We present the design and test results of a Drivers and Limiting Amplifiers (DLAS10) and Miniature Optical Transmitter/Receiver/Transceiver (MTx+/MRx+, and MTRx+) based on DLAS10.

**CHIP DESIGN**

DLAS10 has two channels. Each channel of DLAS10 consists of an input buffer, a four-stage Limiting Amplifier (LA), and an output driver.

The conventional Continuous-Time Linear Equalization (CTLE) are used in the input buffer.

An active feedback is adopted in the LA to accommodate the Processes, Voltages and Temperatures (PVTs) variations.

The output driver is based on Current-Mode Logic (CML) structure.

**MODULE DESIGN**

Matching DLAS10 with a Transmitter Optical Sub-Assembly (TOSA) and a Receiver Optical Sub-Assembly (ROSA) with only Trans-Impedance Amplifier (TIA), and with a custom optical coupler, MTx+/MRx+/MTRx+ offers an economical option with a robust electrical connector and receives fibers with the LC connectors. The modules stay below 6 mm in height and are both board and panel mountable.

**RESULTS**

The input electrical sensitivity is 40 mVp-p, while the input optical sensitivity is -12 dBm.

Two 2 m long coaxial cables with SMA connectors are used to test input CTLE. When the input equalization is 62, the RMS jitter achieves 2.8 ps.

OMA decreases when the feedback strength (FBS) increases because of the gain of LA decreases.

DLAS10 has been tested in MTx+, MRx+, and MTRx+ modules. A pattern generator (CENTELLA X TG1C1-A) with a clock module CENTELLA X PCB12500) provides 10 Gbps Pseudo-Random Binary Sequence (PRBS) signals. An optical oscilloscope (Tektronix TDS8000B) captures the optical eye diagrams of MTx+. An electrical oscilloscope (Tektronix DSA72004) measures the electrical eye diagrams of MRx+. For the MRx+ test, MTx+ is the optical source.

**TEST SETUP**

DLAS10 has two channels each works up to 10.24 Gbps and can be configured to be two VCSEL drivers, or two receiver limiting amplifiers, or one driver and one receiver. The previous prototype of DLAS10 and the TOSAs that are used in MTx+/MTRx+ modules will be tested in the future. The previous prototype of DLAS10 has two channels each works up to 10.24 Gbps and can be configured to be two VCSEL drivers, or two receiver limiting amplifiers, or one driver and one receiver. The previous prototype of DLAS10 and the TOSAs that are used in MTx+/MTRx+ modules have been verified to be radiation tolerant before.

**CONCLUSION**

Both measured electrical and optical eye diagrams pass the 10 Gbps eye mask test.

Total jitter 29 ps (P-P); Random jitter 1.6 ps (RMS); Deterministic jitter 9.9 ps.

Each MTx+/MTRx+ module consumes 82 mW/ch and 174 mW/ch, respectively.

The radiation tolerance of DLAS10 and the ROSAs used in the MRx+/MTRx+ modules will be tested in the future.