

ETS-1-10G

Ethernet Access Switches



- L2+ switches
- Stacking support
- Multicast support (IGMP Snooping, MVR)
- Advanced security (with multi-layer ACL, IP Source Guard, and Dynamic ARP Inspection)

MARKET SEGMENTS AND APPLICATIONS

New generation access switches provide end users connectivity to large-scale corporate networks, small and medium business networks, and service provider networks, using 1G/10G interfaces.

The switches support physical stacking, VLANs, multicast groups, and advanced security.

CAPACITY

Switching Capacity	See Table 1
Throughput	See Tables 1 and 2
Max. Frame Size	Jumbo Frame: 10K bytes
MAC Address Table	16K
RAM (DDR3)	512 MB
ROM (RAW NAND)	512 MB
VLAN table	4K
Buffer Memory	See Tables 1 and 2

ETHERNET INTERFACES

Ports	See Table 1
Power over Ethernet (PoE)	PoE (15.4W per port): 802.3af PoE+ (30W per port): 802.3at
Features	Head-of-line blocking (HOL) protection Auto MDI/MDIX Flow control (IEEE 802.3X) Port mirroring Stacking Back pressure

LAYER 2

VLAN	802.1Q Q-in-Q Selective Q-in-Q (VLAN Translation) Voice VLAN GVRP
MAC Table	Independent learning mode per VLAN MAC Multicast Support Configurable aging time of MAC addresses Static MAC entries MAC Flapping logging
L2 Multicast	Multicast profiles Static Multicast groups
IGMP	IGMP Snooping v1,2,3 Port/host-based IGMP Snooping Fast Leave IGMP querier IGMP proxy-report (for PoE options) IGMP authorization via RADIUS
MVR	
MLD	MLD Snooping v1,2



DHCP	DHCP snooping
	DHCP clients filtering
	DHCP autoprovision
	DHCP relay (IPv4 support)
	DHCP relay Option 82
PPPoE	PPPoE Intermediate Agent
	PPPoE Circuit-ID tag
BPDU	BPDU attacks prevention
	STP BPDU Guard
	BPDU Filtering

IP ADDRESSING AND ROUTING

Addressing	IPv4 and IPv6
	IP Unnumbered
Routing Protocols	Dynamic routing protocols
	RIPv2
	OSPFv2, OSPFv3
	BGP (requires license, see Ordering)
	VRRP
	PIM SM, PIM DM, IGMP Proxy
	ECMP Load Balancing
	Address Resolution Protocol (ARP)
Routing Technologies	Static IP routes
DNS	Server and client

RESILIENCY

L2 Protection	ERPS (G.8032v2)
	STP (Spanning Tree Protocol, IEEE 802.1d)
	STP Multiprocess
	RSTP (Rapid Spanning Tree protocol, IEEE 802.1w)
	MSTP (Multiple Spanning Tree, IEEE802.1s)
	STP Root Guard
	STP Loop Guard
	STP BPDU Guard
	PVSTP+
	BPDU Filtering
	Spanning Tree Fast Link option
	Layer 2 Protocol Tunneling
	VLAN-based Loopback Detection (LBD)
	Private VLAN
Link Aggregation	Static LAG
	Dynamic LAG (LACP)
	L2PT over LAG
	LAG Balancing Algorithm

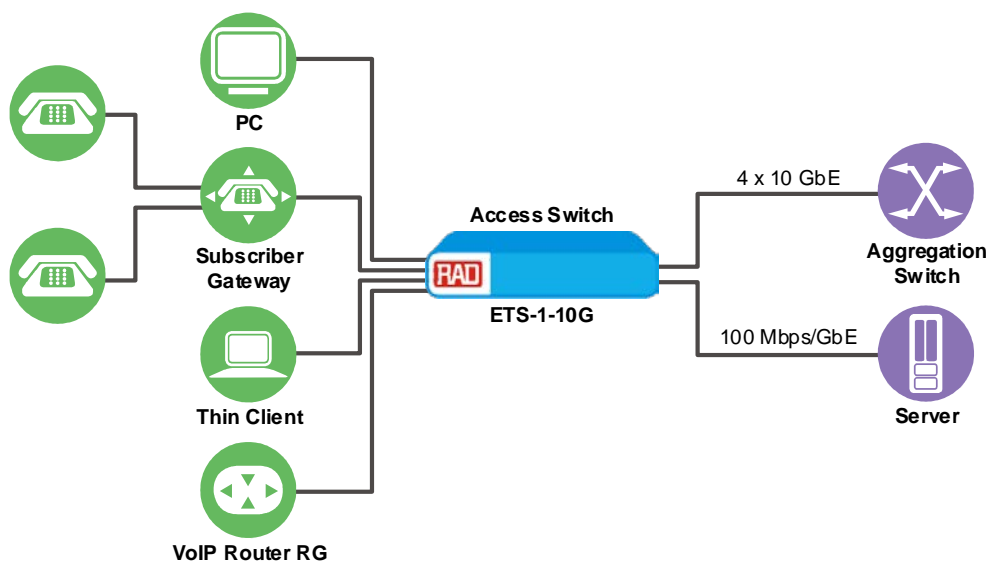


Figure 1. ETS-1-10G Ethernet Access Switches Use Case

MANAGEMENT

Configuration	Web-based interface
	Command Line Interface (CLI) with password-protected access
Control Port	RS-232 interface, RJ-45 connector
Protocols	SNTP (Simple Network Time Protocol)
	SNMPv3
	Traceroute
Access	Access control – privilege levels
	Local authentication
	IP addresses filtering for SNMP
	Flash File System
	Limiting of traffic to CPU
	Redirecting output of CLI commands to an arbitrary file on ROM
	CLI commands logging
	Password encryption
	SSH server
	Macro commands
	System log
IPv6	IPv6 Host
	Dual-stack

SECURITY

ACL	L2-L3-L4 ACL
	IPv6 ACL
	ARP ACL over GRE tunnel
	Dynamic ACL
	ACL based on:
	<ul style="list-style-type: none"> Physical port number IEEE 802.1p VLAN ID EtherType DSCP Protocol type TCP/UDP port number User defined bytes Time-based
TACACS+	TACACS+ clients
RADIUS	RADIUS clients
CoA	Change of Authorization
Syslog	
Passwords	Password encryption
	Password recovery

Security Features	IP Source Guard
	Dynamic ARP Inspection
	Traffic segmentation
	Debugging commands
	MAC-based authentication, Port Security, Static MAC entries
	Protection against non-authorized DHCP servers
	sFlow
SSL/SSH	NetBIOS/NetBEUI filtering
	DoS attacks prevention
IEEE 802.1X	SSH server/SSL
	Port-based authentication IEEE 802.1x

QUALITY OF SERVICE (QOS) AND RATE LIMITING

Class of Service	IEEE 802.1p Class of Service (CoS)
Bandwidth Control	8 egress queues per port
	Shaping
	Policing
	Storm Control
	Scheduling algorithms: Strict Priority/Weighted Round Robin (WRR)
	ACL-based traffic classification
	ACL-based VLAN assignment
	IEEE 802.1p priority for management VLAN
	802.1p, DSCP mark assignment for IGMP
	DSCP to CoS/CoS to DSCP remarking
	QoS statistics

MONITORING AND DIAGNOSTICS

Diagnostic	Ping (IPv4/IPv6 support)
	Virtual Cable Testing (VCT)
	Optical transceiver diagnostics
Monitoring	Statistics on interfaces
	CPU utilization monitoring per task and per queue
	RAM utilization monitoring
	Temperature monitoring
	TCAM utilization monitoring
	RMON/SMON
	Green Ethernet
OAM/CFM	802.3ah Ethernet Link OAM
	802.1ag Connectivity Fault Management (CFM)
	802.3ah Unidirectional Link Detection (UDLD)

Table 1. Technical Features – ETS-1-10G Devices with Internal Power Supply

Specification	ETS-1-10G/ 4SP/24U	ETS-1-10G/4SP/ 4CMB/20S/DC ETS-1-10G/4SP/ 4CMB/20S/12V/AC	ETS-1-10G/ 4SP/24P	ETS-1-10G/ 4SP/48P	ETS-1-10G/4SP/ 48U/12V/AC
Packet Processor	Marvell 98DX3236-A1 (AlleyCat3)				
Interfaces					
10/100/1000BASE-T (RJ-45)	24	-	-	-	48
10/100/1000BASE-T (RJ-45) PoE/PoE+	-	-	24	48	-
1000BASE-X/100BASE-FX (SFP)	-	20	-	-	-
10/100/1000BASE-T/1000BASE-X/100BASE-FX Combo	-	4	-	-	-
10GBASE-R (SFP+)/1000BASE-X (SFP)	4	4	4	4	4
Performance					
Switching Capacity	128 Gbps		176 Gbps		
Throughput for 64 bytes	92.1 MPPS	92.1 MPPS	93.1 MPPS	130.9 MPPS	130.9 MPPS
Buffer memory	12 Mbit	12 Mbit	12 Mbit	24 Mbit	24 Mbit
L2 Multicast groups	2K	2K	2K	2K	2K
TCAM	For routing: 1024 x IPv4 For traffic processing: 1024 x 24B				
ARP table	1K				
L3 IPv4 routes	818				
L3 IPv6 routes	210				
L3 IPv4 Muticast (IGMP Proxy, PIM)	412				
L3 IPv6 Muticast (IGMP Proxy, PIM)	103				
Link Aggregation Groups (LAG)	16, up to 8 ports per LAG				
Maximum size of ECMP groups	8				
Stacking	8 devices				

Table 2. Technical Features – ETS-1-10G with Dual Hot Swappable Power Supplies

Specification	ETS-1-10G/4SP/ 4CMB/20S	ETS-1-10G/4SP/ 4CMB/20U	ETS-1-10G/4SP/ 4CMB/4S	ETS-1-10G/4SP/ 48U	ETS-1-10G/4SP/ 48S
Packet Processor	Marvell 2x98DX3336-A1 (PonCat3)				
Interfaces					
10/100/1000BASE-T (RJ-45)	-	20		48	
10/100/1000BASE-T (RJ-45)	-				
PoE/PoE+					
1000BASE-X/100BASE-FX (SFP)	20		4		48
10/100/1000BASE-T/1000BASE-X/100BASE-FX Combo	4	4	4	-	-
10GBASE-R (SFP+)/1000BASE-X (SFP)	4	4	4	4	4
Console port	RS-232/RJ-45				
Performance					
Switching Capacity	128 Gbps	128 Gbps	96 Gbps	176 Gbps	
Throughput for 64 bytes	95 MPPS	95 MPPS	71 MPPS	130.9 MPPS	
Buffer memory	12 Mbit			24 Mbit	
L2 Multicast groups	4K				
TCAM	For routing: 1024 x IPv4 For traffic processing: 1024 x 24B			For routing: 13K For traffic processing: 3Kx24B	
ARP table	4K				
L3 IPv4 routes	12866				
L3 IPv6 routes	3222				
L3 IPv4 Mutlicast (IGMP Proxy, PIM)	4024				
L3 IPv6 Mutlicast (IGMP Proxy, PIM)	1006				
Link Aggregation Groups (LAG)	16, up to 8 ports per LAG				
Maximum size of ECMP groups	8				
Stacking	8 devices				

Table 3. Power, Physical, and Environmental Specifications – ETS-1-10G with Internal Power Supply

Specification	ETS-1-10G/ 4SP/24U	ETS-1-10G/4SP/ 4CMB/20S/DC	ETS-1-10G/4SP/ 4CMB/20S/12V/AC	ETS-1-10G/ 4SP/24P	ETS-1-10G/ 4SP/48P	ETS-1-10G/ 4SP/48U/12V/AC
Maximum power consumption	25W	35W	45W	410W	1600W	85W
Power supply	100 – 264 VAC, 50/60 Hz or 36 – 72 VDC	36 VDC – 72 VDC	100 – 264 VAC, 50/60 Hz or 12 VDC	176 – 264 VAC, 50/60 Hz or 36 – 72 VDC	100 – 240 VAC, 50/60 Hz (up to 2 hot-swappable power supplies)	100 – 240 VAC, 50/60 Hz or 12 VDC
PoE budget	-	-	-	380W	1440W (dual PS) 720W (single PS)	
Operating temperature	-20 to 50°C (-4 to 122°F)	-20 to 65°C (-4 to 149°F)	-20 to 65°C (-4 to 149°F)	-20 to 50°C (-4 to 122°F)	-10 to 50°C (14 to 122°F)	-20 to 50°C (-4 to 122°F)
Storage temperature	-40 to 70°C (-40 to 158°F)					
Operating humidity	Up to 95% non-condensing					
Cooling	Passive	4 fans	4 fans	2 fans	4 fans	4 fans
Form factor	19", 1U					
Dimensions W x D x H mm (in)	430 x 158 x 44 (17 x 6.2 x 1.7)	430 x 243 x 44 (17 x 9.6 x 1.7)	430 x 243 x 44 (17 x 9.6 x 1.7)	440 x 203 x 44 (17 x 7.9 x 1.7)	440 x 490 x 44 (17 x 19 x 1.7)	440 x 280 x 44 (17 x 11 x 1.7)
Weight	2.8	4.02	4.39	3.8	11.26	4.53

Table 4. Power, Physical, and Environmental Specifications – ETS-1-10G with Dual Hot Swappable Power Supplies

Specification	ETS-1-10G/4SP/4CMB/4S	ETS-1-10G/4SP/4CMB/20U	ETS-1-10G/4SP/4CMB/20S	ETS-1-10G/4SP/48U	ETS-1-10G/4SP/48S
Maximum power consumption	25W	35W	45W	45W	55W
Power supply	Hot Swappable Power Supplies, see Ordering (ordered separately)				
PoE budget	-	-	-	-	-
Operating temperature	-10 to 45°C (14 to 113°F)				
Storage temperature	-40 to 70°C (-40 to 158°F)				
Operating humidity	Up to 95% non-condensing				
Cooling	2 fans	4 fans	4 fans	2 fans	4 fans
Form factor	19", 1U				
Dimensions W x D x H mm (in)	430 x 275 x 44 (17 x 10.8 x 1.7)			440x316x44 (17 x 12.4 x 1.4)	
Weight (kg)	5.23	5.23	5.36	6.4	6.4

ETS-1-10G

Ethernet Access Switches

Ordering

ETS-1-10G/4SP/24U/AC

L2+ Ethernet switch, 24 ports of 10/100/1000BASE-T, 4 ports of 10GBASE-X (SFP+)/1000BASE-X (SFP)

ETS-1-10G/4SP/24U/DC

L2+ Ethernet switch, 24 ports of 10/100/1000BASE-T, 4 ports of 10GBASE-X (SFP+)/1000BASE-X (SFP), 36– 72 VDC

ETS-1-10G/4SP/4CMB/20S/DC

L2+ Ethernet switch, 20 ports of 1000BASE-X/1000BASE-FX (SFP), 4 ports of 10/100/1000BASE-T/1000BASE-X/100BASE-FX Combo, 4 ports of 10GBASE-X (SFP+)/1000BASE-X (SFP), 36– 72 VDC

ETS-1-10G/4SP/4CMB/20S/12V/AC

L2+ Ethernet switch, 20 ports of 1000BASE-X/100BASE-FX (SFP), 4 ports of 10/100/1000BASE-T/1000BASE-X/100BASE-FX Combo, 4 ports of 10GBASE-R (SFP+)/1000BASE-X (SFP), 100 – 264 VAC or 12 VDC

ETS-1-10G/4SP/24P/AC

L2+ Ethernet switch, 24 ports of 10/100/1000BASE-T with PoE/PoE+, 4 ports of 10GBASE-X (SFP+)/1000BASE-X (SFP), 176 – 264 VAC

ETS-1-10G/4SP/24P/ACW

L2+ Ethernet switch, 24 ports of 10/100/1000BASE-T with PoE/PoE+, 4 ports of 10GBASE-X (SFP+)/1000BASE-X (SFP), 100 – 240 VAC

ETS-1-10G/4SP/24P/DC

L2+ Ethernet switch, 24 ports of 10/100/1000BASE-T with PoE/PoE+, 4 ports of 10GBASE-X (SFP+)/1000BASE-X (SFP), 36 – 72 VDC

ETS-1-10G/4SP/48P/AC

L2+ Ethernet switch, 48 ports of 10/100/1000BASE-T with PoE/PoE+, 4 ports of 10GBASE-X (SFP+)/1000BASE-X (SFP), single 100 – 240 VAC

ETS-1-10G/4SP/48P/ACR

L2+ Ethernet switch, 48 ports of 10/100/1000BASE-T with PoE/PoE+, 4 ports of 10GBASE-X (SFP+)/1000BASE-X (SFP), dual 100 – 240 VAC

ETS-1-10G/4SP/48U/12V/AC

L2+ Ethernet switch, 48 ports of 10/100/1000BASE-T (RJ-45), 4 ports of 10GBASE-R (SFP+)/1000BASE-X (SFP), single 100 – 240 VAC or 12 VDC

Switches with Dual Power Supply Slots

(Power Supplies are ordered separately)

ETS-1-10G/4SP/48U

L2+ Ethernet-switch, 48 x 10/100/1000Base-T ports, 4 x 10GBase-R (SFP+)/1000Base-X (SFP) ports, dual PS slots (PSs not included)

ETS-1-10G/4SP/48S

L2+ Ethernet switch, 48 x 1000BASE-X/100BASE-FX (SFP) 4 x 10GBASE-R/1000BASE-X (SFP+/SFP), dual PS slots (PSs not included)

ETS-1-10G/4SP/4CMB/4S

L2+ Ethernet switch, 4 ports of 1000BASE-X/100BASE-FX (SFP), 4 Combo ports of 10/100/1000BASE-T/1000BASEX/100BASE-FX, 4 ports of 10GBASE-R (SFP+)/1000BASE-X (SFP), dual PS slots (PSs not included)

ETS-1-10G/4SP/4CMB/20U

L2+ Ethernet switch, 1 port of 10/100/1000BASE-T (OOB), 20 ports of 10/100/1000BASE-T, 4 Combo ports of 10/100/1000BASE-T/1000BASEX/100BASE-FX, 4 ports of 10GBASE-R (SFP+)/1000BASE-X (SFP), L2+, dual PS slots (PSs not included)

ETS-1-10G/4SP/4CMB/20S

L2+ Ethernet switch, 1 port of 10/100/1000BASE-T (OOB), 20 ports of 1000BASE-X/100BASE-FX (SFP), 4 Combo ports of 10/100/1000BASE-T/1000BASEX/100BASE-FX, 4 ports of 10GBASE-R (SFP+)/1000BASE-X (SFP), L2+, dual PS slots (PSs not included)

Hot Swappable Power Supplies

Separately ordered per needed quantity (1 or 2) and type (DC or AC) for the devices with dual slots for removable power supplies

ETS-1-10G-PS/AC220/160W

AC Power Supply Module for ETS-1-10G, 100-264 VAC, 50-60 Hz, 160W

ETS-1-10G-PS/DC48/100W

DC Power Supply Module for ETS-1-10G, 36-76 VDC, 100W

ETS-1-10G

Ethernet Access Switches

Data Sheet

OPTIONAL ACCESSORIES

ETS-1-BGP-LIC

License for using BGP protocol

CBL-SGW-RJ45-D9-F-6FT

RJ-45 to DB-9 console cable

Transceivers

For the list of available transceivers, see the [Pluggable Transceivers data sheet](#) at www.rad.com

***Note:** It is strongly recommended to order this device with **original** RAD SFPs **installed**. This will ensure that prior to shipping, RAD has performed comprehensive functional quality tests on the entire assembled unit, including the SFP devices. RAD cannot guarantee full compliance to product specifications for units using non-RAD SFPs.*

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