

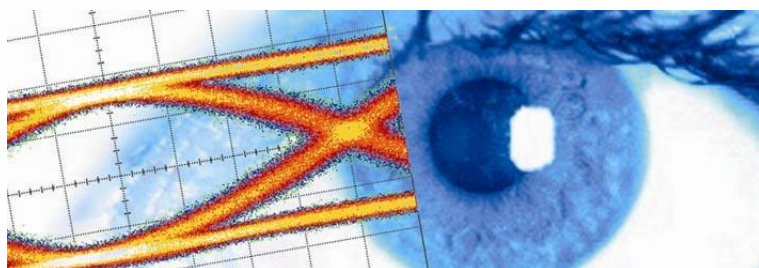


## SHF Communication Technologies AG

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# Datasheet

## SHF 604 A

### 80 Gbps

### 2:1 Power-Multiplexer





## Description

The SHF 604 A is a 2:1 Multiplexer operating at data rates up to 80 Gbps for use in broadband test setups and telecom transmission systems. Two single ended serial data streams of up to 40 Gbps are accepted by the multiplexer and converted into one differential data signal of up to 80 Gbps. A single ended clock signal with a frequency half of the output data rate drives the SHF 604 A.

For data regeneration purposes all input data signals are re-sampled to mitigate any signal impairments resulting e.g. from long cables. Therefore, it becomes possible to place the MUX very close to the DUT.

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 80 Gbps
- Differential data output, 2.8 V differential output swing (1.4 V in single-ended operation)
- Single ended clock and data inputs
- Output Level Control (remote by software)

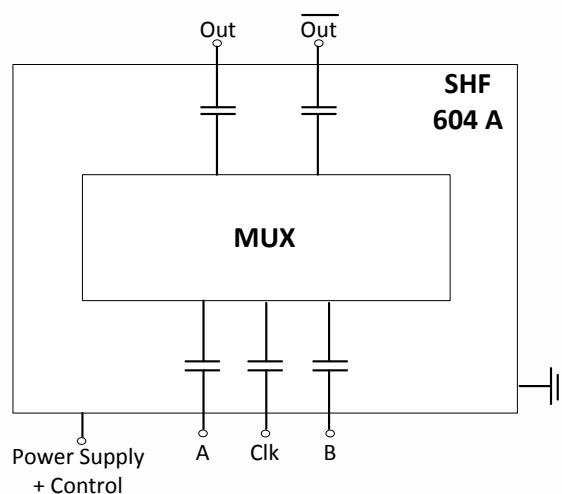
## Applications

- 100, 200 and 400 Gbps system evaluation & development
- Telecom transmission
- Broadband test and measurement equipment

## Options

- Option Case: MUX module, power supplies, heat sink and 1.85 mm panel adaptors are housed in a small benchtop case.

## Block Diagram





## Module Variants

In addition to the MUX itself, the power supplies, USB cable and heat sink are complementary parts of each delivery. It is recommended to use the MUX only with the delivered power supply module. The heat sink can be removed by the customer. In this case it is required to provide other cooling measures to ensure that the maximum case temperature specified on page 6 will not be exceeded.



SHF 604 A

With Option Case the SHF 604 A MUX module, the power supplies, heat sink and the Mini-SMP to 1.85 mm panel adaptors are housed in a small benchtop case that can be easily embedded in the customer's test environment.



SHF 604 A – incl. Opt. Case



## Ease of Use

The easy to use software package, the SHF 600 Series Control, is the most convenient way to control the output amplitude of the MUX.

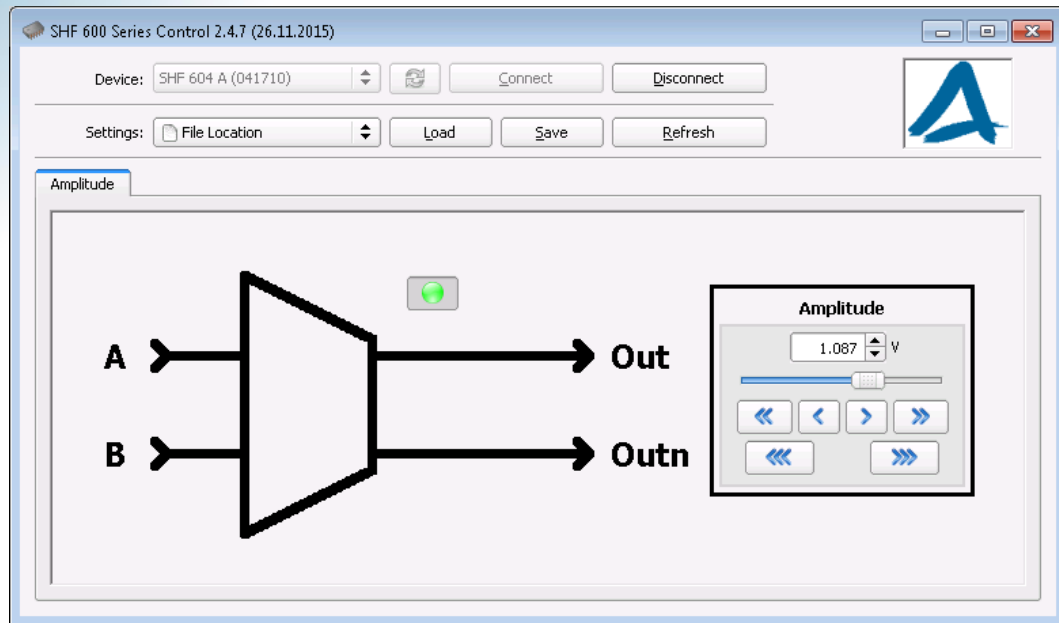


Fig. 1: "SHF 600 Series Control" – GUI



## Absolute Maximum Ratings

Parameter	Unit	Symbol	Min.	Typ.	Max.	Comment
<b>Input Parameters</b>						
Data Input Voltage	mV <sub>pp</sub>	V <sub>data in</sub>			900	
Clock Input Voltage	mV <sub>pp</sub>	V <sub>clk in</sub>			900	
External DC Voltage on RF Input Ports	V	V <sub>DCin</sub>	-10		+10	AC coupled input
External DC Voltage on RF Output Ports	V	V <sub>DCout</sub>	-10		+10	AC coupled output
DC Supply Voltages (MUX-Module)	V	V <sub>ee</sub>	-5.5		0	
		V <sub>cc</sub>	0		+6.0	

## Specifications

Parameter	Unit	Symbol	Min.	Typ.	Max.	Comment
<b>Input Parameters</b>						
Data Input Voltage	mV	V <sub>data in</sub>	300		800	500 mV recommended
Clock Input Voltage	mV <sub>pp</sub>	V <sub>clk in</sub>	300		800	500 mV recommended
Min. Clock Input Frequency	GHz	f <sub>in</sub>		1	2	
Max. Clock Input Frequency	GHz	f <sub>in</sub>	40			
<b>Output Parameters</b>						
Min. Output Data Rate	Gbps	R <sub>out,min</sub>		2	4	
Max. Output Data Rate	Gbps	R <sub>out,max</sub>	80			
Max. Output Amplitude	mV	V <sub>out</sub>	1300	1400		Single ended, adjustable up to -6dB
Rise / Fall time <sup>2</sup>	ps	t <sub>r</sub> /t <sub>f</sub>		6	8	20% / 80%
Output Jitter, RMS value <sup>1,2</sup>	fs	J <sub>rms</sub>		300	450	
Differential Output Skew	ps	t <sub>skew</sub>		±1	±2	

<sup>1</sup> Test condition: Clock Input Signal Jitter<sub>RMS</sub> < 150 fs

<sup>2</sup> Measured on scope display



Parameter	Unit	Symbol	Min.	Typ.	Max.	Comment
<b>Power Requirements (incl. Power Supply Module)</b>						
Supply Voltage	V	$V_c$	+11.5	+12	+12.5	2.1 mm DC Power Jack
Supply Current	mA	$I_c$		460		
Power Dissipation	W	$P_d$		5.5		@ $V_c = +12V$
<b>Power Requirements (with Option Case)</b>						
Supply Voltage	V	$V_c$	+11.5	+12	+12.5	2.1 mm DC Power Jack
Supply Current	mA	$I_c$		670	750	
Power Dissipation	W	$P_d$		8.0	9.0	@ $V_c = +12V$
<b>Conditions</b>						
Case Temperature <sup>3</sup>	°C	$T_{case}$	10		45	

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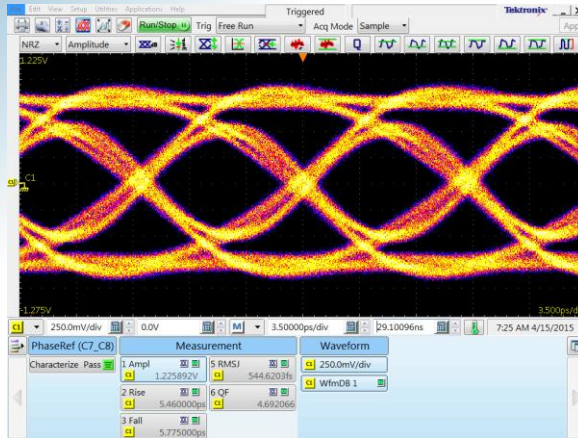
<sup>3</sup> Tr / Tf of the output data signal can be slightly decreased by applying additional cooling measures like heat sinks or cooling fans.



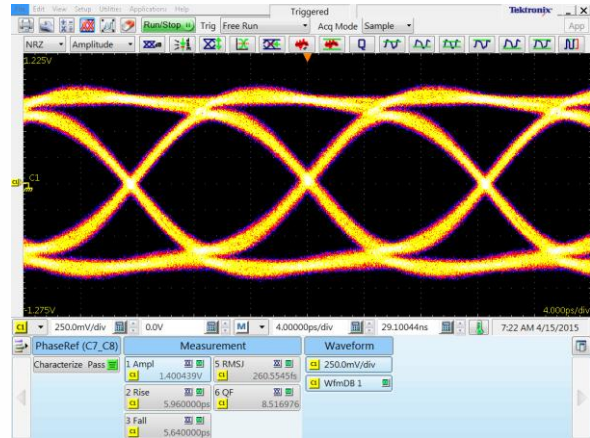


## Typical Output Eye Diagrams

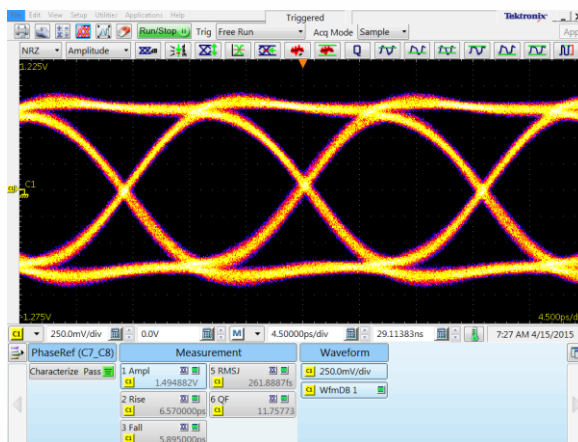
The measurements below had been performed using a SHF 12104 A Bit Pattern Generator (PRBS  $2^{31}-1$ ) and a Tektronix DSA 8300 Digital Serial Analyzer (DSA) with Phase Reference Module (82A04B-60G) and 70 GHz Sampling Module (80E11). The output of the MUX module had been connected directly to the DCA input with a 10 dB attenuator.



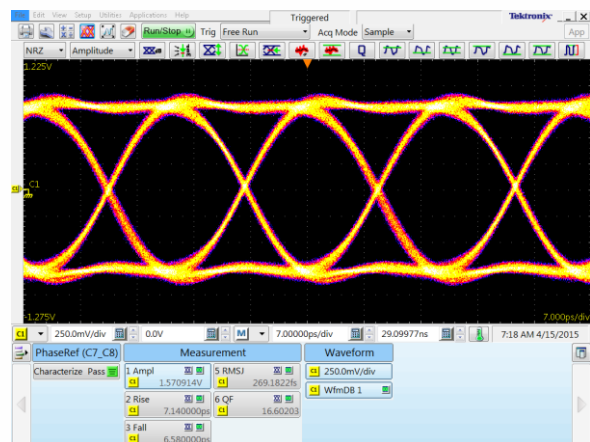
Out @ 100 Gbps



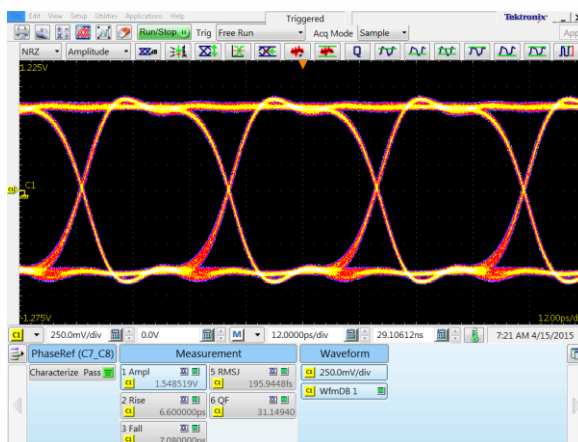
Out @ 80 Gbps



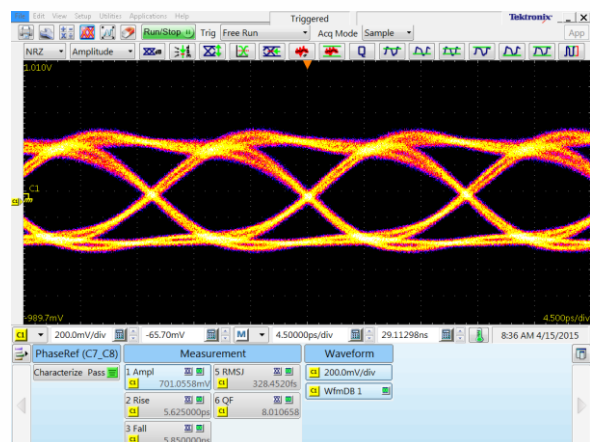
Out @ 70 Gbps



Out @ 60 Gbps



Out @ 32 Gbps

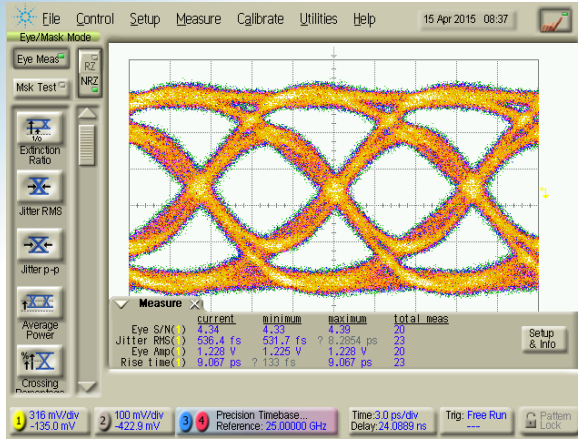


Out @ 80 Gbps, Level = -6 dB

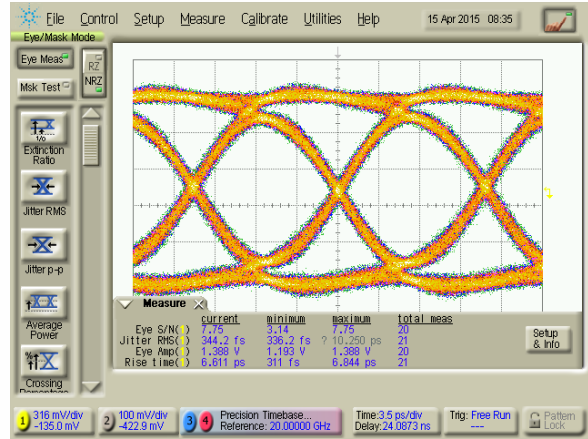


## Typical Output Eye Diagrams

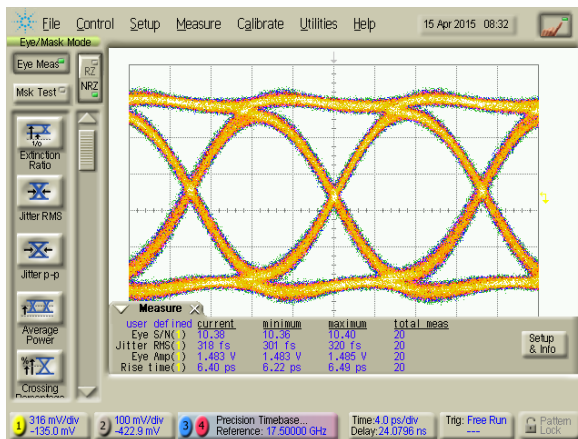
The measurements below had been performed using a SHF 12104 A Bit Pattern Generator (PRBS  $2^{31}-1$ ) and an Agilent Digital Communication Analyzer (DCA) with a Precision Timebase Module (86107A) and a 70 GHz Sampling Module (86118A). The output of the MUX module had been connected directly to the DCA input with a 10 dB attenuator.



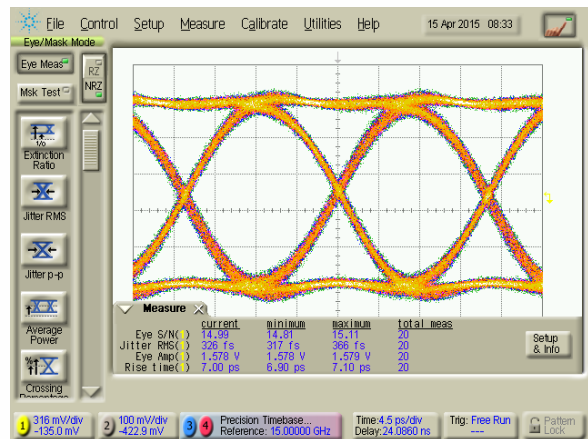
Out @ 100 Gbps



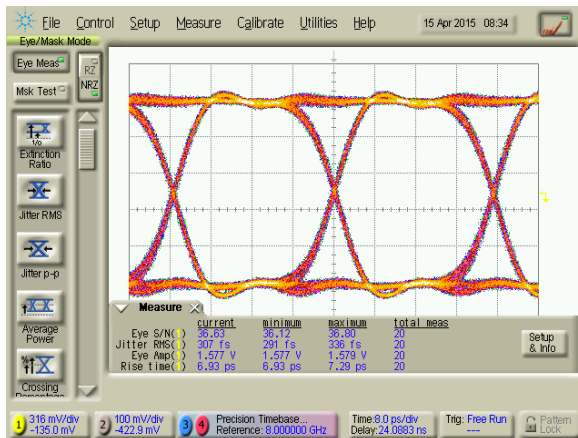
Out @ 80 Gbps



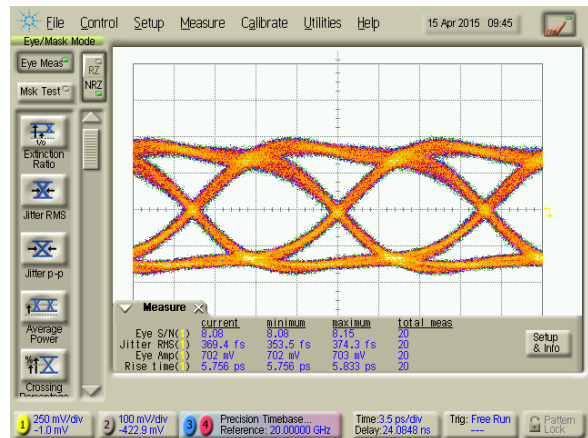
Out @ 70 Gbps



Out @ 60 Gbps



Out @ 32 Gbps

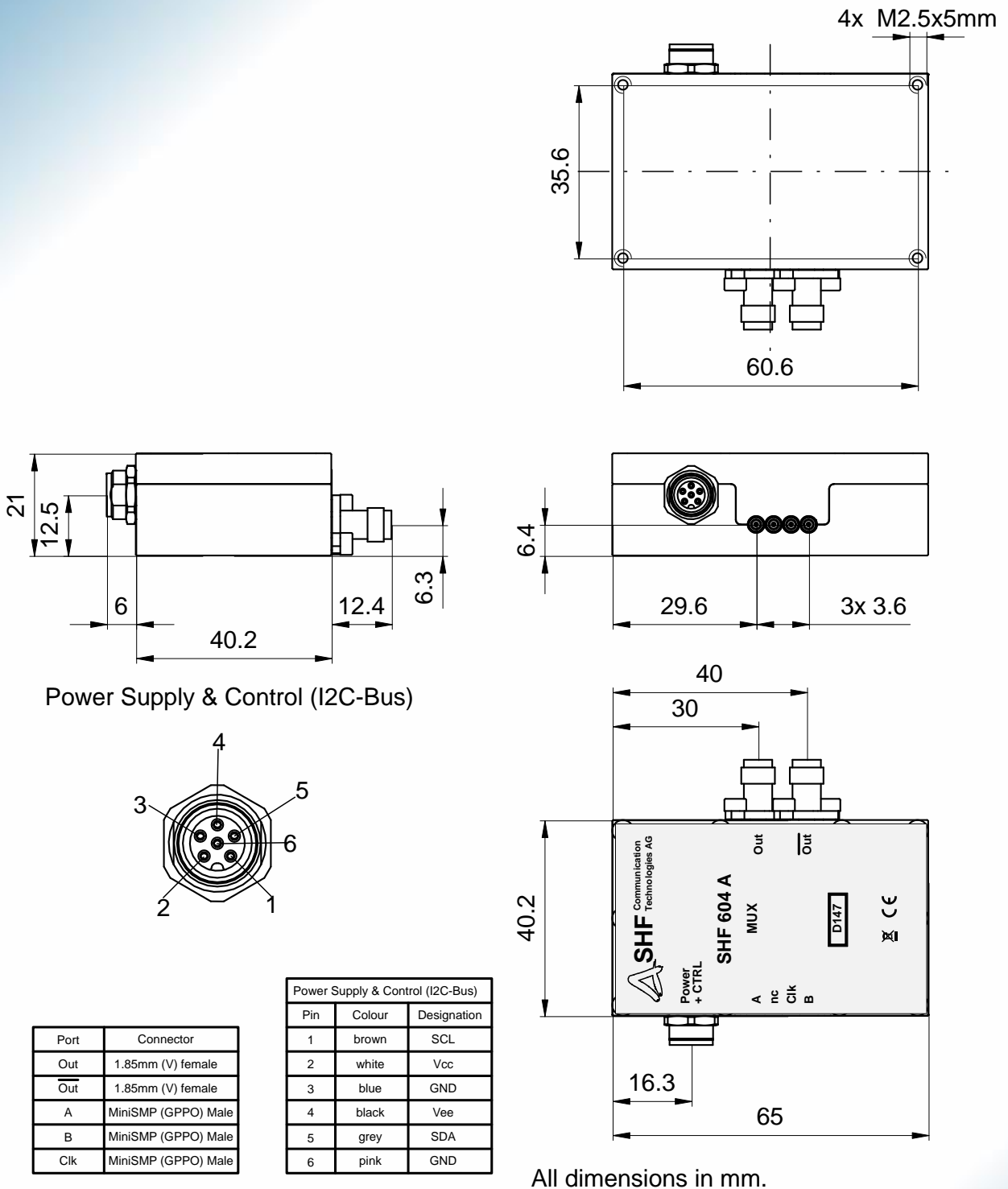


Out @ 80 Gbps, Level = -6 dB





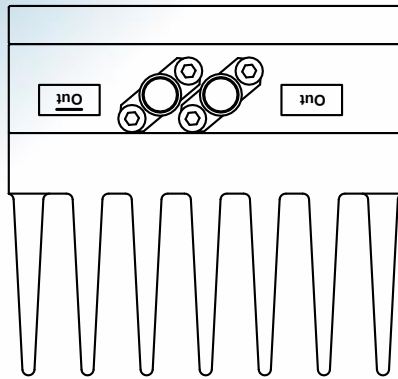
## Outline Drawing – Module



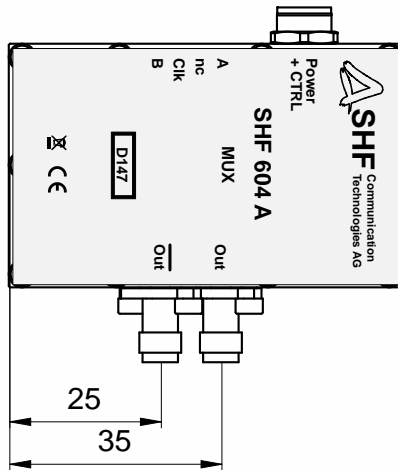
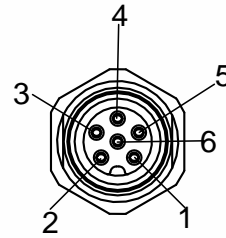
All dimensions in mm.



## Outline Drawing – Module with Heat Sink



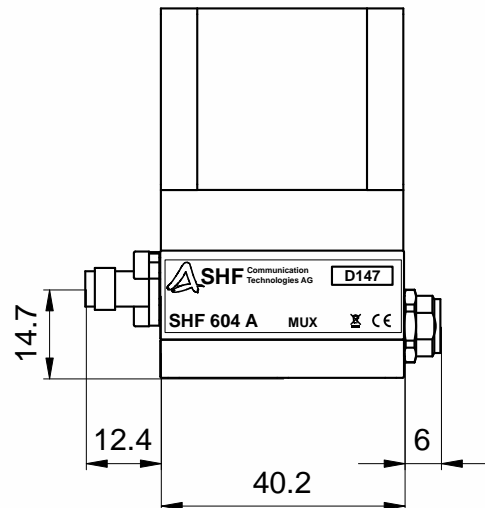
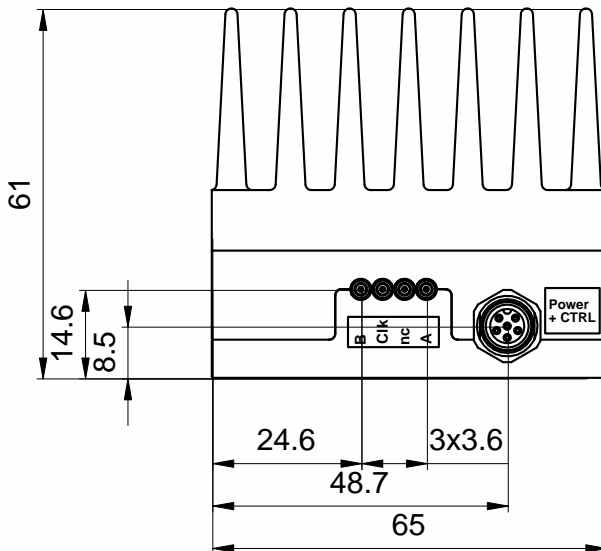
Power Supply & Control (I2C-Bus)



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

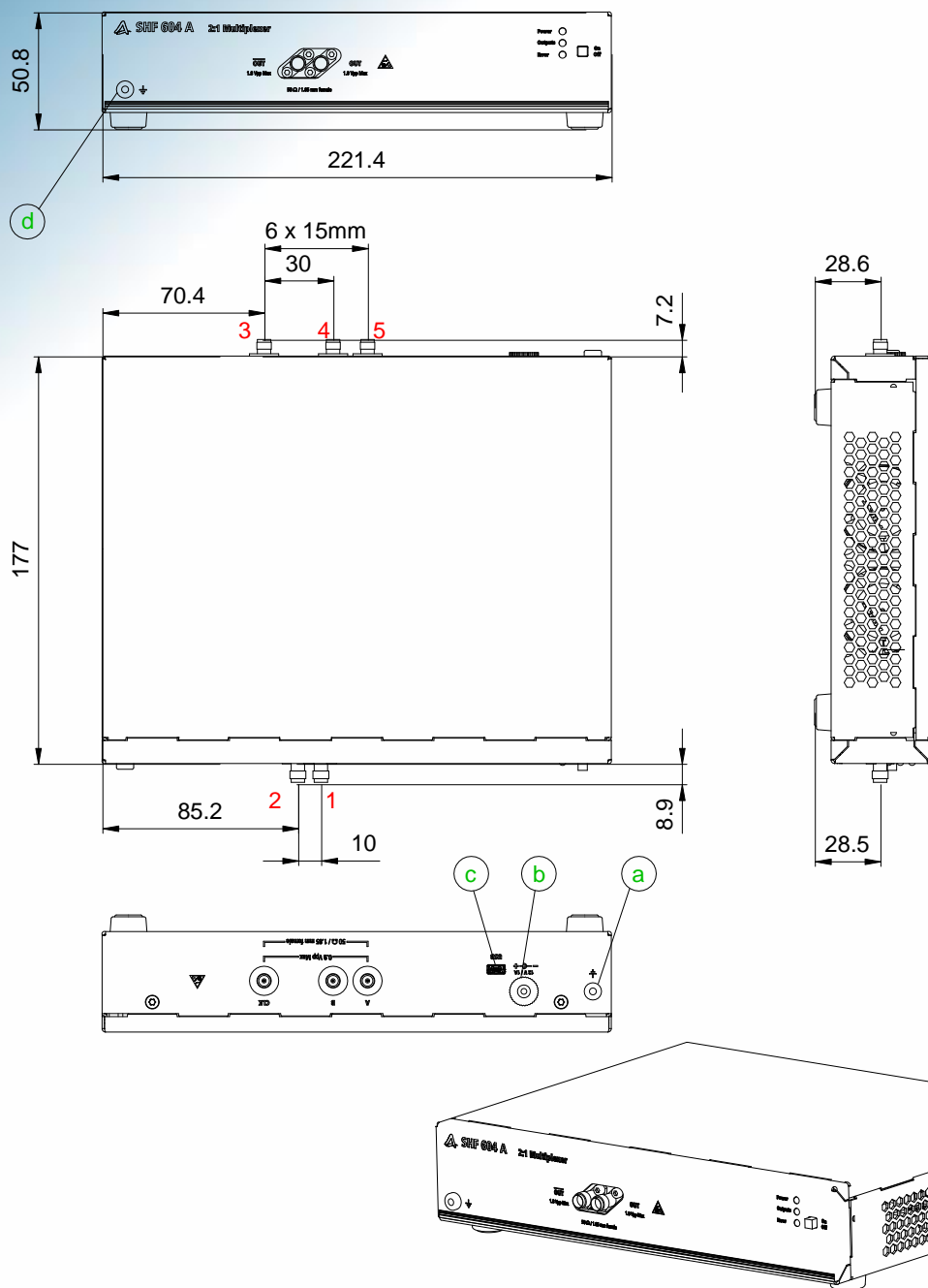
Pin	Colour	Designation
1	brown	SCL
2	white	Vcc
3	blue	GND
4	black	Vee
5	grey	SDA
6	pink	GND

All dimensions in mm.





## Outline Drawing – SHF 604 A with Option Case



Pos.	Designation	Connector
1	Data Out	1.85mm (V) Female
2	Data Out	1.85mm (V) Female
3	Clock In	1.85mm (V) Female
4	B	1.85mm (V) Female
5	A	1.85mm (V) Female

Pos.	Designation
a	GND
b	Power Supply
c	USB
d	GND