

FIBER OPTIC MODULE FORM FACTORS

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THE MSA

MSA stands for multi-source agreement and is simply an agreement on the physical, thermal and mechanical characteristics of a pluggable transceiver and DOES NOT in any way impact the internal optical or copper interface (e.g. 10GBASE-LR vs. 10GBASE-CX4) inside the pluggable. In other words, a single point to point link can have different MSA pluggable (e.g. XENPAK vs. XPAK) formats on either end and will work just fine as long as the optical or copper interface (e.g. 10GBASE-SR, OC-48) inside the pluggable is identical.

SFP

The Small Form-factor Pluggable (SFP) is a compact optical transceiver used in optical communications for both telecommunication and data communications applications. It interfaces a network device mother board (for a switch, router or similar device) to a fiber optic or unshielded twisted pair networking cable. It is a popular industry format supported by several fiber optic component vendors. SFP transceivers are available with a variety of different transmitter and receiver types, allowing users to select the appropriate transceiver for each link to provide the required optical reach over the available optical fiber type (e.g. multi-mode fiber or single-mode fiber). Optical SFP modules are commonly available in four different categories: 850 nm, 1310nm, 1550nm, and DWDM. SFP transceivers are also available with a "copper" cable interface, allowing a host device designed primarily for optical fiber communications to also communicate over unshielded twisted pair networking cable.

The SFP transceiver is specified by a multi-source agreement (MSA) between competing manufacturers. The SFP was designed after the GBIC interface, and allows greater port density (number of transceivers per inch along the edge of a mother board) than the GBIC, which is why SFP is also known as mini-GBIC. The related Small Form-Factor (SFF) transceiver is similar in size to the SFP, but is soldered to the host board as a pin through-hole device, rather than plugged into a edge-card socket. Optical SFPs often include a digital diagnostics interface that provides a powerful optical management tool. SFP transceivers are commercially available with capability for data rates up to 4.25 Gbit/s. A variant standard, XFP, is capable of 10 Gbit/s. SFP transceivers are designed to support SONET, Gigabit Ethernet, Fibre Channel, and other communications standards.

SFF

The small form factor module. Basically the same as the SFP except it is not pluggable and solders directly to the optic line unit PC board.

XFP

The XFP (10 Gigabit Small Form Factor Pluggable) is a hot-swappable, protocol independent optical transceiver, typically operating at 1310nm or 1550nm, for 10 Gigabit SONET/SDH, Fibre Channel, Gigabit Ethernet and other applications.

It includes digital diagnostics similar to SFF-8472 but more extensive, that provide a robust management tool.

XENPAK is a standard that defines a type of fiber-optic transceiver modules which are compatible with the 10 Gigabit Ethernet (10 GbE) standard.

Agere Systems, formerly known as the Microelectronics Group of Lucent Technologies and Agilent Technologies announced it on March 12th, 2001.

XENPAK

XENPAKs come in a variety of physical layer interfaces, for multi-mode and single mode fibre optic cables. Transmission distances vary from 100 metres to 80 kilometres. Recently introduced XENPAKs using the 10GBase-LX4 standard operate using multiple wavelengths on legacy multi-mode fibres at distances of up to 300 metres, eliminating the need to reinstall cable in a building when upgrading certain 2.5 Gbit/s circuits to 10 Gbit/s.

XPAK

This MSA was pushed heavily by Intel and Infineon for use in PCI applications, as it is fully compliant with PCI height, width and bezel requirements. As a result, this MSA is almost exclusively targeted at the 10 Gigabit Ethernet Network Interface Card (NIC) or Host Bus Adapter (HBA) market. In other words, this MSA will be used to provide pluggable optics on an adapter card that would slide in to a 10 Gigabit Ethernet server or NAS device.

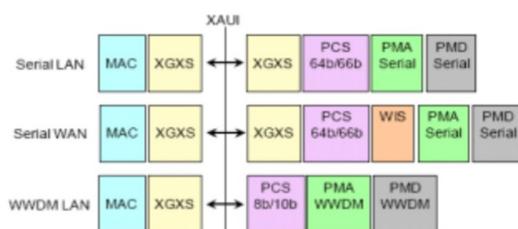
X2

The X2 is a smaller version of XENPAK that is targeted at the same market as XPAK. It competes directly with XPAK and there is some desire for the X2 and XPAK MSAs to merge.

XAUI

The XAUI is NOT a form factor but is the specification used to interface 10GBE electronics on a printed circuit board to whatever form factor is implemented. XAUI (10 Gigabit eXtended Attachment Unit Interface) is derived from the ethernet AUI, attachment unit interface nomenclature. It uses 4 serial channels at 3.125 Gb/s with 8B/10B encoding per 3.125Gb/s channel.

10 GbE PHY Architectures



For more detailed information on the XAUI see
http://www.xilinx.com/esp/wired/optical/collateral/xau_i_xgmii.pdf

MAC: Media Access Control
PCS: Physical Coding Sub-layer
PHY: Physical Layer
PMA: Physical Media Attachment
PMD: Physical Media Dependent
WWDM: Wide Wave Division Multiplexing
WIS: Wan Interface Sub-layer
XGMII: 10GB Media Independent Interface
XGXS: XGMII Extender Sub-layer
XSBI: 10GB, 16bit interface

References:

www.xilinx.com
www.extremenetworks.com

www.sonet.com
