Precision Timing Solutions

PAM4 for High-Speed Links, 400Gbps & Higher

Precision Timing for PAM4 based High-Speed Links

Datacenters require extremely reliable 200Gbps, 400Gbps or higher throughput links to sustain data traffic generated by increasing user application loads in dense rack-based servers.
PAM4 stands for pulse amplitude modulation, 4-Level. This is the critical piece of technology that enables high-speed, 400Gbps and 800Gbps links.

Key Considerations

- Frequency stability
- Temperature changes
- Thermal noise
- Mechanical

Increasing demand for Ethernet bandwidth is pushing networking infrastructure vendors and datacenter vendors towards higher speeds over Ethernet. Most networking infrastructure, like routers, switches and Ethernet links in datacenters, have deployed 400Gbps links and are already planning for 800Gbps links.

Block Diagram

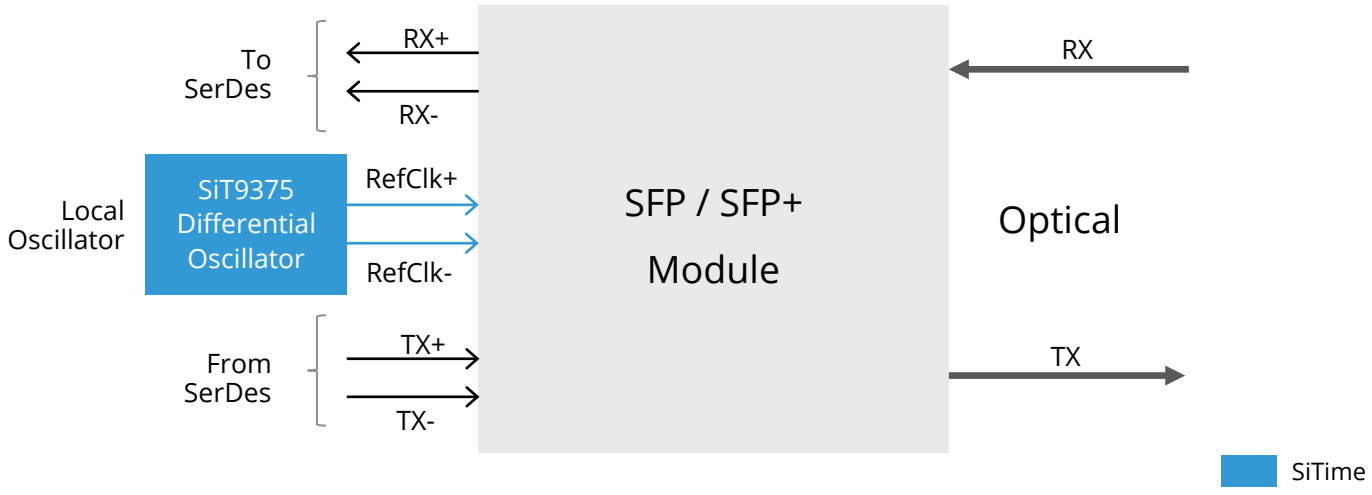

Figure 1: 400G Optical module

High speed Ethernet links (10Gbps and higher) initiated the move towards adopting PAM4 but 400Gbps and 800Gbps rates are impossible to achieve without PAM4. Advances in PCB fabrication technology with tighter tolerances on the signal traces, allowed for PAM4 to be deployed for high-speed SERDES links (56G and 112G) whereas better laser technology allowed for PAM4 to be deployed over fiber optic links.

Telecom infrastructure vendors depend on SiTime MEMS-based oscillators and clock products to meet and exceed the demands for increased data bandwidths from streaming content providers.

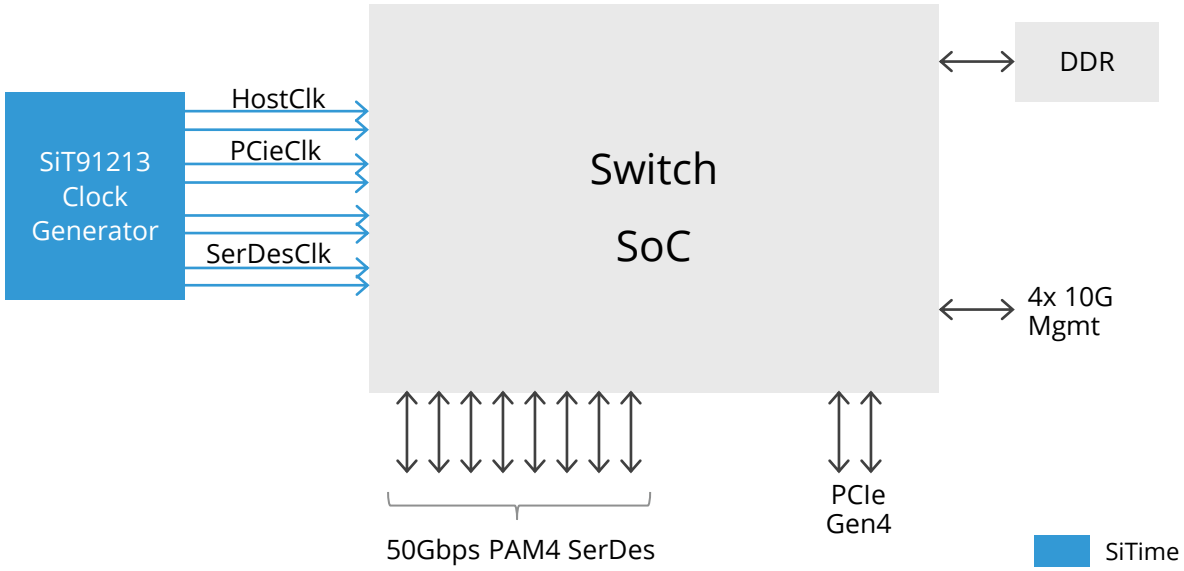

Figure 2: Multi-port Network Switch SoC

Featured products – please refer to SiTime.com or contact us for more options.

Type	Product	Frequency	Key Features	Key Values
Differential Oscillator	SiT9501	25 to 644.5 MHz (70 fs[1] IPJ)	• ±20 ppm to ±50 ppm frequency stability • LVPECL, LVDS, HCSL • 1.8 V to 3.3 V • -40°C to 105°C • 2.0 x 1.6 mm, 2.5 x 2.0 mm, 3.2 x 2.5 mm packages	• Meets demanding jitter requirements • Small PCB footprint, easier layout • Easy design due to flexibility • Better MEMS reliability
	SiT9375	25 to 644.5 MHz (150 fs[1] IPJ)		
Clock Generator	SiT91211[2]	1 to 750 MHz (200 fs[1] IPJ)	• 4 differential output clocks • ±20 ppm frequency stability • LVDS, LVPECL, LPHCSL • 0.01 ps/mV PSRR • -40°C to 105°C • 4 mm x 4 mm package	• Simplifies clock tree design with multiple low jitter clocks • Programmable clocks add flexibility to complex clocking architectures • Better frequency stability and noise immunity in harsh environments • Small PCB footprint, compact layout
	SiT91213[2]	1 to 750 MHz (90 fs[1] IPJ)		

[1] 12 kHz to 20 MHz integration range [2] Please contact SiTime for availability

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