Fraunhofer Institut
Integrierte Schaltungen

Gbit/s-Transceiver for POF (polymer optical fiber)

Fig.1 Gbit/s-Transceiver for duplex POF in SC-RJ-Package

Data transmission with POF (polymer optical fibers)

Polymer optical fibers have become a universal transmission medium not only for automobile and audio applications. Due to their thick core diameter, ease of handling and robustness against bending it is also an interesting solution for industrial and home deployment.

New fibers for wider distances

New POF developments (e.g. GI-PMMA-POF) allow an increased transmission distance at a high data rate. The advantage of easy setup and installation can still be utilised with the new fiber with a core diameter of 1 mm. However, high speed transceiver components have been missing in the market up to now.

Gbit/s POF transceiver design

Therefore, effort has been made to build a transmitter and receiver that is capable of handling the data rates and protocol of Gbit-Ethernet (1.25 Gbit/s). Furthermore, the transceiver design is compatible with duplex SC-RJ plugs in order to allow bidirectional data transmission.

As a result, the transceiver has been built in a commercial SC-RJ package (Fig. 1). Measurements of 2 transceivers in back-to-back configuration show the potential of this approach (Fig. 2). Even data rates of 1.5 Gbit/s can be accomplished with those devices.

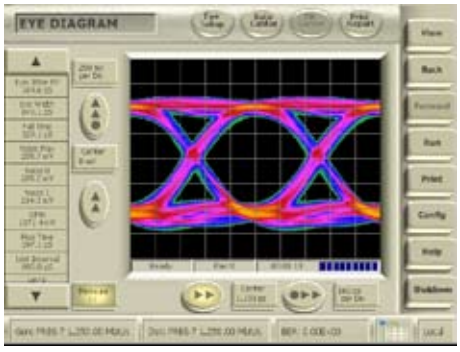

Fig. 2 Eye diagram of 50 m GI-PMMA-POF (OM-Giga) transmission at 1.25 Gbit/s

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Data sheet

Below you will find a preliminary data sheet of the transceiver. As it is not a mass product yet, some parameters can be changed according to customers´ requirements.

Supply voltage:	3.3 V
Current consumption:	< 200 mA
Interface:	CML
Data rate:	125 Mbit/s – 1.25 Gbit/s
Fiber:	@ 1.25 Gbit/s: 50 m OM-Giga, 15 m low-NA POF, 10 m SI-POF (all with core-ø1 mm)
Operating temperature:	-20 .. 60 °C
Storage temperature:	-40 .. 85 °C
Laser:	FP Laser (used for DVD-players); estimated lifetime @ 1% failure rate >25 years @ 60° C
Wavelength:	645 nm – 660 nm
Laser output power:	3 mW - 5 mW (4.5 dBm - 7 dBm)
Laser Class:	1M
Fiber coupled power:	2 mW – 4 mW (3 dBm – 6 dBm, 1 mm core diameter; coupling loss depending on fiber)
Receiver type:	large-area Si-PIN Diode
Receiver sensitivity:	< 50 µW (< -13 dBm) @ BER: 1e-12
Dispersion Filter:	optional non-adaptive electronic dispersion compensation

Applications

Being capable of transmitting at least 1.25 Gbit/s over moderate distances, the transceiver can be used in high-speed data links. It is able to extend the reach of conventional copper cables while using a thin polymer fiber with good robustness. Two transceivers can be used to build up a transparent optical link. Thus, the following applications can be covered:

- IEEE 1394 b (FireWire) up to S800
- Gbit-Ethernet
- proprietary protocols with proper line-coding (e.g. 4B/5B oder 8B/10B)

For FireWire S800 a transmission link has been set up with a gross data rate of 1 Gbit/s (Fig. 3).

Custom Transceiver Design

We have vast experience in transceiver and system design for different applications like data transmission and clock distribution for almost all kinds of fibers, e.g. 1 mm POF, 125 µm POF, 220 µm PCF, 12 / 50 / 65 µm GOF etc. Please feel free to ask for a custom design.

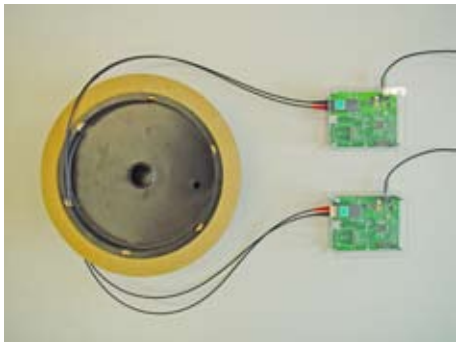

Fig. 3 Transmission of IEEE1394b over 50 m duplex GI-PMMA POF utilizing POF transceivers