

# Technical Comparison of Proposed vs. Existing Platforms

Altera DE1-SoC vs. DE2 Boards

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# Summary Findings

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- DE1-SoC has all components essential for embedded systems design.
- Significant capacity and performance improvement in all areas vs. DE2.
- Upgraded parts in general; uses Cyclone V FPGA vs Cyclone II
- ARM CPU hardcore
- Supported by Quartus Prime which is the most recent iteration of Altera's design software with many new features
- Missing aspects not critical
  - LCD display but there are LEDs and Seven Segment display
  - No Flash on the board but SD Card slot

# DE2 vs. DE1-SoC

Component	DE2	DE1-SoC	Summary
Price	\$284	\$175	\$100 cheaper (less component cost below)
FPGA	Cyclone II	Cyclone V	DE1-SoC roughly 10x comp. power, see slide 2
Hard Processor		ARM Cortex-A9 Dual Core	Ability to explore hard/soft core tradeoffs, significantly faster processor (925 MHz)
Soft Processor	Nios II 50MHz	Nios II 220MHz	DE1-SoC much faster softcore speed
SDRAM	8MB	64MB (FPGA) 1GB (HPS)	DE1-SoC 8x on FPGA & 128x on ARM core
Persistent storage	4MB Flash	SD Card slot	DE1-SoC requires additional component (SD Cards <\$1/GB)
ADC		12bit 8channel	Offers new ability to sample analog signals
Ethernet	10/100 Mbps	10/100/1000 Mbps	DE1-SoC 10x Faster transfer speeds
Video out	10bit VGA	24bit VGA	DE1-SoC offers superior color depth
Accelerometer		3-axis	Offers new sampling ability
Clock	50, 27 MHz	4x 50 MHz	DE1-SoC offers more versatile clocking options

# Cyclone II vs. Cyclone V

Component	Cyclone II	Cyclone V	Summary
Exact model	EP2C35F672C6	5CSEMA5F31C6	
Process	90nm (low-k)	28nm (LP28)	
Core voltage	1.2V	1.1V	
N-input LEs	4 input	8 input	Can implement higher logic functions per block
# of LEs	33k	85k	Offers roughly 5x as many logical element equivalents
18x18 multipliers	35	174	5x more multiplier processing power
PLLs	4	6+3	More versatile clocking options
Memory blocks	105 M4K	3970 M10K	Roughly 100x more memory
Extern. memory support	SDR, DDR, DDR2, QDRII	LPDDR2, DDR2, DDR3	DDR3 offers a superior data rate

# Sources

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- 1) [https://www.altera.com/content/dam/altera-2\)www/global/en\\_US/pdfs/literature/hb/cyclone-v/cv\\_51001.pdf](https://www.altera.com/content/dam/altera-2)www/global/en_US/pdfs/literature/hb/cyclone-v/cv_51001.pdf)
- 2) <https://www.altera.com.cn/products/fpga/cyclone-series/cyclone-ii/support.html>
- 3) <https://www.altera.com/support/training/university/boards.html#de1-soc>
- 4) <https://www.altera.com/support/training/university/boards.html#de2>
- 5) <https://www.altera.com/products/processors/overview.html>