Trends in Prototyping Systems

A Complete Design Platform

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Agenda

- Focus of design dept.
- Electronic system & Flow
- Design problems
- Educating design
- Prototype
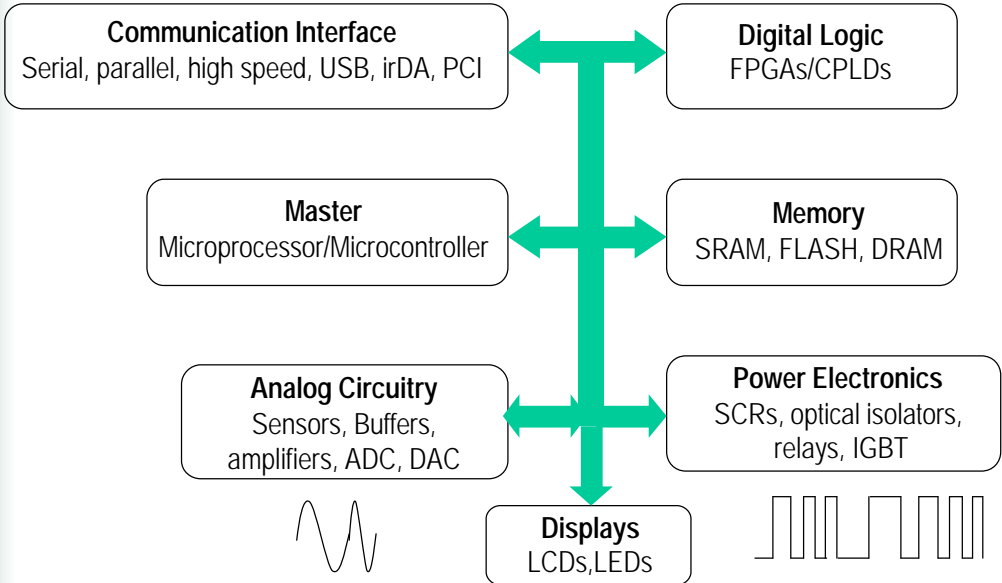- USDP
- Features
- Applications
- Conclusion

Focus of Design Dept.

- Faster Solutions
- Higher Integration
- More Features
- Compact form factor
- TTM

Electronic System

- A system can be defined as "A group of independent but inter related elements comprising a unified whole".

- Or "A processing platform, where all element work together for a goal, with the given instructions. "

Electronic System

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Communication Interface
Serial, parallel, high speed, USB, irDA, PCI

Digital Logic
FPGAs/CPLDs

Master
Microprocessor/Microcontroller

Memory
SRAM, FLASH, DRAM

Analog Circuitry
Sensors, Buffers, amplifiers, ADC, DAC

Power Electronics
SCRs, optical isolators, relays, IGBT

Displays
LCDs,LEDs

Electronic System

- Microprocessor/Microcontroller (8051, RISC, PIC, ARM)
    - A traditional approach
    - Small form factor available
    - Ease of design
    - A real manager
- Digital Logic (FPGA, CPLD)
    - HUGE complex logic in one device
    - Small form factor
    - Higher frequencies
    - Flexible & reprogrammable

Electronic System

- Communication Interface (USB, RS232, irDA, PCI)
  - Depends on data size and speed.
- Memory (FLASH, SRAM, DRAM)
  - For what reasons to store data
  - Look up tables
  - Log files
  - Access time
- Analog Circuitry (ADC,DAC, buffers, SCU, filters)
  - Real world communicator
  - Level translations
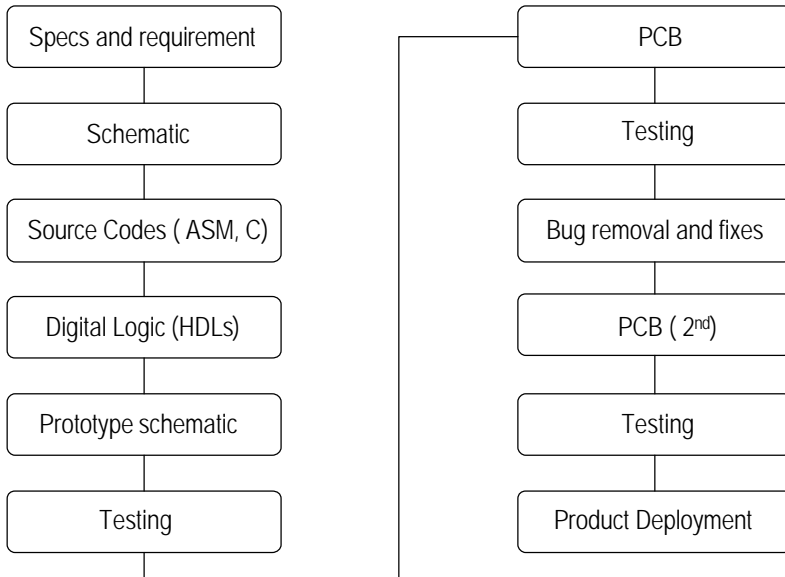 - Sensors

Electronic System

- Power Electronics (IGBT, SCR, relay)
    - High V & I to handle
    - Motor control
    - Electromechanical design

Selection of devices and interfaces depends

- Application
- Handling
- Environment
- End user needs

Design Flow


```
Specs and requirement  ──────┐              ┌──  PCB
        │                     │              │     │
    Schematic                 │              │  Testing
        │                     │              │     │
Source Codes ( ASM, C)        │              │  Bug removal and fixes
        │                     │              │     │
 Digital Logic (HDLs)         │              │  PCB ( 2nd)
        │                     │              │     │
 Prototype schematic          │              │  Testing
        │                     │              │     │
     Testing  ────────────────┘              └──  Product Deployment
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Design problems

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■ Designing an circuit or part of application is easy than the integrating all circuits to make a system.

■ Problem Focus
- Schematic prototyping
- Integration of modules at test level
- Ease of integrating various modules
- Testing of prototypes
- Code debugging
- Flexibility in prototype hardware

Boss is always for TTM

Educating design

- College Laboratories
  - Microprocessor, Microcontroller, VLSI, Instrumentation, EDC, electrical, communication, Project.
- Fresher is known to modular designs (with hiccups)
- Need for sophisticated equipments and kits for training
- More focus on system design
- Intensive labs on application design & development
- Deadline attitude
- Research platform
- Industry connection

Prototype

*"*A system model to test and develop the product before its final implementation.*"*

- Prototyping is like headache to designers
- Ease of prototyping is necessity
- Flexibility is must
- Individual eval boards or kits available

- Need for universal platform integration
- Modular approach
- Up gradation and addition of modules at regular interval.
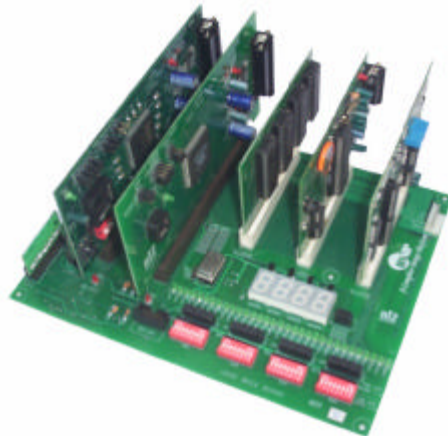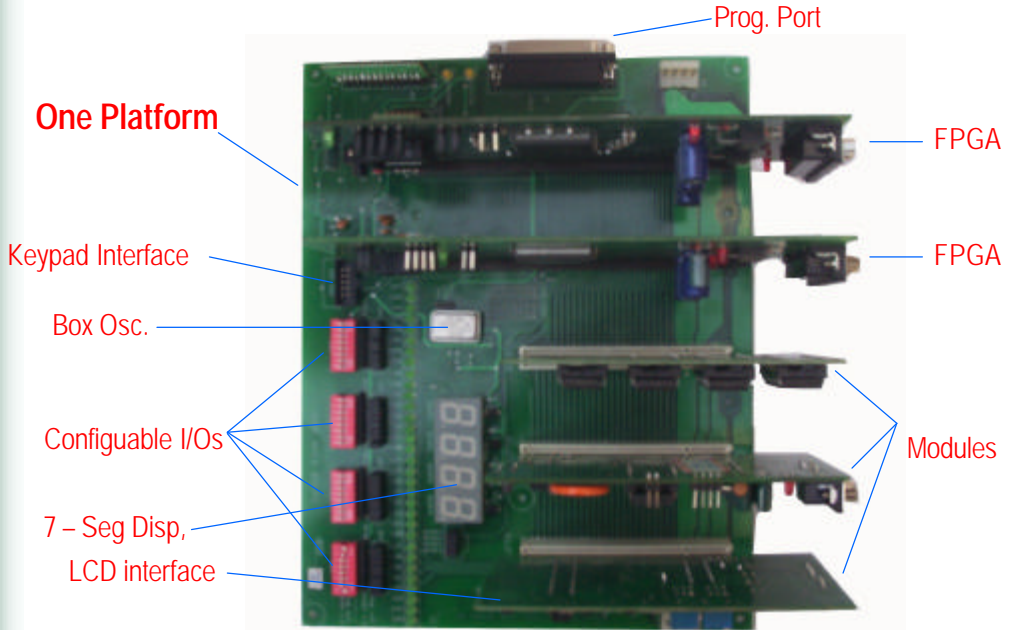
Features

■ Backplane features

  ■ Supports interface with dual daughter PLD cards

  ■ Supports FPGAs from reputed PLD vendors like Xilinx, Altera, etc.

  ■ 3 PCI connector based application specific add-on cards

  ■ 64 bit bus sharing between application add-on cards and PLD daughter cards

  ■ 32 Digital I/Ps and O/Ps

  ■ On board system reset circuit.

  ■ Four seven segment Multiplexed display.

  ■ 4x4 switch matrix keyboard interface header.

  ■ On board crystal oscillator socket (user can select his desired oscillators).

 ■ High performance backplane PCB (upto 80MHz board designs).

Features

- **Xilinx FPGA Card**
  - Supports Spartan-II device family of FPGA's.
  - User selectable configuration modes
  - Onboard PROM support.
  - Support for different I/O Standards
  - High speed interface with other add-on cards
  - A complete I/O bank for user VREF interface, using DB25 connector

- **Altera FPGA Card**
  - Supports ACEX 1K device family of FPGA's.
  - User selectable configuration modes.
  - Onboard PROM support.
  - High-speed interface with other add-on cards.
  - Parallel port interface directly from add-on card of FPGA
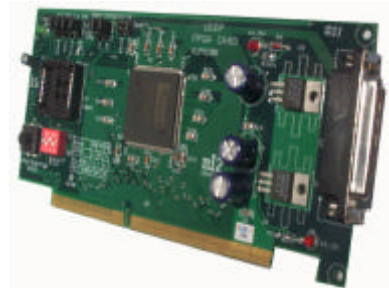
Features

- **Micro-controller Card**
  - Philips 89C51 RD2 controller (ISP).
  - RS-232 interface.
  - On board serial EEPROM.
  - On board serial RTC.
- **PIC Micro-controller Card**
  - Microchip 16F877 PIC microcontroller (ISP).
  - In built ADC,PWM, timers, etc.
  - On board RTC and RS 232 Interface.
  - Interrupt port.
- **Memory Add-On Card**
  - 512KB x 4 SRAMs, total 2MB capacity.
  - Direct interface with FPGA module.
  - 70ns of access time.

**All ports accessible through edge connector.**

Features

- **ADC/DAC Add-On card**
  - 4-channel ADC.
  - 2-channel DAC.
  - Sampling rate upto 400 KSPS.
  - 8-bit ADC resolution.
  - 12 –bit DAC resolution.
  - 0-5V or +/- 2.5V input voltage.

- **General Purpose Add-On Card**
  - General-purpose layouts.
  - Helps in prototyping electronic circuits
  - To interface custom circuits with modules
  - Useful in mixed signals designs.
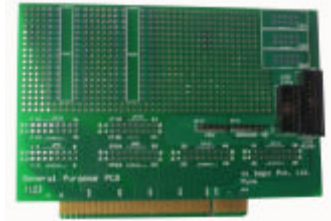
Features

Power Electronics module

- IGBT based O/P drive, with current rating upto 60 Amps.
- Dual high current relays.
- Stepper motor controller circuit.
- 5 optically isolated O/Ps.
- Step down transformer (/100) for line monitoring applications.
- High current capacity connectors (10Amps)

Other Accessories Provided

- SMPS
- 4x4 membrane keypad with cable.
- 16x2 character LCD with cable.
- User Manual with instructions, reference designs, examples, sources codes, reference datasheets & eval softwares.

Conclusion

- With the use of USDP designers are free from basic development problems and enjoys following:

  - Easy system design and development.
  - Good learning and design implementation platform.
  - Single platform for multiple technologies.
  - Stacking of multiple FPGAs which makes multiple FPGA designs development possible.
  - Higher performance.
  - Add-on modules for all type of applications.
  - Capable for future advancement and up gradation with new technologies.
  - Large number of user interface.

Thank You

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