INDUSTRIAL TRAINING

ARDUINO & IT'S INTERFACING
WITH
INTERNET OF THINGS - IOT

SHREEJI CHARAN electronics

Presented by

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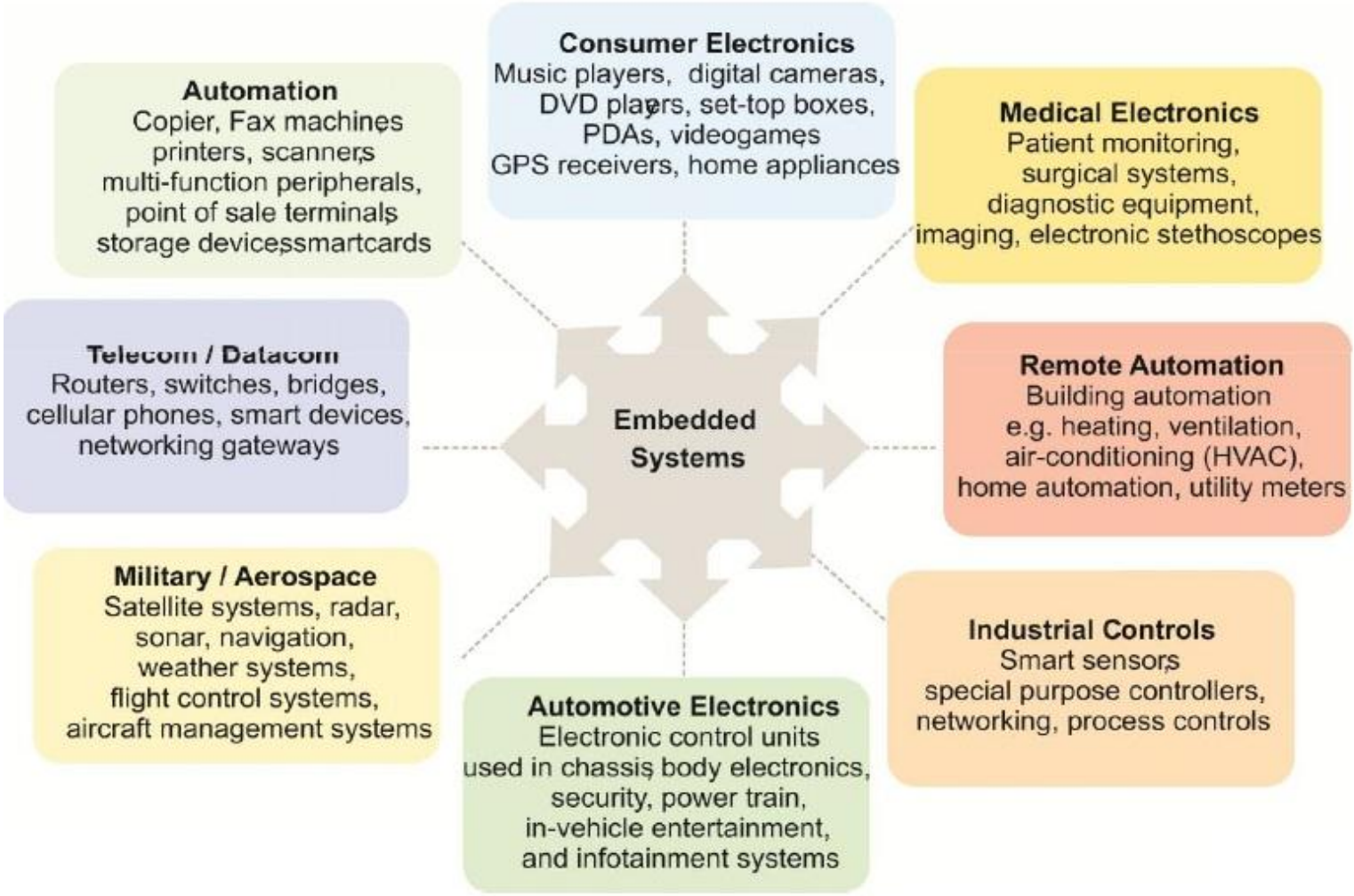
Application of Embedded System



CONTENTS

History

- ✓ Semiconductor devices developed in 1940…(R,T,C,L)
- ✓ Using this components develop 7400 IC for logical Operation…(AND,OR,NOT..)
- ✓ Then Intel Company Engineer, Ted Hoff develop first microprocessor 4004(4 Bit)
- ✓ Microprocessor (4004,8008,8085 etc…)
- ✓ Microcontroller (8051,PIC,AVR,ARM,ARM Cortex, ARM Cortex+etc..)

INTRODUCTION

What is a Microcontroller?

Wikipedia definition:

- A micro-controller is a small computer on a single integrated circuit containing a processor core, memory and programmable input/output peripherals.

AVR Controller

- There is no any meaning for AVR but we can say that Advance Virtual RISC.
- The AVR is a modified Harvard architecture 8-bit RISC single-chip microcontroller, which was developed by Atmel in 1996.
- The AVR architecture was conceived by two students at the Norwegian Institute

Basic families

- **tinyAVR** — the AT tiny series
  - ✓ 0.5–16 kB program memory
  - ✓ 6–32-pin package
  - ✓ Limited peripheral set

- **megaAVR** — the AT mega series
  - ✓ 4–512 kB program memory
  - ✓ 28–100-pin package
  - ✓ Extended instruction set (multiply instructions and instructions for handling larger program memories)
  - ✓ Extensive peripheral set

ATMega Series

- ATMega 8
- ATMega 16
- ATMega 32

- The most significant difference amongst the ATmega8/168/328 is the amount of “flash” storage space in the chip.

- Arduino is an open-source electronics platform based on easy-to-use hardware and software.

Arduino

✓Arduino (hosted by MIT Media Lab), Boston,Massachusetts, USA

✓Officine Arduino, Torino, Italy

✓Arduino Verkstad, Malmo, Sweden

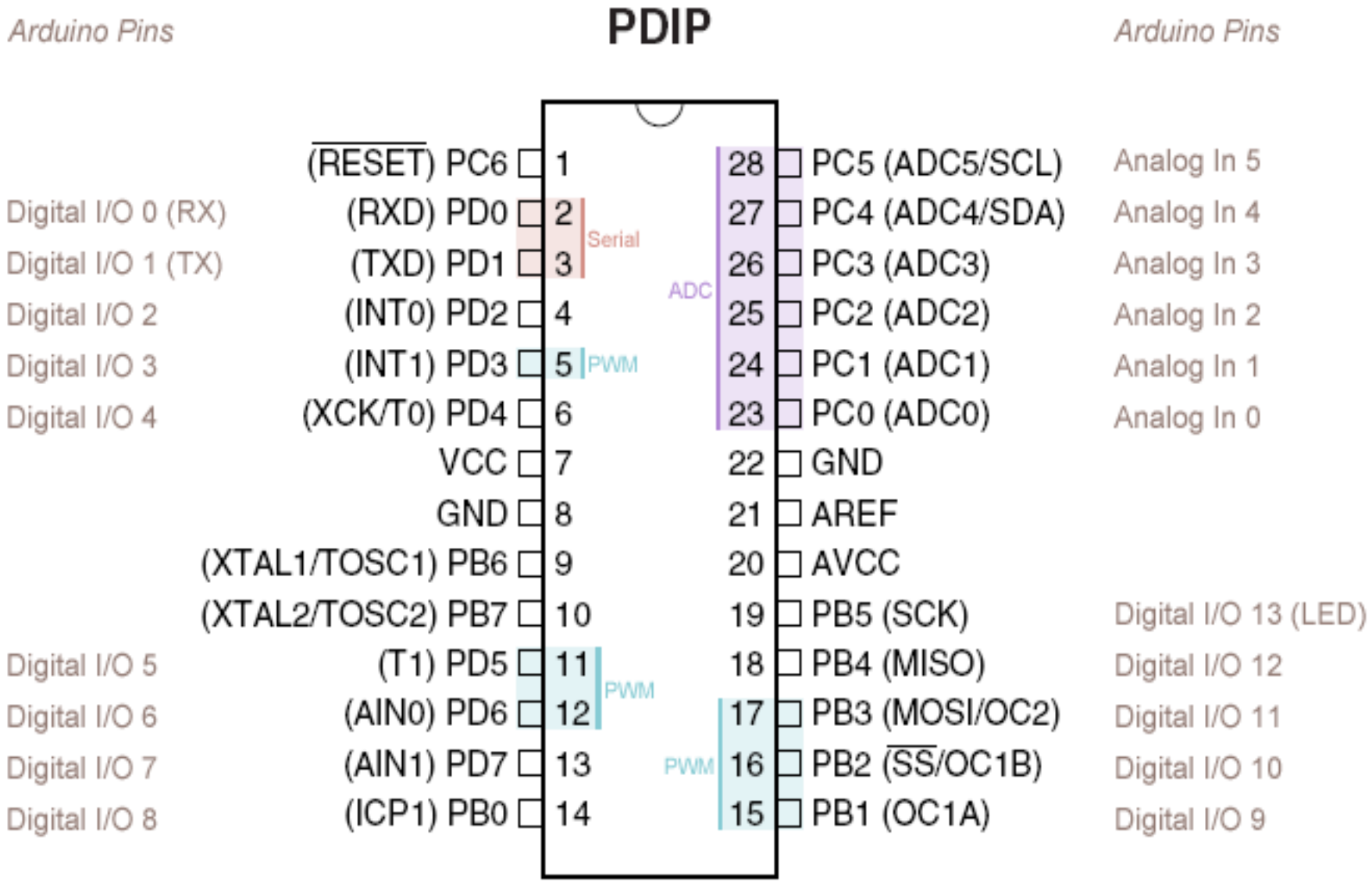
✓Arduino Karkhana, Bangalore, India

✓Arduino Budapest, Budapest, Hungary

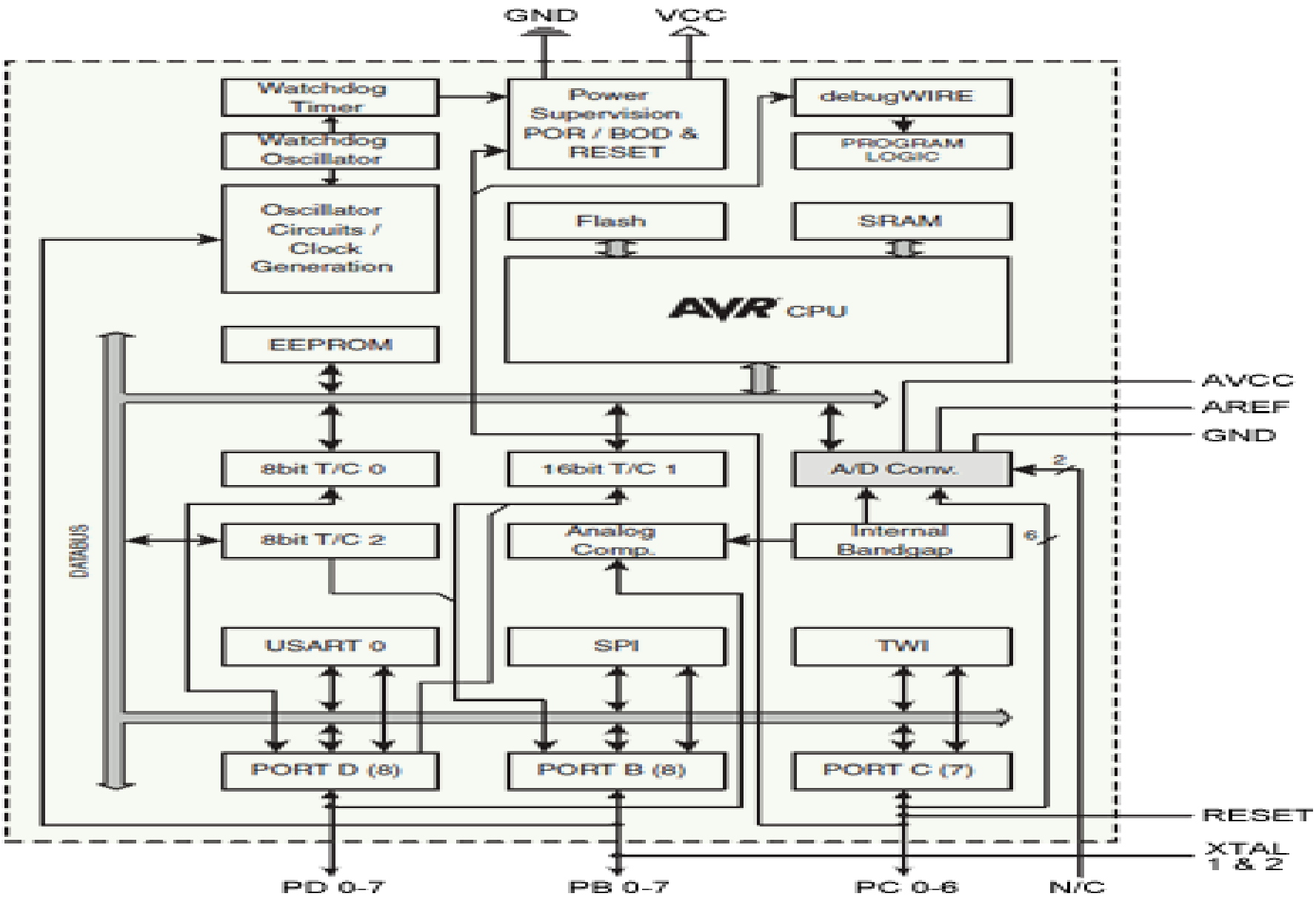
ATMega 32

- ✓ Microcontroller ATmega32
- ✓ Operating Voltage 5V Input Voltage
- ✓ Digital I/O Pins 14 (6 provide PWM output)
- ✓ Analog Input Pins 6
- ✓ DC Current per I/O Pin 40 mA
- ✓ Flash Memory 32 KB of which 0.5 KB used by boot loader
- ✓ SRAM 2 KB ,EEPROM 1 KB Clock Speed 16 MHz
- ✓ Write/Erase Cycles: 10,000 Flash/ 100,000 EEPROM
- ✓ Two Timers, Two Interrupts.

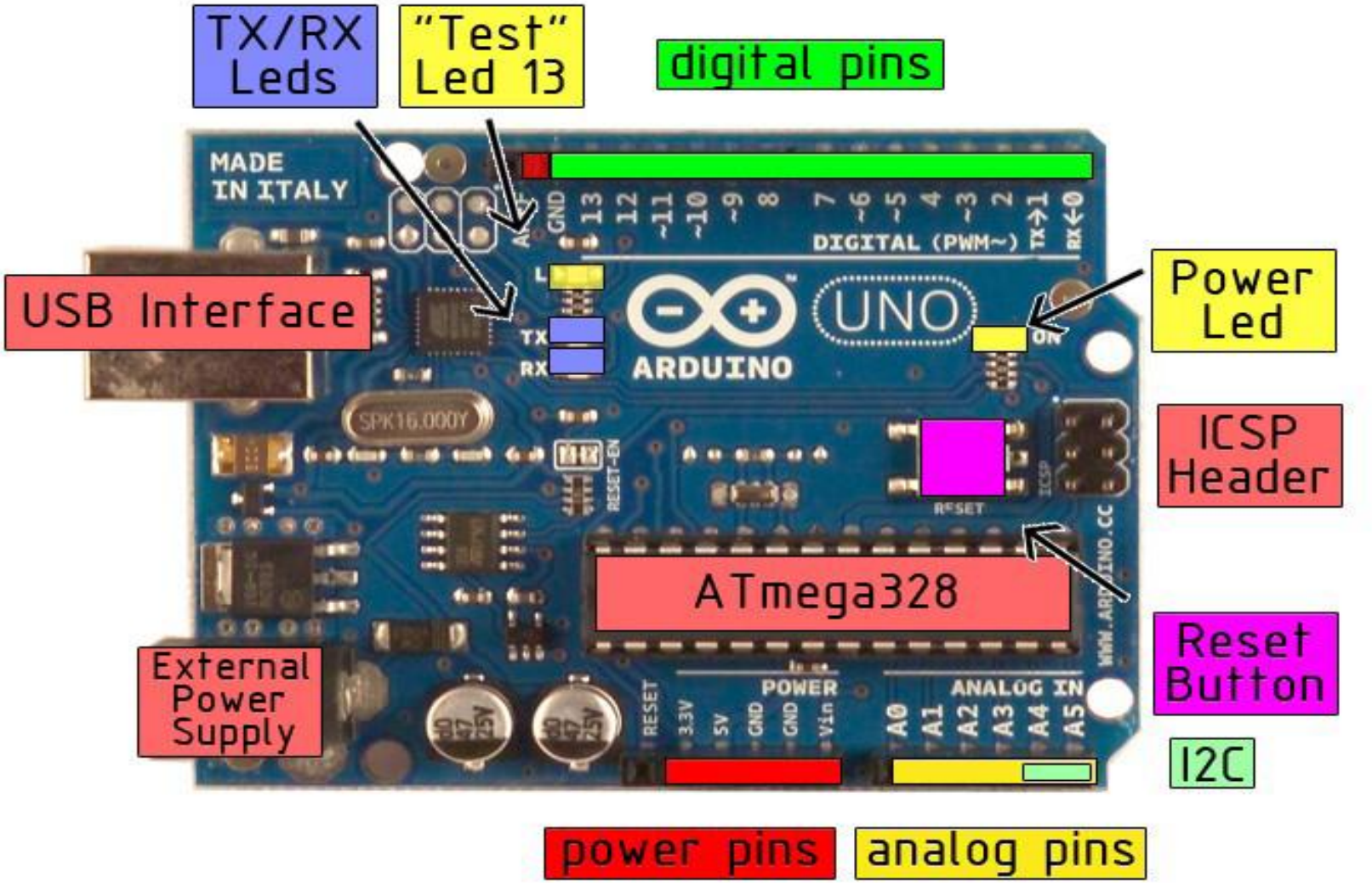
PIN DIAGRAM


Arduino Pins
PDIP
Arduino Pins
(RESET) PC6 1
Digital I/O 0 (RX) (RXD) PD0 2
Digital I/O 1 (TX) (TXD) PD1 3
Digital I/O 2 (INT0) PD2 4
Digital I/O 3 (INT1) PD3 5
Digital I/O 4 (XCK/T0) PD4 6
VCC 7
GND 8
(XTAL1/TOSC1) PB6 9
(XTAL2/TOSC2) PB7 10
Digital I/O 5 (T1) PD5 11
Digital I/O 6 (AIN0) PD6 12
Digital I/O 7 (AIN1) PD7 13
Digital I/O 8 (ICP1) PB0 14
28 PC5 (ADC5/SCL) Analog In 5
27 PC4 (ADC4/SDA) Analog In 4
26 PC3 (ADC3) Analog In 3
25 PC2 (ADC2) Analog In 2
24 PC1 (ADC1) Analog In 1
23 PC0 (ADC0) Analog In 0
22 GND
21 AREF
20 AVCC
19 PB5 (SCK) Digital I/O 13 (LED)
18 PB4 (MISO) Digital I/O 12
17 PB3 (MOSI/OC2) Digital I/O 11
16 PB2 (SS/OC1B) Digital I/O 10
15 PB1 (OC1A) Digital I/O 9
Serial
PWM
ADC
PWM
PWM

BLOCK DIAGRAM



ARDUINO BOARD INTRODUCTION

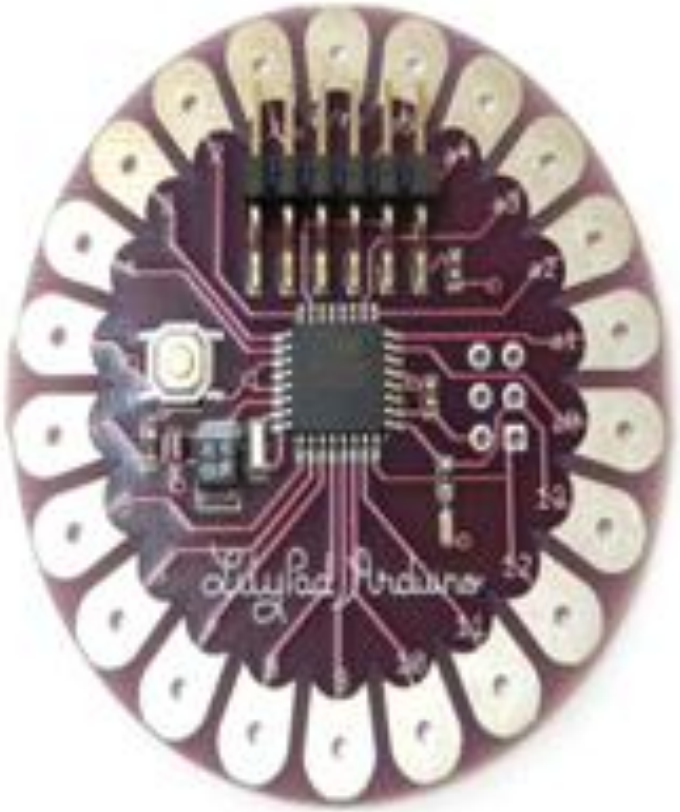


ARDUINO BOARD SERIES

ARDUINO BOARD SERIES (CONTINUE..)

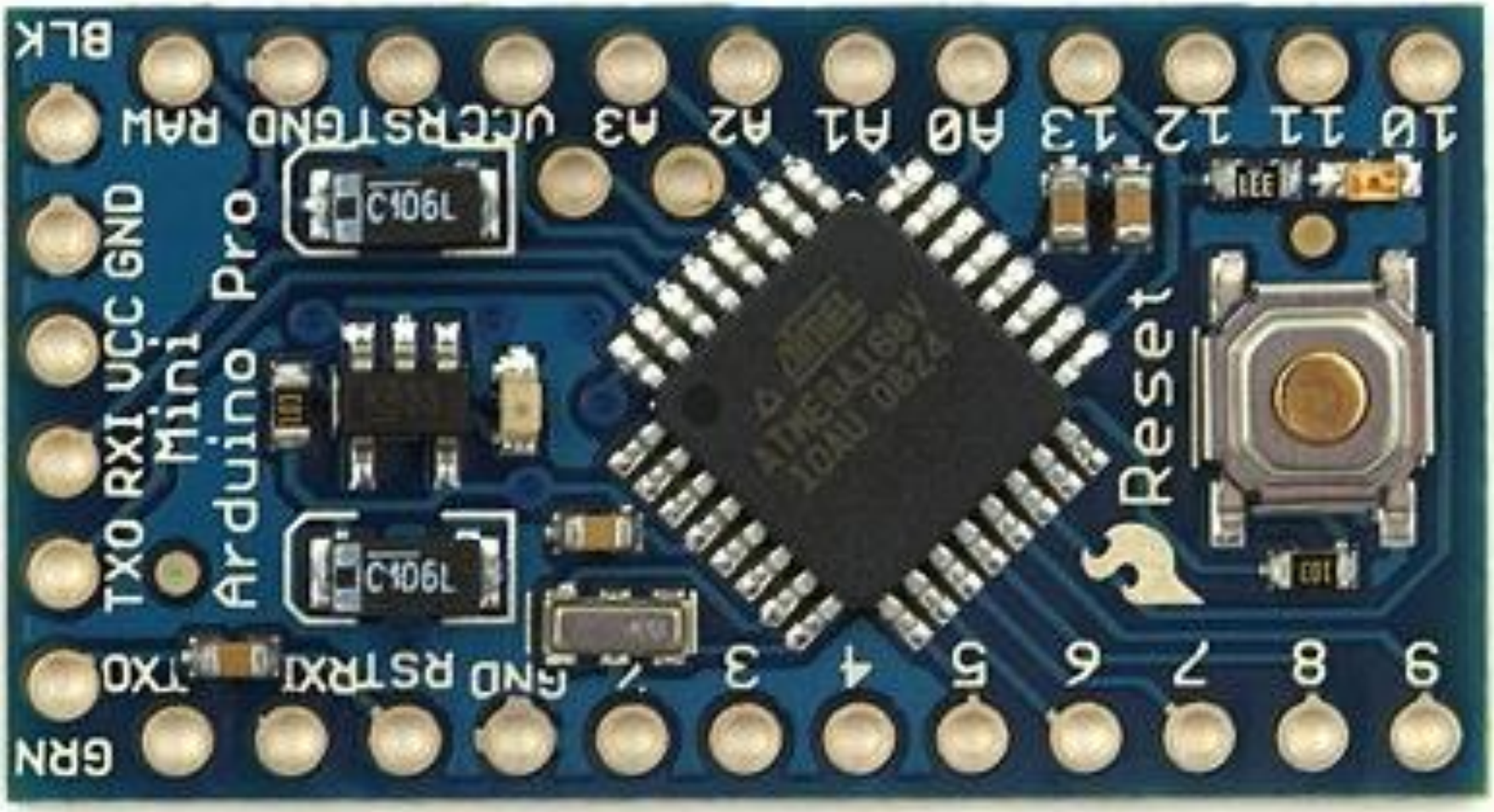
Arduino Mega 256

Arduino Mega 2560



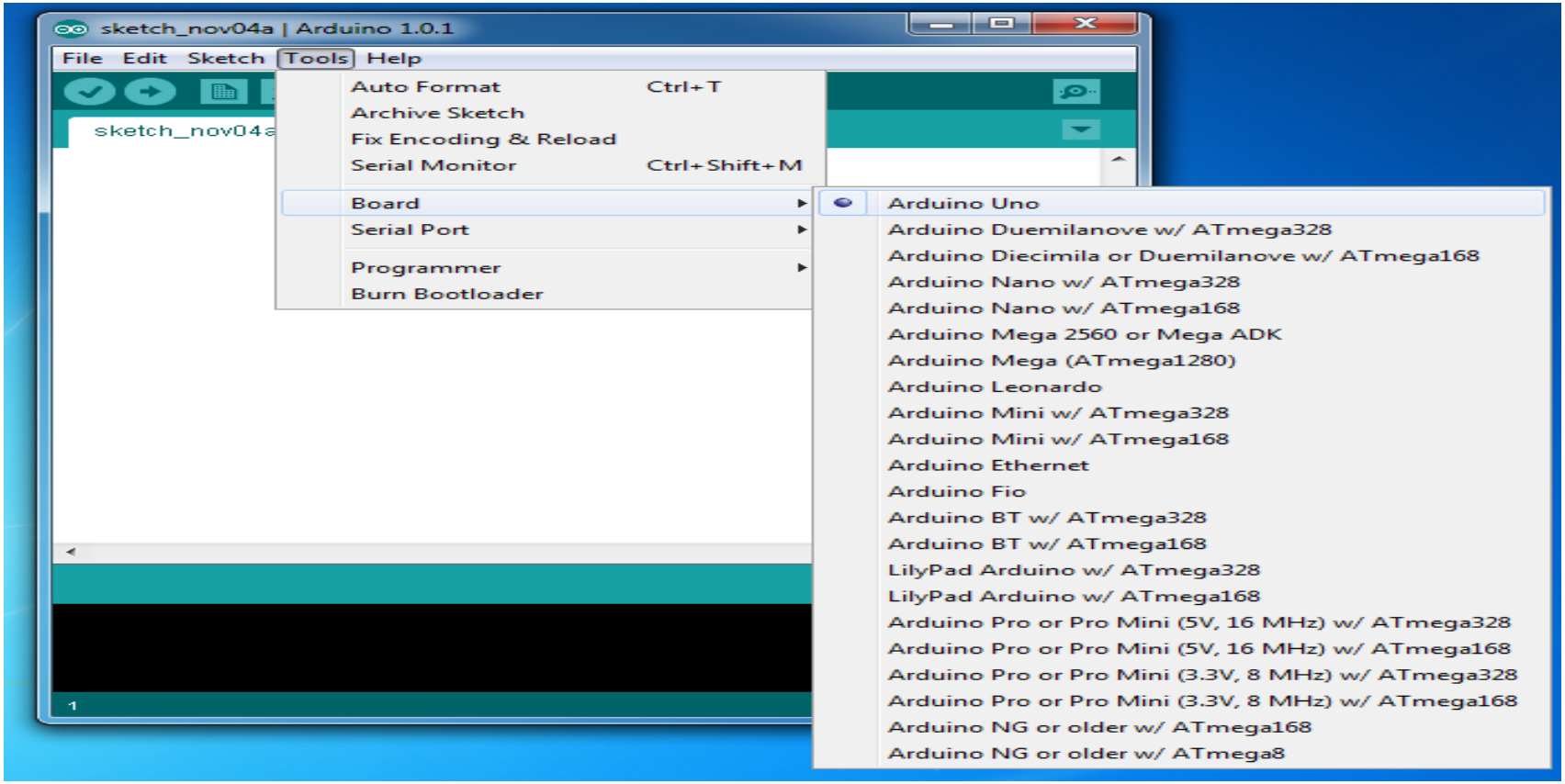
ARDUINO BOARD SERIES (CONTINUE..)

ARDUINO MINI PRO



ARDUINO SOFTWARE

- ✓ It is Open Source Software we can Download From www.arduino.cc/en/main/software
- ✓ New version of Arduino software is Arduino 1.6.3



PROGRAM INTRODUCTION

- ✓ Arduino programs can be divided in **three** main parts:

1) Structure
2) Values (variables and constants)
3) Functions.

- ✓ The Arduino language is based on C/C++.

PROGRAMMING INTRODUCTION (Continue..)

- Structure An Arduino program run in two parts:

1) **void setup()**

In the setup section, always at the top of your program, you would set pin Modes, initialize serial communication, etc.

2) **void loop()**

The loop section is the code to be executed -- reading inputs, triggering outputs, etc. Variable Declaration Function Declaration

PROGRAMMING INTRODUCTION (Continue..)

❑ Control Structures:

- ✓ if
- ✓ if…else
- ✓ for (Initilazation;check cond;Incremenr/Decrement)
- ✓ Switch…case
- ✓ While
- ✓ do… while
- ✓ break
- ✓ Continue
- ✓ return

❑Further Syntax :

- ✓ ; (semicolon)
- ✓ {} (curly braces)
- ✓ // (single line comment)
- ✓ /* */ (multi-line comment)

Operators of Arduino Software

ARITHMETIC OPERATORS	LOGICAL OPERATORS
+ (addition)	&& (AND)
- (subtraction)	|| (OR)
* (multiplication)	! (NOT)
/ (division)	
% (modulo)	

COMPOUND OPERATORS	COMPARISON OPERATORS
++ (increment)	== equal to
-- (decrement)	!= not equal to
+= (compound addition)	< Less than
-= (compound subtraction)	> Greater than
*= (compound multiplication)	<= Less than or equal
/= (compound division)	>= Greater than or equal

Functions of Arduino Software

DIGITAL I/O	SERIAL COMMUNICATION
pin Mode(pin, mode)	Serial.begin(speed)
digital Write(pin, value)	int Serial.available()
int digital Read(pin)	int Serial.read()
ANALOG I/O	Serial.print(data)
int analog Read(pin)	Serial.println(data)
analog Write(pin, value)	

FUNCTIONS OF ARDUINO SOFTWARE

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FUNCTIONS OF ARDUINO SOFTWARE

Constants	Data Types
HIGH/ LOW	Boolean
INPUT/ OUTPUT	Char
TRUE/ FALSE	Int
	unsigned int
	Long unsigned
	Long float
	Double
	String
	array

INTERFACING

List of Examples
LED Interfacing
Keypad Interfacing
ADC
Serial Communication
Relay
Seven Segment

Thank You