

# BROCADE OPTICS FAMILY



## ENTERPRISE LAN SWITCHING

## Highly Reliable, Brocade- Qualified Optics

### 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 Requirements to Reduce Hazardous Substances (RoHS), meeting either RoHS 5 or RoHS 6 EU standards

Brocade offers a unique set of high-performance, reliable, and cost-effective optical transceivers that 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.

The Brocade One™ strategy helps simplify networking infrastructures through innovative technologies and solutions. The Brocade optics family supports this strategy by delivering thoroughly tested and standards-compliant optics that enable simple, non-stop connectivity across diverse storage resources.

# BROCADE

## OPTICS FAMILY FEATURES

The Brocade 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 transmissions 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

### 100 GbE CFP Optics

- 100 GbE transmissions support link lengths up to 10 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

## PRODUCT SUPPORT FOR FAST ETHERNET

Fast Ethernet Optics	FastIron® Series			FastIron X Series	BigIron® Series	NetIron® Series		
	LS	ICX™ 6610	FCX			XMR/MLX®	CES/CER/CER-RT	Brocade 6910
E1MG-100FX-OM	•	• <sup>1</sup>	•	• <sup>2</sup>	•	•	•	•
E1MG-100FX-IR-OM	•	• <sup>1</sup>	•	• <sup>2</sup>	Software v2.6.0	Software v3.9.0	•	•
E1MG-100FX-LR-OM	•	• <sup>1</sup>	•	• <sup>2</sup>	Software v2.6.0	Software v3.9.0	•	•

<sup>1</sup> Available only with Brocade ICX 6610-24F.

<sup>2</sup> Available only with SX-FI424HF and SX-FI-24HF.

**PRODUCT SUPPORT FOR 1 GIGABIT ETHERNET**

	EdgeIron Series		FastIron Series				FastIron X Series	BigIron Series	NetIron Series			ServerIron® Series	TurboIron®
	CF	G	ICX 6610	ICX 6430/6450	LS	FCX	SX	RX	XMR/MLX	CES/CER/CER-RT	Brocade 6910	ADX	24X
1 GbE Fiber Optics													
E1MG-SX-OM	•	•	•	•	•	•	•	•	•	•	•	•	•
E1MG-SX-OM-T											•		
E1MG-LX-OM	•	•	•	•	•	•	•	•	•	•	•	•	•
E1MG-LX-OM-T											•		
E1MG-LHA-OM	•	•	•	•	•	•	•	•	•	•	•		•
E1MG-LHA-OM-T											•		
E1MG-LHB	•	•	•	•	•		•	•	•	•	•		
E1MG-BXD			•		•	•	•	•	•	•	•		•
E1MG-BXU			•		•	•	•	•	•	•	•		•
E1MG-CWDM80-XXXX		•	•		•		•	•	•	•	•		
E1MG-TX			•		•	•	•	•	•	• <sup>1</sup>		•	•
1G-SFP-C-0x01				•									

<sup>1</sup> Qualified for 10/100/1000 Mbps speed.

## PRODUCT SUPPORT FOR 10 GIGABIT ETHERNET

	FastIron Series				FastIron X Series	BigIron Series	NetIron Series		ServerIron Series	TurboIron	Brocade VDX®
	LS	ICX 6610	ICX 6450	FCX	SX	RX	XMR/MLX	CER/CES/CER-RT	ADX	24X	6710/6720
10 GbE Fiber Optics	•			•	• <sup>1</sup>	• <sup>3</sup>	• <sup>3</sup>	•	•		
10G-XFP-SR, LR	•			•	• <sup>1</sup>	• <sup>3</sup>	• <sup>3</sup>	•	•		
10G-XFP-ER	•			•	• <sup>1</sup>	• <sup>3</sup>	• <sup>3</sup>	•	•		
10G-XFP-ZR	•			•	• <sup>1</sup>	• <sup>3</sup>	• <sup>3</sup>	•	•		
10G-XFP-ZRD	•			•	• <sup>1</sup>	• <sup>3</sup>	• <sup>3</sup>	•	•		
10G-XFP-CX4	•				• <sup>1</sup>	•	•	•	•		
10G-XFP-1310-LRM				•			•				
10G-SFP-USR		•	•	•	• <sup>2</sup>					•	•
10G-SFP-SR, LR		•	•	•	• <sup>2</sup>	•	•		• <sup>4</sup>	•	•
10G-SFP-ER		•	•		• <sup>2</sup>	•	•				
10G-SFP-LRM		•	•		• <sup>2</sup>				• <sup>4</sup>	•	
10G-SFP-TWX-XXXX		•		•	• <sup>2</sup>		•			•	•

<sup>1</sup> SX-FI42XGW module supports WAN mode.

<sup>2</sup> Available only with SX-FI-8XG and SX-FI-2XG.

<sup>3</sup> All Brocade NetIron XMR and Brocade BigIron RX 10 GbE modules support WAN mode.

<sup>4</sup> Available with Brocade ADX 1000F only.

## PRODUCT SUPPORT FOR POS OPTICS

	NetIron Series XMR/MLX
OC12-SFP-MM	•
OC12-SFP-IR1	•
OC12-SFP-LR1	•
OC12-SFP-LR2	•
OC48-SFP-SR1	•
OC48-SFP-IR1	•
OC48-SFP-LR1	•
OC48-SFP-LR2	•
OC192-XFP-SR1	•
OC192-XFP-IR2	•
OC192-XFP-LR2	•

## PRODUCT SUPPORT FOR 100 GIGABIT ETHERNET OPTICS

	Brocade MLX Series MLX/MLXe
Brocade 100 GbE CFP 10×10 2 km	•
Brocade 100 GbE CFP 10×10 10 km	•
Brocade 100 GbE CFP LR4 10 km	•

## KEY STANDARDS AND FEATURES

	IEEE Standards	Domestic Safety Standards	International Safety Standards	Wavelength (nm)	Fiber Type	Maximum Cable Distance	Digital Optical Monitoring
<b>Fast Ethernet</b>							
E1MG-100FX-OM	802.3u	FDA 21CFR 1040.10 Class 1, CSA 60950-1-03/UL 60950-1	EN 60825-1, EN 60950-1	1310	MMF	2 km	Yes
E1MG-100FX-IR-OM	802.3			1310	SMF	15 km	Yes
E1MG-100FX-LR-OM	802.3			1310	SMF	40 km	Yes
<b>1 GbE Fiber</b>							
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			1310	MMF/SMF	550 m to 10 km	Yes
E1MG-LHA-OM/ E1MG-LHA-OM-T	802.3z			1550	SMF	70 km	Yes
E1MG-LHB	802.3z			1550		150 km w/0.18 dB/km cable, 91 km w/standard 0.3 dB/km cable	No
E1MG-BXD	802.3ah			TX:1490, RX:1310		10 km	Yes
E1MG-BXU	802.3ah			TX:1310, RX:1490		10 km	Yes
E1MG-CWDM80-XXXX	802.3z			1470 to 1610	80 km	No	
<b>1000BaseT Copper</b>							
E1MG-TX	802.3z	CSA 60950-1-03/UL	EN 60950-1	N/A	Cat5	100 m	N/A
1G-SFP-C-0x01	802.3z	Direct-attached SFP copper cables				1 m, 5 m	No
<b>10 GbE Fiber</b>							
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			1310		10 km	
10G-XFP-ER	802.3ae			1550		40 km	
10G-XFP-ZR	802.3ae			1550		80 km	
10G-XFP-ZRD	802.3ae			1528.77 to 1561.42	80 km		
10G-XFP-1310-LRM	802.3aq			1310	MMF	220 m	
10G-SFPP-USR	N/A			850	MMF	100 m	
10G-SFPP-SR	802.3ae			850	MMF	300 m	
10G-SFPP-LR	802.3ae			1310	SMF	10 km	
10G-SFPP-ER	802.3ae			1550	SMF	40 km	
10G-SFPP-LRM	802.3ae			1310	MMF	220 m	
<b>10GBase Copper</b>							
10G-XFP-CX4	802.3ak	CX4-grade copper cable with CX4 connector				15 m	No
10G-SFPP-TWX-XXXX	802.3ae	Direct-attached SFP+ Twinax copper cables				1 m, 3 m, 5 m	No
<b>100 GbE Fiber</b>							
100G-CFP-LR4-10km	802.3ba	FDA 21CFR 1040.10 Class 1, CSA 60950-1-03/UL 60950-1	EN 60825-1, EN 60950-1	1294.53 to 1310.19	SMF	10 km	Yes
100G-CFP-10x10-2km	10x10 MSA			1523 to 1595	SMF	2 km	Partial
100G-CFP-10x10-10km	10x10 MSA			1523 to 1595	SMF	10 km	Partial

## ORDERING INFORMATION

Part Number	Description
<b>100 MbE SFP Transceivers</b>	
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.
<b>1 GbE Optics</b>	
E1MG-BXD	1000Base-BXD SFP optic, SMF, 1490 nm, LC connector. This optic can be connected only to an E1MG-BXU at the far end.
E1MG-BXU	1000Base-BXU SFP optic, SMF, 1310 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, 1470 to 1610 (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, industrial temperature.
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	1000Base-TX 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).
<b>10 GbE-XFP</b>	
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	1550 nm serial pluggable XFP optic (LC) for up to 80 km over SMF.
10G-XFP-ZRD-XXXX-AA	10GBase-ZR DWDM, XFP optic, 80 km, 1528.77 to 1561.42 (total of 41 wavelengths supplied by 41 optics, each 100 GHz apart in frequency).
10G-XFP-CX4	10GBase-CX4, XFP module, 15 m, CX4 connector.
10G-XFP-1310-LRM	10GBase-LRM, XFP optic, 1310 nm serial pluggable optic (LC) for use on OM1/OM2/OM3 MMF up to 220 m.

10 GbE-SFP+	
10G-SFPP-USR	10 GbE Ultra-Short Reach (USR), SFP+ optic (LC), target range 100 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-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.
OC12-POS-SFP	
OC12-SFP-MM	POS OC-12 (STM-4) pluggable SFP optic (LC connector). Range up to 500 m over MMF.
OC12-SFP-IR1	POS OC-12 (STM-4) SR-1/IR-1 pluggable SFP optic (LC connector). Range up to 15 km over SMF. No attenuator needed for SR-1 applications.
OC12-SFP-LR1	POS OC-12 (STM-4) LR-1 pluggable SFP optic (LC connector). Range up to 40 km over SMF.
OC12-SFP-LR2	POS OC-12 (STM-4) LR-2 pluggable SFP optic (LC connector). Range up to 80 km over SMF.
OC48-POS-SFP 2.5 Gbps	
OC48-SFP-SR1	POS OC-48 (STM-16) SR-1 pluggable SFP optic (LC connector). Range up to 2 km over SMF.
OC48-SFP-IR1	POS OC-48 (STM-16) LR-1 pluggable SFP optic (LC connector). Range up to 15 km over SMF.
OC48-SFP-LR1	POS OC-48 (STM-16) LR-2 pluggable SFP optic (LC connector). Range up to 40 km over SMF.
OC48-SFP-LR2	POS OC-48 (STM-16) LR-2 pluggable SFP optic (LC connector). Range up to 80 km over SMF.
OC192-POS-XFP	
OC192-XFP-SR1 POS	OC-192 (STM-64) SR-1 pluggable XFP optic (LC connector). Range up to 2 km over SMF.
OC192-XFP-IR2	POS OC-192 (STM-64) IR-2 pluggable XFP optic (LC connector). Range up to 40 km over SMF.
OC192-XFP-LR2	POS OC-192 (STM-64) LR-2 pluggable XFP optic (LC connector). Range up to 80 km over SMF.
100GbE-CFP	
100G-CFP-LR4-10KM	100 GbE CFP optic (SC), LR4, for distances up to 10 km over SMF.
100G-CFP-10x10-2KM	100 GbE CFP optic (LC), 10×10, for distances up to 2 km over SMF.
100G-CFP-10x10-10KM	100 GbE CFP optic (LC), 10×10, for distances up to 10 km over SMF.

**BROCADE GLOBAL SERVICES**

Brocade Global Services has the expertise to help organizations build scalable, efficient cloud infrastructures. Leveraging 15 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.

**CLOUD-OPTIMIZED NETWORK ACQUISITION**

Brocade helps organizations easily address their information technology requirements by offering flexible network acquisition and support alternatives to meet their financial needs. Organizations can select from purchase, lease, and Brocade Network Subscription options to align network acquisition with their unique capital requirements and risk profiles.

**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](http://www.brocade.com).

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