Cyclone IV Architecture - Logic Element (LE)

- Smallest units of logic in the IC
- Four-input LUT (LE)
- Programmable Register
- Carry Chain and Register Chain Connection



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Cyclone IV Architecture - Logic Element (LE)

- Normal Mode
- Retains 4-input LUT
- For General Logic Applications



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Cyclone IV Architecture - Logic Element (LE)

- Arithmetic Mode
- Two 3-input LUTs
- ► For Adders, Counters, Accumulators, Comparators
- ▶ LE implements two-bit full adder, and carry chain



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Cyclone IV Architecture - Logic Array Blocks

- Logic Array Blocks contain 16 LEs
- Hierarchical routing resources, inter-LAB, extra-LAB
- Allows choosing of optimum wiring resource



Cyclone IV Architecture - Embedded Memory

- ▶ 66 blocks of 8K (1024) bit SRAM in columns
- RAM, ROM, FIFO, shift register
- One parity bit for each byte
- Fully synchronous SRAM (registered data and address)
- Memory can be preloaded during initialization
- Multiple configurations possible



Cyclone IV Architecture - Embedded Memory

Memory Configurations



Single Port Memory



Simple, Two-Port Memory



True Dual Port Memory



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Cyclone IV Architecture - Embedded Memory

- Memory Configurations Shift Register Mode
 - Used to implement shift registers for DSP applications
 - ▶ Shift register sized by: width × tap_length × number_taps



Cyclone IV Architecture - Embedded Multipliers

- ► Cyclone IV (CE22) : 132, 9x9 or 66, 18x18 multipliers
- Cascadable for wider operations
- Handles signed or unsigned data



Multipliers are in Columns with Adjacent LABs



Multiplier Architecture

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Cyclone IV Architecture - I/O

- ► Comprehensive support: 3.3v, 2.5v, 1.8V, 1.5V, 1.2V, LVDS, LVPECL
- Bidirectional I/O Buffer + Five Registers
- Single-ended or Differential Drive, On Chip Termination, Slew Rate

