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100g optical module threshold



Overview

Abstract: In today''s fast-paced digital landscape, the demand for high-speed data transmission has never been greater.

Key Takeaways

100G optical modules have defined optical thresholds, including receiver sensitivity and link budgets, which vary by module type and fiber, typically ranging from 4.2 dB for short-reach multimode to higher values for long-reach single-mode links.Optical Thresholds and Link Budgets

Optical thresholds in 100G modules refer to the minimum and maximum optical power levels that the receiver can reliably detect, ensuring error-free data transmission. These thresholds are critical for maintaining signal integrity across different fiber types and distances.

• Short-Reach Multimode (SR4/SR4-S): Cisco 100GBASE-SR4-S modules support link lengths up to 70m over OM3 and 100m over OM4 multimode fiber. The optical link budget is 4.2 dB, which accounts for fiber loss, connector loss, and patch panels in data center environments .

• Single-Mode Short/Medium Reach (DR/FR): Single-lambda 100G modules, such as 100G-DR (500m) and 100G-FR (2 km), use PAM4 modulation to double data per pulse. The optical thresholds are designed to accommodate the lower signal-to-noise ratio inherent in PAM4, ensuring reliable detection over the specified distances .

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• Long-Reach Single-Mode (LR/LR4/ER-Lite): Modules like 100G-LR4 and 100G ER-Lite support distances from 10 km up to 25 km. These modules have higher receiver sensitivity requirements and stricter optical thresholds to compensate for fiber attenuation and dispersion over long distances .
Modulation and Threshold Considerations
• PAM4 vs NRZ: Modern 100G modules often use PAM4 (four-level pulse amplitude modulation) instead of NRZ (two-level). PAM4 allows twice the data per symbol but is more sensitive to amplitude noise, requiring careful design of optical thresholds to avoid bit errors .

• Link Budget Impact: The optical threshold directly affects the maximum achievable link distance. For example, a 4.2 dB link budget in SR4 modules allows short-reach connections in data centers, while LR4 modules require higher sensitivity to reach 10 km over single-mode fiber .
Practical Implications
• Ensure module type matches fiber type and distance to stay within optical thresholds.

• Consider connector and patch panel losses when calculating link budgets.

• For PAM4 modules, maintain clean signal integrity to prevent errors due to smaller voltage margins.

• Use forward error correction (FEC) where supported to extend reach and compensate for threshold limitations. In summary, 100G optical module thresholds define the operational optical power range for reliable transmission, varying by module type, fiber, and modulation scheme. Short-reach multimode modules have lower link budgets (~4.2 dB), while long-reach single-mode modules require higher sensitivity and stricter thresholds to maintain error-free communication .

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The transmission distance of the optical module is mainly determined by the luminous power and the receiving

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Optical-Module Parameter Inquiry and Alarm Configuration

The following command shows how to enable the transmitting optical power alarm on port e8/1, set the maximum and minimum

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