LPC2148 Microcontroller

- **Manufacturer**: NXP (formerly Philips)
- **Core**: ARM7TDMI-S (32-bit RISC processor)
- **Architecture**: ARMv4T (supporting both ARM and Thumb instruction sets)
- **Operating Frequency**: Up to 60 MHz
- **Flash Memory**: 32 KB to 512 KB (on-chip)
- **SRAM**: 8 KB to 40 KB (on-chip)
- **GPIO**:
    - 2 Ports (Port 0 and Port 1)
    - Up to 45 I/O pins configurable as input or output
- **Timers**:
    - Two 32-bit timers/counters
    - Watchdog timer
    - Real-Time Clock (RTC)
- **Communication Interfaces**:
    - **UART**: 2 (for serial communication)
    - **I2C**: 2 (for communication with external devices)
    - **SPI/SSP**: 2 (for high-speed communication)
    - **USB 2.0**: Full-Speed Device Controller
- **ADC**:
    - 2 ADCs (10-bit)
    - Total of 14 channels (6 channels on ADC0, 8 channels on ADC1)
- **DAC**:
    - 1 DAC (10-bit)
    - Used for generating analog outputs
- **PWM**:
    - 6-channel PWM (Pulse Width Modulation) for motor control and other applications
- **Power Consumption**:
    - Low power consumption with power-down modes for energy efficiency
- **Applications**:
    - Embedded systems, automation, data acquisition, motor control, communication systems, etc.

ARM7TDMI Core

- **Architecture**: ARMv4T (32-bit)
- **Key Features**:
    - **RISC (Reduced Instruction Set Computing)**: Simplifies the instructions to allow faster processing.

    - **32-bit Data Bus**: Processes data in 32-bit chunks for efficient computation.
    - **16-bit Thumb Mode**: Optimized for higher code density, saving memory while offering performance close to 32-bit mode.
    - **32-bit ARM Mode**: Used for maximum performance in critical tasks.
- **Instruction Set**:
    - Supports both 32-bit ARM instructions and 16-bit Thumb instructions.
    - Enables a trade-off between performance and memory use.
- **Pipeline Architecture**:
    - **Three-Stage Pipeline**:
        - **Fetch**: Retrieve the instruction.
        - **Decode**: Interpret the instruction.
        - **Execute**: Carry out the instruction.
- **JTAG Interface**: Supports in-circuit debugging and testing.
- **Operating Modes**:
    - **User Mode**: Normal program execution.
    - **FIQ (Fast Interrupt Mode)**: High-speed interrupts for critical tasks.
    - **IRQ (Interrupt Request Mode)**: Standard interrupt handling.
    - **Supervisor Mode**: Protected mode for operating system operations.
    - **Abort Mode**: Handles memory access violations.
    - **Undefined Mode**: Handles undefined instructions.
    - **System Mode**: Privileged mode for system-level tasks.