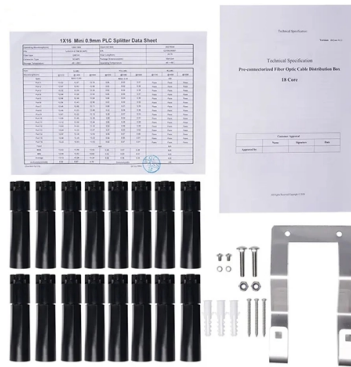


EML Selection Guide for Base Station-Grade Access Switches



Overview

In this study, we optimized the transmission line on the flexible printed circuit (FPC) of 25-Gbps EML CAN(1) and driving conditions.

Key Takeaways

Selecting EMLs for base station-grade access switches requires evaluating transmission speed, modulation format, package type, thermal performance, and compatibility with network architecture.

Key Selection Criteria for EMLs



1. **Transmission Speed and Modulation Format** For 5G base station midhaul applications, EMLs typically operate at 50 Gbps using 26-Gbaud PAM4 modulation, which supports high-capacity data transmission over distances up to 40 km . Ensure the EML supports the required baud rate and modulation format for your network layer.

2. **Package Type and Integration** EMLs are commonly packaged in ceramic and metal box packages or CAN packages. Box packages provide robust thermal management, while CAN packages may introduce band-limiting due to impedance mismatch, which can affect PAM4 performance . Selection should consider the compatibility with printed circuit boards (FPCs) and the ability to maintain signal integrity.

3. **Thermal and Power Considerations** Base station-grade EMLs must operate reliably across a wide temperature range. Typical thermoelectric cooler (TEC) power consumption ranges from 0.19 W at +80°C to 0.20 W at –5°C . Evaluate the thermal management requirements to ensure stable operation under varying environmental conditions.

4. **Extinction Ratio and Signal Quality** The extinction ratio (e.g., 7.0 dB) and TDECQ (Transmitter and Dispersion Eye Closure Quaternary) values (e.g., 2.0 dB) are critical for maintaining signal integrity over the optical link . Choose EMLs that meet or exceed the 50GBASE-ER standard for midhaul applications.

5. **Network Compatibility** Ensure the EML is compatible with the access switch architecture, including Layer 1 or Layer 2 switching requirements. For Layer 1 switches, consider manual or intelligent switching capabilities, such as A/B/C/D common switches, gang switch models, or remote control interfaces . This ensures seamless integration with base station equipment and redundancy mechanisms.

6. **Reliability and Compliance** Select EMLs and switches that comply with telecom-grade standards and have proven reliability in high-traffic base station environments. Consider vendor certifications, environmental testing, and long-term operational stability.

Practical Recommendations

- **Match EML speed to network requirements:** Use 50 Gbps EMLs for midhaul links requiring 26-Gbaud PAM4.
- **Optimize PCB layout:** Minimize impedance mismatch to reduce band-limiting effects.
- **Plan for thermal management:** Include TECs or heat sinks to maintain performance across temperature extremes.
- **Verify switch compatibility:** Ensure Layer 1 or Layer 2 switches support the selected EMLs and provide necessary failover or access control features.
- **Check signal quality metrics:** Confirm extinction ratio and TDECQ meet network standards to avoid data errors. By carefully evaluating these factors, network engineers can select EML devices and base station-grade access switches that deliver high-speed, reliable, and efficient optical connectivity for 5G and beyond .

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