



INSIDETECHNOLOGY

## **Case Study: What we found inside Apple's iPod – a Teardown to the Atomic Scale**

Dick James, Senior Technology Analyst, Chipworks

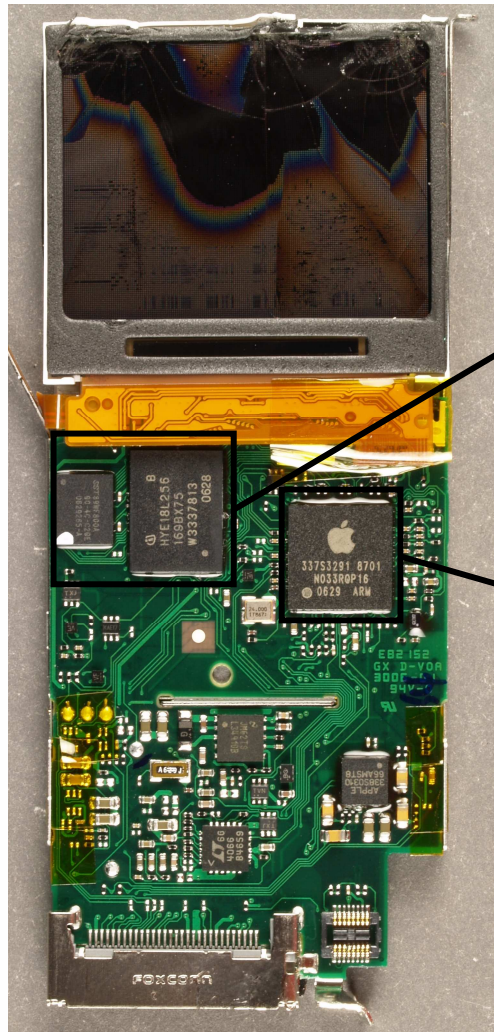
# Apple's 8-GB iPod



Why the iPod?  
For the leading  
edge parts



## Covers off - Top!



**SST 8 Mb multi-purpose NOR Flash**

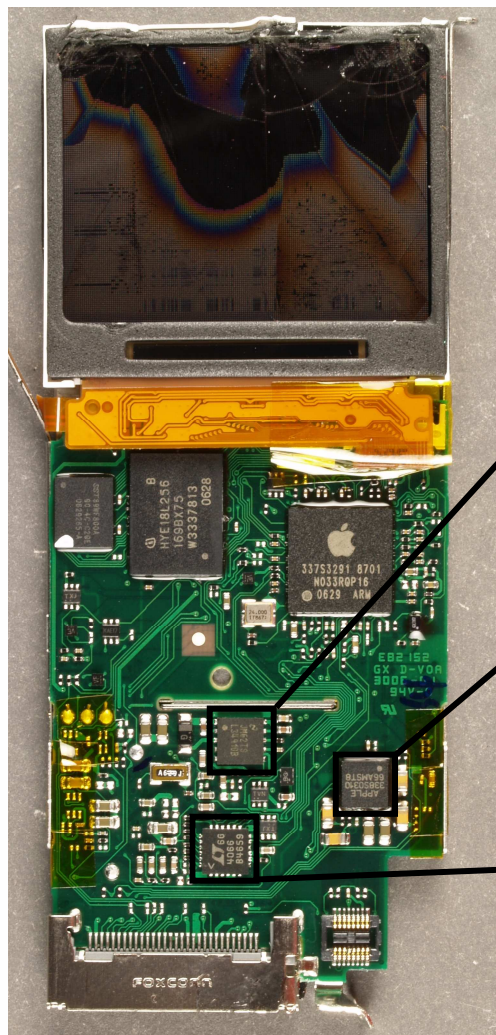


**Samsung S5L8701 ARM core DSP + Flash controller**

**Qimonda 256 Mb SDR extended temp mobile DRAM**



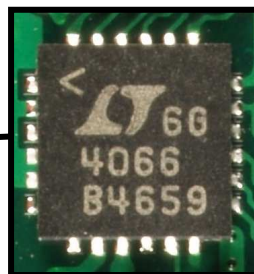
# Covers off - Top!



National step-down switching regulator



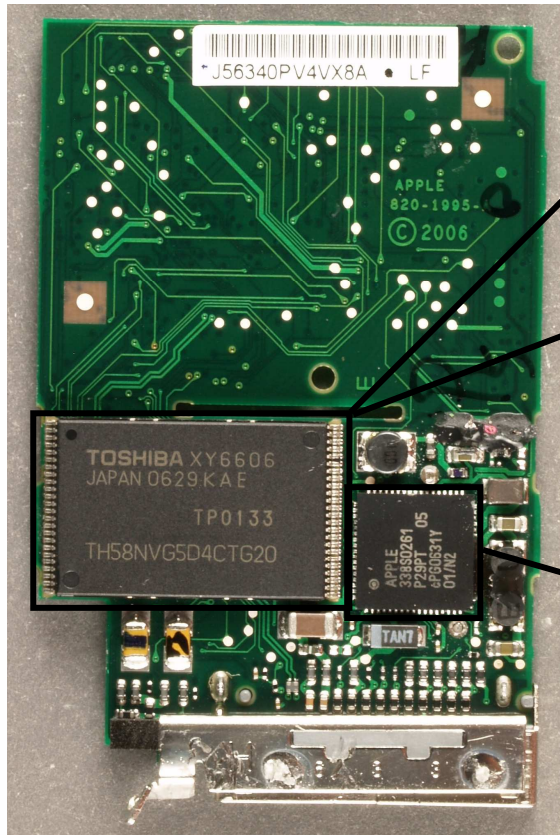
Apple (Wolfson?) audio CODEC – fabbed by TI



Linear Technology USB power manager

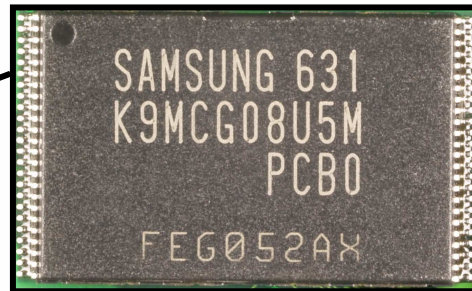


# Covers off – Bottom – the Memory Side!



Toshiba 32 Gb (x2)  
multi-level cell NAND  
Flash memory

or



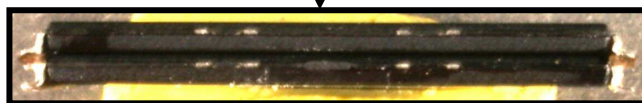
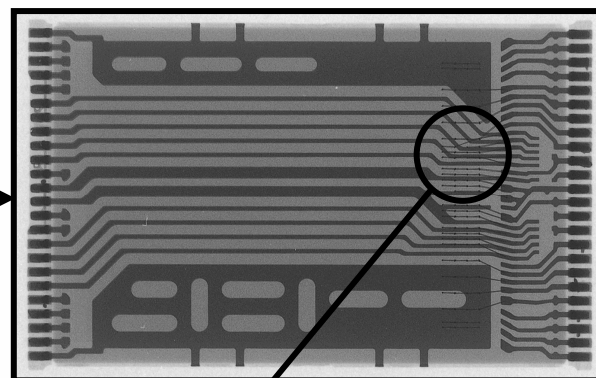
Samsung 64Gb dual-  
stack package, multi-  
level cell NAND  
Flash memory



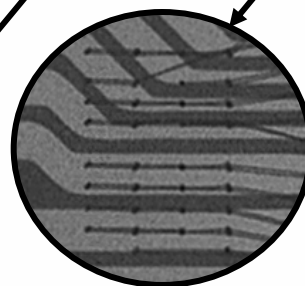
Apple (Philips  
PCF50635) power  
manager



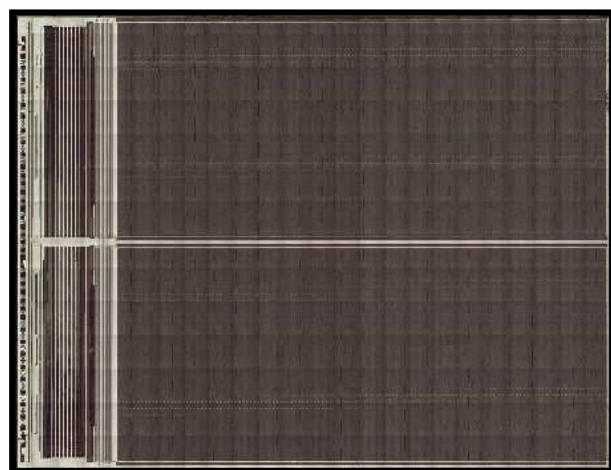
# Toshiba NAND Flash



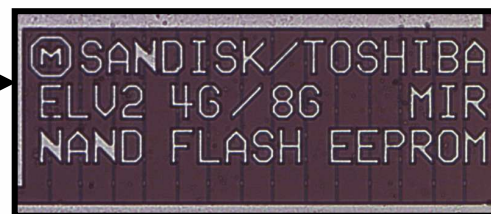
A twinpack – 2 x 32 Gb



4 x 8 Gb dice in each package



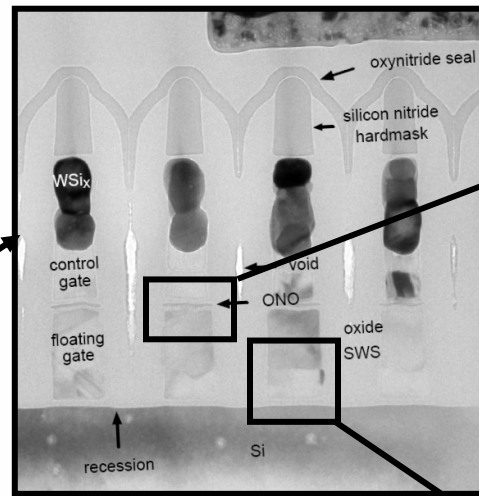
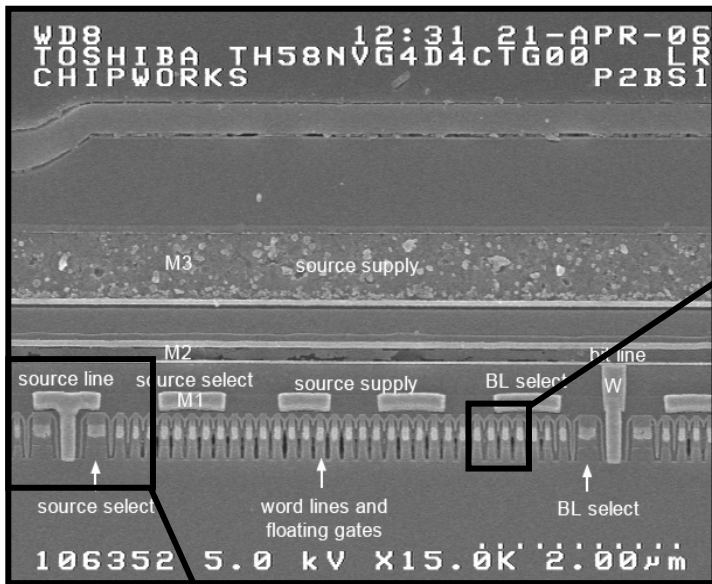
Die photo



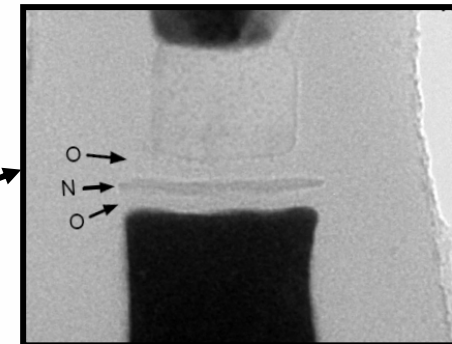
Die marking



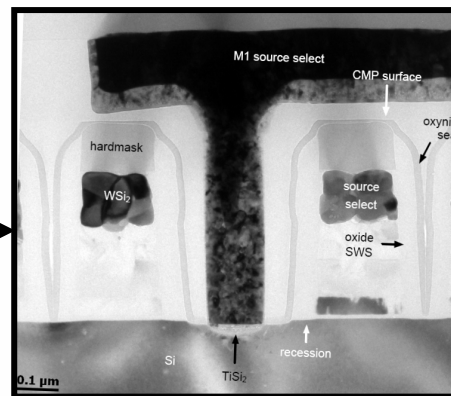
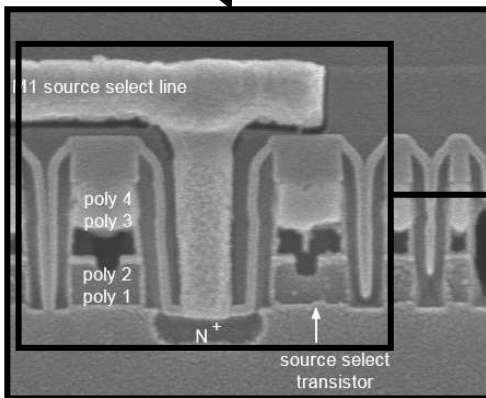
# Toshiba NAND Flash in Cross-Section



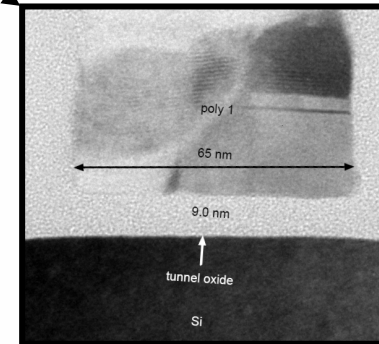
Memory cells



Interpoly dielectrics



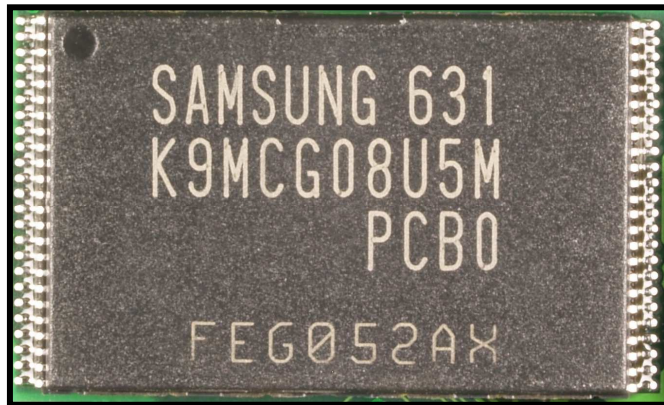
Source select line & transistors



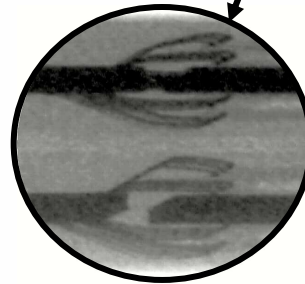
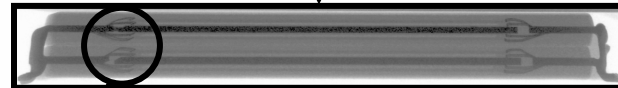
Gate oxide



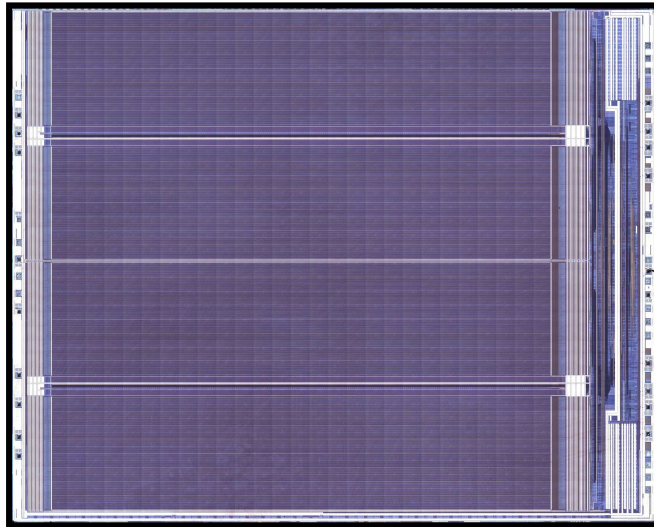
# Samsung NAND Flash



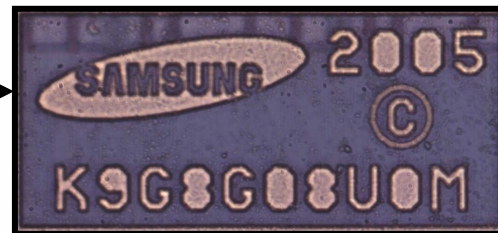
A twinpack also – 2 x 32 Gb



4 x 8 Gb dice in each package



Die photo

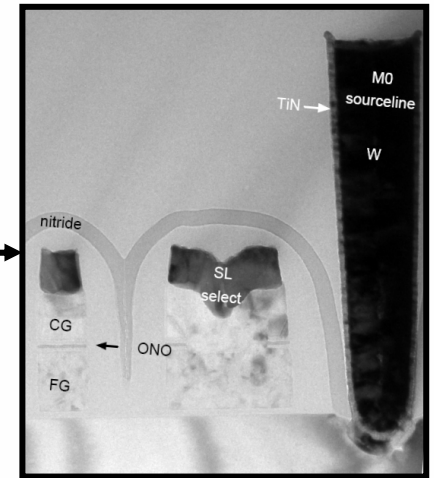
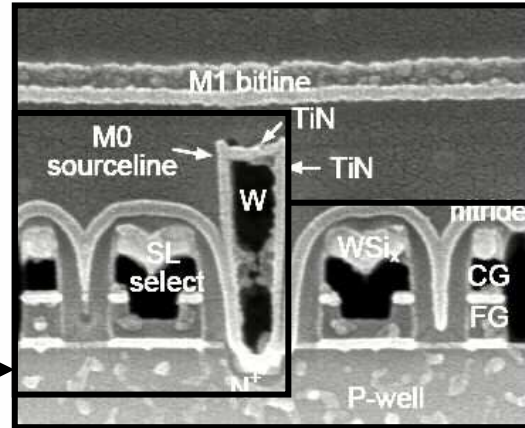
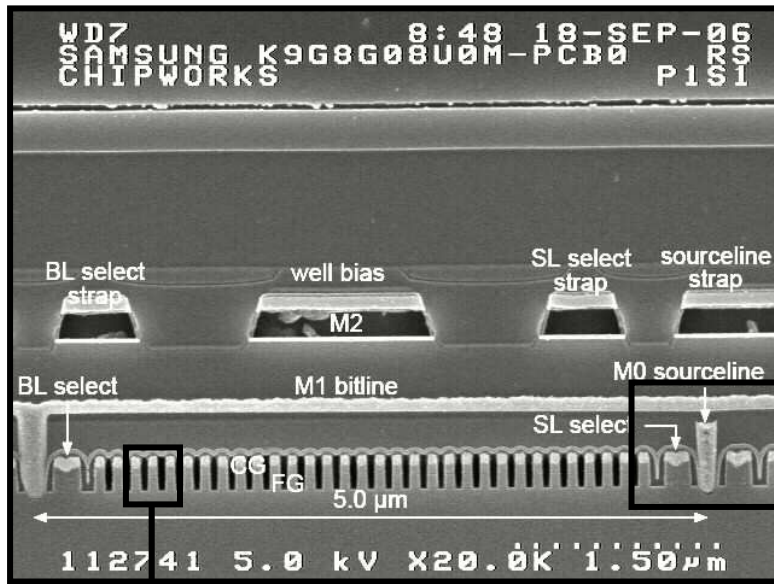


Die marking

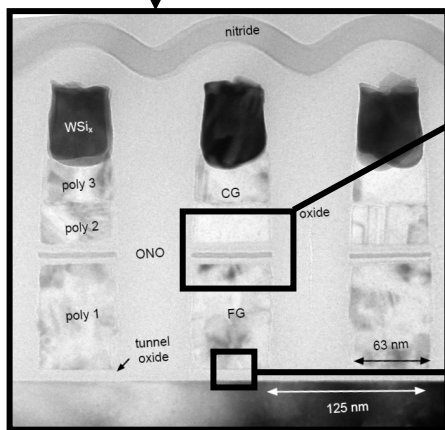




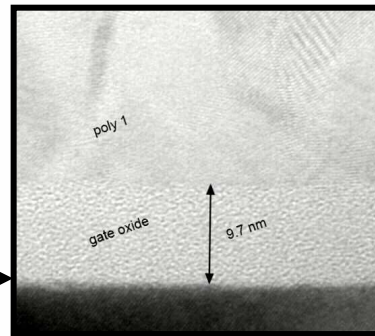
# Samsung NAND Flash in Cross-Section



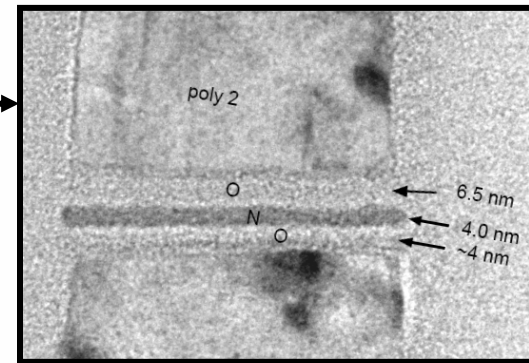
Source select line & transistors



Memory cells



Gate oxide



Interpoly dielectrics

