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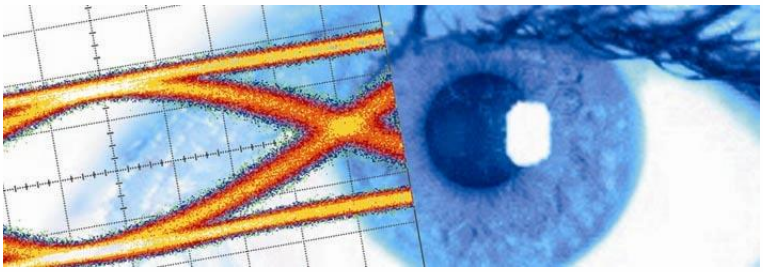
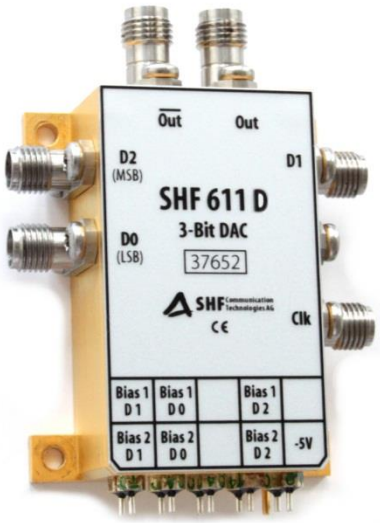


Datasheet

SHF 611 D

32 GBaud 3-Bit DAC



Description

The SHF 611 D a 3-Bit Digital-to-Analog Converter (DAC) operating at data rates up to 32 GBaud for use in broadband test setups and telecom transmission systems. Three 32 Gbps single ended serial data streams are accepted by the DAC and converted into one differential 8-Level data signal at a nominal output data rate of 32 GBaud. By using only two input ports it is possible to convert two single ended input data serial data streams into a 4-Level output signal. A single ended clock signal with the same frequency as the output data rate drives the SHF 611 D.

For data regeneration purposes all input data signals are re-timed by the clock signal. All RF input and output ports are AC-coupled.

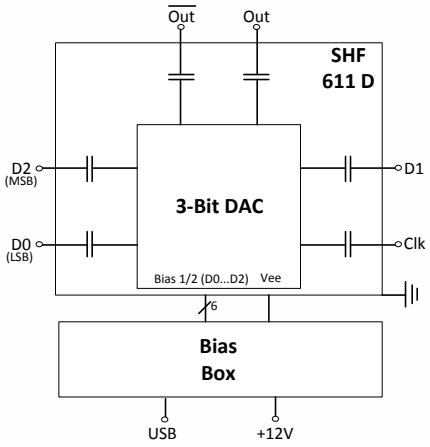
Features

- Broadband operation up to 32 GBaud
- Differential data output, 800 mV single ended output swing
- Single ended clock and data inputs
- Latched input ports
- Output level control
- Bias Box

Applications

- 100G Ethernet development and prototyping
- 200G and 400G systems
- OC-768 / STM-256 applications
- Telecom transmission
- Fibre Channel®
- Broadband test and measurement equipment

Block Diagram



® Fibre Channel is a registered trademark of the Fibre Channel Industry Association

Bias Box

At delivery, the Bias Box SHF 88120 B is mounted on a common base plate, together with the SHF 611 D 3-Bit DAC (Fig.1). All bias voltages are provided by this Bias Box which is controlled by a PC via a USB interface. The easy to use software package is a complementary part of each delivery. For system applications it is possible to remove the Bias Box. In that case the operating voltages have to be supplied by the customer's circuitry.

The Bias Box can only be used with the delivered power supply. Using other power supplies can damage the Bias Box.

Fig. 1: "SHF 611 D + Bias Box"-Assembly

SHF 600 Series Control - Software

At delivery, the software package for a MS Windows installation including a 1.5m USB cable will be provided. Control software for other operating systems is available on request.

Fig. 2: "SHF 600 Series Control" – GUI

Specifications

Parameter	Unit	Symbol	Min.	Typ.	Max.	Comment
Input Parameters						
Data Input Voltage	mV	$V_{data\ in}$	300	500	1000	Clock input amplitude = 500mV
Clock Input Frequency	GHz	f_{in}				Equates to the output data rate
Clock Input Voltage	mV_{pp}	$V_{clk\ in}$	300	500	1000	Data input amplitude = 500mV
External DC Voltage on RF Input Port	V	V_{DCin}	-10		+10	AC coupled input
Output Parameters						
Minimum Output Data Rate	GBaud	$R_{in,min}$			1	
Maximum Output Data Rate	GBaud	$R_{in,max}$	32	38		
Output Amplitude	mV	V_{out}	110		870	Single ended, adjustable up to -6dB, see table on page 5
External DC Voltage on RF Output Port	V	V_{DCout}	-10	0	+10	AC coupled output
Power Requirements (incl. Bias Box)						
Supply Voltage	V	V_{ee}	+11.75	+12	+12.25	
Supply Current	mA	I_{ee}		220	250	
Power Dissipation	W	P_d		2.7		
Power Requirements (DAC-Module only)						
Supply Voltage	V	V_{ee}	-5.2	-5	-4.8	
Supply Current	mA	I_{ee}		350	380	
Power Dissipation	W	P_d		1.8		@ V_{EE} = -5V
Bias Voltages						
Bias Adjust 1 for D0, D1 & D2	V	V_{Bias1}	-3.3		0	
Bias Adjust 2 for D0, D1 & D2	V	V_{Bias2}	-3.3		0	
Conditions						
Case Temperature[1]	°C	T_{case}	10		45	

[1] Tr / Tf of the output data signal can be slightly decreased by applying additional cooling measures like heat sinks or cooling fans.

Output Amplitudes

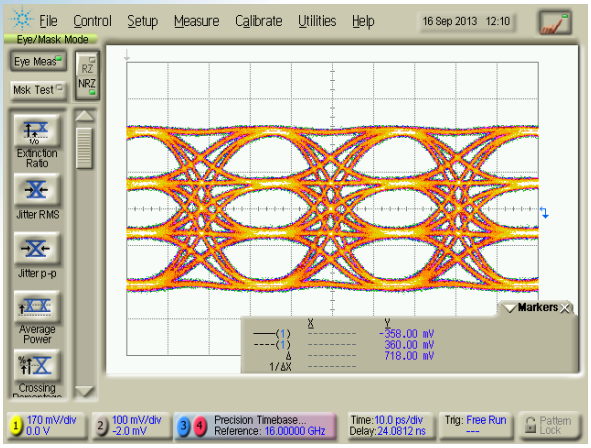
Output amplitudes shown below are adjustable up to -6 dB via “SHF 600 Series Control” - software.

Input D2	Input D1	Input D0	Minimum Output Amplitude [mV]	Typical Output Amplitude [mV]	Maximum Output Amplitude [mV]
-	-	On	**100**	**120**	**140**
-	On	-	**200**	**240**	**270**
-	On	On	**300**	**360**	**400**
On	-	-	**450**	**500**	**550**
On	-	On	**550**	**620**	**700**
On	On	-	**650**	**720**	**800**
On	On	On	**750**	**820**	**900**

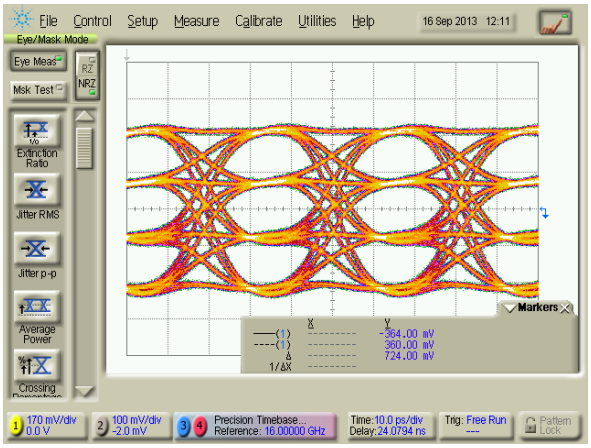
Typical Output Eye Diagrams

The measurements below had been performed using a SHF 12104 A Bit Pattern Generator (PRBS 2^{31}-1) and an Agilent 86100D Digital Communication Analyzer (DCA) with Precision Time Base Module (86107A) and 70 GHz Sampling Head (86118A). The outputs of the DAC module had been connected directly to the DCA input.

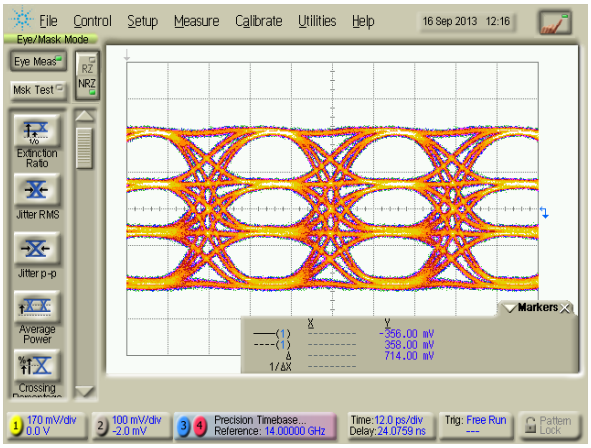
4-Level Output Signal Measurement



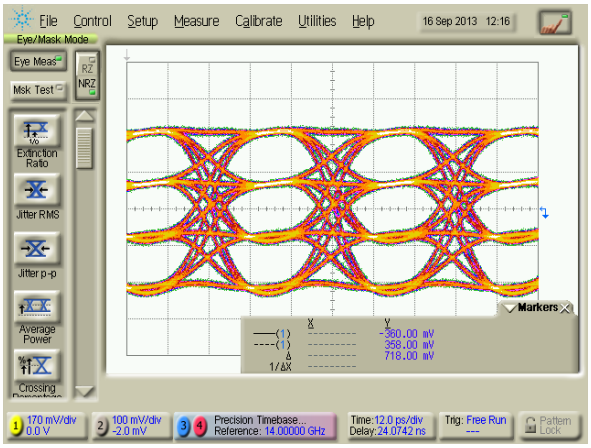
Out @ 32 GBaud



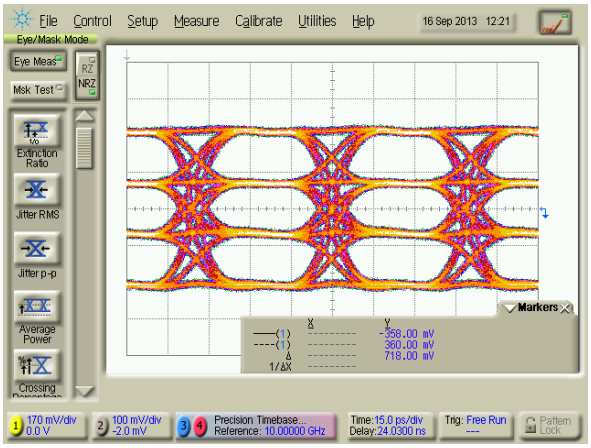
Out! @ 32 GBaud



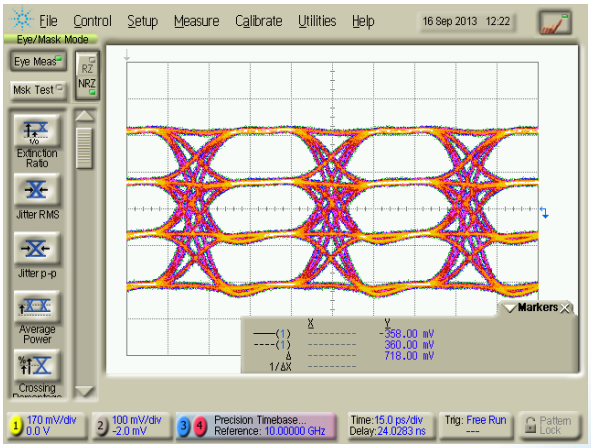
Out @ 28 GBaud



Out! @ 28 GBaud

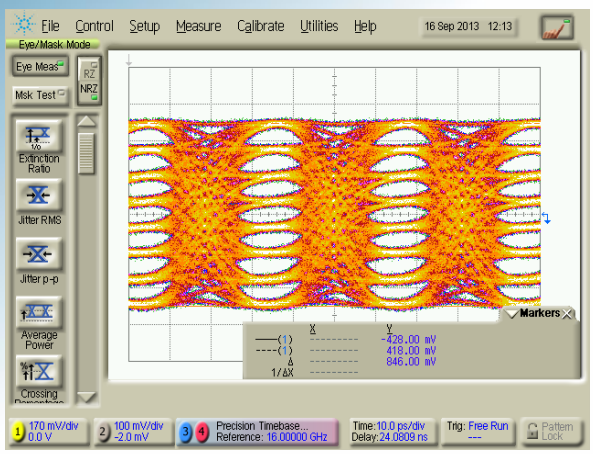


Out @ 20 GBaud

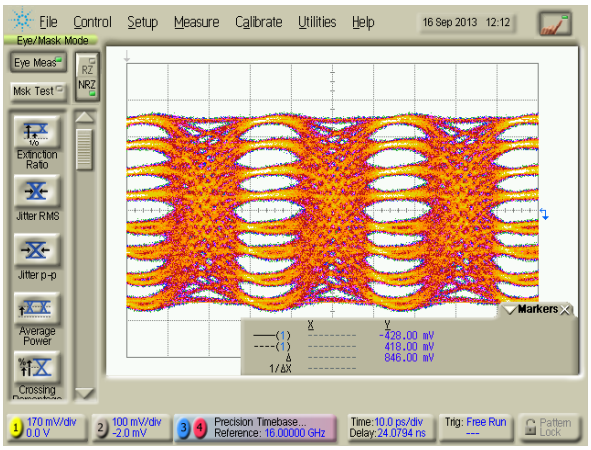


Out! @ 20 GBaud

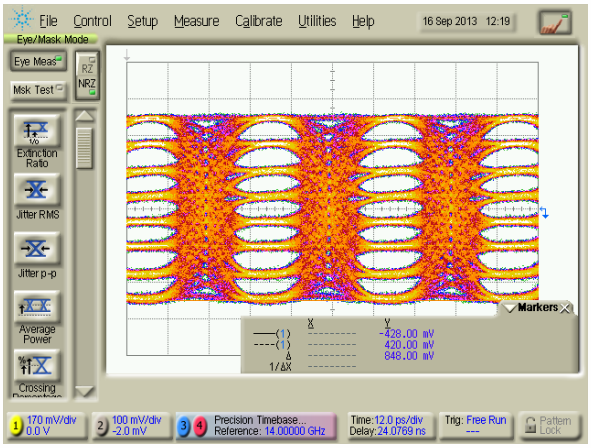
8-Level Output Signal Measurement



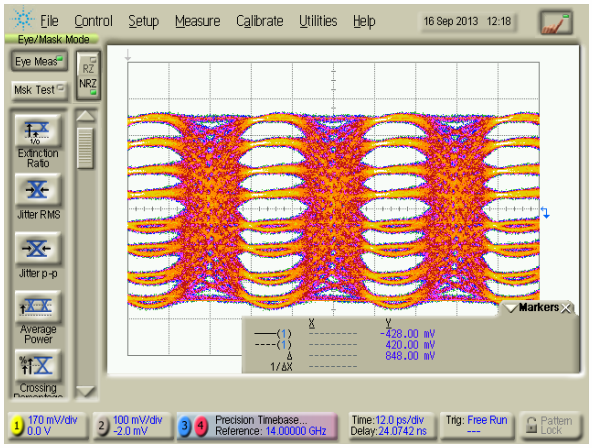
Out @ 32 GBaud



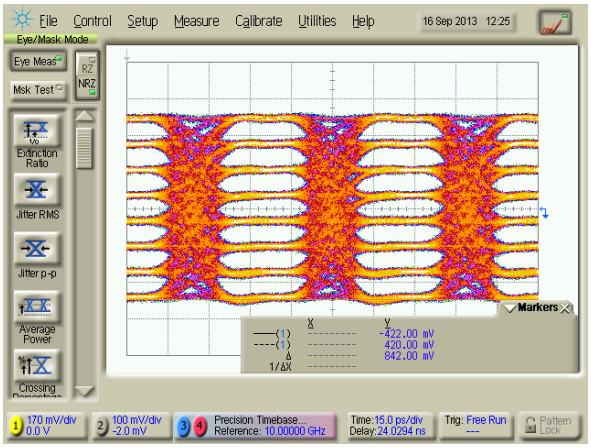
Out! @ 32 GBaud



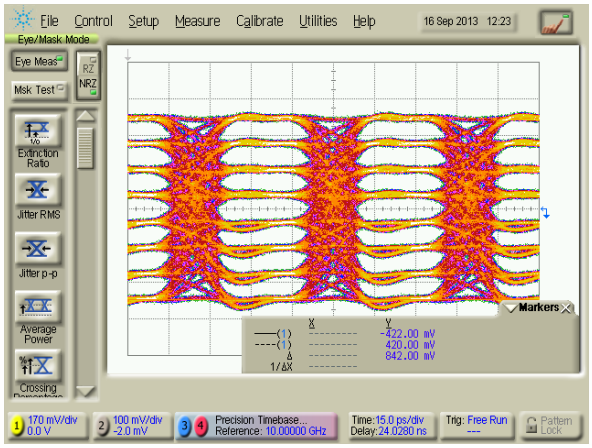
Out @ 28 GBaud



Out! @ 28 GBaud

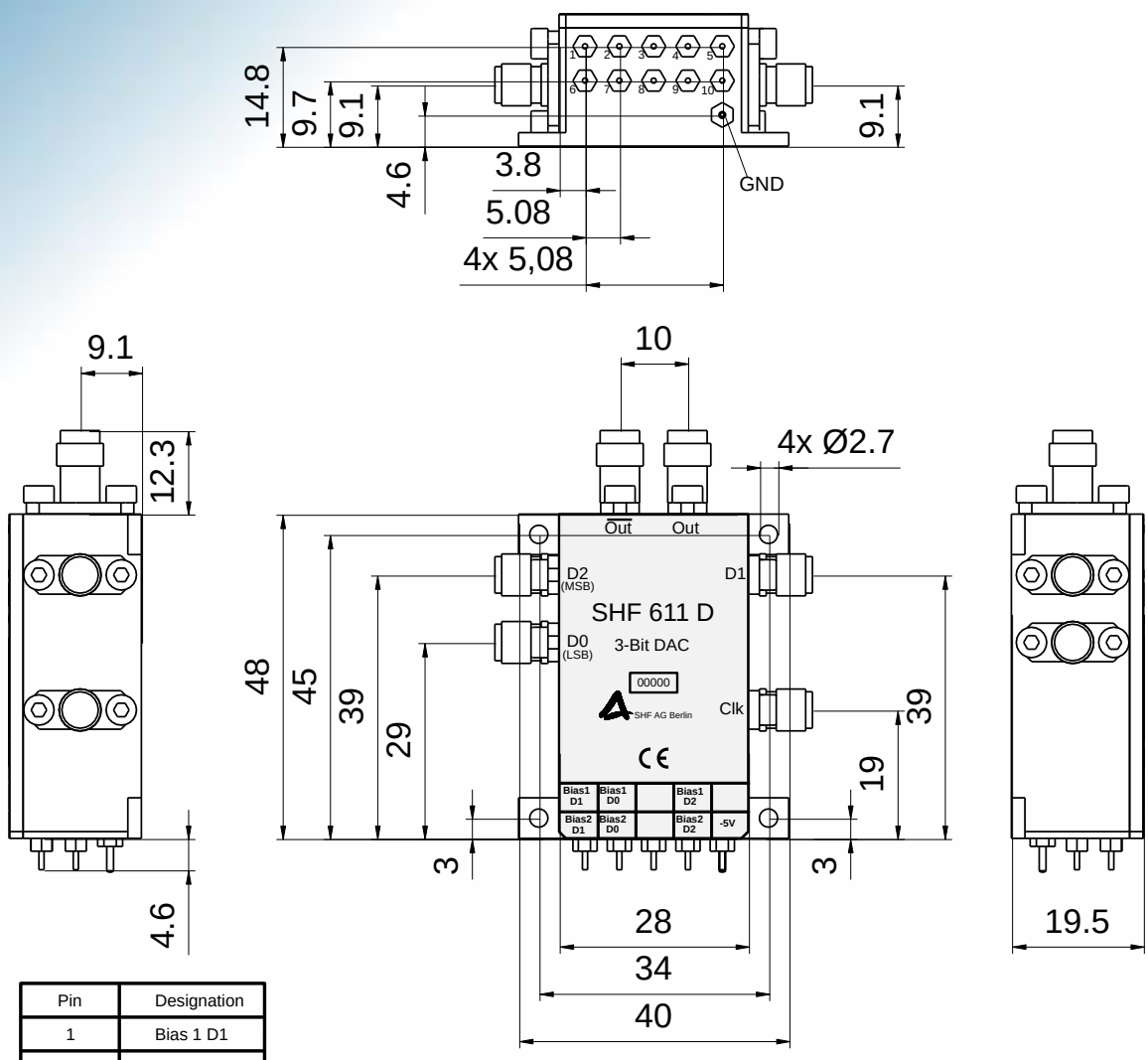


Out @ 20 GBaud



Out! @ 20 GBaud

Outline Drawing - Module

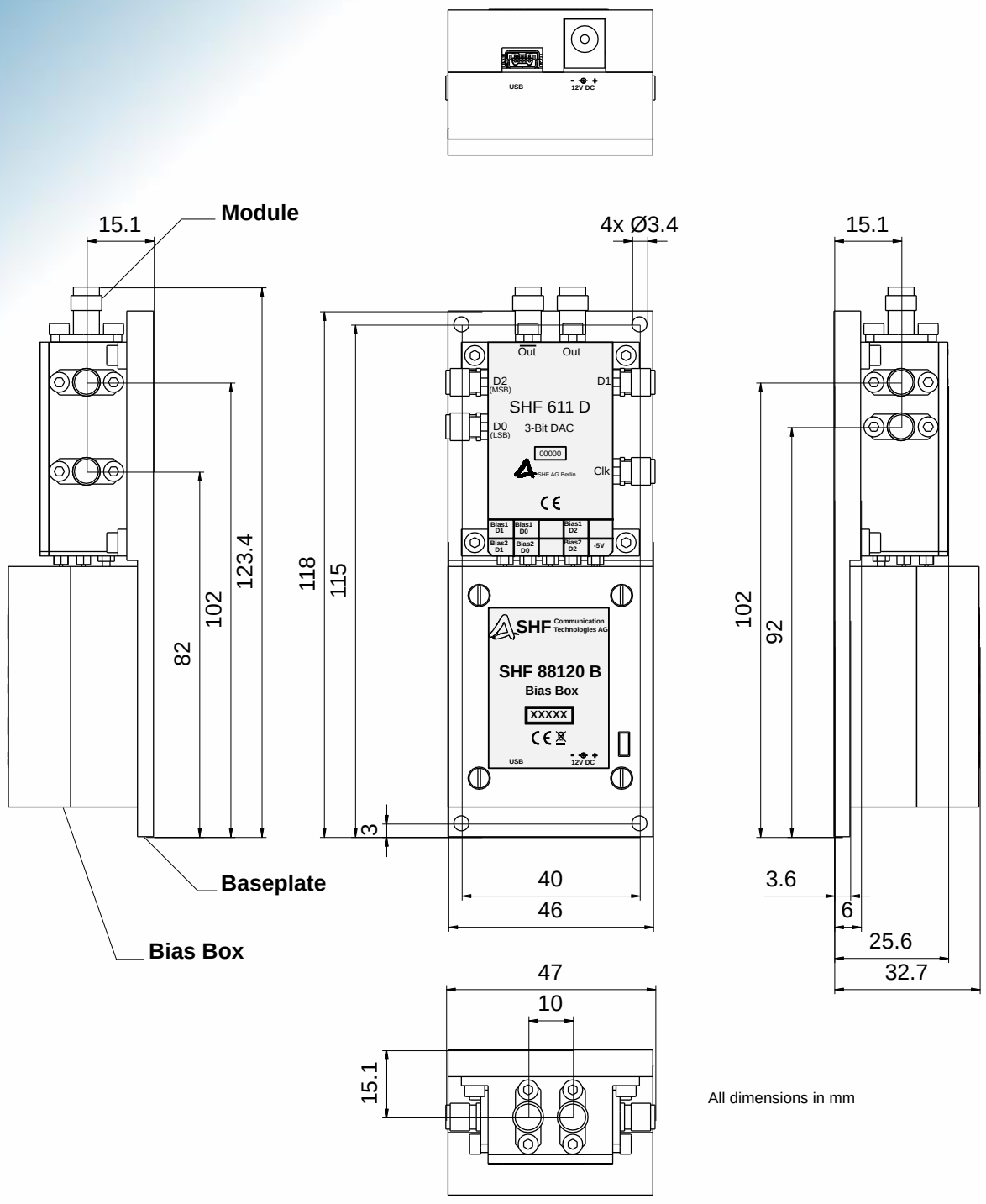


Pin	Designation
1	Bias 1 D1
2	Bias 1 D0
3	nc
4	Bias 1 D2
5	nc
6	Bias 2 D1
7	Bias 2 D0
8	nc
9	Bias 2 D2
10	-5V

All dimensions in mm

Port	Connector
Out	1.85mm (V) female
$\overline{\text{Out}}$	1.85mm (V) female
D0	2.92mm (K) female
D1	2.92mm (K) female
D2	2.92mm (K) female
Clk	2.92mm (K) female

Outline Drawing – “Module + Bias Box”- Assembly



All dimensions in mm