

Brocade Ethernet Optics Family

HIGHLIGHTS

- Rigorously tested for performance and reliability by Brocade
- Hot-swappable flexibility in the field for greater ease and lower total cost of ownership
- Standards-based—802.3z, 802.3ah, 802.3u, 802.3ae, 802.3ak, and 802.3ba—and compliant as required
- Compliant with Restrictions on Hazardous Substances (RoHS), meeting either RoHS 5 or RoHS 6 EU standards

Highly Reliable, Brocade-Qualified Optics

Brocade offers a unique set of high-performance, reliable, and cost-effective optical transceivers to help enterprises and service providers meet the challenges of diverse network topologies. To ensure maximum quality, Brocade selects and tests the most reliable, highest-performing optical transceivers on the market, and then warrants their availability, capacity, and performance in Brocade® products.

Extensive performance and reliability testing reflects an ongoing commitment to quality. Brocade tests transceivers using the industry's most advanced tools and instruments to help ensure that they provide the right mix of functionality and performance when used in conjunction with Brocade products. The speed, capacity, reliability, and low cost of ownership that Brocade is known for is also provided in all optical components.

By using Brocade-qualified components, organizations can be assured that their warranty and service requirements will be met and that their Brocade products will continually provide the uptime, performance, and reliability required by today's leading enterprise service providers.

Ethernet Optics Family Features

The Brocade Ethernet optics family includes several offerings designed to meet the performance and scalability requirements of service provider and enterprise environments. The new 100 Gigabit Ethernet (GbE) CFP optics deliver even greater performance capacity to support cloud services for these environments.

100 MbE Optics

- 100 Megabit Ethernet (MbE) transceivers support link lengths from 2 km to 40 km
- Both SMF and MMF fiber types
- RoHS 5 and 6 compliant
- Enterprise switching and routing

1 GbE Optics

- 1 GbE transceivers support link lengths from 300 m to 100 km
- Both SMF and MMF fiber types
- Coarse Wavelength Division Multiplexing (CWDM) support for distances of 80 km to 100 km
- RoHS 5 and 6 compliant
- For core routers and security applications

10 GbE Optics

- 10 GbE transceivers support link lengths of 26 m to 80 km
- Protocol-independent
- Less than one-third the power and size of MSA optic
- Hot-swappable
- Digital Optical Monitoring (DOM) support
- RoHS 5 and 6 compliant
- Application delivery and acceleration
- High-Performance Computing (HPC) interconnects
- Service provider traffic management

POS Pluggable OC12, OC48, and OC192 XFP Optics

- Pluggable XFP optic
- Ranges from 500 m to 80 km

40 GbE QSFP+ Optics

- 40 GbE transceivers support link lengths up to 100 m
- Hot-pluggable
- Industry-standard QSFP+
- Digital Optical Monitoring (DOM) support
- High-density 40 GbE connectivity options for data center, enterprise, and service provider applications

100 GbE CFP2 Optics

- 100 GbE transceivers support link lengths up to 40 km
- Hot-pluggable
- Low voltage
- Industry-standard CFP
- Diagnostic features per CFP MSA for laser bias, temperature, supply voltage
- Carrier, service provider, and cloud services
- Enterprise campus core routing
- RoHS 6 compliant

Brocade Global Services

Brocade Global Services has the expertise to help organizations build scalable, efficient cloud infrastructures. Leveraging 20 years of expertise in storage, networking, and virtualization, Brocade Global Services delivers world-class professional services, technical support, network monitoring services, and education, enabling organizations to maximize their Brocade investments, accelerate new technology deployments, and optimize the performance of networking infrastructures.

Affordable Acquisition Options

Brocade Capital Solutions helps organizations easily address their IT requirements by offering flexible network acquisition and support alternatives. Organizations can select from purchase, lease, Brocade Network Subscription, and Brocade Subscription Plus options to align network acquisition with their unique capital requirements and risk profiles. To learn more, visit www.brocade.com/capital.

Maximizing Investments

To help optimize technology investments, Brocade and its partners offer complete solutions that include professional services, technical support, and education. For more information, contact a Brocade sales partner or visit www.brocade.com.

Product Support for Fast Ethernet

Fast Ethernet Optics	Brocade ICX Switches			FastIron Series		FastIron X Series	BigIron Series	NetIron Series		
	ICX 6430/6450	ICX 7450	ICX 6610	FCX	FSX Gen3	SX	RX	XMR/MLX	CES/CER/CER-RT	Brocade 6910
E1MG-100FX-OM	•	•	• ¹	•	•	•	• ²	•	•	•
E1MG-100FX-IR-OM		•	• ¹	•	•	•	• ²	•	•	•
E1MG-100FX-LR-OM		•	• ¹	•	•	•	• ²	•	•	•

¹ Available only with Brocade ICX 6610-24F.

² Available only with SX-FI424HF and SX-FI-24HF.

Product Support for 1 Gigabit Ethernet

1 GbE Fiber Optics	Brocade ICX Switches							Brocade FastIron Series		Brocade NetIron Series			Brocade ServerIron Series	Brocade VDX Switches	Brocade SLX Series
	ICX 6430	ICX 6450	ICX 7250	ICX 7450	ICX 6610	ICX 6650	ICX 7750	FCX	FSX Gen3	XMR/MLX	CES/CER/CER-RT	Brocade 6910	ADX	VDX 6710/6720/6730/6740/6940/8770	SLX 9850
E1MG-SX-OM	○ ¹	•	•	•	•	•	•	•	•	•	•	•	•	• ⁵	•
E1MG-SX-OM-T												•			
E1MG-LX-OM	•	•	•	•	•	•	•	•	•	•	•	•	•	• ⁵	•
E1MG-LX-OM-T												•			
E1MG-LHA-OM	•	•			•			•	•	•	•	•			
E1MG-LHA-OM-T			•	•			•					•			
E1MG-LHB	•	•			•				•	•	•	•			
E1MG-BXD	•	•	•	•	•		•	•	•	•	•	•			•
E1MG-BXU	•	•	•	•	•		•	•	•	•	•	•			•
E1MG-CWDM80-XXXX					•				•	•	•	•			
E1MG-TX	○ ¹	•	•	•	•	•	•	• ²	•	•	• ⁴		•		•
XBR-000190										• ³				• ⁵	
1G-SFP-C-0x01	○ ¹	•	•												

○ Optics supported for both stacking and regular data links. For further details, visit www.brocade.com/fastironstacking.

¹ Stacking is not supported on the Brocade ICX 6430 12-port compact switch.

² Only qualified on FCX-624S-F.

³ Qualified on Brocade MLX 24x1 GbE-X, Brocade MLX 10 GbEx4 SFP+, Brocade MLX 10 GbEx20 SFP+ modules.

⁴ Qualified for 10/100/1000 Mbps speed.

⁵ For more information, see the Brocade VDX Transceiver Support Matrix.

Product Support for 10 Gigabit Ethernet

	Brocade ICX Switches						FastIron Series		NetIron Series		ServerIron Series	Brocade VDX Switches	Brocade SLX Series
	ICX 6450	ICX 7250	ICX 7450	ICX 6610	ICX 6650	ICX 7750	FCX	FSX Gen3	XMR/MLX	CER/CES/CER-RT	ADX	VDX 6710/6720/6730/6740/6940/8770	SLX 9850
10 GbE Fiber Optics													
10G-XFP-SR, LR							●	●	● ⁴	●	●		
10G-XFP-ER							●	●	● ⁴	●			
10G-XFP-ZR							●	●	● ⁴	●			
10G-XFP-1310-LRM							●						
10G-SFPP-USR	○ ¹	○	○	●	●	●	○	● ³	●	●		● ⁷	●
10G-SFPP-SR	○ ¹	○	○	●	●	●	○	● ³	● ⁴	●	● ⁶	● ⁷	●
10G-SFPP-LR	●	○	○	●	●	●	●	● ³	● ⁴	●	● ⁶	● ⁷	●
10G-SFPP-ER	●	●	●	●	●	●	●	● ³	● ⁴	●		● ⁷	●
10G-SFPP-ZR		●	●			●			●	●		● ⁷	
10G-SFPP-ZRD-T									● ⁵			● ⁷	
10G-SFPP-LRM	○ ¹		●	●			○ ²	● ³		●	● ⁶		
10G-SFPP-TWX-XXXX	●	○	○	○	●	●	○	● ³	●	●		● ⁷	
10GE-SFPP-AOC-XXXX		●	●		●	●			●	●		● ⁷	

○ Optics supported for both stacking and regular data links. For further details, visit www.brocade.com/fastironstacking.

¹ Stacking is not supported on the Brocade ICX 6450 12-port compact switch.

² Available only with the FCX-2SFPP module.

³ Available only with SX-FI-8XG, SX-FI-2XG, SX-FI-2XGMR-XL, and SX-FI-2XGMR-XL-PREM6 modules.

⁴ The Brocade MLX and NetIron XMR modules (BR-MLX-10Gx8-X, BR-MLX-10Gx8-M, BR-MLX-10Gx4-X, BR-MLX-10Gx4-X-ML, NI-MLX-10Gx4, NI-MLX-10Gx2, NI-XMR-10Gx4, NI-XMR-10Gx2) support WAN mode.

⁵ Available only with the Brocade MLXe 8x10 GbE and 24x10 GbE modules.

⁶ Available only with Brocade ADX 1000F.

⁷ For more information, see the Brocade VDX Transceiver Support Matrix.

Product Support for 40 Gigabit Ethernet

	Brocade ICX Switches ¹				Brocade VDX Switches	Brocade MLX Series	Brocade SLX Series
40 GbE Fiber Optics	ICX 7450	ICX 6610	ICX 7750	ICX 6650	VDX 6740/6940/8770	MLXe	SLX 9850
40G-QSFP-SR4	○		○	●	● ²	●	
40G-QSFP-SR4-INT			●	●	● ²	●	●
40G-QSFP-ESR4	●		●		● ²	●	●
40G-QSFP-LR4	●		○	●	● ²	●	●
40G-QSFP-LM4	●		●		● ²	●	
40G-QSFP-ER4					● ²	●	
40G-QSFP-SR-BIDI	●		○		● ²	●	
40G-QSFP-4SFP-C-XXXX			●	●			
40G-QSFP-QSFP-C-XXXX	○		○	●		●	
40G-QSFP -C-XXXX	○	○ ¹	○				
40G-QSFP-QSFP-AOC-XXXX	○		○			●	

○ Optics supported for both stacking and regular data links. For further details, visit www.brocade.com/fastironstacking.

¹ 40 GbE ports on the Brocade ICX 6610 are supported for stacking only.

² For more information, see the Brocade VDX Transceiver Support Matrix.

Product Support for 100 Gigabit Ethernet

	Brocade MLX Series	Brocade VDX Switches		Brocade SLX Series
100 GbE Fiber Optics	MLXe	VDX 6940	VDX 8770	SLX 9850
100G-CFP2-LR4-10KM	●		● ¹	
100G-CFP2-SR10	●		● ¹	
100G-CFP2-ER4-40KM	●		● ¹	
100G-QSFP28-LR4-10KM	●	● ¹	● ¹ (with adaptor)	●
100G-QSFP28-LR4L-2KM	●	● ¹	● ¹ (with adaptor)	●
100G-QSFP28-LR4LP-10KM				●
100G-QSFP28-SR4	●	● ¹	● ¹ (with adaptor)	●
100G-QSFP28-CWDM4 -2KM				●

¹ For more information, see the Brocade VDX Transceiver Support Matrix.

Key Standards and Features

	IEEE Standards	Domestic Safety Standards	International Safety Standards	Wavelength (nm)	Fiber Type	Maximum Cable Distance	Digital Optical Monitoring	
Fast Ethernet								
E1MG-100FX-OM	802.3u	FDA 21CFR 1040.10 Class 1, CSA 60950-1-03/UL 60950-1	EN 60825-1, EN 60950-1	1,310	MMF	2 km	Yes	
E1MG-100FX-IR-OM	802.3			1,310	SMF	15 km	Yes	
E1MG-100FX-LR-OM	802.3			1,310	SMF	40 km	Yes	
1 GbE Fiber								
E1MG-SX-OM/ E1MG-SX-OM-T	802.3z	FDA 21CFR 1040.10 Class 1, CSA 60950-1-03/UL 60950-1	EN 60825-1, EN 60950-1	850	MMF	220 m to 550 m	Yes	
E1MG-LX-OM/ E1MG-LX-OM-T	802.3z			1,310	MMF/SMF	550 m to 10 km	Yes	
E1MG-LHA-OM/ E1MG-LHA-OM-T	802.3z			1,550	SMF	70 km	Yes	
E1MG-LHB	802.3z			1,550		150 km w/0.18 dB/km cable, 91 km w/standard 0.3 dB/km cable	No	
E1MG-BXD	802.3ah			TX: 1,490 RX: 1,310		10 km	No	
E1MG-BXU	802.3ah			TX: 1,310 RX: 1,490		10 km	No	
E1MG-CWDM80-XXXX	802.3z			1,470 to 1,610	80 km	No		
1000BASE-T Copper								
E1MG-TX, XBR-000190	802.3z	CSA 60950-1-03/UL	EN 60950-1	N/A	Cat5	100 m	N/A	
1G-SFP-TWX-0x01	802.3z	Direct-attached SFP copper cables				1 m, 5 m	No	
10 GbE Fiber								
10G-XFP-SR	802.3ae	FDA 21CFR 1040.10 Class 1, CSA 60950-1-03/UL 60950-1	EN 60825-1, EN 60950-1	850	MMF	26 m to 300 m	Yes	
10G-XFP-LR	802.3ae			1,310		SMF		10 km
10G-XFP-ER	802.3ae			1,550				40 km
10G-XFP-ZR	802.3ae			1,550				80 km
10G-XFP-1310-LRM	802.3aq			1,310				220 m
10G-SFPP-USR	N/A			850	MMF	100 m		
10G-SFPP-SR	802.3ae			850	MMF	26 m to 300 m		
10G-SFPP-LR	802.3ae			1,310	SMF	10 km		
10G-SFPP-ER	802.3ae			1,550	SMF	40 km		
10G-SFPP-ZR	802.3ae			1,550	SMF	80 km		
10G-SFPP-ZRD-T	802.3-2005 Clause 52 standard			102 C-band tunable wavelengths from 1,528 to 1,568 (50 GHz apart)	SMF	80 km		
10G-SFPP-LRM	802.3ae			1,310	MMF	220 m		

Key Standards and Features (Continued)

	IEEE Standards	Domestic Safety Standards	International Safety Standards	Wavelength (nm)	Fiber Type	Maximum Cable Distance	Digital Optical Monitoring
10GBASE Cable							
10G-SFP-TWX-XXXX	802.3ae	Direct-attached SFP+ Twinax copper cables				1 m, 3 m, 5 m	No
10G-SFP-AOC-XXXX	N/A	Direct-attached SFP+ active optical cables				7 m, 10 m	No
40 GbE Fiber							
40G-QSFP-SR4	802.3ba	FDA 21CFR 1040.10 Class 1, CSA 60950-1-03/ UL 60950-1	EN 60825-1, EN 60950-1	850	OM3 MMF OM4 MMF	100 m 150 m	Yes
40G-QSFP-SR4-INT (compatible with 10GBASE-SR)	802.3ba				OM3 MMF OM4 MMF	100 m 150 m	Yes
40G-QSFP-LR4	802.3ba			1,264.5 to 1,337.5	SMF	10 km	
40 GbE Copper							
40G-QSFP-4SFP-C-XXXX	N/A	Direct-attached QSFP+ to 4 SFP+ copper cables				1 m, 3 m, 5 m	No
40G-QSFP-QSFP-C-XXXX	N/A	Direct-attached QSFP+ to QSFP+ copper cables				1 m, 3 m, 5 m	No
100 GbE CFP Fiber							
100G-CFP-SR10	802.3ba	FDA 21CFR 1040.10 Class 1, CSA 60950-1-03/ UL 60950-1	EN 60825-1, EN 60950-1	850	OM3 MMF OM4 MMF	100 m 150 m	Yes
100G-CFP-LR4-10KM	802.3ba			1,294.53 to 1,310.19	SMF	10 km	Yes
100G-CFP-10x10-2KM-OM	10x10 MSA			1,523 to 1,595	SMF	2 km	Yes
100G-CFP-10x10-10KM-OM	10x10 MSA			1,523 to 1,595	SMF	10 km	Yes
100G-CFP-ER4-40KM	802.3ba			1,294.53 to 1,310.19	SMF	40 km	Yes
100 GbE CFP2 Fiber							
100G-CFP2-LR4-10KM	IEEE 802.3ba	–	–	1,294.53 to 1,310.19	SMF	10 km	Yes
100G-CFP2-SR10	IEEE 802.3ba	UL/CSA 60950, CDRH Class 1	EN 60950, EN 60825 Class 1	840 to 860	OM3 MMF OM4 MMF	100 m 150 m	Yes
100 GbE QSFP28 Fiber							
100G-QSFP28-SR4	802.3bm	North America: UL/CSA 60950, CDRH Class 1 European Union: EN 60950, EN 60825 Class 1		850	MMF	100 m	
100G-QSFP28-LR4	802.3ba			1295, 1300, 1305, 1310	SMF	10 km	
100G-QSFP28-LR4-LP	802.3ba				SMF	10 km	
100G-QSFP28-LR4L	802.3ba			1295, 1300, 1305, 1310	SMF	2 km	
100G QSFP28-CWDM4	802.3bm			1310	SMF	2 km	

Brocade Ethernet Optics Ordering Information

Part Number	Description
100 MbE SFP Transceivers	
E1MG-100FX-OM	100BASE-FX SFP optic MMF, LC connector, optical monitoring capable.
E1MG-100FX-IR-OM	100BASEFX-IR SFP optic for SMF with LC connector, optical monitoring capable. For distances up to 15 km.
E1MG-100FX-LR-OM	100BASEFX-LR SFP optic for SMF with LC connector, optical monitoring capable. For distances up to 40 km.
1 GbE SFP	
E1MG-BXD	1000BASE-BXD SFP optic, SMF, 1,490 nm, LC connector. This optic can be connected only to an E1MG-BXU at the far end.
E1MG-BXU	1000BASE-BXU SFP optic, SMF, 1,310 nm, LC connector. This optic can be connected only to an E1MG-BXD at the far end.
E1MG-CWDM80-XXXX	CWDM SFP optic, 80 km, 1,470 to 1,610 (total of eight wavelengths supplied by eight optics, each 20 nm apart in wavelength), LC connector.
E1MG-LHA-OM	1000BASE-LHA SFP optic SMF, LC connector, optical monitoring capable. For distances up to 70 km.
E1MG-LHA-OM-T	1000BASE-LHA SFP optic, MMF, LC connector, optical monitoring capable (70 km), industrial temperature.
E1MG-LHB	1000BASE-LHB SFP optic, SMF, LC connector, 150 km maximum reach.
E1MG-LX-OM	1000BASE-LX SFP optic SMF, LC connector, optical monitoring capable. For distances up to 10 km.
E1MG-LX-OM-T	1000BASE-LX SFP optic, SMF, LC connector, optical monitoring capable, industrial temperature.
E1MG-SX-OM	1000BASE-SX SFP optic, MMF, LC connector, optical monitoring capable.
E1MG-SX-OM-T	1000BASE-SX SFP optic, MMF, LC connector, optical monitoring capable, industrial temperature.
E1MG-TX, XBR-000190	1000BASE-T SFP copper, RJ-45 connector.
1G-SFP-C-0x01	1 GbE direct-attached SFP copper cable, 1 m or 5 m (where x=1 for 1 m; x=5 for 5 m).
10 GbE XFP	
10G-XFP-SR	850 nm serial pluggable XFP optic (LC), target range 300 m over MMF.
10G-XFP-LR	1310 nm serial pluggable XFP optic (LC) for up to 10 km over SMF.
10G-XFP-ER	1550 nm serial pluggable XFP optic (LC) for up to 40 km over SMF.
10G-XFP-ZR	1,550 nm serial pluggable XFP optic (LC) for up to 80 km over SMF.
10G-XFP-1310-LRM	10GBASE-LRM, XFP optic, 1,310 nm serial pluggable optic (LC) for use on OM1/OM2/OM3 MMF up to 220 m.

Brocade Ethernet Optics Ordering Information (Continued)

Part Number	Description
10 GbE SFP+	
10G-SFPP-USR	10 GbE Ultra-Short Reach (USR), SFP+ optic (LC), target range 100 m over MMF.
10G-SFPP-SR	10GBASE-SR, SFP+ optic (LC), for up to 300 m over MMF.
10G-SFPP-LR	10GBASE-LR, SFP+ optic (LC), for up to 10 km over SMF.
10G-SFPP-ER	10GBASE-ER, SFP+ optic (LC), for up to 40 km over SMF.
10G-SFPP-ZR	10GBASE-ZR, SFP+ optic (LC), for up to 80 km over SMF.
10G-SFPP-ZRD-T	10 GbE tunable DWDM SFP+ optic (LC), for up to 80 km over SMF.
10G-SFPP-LRM	10GBASE-LRM, SFP+ optic (LC), 220 m over OM1/OM2/OM3 MMF.
10G-SFPP-TWX-XXXX	10 GbE SFP+ direct-attached copper cable, 1 m, 3 m, or 5 m.
10G-SFPP-AOC-XXXX	10 GbE SFP+ direct-attached active optical cable, 7 m or 10 m.
40 GbE QSFP+	
40G-QSFP-SR4	40GBASE-SR4 QSFP+ optic (MTP 1×8 or 1×12), 100 m over MMF (not compliant with 10GBASE-SR4 modules per IEEE 802.3ae standard).
40G-QSFP-ESR4	40GBASE-ESR4 QSFP+ optic (MTP 1×8 or 1×12), 300 m over MMF, (10GBASE-SR compatible, breakout)
40G-QSFP-SR4-INT	40GBASE-SR4 QSFP+ optic (MTP 1×8 or 1×12), 100 m over MMF (10GBASE-SR compatible, breakout-capable).
40G-QSFP-LR4	40GBASE-LR4 QSFP+ optic (LC), for up to 10 km over SMF.
40G-QSFP-SR-BIDI	40GE SR QSFP+ optic (LC), bidirectional, 100 m over OM3 MMF.
40G-QSFP-4SFP-C-XXXX	4×10 GbE direct-attached QSFP+ to four SFP+ copper breakout cable, 1 m, 3 m, or 5 m.
40G-QSFP-QSFP-C-XXXX	4×10 GbE direct-attached QSFP+ to QSFP+ copper breakout cable, 1 m, 3 m, or 5 m.
100 GbE CFP	
100G-CFP-SR10	100 GbE CFP optic (MPO24), SR10, for distances up to 100 m over MMF.
100G-CFP-LR4-10KM	100 GbE CFP optic (SC), LR4, for distances up to 10 km over SMF.
100G-CFP-10x10-2KM-OM	100 GbE CFP optic (LC), 10×10, for distances up to 2 km over SMF.
100G-CFP-10x10-10KM-OM	100 GbE CFP optic (LC), 10×10, for distances up to 10 km over SMF.
100G-CFP-ER4-40KM	100 GbE CFP optic (LC), ER4, for distances up to 40 km over SMF.
100 GbE CFP2	
100G-CFP2-SR10	100 GbE CFP2 optic, SR10, for distances up to 100 m over MMF, 1-pack.
100G-CFP2-LR4-10KM	100 GbE CFP2 optic (LC), LR4, for distances up to 10 km over SMF.

Brocade Ethernet Optics Ordering Information (Continued)

Part Number	Description
100 GBE QSFP28	
100G-QSFP28-CWDM4-2KM	100GBASE CWDM4 QSFP transceiver LC 2 km over SM.
100G-QSFP28-SR4	100 GbE QSFP28 SR4 transceiver 100 m over MMF.
100G-QSFP28-LR4L-2KM	100 GbE QSFP28 LR4 lite transceiver 2 km over SMF.
100G-QSFP28-LR4-10KM	100 GbE QSFP28 LR4 transceiver 10 km over SMF.
100G-QSFP28-LR4-LP-10KM	100 GbE QSFP28 LR4 low power 10 km over SMF.

Corporate Headquarters

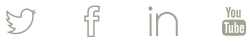
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