I.3.2	**Electroless Ni Immersion Au (ENIG)**	
I.3.2.1	Solderability 	Au thickness, oxidation level of Ni prior to Au deposition, ENIG process, humidity during storage, flux chemistry
I.3.2.2	Solderability: skip plating 	ENIG process control, design
I.3.2.3	Solderability: black pad 	ENIG process control
I.3.2.4	Surface Insulation Resistance and corrosion	ENIG chemistry residus: cleaning quality, solder mask design

Ref.	Failure mechanisms	Critical elements
I.3.3	**Immersion Sn**	
I.3.3.1	Solderability	Sn thickness, storage: heat, humidity during storage, flux chemistry
I.3.3.2	Surface Insulation Resistance and corrosion	Im Sn chemistry residus: cleaning quality, solder mask design
I.3.3.3	Sn whisker on Sn-finished PCB	Im Sn chemistry
I.3.4	**Immersion Ag**	
I.3.4.1	Solderability	Ag thickness, storage, SO_2 contaminated air, humidity during storage, flux chemistry
I.3.4.2	Surface Insulation Resistance and corrosion	Im Ag chemistry residus: cleaning quality, solder mask design
I.3.4.3	"Champaign" voiding (Ag finished PCB) 	Im Ag process, organic content
II	**Component failure mechanisms**	
II.1	**Component body related**	
II.1.1	**Excessive heating during reflow soldering** 	Body material, peak temperature, Time-Above-Liquid, component technology
II.1.1.1	Active components	Packaging technology
II.1.1.2	Passive components	Design: heat resistance
II.1.2	**Excessive heating during wave soldering**	Body material, component technology, solder bath temperature, dwell time
II.1.2.1	Active components	Packaging technology
II.1.2.2	Passive components	Design: heat resistance
II.1.2.3	SMD component heat stress failure 	Design: compatibility with wave soldering, process conditions, solder alloy
II.1.3	**Moisture-related component issues**	Humidity, temperature
II.1.3.1	Pop-corning 	Moisture Sensitivity Level (MSL), package dimensions, body material
II.1.3.2	Warpage 	Package dimensions, packaging technology, package quality