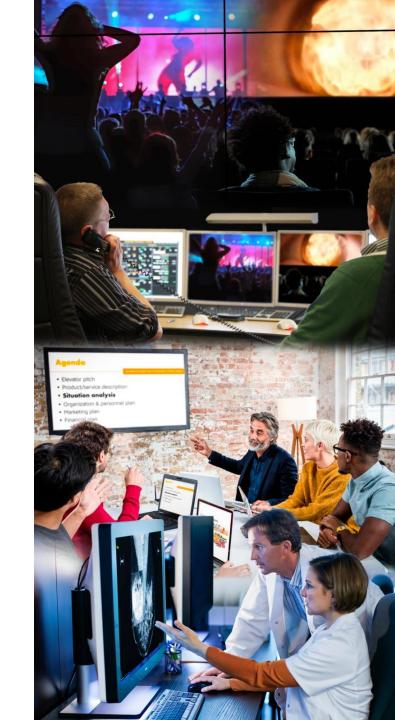


Prototype 2018

World Wide NPI: PBA Passport facilitates manufacturing

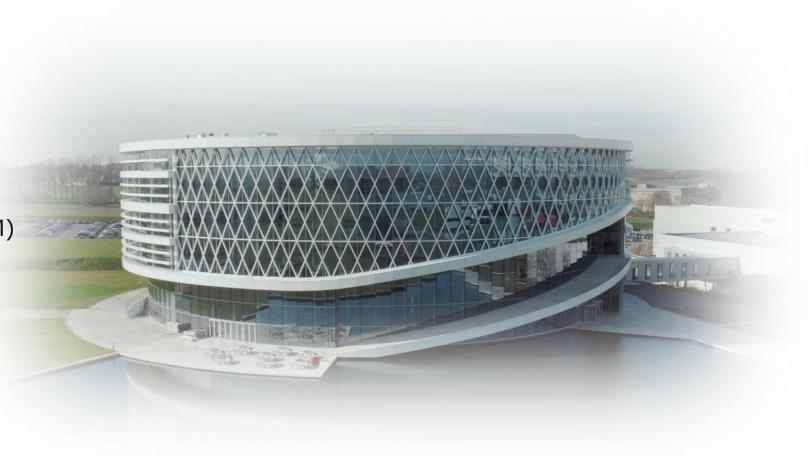
Lena Eeckhout – Components Manager 08 November 2018





Agenda

- Introduction
- History
- Quality Acceptance Manual (QAM)
- Passport
- Request for Quotation
- Embedded in NPI
- Benefits





Introduction

"Enabling Bright outcomes"

We empower you with impressive visualization and innovative collaboration solutions!

> **Entertainment**: Cinema, Venues and Hospitality and professional Audio Visual (pro-AV), Simulation

➤ **Healthcare**: Diagnostic and Surgical Displays and Original Equipment Manufacturer (OEM) business

➤ **Enterprise**: Meeting, Learning, Operator and Virtual Experience.





History

- Due to ...
 - Reliability issues of PBA's in the past
 - OLack of knowledge of PBA and PCB technologies
 - Too many iterations in PCB design phase
 - Too many revisions of the PBA before final production
- ... we needed to improve and act upfront ...
 - In order to capture **possible issues at the start** of the project
 - OBy defining a Quality Acceptance Manual for PBA & PCB
 - OBy defining the **process requirements** for the PBA at the EMS
 - To improve the manufacturability of the board
 - To pro-actively request a Price Quotation
- ... in collaboration with cEDM (Imec)

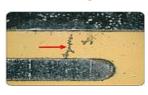
Component Selection



Pb Free soldering



Design for Reliability



Mechanical Vibration



Design for Cost



Material Selection



Green Design Halogen Free



PBA Design Complexity



Thermal Design



Supplier Selection





Quality Acceptance Manual (QAM)

- What are the required Quality criteria for PBA?
 - OMax Quality @ minimum cost
 - OMax Quality @ best manufacturability



- OReduce risks on rework & repair
- Acceptable quality for all applications
- Who defined these requirements? Who was involved?
 - Multidisciplinairy team
 - ocEDM (Imec)
 - Signed off by our EMS & PCB Manufacturers















Quality Acceptance Manual (QAM)

- General requirements
 - Datapackage
 - Precedence order ...
- Environmental Requirements
 - Reach / RoHS ...
- PCB related Requirements
 - Classification
 - Material specification
 - Plating & Finish ...
- PBA Requirements
 - Solder Processes, Solder alloy & Fluxes
 - Cleanliness
 - Label requirements & marking ...
 - Clearances

QAM007 QUALITY ACCEPTANCE MANUAL PCBA

Barco NV President Kennedypark 35 8500 Kortrijk Belgium



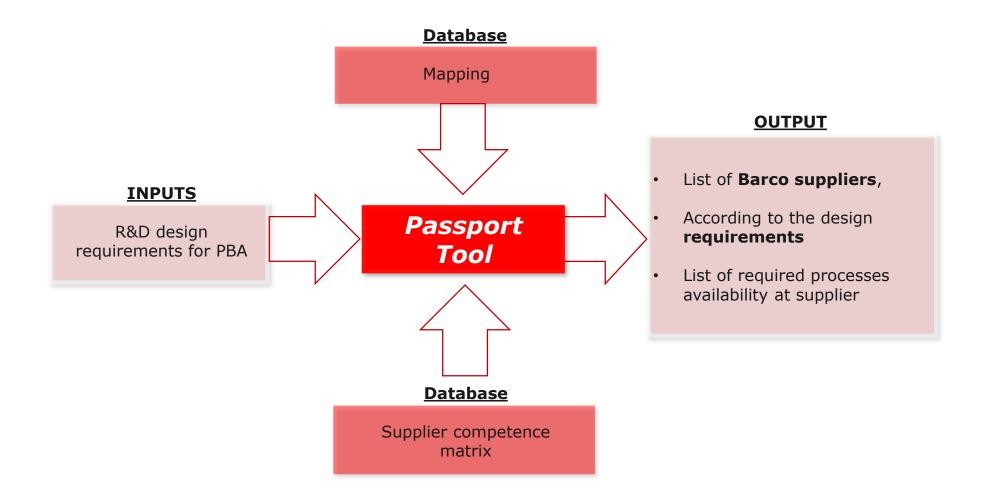


B-WIRED

QAM007 Revision 03 - 04/06/2018



Passport



In a very early stage of the PCB design!



Request for Quotation

- At final schematic entry:
 - Request for Quotation to EMS & PCB Manufacturer can be sent out before PCB design is started
 - Process & capabilities requirements are extracted from the Passport
 - Additional information to be sent out for RFQ
 - Approved Manufacturers List (AML) of the Components
 - Dimensions of the board
 - Layer Stackup

Pcb Number	N	ame			PCB Engineer			
Nomenclature	D	escription		HW Engineer				
Requirements: All	~							Creat
PBA				PCB				
PBA DESIGN OPTIONS & ATTRIBUTES				PCB DESIGN OPTIONS & ATTRIBUTES				
PBA Width (Y in mm)		Width is the lower of the 2 values, breakaway zones included or panel dimension after finalisation of PCB design. Initially, real board outline dimensions required.		PCB Thickne	ss (mm) ^	Select value	v	Below 1,8mm is the reference, severe restrictions when above (via choice: must have bigger drill size (more restriction on BGA fanout's!!!), through mounted component -> length of lead is critical to obtain class? 2 or class? 3 solder
PSA Length (X in mm)		Lenght is the higher of the 2 values, breakaway zones included or panel dimension after finalisation of PCB design. Initially, real board outline dimensions required.						requirements!!) Standard tol is 10% on thicknesses > 1mr and +/-0.1 below 1mm thickness. Other:
				PCB Thickness Tolerance ^	Select value	V	10% below 1mm thickness, 7% used for PCIExpress or 5% increases the cost dramatically	
RoHS compliant *	Select value V	deviates from	this rule			+		Standard Cu thickness on outer layers is
Necessary Solder Cycles		calculate the	rack calculator from EDM to max solder cycles a board can fore via cracking &	Cu foil thicks	ness on outer layers (µm)	Select value	٧	
Cleaning Yes No	○Yes ○No	Standard NO Cleanliness Report is required due to No Clean Fluxes requirement. Will be needed in harsch environments where coating is required.		Cu thickness inner layers (µm) ^		Select value	v	Standard Cu thickness on inner layers is 17/35um. Clearances and trackwidth definition increases with Cu thickness
	1.7-2807-89					-		etching
Green	○Yes ○No	Do not use at this moment, already covered by RoHS/ REACH (= Barco Green)		Estimated di	illed Via Holes			= ~# connections, for finalized jobs see Production border
IPC Class ^	Select value >	IPC Class 3 o	only for Life Critical applications	Laminate Pe	rformance Class	Select value	~	
PBA BUILD-UP (IPC-CM-770)				Controlled In	mpedance	Select value	V	You still need to take into account impact laminates for all allowed PCB manufacture

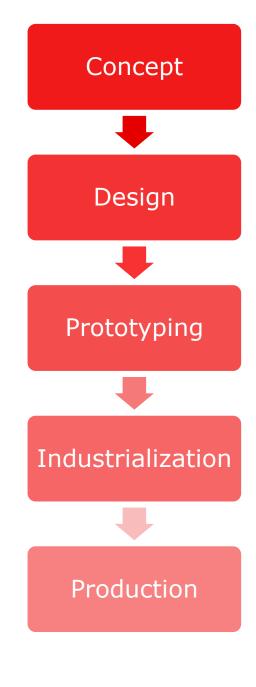
Component Side Bottom Mounting	SMD + Through Hole	Processes: SMD	Vapor phase soldering in- line/off-line	Optional
Component Side Bottom Mounting	SMD + Through Hole	Processes: Through hole (see QAM 007)	Selective soldering (fountain)	Optional
Component Side Bottom Mounting	SMD + Through Hole	Processes: Through hole (see QAM 007)	Selective dip soldering	Optional
Component Side Bottom Mounting	SMD + Through Hole	Processes: Through hole (see QAM 007)	Pin-in-Paste reflow soldering	Optional
BOM build-up (component)				
Component SMD types	High Density & Standard	High Density & Standard	Placement: Chips down to 0402	Required
Component SMD types	High Density & Standard	High Density & Standard	Placement: Peripheral leaded down to 0.5mm pitch	Required
Component SMD types	High Density & Standard	High Density & Standard	Placement: BGA down to 0.8mm pitch	Required
Component SMD types	High Density & Standard	High Density & Standard	Placement: QFN down to 0.5mm pitch - LGA down to 0.8mm	Required
Component SMD types	High Density & Standard	High Density & Standard	Placement: Peripheral <0.5mm pitch	Required
Component SMD types	High Density & Standard	Processes: Solder paste jetting		
Component SMD types	High Density & Standard	Processes: Stencil thickness range 100/125	100	Optional
Component SMD types	High Density & Standard	Processes: Stencil thickness range 100/125	125	Optional
RoHS compliant	Pb Free Soldering	Finish: Pb Free (see QAM 007)	ImAg IPC-4553	Required
PBA Length (X in mm)	279.4	Max PCB Width (mm)		
PBA Length (X in mm)	279.4	Min PCB Width (mm)		
PBA Width (Y in mm)	218.93	Max PCB Height (mm)		
PBA Width (Y in mm)	218.93	Min PCB Height (mm)		
IPC Class	IPC Class 2	Logistics: IPC 6012 / 6013 Plating Class 3		
IPC Class	IPC Class 2	Logistics: IPC-601X/IPC- A-600 Class 2 manufacturing (see QAM 007)		
IPC Class	IPC Class 2	Logistics: QAM 007 Document for PCB		
PCB Design Options & Att	ributes			
PCB Design Options & Att	Yes, Via Back Drilling not Required	Logistics: Impedance control according IPC- TM-650 2.5.5.12	Impedance Test Method IPC-TM-650: Effective Bandwidth (EBW) method	Optional
	Yes, Via Back Drilling	control according IPC-	IPC-TM-650: Effective	Optional Optional
Controlled Impedance	Yes, Via Back Drilling not Required Yes, Via Back Drilling	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC-	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE)	
Controlled Impedance	Yes, Via Back Drilling not Required Yes, Via Back Drilling not Required Yes, Via Back Drilling	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC-	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE) method Impedance Test Method IPC-TM-650: Short Pulse	Optional
Controlled Impedance Controlled Impedance Controlled Impedance Controlled Impedance Cu foil thickness on outer layers (µm)	Yes, Via Back Drilling not Required Yes, Via Back Drilling not Required Yes, Via Back Drilling not Required Yes, Via Back Drilling	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Cu-thicknesses outer layers (foil)	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE) method Impedance Test Method IPC-TM-650: Short Pulse Propagation (SPP) method Impedance Test Method IPC-TM-650: Frequency	Optional Optional
Controlled Impedance Controlled Impedance Controlled Impedance Controlled Impedance Cu foil thickness on outer	Yes, Via Back Drilling not Required Yes, Via Back Drilling	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Cu-thicknesses outer layers (foil) Cu-thicknesses inner layers (foil)	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE) method Impedance Test Method IPC-TM-650: Short Pulse Propagation (SPP) method Impedance Test Method IPC-TM-650: Frequency	Optional Optional
Controlled Impedance Controlled Impedance Controlled Impedance Controlled Impedance Cu foil thickness on outer layers (jum) Cu thickness inner layers (jum) Solder Mask Color	Yes, Via Back Drilling not Required 17 17 Green	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Cu-thicknesses outer layers (foil) Cu-thicknesses outer layers (foil) Cu-thicknesses immer layers (foil) Material: Solder mask IPC-SM-840 qualified (see QAM 007)	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE) method Impedance Test Method IPC-TM-650: Short Pulse Propagation (SPP) method Impedance Test Method IPC-TM-650: Frequency	Optional Optional
Controlled Impedance Controlled Impedance Controlled Impedance Controlled Impedance Cu foil thickness on outer layers (Imi) Cu thickness inner layers (Imi) Solder Mask Color Solder Mask Color	Yes, Via Back Drilling not Required 17 17 Green Green	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Cu-thicknesses outer layers (foil) Cu-thicknesses inner layers (foil) Cu-thicknesses inner layers (danimates) Material: Solder mask IPC-SM-840 qualified (see QAM 007) Solder Mask Color	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE) method Impedance Test Method IPC-TM-650: Short Pulse Propagation (SPP) method Impedance Test Method IPC-TM-650: Frequency	Optional Optional
Controlled Impedance Controlled Impedance Controlled Impedance Controlled Impedance Cu foil thickness on outer layers (µm) Cu thickness inner layers (µm) Solder Mask Color Solder Mask Color Silkscreen color	Yes, Via Back Drilling not Required 17 17 Green Green White	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Cu-thicknesses outer layers (foil) Cu-thicknesses inner layers (foil) Material: Solder mask IPC-SM-840 qualified (see QAM 007) Solder Mask Color Silk screen Color	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE) method Impedance Test Method IPC-TM-650: Short Pulse Propagation (SPP) method Impedance Test Method IPC-TM-650: Frequency	Optional Optional
Controlled Impedance Controlled Impedance Controlled Impedance Controlled Impedance Cu foil thickness on outer layers (µm) Cu thickness inner layers (µm) Solder Mask Color Solder Mask Color Solder Mask Color FOB Thickness Tolerance	Yes, Via Back Drilling not Required 17 17 Green Green	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Cu-thicknesses outer layers (foil) Cu-thicknesses inner layers (laminates) Material: Solder mask IPC-SM-840 qualified (see QAM 007) Solder Mask Color Silk screen Color Overall Board Thickness	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE) method Impedance Test Method IPC-TM-650: Short Pulse Propagation (SPP) method Impedance Test Method IPC-TM-650: Frequency	Optional Optional
Controlled Impedance Controlled Impedance Controlled Impedance Controlled Impedance Cu foil thickness on outer layers (im) Cu thickness inner layers (im) Solder Mask Color Solder Mask Color Silkscreen color PCB Thickness Tolerance Laminate Performance Class	Yes, Via Back Drilling not Required 17 17 Green Green White	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Cu-thicknesses outer layers (fall) appers (fall) appers (fall) appers (fall) appers (fall) appers (fall) minates) Material: Solder mask IPC-SM-840 qualified (see QAM 007) Solder Mask Color Silk screen Color Overall Board Thickness Tolerance: 10% Logistics: PCB moisture control IPC-1601 (see QAM 007)	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE) method Impedance Test Method IPC-TM-650: Short Pulse Propagation (SPP) method Impedance Test Method IPC-TM-650: Frequency	Optional Optional
Controlled Impedance Controlled Impedance Controlled Impedance Controlled Impedance Cu foil thickness on outer layers (im) Cu thickness inner layers (im) Solder Mask Color Silkscreen color PCB Thickness Tolerance Laminate Performance	Yes, Via Back Drilling not Required 17 17 Green Green White 10%	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Cu-thicknesses outer layers (faminates) Material: Solder mask IPC-SM-840 qualified (see QAM 007) Solder Mask Color Silk screen Color Overall Board Thickness Tolerance: 10% Logistics: PCS moisture control IPC-1601 (see QAM 007) Logistics: UC qualification for Rigid PCB (see QAM 007)	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE) method Impedance Test Method IPC-TM-650: Short Pulse Propagation (SPP) method Impedance Test Method IPC-TM-650: Frequency	Optional Optional
Controlled Impedance Controlled Impedance Controlled Impedance Controlled Impedance Cu foil thickness on outer layers (um) Cu thickness inner layers (um) Solder Mask Color Solder Mask Color Solder Mask Color PCB Thickness Tolerance Laminate Performance Class Laminate Performance	Yes, Via Back Drilling not Required 17 17 Green Green White 10% High Performance	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Cu-thicknesses outer layers (familiaryers (familiaryers (familiaryers (familiaryers) (familiaryer	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE) method Impedance Test Method IPC-TM-650: Short Pulse Propagation (SPP) method Impedance Test Method IPC-TM-650: Frequency	Optional Optional
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Controlled Impedance Controlled Impedance Controlled Impedance Controlled Impedance Cu foil thickness on outer layers (Im) Cu thickness inner layers (Im) Solder Mask Color Solder Mask Color Silkscreen color PCB Thickness Tolerance Laminate Performance Class Laminate Performance Class Contact Finish Estimated drilled Via	Yes, Via Back Drilling not Required 17 17 Green Green White 10% High Performance High Performance	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Cu-thicknesses outer layers (foil) Cu-thicknesses outer layers (foil) Cu-thicknesses outer layers (foil) Cu-thicknesses inner layers (foil) Solder Mask Color Solider Mask Color Silk screen Color Overall Board Thickness Tolerance: 10% Logistics: PCB moisture control IPC-1601 (see QAM 007) Logistics: PCB moisture control IPC-1601 (see QAM 007) Material: IPC-4101 sheets /126 or /129 qualified laminates (no lead-free req.) (see QAM 007) Contact Finish: Electroplated Au ASTM B-488 Contact (see QAM 007) Contact Finish: Logistics: see Stackup	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE) method Impedance Test Method IPC-TM-650: Short Pulse Propagation (SPP) method Impedance Test Method IPC-TM-650: Frequency	Optional Optional
Controlled Impedance Controlled Impedance Controlled Impedance Controlled Impedance Controlled Impedance Cu foil thickness on outer layers (µm) Solder Mask Color Solder Mask Color Solder Mask Color Silkscreen color PCB Thickness Tolerance Laminate Performance Class Laminate Performance Class Contact Finish Estimated drilled Via Holes	Yes, Via Back Drilling not Required 17 17 Green Green White 10% High Performance High Performance	control according IPC- TM-650 2.5.5.12 Logistics: Impedance control according IPC- TM-650 2.5.5.12 Cu-thicknesses outer layers (foil) Cu-thicknesses outer layers (foil) Cu-thicknesses outer layers (foil) Cu-thicknesses inner layers (foil) Solder Mask Color Solider Mask Color Silk screen Color Overall Board Thickness Tolerance: 10% Logistics: PCB moisture control IPC-1601 (see QAM 007) Logistics: PCB moisture control IPC-1601 (see QAM 007) Material: IPC-4101 sheets /126 or /129 qualified laminates (no lead-free req.) (see QAM 007) Contact Finish: Electroplated Au ASTM B-488 Contact (see QAM 007) Contact Finish: Logistics: see Stackup	IPC-TM-650: Effective Bandwidth (EBW) method Impedance Test Method IPC-TM-650: Root Impulse Energy (RIE) method Impedance Test Method IPC-TM-650: Short Pulse Propagation (SPP) method Impedance Test Method IPC-TM-650: Frequency	Optional Optional



Embedded in NPI

- Different stage gates defined for each PBA
 - Each stage gate has a checklist to complete
 - Responsibilities are described in process document
 - Milestones in NPI require proof of these checklists
 - Risk assessment shall be done
 - This is a Team responsibility

- Checkist for each PBA stage gate, including:
 - Passport @ Concept phase
 - Passport @ Design Phase
 - Passport update at each redesigns





Benefits



Passport

 Questionair to be completed @ Concept and Design Phase to enable correct use of guidelines



Request for Quotation

 Before PCB layout starts: more negotiation power & cost simulations possible



Design verification

- Passport prevents
 impossible requirement
 combinations & identifies
 complex/expensive choices
- Early impact assessment enabling other design decisions



Supplier Assessment

- By requesting & updating their processes & capabilities on a regular base
- New technologies shall be assessed and included in QAM



World Wide NPI: PBA Passport facilitates manufacturing

Passport enables early Supplier involvement, early Cost indicator & early design guidelines choices (early = design phase)

Passport embedded in NPI Process enables early risk assessment for all PBA designs WW



Questions?







ENABLING BRIGHT OUTCOMES

- YouTube | youtube.com/BarcoTV
 - in | linkedin.com/company/Barco
 - **y** | twitter.com/Barco
 - f | facebook.com/Barco