



مرکز آموزش نیرا سیستم
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ETH (Ethernet)

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Introduction

- The Ethernet protocol is a widely used standard for local area network (LAN) communication, enabling data exchange between devices over wired connections.
- The STM32F407 microcontroller from STMicroelectronics features an integrated Ethernet controller, which supports the IEEE 802.3 standard, facilitating high-speed network communication for embedded systems.



Applications

- **Industrial Automation**

- Enabling real-time data exchange and control in industrial networks.

- **IoT Devices**

- Connecting smart devices to local networks or the internet for data transfer and remote control.

- **Home Automation**

- Integrating home appliances and systems for centralized control and monitoring.

- **Embedded Web Servers**

- Hosting web interfaces for configuring and monitoring embedded systems.

- **Networked Sensors**

- Collecting and transmitting sensor data over a network for analysis and monitoring.



Properties

- Connection Type: Serial, Semi-Parallel
- Communication Type: Full-Duplex, Half-Duplex
- Data Type: Packet
- Synchronize: Async
- Channel Type: Copper Wire, Fiber, Coaxial
- Byte Order: Little-Endian



Features

- **High-Speed Data Transfer**
 - Supports 10/100 Mbps data rates, ensuring fast communication.
- **MAC Layer Integration**
 - Built-in Media Access Control (MAC) layer compliant with IEEE 802.3.
- **Flexible Configuration**
 - Configurable for various network topologies and applications.
- **DMA Support**
 - Direct Memory Access (DMA) for efficient data transfer, reducing CPU load.
- **Packet Filtering**
 - Hardware support for filtering and discarding unwanted packets to enhance performance and security.



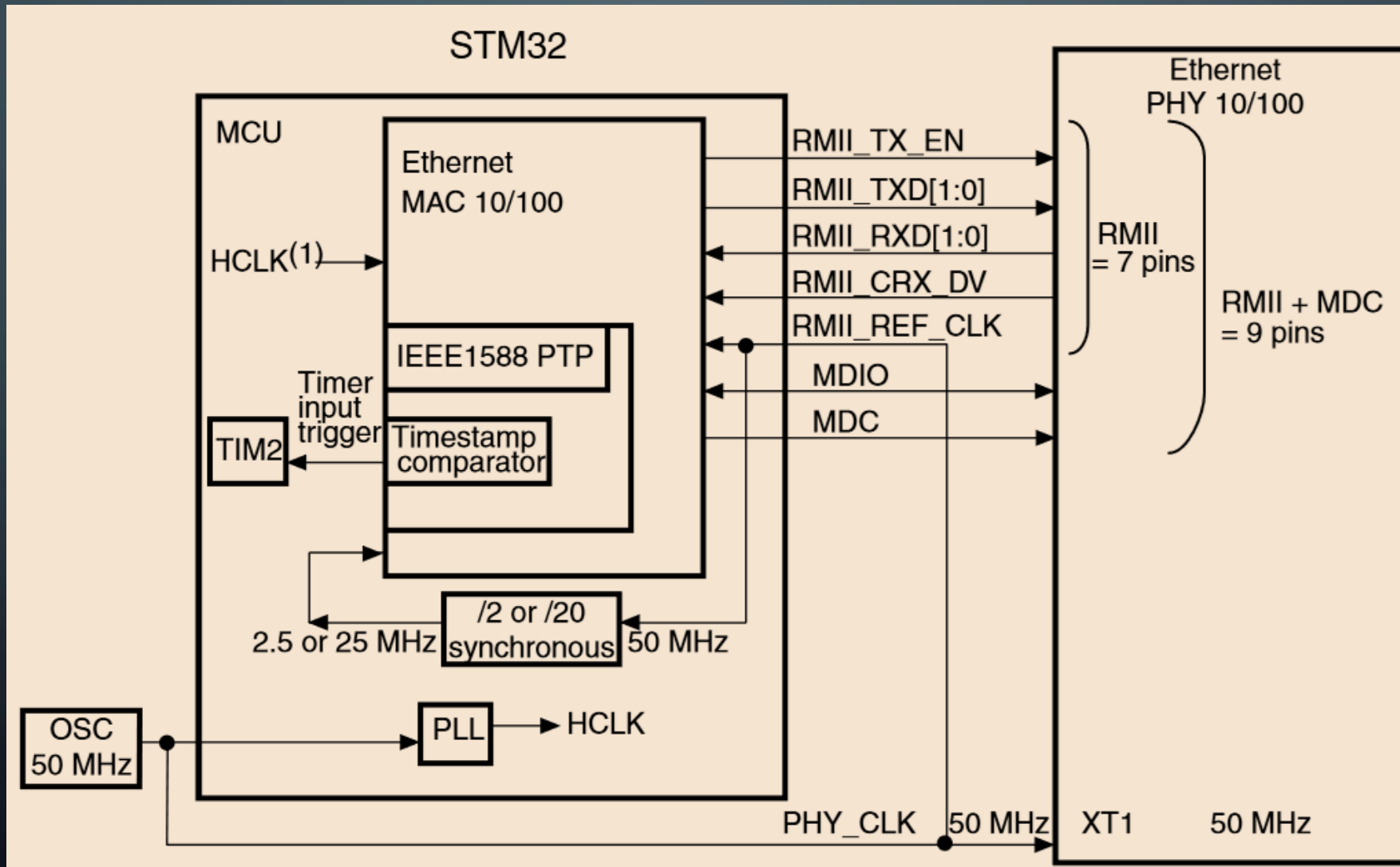
Registers

- **MACCR (MAC Configuration Register)**
 - Configures the MAC layer, including speed, duplex mode, and loopback mode.
- **MACFFR (MAC Frame Filter Register)**
 - Controls frame filtering options, including multicast, unicast, and broadcast frames.
- **MACHTHR/MACHTLR (MAC Hash Table High/Low Register)**
 - Used for multicast filtering.
- **MACFCR (MAC Flow Control Register)**
 - Manages flow control settings to prevent network congestion.
- **DMAOMR (DMA Operation Mode Register)**
 - Configures the operation of the DMA, including transmit and receive modes.
- **DMASR (DMA Status Register)**
 - Indicates the current status of the DMA, including errors and interrupts.
- **DMARDLAR/DMATDLAR (DMA Receive/Transmit Descriptor List Address Register)**
 - Pointers to the descriptor lists for receive and transmit operations.

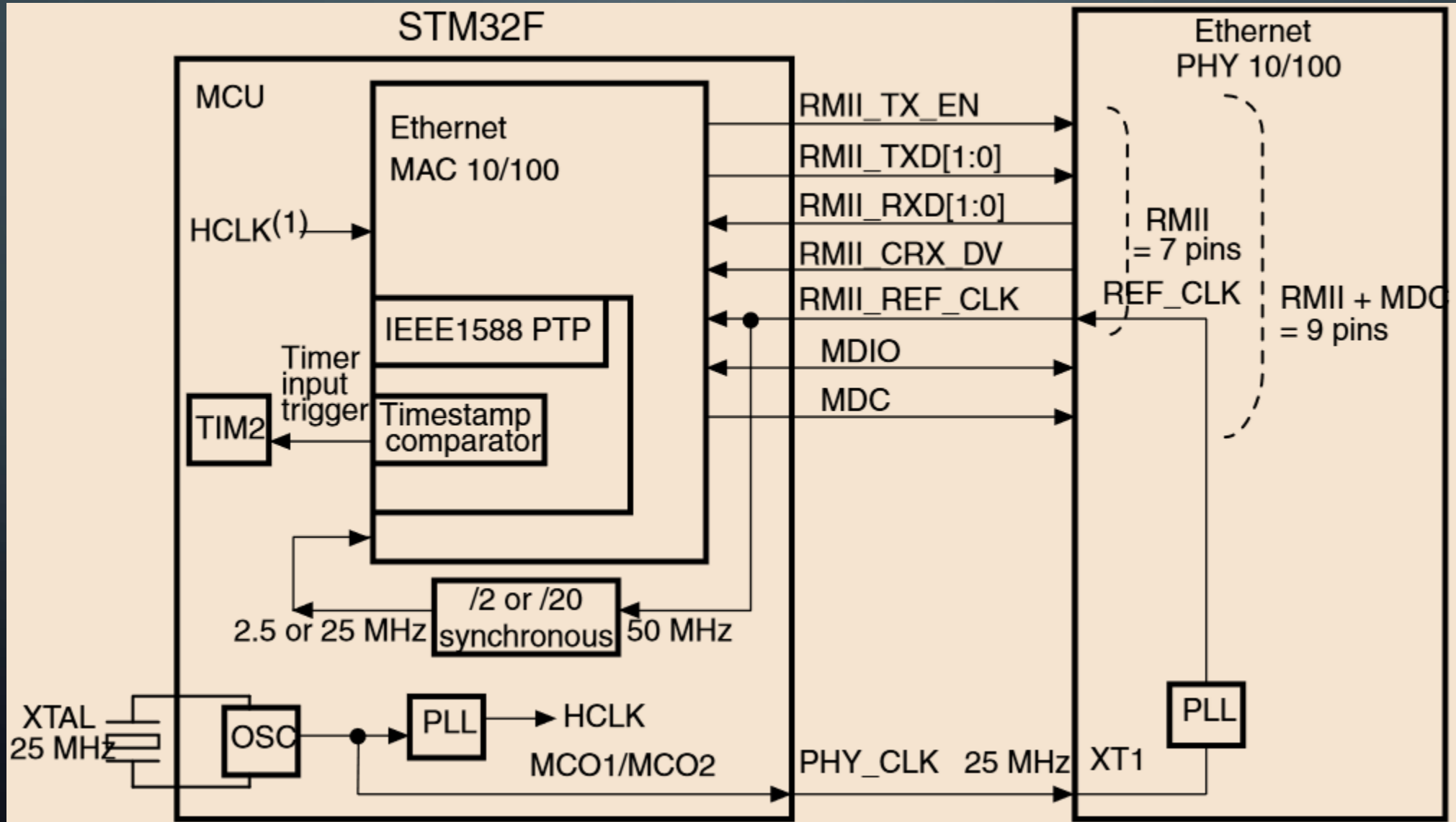
Phy - MII



Phy - RMII (50Mhz)

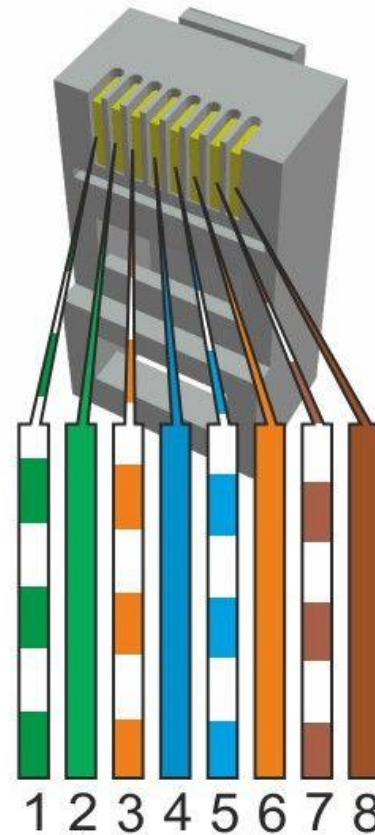
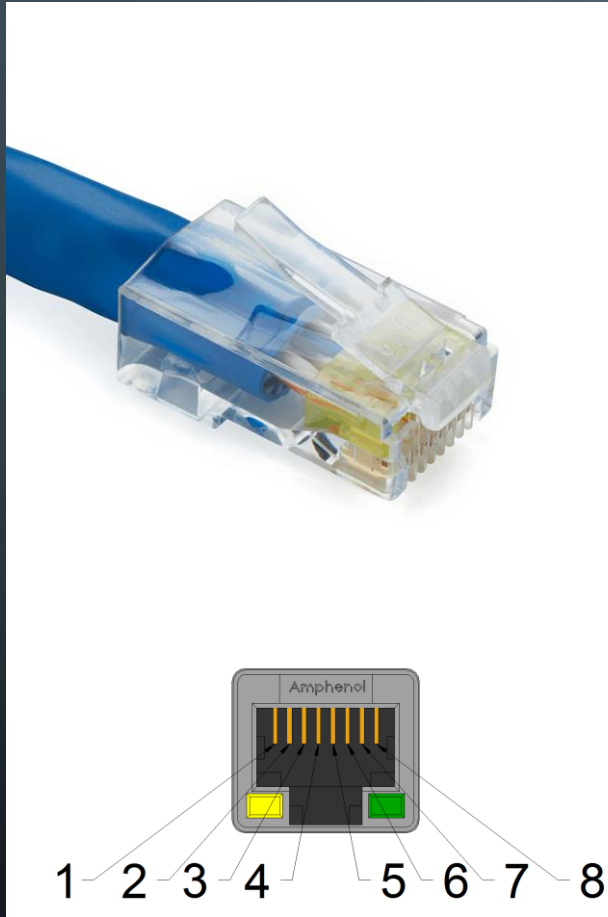


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RJ45



T-568A

Pin	Description	10base-T	100Base-T	1000Base-T
1	Transmit Data+ or BiDirectional	TX+	TX+	BI_DA+
2	Transmit Data- or BiDirectional	TX-	TX-	BI_DA-
3	Receive Data+ or BiDirectional	RX+	RX+	BI_DB+
4	Not connected or BiDirectional	n/c	n/c	BI_DC+
5	Not connected or BiDirectional	n/c	n/c	BI_DC-
6	Receive Data- or BiDirectional	RX-	RX-	BI_DB-
7	Not connected or BiDirectional	n/c	n/c	BI_DD+
8	Not connected or BiDirectional	n/c	n/c	BI_DD-



Categories

Category	Speed	Bandwidth	Max Distance	Usage
CAT5	100 Mbps	100 MHz	100 meters	Improved performance for 1000BASE-T Ethernet, reduced crosstalk
CAT6	1 Gbps	250 MHz	100 meters	Suitable for 1000BASE-T and 10GBASE-T Ethernet over shorter distances
CAT6a	10 Gbps	500 MHz	100 meters	Supports 10GBASE-T Ethernet up to 100 meters
CAT7	10 Gbps	600 MHz	100 meters	Enhanced shielding for reduced interference, suitable for 10GBASE-T Ethernet
CAT8	25 Gbps 40 Gbps	2000 MHz	30 meters	Designed for data centers and high-performance networking environments