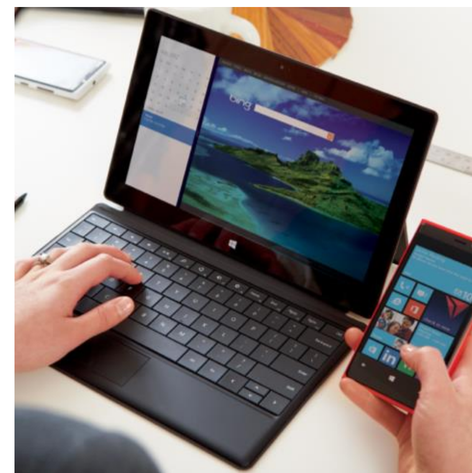
Packaging For Consumer Electronics

Raj Master
GM, Microsoft
Silicon Operations & Reliability.



Microsoft Hardware Teams:
30+ years of Innovation

Specialty Devices & PC Peripherals

Surface
Mice
Cameras
Keyboards

IEB Hardware

Xbox
Kinect
Accessories

Manufacturing & Supply Chain

Sourcing & Planning
Manufacturing & Repair
IC Packaging
Silicon Reliability
Quality & Reliability
Safety
Compliance & Sustainability
Product Services & Localization

1982
PCHW Forms

1983
Microsoft Mouse Debuts

1994
First ergonomic Keyboard
Trackballs
Joysticks

1999
Optical Mouse

2001
Xbox v1

2005
Xbox 360
Xbox Controller v2

2008
Surface

2009
LifeCam
Bluetooth Mobile Keyboard

2010
Xbox 360S
Transforming DPAD
KINECT
LifeCam Studio
Arc Touch Mouse

2011
Xbox Speed Wheel

2012
Surface RT

2013
Surface Pro
XBOX One

2014
Surface Pro 2

2014
Exciting!!!! NOKIA!

Package Drivers

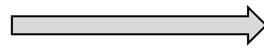
Hardware Platforms at MSFT have three distinct package trajectories

High performance Processors packages for Console (XBOX)	Specialty GaAs/Si/Pkg for Unique Applications (Kinect)	Small Form factor packages for handheld devices Tablets + Cell Phone
Long product life cycle – 3 to 5 years Severe thermal management issues. Power > 100W Die shrinks (process node 28nm >20nm>14nm) resulting in increasing power density	Significant use of image sensors and illumination Higher power (Watts) on unique long term reliability requirements "***Always on***"	**Short product development cycle** (not field life) of less than one year Fine pitch devices BGA & lead-frame based devices Processors with memory integration using Package on Package (POP) & Stacked die Increased use of sensors (Accelerometers, Gyroscopes, Ambient light sensors, Flash LEDs) ***Lowest cost implementation with Fast volume ramp***

Pkg Trends: Long Product life hardware

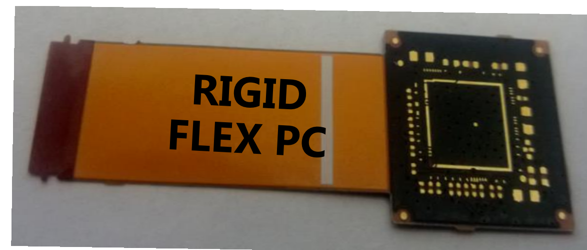
Processors

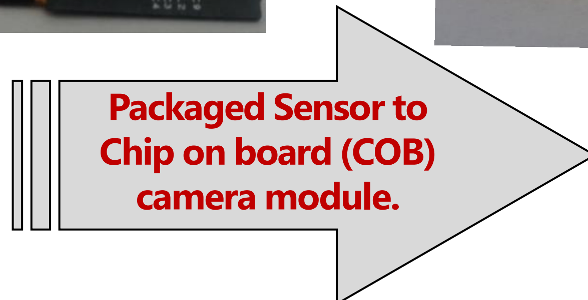
Substrate: 3/2/3

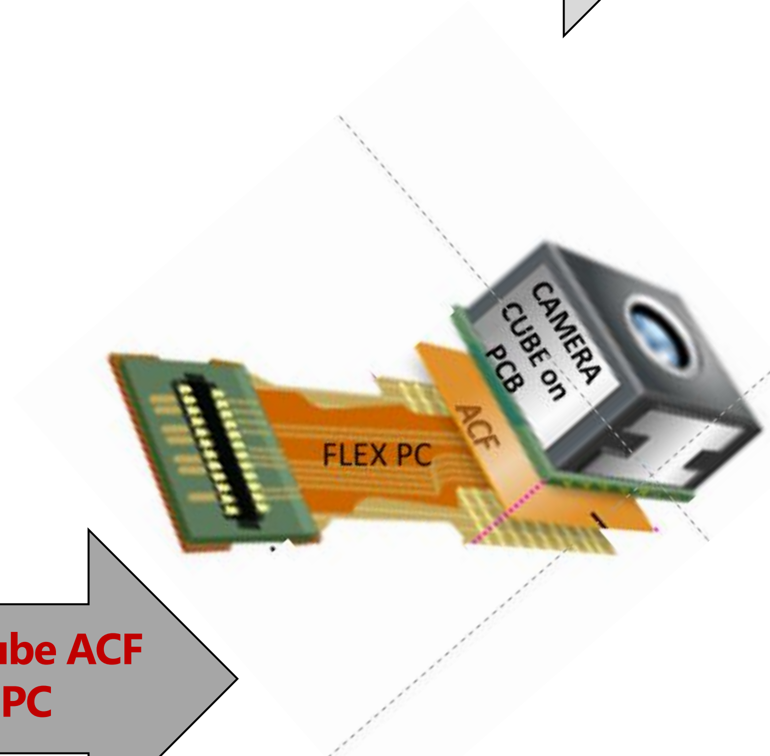


Substrate: 2/2/2

Cameras



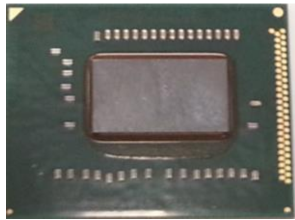


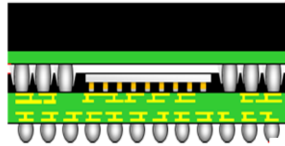


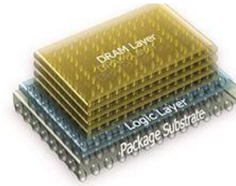
Pkg Trends: Short Product Development Cycle

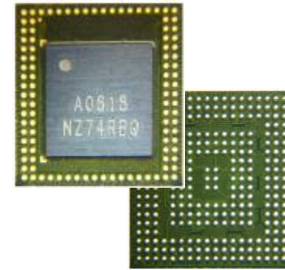
POP

TSV



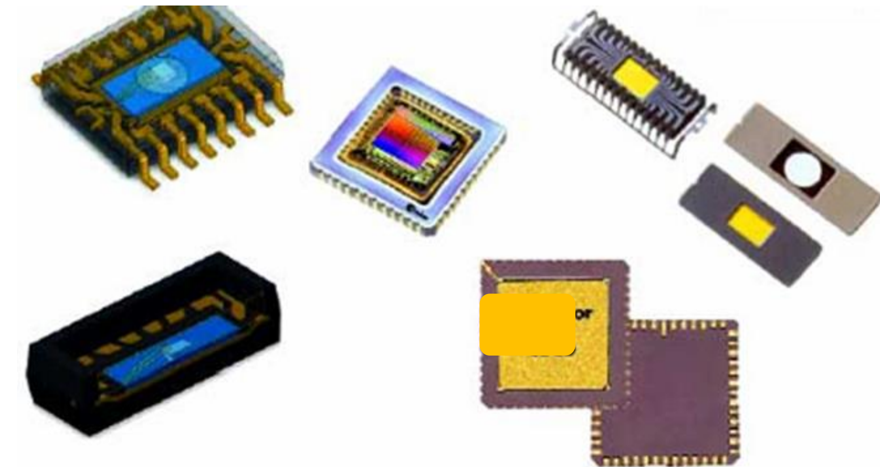






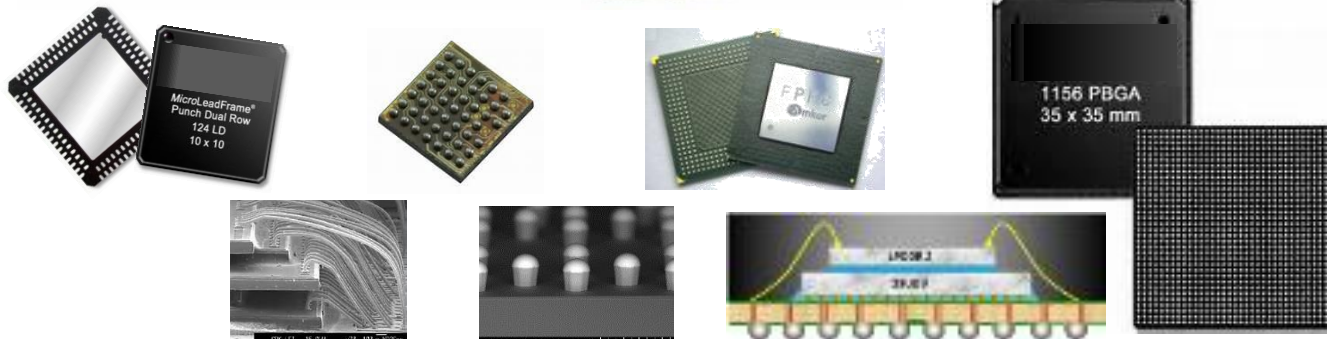
Processors/ASIC's

Maximum Processing Power & Bandwidth with Minimum Power



Sensor's

Enable new experience, software applications & improve reliability - Cameras, Compass, Gyros etc.



Conventional IC's

Au wire to Ag/Cu wire
Smaller die/ pkg. size

Summary - Packaging Trends

Always Green Packaging

Enable Performance *Faster and Cooler*	Form Factor *Smaller X, Y, and Z Dimensions*	Cost
• Flip Chip development for 20nm & 14nm Flip chip assembly/ Copper pillar • Aggressive thermal/mechanical management	• Stacked Die and Package stacking (PoP) • Increased use of MEMS and custom sensor packaging	• Reduction in Gold use without compromising Quality • Aggressive Cooling techniques to enable smaller form factors

Thank you