Outline

- The Business of Semiconductors
- The Business of CMP
- Wrap Up
The Business of Semiconductors

Wafer Starts per Month by Technology

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Logic Wafer Starts per Month by Technology

RAM Wafer Starts per Month by Technology

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NVRAM Wafer Starts per Month by Technology

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Pad & Slurry Revenue by Application

Annual Revenue (US$M)

Source: Techcet Group, 2013

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Pad & Slurry Revenue by Application

Annual Revenue (US$M)

- Cu Barrier
- Cu Step 1
- Tungsten
- Oxide
- HkMG Oxide
- HkMG Electrode
- S–STI

Ceria Price Jump

Source: Techcet Group, 2013

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Pad & Slurry Revenue by Application

Annual Revenue (US$M)

- Cu Barrier
- Cu Step 1
- Tungsten
- Oxide
- HkMG Oxide
- HkMG Electrode
- S-STI

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Tungsten CMP Wafer Passes per Year

- Logic 450mm 11–10 nm
- Logic 300mm 11–10 nm
- NVRAM 300mm 11–10 nm
- RAM 300mm 11–10 nm
- Logic 300mm 14nm
- NVRAM 300mm 14nm
- RAM 300mm 14nm
- Logic 300mm 22–20 nm
- NVRAM 300mm 22–20 nm
- RAM 300mm 22–20 nm
- Logic 300mm 32–28 nm
- NVRAM 300mm 32–28 nm
- RAM 300mm 32–28 nm
- Logic 300mm 45 nm
- NVRAM 300mm 45 nm
- RAM 300mm 45 nm
- Logic 200mm 45 nm
- NVRAM 200mm 45 nm
- RAM 200mm 45 nm
- Logic 300mm 65 nm
- NVRAM 300mm 65 nm
- RAM 300mm 65 nm
- Logic 200mm 65 nm
- NVRAM 200mm 65 nm
- RAM 200mm 65 nm
- Logic 300mm 90 nm
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S–STI CMP Wafer Passes per Year (Ceria Slurry)
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Copper CMP Wafer Passes per Year

NOTE: numbers apply equally to Cu Step 1 and Cu Barrier
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HkMG CMP Wafer Passes per Year

NOTE: numbers apply equally to HkMG Electrode and HkMG Oxide
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Total CMP Wafer Passes per Year

- HkMG Oxide
- HkMG Electrode
- Cu Barrier
- Cu Step 1
- S–STI
- Tungsten
- Oxide

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Slurry Revenue

- Cu Barrier
- Cu Step 1
- Tungsten
- Oxide
- HkMG Oxide
- HkMG Electrode
- S-STI
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Number of CMP Pads Used by Application

Annual Pad Usage

- Cu Barrier
- Cu Step 1
- Tungsten
- Oxide
- HkMG Oxide
- HkMG Electrode
- S-STI

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Pad Revenue

Annual Revenue (US$M)

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<th>Oxide</th>
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% 450mm Pad Revenue by Process

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% Pad Revenue by Wafer Size

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Some 200mm capacity did not recover
Wrap Up

🌟 Steady revenue with low/no growth
- Oxide slurry for >32nm
- Tungsten slurry
- CMP pads overall

🌟 These businesses are neither small nor dead
Wrap Up

🌟 Technology drivers

✧ NVRAM
✧ Sub–20nm device structures
✧ 450mm

🌟 Beneficiaries

✧ Slurries for HkMG & new structures
  ✧ *Single pass, thin films, low volumes*
✧ Oxide slurry for $\leq 32\text{nm}$
✧ Pads for 450mm

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CMP Consumables Report

- Available by individual consumable
- Some content available by the page

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