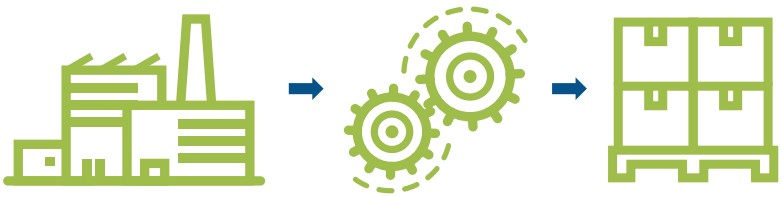
Understanding Semiconductor Lead Times



Complex wafer fabrication process takes up to 12 weeks

- Involves hundreds of sequential steps like photolithography, etching, and ion implantation.
- Requires clean room conditions and highly skilled workers.
- While many suppliers have their own fab capabilities, most suppliers also outsource some or all of their wafer fabrication to outside foundries.

Cycle time increases with complexity

- Advanced processors with smaller geometries require even more precise techniques.
- Next frontier applications for semiconductors like AI and self-driving cars require faster processing and longer cycle times.
- Foundries for some of these applications are currently under construction all over the globe.

Assembly and test add another 4-8 weeks

- Most chips require 'packaging' so they can be connected to the PC board in an electronic device.
- There are many possible configurations depending on end application and cost considerations.
- Component then goes through a separate testing process.

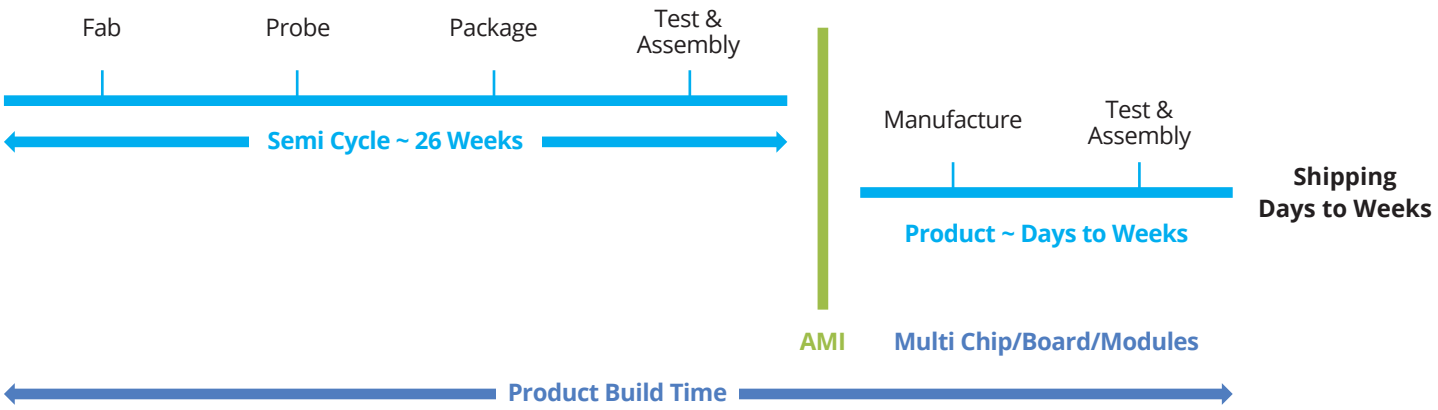
Capacity constraints and demand peaks add more uncertainty

- Foundries may prioritize certain customers and/or certain end markets.
- When unpredictable demand peaks occur, recovery can take years.
- Building a new foundry to add substantial capacity can cost $10-20 billion.

Lead time forecasters have no visibility into channel inventory pockets

- Customers double order when supply tightens.
- Excess inventory can create a 'bull whip' when demand falls off.
- Small demand fluctuations cause cascading excess inventory throughout the channel.

Understanding Product Cycle Time



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