

Open Transport Network (OTN)

INDUSTRIAL ETHERNET SWITCH ETS-4GC24FP

Introduction

Thanks to its design, the OTN (Open Transport Network) can handle nearly all existing communication standards for voice, data, LAN and video.

As an extension of OTN's Ethernet capabilities, the ETS-4GC24FP industrial Ethernet Switch allows to pick-up Ethernet based applications from different locations and carry them back to the OTN backbone in a cost efficient way. Point-to-point, daisy chain, star or ring access network designs are supported.

Description

The ETS-4GC24FP is a managed Industrial Ethernet Switch, which provides 24 x 10/100 TX ports supporting PoE and 4 x 10/100/1000 RJ-45/SFP Combo ports.

Thanks to its Gigabit Combo port design, the ETS-4GC24FP is a very flexible switch that can use Single Mode and Multi Mode fiber optic cable or copper cabling.

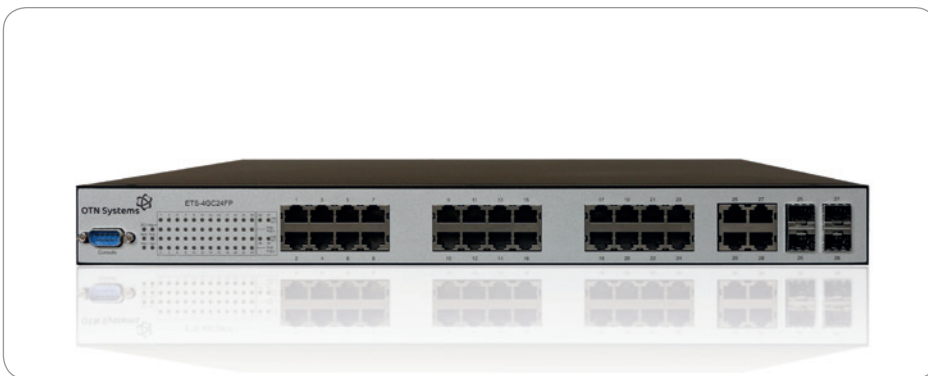
Typically, 2 Gigabit SFP ports are used to form a Redundant Gigabit Ethernet Ring. The 2 other Gigabit Ethernet ports can be used for user applications or to connect the Gigabit Ethernet Ring to the OTN Gigabit Ethernet interface (e.g. ET100DAE, ETX or N50/N70). It is also possible to close the Redundant Gigabit Ethernet Ring over the OTN backbone, to provide a redundant uplink.

The embedded software supports full Layer 2 features, Gigabit Ethernet Ring redundancy, network control, monitoring, notification and security. The ETS-4GC24FP also provides a digital input and relay output for local alarm notification.

Mechanical Design

The ETS-4GC24FP has a 19" metal case (44 mm x 431 mm x 375 mm (HxWxD)) compliant with IP31.

The fanless design of the switch allows it to operate in a wide temperature range from -25°C to +65°C (-13°F to 149°F).



Features

The ETS-4GC24FP is an Industrial Ethernet Access Switch for OTN

24 10 / 100-TX ports supporting PoE and 4 Gigabit RJ-45/SFP Combo ports (10 / 100 / 1000 Base-TX, 1000 Base-X)

The total power budget is 540 W in DC power mode and 240 W in AC power mode IEEE 802.3at compliant with maximum 30 W per port

Redundant Gigabit Ethernet Ring (recovery time <20ms) and RSTP or MSTP

VLAN, QoS, IGMP Snooping V1/V2/V3, Rate Control, Port Mirroring

Alarm Management via OTN Management System (OMS) (Pending)

Supports Web interface, SNMP V3 & CLI

Advanced Security: supports Port Security

Event Notification by SNMP trap and Relay Output

Aluminum Housing complies with IP31

Fanless design

Power input (90-264VAC or 46-57VDC)

19" mounting frame

-25°C to +65°C (-13°F to 149°F) operating temperature



Power Supply

The ETS-4GC24FP provides 2 types of power input, i.e. AC power input and DC power input. It also provides redundant or aggregated power inputs, depending on the power input voltage. If more than 2 power inputs of different voltages are connected, the ETS-4GC24FP will be powered by the highest connected voltage (redundant power). If the power input voltages are the same, the total power output will be aggregated (aggregated power).

The AC power input range is 100-250VAC. The DC input range depends on the PoE requirements. If IEEE 802.3af is required, the range of the available DC power input is 46-57VDC. If the IEEE802.3at mode is required, the range of the DC power input is 52-57VDC. If the DC power input is 53VDC, the unit will aggregate the power with the AC power input, if any.

The internal power consumption of the ETS-4GC24FP is 28 W. The total power budget for PoE is 540 W in DC power mode (up to 65°C/149°F) and 240 W in AC power mode (up to 50°C/122°F) IEEE 802.3at compliant with maximum 30 W per port.

Interface Ports

The ETS-4GC24FP switch provides a total of 28 Ethernet ports. 24 of these ports are electrical 10/100 TX ports.

The 4 remaining ports are 10/100/1000 RJ-45/SFP Combo ports. These Combo ports can be used as electrical 10/100/1000 RJ-45 ports, or they can be equipped with (optional) SFP modules.

Optical SFP (Small Form factor Pluggable) Transceivers

The ETS-4GC24FP has 4 Gigabit Ethernet Combo ports that can be equipped with 1000 Base LX/EX/ZX Single Mode SFP transceivers or 1000 Base SX Multi Mode SFP transceivers.

The LX transceiver (1310nm) can reach up to 10 km (6.2 mi), the EX transceiver (1310nm) up to 40 km (24.8 mi) and the ZX transceiver (1550nm) up to 70 km (43.5 mi) on Single Mode fiber.

The SX Multi Mode module (850nm) can be used for distances up to 550 m (0.34 mi) on Multi Mode fiber.

It is possible to use a mix of different SFP transceivers or electrical RJ-45 ports in a single switch.

The use of the optical fiber ports improves the immunity to electromagnetic interference and allows to cover large distances between the ETS-4GC24FP switches, or between an ETS-4GC24FP switch and the ET100DAE, N5024CF, N7024CF or BORA2500/10G-X3M-ETX cards for OTN-X3M.

Redundant Gigabit Ethernet Ring

The ETS-4GC24FP is typically used in a ring structure for redundancy reasons. The Redundant Gigabit Ethernet Ring technology provides failover switching in less than 20ms (with FO links).

The ETS-4GC24FP also supports standard Multiple and Rapid Spanning Tree Protocol for connection with 3rd party switches.

Advanced Ethernet Features

The ETS-4GC24FP supports VLANs, which allows the logical separation of applications.

When used in combination with the ET100DAE interface card for OTN-X3M or N50/N70 series, the different VLANs which are used in the ETS-4GC24FP access network can be mapped into S-LANs (Secure LANs with a dedicated amount of bandwidth) on the OTN-X3M backbone.

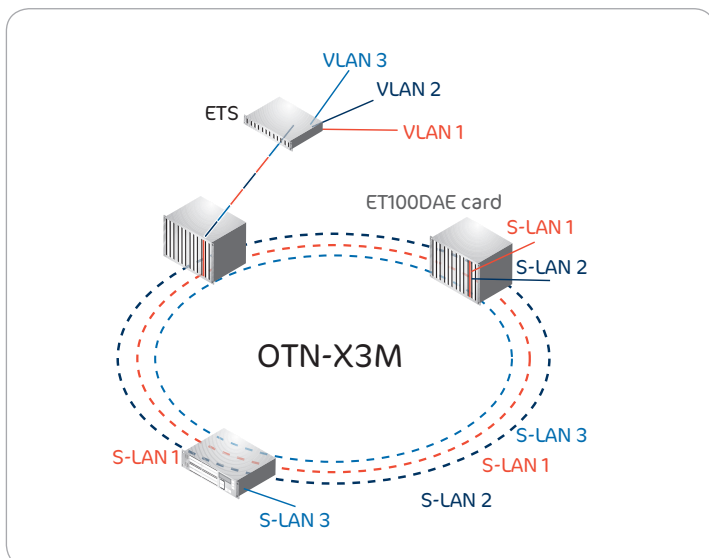
The ETS-4GC24FP switches also support IGMP snooping, which is useful in case IP video applications or other applications that require multicast IP traffic are used.

Other supported Ethernet features include Quality of Service (QoS), and Rate Control.

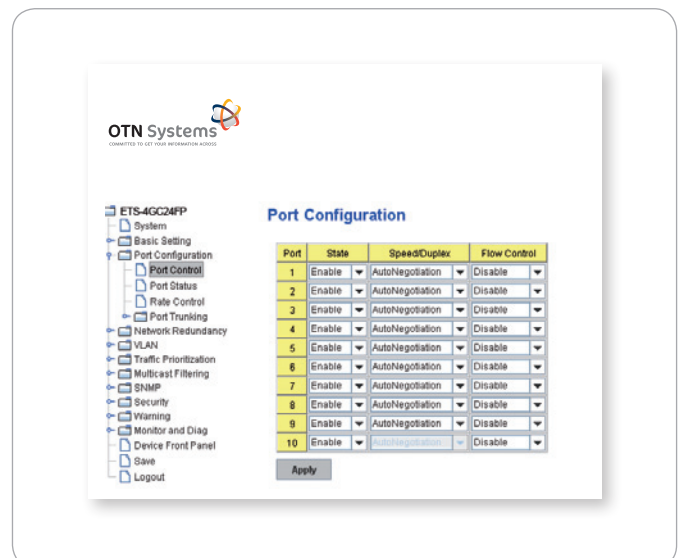
Security Features

Various features help to increase network security. The ETS-4GC24FP supports Port Security and IP Security.

The ETS-4GC24FP switch provides Port Security to enhance network security. Port Security allows the network manager to assign an authorized MAC address to a specific port.



Mapping of Ethernet VLANs to Secure LANs on the OTN backbone



ETS-4GC24FP embedded webserver

To achieve this, the MAC and Port binding entry/entries are added to the port security table. Port Security will only allow the devices with MAC address(es) listed in the Port Security List to access the network through the switch.

Other devices are denied access to the Ethernet port. This is a simple way to secure your network and avoid unwanted access by hackers.

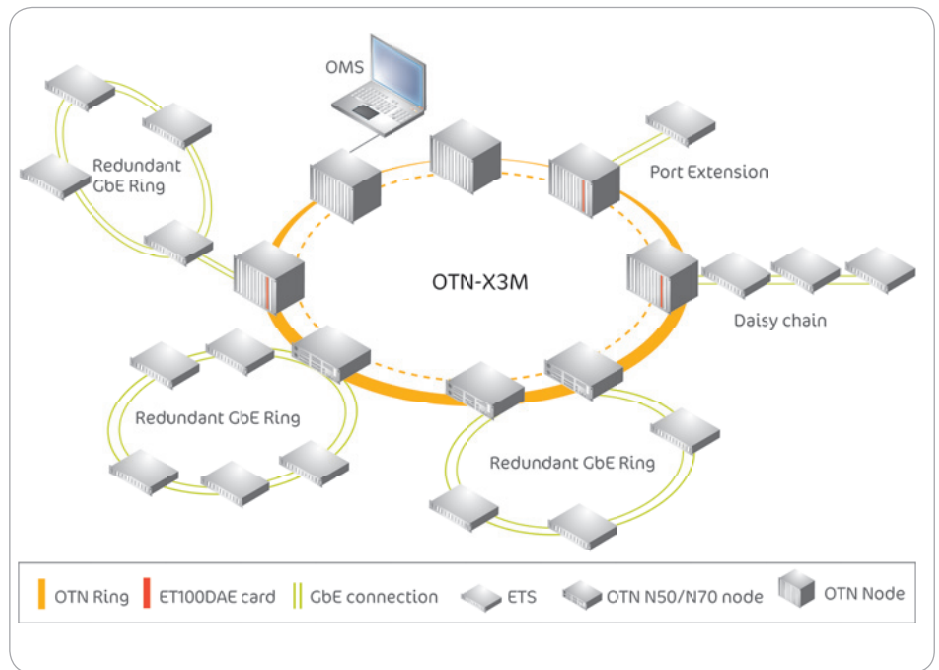
IP Security prevents unauthorized (management) access to the ETS-4GC24FP switch by specifying the allowed IP address. It is possible to configure specific IP addresses to authorize management access to the ETS-4GC24FP switch via a web browser or Telnet.

ETS-4GC24FP Switch Management

The ETS-4GC24FP can be configured via the embedded Web server. Alternatively Telnet or RS-232 Command Line Interface (CLI) can be used.

Once the ETS-4GC24FP switch is configured, it can be monitored by the OTN Management System (OMS), together with the rest of the OTN network. The OMS receives information about the ETS-4GC24FP switches via SNMP and will report equipment alarms and broken network connections if they occur.

The ETS-4GC24FP also provides alarm notification via SNMP Trap or Alarm Relay.



ETS-4GC24FP access network topology

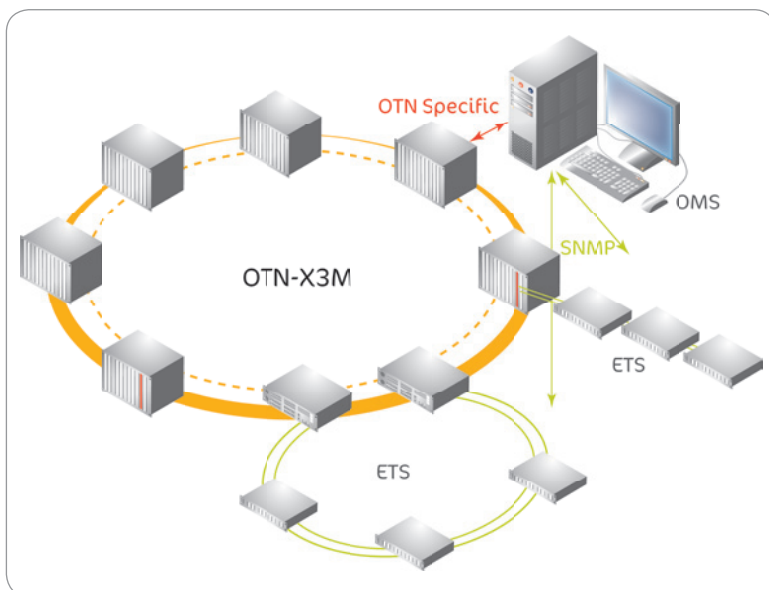
Network Topology

Different access network topologies can be built with the ETS-4GC24FP switches. A single ETS-4GC24FP switch can act as port multiplier for an Ethernet interface port on OTN.

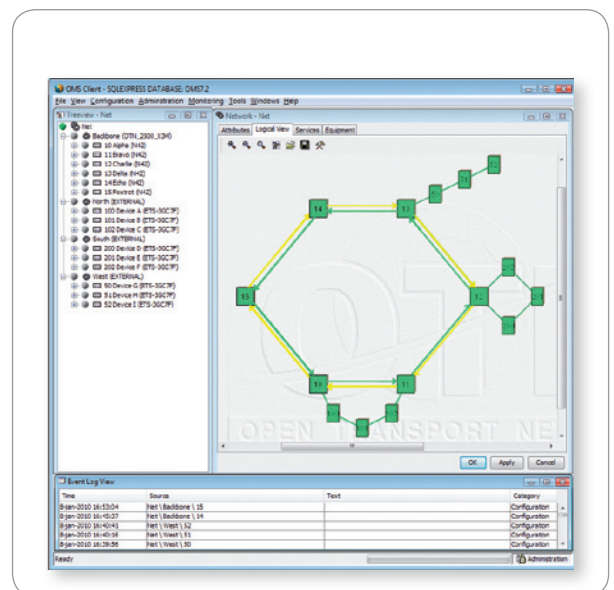
When different Ethernet applications are distributed over a larger area, a daisy chain of ETS-4GC24FP switches can be installed to pick-up these remote applications. Either copper or fiber optic cabling can be used depending on the distances between the applications. To increase Ethernet access network redundancy, the ETS-4GC24FP switches can also be installed in a ring

configuration. The Rapid Spanning Tree Protocol (RSTP) or Redundant Gigabit Ethernet Ring will then (logically) open a link to prevent Ethernet loops and will reconfigure the network in case a cable between the ETS-4GC24FP switches is broken.

It is also possible to connect a daisy chain of ETS-4GC24FP switches to 2 different OTN nodes to create a redundant uplink. This type of configuration is typically used in applications where small amounts of Ethernet/IP data need to be collected along a track between the OTN nodes (e.g. in highway, rail or pipeline applications).



Communication between OMS and ETS-4GC24FP via SNMP



Representation of ETS in OMS GUI

Specifications

Ethernet Standards:

- IEEE 802.3 10Base-T Ethernet
- IEEE 802.3u 100Base-TX Fast Ethernet
- IEEE 802.3ab 1000Base-TX
- IEEE 802.3z Gigabit Ethernet Fiber
- IEEE 802.3x Flow Control and Backpressure
- IEEE 802.1p Class of Service
- IEEE 802.1Q VLAN and GVRP
- IEEE 802.1D-2004 Rapid Spanning Tree Protocol (RSTP)
- IEEE 802.3ad LACP
- IEEE 802.3af Power over Ethernet 15.4 W
- IEEE 802.3at Power over Ethernet 30 W
- IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)

Switch Performance

Switch technology:

Store and Forward Technology, 12.8 Gbps Wire-Speed Switching

System Throughput:

14,880pps for 10M Ethernet, 148,800pps for 100M Fast Ethernet, 1,488,100pps for Gigabit Ethernet

Transfer packet size: 64 bytes to 1536 bytes (with VLAN Tag)

MAC Address Table: 16K MAC

Management

Configuration: Embedded Webserver, CLI

Monitoring:

via OMS or SNMP

SNMP v1, v2c, v3, Traps and RMON1. SNMP MIB: MIB-II, Bridge MIB, VLAN MIB, SNMP MIB, RMON and Private MIB

Port Trunk: Up to 5 Static Trunk and IEEE802.3ad LACP

VLAN: IEEE802.1Q VLAN, GVRP. Up to 256 VLAN groups

Quality of Service: Eight priority queues per port, IEEE802.1p COS and Layer 3 TOS/DiffServ

IGMP Snooping: IGMP Snooping V1/V2/V3 for multicast filtering and IGMP Query V1/V2

Rate Control: Ingress filtering for Broadcast, Multicast, Unknown DA or All packets, and Egress filtering for All packets

NTP: Network Time Protocol for time of day synchronization

Embedded Watchdog: Embedded hardware watchdog timer to auto-reset in case of failure

Port Mirroring: Online traffic monitoring on multiple selected ports

Port Security: Assign authorized MAC to specific port

IP Security: IP security to prevent unauthorized access

Network Redundancy

RSTP: IEEE802.1D-2004 Rapid Spanning Tree Protocol. Compatible with Legacy STP and IEEE802.1w.

Multiple Spanning Tree Protocol: IEEE802.1s MSTP, each MSTP instance can include one or more VLANs

Redundant Gigabit Ethernet Ring: Failure recovery within 20ms.

Interfaces

Number of Ports:

10/100TX: 24 x RJ-45, Auto MDI/MDI-X, Auto Negotiation

10/100/1000TX: 4 x RJ-45/ SFP Combo with Gigabit SFP (Hot Swappable)

Cables:

10Base-T: 2-pair UTP/STP Cat. 3, 4, 5 cable (100m/328ft)

100 Base-TX: 2/4-pair UTP/STP Cat. 5 cable (100m/328ft)

1000 Base-T: 4-pair UTP/STP Cat. 5 cable (100m/328ft)

Single Mode & Multi Mode Fiber (depending on SFP type)

LED Indications per port:

10/100 RJ-45: Link/Activity, Full duplex/Collision
Gigabit Copper/SFP: Link/Activity PoE enabled af/at

LED Indicators unit:

DC1, DC2, PSU input Alarm,

System running (Green)

RS232 Console: RJ-45 Connector,

Pin3: TxD, Pin6: RxD, Pin5:GND

Power: 2 power Inputs

Digital Input: 2 Digital Input Logic Low (0): 0-10VDC/Logic High(1): 11-30VDC

Alarm: 2 Relay outputs for predefined events

Reset: Reset button is provided to restore default settings

Power Requirements System

Power:

46-57VDC with Reverse Polarity Protection or 90-264VAC

Power Consumption: 28 Watts

Mechanical Installation:

19 inch, 1U rack mount

Dimensions:

HxWxD: 44 mm x 431 mm x 375 mm

Weight: 8 kg including packaging

Environmental Conditions

Operating Temperature:

-25°C to +65°C (-13°F to +149°F)

Operating Humidity:

5% to 95% (non-condensing)

Storage Temperature:

-40°C to +85°C (-40°F to +185°F)

Hi-Pot: 1.2KV for ports and power

Regulatory Approvals

EMI:

EN55022 CLASS A, IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11

Safety: UL/cUL 60950

Shock: IEC60068-2-27

Vibration: IEC60068-2-6

Free Fall: IEC60068-2-32

MTBF: 200,000 Hours, MIL-HDBK-217F GB standard

Ordering Information

S30828-B2-X1:

ETS-4GC24FP Industrial 24+4G Gigabit Managed Ethernet Switch

Includes:

ETS-4GC24FP (without SFP transceivers) 19 inch mounting frame

AG-L119:

ETS-3GC7F/4GC24FP OMS License for one switch

Optional:

V30813-S19-A1: Optical GigE SFP 850nm Multi Mode module – SX (550 m / 0.34 mi)

V30813-S20-A1: Optical GigE SFP 1310nm Single Mode module – LX (10 km / 6.2 mi)

V30813-S34-A1: Optical GigE SFP 1310nm Single Mode module – EX (40 km / 24.8 mi)

V30813-S35-A1: Optical GigE SFP 1550nm Single Mode module – ZX (70 km / 43.5 mi)

V30812-A5020-A92: DIN rail PoE Power Supply, 100-240Vac/110-150Vdc for ETS-4GC24FP

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