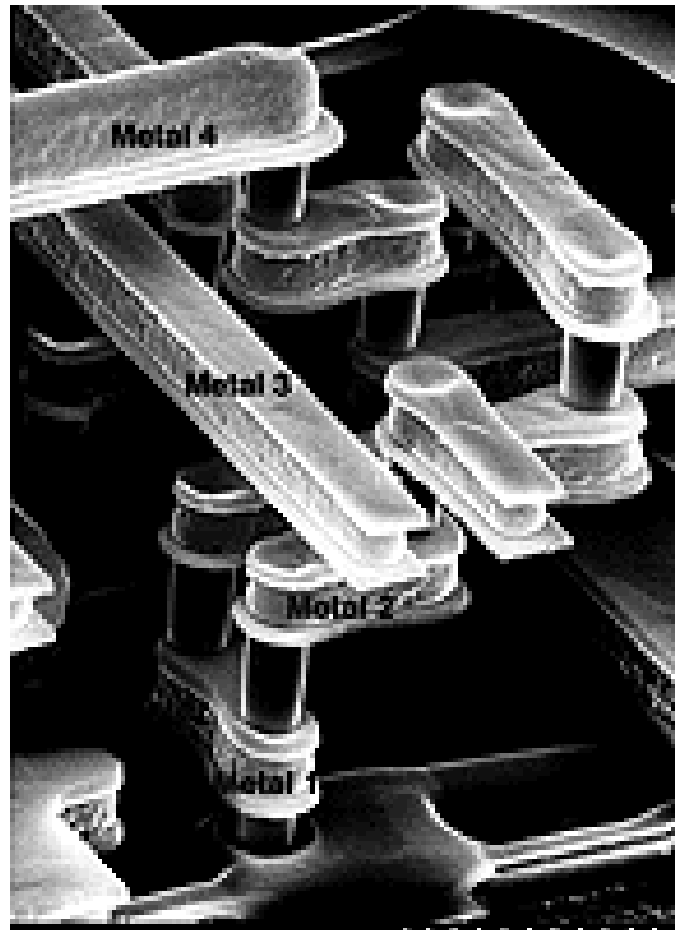
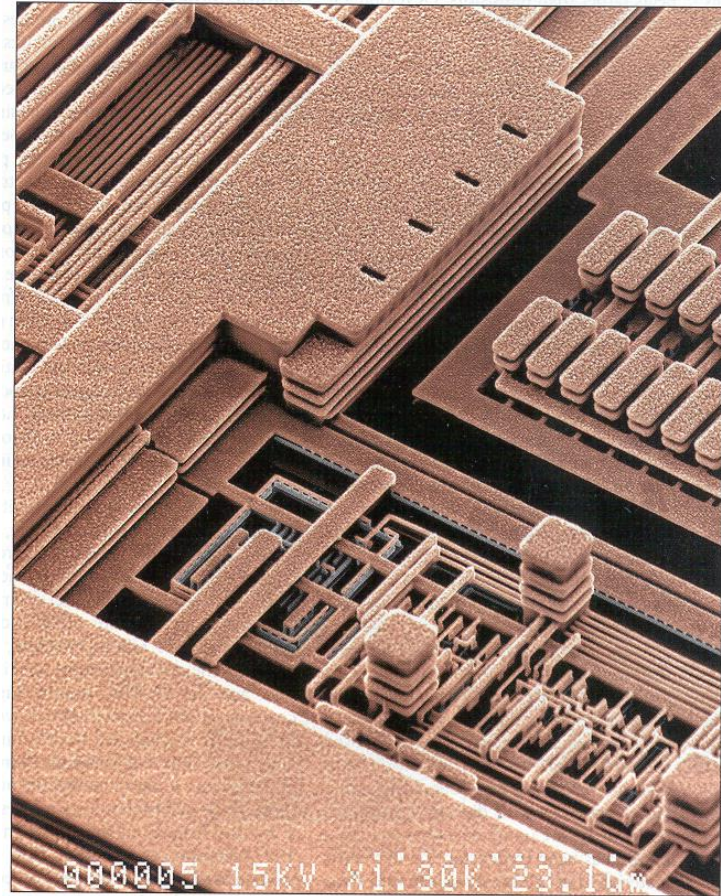
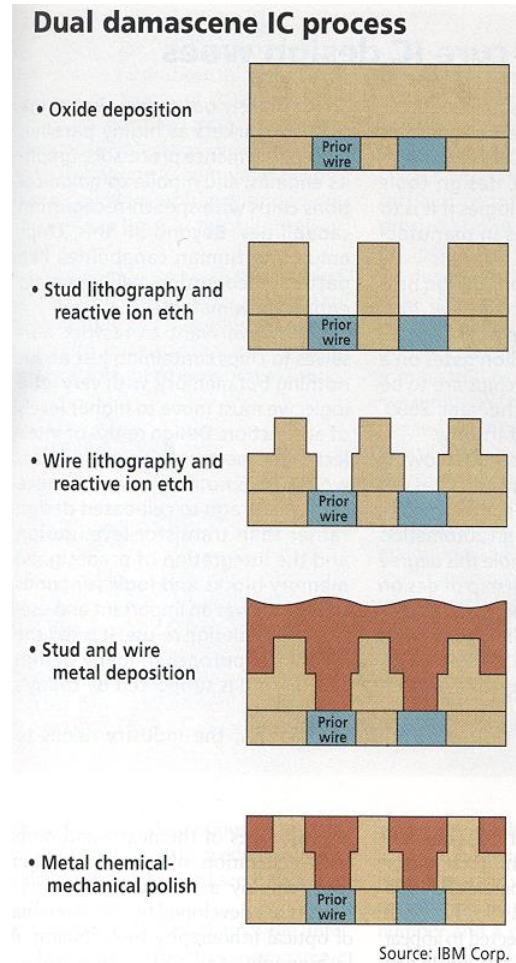


# ADVANCED METAL INTERCONNECT EXAMPLES

# Four Levels of Metal Example



# Advanced Metallization



# Microprocessor Interconnect

- Microprocessor interconnect
- 8 levels of metal
- Steadily increasing pitch and thickness with higher levels for higher performance

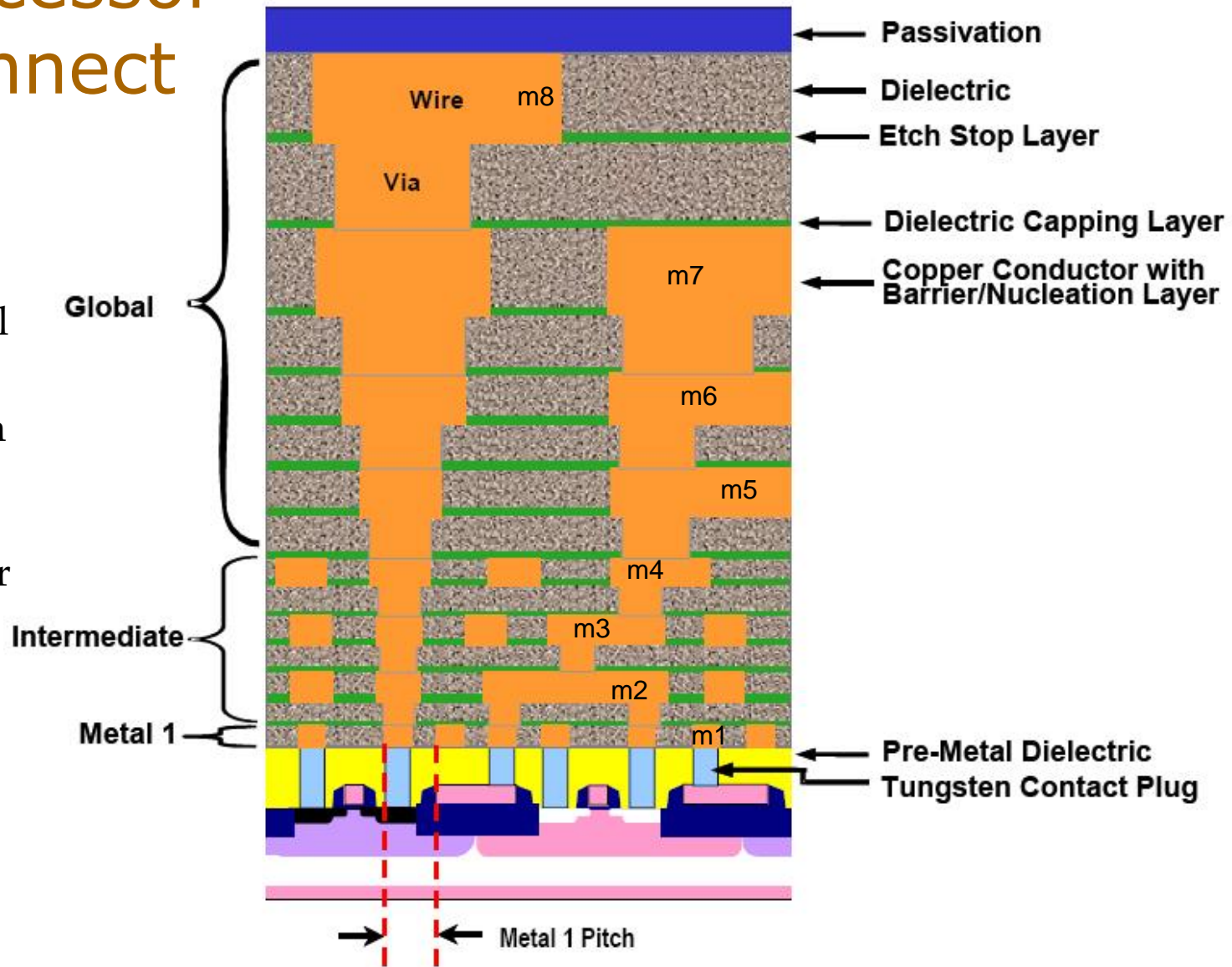


Figure 70 Cross-section of Hierarchical Scaling—MPU Device



# ASIC Interconnect

- Application Specific IC (ASIC) interconnect
- 8 levels of metal
- More regular structure
  - Semi-global is 2x Intermediate pitch
  - Global is 4x Intermediate pitch

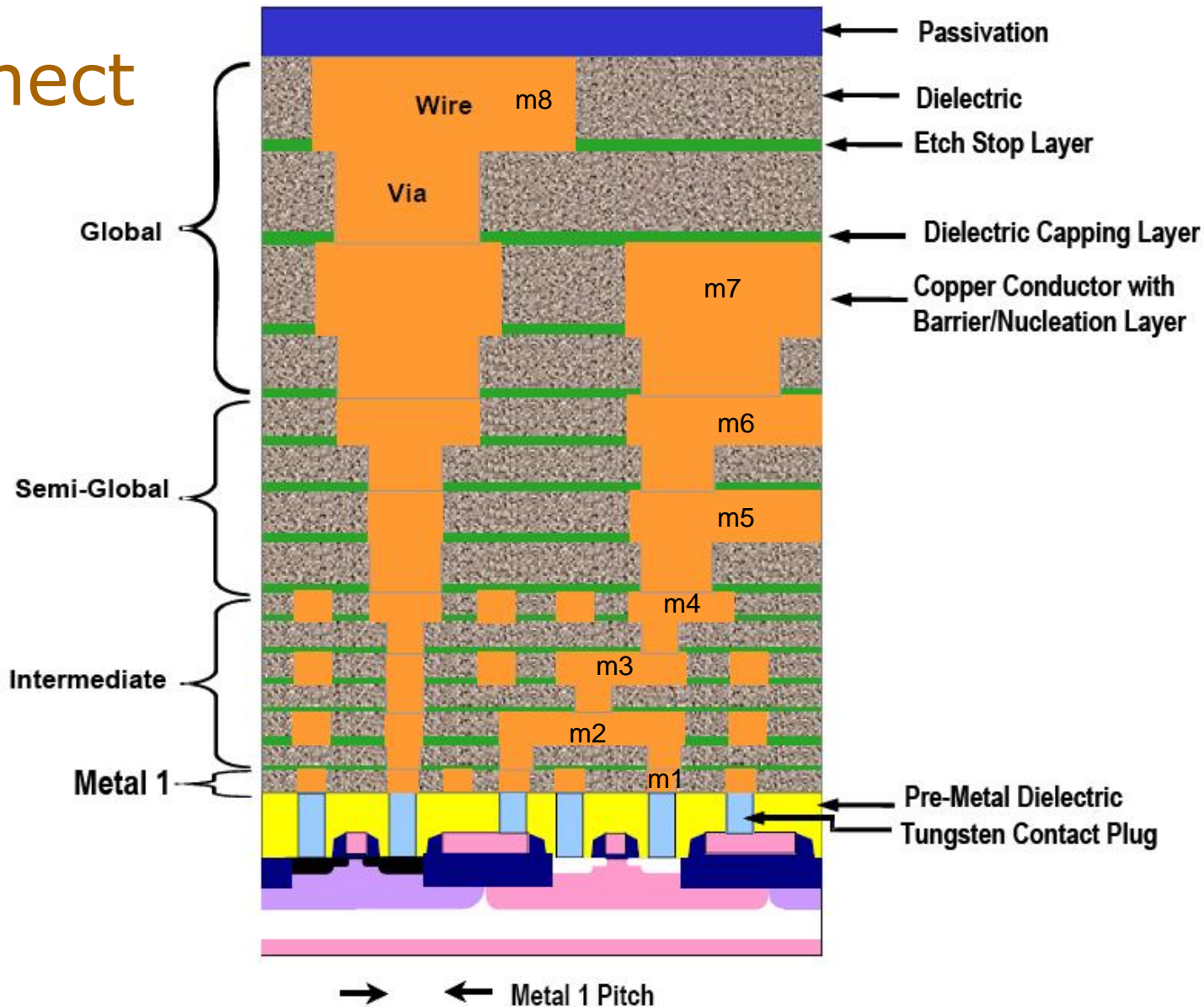
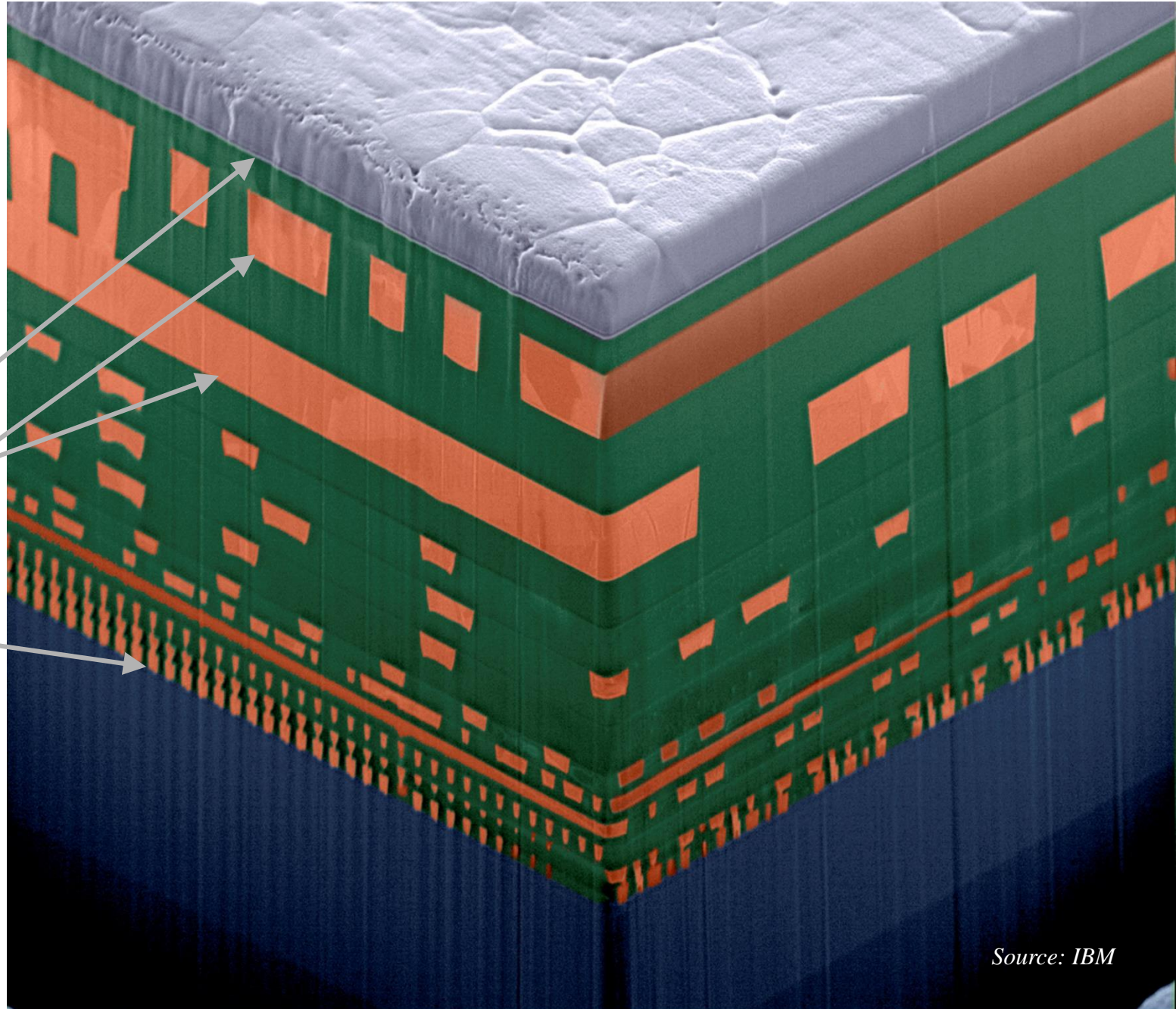


Figure 71 Cross-section of Hierarchical Scaling—ASIC Device

Source: ITRS Interconnect, 2005

# IBM 90 nm

- 64-bit micro-processor
- (1) Al(Cu) [top]
- (2) 6x Cu
- (3) 2x Cu
- (5) 1x Cu
- (1) W local [bottom]
  - 0.12  $\mu\text{m}$  width & spacing



Source: IBM

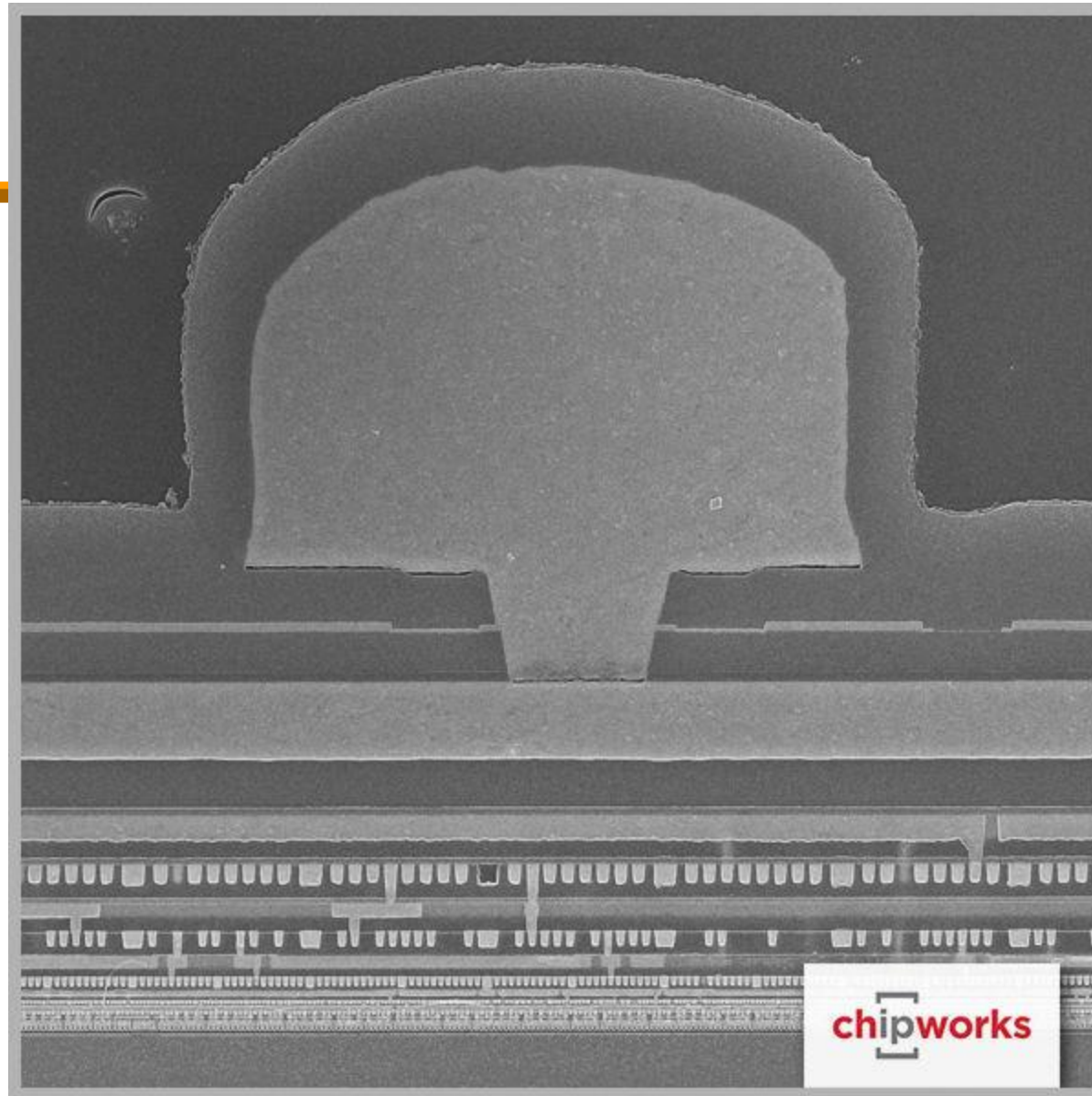
EEC 116, B. Baas

E-Beam 5.00 kV	Mag 15.0 kX	Tilt 59.0°	Spot 4	Det TLD-S	FWD 4.855	5 $\mu\text{m}$
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# Intel 14 nm

- Broadwell  
Core M
- 13 metal layers
- Super thick top  
level metal
- MIM-capacitor  
layer under the  
top level metal



# Intel 14 nm

- Broadwell  
Core M
- Detail of  
metal  
layers  
1-12

