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AM335x SoC Functional Block Overview

The **TI AM335x** is a powerful, integrated SoC built around an **ARM Cortex-A8 processor** and includes a wide set of peripherals and accelerators for embedded applications.

🔷 1. Processor Core

- **ARM Cortex-A8 CPU**
  - 32-bit RISC processor
  - Up to **1GHz clock**
  - NEON SIMD engine (for multimedia/data processing)
  - ARMv7-A architecture

🔷 2. Memory System

- **512MB DDR2/DDR3 Controller**
- **L1 and L2 Caches**
- **Internal RAM**
- External support:
  - NAND Flash
  - NOR Flash
  - eMMC
  - microSD

🔷 3. Graphics Subsystem

- **PowerVR SGX530 GPU**
    - Supports **OpenGL ES 2.0**
    - 2D/3D acceleration for GUI rendering

🔷 4. Real-Time Units (PRUs)

- **Two PRU-ICSS (Programmable Real-time Units)**
    - Each 32-bit RISC core, clocked up to 200MHz
    - Direct control of I/O for real-time response
    - Used for protocols like **EtherCAT**, **RS-485**, or **custom timing-sensitive tasks**

🔷 5. Industrial Communication Interfaces

- **CAN**, **UART**, **SPI**, **I2C**
- **Ethernet MAC with 10/100/1000 support**
- Support for industrial protocols like:
    - **Profibus**, **Modbus**, **EtherCAT**, **Profinet**

🔷 6. Display Subsystem

- **LCD controller** with TFT interface
- **Resistive Touch support**
- Direct drive for small to medium displays

🔷 7. Power Management

- Integrated **power, reset, and clock management (PRCM)**
- On-chip regulators and support for external PMICs

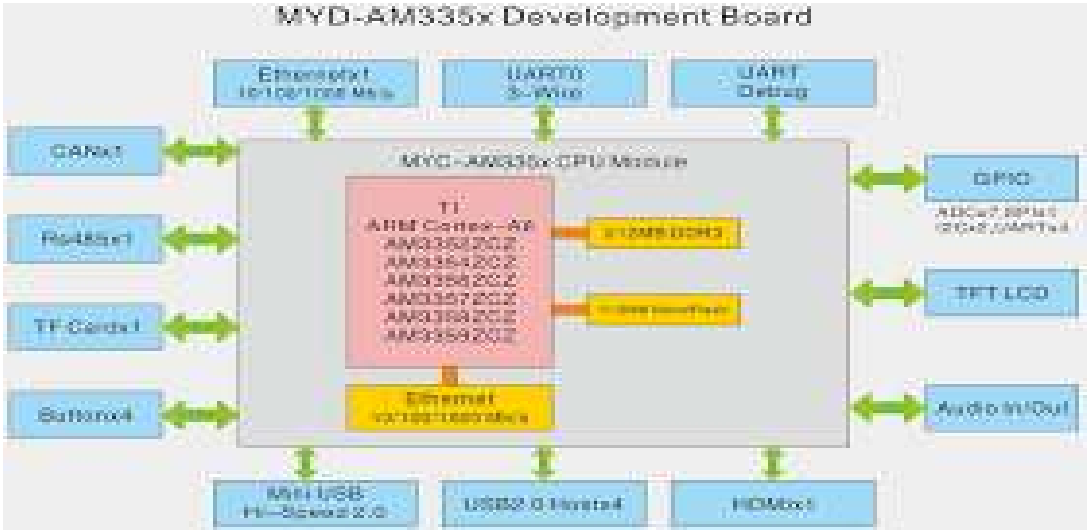
🔷 8. Connectivity & IO

- **USB 2.0 Host and OTG**
- **UARTs (6x)**
- **SPI (2x)**
- **I2C (3x)**
- **PWM**, **ADC**, and **Timers**

🔷 9. Security & Encryption (Optional)

- Some AM335x variants support:
  - **Secure Boot**
  - **AES, SHA, RNG** hardware engines

🧩 Block Diagram (Conceptual)



✅ Summary Table

Subsystem	Features
CPU	ARM Cortex-A8 @ 1GHz
GPU	PowerVR SGX530
Real-time	2× PRU cores
RAM Support	DDR2/DDR3 (up to 1GB)
IO	GPIO, UART, I2C, SPI, PWM, ADC
Networking	10/100/1000 Ethernet MAC
Display	TFT LCD controller
Storage	eMMC, microSD, NAND/NOR Flash
Security	Optional crypto engine (varies by model)