

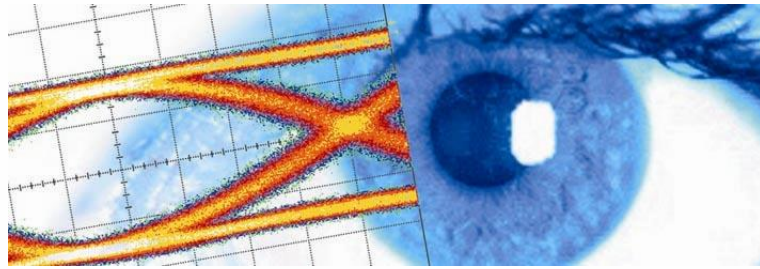


SHF Communication Technologies AG

Wilhelm-von-Siemens-Str. 23D • 12277 Berlin • Germany

Phone +49 30 772051-0 • Fax +49 30 7531078

E-Mail: sales@shf-communication.com • Web: www.shf-communication.com



Datasheet

SHF C603 B

128 Gbps

2:1 Multiplexer





Description

The SHF C603 B is a 2:1 Multiplexer operating at data rates up to 128 Gbps for use in broadband test setups and telecom transmission systems. Two single ended serial data streams of up to 64 Gbps are accepted by the multiplexer and converted into one differential data signal of up to 128 Gbps. A single ended clock signal with a frequency half of the output data rate drives the SHF C603 B. All RF in- and output ports are AC-coupled and internally terminated with 50 Ohm to GND. Unused in- or output ports should be terminated with 50 Ohm.

Features

- Broadband operation up to 128 Gbps
- Differential data output, 500 mV single ended output swing
- Single ended clock and data inputs
- Latched (re-timed and re-shaped) input ports
- Output amplitude, output bandwidth & input threshold level control (remote by software)
- USB interface

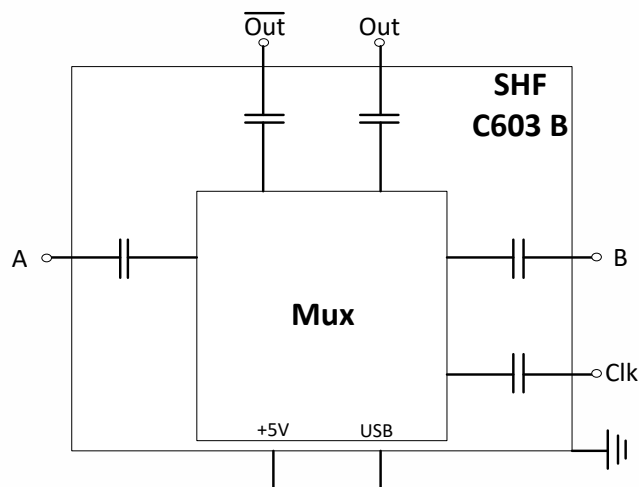
Applications

- 100 Gbps (100GbE), 200 Gbps (200GbE), 400 Gbps (400GbE) & 1 Tbps (TbE) system evaluation
- Telecom transmission
- Broadband test and measurement equipment

Available Option:

- WF: 1.0 mm female connectors at the data output ports instead of 1.85 mm connectors

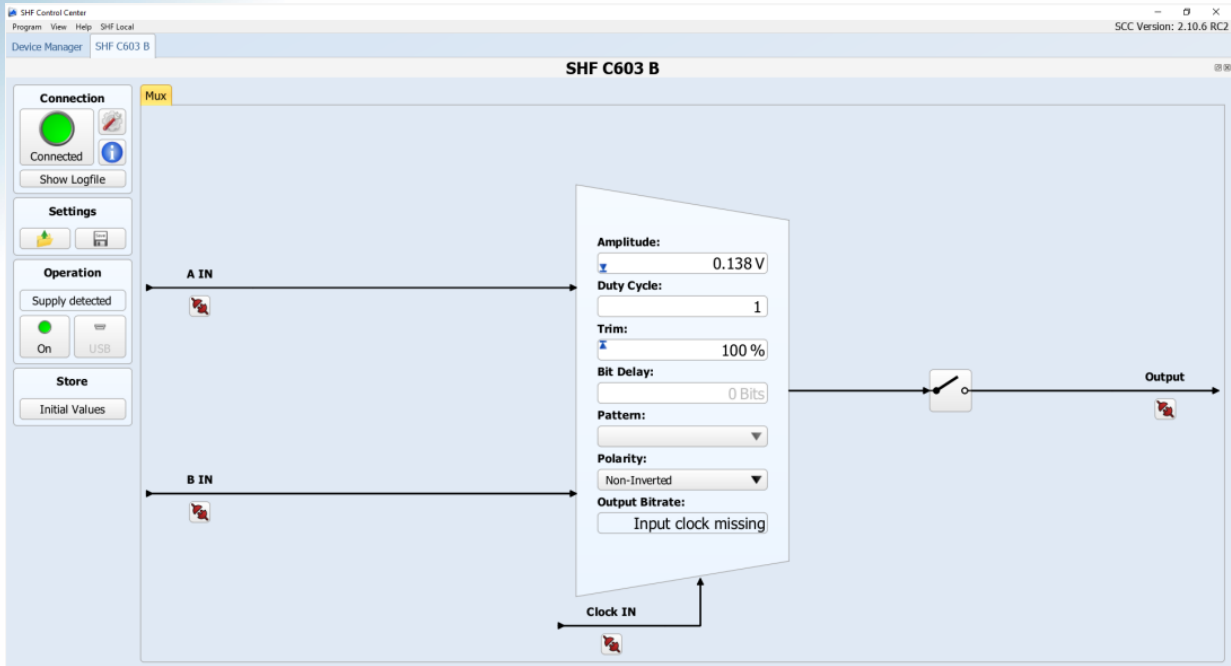
Block Diagram





Remote Interface & Software

The MUX is controlled by the easy to use software package SHF Control Center (SCC). The amplitude, duty cycle, output signal speed (Trim) and the RF output state (on/off) can be set and are displayed in the graphical user interface (GUI).



SHF Control Center (SCC)

Absolute Maximum Ratings

Parameter	Unit	Symbol	Min.	Typ.	Max.	Comment
Input Parameters						
Data Input Voltage	mV	$V_{data\ in}$			900	Peak-to-Peak
Clock Input Voltage	mV	$V_{clk\ in}$			900	Peak-to-Peak
External DC Voltage on RF Input Ports	V	V_{DCin}	-6		+6	AC coupled input
External DC Voltage on RF Output Ports	V	V_{DCout}	-6		+6	AC coupled output
DC Supply Voltage	V	V_{cc}	0		+6	



Specifications

Parameter	Unit	Symbol	Min.	Typ.	Max.	Comment
Input Parameters						
Data Input Voltage	mV	$V_{data\ in}$	300		800	
Minimum Clock Input Frequency	GHz	$f_{in,\ min}$			1.5	
Maximum Clock Input Frequency	GHz	$f_{in,\ max}$	64			
Clock Input Voltage	mV _{pp}	$V_{clk\ in}$	300		800	
Output Parameters						
Minimum Output Data Rate	Gbps	$R_{out,\ min}$			3	@ 500 mV _{pp} clock input
Maximum Output Data Rate	Gbps	$R_{out,\ max}$	128			@ 500 mV _{pp} clock input
Maximum Output Voltage	mV	V_{out}	400	500	600	single ended, adjustable up to -6 dB
Rise / Fall time	ps	t_r/t_f		4	5.5	20 % / 80 %; @ Trim=100 %; on scope display
Output Jitter, RMS value ¹	fs	J_{rms}		350 450	450 550	≤ 100 Gbps > 100 Gbps on scope display
Power Requirement						
Supply Voltage	V	V_{cc}	+5	5.2	+5.5	2.5 x 0.7 mm DC Power Jack
Supply Current	mA	I_{cc}		790		
Power Dissipation	W	P_d		4.1		@ $V_{cc} = +5\ V$
Mechanical Characteristics						
Input Connectors	Ω			50		1.85 mm (V) female
Output Connectors	Ω			50		1.85 mm (V) female
Dimensions	mm					see pages 9/10
Weight	g			90 430		without heat sink with heat sink
Conditions						
Case Temperature ²	°C	T_{case}	10		45	

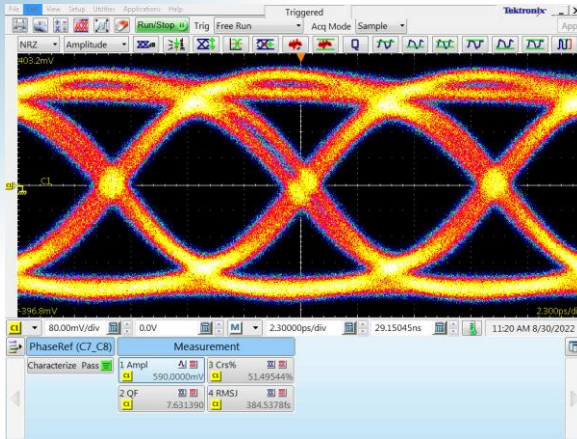
¹ Test condition: Clock Input Signal Jitter_{RMS} < 150 fs

² Tr / Tf of the output data signal can be slightly decreased by applying additional cooling measures like heat sinks or cooling fans.

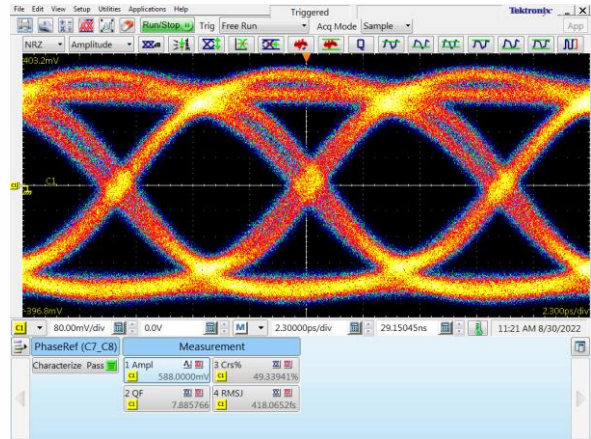


Typical Output Eye Diagrams

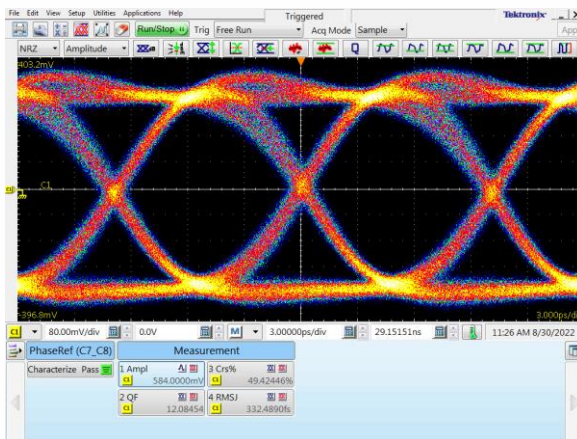
The measurements below had been performed using a SHF 12105 A Bit Pattern Generator (PRBS $2^{31}-1$) and a Tektronix DSA 8300 Digital Serial Analyzer (DSA) with Phase Reference Module (82A04B-60G) and 70 GHz Sampling Module (80E11). The outputs of the MUX module had been connected directly to the DSA input.



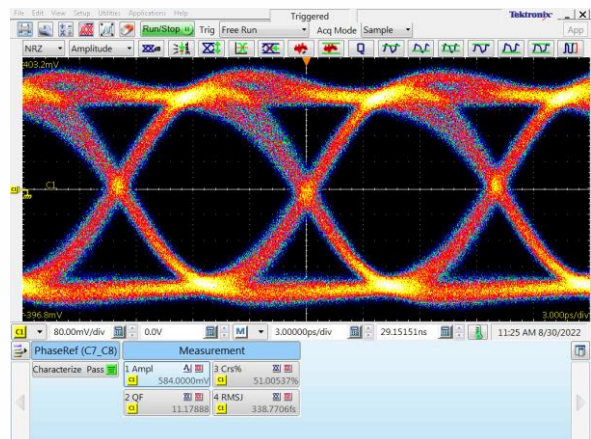
Out @ 128 Gbps



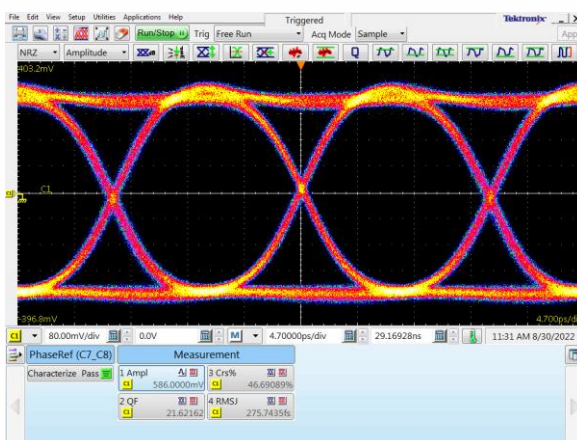
Out inv. @ 128 Gbps



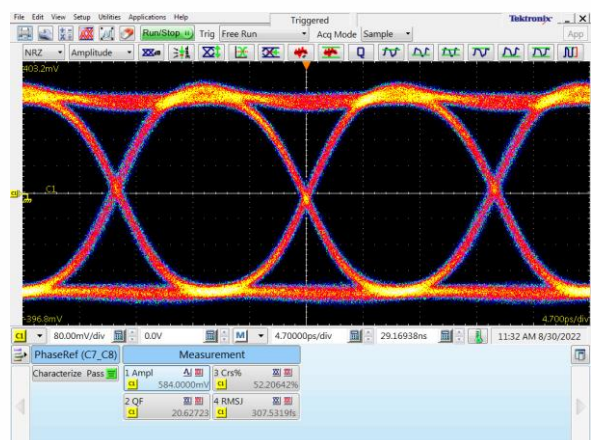
Out @ 100 Gbps



Out inv. @ 100 Gbps



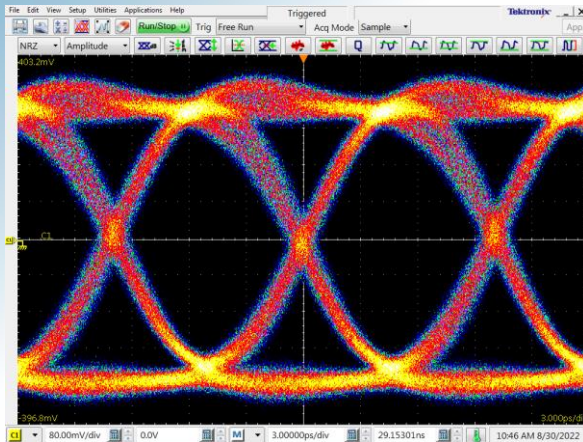
Out @ 64 Gbps



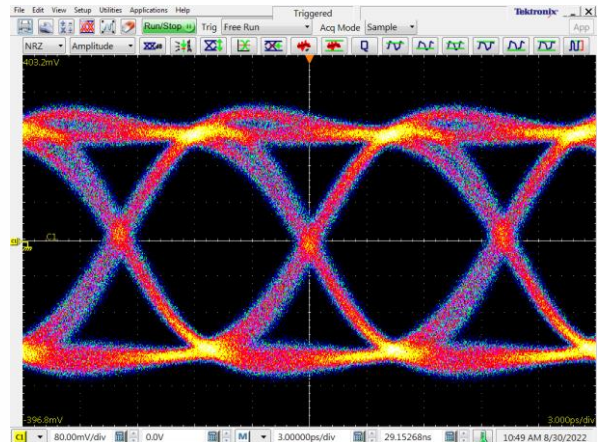
Out inv. @ 64 Gbps



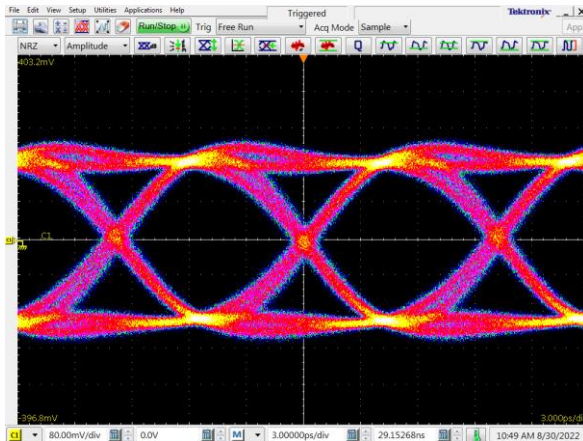
Output Amplitude Adjustment



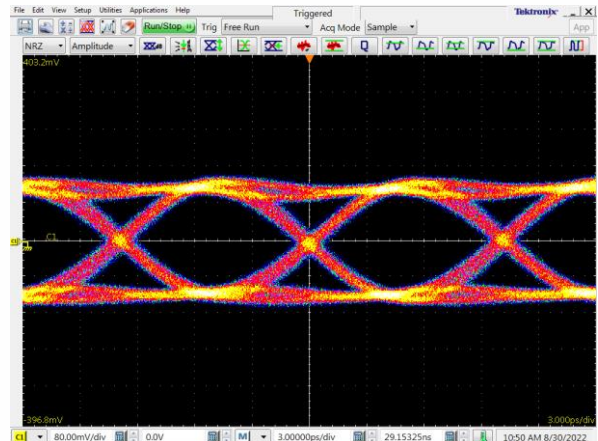
100 Gbps @ 500 mV



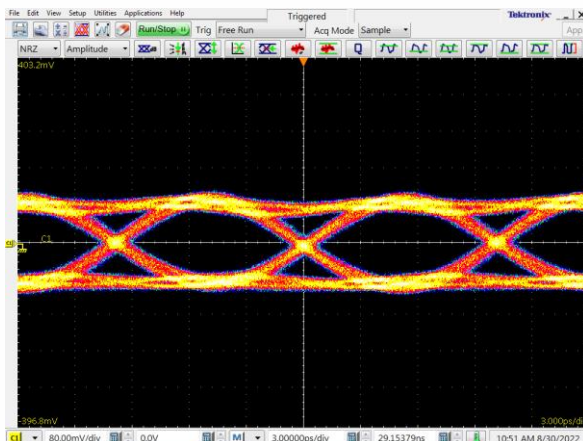
100 Gbps @ 400 mV



100 Gbps @ 300 mV



100 Gbps @ 200 mV

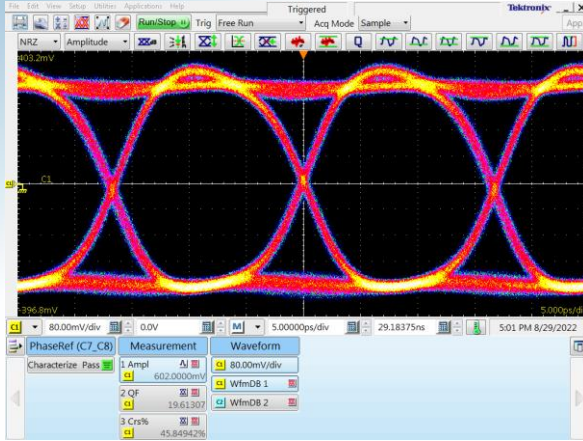


100 Gbps @ 150 mV

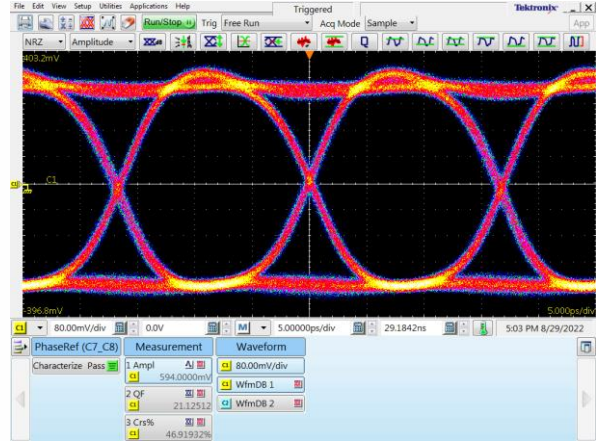


Output Signal Speed (TRIM) - Adjustment

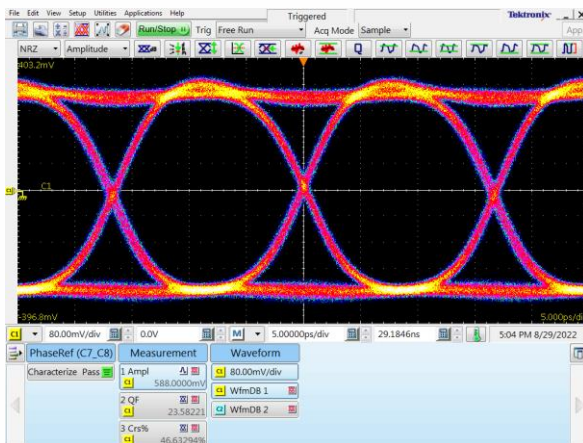
The rise and fall time of the output signal can be varied with the TRIM function. It is possible to reduce the overshoot of the signal edges at lower operating bit rates, shown at 60 Gbps below.



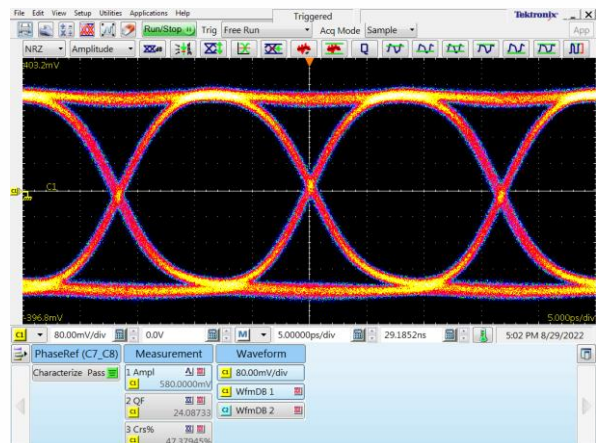
60 Gbps @ TRIM = 100 %



60 Gbps @ TRIM = 50 %



60 Gbps @ TRIM = 25 %



60 Gbps @ TRIM = 0 %

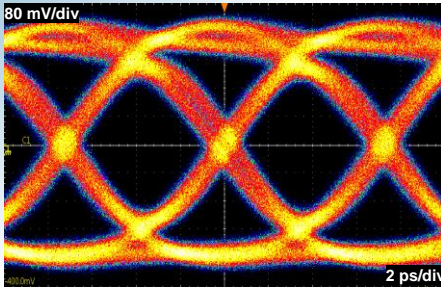


Oscilloscope comparison

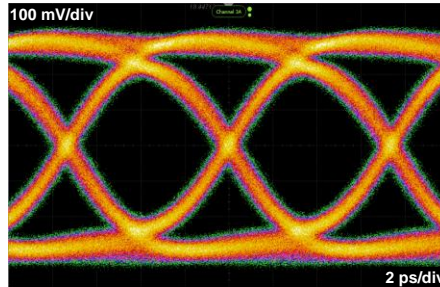
The measurements below had been performed using a SHF 12105 A Bit Pattern Generator (PRBS $2^{20}-1$), a Tektronix DSA 8300 Digital Serial Analyzer (DSA) with Phase Reference Module (82A04B-60G) and 70 GHz Sampling Module (80E11) and a Keysight DCA N1000A with Precision Timebase and 122 GHz Sampling Module (N1046A). The outputs of the MUX module had been connected directly to the DSA/DCA input. Measurements with the Keysight DCA will not be part of the inspection report delivered with each particular device.

Tektronix DSA / BW = 70 GHz

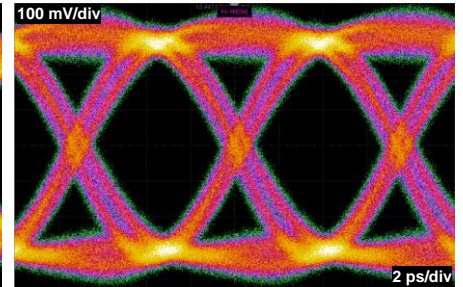
Keysight DCA / BW = 122 GHz



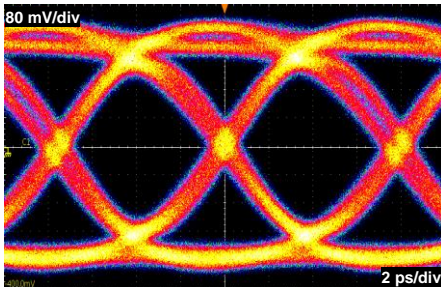
138 Gbps measurement



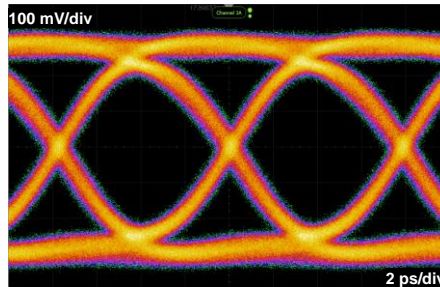
138 Gbps measurement



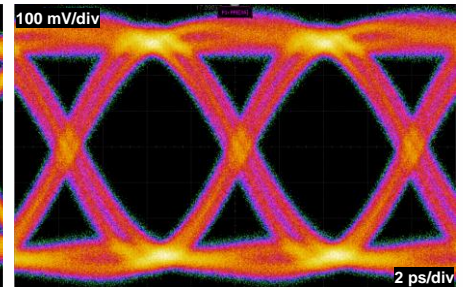
138 Gbps measurement
+ Linear FFE (7-Tap with 2 pre cursors)



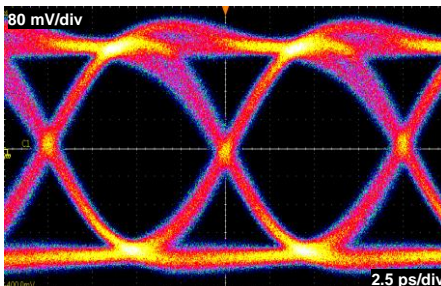
128 Gbps measurement



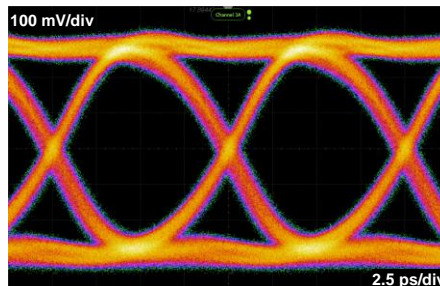
128 Gbps measurement



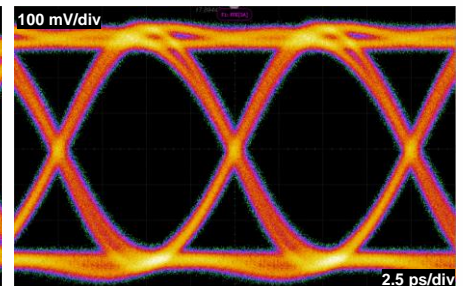
128 Gbps measurement
+ Linear FFE (7-Tap with 2 pre cursors)



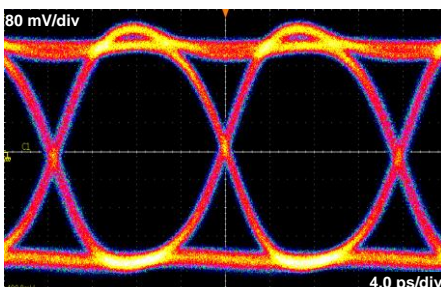
100 Gbps measurement



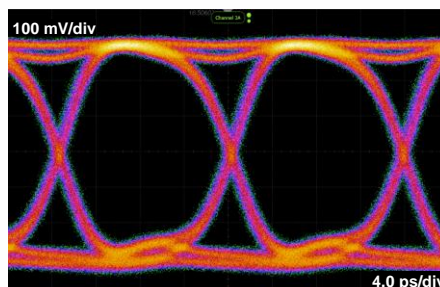
100 Gbps measurement



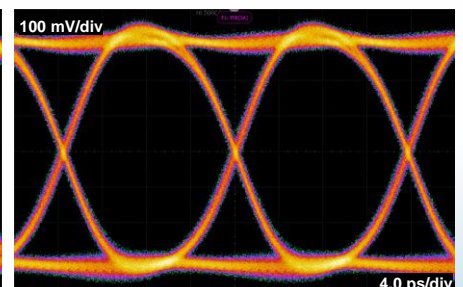
100 Gbps measurement
+ Linear FFE (7-Tap with 2 pre cursors)



64 Gbps measurement



64 Gbps measurement



64 Gbps measurement
+ Linear FFE (7-Tap with 2 pre cursors)

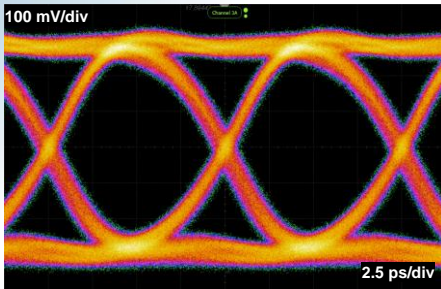


Output signals with recommended output amplifier

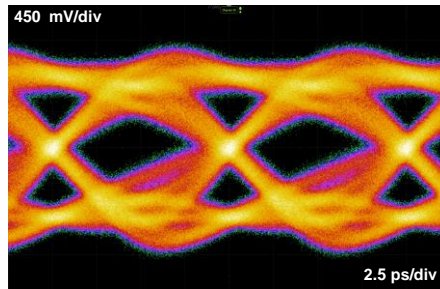
The measurements below had been performed using a SHF 12105 A Bit Pattern Generator (PRBS $2^{13}-1$), a Keysight DCA N1000A with Precision Timebase and 122 GHz Sampling Module (N1046A). The outputs of the MUX module had been connected directly to the amplifier input. The output of the amplifier had been connected with a 20 dB attenuator to the DCA input.

Output SHF C603 B

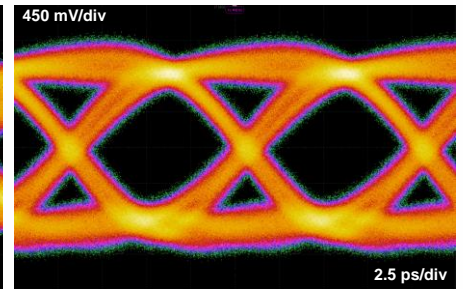
Output SHF M827 B –VMVF



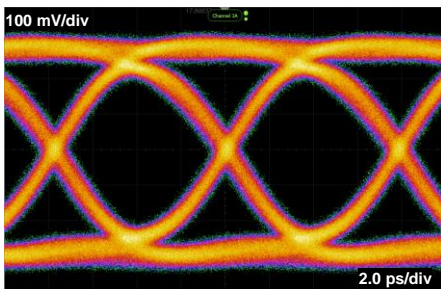
100 Gbps measurement
Eye Amplitude = 500 mV



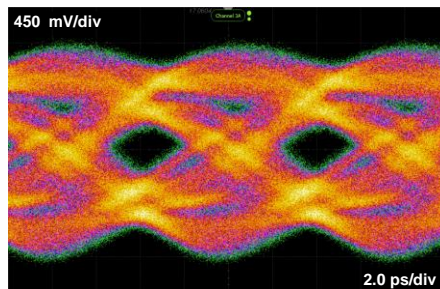
100 Gbps measurement
Eye Amplitude = 1700 mV



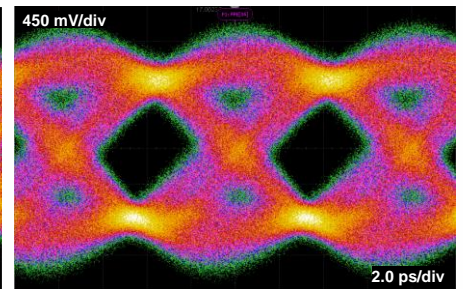
100 Gbps measurement
+ Linear FFE (8-Tap with 2 pre cursors)



128 Gbps measurement
Eye Amplitude = 500 mV



128 Gbps measurement
Eye Amplitude = 1500 mV



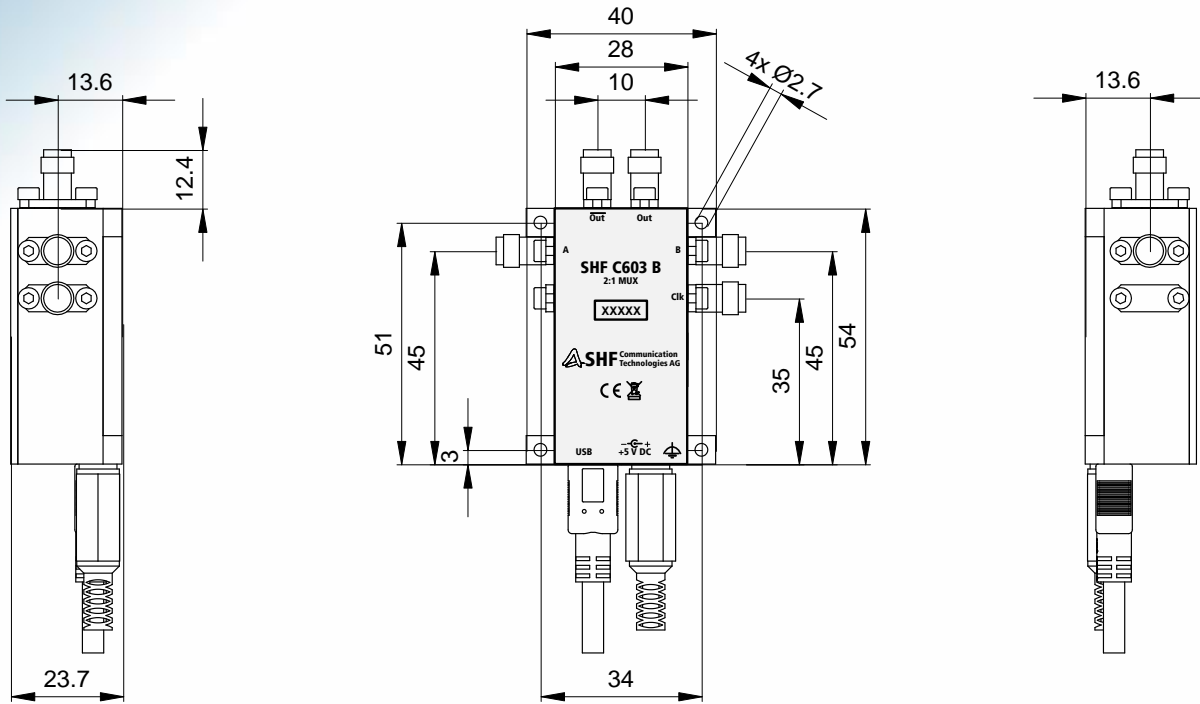
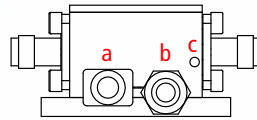
128 Gbps measurement
+ Linear FFE (8-Tap with 2 pre cursors)

For more information about SHFs amplifiers, please refer to:

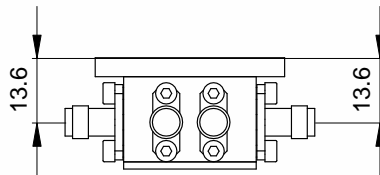
<https://www.shf-communication.com/products/rf-broadband-amplifiers/>



Outline Drawing – Module



Port	Connector
Out	1.85mm (V) female
Out	1.85mm (V) female
A	1.85mm (V) female
B	1.85mm (V) female
Clk	1.85mm (V) female

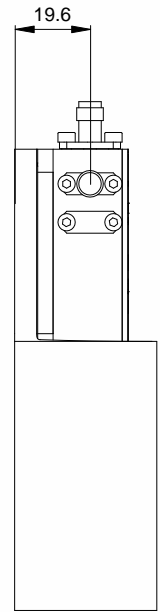
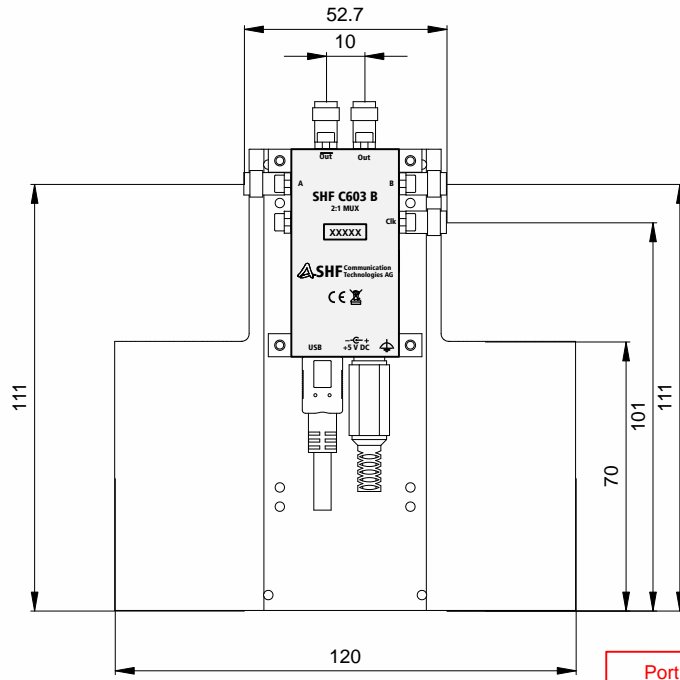
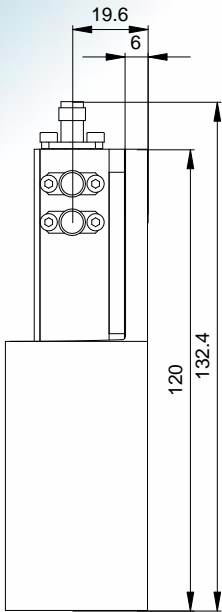
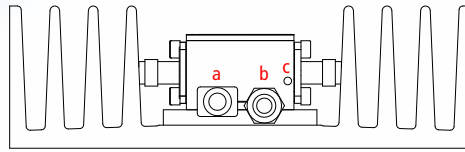


Port	Connector
a	Mini-USB
b	Power
c	Functional earth (FE)

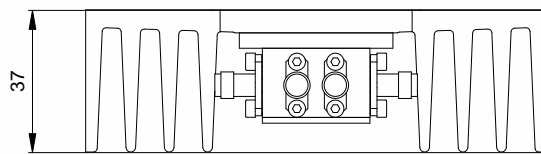
all dimensions in mm



Outline Drawing – Module with Heat Sink



Port	Connector
Out	1.85mm (V) female
Out	1.85mm (V) female
A	1.85mm (V) female
B	1.85mm (V) female
Clk	1.85mm (V) female

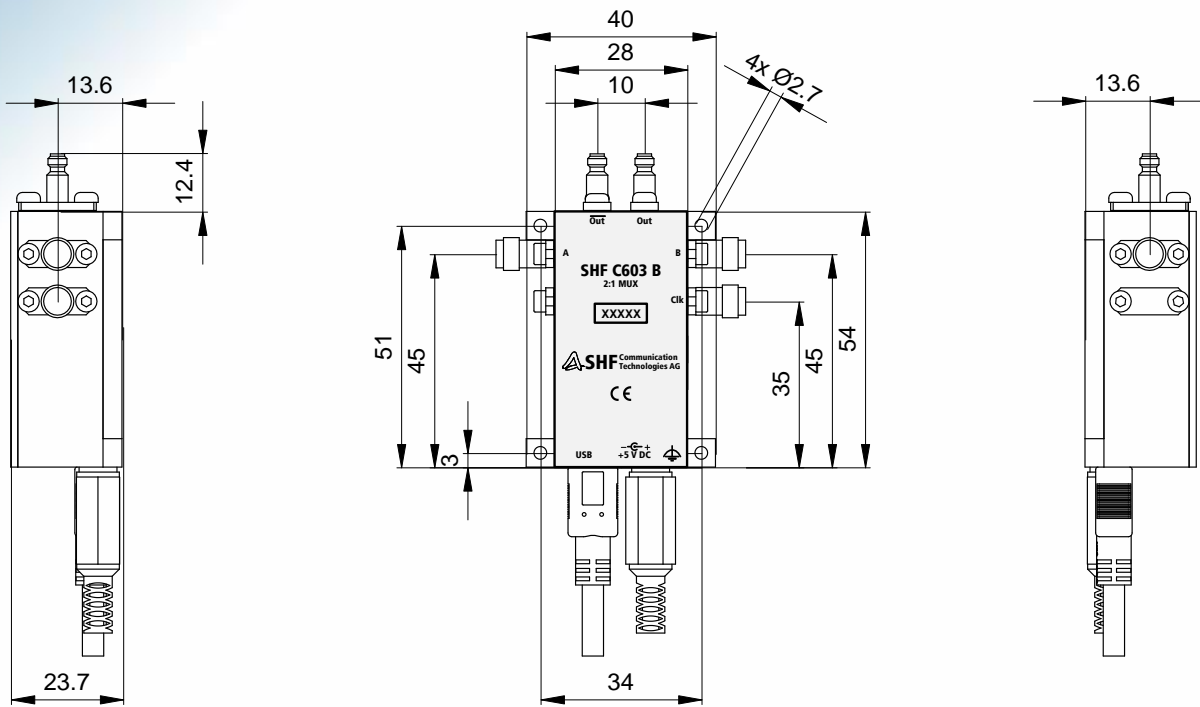
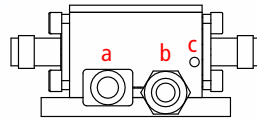


Port	Connector
a	Mini-USB
b	Power
c	Functional earth (FE)

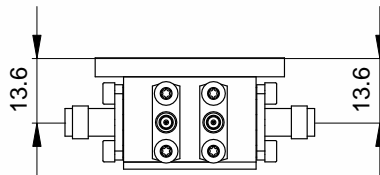
all dimensions in mm



Outline Drawing – Module -Option WF



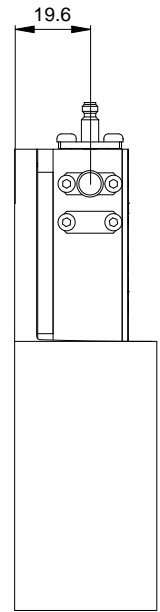
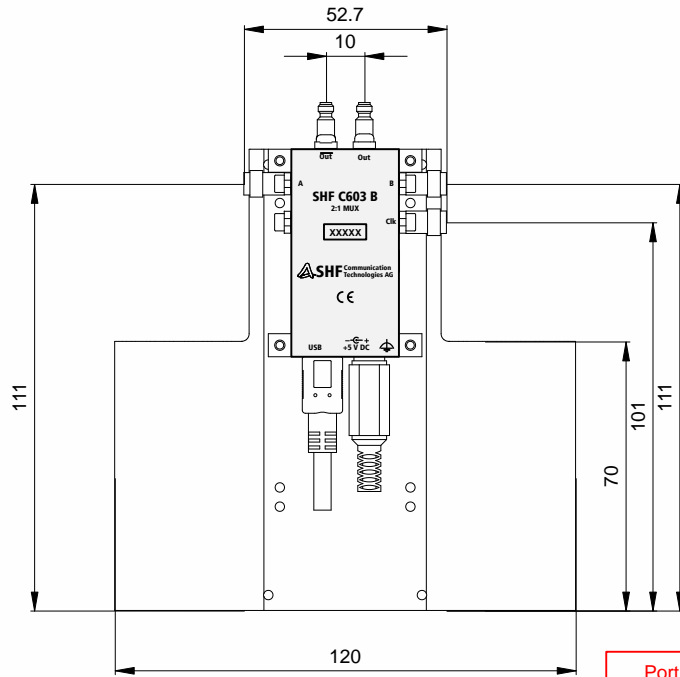
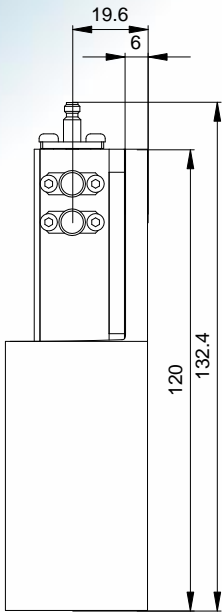
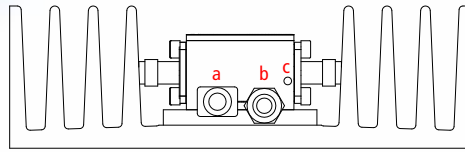
Port	Connector
Out	1.00mm (W) female
Out	1.00mm (W) female
A	1.85mm (V) female
B	1.85mm (V) female
Clk	1.85mm (V) female



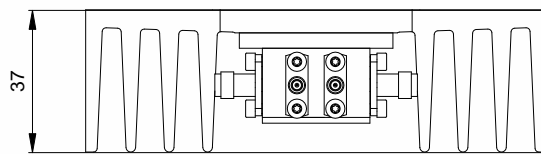
Port	Connector
a	Mini-USB
b	Power
c	Functional earth (FE)



Outline Drawing – Module with Heat Sink -Option WF



Port	Connector
Out	1.00mm (W) female
Out	1.00mm (W) female
A	1.85mm (V) female
B	1.85mm (V) female
Clk	1.85mm (V) female



Port	Connector
a	Mini-USB
b	Power
c	Functional earth (FE)