

800 GbE BER Evaluation 64 Gbaud Multichannel PAM4 BERT Signal Quality Analyzer-R MP1900A

PAM4 PPG MU196020A
PAM4 ED MU196040B



In the future 800 GbE standard, which follows the 400 GbE, speedup using PAM4, 53 Gbaud, and 8 lanes is being considered. Since the amplitude of the three Eyes of the PAM4 method is one-third that of the NRZ method, the receive circuits require sufficient input sensitivity as well as the FEC function, etc. Additionally, the pulse width at 53 Gbaud is just 18.8 ps (1 bit), which increases the importance not only of Rx sensitivity but also of signal quality, including Tr/Tf time, jitter, etc.

The Signal Quality Analyzer-R MP1900A series PAM4 BERT module is a bit error rate tester optimized for measuring high-speed interfaces, such as 400 GbE and the future 800 GbE standard. It provides powerful support for design testing of PAM4 devices using high-quality waveforms up to 64 Gbaud and high input sensitivity performance. Additionally, with an all-in-one architecture offering Jitter Addition, Clock Recovery, Equalizer, Emphasis, PAM4 Pattern Editing, Capture, and SER functions, the MP1900A is the ideal high-reproducibility and easy-to-configure system for PAM4 measurements.

[Target Applications] 200/400/800 GbE, CEI-56G/112G, InfiniBand HDR, 64G Fibre Channel

PAM4 One Box Test Solution

Emphasis 4Tap, 20 dB

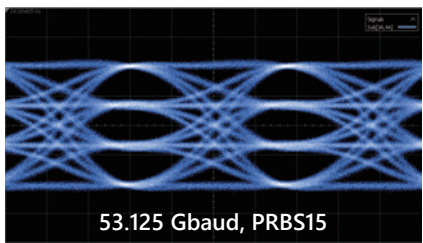


Jitter/Noise Addition

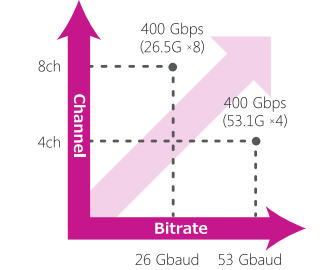
Built-in Clock Recovery, Equalizer

Jitter Tolerance Test

Highest Level Waveform Quality



Next-Generation Terabit



All-in-One PAM4 BERT
Built-in Clock Recovery
Built-in Noise* and Jitter Addition
Emphasis and Linearity Control
Symbol Error Measurement
*: 32.1G max.

High-Quality Waveforms and Excellent Input Sensitivity
Fast Tr/Tf: 8.5 ps
Low Intrinsic Jitter: 170 fs rms
High Input Sensitivity: 23 mV @26G, 36 mV@53G
116 Gbit/s PAM4 Error Free Measurement

High Transmission Capacity and Good Expandability
512 Gbit/s max. Transfer Capacity (all-in-one, 1X)
4ch (max.) Multichannel Expandability
2.4 Gbaud to 64.2 Gbaud PAM4/NRZ Support

4 Level, Encode/Pattern Setting

Symbol Error Measurement Screen

Typical Specifications

PAM4 PPG MU196020A

Operation Rate (PAM4/NRZ)	2.4 Gbaud to 32.1/58.2/64.2 Gbaud (option selection)
No. of Channels	1
Output Amplitude	70 mVp-p to 800 mVp-p (Single-end) 140 mVp-p to 1600 mVp-p (Differential)
Offset	-2 V to +3.3 V
Emphasis	4 Tap, -20 to +20 dB
Channel Emulator	Generates waveform with insertion loss and simulates waveform with corrected insertion loss Set by loading S-Parameter file (S2 P, S4 P)
ISI	Simulates ISI generation waveform Set using loss (-8.00 to 8.00 dB) at CEI-specified Nyquist frequency Used in combination with channel board, such as J1800A/J1758A (optional accessories parts), or Noise Generator MU195050A
Independently Variable PAM4 3 Eye	20 to 50% (PAM4 Amplitude 0/3 level = 100%)
PAM4 Pattern	SSPRQ, PRBS13Q, PRBS31Q, RS-FEC, etc.
PAM4 Pattern Error Addition	MSB Error, LSB Error, LSB&MSB Error, RS-FEC Symbol Error
Tr/Tf (20 to 80%)	8.5 ps (typ., NRZ)
Random Jitter	170 fs rms (typ., NRZ)
I/O Connector	V (f)
Jitter Emphasis (Using MU181500B)	SJ, RJ, BUJ, SSC
Noise Addition (Using MU195050A)	CMI, DMI, White Noise (<32.1G)

PAM4 ED MU196040B

Operation Rates	2.4 Gbaud to either 32.1 Gbaud, or 58.2 Gbaud (PAM4)/64.2 Gbaud (NRZ) (option selection)
No. of Channels	1
Input Amplitude	NRZ: ≤32.1G: 0.05 Vp-p to 1.0 Vp-p, >32.1G: 0.1 Vp-p to 1.0 Vp-p PAM4: ≤32.1G: 0.3 Vp-p to 1.0 Vp-p, >32.1G: 0.4 Vp-p to 1.0 Vp-p
Input Sensitivity (Eye Height)	NRZ: 19 mV @ 26.5625 Gbaud, 21 mV @ 53.125 Gbaud PAM4: 23 mV @ 26.5625 Gbaud, 36 mV @ 53.125 Gbaud
Clock Recovery (Option)	2.4 Gbaud to 32.1 Gbaud, 51 Gbaud to 58.2 Gbaud
Equalizer (Option)	Low-frequency Equalizer (≤1 GHz, 2 dB typ.) + DFE (1.4 dB typ.)
PAM4 Patterns	SSPRQ, PRBS13Q, PRBS31Q, etc.
PAM4 Counter	MSB, LSB, Symbol 0 to 3 (Option)
Input Connector	V (f)

Ordering Information

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

Contact your sales representative for more details.

Model/Order No.	Name
MU196020A	PAM4 PPG
MU196020A-001	32 Gbaud
MU196020A-002	58 Gbaud
MU196020A-003	64 Gbaud
MU196020A-011	4Tap Emphasis
MU196020A-030	Data Delay
MU196020A-040	Adjustable ISI
MU196020A-042	FEC Pattern Generation
MU196020A-050	Inter-Module Synchronization
MU196040B	PAM4 ED
MU196040B-001	32G baud (2.4G to 32.1G)
MU196040B-002	58G baud (NRZ:2.4G to 64.2G, PAM4:2.4G to 58.2G)
MU196040B-011	Equalizer
MU196040B-021	29G baud Clock Recovery (2.4G to 29G)
MU196040B-022	32G baud Clock Recovery (2.4G to 32.1G)
MU196040B-023	58G baud Clock Recovery Extension (51G to 58.2G)
MU196040B-041	SER Measurement

Model/Order No.	Name
MP1900A	Signal Quality Analyzer-R
MU181500B	Jitter Modulation Source
MU181000B	12.5 GHz 4-Port Synthesizer
MU195050A	Noise Generator
J1792A	Paired Matched Skew Semi-rigid Cables (V-K Connector, Data Input1) (For Noise Addition (32.1 Gbaud max.))
J1789A	Coaxial Specified Electrical Length Cable (0.4 m, V-connector)
J1790A	Coaxial Specified Electrical Length Cable (0.8 m, V-connector)
34VFK50	Coaxial Adapter V (f)-K (m)*
J1800A	ISI Board V

*: The MU196020A Data OUT and MU196040A Data IN connectors, and the J1789A/J1790A cables all use V-connectors. Consequently, for K-connectors, use 34VFK50 adapters.