









# Avago Technologies provides proven high-speed optical interconnects for your Altera FPGA design.

Avago is the industry leader in high-density, high-speed optical interconnects for applications such as Enterprise Networking, Metro-Access connectivity, including FTTH and Wireless Base Station links, and the fast growing converged Data Center which can include Ethernet, Fibre Channel or InfiniBand architectures.

Based on proven laser and IC technology, Avago provides a comprehensive portfolio of fiber optic transceiver, transmitter and receiver module and single-mode optical component solutions with unmatched quality and performance.

Avago fiber optic modules come in a wide range of form factors including SFP/SFP+, QSFP+, CFP2, and CXP that support 1G, 10G, 40G, and 100G applications.

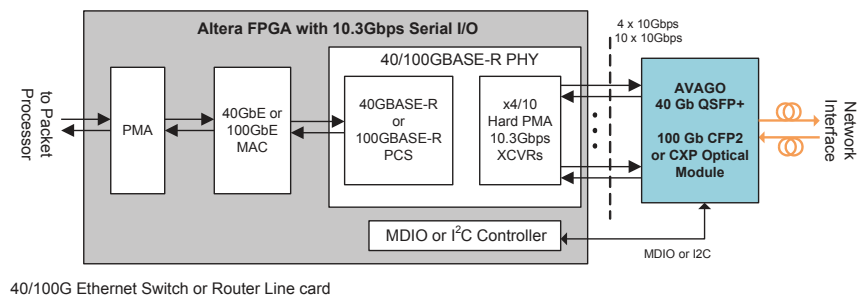
High-Speed Optical Solutions for Networking																											
ALTERA	100G	40G	10G	1G																							
		Stratix® V (GX, GS, GT) Stratix® IV GT Arria® V (GT, GZ)	Stratix® V (GX, GS, GT) Stratix® IV GT Arria® V (GT, GZ)	Stratix® V (GX, GS, GT) Stratix® IV GT Arria® V (GT, GZ)	Stratix® V (GX, GS, GT) Stratix IV (GX, GT) Stratix II GX Arria® V, II Cyclone® V (GX, GT)																						
Avago Pluggable Optical Transceivers	100G CFP2 / CXP	40G QSFP+	10G SFP+	1G SFP																							
	 <table border="1"> <tr> <td rowspan="2">Ethernet</td> <td><b>AFBR-8420Z</b></td> <td>100G-SR10, CFP2 100m over OM3 MMF</td> </tr> <tr> <td><b>AFBR-83ExZ</b></td> <td>100G-SR10, CXP 100m over OM3 MMF</td> </tr> </table>	Ethernet	<b>AFBR-8420Z</b>	100G-SR10, CFP2 100m over OM3 MMF	<b>AFBR-83ExZ</b>	100G-SR10, CXP 100m over OM3 MMF	 <table border="1"> <tr> <td rowspan="2">Ethernet</td> <td><b>AFBR-79EQxZ</b></td> <td>40G-SR4 100m over OM3 MMF</td> </tr> <tr> <td><b>AFBR-79EExZ</b></td> <td>40G-SR4 (extended) 300m over OM3 MMF</td> </tr> </table>	Ethernet	<b>AFBR-79EQxZ</b>	40G-SR4 100m over OM3 MMF	<b>AFBR-79EExZ</b>	40G-SR4 (extended) 300m over OM3 MMF	 <table border="1"> <tr> <td rowspan="3">Ethernet</td> <td><b>AFBR-708SMZ</b></td> <td>10G-USR 100 m. OM3 MMF</td> </tr> <tr> <td><b>AFBR-709SMZ</b></td> <td>10G-SR 300/400 m. OM3/ OM4 MMF</td> </tr> <tr> <td><b>AFCT-701SDZ/ AFCT-709SMZ*</b></td> <td>10G-LR 10 km over SMF</td> </tr> </table> <p>* Available early 2014</p>	Ethernet	<b>AFBR-708SMZ</b>	10G-USR 100 m. OM3 MMF	<b>AFBR-709SMZ</b>	10G-SR 300/400 m. OM3/ OM4 MMF	<b>AFCT-701SDZ/ AFCT-709SMZ*</b>	10G-LR 10 km over SMF	 <table border="1"> <tr> <td rowspan="3">Ethernet</td> <td><b>AFBR-5715PZ</b></td> <td>1000BASE-SX 500 m. over MMF</td> </tr> <tr> <td><b>AFCT-5715PZ</b></td> <td>1000BASE-LX 10km over SMF</td> </tr> <tr> <td><b>ABCU-5740RZ</b></td> <td>10/100/1000BASE-T 100m. over Cat5</td> </tr> </table>	Ethernet	<b>AFBR-5715PZ</b>	1000BASE-SX 500 m. over MMF	<b>AFCT-5715PZ</b>	1000BASE-LX 10km over SMF	<b>ABCU-5740RZ</b>
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Avago Active Optical Cables (AOCs)	CXP AOC	QSFP+ AOC	SFP+ AOC																								
	 <p><b>AFBR-83ExyyyZ</b></p>	 <p><b>AFBR-7QERxxZ</b></p>	 <p><b>AFBR-7CERxxZ</b></p>	 <p><b>AFBR-7IERxxZ (Octopus)</b></p>																							

## QSFP+ and CXP/CFP2 for 40 & 100Gbps Solutions

40/100Gbps Modules and Active Optical Cables (AOC)				
40G QSFP+ AOC	AFBR-7QERxxZ	40G AOC, 0.5 to 20m links		<b>40G QSFP+ AOC</b> <ul style="list-style-type: none"> <li>Compliant to QSFP+ MSA (SFF-8436)</li> <li>XLPP electrical interface (IEEE 802.3ba)</li> </ul>
	AFBR-79EQxZ	40G-SR4, 100m OM3 MMF		<b>40G QSFP+</b> <ul style="list-style-type: none"> <li>Compliant to QSFP+ MSA (SFF-8436)</li> <li>XLPP electrical interface (IEEE 802.3ba)</li> <li>Programmable electrical output amplitude/de-emphasis for signal integrity</li> <li>Internal digital diagnostics via I<sup>2</sup>C</li> </ul>
AFBR-79EEExZ	40G-SR4, 300m OM3 MMF			
100G CXP AOC	AFBR-83ExyyyZ	100G AOC, 0.5 to 10m links		<b>100G CXP-AOC</b> <ul style="list-style-type: none"> <li>Compliant with the CXP MSA (SFF-8642)</li> <li>CPPI electrical interface (IEEE 802.3ba)</li> <li>Programmable Electrical amplitude/de-emphasis and input equalization</li> <li>Full digital diagnostics via I<sup>2</sup>C</li> </ul>
100G Transceiver	AFBR-8420Z	100G-SR10, CFP2 for 100m OM3 MMF		<b>100G CFP2</b> <ul style="list-style-type: none"> <li>Compliant with 100GBASE-SR10 per the IEEE 802.3ba for parallel ribbon fiber</li> <li>Internal CDRs for both re-timed (CAUI) and non-retimed (CPPI) operation</li> <li>Full digital diagnostics and loopback modes available via MDIO</li> </ul>
	AFBR-83ExZ	100G-SR10, CXP for 100m OM3 MMF		<b>100G CXP</b> <ul style="list-style-type: none"> <li>Compliant with the CXP MSA (SFF-8642)</li> <li>CPPI electrical interface (IEEE 802.3ba)</li> <li>Programmable Electrical amplitude/de-emphasis and input equalization</li> <li>Full digital diagnostics via I<sup>2</sup>C</li> </ul>

Evaluation Kits and Design Tools		
CFP2	CXP	QSFP+
Module Compliance Evaluation Kit	Module Compliance Evaluation Kit	Module Compliance Evaluation Kit
P/N: AFBR-8420EVB	P/N: AFBR-83EVB	P/N: AFBR-79QEKZ

Altera Stratix FPGA's offer a proven 40/100G MAC and PCS/PMA sub-layer which, combined with Avago 40/100G fiber optics components, completes a robust solution for high-speed networking applications.



## SFP/SFP+ Transceivers and Active Optical Cables (AOCs)

1 - 10Gbps Modules and Active Optical Cables (AOC)				
10G SFP+ AOC	<b>AFBR-7CERxxZ</b>	10G AOC, 0.5 - 20m link distance		<b>10G SFP+ AOCs</b> <ul style="list-style-type: none"> <li>Fully compliant to IEEE 802.3ae and the SFP+ MSA (SFF-8431/8472)</li> <li>Data rate and protocol agnostic (1 thru 10G)</li> <li>Performance and reliability exceeds that of other cabling solutions (passive/active-DAC and 10GBASE-T)</li> </ul>
	<b>AFBR-708SMZ</b>	10G-USR for 100m over OM3 MMF		<b>10G SFP+</b> <ul style="list-style-type: none"> <li>Fully compliant to IEEE 802.3ae and the SFP+ MSA (SFF-8431/8472)</li> <li>Proven high volume designs support reaches up to 10km with industry leading reliability</li> <li>Full digital diagnostics via I<sup>2</sup>C</li> </ul>
<b>AFBR-709SMZ</b>	10G-SR for 300/400m over OM3/OM4 MMF			
<b>AFCT-701SDZ/AFCT-709SMZ*</b>	10G-LR for 10 km over Single Mode Fiber			
1G SFP	<b>AFBR-5715PZ</b>	1GBASE-SX for 500m over MMF		<b>SFP</b> <ul style="list-style-type: none"> <li>Compliant to IEEE802.3 and the SFP MSA (SFF-8074i) for SFPs with Digital Diagnostics</li> <li>Avago proprietary OSA design ensures excellent signal integrity and low EMI</li> </ul> <b>Also available:</b> <ul style="list-style-type: none"> <li>Fibre Channel (16/8/4G) SFP's</li> <li>Base Station CPRI/OBSAI SFP's (up to 9.8G)</li> <li>SONET OC-3/12/48 SR-1 and Fast Ethernet</li> </ul>
	<b>AFCT-5715PZ</b>	1GBASE-LX for 10km over SMF		
	<b>ABCU-5740RZ</b>	10/100/1000BASE-T for 100m over Cat5		

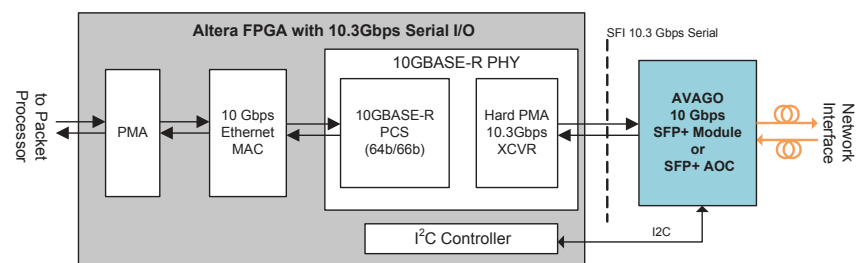
\*Available early 2014

Evaluation Kits and Design Tools		
SFP (1-4Gbps)	SFP+ / SFP+ AOC	
Module Compliance Evaluation Kit	Module Compliance Evaluation Kit	Host Extender Board
P/N: HFBR-0544	P/N: AFCT-5716Z	P/N: AFCT-5716EXBZ

Avago high-speed fiber optics have been evaluated in conjunction with Altera high-speed FPGAs.

Design References and Applications Notes are available.

For more information please visit: [www.avagotech.com/fiber](http://www.avagotech.com/fiber)



10G Ethernet Switch/NIC or Router Line Card

# Your Imagination. Our Innovation



Avago Technologies is a leading designer, developer and global supplier of a broad range of analog, mixed signal and optoelectronics components and subsystems with a focus in III-V compound semiconductor design and processing. Backed by an extensive portfolio of intellectual property including approximately 4,200 patents and pending applications, Avago products serve three primary target markets: wireless communications, wired infrastructure, and industrial and other. Avago has a global employee presence and heritage of technical innovation dating back 50 years to its Hewlett-Packard roots.

## Avago products serve three diverse end markets

**Wireless Communications** serving the smartphone/handset and Base Station infrastructure markets with over 250 patents and leading-edge products that include:

- Power Amplifiers
- Front End Modules
- Film Bulk Acoustic Resonator (FBAR) Filters
- GPS/GLONASS LNAs
- Optical Finger Navigation
- LED Backlighting, Screen Illumination
- Ambient Light and Proximity Sensors

**Wired Infrastructure** for switches/routers, data centers, supercomputers and storage/ servers with over 200 patents in parallel optics alone and products that include:

- 168Gb Parallel Optic Arrays
- 28Gb SerDes ASICs in 28nm
- Storage Fibre Channel Transceivers
- QSFP+/SFP+ Ethernet Transceivers

**Industrial and Other** for alternative energy power generation, electronic sign and signals, automated manufacturing, automotive lighting, GPS/GLONASS navigation, motor inverter system, battery charging and management, infotainment systems and vehicle safety systems with products that include:

- Inverters
- Isolation and Digital Optocouplers
- Motion Control Optical & Magnetic Encoders
- Polymer Optical Fiber
- Indicator and Display LEDs



For product information and a complete list of distributors, please go to our web site:

**[www.avagotech.com](http://www.avagotech.com)**  
**[www.avagotech.com/fiber](http://www.avagotech.com/fiber)**  
**[www.avagotech.com/asics](http://www.avagotech.com/asics)**

For technical support please email a Technical Response Center in your region:

*United States:* [support@avagotech.com](mailto:support@avagotech.com)

*Europe:* [info@promotionteam.de](mailto:info@promotionteam.de)

*Asia Pacific:* [pacrim.components@avagotech.com](mailto:pacrim.components@avagotech.com)

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