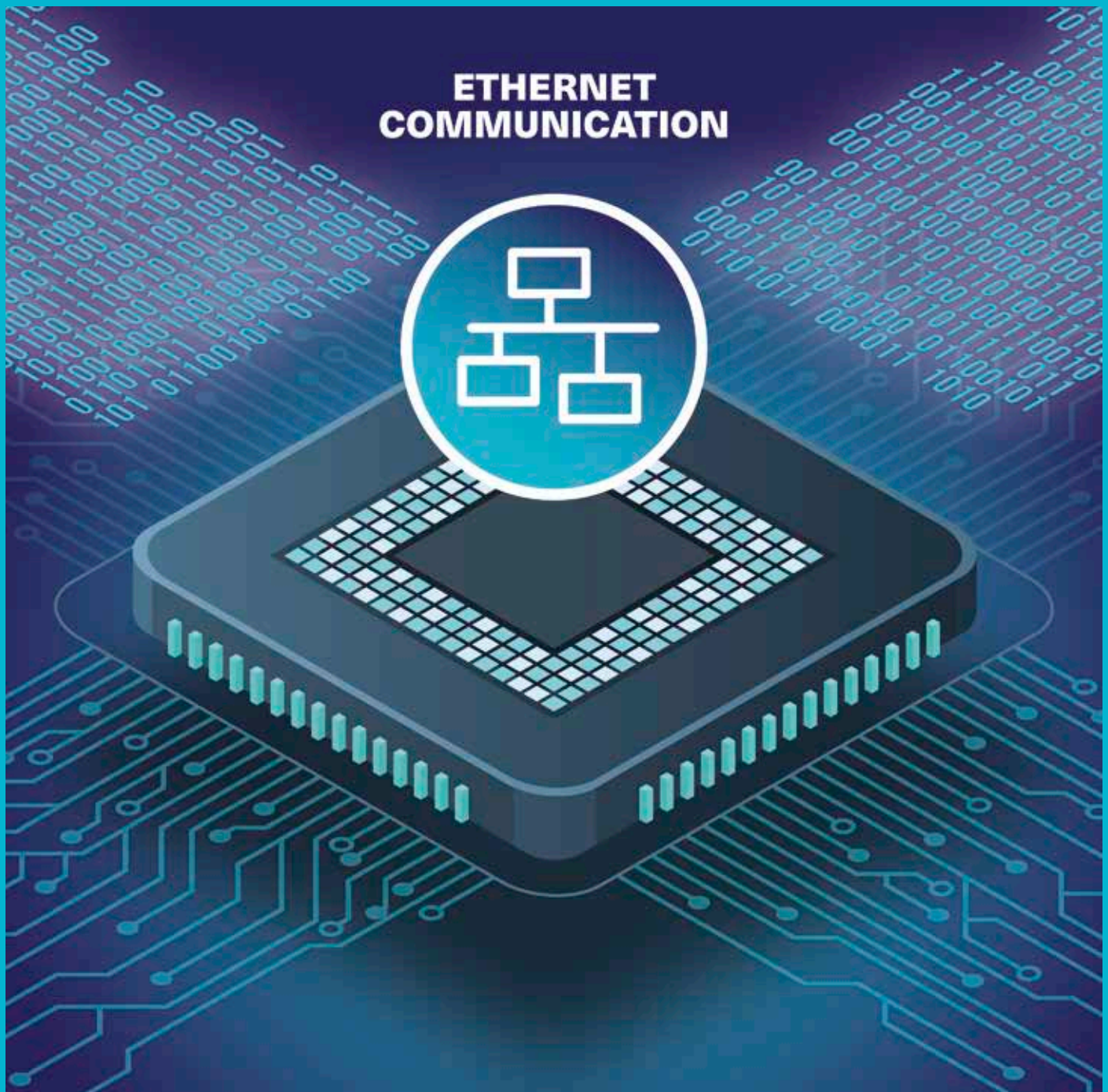


# SocTek® IP Cores



10M/100M/1G Multiport TSN  
Ethernet Switch IP Core

MTSN

# Overview

MTSN is a multi-port, multi-rate managed Ethernet switch with Time-Sensitive Networking (TSN) capabilities to achieve deterministic Ethernet solutions in which streams are delivered with guaranteed bandwidth and deterministic latency.

With a rich set of layer-2 configurable features, both at synthesis time & during runtime, MTSN allows building advanced Ethernet switch systems with

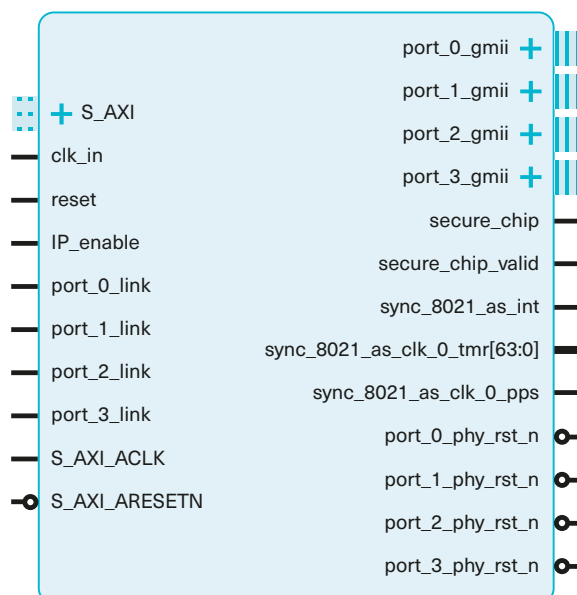
TSN capabilities. MTSN switch has been designed to address the maximum throughput using optimized resources.

All these characteristics enable a wide number of applications/sectors where the use of MTSN IP Core is key. Automotive, Marine, Aerospace, Defence or Electric are examples of markets where our customers are already applying this technology.

## Key Features

- Time-Sensitive Networking (TSN) support: aligned with the different TSN profiles, such as Aerospace (P802.1DP), Automotive (P802.1DG) or Industrial Automation (IEC/IEEE 60802).
- Ethernet switch IP "builder": hundreds of user-configurable parameters allow obtaining the exact switch configuration required by the customer, ensuring efficient use of the available programmable logic resources.
- Different data-rate per port: each port speed and interface can be assigned independently.
- High-performance: up-to 1G interfaces without HOL (Head-of-line) blocking effect.
- Fast & smooth integration: GUI available for some FPGA vendor tools (i.e., AMD Vivado™ Design Suite). Drivers & software components included as part of the product deliverable.
- Evaluation version available: encrypted, time-limited version available.

## GUI Block Diagram



# Technical Specifications

## Communication Interfaces

- Integrated 10M/100M/1000M MACs for 10/100 Mbps and 1 Gbps PHY interface rates to use with any PHY interface type (e.g. MII, RMII, GMII, RGMII) depending on application
- Compatible with SGMII (Serial Gigabit Media Independent Interface) or QSGMII (Quad Serial Gigabit Media Independent Interface) PHY interfaces throughout an internal GMII based connection to AMD LogiCORE™ SGMII IP core and LogiCORE™ QSGMII IP core respectively
- 10/100/1000 Mbps AXI-Stream interface with a data width of 8 bits @ 125 MHz

## Time-Sensitive Networking (TSN)

- TSN features can be enabled/disabled independently
- IEEE 802.1AS - Timing and Synchronization
- IEEE 802.1Qav - Credit Based Shaper (CBS)
- IEEE 802.1Qbv - Time Aware Shaper (TAS)
- IEEE 802.1Qci - Per-Stream Filtering and Policing
- IEEE 802.1CB - Frame Replication and Elimination for Reliability (FRER)
- IEEE 802.1Qbu / IEEE 802.3br - Frame Preemption
- IEEE 802.1Qcc - Stream Reservation Protocol (SRP) Enhancements and Performance Improvements

## Time Synchronization

- Time synchronization according to IEEE 802.1AS-2020 and IEEE1588 (PTP)
  - Up to four IEEE 802.1AS time domains
- Legacy PTP: IEEE 1588 Boundary Clock (BC) at layer-2 and layer-3 (IPv4)

## Traffic Management

- Integrated Ethernet switch fabric supporting up to 32 ports (number limited by the available resources on the device)
- HOL (Head-of-line) blocking free switch fabric
- Shared dynamic and static filtering database. Implements hardware MAC address learning/ageing and look-up for up-to 9K absolute MAC addresses (synthesis scalable) at wire speed
- Independent VLAN learning support for MAC address learning
- Searchable MAC addresses (and associated information) contained in the filtering database
- Programmable frame forwarding port mask to restrict frame forwarding towards port(s)
- Programmable EtherType based frame forwarding to restrict frame forwarding towards port(s)
- Static multicast frame filtering
- IGMP v1/v2 snooping1 (IPv4) support for multicast frame filtering
- Standard frame size support (1518 bytes) or Jumbo frames up to 9 kByte (depends on memory availability)

## Quality of Service

- Up to 8 priority queues per port (synthesis option):
  - Priority classification based on ingress port, PCP bits (802.1p), DSCP TOS bits of the IP packets (IPv4 TOS / IPv6 COS) and EtherType
  - Programmable remapping from PCP or DSCP fields to internal priority queues on a per-port basis
  - Programmable priority regeneration on a per-port basis
  - Egress traffic prioritization based on strict priority or Weighted Round Robin (WRR) scheduling algorithm
- IEEE 802.1Q tag-based and port-based VLANs. VLAN manipulation functions on reception (VLAN insertion) and transmission (VLAN removal/overwrite)
- MAC level ingress frame filtering based of destination MAC address and/or EtherType on per port basis
- Token bucket based ingress throughput rate limiting on per port basis
- MAC level ingress frame rate limiting on per port basis
- Credit Based Shaper (CBS) egress throughput rate Limiting on per port basis
- Egress frame rate limiting on per port basis
- Broadcast/Multicast storm protection

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## Network Management & Monitoring

- IEEE 802.1D Spanning-Tree Protocol (STP) to prevent loops from being formed when switches or bridges are interconnected via multiple paths
- IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) provides rapid convergence of spanning tree
- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP) provides link availability in multiple VLAN environments by allowing multiple spanning trees
- Multisession port mirroring capabilities. Ingress and Egress mirroring functions to allow copying of frames to a mirror port. Option for mirroring only filtered frames that match a specific data pattern
- User/network port-level security via IEEE 802.1X authentication and MAC-based filtering
- Host access control for only frames specified by the user (destination MAC and/or EtherType based)
- Per port MAC and switch statistics for managing and debugging purposes
- Wide range of management interfaces to access control and statistics registers (selectable at synthesis time)
- I2C master interface for external device configuration (i.e. an EEPROM memory with non-volatile configuration)

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## Others

- Distributed Switch Architecture (DSA) frame tagging to merge application specific messages to management port and to distribute application specific messages to a specific port
- Exclusive forwarding of known protocol specific frames or custom frames to/from management port

# Technical Support, Verification & Deliverables

## Technical Support

IP Licenses are provided along with a technical support package that ensures a direct communication channel with our highly experienced support

engineers. This is vastly valued during customer product development & integration phases.

## Verification

All our IP Cores are rigorously tested, hardware-validated and verified in real-life environments. A 3-phase based IP product verification is applied:

- Entity / Block-oriented simulation
- Global-oriented simulation
- In-hardware validation

## Deliverables

- Encrypted / Source RTL code
- Software components: drivers, configuration API & SW stacks
- Documentation (IP Core and software components)

- (Optional) Networking Testbench Suite (NTS)
- (Optional) AMD Vivado™ design suite example design

# Evaluation & Design-in Kit

In order to evaluate MTSN in a plug&play platform please refer to our RelyUm Industrial TSN Switches and Endpoints product family.

To know more about these products, please contact your sales representative.

## Related Products

- Networking Testbench Suite (NTS)
- TSN EndPoint (ETSN IP Core)
- 10G TSN Ethernet Switch (TGES IP Core)

- 1G Managed Ethernet Switch (MES IP Core)

## Ordering Code

### Ordering code

S-3129 (MTSN IP Core)

[To know more](#) about other available references, please contact your sales representative.

# SocTek<sup>®</sup> By

MTSN

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Ethernet Switch IP Core

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[www.soc-e.com](http://www.soc-e.com)  
[info@soc-e.com](mailto:info@soc-e.com)

Calle Islas Canarias 19, piso -1  
48015 Bilbao (Spain)