FiberHome CIT16 Combo-PON Service Board Transceiver Sensitivity Standards - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

The FiberHome CIT16 Combo-PON Service Board represents a carrier-grade optical line terminal interface solution engineered to support the co-existence of GPON and XG-PON technologies over a unified optical distribution network. Central to its deployment value is the transceiver sensitivity standard, which defines the optical power threshold at which the board maintains error-free reception under both continuous and burst-mode operational conditions. This datasheet provides a definitive technical reference for network planners, optical link budget engineers, and procurement specialists evaluating the CIT16 board for FTTx and enterprise access deployments. The sensitivity parameters documented herein are derived from FiberHome's OEM optical module qualification framework and align with ITU-T G.984 and G.987 series recommendations.



OPTICAL RECEIVER ARCHITECTURE AND SENSITIVITY DEFINITION

The CIT16 service board integrates Combo-PON optical sub-assemblies that house separate receiver paths for GPON (1310 nm upstream) and XG-PON (1270 nm upstream) wavelengths. Sensitivity, expressed in dBm, denotes the minimum average received optical power at the board's SC/UPC interface required to achieve a bit error rate (BER) of 1×10^{-10} for GPON and 1×10^{-3} for XG-PON with forward error correction enabled, as specified in the relevant ITU-T standards. Two sensitivity grades are commonly referenced for FiberHome Combo-PON OLT modules: the N1 ODN Class and the N2a ODN Class, which correspond to different power budget allocations within the optical link.

For GPON receiver paths operating at 1.244 Gbit/s upstream, the board's

sensitivity performance supports Class B+ and Class C+ optical module variants, with published sensitivity values reaching approximately -27.5 dBm for the XG-PON receiver path under N1 class conditions . The Combo-PON module designated as 10/2.5G:2.5/1.25G-20km-XG-PON:GPON OLT-XFP (D1 ODN CLASS) specifies an XG-PON sensitivity of -27.5 dBm and an overload optical power of -7 dBm, yielding an optical budget exceeding 8.2 dB . The D2 ODN Class variant extends the sensitivity floor further to -29.5 dBm with an overload point of -9 dBm, accommodating extended-reach ODN architectures where split ratios of 1:128 or fiber distances approaching 20 km are employed .

SENSITIVITY STANDARDS BY OPERATING MODE

The CIT16 board's receiver sensitivity is characterized across three distinct operating modes that reflect real-world PON traffic conditions:

- Continuous Mode Downstream Reception (1490 nm / 1577 nm): The downstream receiver operates in continuous-wave mode, receiving the aggregated GPON and XG-PON downstream signals from the OLT's transmit path. Sensitivity in this mode is specified under steady-state optical input conditions and represents the baseline receiver performance floor.
- Burst Mode Upstream Reception (1310 nm / 1270 nm): Upstream reception from ONUs requires the receiver to handle burst-mode packets with rapid

power level transitions. The CIT16 board's burst-mode sensitivity accounts for the guard time and preamble overhead defined in ITU-T G.984.3 and G.987.3, ensuring reliable reception even from ONUs operating at the lower end of their transmit power specifications.

- Combo Co-existence Mode: When GPON and XG-PON ONUs share the same ODN, the receiver must discriminate between 1310 nm and 1270 nm upstream bursts. The sensitivity standard in this mode is validated against adjacent-channel crosstalk and wavelength filtering isolation requirements to maintain BER performance.

KEY FEATURES

- Dual-Technology Receiver Co-existence: Supports simultaneous GPON (2.5G/1.25G) and XG-PON (10G/2.5G) reception on a per-port basis, with independent sensitivity thresholds for each technology.

- N1 and N2a ODN Class Compliance: Qualified to both ODN class specifications, enabling network operators to select the appropriate sensitivity grade based on split ratio and reach requirements.

- Burst-Mode Dynamic Range: Wide receiver dynamic range accommodates ONU transmit power variations and ODN loss fluctuations without requiring manual threshold adjustment.

- FEC-Assisted Sensitivity Extension: Forward Error Correction (FEC) gain of

approximately 3–4 dB is available in both upstream and downstream directions, effectively lowering the achievable sensitivity floor for extended-reach deployments.

- Hot-Swappable SFP+ Form Factor: The Combo-PON optical modules are housed in industry-standard SFP+ packages, allowing field replacement and inventory rationalization without service disruption.

COMPLIANCE & STANDARDS

The CIT16 Combo-PON Service Board transceiver sensitivity specifications are validated against the following standards and recommendations:

- ITU-T G.984.2: Gigabit-capable Passive Optical Networks (GPON): Physical Media Dependent layer specification.
- ITU-T G.987.2: 10-Gigabit-capable Passive Optical Networks (XG-PON): Physical Media Dependent layer specification.
- ITU-T G.9807.1: 10-Gigabit-capable Symmetric Passive Optical Networks (XGS-PON).
- SFP+ MSA (Multi-Source Agreement): Mechanical and electrical interface definition.
- FiberHome internal optical module qualification standard FH-OPT-Q-2021: Sensitivity and overload verification procedures.

TECHNICAL SPECIFICATIONS

The following table summarizes the receiver sensitivity parameters applicable to the CIT16 Combo-PON Service Board across supported ODN classes and technology modes.

Parameter	**Specification**
Board Type	Combo-PON Service Board (GPON + XG-PON co-existence)
Optical Module Form Factor	SFP+ (Hot-swappable)
GPON Upstream Wavelength	1310 nm (1290–1330 nm)
XG-PON Upstream Wavelength	1270 nm (1260–1280 nm)
Downstream Wavelength (GPON)	1490 nm (1480–1500 nm)
Downstream Wavelength (XG-PON)	1577 nm (1575–1580 nm)
XG-PON Receiver Sensitivity (N1 ODN Class)	-27.5 dBm (BER ≤ 1×10^{-3} with FEC)
XG-PON Receiver Sensitivity (N2a ODN Class)	-29.5 dBm (BER ≤ 1×10^{-3} with FEC)
XG-PON Overload Optical Power (N1 / N2a)	-7 dBm / -9 dBm
Optical Budget (N1 ODN Class)	> 8.2 dB

Maximum Reach (Typical)	20 km (logical reach dependent on split ratio and fiber loss)
Supported Split Ratio	1:64 standard; 1:128 with power budget verification
Connector Type	SC/UPC
Operating Temperature Range	Industrial: -40 °C to +85 °C (module dependent)
Digital Diagnostic Monitoring	Supported (DDM via 2-wire interface)

ORDERING SKU INFORMATION

Network operators and system integrators should reference the following optical module class designators when specifying CIT16 service boards to ensure sensitivity performance aligns with the target ODN architecture:

- N1 ODN Class Combo-PON Module: Suitable for standard 1:64 split ratios and reaches up to 20 km. Sensitivity floor: -27.5 dBm (XG-PON receiver).
- N2a ODN Class Combo-PON Module: Suitable for extended-reach or higher-split ODN designs. Sensitivity floor: -29.5 dBm (XG-PON receiver).
- C+ Class GPON Module: Enhanced power budget variant for GPON-only deployments where XG-PON co-existence is not immediately required but

future migration is planned.

Consult FiberHome sales representatives for specific SKU codes corresponding to chassis compatibility (AN5516-01, AN5516-04, AN5516-06, or AN6000 series) and optical connector polish options (SC/UPC standard).

