

Innovation for the next generation



## AT4080

### 4-Lane BERT-PPG & AWG

4-Channel Differential Arbitrary Waveform Generator with 1-64 GBd selectable Baud Rate and User Defined Modulation | 2 Dual-Channel (I/Q) Differential Pulse Pattern Generators with 25-64 GBd selectable Baud Rate | NRZ/PAM4 Modulation | Independent 7-tap FFE on each transmitter

### Summary

The AT4080 is part of Multilane's high-speed instrumentation family for high volume production wafer and packaged silicon test. The AT4080 is a fully integrated extension of the V93000 tester experience, taking full advantage of the V93000 Smartest software tools and docking mechanics.

The AT4080 consists of 4 differential transmit channels that can be synchronized to other AT instruments in the V93000.

The Multilane instruments reside directly under the loadboard, allowing minimum coax cable length from the instruments to the device under test (DUT). SMPM Blindmate coax connections between the instruments and the loadboard allow quick DUT loadboard changeover during production testing.

# AT4080

## Introduction

The AT4080 is a x4 lanes AWG and uses Smartest APIs under Linux. An API package and a GUI are also available for Windows OS.

The AWG is also a PPG that generates various PRBS patterns to double as a BERT TX for either NRZ or PAM-4. In this mode, the PPG offers an FFE de-emphasis filter with linear 7 taps (1 tap/UI).

## Key Features

- 4-Channel Differential Arbitrary Wave Form Generator with selectable Baud Rate in the range of 1-64 GBd, 8-bit DAC, and User Defined Modulation
- 2 Dual-Channel (I/Q) Differential Pulse Pattern Generators with selectable Baud Rate in the range of 25-64 GBd, NRZ/PAM-4 Modulation, and Independent 7-tap FFE on each transmitter.
- Ability to generate coherent signals for QAM modulation (horizontal and vertical I/Q pairs)
- The wide range of bitrate coverage allows PHY testing of Ethernet, PCIe Gen 4/5/6, USB and others
- Independent control of inner eye levels
- Ability to tune the bit rate in very fine steps to facilitate finding locking margin
- Library of pre-defined waveforms
- Ability to generate custom modulation like PAM7, PAM9, etc. in AWG mode

## Target Applications

- High-speed SerDes, transceivers, amplifiers
- Validation Test
- Production Wafer Sort Test
- Production Package Test
- Production Multisite Testing

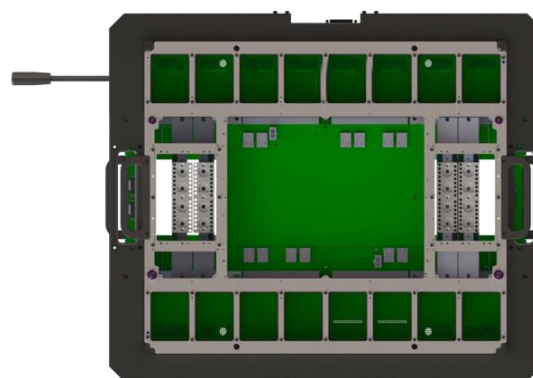


Figure 1: Advantest V93000 testhead extender frame with Four Multilane Cassettes

## Mechanical Dimensions

- Length: 265.6 mm
- Height: 58 mm
- Depth: 33.2 mm



## Cables

Because the AT4080 is located directly underneath the loadboard, shorter cables can be used. To connect the instrument through the stiffener to the device load board, some cable set examples are shown here. Check with MultiLane for the best cabling options for your application:

- Vertical or right angle 1x8 coreHC to SMPM cable: allowing direct connection between instrument and load board
- 1x8 coreHC to 1.85 mm cable combined with a 1.85 mm to SMPM cable (bought from MultiLane), allowing connection between instrument and load board or external source



Figure 2: 1x4 coreHC cables

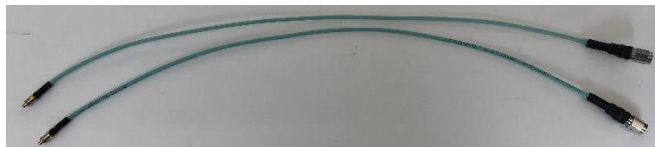


Figure 3: MultiLane SMPM-BM to 1.85 mm cable

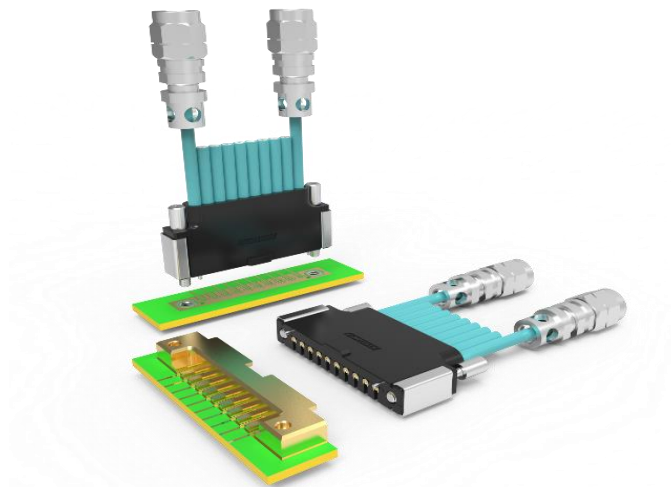


Figure 4: 1x8 channel coreHC to 1.85 mm cable

## Electrical Specifications

Parameter	Specifications
TX Coupling	AC coupled
Channel Impedance (Diff)	100 Ohm
TX/RX connectors	SMPM (M)
TX 3dB Bandwidth	35 GHz
Reference clock Output	Baud Rate/48 or Baud Rate/24 (<1.2GHz max)
Clock out amplitude (SE/Diff)	0.6/1.2 Vpp
Clock input amplitude (SE/Diff)	0.5/1 Vpp
Clock Input Validated Range	150 - 160 MHz
Instrument Automatic Shutoff	85 °C
Recovery from over-temperature shutoff	Manual reboot of the system and instrument temperature below 85 °C
Setup time / Reboot	38 s
Normal Operating Temperature	0 - 65 °C
Air Supply Flow	See site preparation manual for system air supply requirements
Air Supply Temperature	See site preparation manual for system air supply requirements
Ambient Air Temperature	See site preparation manual for system air supply requirements
Power	12 V, 1.5 A

**Table 1: General Specs**

Parameter	Specifications
Tx Maximum Amplitude (Sine wave)	1050 mVppd <sup>1</sup>
Bit Rates	1 – 64 GBd
Vertical Resolution	8 bits
Modulation	User-defined
Pre-programmed Waveforms	PRBS 7, PRBS 9, Square wave, triangular Wave, sinewave, multi-tone, linear chirp, log chirp, sawtooth, exponential rise, exponential decay, Sinc, Lorentz, Surge, Damped Oscillation, Stairs, Serial Data, half-sine, Distorted sinewave and Gaussian.
Memory Depth	33.6 kSa per channel

**Table 1: Arbitrary Waveform Generator Specs**

<sup>1</sup> For a two-tone signal, the amplitude will be half for each tone. For wideband signals, the amplitude will also be less than the sinewave amplitude since energy will be distributed among the fundamental and the overtones



Parameter	Specifications
Bit Rates	25 – 64 GBd
Modulation	NRZ and PAM4
Tx Maximum PRBS Amplitude at 26G	750 mVppd (350 mVppd in calibration mode)
Tx Maximum PRBS Amplitude at 53G	500 mVppd (300 mVppd in calibration mode)
Patterns	PRBS 7/9/11/15/20/23/29/31/35/39/41/47
TX Amplitude Adjustment	Steps of 1 mV
TX Equalization	FFE 3 taps or 7 taps
Pre-Emphasis Resolution	±168 steps
Equalizing Filter Spacing	1UI
Random Jitter RMS	290 fs
Rise/ Fall Time (20–80%)	12 ps <sup>2</sup>
Output Return Loss up to 10GHz	< -15dB
Output Return Loss (16-25GHz)	< -10dB

**Table 3: PPG Specs**

<sup>2</sup> With appropriate pre and post emphasis settings and 50 GHz scope

Appendix A: AWG Waveform Examples

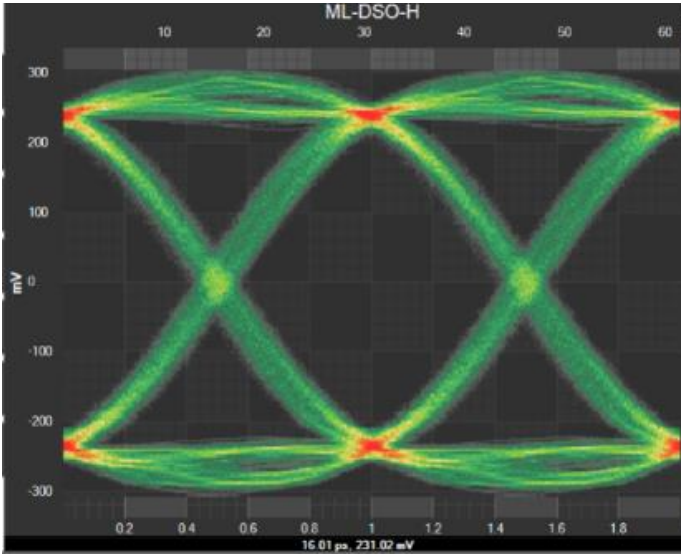


Figure 5: 32.5G NRZ Signal

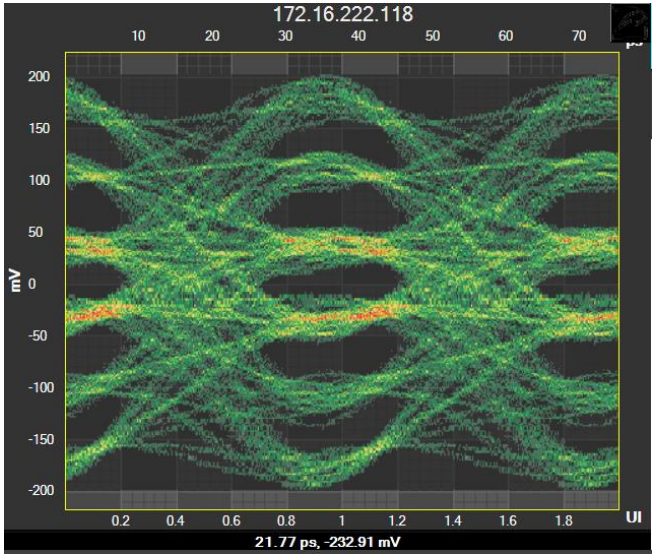


Figure 7: 26.5625G PAM6 Signal

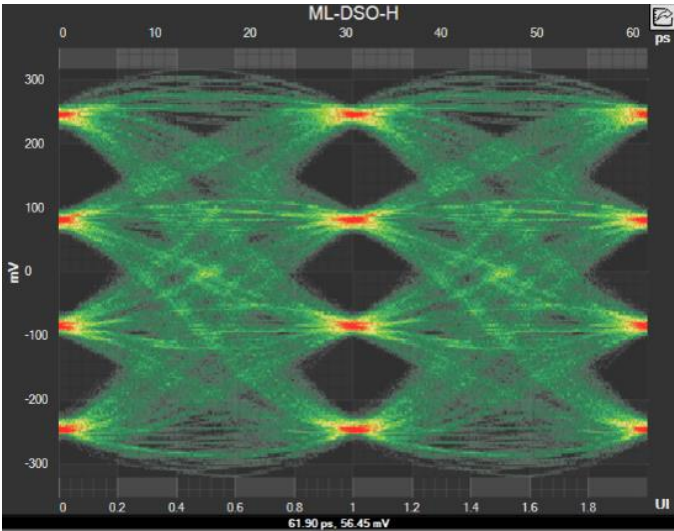


Figure 6: 32.5G PAM4 Signal

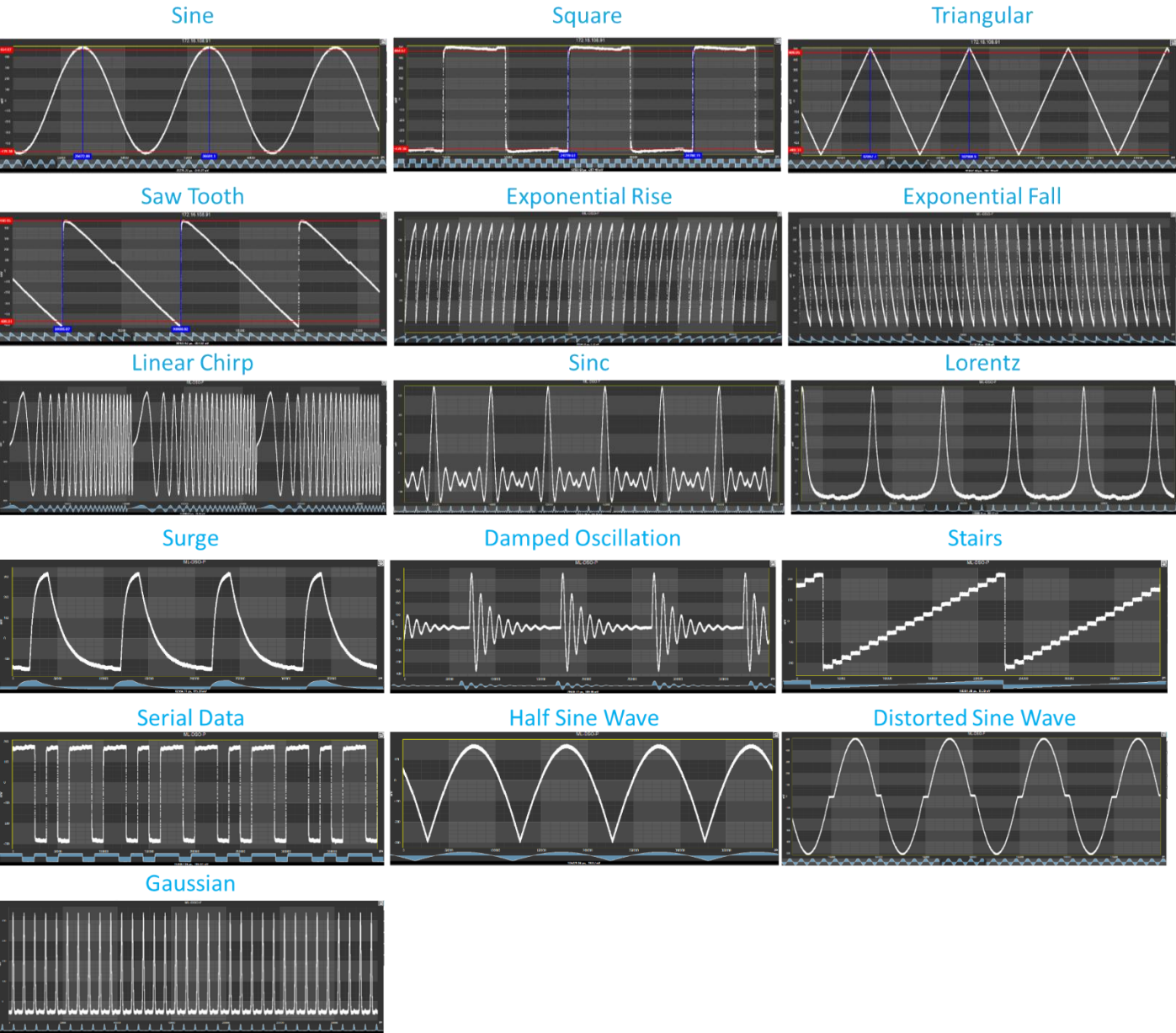


Figure 8: Arbitrary Waveforms, DAC rate 96 GigaSamples/second, Rep Rate 1GHz



## Pinout

Only 1 AT4080 instrument per cassette. A 2<sup>nd</sup> instrument is not allowed in the same cassette due to air-cooling constraints.

Channel pinout is enumerated in the below picture, taking as reference the backplane connector, beginning by TX row with TX1-N, TX1-P to TX4-N, TX4-P.

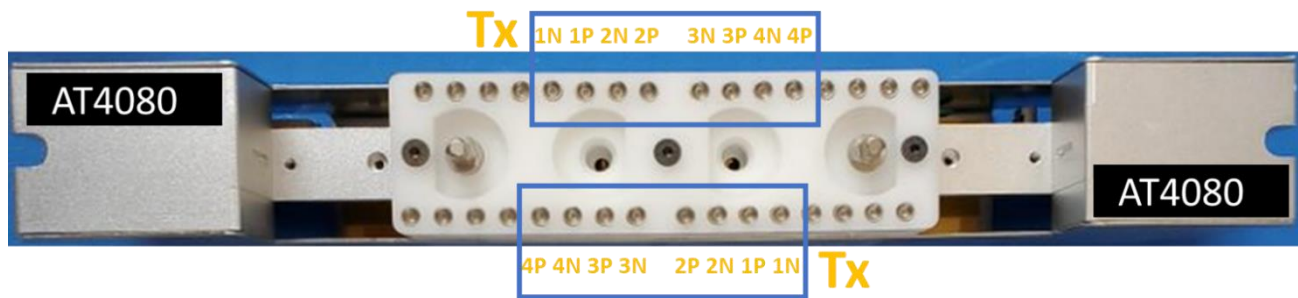


Figure 9: AT4080 Pinout. Only 1 AT4080 per cassette is allowed. No 2nd instrument allowed in same cassette

## Ordering Information

Option	Description
AT4080	4-lane AWG
1YW	1-year standard warranty
3YW	3-year warranty
CAL	Single calibration
3YWC	3-year warranty + 3 annual calibrations

Please contact us at [sales@multilaneinc.com](mailto:sales@multilaneinc.com)