IEEE Std 802.3cz

Automotive Optical nGBASE-AU Physical Layers

OVERVIEW

The IEEE Std 802.3cz is the new Ethernet standard for automotive multi-gigabit optical links over multi-mode glass optical fiber. It defines five optical physical layers at 2.5, 5, 10, 25 and 50 Gb/s operating in full-duplex over a duplex optical fiber cable for the in-vehicle network. It withstands operation ambient temperatures from -40 °C up to 105 °C, according to the qualification standard AEC-Q100 grade-2.

IEEE Std 802.3cz leverages mature components from other industries: OM3 multi-mode optical fiber, VCSEL (Vertical Cavity Surface Emitting Laser) devices and infrared photo- diodes.

Thanks to the excellent channel response of the OM3 fibers, this new standard enables low-complexity PHYs with no need for echo cancellation and with simpler DSP and equalization, which results into low cost, small silicon area, low latency and, most important, low power consumption. Moreover, it offers very high link budget and longer range of 40 meter with up to 4 in-line connections, enabling applications also for commercial vehicles, buses, and trucks.

The nGBASE-AU links are optimized for a maximum link margin, which allows using low- cost connectors with much higher insertion loss than ones used in datacenter applications.

The IEEE Std 802.3cz supports operation in automotive environments (e.g., EMC, temperature, harsh environment).

Link operates at a wavelength of 980 nm, which allows using VCSEL devices with superior reliability to meet the automotive mission profiles with margin.

FEATURES

- Physical layers at 2.5, 5, 10, 25 and 50 Gb/s over a single duplex fiber

  - ➢ 2.5GBASE-AU ➢ 5GBASE-AU ➢ 10GBASE-AU
  - ➢ 25GBASE-AU ➢ 50GBASE-AU

- Support for AEC-Q100 grade 2 automotive qualification (operation T_J & T_{BS} -40 °C to 125 °C)

- Maximum reach of 40 meter, which enable applications not only for passenger cars, but also for buses, trucks and commercial vehicles

- BER < 10^{-12}

- EMC-issues free technology

- Support for low-cost, small-size, auto-grade optical connectors (up to 4 inline connections[1] per link) and cables

- Adaptive data-aided equalization and timing recovery for best RX sensitivity and production yield

- Support for advance diagnosis, wake-up & sleep functions, dependability function with OAM channel

- Support for Energy Efficient Ethernet (EEE) for big power saving in low traffic conditions or asymmetric-rate use cases

- Scalability: same cables and connectors for all bitrates

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[1] 50GBASE-AU specifies a link budget for 2 inline connections.