



Volex

High-Speed Copper Interconnect Solutions

**Direct Attach and
High-Speed I/O Cables**



Volex is a leading integrated cable manufacturing and electronics manufacturing service specialist for performance-critical applications and power products.

Our products and services are as diverse as the customers we serve. Each helps to enable the increasingly sophisticated digital world in which we live. Providing power and connectivity for both complex machinery and everyday items, from data centre high-speed interconnects and power distribution, radiation oncology treatments, industrial lasers, right through to electric vehicles for the 21st century, Volex is integral to a vast universe of modern manufacturers.



Volex High-Speed Copper Interconnect Solutions

We deliver interconnect solutions crucial to leading-edge data centre infrastructure, helping organizations of all sizes support faster processing, greater bandwidth and increased density. With advanced interconnect solutions designed to support the fastest speeds, Volex has the proven IP and expertise and manufacturing prowess that megascale data centres rely on.

We offer external and internal copper cable assemblies in various form factors to support applications including Ethernet, InfiniBand, PCIe and SAS at speeds up to 800 Gbps, 1.6 TB is in developing. All our products are 100% tested in the factory before shipping to ensure optimal signal integrity performance, allowing trouble-free installation and reliable operation.

Global reasons for doing business with Volex

- TOTAL SYSTEMS SOLUTION DESIGN, MANUFACTURING, AND DELIVERY PROVIDER
- TARIFF-FREE MANUFACTURING OPTION
- ASSISTING ORGANIZATIONS OF ALL SIZES TO SUPPORT FASTER PROCESSING, GREATER BANDWIDTH AND INCREASED DENSITY
- LOCAL ENGINEERING AND SALES SUPPORT IN OVER 20 COUNTRIES
- QUICK TURNAROUND AND CUSTOMER RESPONSE TIME
- COST COMPETITIVE WITHOUT SACRIFICING PERFORMANCE AND QUALITY

As next-gen data centres deploy faster speeds in a tighter space, cables must exhibit strong signal integrity performance beyond Nyquist, reduced power consumption, and reliable operation.

VOLEX DIRECT ATTACH COPPER CABLES

- LOW POWER CONSUMPTION, LOW HEAT DISSIPATION, VERY LOW COST
- COMPLETE CABLE ASSEMBLY UNIQUELY TERMINATED AT THE FACTORY TO PROVIDE MOST RELIABLE OPERATION
- 100% TESTED FOR SIGNAL INTEGRITY WITH SERIAL NUMBER TRACEABILITY
- PRODUCT CUSTOMIZATION AVAILABLE TO MEET CUSTOMER SPECIFICATIONS
- PRODUCTION CAPACITY TO MEET MEGA SIZED GLOBAL DATA CENTRE DEMAND
- INNOVATIVE DESIGN DEVELOPMENT TO SUPPORT NEXT-GENERATION INTERCONNECT TECHNOLOGY AND DEPLOYMENT

Optimized for Ethernet and InfiniBand data centre interconnect applications:

- **Servers**
- **Switches**
- **Routers**
- **High Performance Computing**
- **Storage**

Volex offers a full line of Direct Attach Copper Cables, includes passive, ACC and AEC from 10Gbps SFP+ to 800Gbps OSFP and QSFP-DD800 designed to meet the requirements of the most demanding data centres with industry leading quality and reliability. Our engineering teams can customize a solution to a customer's specific requirements and provide quick turn custom design samples supported by skilled local sales and FAE teams. Our worldwide factory footprint, which provides tariff-free manufacturing options and efficient global supply chains and logistics support, enables reduced product lead times and effective cost management. By partnering with Volex on data center high-speed interconnect solutions, you can benefit from our technical expertise and manufacturing prowess to help you future-proof your data centre and fulfil infrastructure development and growth goals.

VOLEX DIRECT ATTACH COPPER CABLE PRODUCT HIGHLIGHTS

FEATURES	BENEFITS
Wide AWG range	Provides cost, reach, signal integrity margin and cable flexibility optimization
Passive copper length up to 6 meters	Meets industry standard signal integrity requirements up to lengths of 6 meters (varies depending on cable speed)
Unique foam dielectric cable jacket construction	Increased flexibility cables while maintaining signal integrity quality
Custom EEPROM programming	Programmable to customer requirements
Optimised PCB design	Provides superior margin for 24G NRZ, 50G PAM4 and 100G PAM4 signal integrity parameters against standard specification
Advanced wire stripping and cable termination process	Eliminate damage to the conductor and shield, prevent dielectric shrink back, protect solder joints, re-enforced strain relief, all while maintaining signal integrity, product quality, and operational reliability
LSZH cable jacket and PCB options	Environmentally-friendly
Custom solutions supported	Custom solutions forcible configuration, connector pin repurposing and beyond

VOLEX OSFP-800G, QSFP-DD800 and QSFP112 ACTIVE AND PASSIVE DIRECT ATTACH COPPER CABLES SUPPORT LEADING-EDGE SPEEDS OF NEXT GENERATION DATA CENTRE

Data centre networking speeds are moving fast, and they're about to get much faster. Significant developments by the standards committees and industry are pushing data centres beyond 400G to 800G, shortening refresh cycles and bringing new technologies to market at an accelerated pace. While technological hurdles are being cleared, it becomes more challenging for data centre architects to time their hardware transitions properly and maximize the throughput of both switch and server ports. Whether selecting the highest speed and density available in OSFP-800G or QSFP-DD800, each supporting 8x100Gb/s PAM4 channels or QSFP112 with 4 such channels as the next transition step, Volex offers a full line of 100Gb/s PAM4 per channel active and passive Direct Attach Copper Cables.

A key design challenge for 100Gb/s PAM4 is to maintain an end-to-end even impedance profile with minimal loss to support signal integrity that operates symbol-error free. Advanced high-speed copper interconnect cable construction technology and design, coupled with robust manufacturing process, enables Volex to successfully produce Direct Attach Copper Cables for 100Gb/s PAM4 applications.

Volex active Direct Attach Cables enhance Signal Integrity, which is severely stressed under high-speed data transmission, through advance linear equalization (ACC) or DSP equalization (AEC). The result is up to 5M reach for 100Gbps PAM4 channels vs. max 2M reach for the passive version.

All Volex Direct Attach Copper Cables have the same unique dielectric material and cable construction offering the smallest cable outer diameter and highest flexibility. Volex active DAC Cables can further reduce the cable OD from the passive version for the same cable length by using larger wire gauge. At less than 150mW per active channel, Volex active DAC Cables are cost-effective alternatives to the high power consuming Active Optical Cables, with superior reliability for next-gen data centres that deploy faster speeds in tighter spaces.



800G OSFP DAC Cable



QSFP-DD800 DAC Cable



VOLEX QSFP-DD ACTIVE AND PASSIVE DIRECT ATTACH COPPER CABLES SUPPORT DATA CENTRE UPGRADE TO 400G

Quad Small Form-factor Pluggable Double Density (QSFP-DD) supports 400Gbps for future ready applications. Choose QSFP-DD DACs to support the data centre growth in years to come.

Volex QSFP-DD active and passive Direct Attach Copper Cables double the number of lanes of the previous 100/200Gbps generation QSFP28/56 from 4 to 8. Volex QSFP-DD cables support 200Gbps with 25Gbps/lane NRZ modulation and 400Gbps with 50Gbps/lane PAM4 modulation for a reach up to 5 and 3 meters, respectively. Thanks to unique foam dielectric construction, Volex QSFP-DD cables offer smallest cable outer diameter and bend radius and highest flexibility. The active QSFP-DD DAC Cable, with its ability to compensate for signal loss and enhance Signal Integrity, can extend the reach up to 9M for both 25G NRZ and 50G PAM4 channels vs. max 5M (25G NRZ) and 3M (50G PAM4) reach for the passive version.



QSFP-DD to 2x QSFP56 Breakout DAC

VOLEX SFP28/56 and QSFP28/56 ACTIVE AND PASSIVE DIRECT ATTACH COPPER CABLES SUPPORT HIGH-DENSITY AND EFFICIENCY OF TODAY'S DATA CENTRES

QSFP28 and SFP28 emerged to address the industry's primary concerns of port density, power consumption and cost. Defined by IEEE802.3bj and InfiniBand EDR, QSFP28 supports 100Gbps Ethernet with 4 lanes of 25Gbps in the same mechanical form factor as QSFP+. QSFP28 thus delivers 2.5 times the transmission throughput of QSFP+ and provides lower cost per Gbps by fully utilizing switch port density and capabilities. The single lane 25Gbps form factor of QSFP28 is SFP28.

QSFP56, defined by IEEE 802.3cd and InfiniBand HDR with 4 lanes of 50Gbps PAM4 for an aggregate bandwidth of 200Gbps, further extends per lane and per port bandwidth of QSFP28 by a factor of 2 in the same mechanical form factor. The single lane 50Gbps form factor of QSFP56 is SFP56.

Volex QSFP28/56 DAC Cables offer a wide range of straight and breakout variants to support the needs of today's 100Gbps Ethernet data centres and to facilitate the transition to 200Gbps and 400Gbps port speeds. The active SFP28/56 and QSFP28/56 DAC Cable can extend the reach up to 9M for both 25G NRZ and 50G PAM4 channels vs. max 5M (25G NRZ) and 3M (50G PAM4) reach for the passive version. For SFP28 and QSFP28 active DAC Cables, IEEE CA-25G-N spec can be met for full in-rack cabling length to support no FEC for low latency applications.



QSFP56 DAC Cable

Volex Active DAC Maximum Reach (M)

AWG	25G NRZ Channel	50G PAM4 Channel	100G PAM4 Channel
30	5	5	3
28	7	7	4
26	9	9	5

VOLEX 10G TO 1.6 TB DIRECT ATTACH COPPER CABLES

Volet Direct Attach Copper Cable Product Lines	Total Speed (Gbps)	Lanes, Lane Speed (Gbps)	Lengths (M)	Twinax (n-pair)	Application
SFP+	10	1, 10	0.5 - 7	2	E, F
QSFP+	40	4, 10		8	E, I, F
QSFP+ to 4x SFP+	40/ 4x 10	4, 10	0.5 - 5 (Passive) 4 - 9 (ACC)	4x 2	E, F
SFP28	25	1, 25		2	E, F
QSFP28	100	4, 25	0.5 - 5 (Passive) 4 - 9 (ACC)	8	E, I, F
QSFP28 to 2x QSFP28	100/ 2x 50	4, 25		2x 4	E
QSFP28 to 4x SFP28	100/ 4x 25	4, 25	0.5 - 3 (Passive) 4 - 7 (ACC or AEC)	4x 2	E, F
SFP56	50	1, 50		2	E, F
QSFP56	200	4, 50	0.5 - 3 (Passive) 4 - 7 (ACC or AEC)	8	E, I, F
QSFP56 to 2x QSFP56	200/ 2x 100	4, 50		2x 4	E, I
SFP-DD	100	2, 50	0.5 - 3 (Passive) 4 - 7 (ACC or AEC)	4	E, F
DSFP	100	2, 50		4	E
QSFP56 to 4x SFP56	200/ 4x 50	4, 50	0.5 - 3 (Passive) 4 - 7 (ACC or AEC)	4x 2	E, F
QSFP-DD 400G	400	8, 50		16	E, I
QSFP-DD to 2x/4x QSFP56	400/ 2x 200 or 4x 100	8, 50	0.5 - 2 (Passive) 1-5 (ACC or AEC)	2x 8 or 4x 4	E, I
QSFP-DD to 8x SFP56	400/ 8x 50	8, 50		8x 2	E
OSFP-400G*	400	8, 50	0.5 - 2 (Passive) 1-5 (ACC or AEC)	16	E, I
QSFP112	400	4, 100		8	E, I
800G OSFP	800	8, 100	0.5 - 2 (Passive) 1-5 (ACC or AEC)	16	E, I
800G QSFP-DD	800	8, 100		16	E, I
800G QSFP-DD to 2x/4x QSFP112	800/ 2x 400 or 4x 200	8, 100	0.5 - 1.5 (Passive)	2x 8 or 4x 4	E, I
800G OSFP to 2x/4x QSFP112	800/ 2x 400 or 4x 200	8, 100		2x 8 or 4x 4	E, I
1.6 TB OSFP-XD**	1600	16, 100	0.5 - 1.0 (Passive)	32	E, I
1.6 TB OSFP1600**	1600	8, 200		16	E, I

** Cables are pending final qualification. Length listed above are preliminary.

APPLICATION LEGEND:

E = Ethernet, I = InfiniBand, F = Fibre Channel

For each product line, different lengths (meters) and wire gauges (AWG) and other customization options including pull tab color, cable jacket type (PVC or Low Smoke Zero Halogen) and color, and EEPROM custom programming are available. For detailed specification and ordering information, please refer to datasheet and drawing of each product line or contact us at sales@volex.com for assistance in finding the right solution for your needs.

* Volex's OSFP 400G Passive DAC Cable Products (including part numbers DO50PDG05BS, DO50PDG10BS, DO50PDG15BS, DO58PDG20BS, DO58PDG25BS and DO56PDG30BS) are not intended for use and should not be used with cages configured to also receive an OSFP module with a riding heat sink or with stacked cages configured to receive an OSFP module with a riding heat sink.

VOLEX HIGH-SPEED I/O CABLES

Data centre compute and storage architectures are fast moving to composable and are being increasingly disaggregated as CPUs, GPUs, PCIe-based NVMe storage, AI accelerators, and DRAM are separated into their own rack units and are interconnected via high-speed I/O cables at the rack level.

The disaggregation trend also revolutionizes server internal interconnect leading to more use of flyover internal cables replacing PCB traces to eliminate the need for retimers and enable flexible system configuration via cable-to-any media module.

VOLEX MINI-SAS HD MULTI-LANE INTERNAL AND EXTERNAL INTERCONNECT SOLUTIONS ARE DESIGNED FOR NEXT GENERATION SPEEDS AND DENSITY

Volex SFF-8644 and SFF-8643 external and internal high-speed I/O cables are high performance interconnect solutions that maximize PCIe/NVMe and SAS drives performance. The standard PCI-SIG External Cabling Specification 3.0 compliant version supports Cable Management Interface (CMI) sideband signaling. Volex also offers a variety of wiring configurations for both external and internal PCIe Mini-SAS HD cable assemblies to meet custom requirements for sideband signals.

Volex's PCIe SFF-8644/8643 cable assembly family is offered in SAS 3.0, SAS 4.0, PCIe 3.0 and PCIe 4.0 versions and high density 4x and 8x configurations supporting up to 24Gbps for each channel.

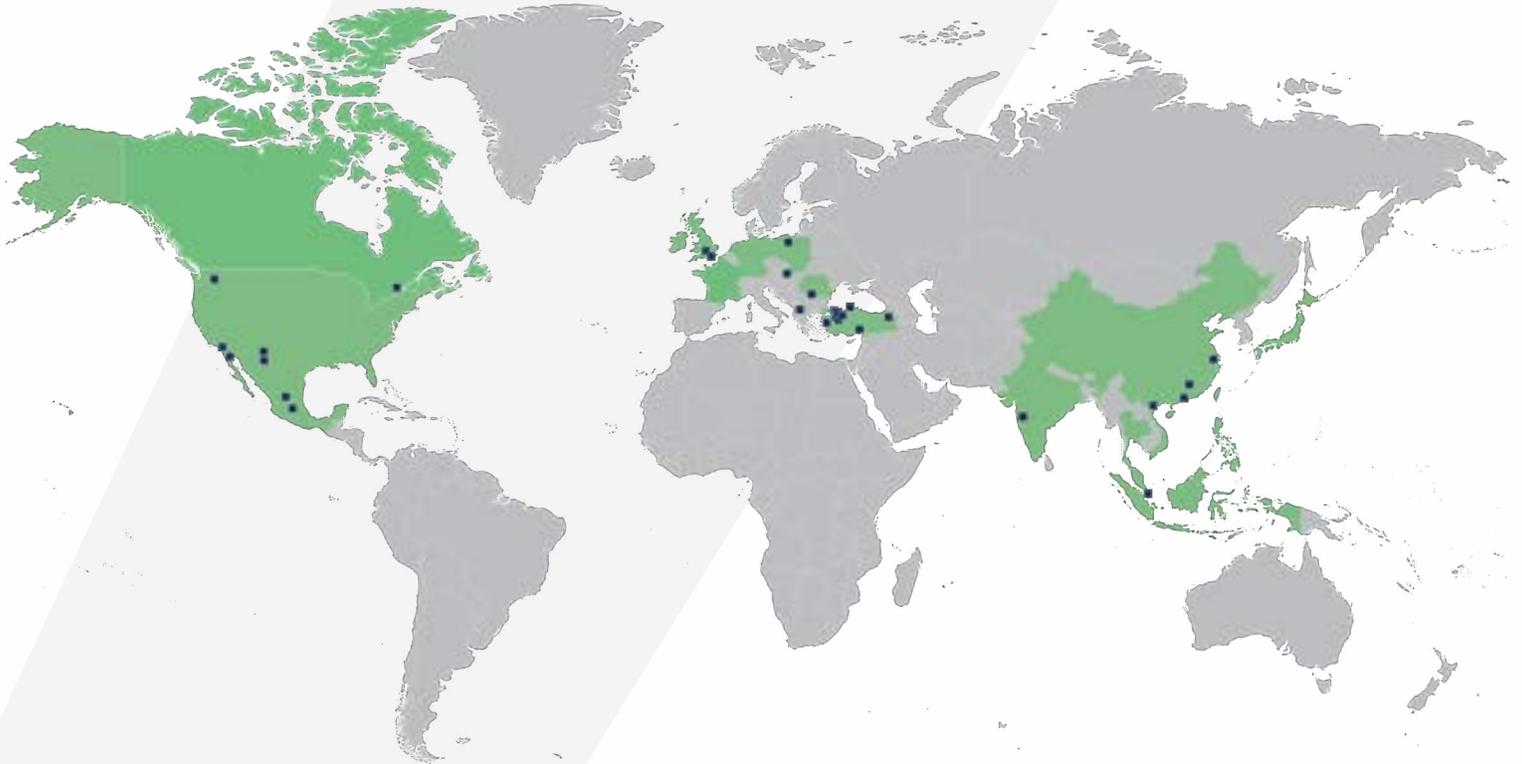


Mini-SAS HD 8X





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