FINISAR OPTICS REFERENCE GUIDE

Introduction to Fiber Optics: Finisar's broad product selection and innovative technology have made us the optical module manufacturer of choice for all major networking equipment vendors worldwide. We have taken a lead role in transforming the data communications and telecommunications equipment markets from utilizing expensive discrete optical components to high volume pluggable pay-as-you-grow optical modules.

DEFINITIONS:

- **DATACOM:** Data traffic transmitted using Fibre Channel or Ethernet protocols.
- **TELECOM:** Data/telecommunications traffic transmitted using SONET/SDH protocols.
- **ACCESS:** Portion of a telecommunication network connecting end-users using typically Ethernet or SONET/SDH protocols at distances <15 km.
- **METRO:** Portion of a telecommunication network connecting suburbs or access nodes using Ethernet, WDM or SONET/SDH protocols at distances <80 km.
- **LAN:** Local Area Network (using Ethernet protocol), typically <500 m.
- **SAN:** Storage Area Network (using Fibre Channel protocol), typically <300 m.
- **PIN-THRU HOLE OPTICS:** Transceivers with pins that are directly soldered into mounting holes on the host board (example SFF—Small Form Factor transceivers).
- **HOT-SWAPPABLE/PLUGGABLE:** Modules that can be manually inserted or removed from cages or sockets in host systems that are running (powered up and in operation).
- **OPTICAL TRANSCEIVERS:** Integrated modules incorporating optical laser transmitters and photodiode receivers. These modules convert physical signals from electrical to optical (and vice-versa) in a network and couple the optical signals into (and out of) optical fiber. Transceivers have serial electrical interfaces on the host board.
- **OPTICAL TRANSPONDERS:** Integrated modules incorporating optical laser transmitters and photodiode receivers. These modules convert physical signals from electrical to optical (and vice-versa) in a network and couple the optical signals into (and out of) optical fiber. Transponders have parallel electrical interfaces on the host board.

Finisar

Finisar products are fully compliant with Ethernet, Fibre Channel, SONET/SDH and WDM standards and operate at data rates up from 100 Mb/s to 40 Gb/s and for distances beyond 100 km. They feature outstanding performance over extended voltage and temperature ranges, while minimizing jitter, electromagnetic interference (EMI) and power dissipation.

FINISAR PRODUCT FORM FACTORS AND PHOTOS:

SFP: SMALL FORM FACTOR PLUGGABLE

Small form factor pluggable (SFP) transceivers are designed to be hot-swappable in industry standard cages and connectors, and offer high speed and physical compactness. Because SFP modules can be easily interchanged, electro-optical or fiber optic networks can be upgraded and maintained more conveniently than with traditional soldered-in modules. Rather than replacing an entire circuit board containing several pin-thru hole modules, a single module can be removed and replaced for repair or upgrading. This can result in a substantial cost savings, both in maintenance and in upgrading efforts.

SFF: SMALL FORM FACTOR

Small form factor (SFF) transceivers are designed for a range of data-rates up to 4 Gb/s and offer physical compactness and pin-thru hole soldering onto a host board. They are available with several configurations including industry standard 2x5 / 2x10, and de-facto 2x6 and 2x7 pinouts.

GBIC: GIGABIT INTERFACE CONVERTER

The gigabit interface converter (GBIC) was the original hot-swappable form factor. The GBIC has been widely adopted in a large number of legacy systems, with designs ranging in data-rates up to 2.5 Gb/s. The devices are economical because they eliminate the necessity for replacing entire boards at the system level. Upgrading can be done with any number of units at a time, from an individual module to all the modules in a system.

SFP CAGES

SFP Cages are designed to mechanically hold and support SFP's in host systems. Finisar cages are designed from a single piece of sheet metal enabling strong mechanical integrity and rigidity, while reducing unwanted EMI.

XFP

XFP is a standardized form factor for serial 10 Gb/s fiber optic transceivers that is used for data transfer rates from 9.95 Gb/s to 11.1 Gb/s. It is protocol-independent and fully compliant to the following standards: 10G Ethernet, 10G Fibre Channel, SONET OC-192 and SDH STM-64. XFP transceivers are used in datacom and telecom optical links and their benefits are a smaller footprint and lower power consumption than other 10G transceiver or transponder form factors. Its electrical interface to the host board is also standardized and is called XFI (10 Gb/s).

XPAK

XPAK is a standardized form factor for 10 Gb/s fiber optic transponders that is used for data transfer rates from 10.3 Gb/s to 10.5 Gb/s. It is protocol-specific: Either 10G Ethernet or 10G Fibre Channel versions are available. XPAK transponders are used in datacom optical links only (not telecom), and their main benefit is a smaller size than other 10G transponder form factors like XENPAK and X2. Its electrical interface to the host board is also standardized and is called XAUI (4 x 3.125 Gb/s).

X2

X2 is a standardized form factor for 10 Gb/s fiber optic transponders that is used for data transfer rates from 10.3 Gb/s to 10.5 Gb/s. It is protocol-specific: Either 10G Ethernet or 10G Fibre Channel versions are available. X2 transponders are used in datacom optical links only (not telecom), and they are smaller than XENPAK transponders. Its electrical interface to the host board is also standardized and is called XAUI (4 x 3.125 Gb/s).

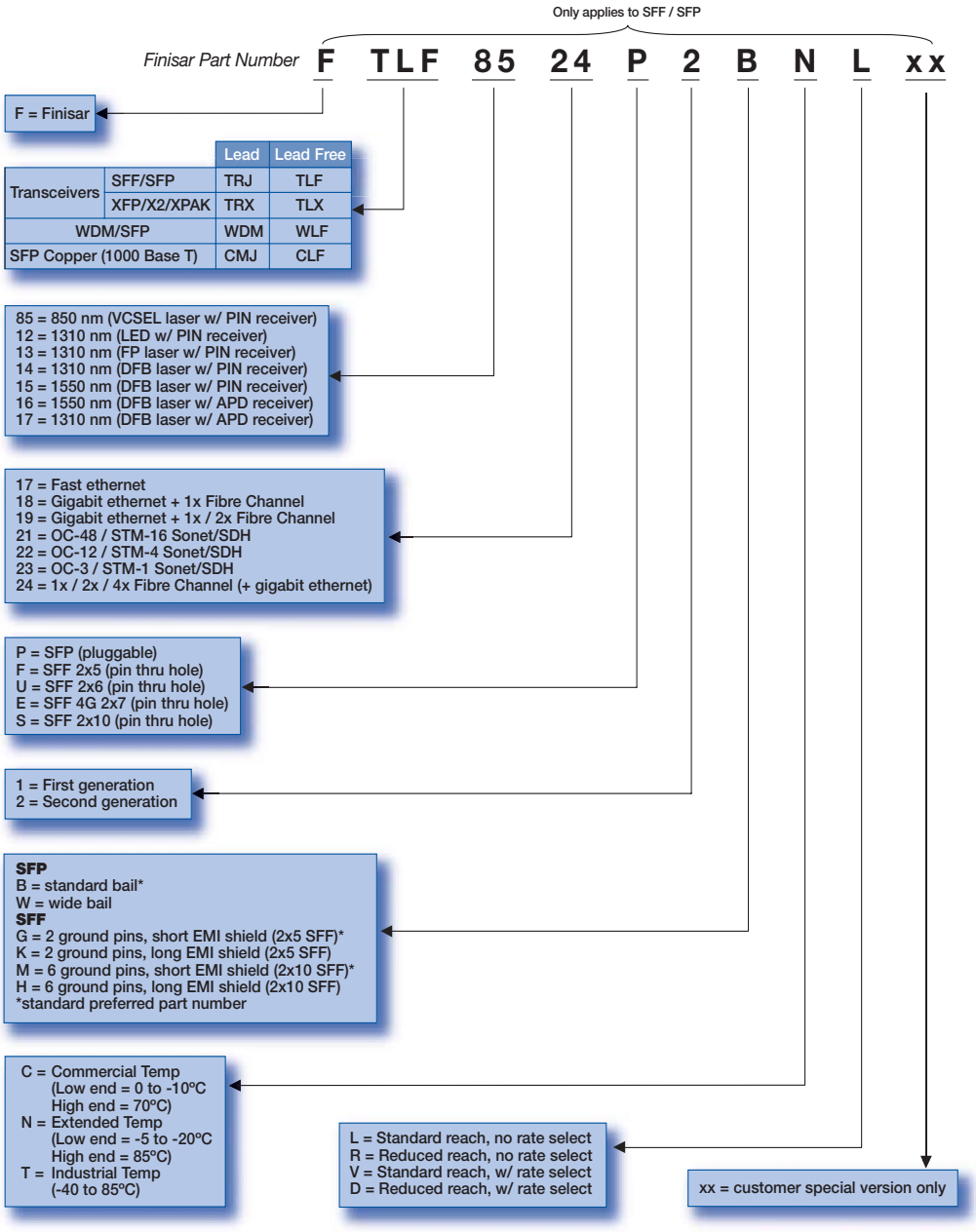
DEFINITIONS (CONTINUED):

- **ETHERNET:** Dominant communications protocol for networking over copper or optical fiber.
- **SONET:** Synchronous Optical Network. Widely used protocol for telecommunications carriers in North America to transport data and voice traffic over optical fiber.
- **SDH:** Synchronous Digital Hierarchy. Widely used protocol for telecommunications carriers outside North America to transport data and voice traffic over optical fiber.
- **FIBRE CHANNEL:** Dominant protocol for transmitting storage data over optical fiber in enterprises.
- **WDM:** Wave Division Multiplexing. Enables multiple data streams of varying wavelengths ("colors") to be combined into a single fiber, significantly increasing the overall capacity of the fiber. WDM is used in applications where large amounts of traffic are required over long distances in carrier networks. There are 2 types of WDM architectures: Course Wave Division Multiplexing (CWDM), up to 8 wavelengths, or Dense Wave Division Multiplexing (DWDM), up to 40+ channels.
- **DIGITAL DIAGNOSTICS:** Developed by Finisar, this functionality enables real-time monitoring of 5 parameters critical to transceiver operation: transmitter output power, receiver sensitivity, laser bias current, transceiver input voltage and transceiver temperature.

KEY QUESTIONS TO ASK YOUR CUSTOMERS ABOUT THEIR OPTICS NEEDS:

1. What is your Data Rate?
2. What is your link length?
3. What temperature range does your application need?
4. What standards do you work with (SONET/SDH, Gigabit Ethernet, Fibre Channel, etc.)?
5. Do you need Pluggable optics or Pin-thru hole optics?
6. What Product Form Factor do you want?
7. What is your transceiver annual volume usage? What is your target price?
8. What is your program schedule?

PART NOMENCLATURE



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