INDUSTRIAL ETHERNET SWITCH ETS-3GC7F(-X)

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-3GC7F 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-3GC7F is a managed Industrial Ethernet Switch, which provides 7 x 10/100 TX ports and 3 x 10/100/1000 RJ-45/SFP Combo ports.

Thanks to its Gigabit Combo port design, the ETS-3GC7F 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 3rd Gigabit Ethernet port 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-3GC7F also provides a digital input and relay output for local alarm notification.

Mechanical Design

The ETS-3GC7F has a compact design (137 mm x 96 mm x 119 mm (HxWxD)) and provides a corrosion resistant aluminum extrusion housing which complies with IP31. The switch can be mounted on a DIN-Rail or can be wall mount.
The fanless design of the ETS-3GC7F switch allows it to operate in a wide temperature range from -25°C to 70°C (-13°F to 158°F). The extended temperature range version ETS-3GC7F-X has a temperature range of -40°C to 74°C (-40°F to 165°F) and complies with NEMA TS2 specifications.

Features

The ETS-3GC7F(-X) is an Industrial Ethernet Access Switch for OTN

7 10 / 100-TX ports and 3 Gigabit RJ-45/SFP Combo ports (10 / 100 / 1000 Base-TX, 1000 Base-X)

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

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

Alarm Management via OTN Management System (OMS)

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

Redundant power input

(12-48VDC)

DIN-Rail or Wall-Mounting

Operating temperature
ETS-3GC7F: -25°C to 70°C (-13°F to 158°F)
ETS-3GC7F-X: -40°C to 74°C (-40°F to 165°F, NEMA TS2)

OTN Systems
COMMITTED TO GET YOUR INFORMATION ACROSS

Power Supply

The ETS-3GC7F can be powered via dual 12~48VDC inputs with reverse polarity protection. The low power consumption of only 15 Watts (@ 48VDC), means that it can also be used in combination with solar or wind power.

Interface Ports

The ETS-3GC7F switch provides a total of 10 Ethernet ports. 7 of these ports are electrical 10/100 TX ports.

The 3 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-3GC7F has 3 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 (1310 nm) can reach up to 10 km (6.2 mi), the EX transceiver (1310 nm) up to 40 km (24.8 mi) and the ZX transceiver (1550 nm) up to 70 km (43.5 mi) on Single Mode fiber.

The SX Multi Mode module (850 nm) can be used for distances up to 550 m (0.34 mi) on Multi Mode fiber.
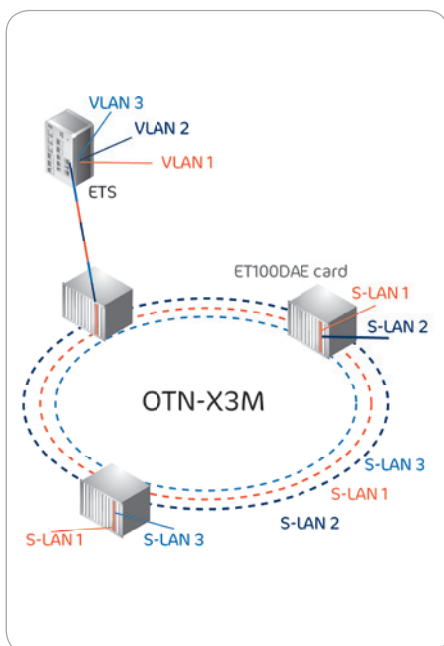
It is possible to use a mix of different SFP transceivers or electrical RJ-45 ports in a single switch.

The use of the optical fiber ports improves the immunity to electromagnetic interference and allows to cover large distances between the ETS-3GC7F switches, or between an ETS-3GC7F switch and the ET100DAE, N5024CF, N7024CF or BORA2500/10G-X3M-ETX cards for OTN-X3M.

Redundant Gigabit Ethernet Ring

The ETS-3GC7F 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-3GC7F also supports standard Rapid and Multiple Spanning Tree Protocol for connection with 3rd party switches.

Advanced Ethernet Features

The ETS-3GC7F supports VLANs, which allows the logical separation of applications.

When used in combination with the ET100DAE or ET100AE interface cards for OTN-X3M or N50/N70 series, the different VLANs which are used in the ETS-3GC7F access network can be mapped into SLANs (Secure LANs with a dedicated amount of bandwidth) on

the OTN-X3M backbone.
The ETS-3GC7F 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-3GC7F supports Port Security and IP Security.

The ETS-3GC7F switch provides Port Security to enhance network security. Port Security allows the network manager to assign an authorized MAC address to a specific port.

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-3GC7F switch by specifying the allowed IP address. It is possible to configure specific IP addresses to authorize management access to the ETS-3GC7F switch via a web browser or Telnet.

Mapping of Ethernet VLANs to Secure SLANs on the OTN backbone
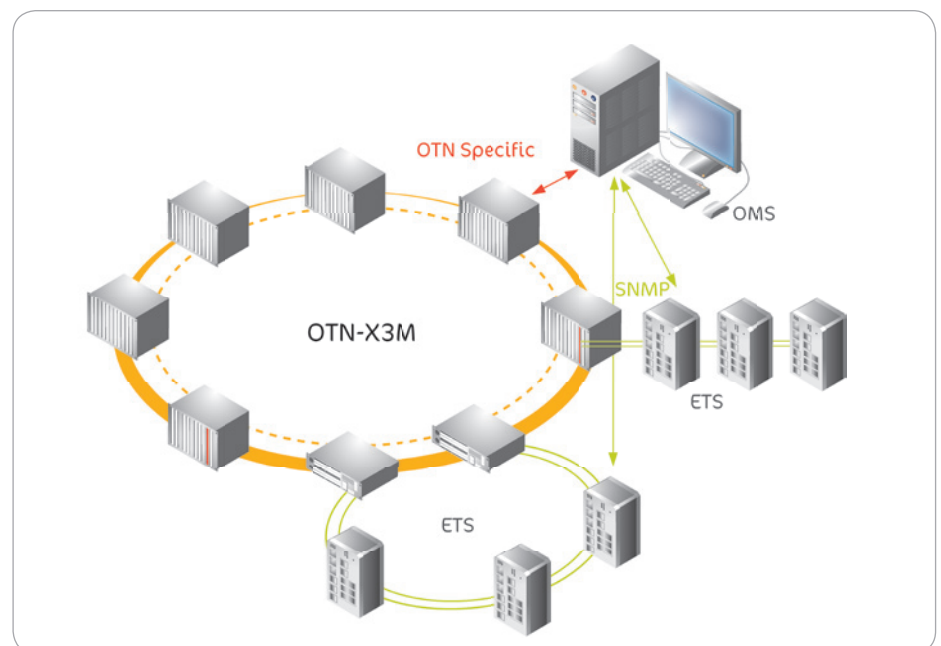
Communication between OMS and ETS-3GC7F via SNMP

ETS-3GC7F Switch Management

The ETS-3GC7F can be configured via the embedded Web server. Alternatively Telnet or RS-232 Command Line Interface (CLI) can be used.

Once the ETS-3GC7F 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-3GC7F switches via SNMP and will report equipment alarms and broken network connections if they occur.

The ETS-3GC7F also provides alarm notification via SNMP Trap or Alarm Relay.

The ETS-3GC7F has a built-in watchdog timer for system recovery in case of a CPU failure. In that case the ETS-3GC7F will automatically perform a warm boot, without the need for maintenance personnel to go on site.

Network Topology

Different access network topologies can be built with the ETS-3GC7F switches. A single ETS-3GC7F 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-3GC7F switches can be installed to pick-up these remote
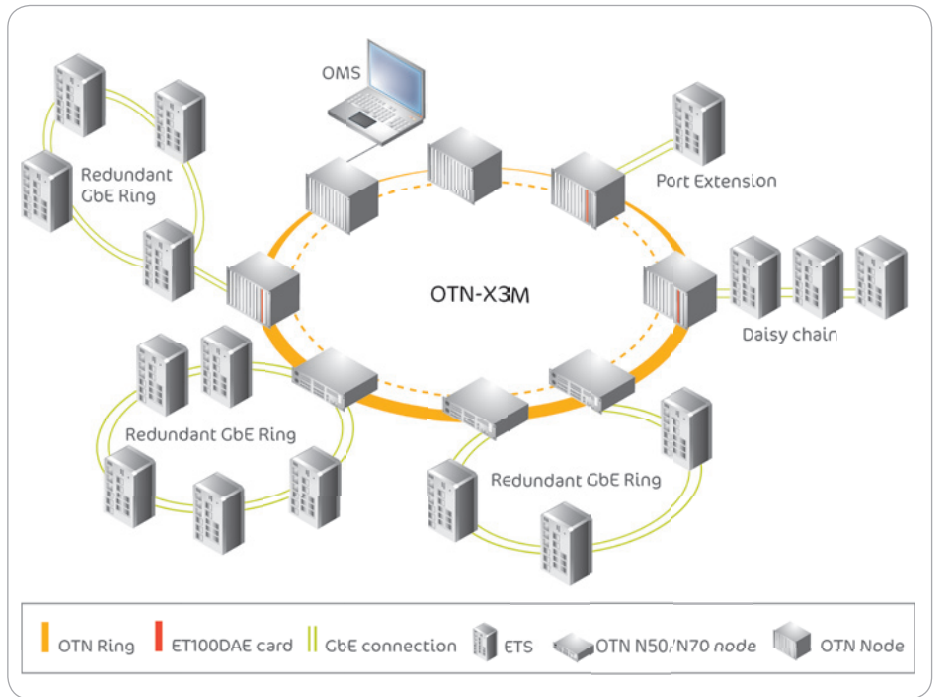

ETS-3GC7F access network topology

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-3GC7F switches can also be installed in a ring configuration. Multiple Spanning Tree Protocol (MSTP) 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-3GC7F 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).

ETS-3GC7F embedded webserver
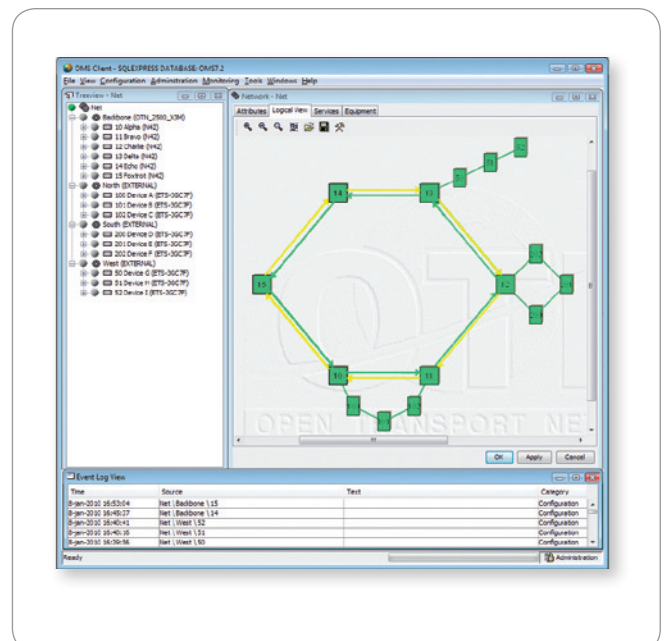
Representation of ETS-3GC7F in OMS GUI

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 Back-pressure
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 802.1s Multiple Spanning Tree Protocol (MSTP)

Switch Performance
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 1522 bytes (with VLAN Tag)
MAC Address Table: 8K 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 64 VLAN groups
Quality of Service: Four 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: 7 x RJ-45, Auto MDI/MDI-X, Auto Negotiation
10/100/1000TX: 3 x RJ-45/ SFP Combo with Gigabit SFP (Hot Swappable)
Cables:
10Base-T: 2-pair UTP/STP Cat. 3, 4, 5 cable (100 m/328 ft)
100 Base-TX: 2/4-pair UTP/STP Cat. 5 cable (100 m/328 ft)
1000 Base-T: 4-pair UTP/STP Cat. 5 cable (100 m/328 ft)
Single Mode & Multi Mode Fiber (depending on SFP type)
LED Indications:
10/100 RJ-45: Link/Activity(Green), Full duplex/Collision (Yellow)
Gigabit Copper/SFP: Link/Activity(Green)
Unit:
Power (Green),
Digital Out (Red),
Digital Input (Green),
Running Mode (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: 12~48VDC with Reverse Polarity Protection
Power Consumption:
15 Watts @ DC 48V

Mechanical
Installation:
DIN-Rail mount or Wall Mount
Housing: IP-31 protection, aluminum metal case
Dimensions:
HxWxD: 137 mm x 96 mm x 119 mm
Weight: 0.915 kg including packaging

Environmental Conditions
Operating Temperature:
ETS-3GC7F: -25°C to 70°C
(-13°F to 158°F)
ETS-3GC7F-X: -40°C to 74°C
(-40°F to 165°F, NEMA TS2)
Operating Humidity:
0% 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, EN61000-3-2, EN61000-3-3, EN61000-6-4
EMS: EN55024, EN61000-6-2, 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, IEC 61000-6-2
Safety: UL/cUL 60950
Shock: IEC60068-2-27
Vibration: IEC60068-2-6
Free Fall: IEC60068-2-32
MTBF:
249,683 Hours (28.5 years),
MIL-HDBK-217F GB standard

Ordering Information

S30828-B1-X1:
ETS-3GC7F Industrial 7+3G Gigabit Managed Ethernet Switch
S30828-B1-X2:
ETS-3GC7F-X Industrial 7+3G Gigabit Managed Ethernet Switch (NEMA TS2)
Includes:
ETS-3GC7F(-X) (without SFP transceivers) Wall mounting plate

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-A2: 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-A2: Optical GigE SFP 1550nm Single Mode module – ZX (70 km / 43.5 mi)
Note: for ETS-3GC7F-X only extended temperature range -A2 optics should be used
V30812-A5020-A58: DIN rail Power Supply 100-120/220-240Vac for N20xx and ETS-3GC7F
V30812-A5020-A99: DIN rail PSU 88-276Vac/88-375Vdc for ETS-3GC7F-X (NEMA TS2 Temp.)

OTN
OPEN TRANSPORT NETWORK