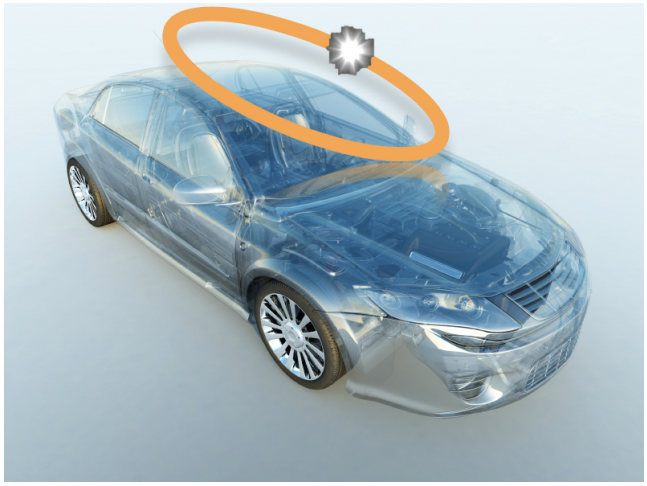
POF Standards for Automotive



How to choose the best POF transmission protocol for automotive applications

There are several alternatives to transmit over POF but with different advantages

Plastic Optical Fiber (POF) is the only reasonable alternative for 100 and 1000 Mbps data transmission on EMC-constrained applications like automotive.

POF is already qualified for automotive since more than 10 years and the ever-growing number of electrical and hybrid powertrains require an optical transmission medium to implement a practical high speed automotive data backbone. Copper alternatives suffer from Electromagnetic emissions, immunity, lack of galvanic isolation, not to mention their higher weight and cost instability.

Although transmission with automotive quality over POF at 1000 Mbps is only possible with the 1000BASE-RH protocol, there are several choices available to communicate at the lower speed of 100 Mbps. like 100BASE-RH or 100BASE-FX. This paper compares both alternatives to help choose the best option for automotive applications.

100BASE-FX is the name of the PMD sublayer described in IEEE 802.3 clauses 24 & 26. Originally released for communication over 2 strands of multimode optical fiber, it implements a basic 4B5B NRZI line coding best suited for Glass Optical Fiber.

On the other hand, 100BASE-RH, has been originally conceived from the beginning as an optimized 100 Mbps transmission

protocol over auto-grade POF. 100BASE-RH is the name of the automotive 100 Mbps POF PMD 802.3 draft standard, to be initiated in 2016. 100BASE-RH formalizes a 100 Mbps link over 2 strands of Step-Index POF (A4a.2 automotive qualified) with a 2 PAM modulation and equalization scheme.

100BASE-RH for POF transmission is superior to 100BASE-FX for automotive applications

A quick comparison of both protocols for 100 Mbps communication over POF is best done considering the following items:

- Link Budget: A measure of the link robustness for longer cable lengths, diversity of in-line connectors, bendings, assembly or servicing damage and live wear out. When measured at 105 °C after aging cycles, 100BASE-RH has a link margin of 19 dB whilst 100BASE-FX lies below at only 10 dB margin.
- Monitoring Capabilities: Only 100BASE-RH enjoys such capabilities in a native way. Monitoring allows installation and servicing diagnostics in an easy way avoiding lengthy debugging processes in case of assembly errors or car failures
- Host Interfaces: 100BASE-RH allows several digital host interfaces apart from 100BASE-X like MII, RMII or RGMII. This advantage simplifies the selection of host microprocessors for the main ECU and increases the chances to reuse current designs.

100BASE-FX will never be accepted by IEEE as a standard for 100 Mbps communication over POF

- Future Upgrades: Only 100BASE-RH allows a seamless future upgrade to higher speeds like 1000 Mbps thanks to the support of RGMII in both 100 Mbps and future 1 Gbps speeds.
- Standardization: Although standardized for multimode glass fiber, 100BASE-FX is not standardized and will never be admitted by IEEE as a standard for POF communication. 100BASE-RH will soon be submitted to IEEE for standardization.

SUMMARY: This paper described the main alternatives for 100 Mbps transmission over POF in automotive applications. A comparison of the two main alternatives, namely 100BASE-RH and 100BASE-FX, showed the superior choice of 100BASE-RH for future proven POF applications in harsh EMC automotive environments.