

AS5710-54X EdgeCOS

10GbE SDN capable hybrid switch, supporting OpenFlow 1.3 and OF-DPA

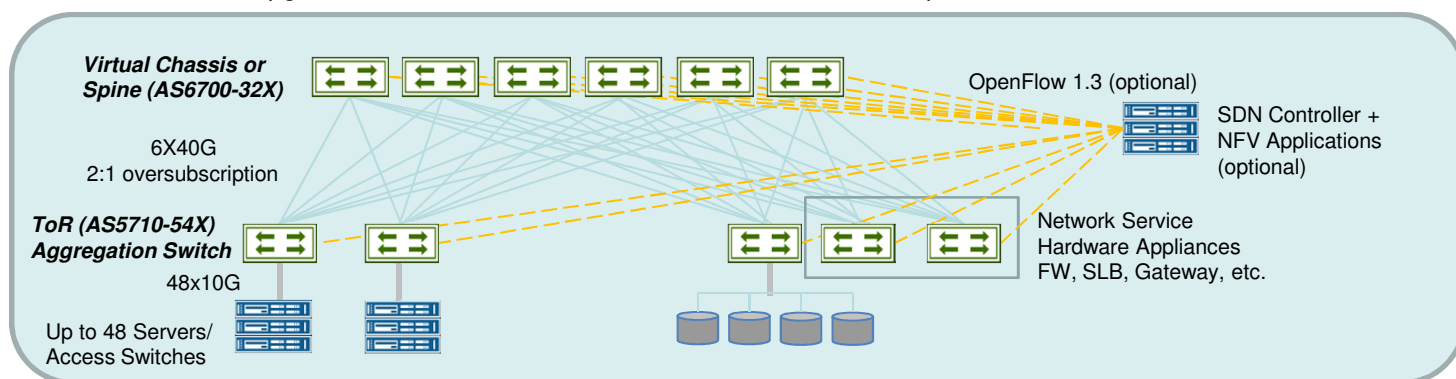


Product Overview

The AS5710-54X is a 48-port 10GbE SFP+ switch with 6-port 40GbE uplink designed for Data Center Top of Rack, Carrier/Enterprise Aggregation and SDN enabled networks. It's the ideal solution for traditional three tier Aggregation or Core and folded Clos architectures, serving with a 2:1 oversubscription.

The switch runs EdgeCOS, providing traditional Layer 2 and Layer 3 switching functionality, as well as OpenFlow 1.3, leveraging Broadcom's OF-DPA, to get the most out of the switching silicon. By using OF-DPA, EdgeCOS provides more tables, larger table sizes, and a streamlined OpenFlow pipelining, compared to legacy OpenVswitch based software solutions.

The EdgeCOS software license is perpetual, the optional annual software maintenance fee entitles to bug fixes, software upgrades and new feature releases within the contracted period.



Key Features and Benefits

- 48 x 10G SFP+ and 6 x 40G QSFP+ ports
- Hybrid Layer 2 / Layer 3, and OpenFlow 1.3
- OF-DPA 1.0 / 2.0*
- Compatible with OpenFlow 1.3 capable controllers and applications written for OF-DPA
- Debian GNU/Linux Open Linux Environment*
- 346W typical power consumption
- 12KBytes Jumbo Frames
- Dual hot-swappable Power Supplies (AC, 48VDC, 12VDC)
- Port-to-power and Power-to-port airflow options
- 2:1 Oversubscription in folded Clos networks
- 4+1 hot-swappable fans
- MLAG support
- VXLAN ready*
- Perpetual license with optional annual maintenance contract

* = EdgeCOS 2.0

OF-DPA

OF-DPA is Broadcom's new OpenFlow 1.3 implementation for Data Center/ Carrier switches.

Earlier implementations were based on OpenVswitch, but it wasn't easily possible to leverage the full capacity of the switching ASIC.

The OpenVswitch design didn't set boundaries on how tables can be used. However the switching ASIC has a fixed processing pipeline, and the hardware tables along this pipeline are of fixed sizes. Therefore OpenFlow designs based on OpenVswitch often don't fit the ASIC's design.

To solve this problem, Broadcom has introduced OF-DPA, which is an abstraction layer between OpenFlow 1.3 and the switching ASIC, providing a defined OpenFlow compatible flow pipeline with defined tables and increased table sizes, with the ability to leverage the full capacity of the switching ASIC.

The following table illustrates the increased table sizes in comparison to the older OpenVswitch based approach.

	OpenVswitch based	OF-DPA 1.0 on AS5710-54X
Tables	1	7
L2 Bridging	32K	128K
L3 Unicast	1500 (shared)	112K (IPv4) / 56K (IPv6)
L3 Multicast	1500 (shared)	104K (IPv4) / 52K (IPv6)
VLANs	494	4094 x 54 ports

As an early adopter, EdgeCOS is one of the first switch operating systems to support OF-DPA, in order to provide a future proof OpenFlow implementation to end users and application providers.

Verified OpenFlow controllers compatible with OF-DPA:

- OpenDaylight (with Table Type Patterns)
- Ryu (with custom OF-DPA library)

Virtual Chassis

A Virtual Chassis (VC) works just like a real chassis, only that it is made of individual switches instead of fabric and module blades.

In a Virtual Chassis, the fabric modules are called Spine switches, while the port modules are called Leaf switches.

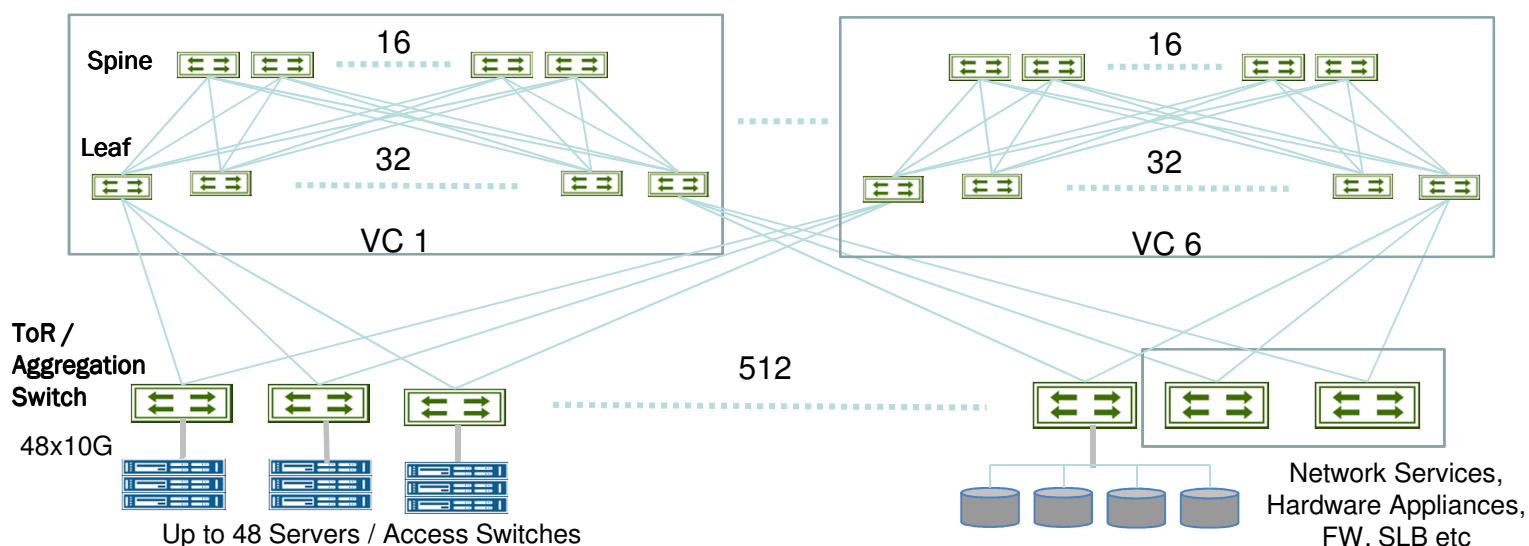
Compared to a traditional chassis, a Virtual Chassis is more flexible in scaling than a fixed size chassis. This results in lower power consumption and space saving in the racks for certain configurations.

In addition to that, a Virtual Chassis can be scaled up to support twice the amount of downstream ports to Top-of-Rack / Aggregation switches, just by adding another layer of 1 RU switches into the Clos architecture.

Tier	Switches per VC	40G ports to ToRs
2	48	512
3	112	1024
4	240	2048
5	496	4096

Using the AS5710-54X for the Top-of-Rack /Aggregation switches, one can connect to 6 Virtual Chassis using ECMP to balance the traffic. This provides a 2:1 oversubscription to the hosts.

For the Leaf and Spine switches within the Virtual Chassis, we suggest to use the "AS6700-32X EdgeCOS" 32x40G QSFP+ switch with no oversubscription.



Features

Ports

Switch Ports:
 48 x SFP+ each supporting 10GbE or 1GbE
 6 x QSFP each supporting 40GbE or 4 x 10GbE
 Management Ports on Front Panel:
 1 x RJ-45 serial console
 1 x RJ-45 100/1000BASE-T management port
 1 x USB Type A storage port

Performance

Wire Speed Forwarding: L2 and L3
 Switching Capacity: 1.44Tbps
 MAC Addresses: 288K max
 VLAN IDs: 4K
 Jumbo frames (12KBytes)
 L3 Routes: IPv4 112K max, IPv6 56K max
 Packet Buffer Size: 12MB shared buffer pool

L2 Features

Flow control:
 ■IEEE 802.3x for full duplex mode
 Jumbo frames
 ■12KB
 Storm Control:
 ■Broadcast
 ■Multicast
 ■Unknown Unicast
 Spanning Tree Protocol
 ■IEEE 802.1D STP
 ■IEEE 802.1w RSTP
 ■IEEE 802.1s MSTP (32 instances)
 ■BPDU Guard
 ■BPDU Filtering
 ■Root Guard
 ■BPDU forwarding
 ■Loopback detection
 ITU-T G.8032 Ethernet Ring Protection
 ■ Sub 50 msec convergence
 ■ Revertive operation mode
 ■ Multiple-ring network
 VLAN
 ■Supports 4k VLANs
 ■Port Based VLAN
 ■IEEE 802.1Q VLAN
 ■Traffic Segmentation (Port Isolated)
 L2 Virtual Private Network
 ■QinQ
 ■Selective QinQ
 ■VLAN Translation
 Link Aggregation
 ■Static Trunk
 ■802.3ad LACP
 ■Trunk group: 26
 ■Load balance based on MAC SA/DS, SIP, DIP, TCP/UDP Port
 IGMP Snooping
 ■IGMP v1/v2/v3 Snooping
 ■IGMP querier support
 ■IGMP Immediate Leave
 ■IGMP Filtering/Throttling
 ■IGMP Snooping Proxy(V1/V2/V3)
 UDLD
 Digital Diagnostic Monitoring (DDM)

QoS Features

8 Priority queues per port
 Traffic Scheduling
 ■Strict Priority
 ■WRR (Weighted Round Robin)
 ■Hybrid (WRR +Strict)
 Traffic Classification (CoS)
 ■802.1p based CoS/port
 ■IP ToS precedence based
 ■IP DSCP based CoS
 ■TCP/UDP Port based CoS
 ■PHB (Per Hop Behavior -- internal priority)
 ■Drop precedence (color aware)
 ■Port based default priority
 DiffServ
 ■SRTCM (1 rate 3 color) Color aware /color blind
 ■TRTCM (2 rate 3 color) Color aware /color blind
 ■Ingress policy map
 ■Egress policy map

IPv6 QoS Features

* DiffServ: SrcIPv6/DstIPv6

Security Features

ACL
 ■Number of ACE (SW) : 4K, current use 1K rule(Auto compression)
 ■Number of ACE per ACL (SW) : 100
 ■Auto compress ACE
 ■L2/L3/L4
 ■Ingress
 ■Egress
 ■Statistics
 Username / Password Authentication
 ■Authenticate management access
 ■Local Authentication
 ■Remote Authentication via RADIUS
 ■Remote Authentication via TACACS+
 HTTPS and SSL (Secured Web)
 SSH 1.5/V2.0 (Secured Telnet Session)
 Management Interface Access Filtering (SNMP, WEB, TELNET)

IPv6 Security Features

IPv6 ACL
 ■Number of ACE (SW) : 4K (Compressed)
 ■L2/L3/L4 : SrcIPv6/DstIPv6

OAM

IEEE 802.3ah Link
 IEEE 802.1ag Connectivity Fault Management
 ■ Connectivity check
 ■ Loopback
 ■ Linktrace
 ITU-T Y.1731 Performance and Throughput Management
 ■ Frame Delay
 ■ Frame Delay variation

Features

IPv6 Features

IPv4/IPv6 Dual Protocol Stack
 IPv6 Address Type
 ■Unicast
 ■Multicast
 ICMPv6
 ICMPv6 Redirect (Host)
 IPv6 Path MTU Discovery
 IPv6 Neighbor Discovery
 ■Duplicate Address
 ■Static Cache Entry
 ■Address Resolution
 ■Unreachable Neighbor Detection
 Manual Configuration
 SNMP over IPv6
 HTTP over IPv6
 SSH over IPv6
 IPv6 Telnet Support
 IPv6 Syslog Support
 IPv6 SNTP Support
 IPv6 TFTP Support
 Remote IPv6 Ping
 Ping over IPv6
 trace route over IPv6
 IPv6 sFlow
 DHCPv6
 ■Client
 ■Relay

L3 Features IPv4

Multi-netting
 CIDR (Classless Inter-Domain Routing)
 Unicast Routing
 ■Static Unicast Routes
 ■RIPv1/v2
 ■OSPF
 ■BGP4+
 ■Equal Cost multipath routing(ECMP)
 Multicast Routing
 ■PIM-DM
 ■PIM-SM
 ■IGMP v1/v2/v3
 ■IGMP v2/v3 Proxy
 IP Redundancy
 ■VRRP RFC3768
 ■UDP Helper
 ■DHCP Server

L3 Features IPv6

IPv6 Unicast Routing
 ■Static Routes
 ■OSPFv3
 ■MLD v1/v2
 ■Equal Cost multipath routing(ECMP)
 IPv6 Multicast Routing
 ■PIM-DM6
 ■PIM-SM6

Management Features

Switch Management:
 ■CLI via console port or Telnet
 ■WEB management
 ■SNMP v1, v2c, v3
 Terminal Setting
 Multiple Management IP Interface
 Software Download/Upgrade
 ■TFTP, Xmodem/Ymodem (Boot code only), FTP, HTTP
 Dual Images
 Configuration Download/Upload
 ■TFTP, HTTP, FTP
 Auto Upgrade
 ■TFTP, FTP
 RMON
 ■RMON1 (1,2,3,9 group)
 ■RMON2 (partly)
 DHCP
 ■Client
 ■Relay
 Port Mirroring
 RSPAN
 Event/Error Logging
 ■Syslog (local Flash)
 ■Remote log (RFC3164)
 Remote Ping
 SNTPv4 (RFC2030)
 NTP
 LLDP (802.1ab)
 ■Link Layer Discovery Protocol
 ■LLDP-MED (VoIP related)
 sFlow(V4/V5)
 Delay reload
 Port Utilization (kbits/sec.Pkts/sec, %Util in recent 300 secs)
 IPv6 Management (Telnet Server/ICMP v6)
 Monitor Environment
 ■Power Status
 ■FAN
 Thermal monitor
 ■Fan speed control
 ■showing temperature
 ■send trap
 Fan failure detection
 ■send trap
 Partial config
 ■FTP
 ■TFTP
 historical data(15min,24HR)
 craft port
 trace route
 MAC learning
 HW/SW watchdog
 Restore and Configure from USB
 USB Port Management
*Zero Touch Provisioning**

AS5710-54X EdgeCOS Product Specifications

Features

Data Center Features

802.1Qbb (PFC)
802.1Qau (ECN)
802.1Qaz (ETS)
DCBx
MLAG
ONIE
OpenFlow 1.3
OF-DPA 1.0
■VLAN Flow Table: 221076 entries (54 ports, 4094 VLANs per port)
■L2 Bridging Flow Table: 128K entries
■Unicast Routing Flow Table: 112K entries
■Multicast Routing Flow Table: 104K entries
Compatible with OpenDaylight / Ryu
*OF-DPA 2.0**
*Tunneling**
*Supports multiple SDN controllers**
*Supports 40G to 4 x 10G breakout cables and 4 x 10G port grouping**

Software License

- Switch is loaded with Open Network Install Environment (ONIE) software installer
- EdgeCOS perpetual license
- Optional annual software maintenance license (incl. bug fixes and upgrades)

Regulatory

EMI
CE Mark (EN55022 Class A)
FCC Part 15 Class A
VCCI
Safety
CB, EN 60950
UL/CUL
Environmental: Temperature: IEC 68-2-14
Drop: ISTA 2A
RoHS-6 Compliant

Physical and Environmental

Dimensions (WxDxH): 443 x 473 x 43.4mm (17.4 x 18.6 x 1.71in)
Weight: 8.5kg (18.74lbs), with two installed PSU modules
Fans: hot-swappable 4+1 redundant fans
Operating Temperature: 0°C to 40°C (32°F to 104°F)
Storage Temperature: -40°C to 70°C (-40°F to 158°F)
Operating Humidity: 5% to 95% non-condensing
Operating Altitude: up to 3048m (10,000ft)

Power

PSUs: 2 redundant, load-sharing, hot-swappable AC or -48VDC
Input Voltage: 90 to 264VAC at 50-60Hz. -48 to -72VDC.
Input Current: Max 6A @100/120VAC, 3A @200/240VAC, 10A @-72VDC
PSU Efficiency: Up to 93% for AC PSUs
12VDC power input options

Supported Optics and Cables

SFP+ Ports:
10GBASE-CR DAC: up to 5m passive; up to 10m active
10GBASE-SRL/SR: up to 100/300m over OM3 MMF
10GBASE-LR: Up to 10km over SMF
100GBASE-SX, 100GBASE-LX, 100/1000BASE-T
QSFP+ Ports:
40GBASE-CR4 DAC; 0.5m to 7m; Passive and Active
40GBASE-CR4 DAC to 4 x SFP+ 10GBASE-CR DAC; up to 5m passive; up to 10m active
40GBASE-SR4: Up to 100m over OM3 MMF, 150m over OM4 MMF
40GBASE-SR4 to 6 x 10GBASE-SR: 100m over OM3, 150m OM4
40GBASE-LR4: Up to 10km over SMF

Warranty

Please check www.edge-core.com for the warranty terms in your country/region.

For More Information

To find out more about Edge-Core Networks products and solutions, visit www.edge-core.com

About Edge-Core Networks

Edge-Core Networks is in the business of providing innovative network solutions. In the service provider network, in the data center or in the cloud, Edge-Core Networks delivers the software and systems that transform the way the world connects. Edge-Core Networks serves customers and partners worldwide. Additional information can be found at www.edge-core.com.

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Ordering Information

5710-54X-O-AC-F-US	AS5710-54X 48-Port 10G SFP+ with 6x40G QSFP uplinks, CPU Module with Freescale P2041 processor, ONIE software installer, dual AC PSUs, port-to-power airflow, N. America
5710-54X-O-AC-B-US	AS5710-54X 48-Port 10G SFP+ with 6x40G QSFP uplinks, CPU Module with Freescale P2041 processor, ONIE software installer, dual AC PSUs, power-to-port airflow, N. America
5710-54X-O-AC-F-EU	AS5710-54X 48-Port 10G SFP+ with 6x40G QSFP uplinks, CPU Module with Freescale P2041 processor, ONIE software installer, dual AC PSUs, port-to-power airflow, Europe
5710-54X-O-AC-B-EU	AS5710-54X 48-Port 10G SFP+ with 6x40G QSFP uplinks, CPU Module with Freescale P2041 processor, ONIE software installer, dual AC PSUs, power-to-port airflow, Europe
5710-54X-O-AC-F-UK	AS5710-54X 48-Port 10G SFP+ with 6x40G QSFP uplinks, CPU Module with Freescale P2041 processor, ONIE software installer, dual AC PSUs, port-to-power airflow, UK
5710-54X-O-AC-B-UK	AS5710-54X 48-Port 10G SFP+ with 6x40G QSFP uplinks, CPU Module with Freescale P2041 processor, ONIE software installer, dual AC PSUs, power-to-port airflow, UK
5710-54X-O-AC-F-JP	AS5710-54X 48-Port 10G SFP+ with 6x40G QSFP uplinks, CPU Module with Freescale P2041 processor, ONIE software installer, dual AC PSUs, port-to-power airflow, Japan
5710-54X-O-AC-B-JP	AS5710-54X 48-Port 10G SFP+ with 6x40G QSFP uplinks, CPU Module with Freescale P2041 processor, ONIE software installer, dual AC PSUs, power-to-port airflow, Japan
5710-54X-O-48V-F	AS5710-54X 48-Port 10G SFP+ with 6x40G QSFP uplinks, CPU Module with Freescale P2041 processor, ONIE software installer, dual 48VDC PSUs, port-to-power airflow
5710-54X-O-48V-B	AS5710-54X 48-Port 10G SFP+ with 6x40G QSFP uplinks, CPU Module with Freescale P2041 processor, ONIE software installer, dual 48VDC PSUs, power-to-port airflow
5710-54X-O-12V-F	AS5710-54X 48-Port 10G SFP+ with 6x40G QSFP uplinks, CPU Module with Freescale P2041 processor, ONIE software installer, one 12VDC power input, port-to-power airflow
5710-54X-O-12V-B	AS5710-54X 48-Port 10G SFP+ with 6x40G QSFP uplinks, CPU Module with Freescale P2041 processor, ONIE software installer, one 12VDC power input, power-to-port airflow
PSU-AC-400-F	400W AC Power Supply FRU, port-to-power airflow, no power cord
PSU-AC-400-B	400W AC Power Supply FRU, power-to-port airflow, no power cord
PSU-48V-400-F	400W -48V DC Power Supply FRU, power-to-port airflow, no power cord
PSU-48V-400-B	400W -48V DC Power Supply FRU, port-to-power airflow, no power cord
PSU-12V-400-1	12V DC power input unit FRU
FAN-1U-1x1D-F	Fan Tray FRU, port-to-power airflow
FAN-1U-1x1D-B	Fan Tray FRU, power-to-port airflow
CBL-PWR-US	AC Power Cable - US (125V/13A, 1830mm)-- only required with spare power supplies
CBL-PWR-EU	AC Power Cable - Europe (250V/10A, 1830mm)-- only required with spare power supplies
CBL-PWR-UK	AC Power Cable - UK (250V/10A, 1830mm)-- only required with spare power supplies
CBL-PWR-JP	AC Power Cable - Japan-- only required with spare power supplies
5710-54X-SVC-RTF	AS5710-54X Annual Hardware Service, post warranty, Return-to-Factory
5710-54X-SSW-E	AS5710-54X EdgeCOS L2/L3 perpetual software license
5710-54X-SSW-OF-E	AS5710-54X EdgeCOS L2/L3/OpenFlow perpetual software license
5710-54X-UPG-OF-E	AS5710-54X EdgeCOS L2/L3 to OpenFlow software upgrade
5710-54X-SVC-E	AS5710-54X Annual Software Maintenance, Technical Support and Upgrades, EdgeCOS
ORSA-1U	Open Rack Switch Adapter, for mounting standard 19 inch form factor 1U switches into 21 inch Open Rack

Ordering Information

ET4201-RJ45	1000BASE-T Copper SFP transceiver
ET4202-SX	1000BASE-SX Multi mode SFP transceiver, up to 500m (850nm)
ET4202-LX	1000BASE-LX Single mode SFP transceiver, up to 10km (1310nm)
ET5402-SR	10 Gigabit SFP+, 850nm Multimode, 802.3ae 10GBASE-SR Compliance, 300m, LC port
ET5402-LR	10 Gigabit SFP+, 1310nm Singlemode, 802.3ae 10GBASE-LR compliance, 10km, LC port
ET5402-DAC-1M	10 Gigabit SFP+ DAC 1m cable
ET5402-DAC-3M	10 Gigabit SFP+ DAC 3m cable
ET5402-DAC-5M	10 Gigabit SFP+ DAC 5m cable
ET5402-AOC-3M	10 Gigabit SFP+ AOC 3m cable
ET5402-AOC-5M	10 Gigabit SFP+ AOC 5m cable
ET5402-AOC-7M	10 Gigabit SFP+ AOC 7m cable
ET5402-AOC-10M	10 Gigabit SFP+ AOC 10m cable
ET6402-40DAC-1M	40G to 40G DAC cable, QSFP+ DAC cable, 1m
ET6402-40DAC-3M	40G to 40G DAC cable, QSFP+ DAC cable, 3m
ET6402-40DAC-5M	40G to 40G DAC cable, QSFP+ DAC cable, 5m
ET6402-10DAC-1M	40G to 4 10G DAC cable, QSFP+ DAC- 4*SFP+DAC Cable, 1m
ET6402-10DAC-3M	40G to 4 10G DAC cable, QSFP+ DAC- 4*SFP+DAC Cable, 3m
ET6402-10DAC-5M	40G to 4 10G DAC cable, QSFP+ DAC- 4*SFP+DAC Cable, 5m
ET6402-10AOC-5M	40G to 4 10G AOC cable, QSFP+ AOC- 4*SFP+AOC Cable, 5m
ET6402-10AOC-7M	40G to 4 10G AOC cable, QSFP+ AOC- 4*SFP+AOC Cable, 7m
ET6402-10AOC-10M	40G to 4 10G AOC cable, QSFP+ AOC- 4*SFP+AOC Cable, 10m
ET6402-10AOC-15M	40G to 4 10G AOC cable, QSFP+ AOC- 4*SFP+AOC Cable, 15m
ET6402-40AOC-3M	40G to 40G AOC cable, QSFP+ AOC cable, 3m
ET6402-40AOC-5M	40G to 40G AOC cable, QSFP+ AOC cable, 5m
ET6402-40AOC-7M	40G to 40G AOC cable, QSFP+ AOC cable, 7m
ET6402-40AOC-10M	40G to 40G AOC cable, QSFP+ AOC cable, 10m
ET6402-40AOC-15M	40G to 40G AOC cable, QSFP+ AOC cable, 15m
ET6402-40AOC-30M	40G to 40G AOC cable, QSFP+ AOC cable, 30m
ET6401-LR4	40G QSFP+ long range transceiver
ET6401-SR4	40G QSFP+ short range transceiver