

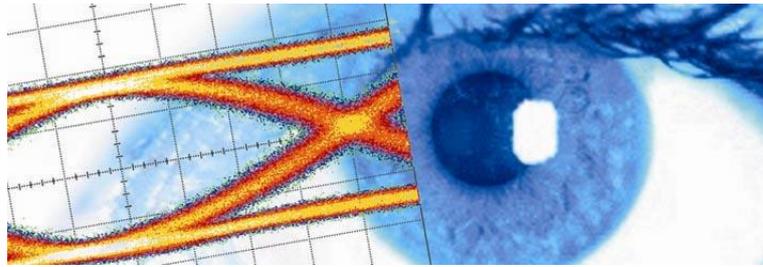


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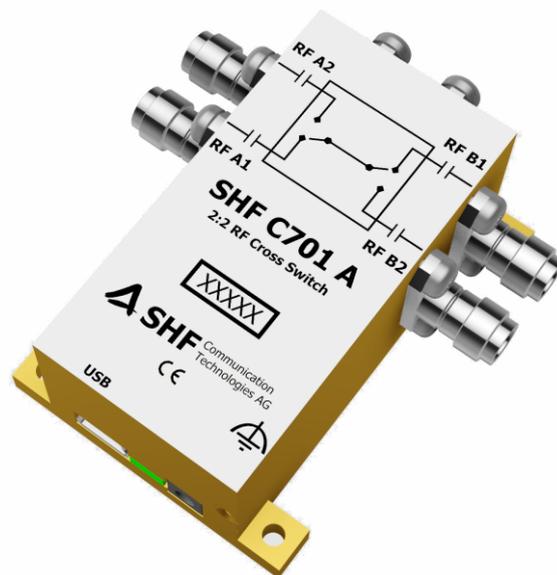
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Datasheet

SHF C701 A

50 GHz / 64 Gbps
2:2 RF Cross Switch



SHF reserves the right to change specifications and design without notice – SHF C701 A - V002 – December 02, 2020 Page 1/14



Description

The SHF C701 A is a dual 2:2 broadband RF cross switch, operating from 100 kHz up to 50 GHz for clock signal, and up to 64 Gbps for NRZ Data signal. It offers high quality output signals together with a compact size and ease of operation.

With the 2:2 cross switch, it is possible to connect any of the 2 ports at the left-hand side of the device (switch A) with one of the ports on the right-hand side of the device (switch B). Ports on the same side (switch) cannot be connected to each other. It operates in both directions, i.e. the signal can be applied to or taken from a port on each side.

An option with low frequency compensation (LFC) is also available.

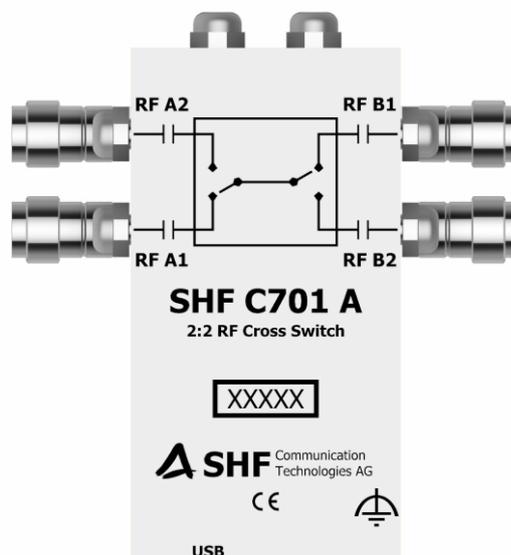
Features

- Broadband operation up to 50 GHz
- Up to 64 Gbps NRZ Data signal
- Bi-directional
- Low power consumption
- Single-ended operation
- USB interface
- Simple, easy to use GUI
- Automated measurements by using different software environments easily possible¹

Applications

- Broadband test and measurement equipment

Block Diagram



¹ To operate the switch, intuitive and well documented plain text commands are sent and received via USB. Thus the device can be operated either by the complementary software or automated by any programming language which can communicate with serial devices.



Accessories

- Functional earth cable
- Mini-USB cable

Options

Option – Low Frequency Compensation (LFC)

The Low Frequency Compensation option is offered in order to reduce the frequency response roll-off. Due to a lower loss at the lower frequencies there is a typical roll-off of 12 dB between 1 MHz and 50 GHz. The compensation reduces the roll-off to approximately 9 dB over the frequency range, but at the same time increases the insertion loss by roughly 3 dB at the lower frequency range.



Absolute Maximum Ratings

Parameter	Unit	Symbol	Min.	Typ.	Max.	Comment
Input Parameters						
Input Power	dBm	P_{in}			23	
External DC Voltage on RF Ports	V	V_{DCext}	-6		+6	AC coupled ports

Specifications – SHF C701 A

Parameter	Unit	Symbol	Min.	Typ.	Max.	Comment
Performance						
Minimum Input Frequency	kHz	f_{min}			100	Clock Signal
Maximum Input Frequency	GHz	f_{max}	50			Clock Signal
Bandwidth	GHz	f_{3dB} f_{6dB}		24 38		Clock Signal
Data Rate	Gbps		64			Data Signal
Insertion Loss	dB			3 6 9 12	5 9 11 15	< 24 GHz 24 - 38 GHz 38 - 42 GHz 42 - 50 GHz
Isolation	dB		30	40		< 50 GHz
Return Loss	dB		5	10		< 50 GHz
Settling Time	ms			1		
Switching Transient Overshoot ²	mV				±300	
Output Parameters						
Jitter RMS	fs	J_{RMS}				See note ³
Duty Cycle	%	DC				See note ³

² Switching Transient Overshoot refers to a voltage overshoot measured on the module's ports while toggling the switch

³ No degradation in jitter or duty cycle performance were observed for sine wave signals



Parameter	Unit	Symbol	Min.	Typ.	Max.	Comment
Power Requirement						
Supply Voltage	V	V_{CC}	+4.40	+5.00	+5.25	Mini USB
Supply Current	mA	I_{CC}		65		
Power Dissipation	mW	P_d		325		@ $V_{CC} = +5 V$
Mechanical Characteristics						
RF A1	Ω			50		1.85 mm (V) female
RF A2	Ω			50		1.85 mm (V) female
RF B1	Ω			50		1.85 mm (V) female
RF B2	Ω			50		1.85 mm (V) female
Dimensions	mm					See Outline Drawing
Weight	g			90		
Conditions						
Operating Temperature	$^{\circ}C$	$T_{ambient}$	15		35	

Specifications – SHF C701 A Option LFC

Parameter	Unit	Symbol	Min.	Typ.	Max.	Comment
Performance						
Bandwidth	GHz	f_{3dB} f_{6dB}		32 40		Clock Signal
Insertion Loss	dB			6	8	< 32 GHz
				10	12	32 - 40 GHz
				12	16	40 - 50 GHz
Return Loss	dB		5	10		< 50 GHz



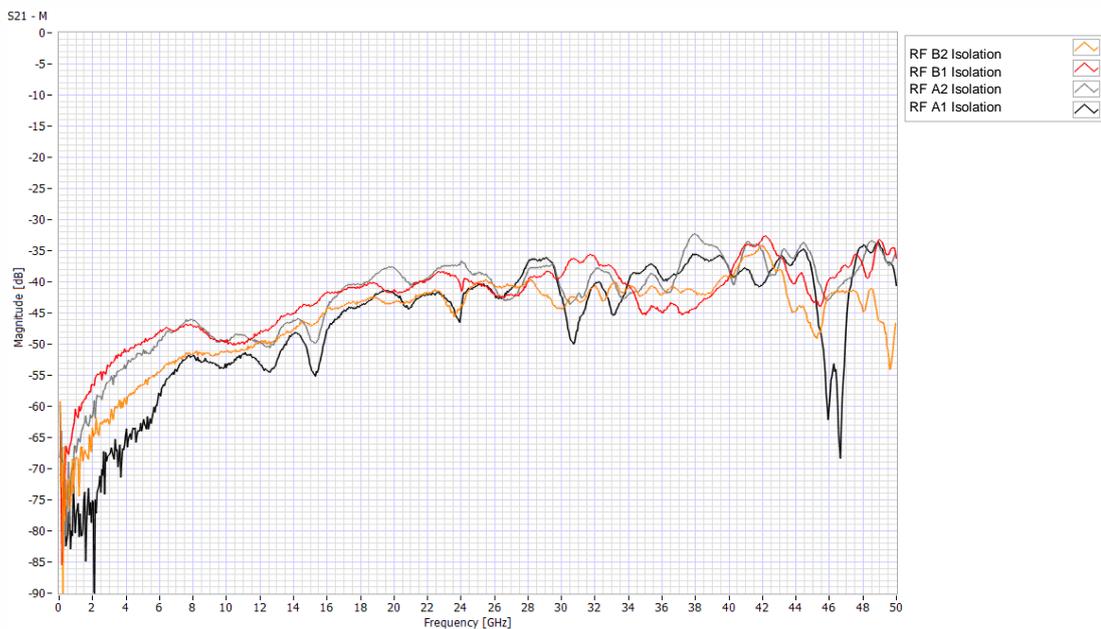
Typical RF Performance @ +25°C

C701 A (no option)

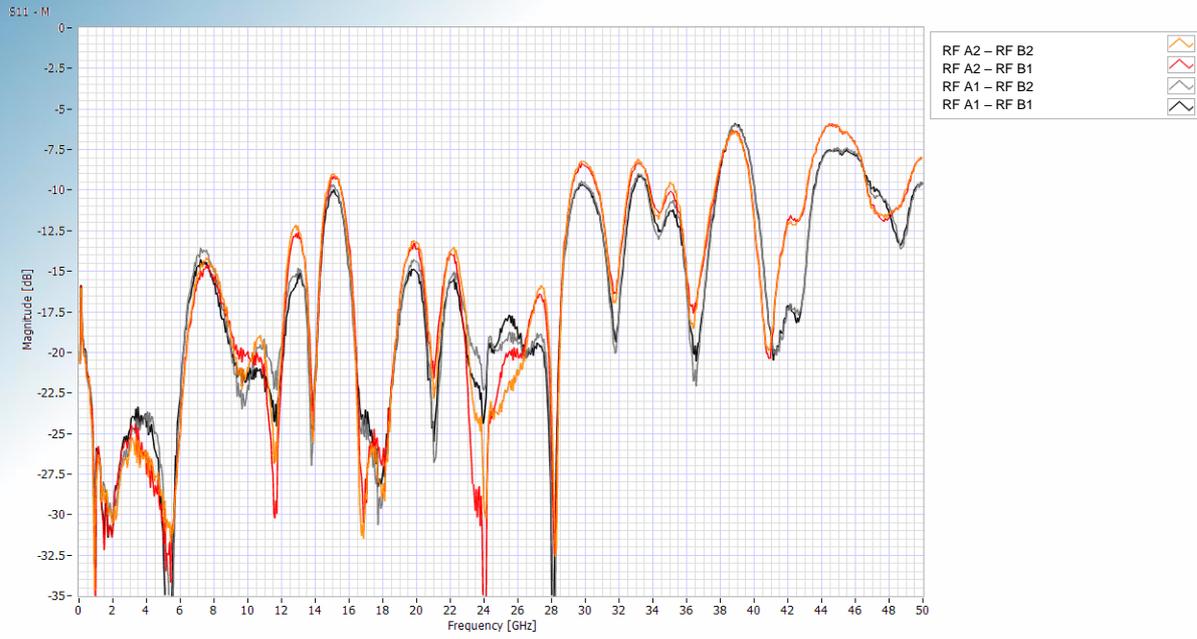
The measurements below had been performed using a VNA.



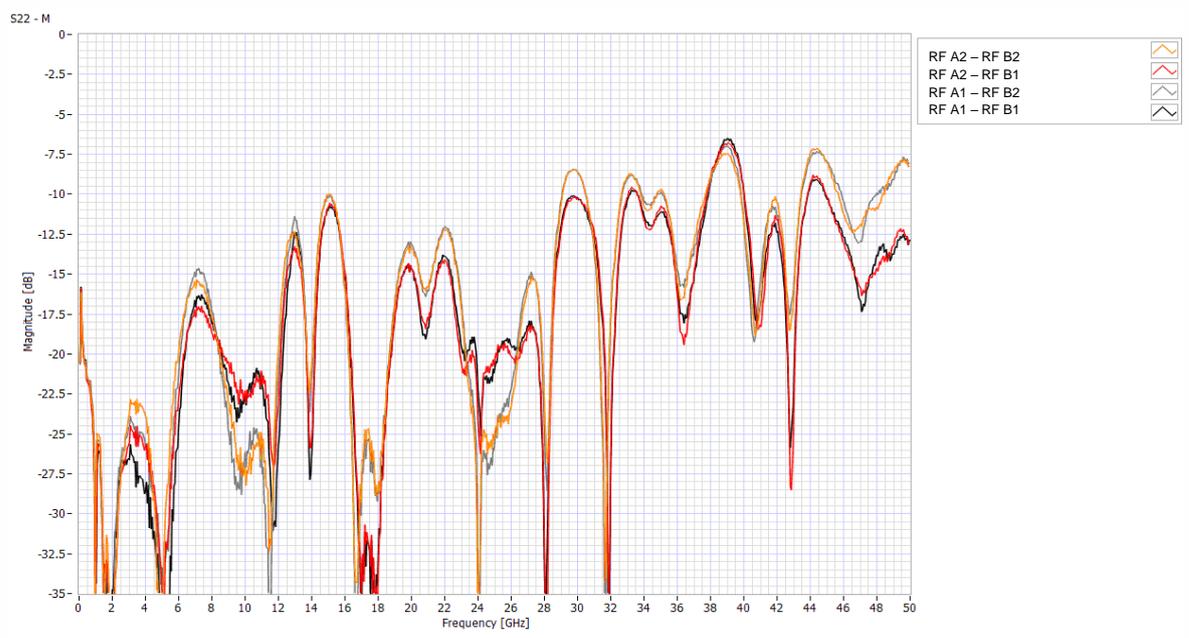
Insertion Loss



Isolation



Return Loss (Switch A)

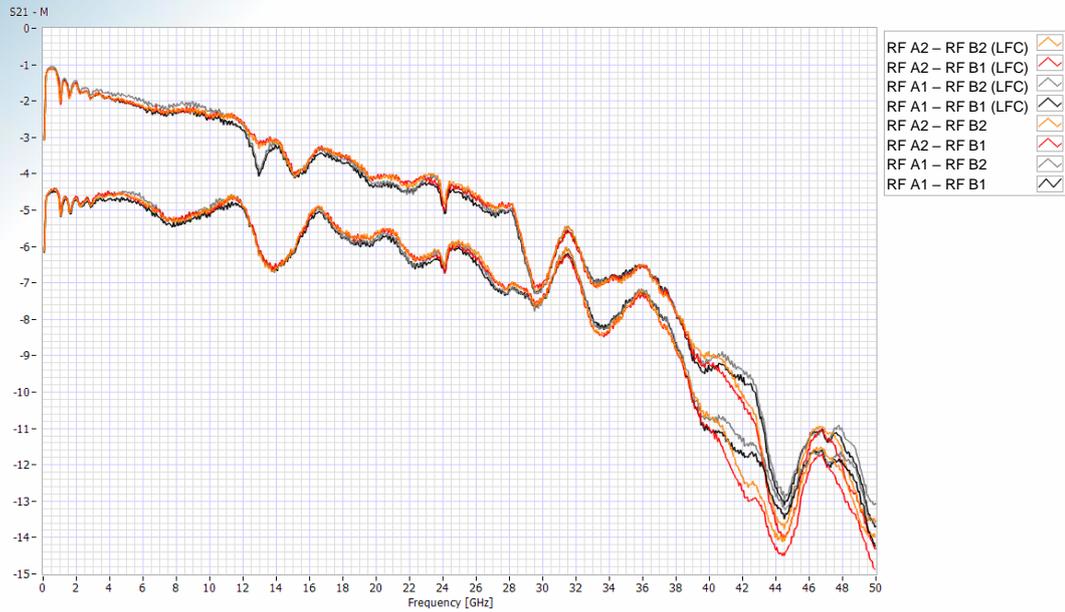


Return Loss (Switch B)

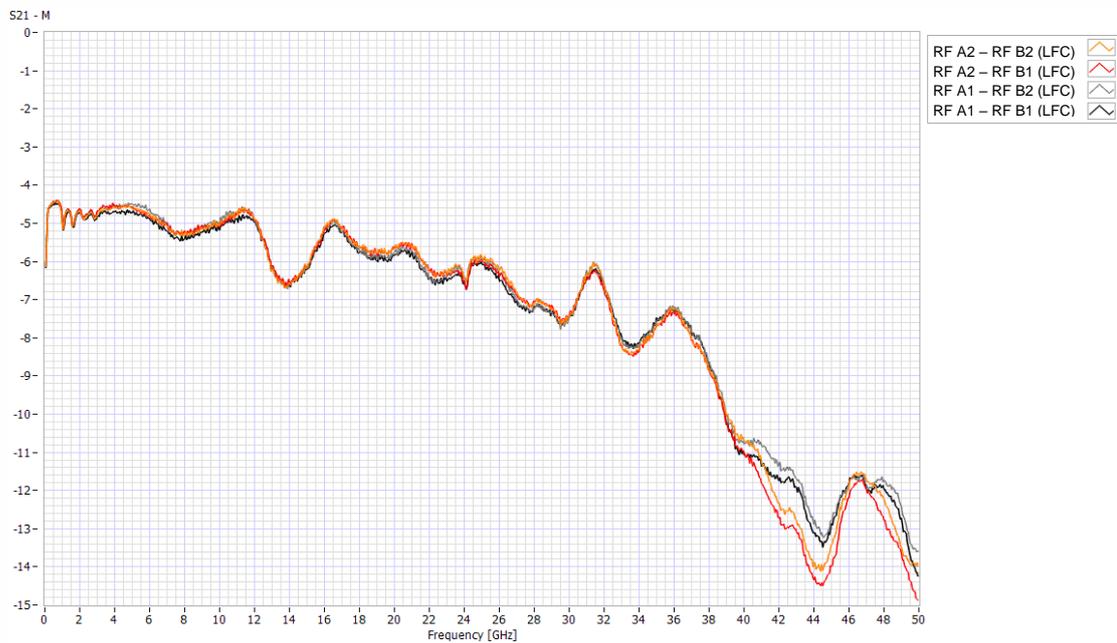


C701 A (option LFC)

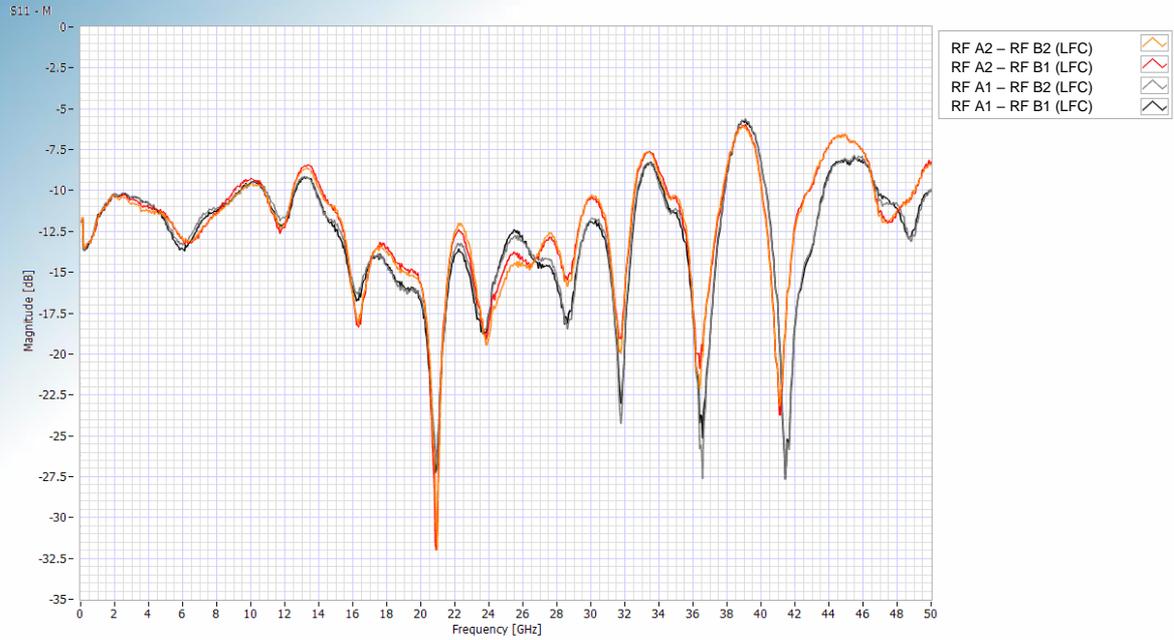
The measurements below had been performed using a VNA.



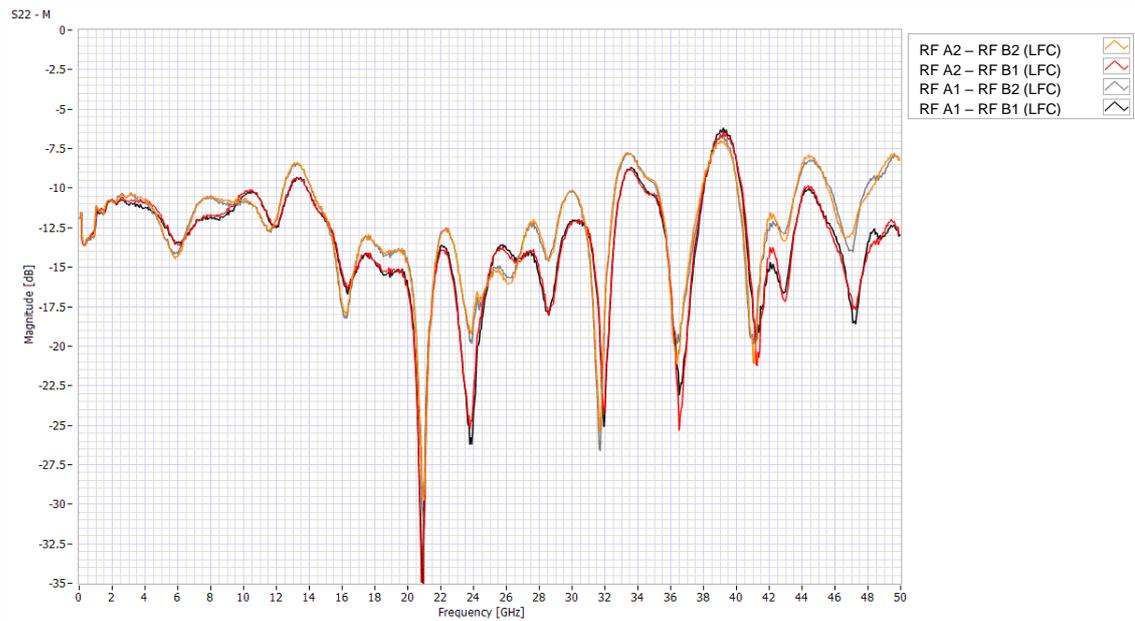
Insertion Loss – LFC compared to “no Option”



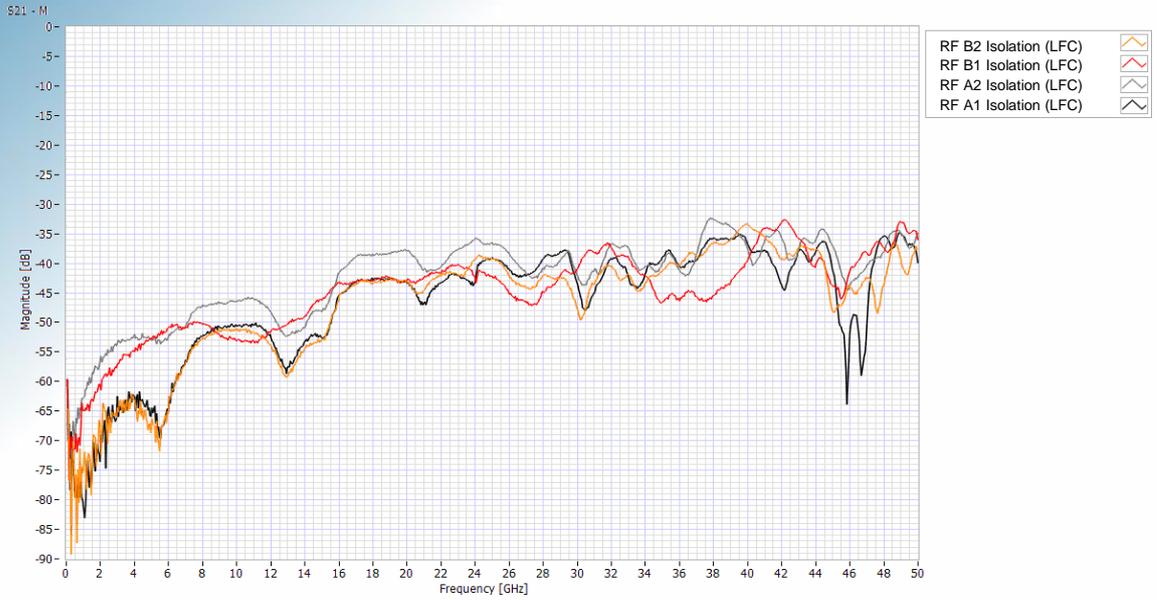
Insertion Loss



Return Loss (Switch A)



Return Loss (Switch B)



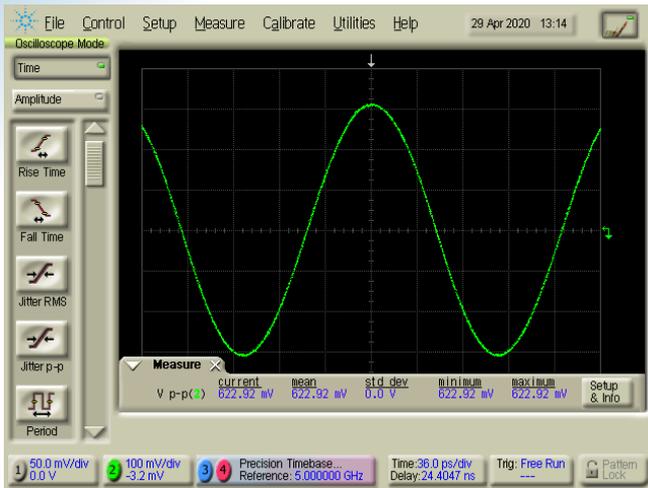
Isolation



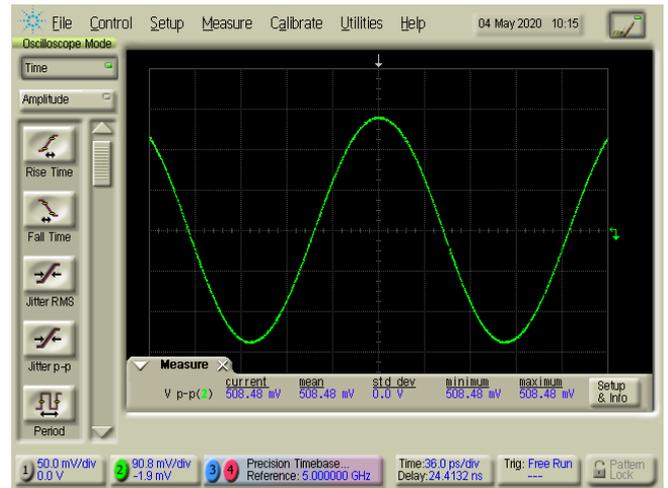
Typical Output Waveforms

Clock Output Signals

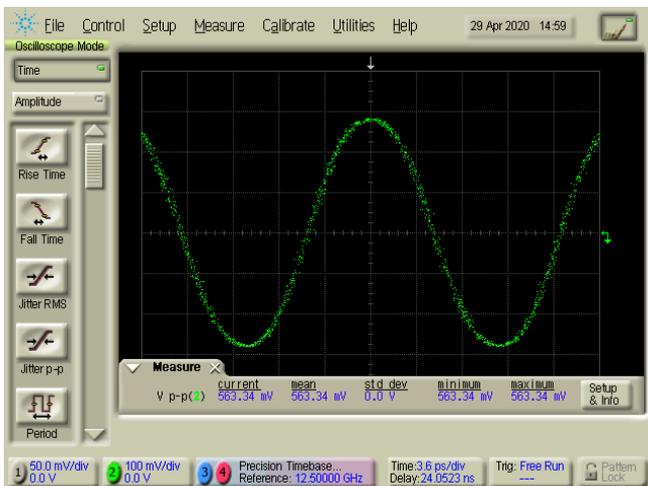
The measurements below had been performed using an Anritsu signal generator (3697C) and an Agilent Digital Communication Analyzer (DCA) with a Precision Timebase Module (86107A) and a 70 GHz Sampling Module (86118A). The outputs of the Switch module had been connected directly to the DCA input. Input power of the clock signal is 0 dBm (630 mV_{pp}).



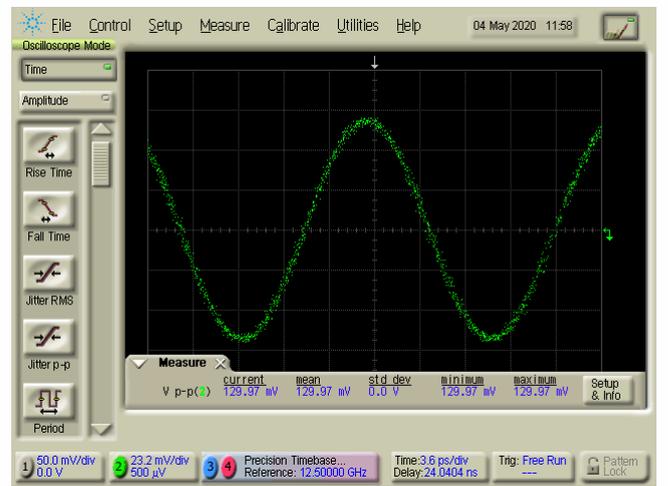
5 GHz input signal



5 GHz output signal



50 GHz input signal

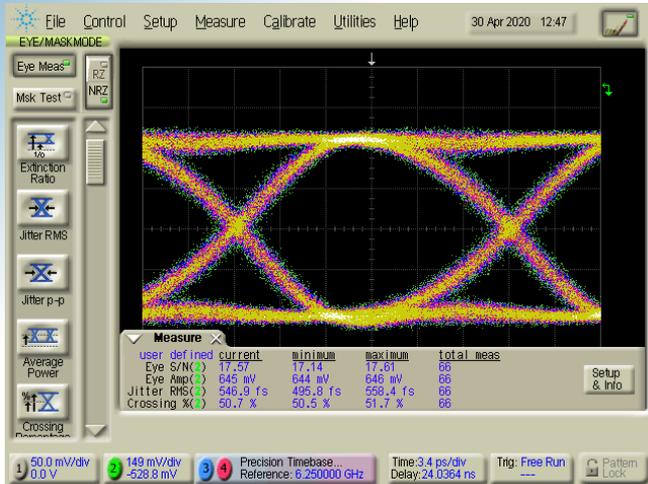


50 GHz output signal

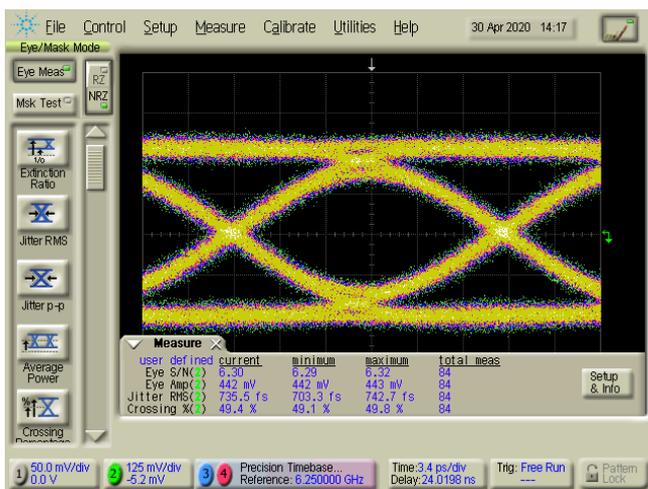


Data Output Signals

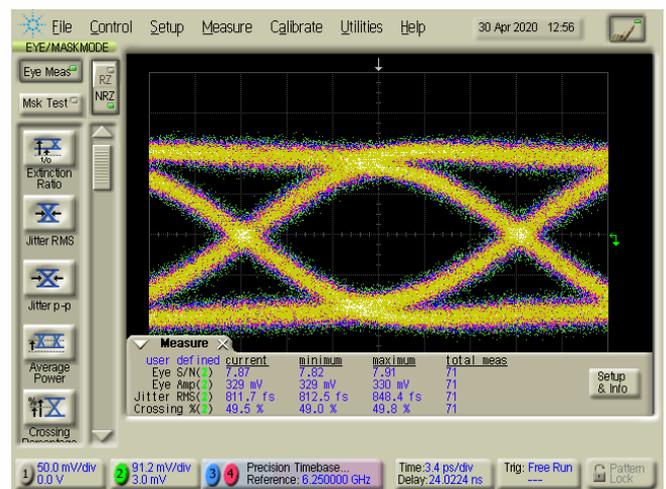
The measurements below had been performed using a SHF 12105 A Bit Pattern Generator and an Agilent Digital Communication Analyzer (DCA) with a Precision Timebase Module (86107A) and a 70 GHz Sampling Module (86118A). The outputs of the Switch module had been connected directly to the DCA input. Input Data amplitude is ~630 mV_{pp}, and it is a PRBS 2³¹-1 signal.



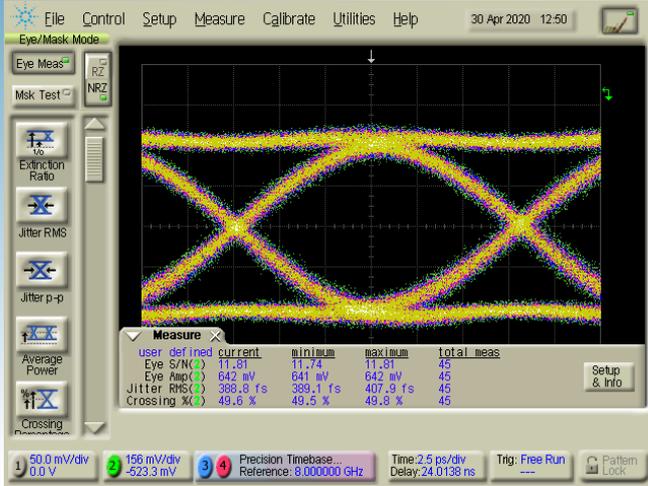
50 Gbps input signal



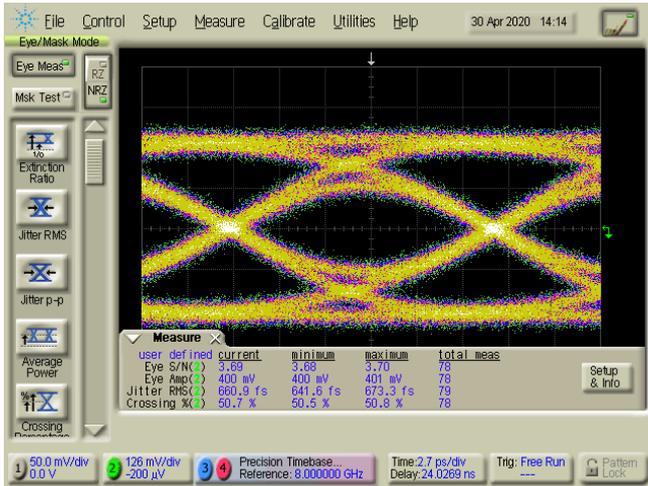
50 Gbps output signal



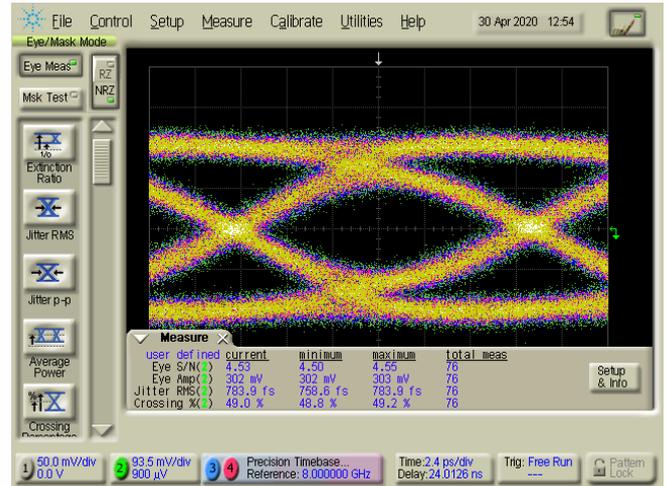
50 Gbps output signal – Option LFC



64 Gbps input signal



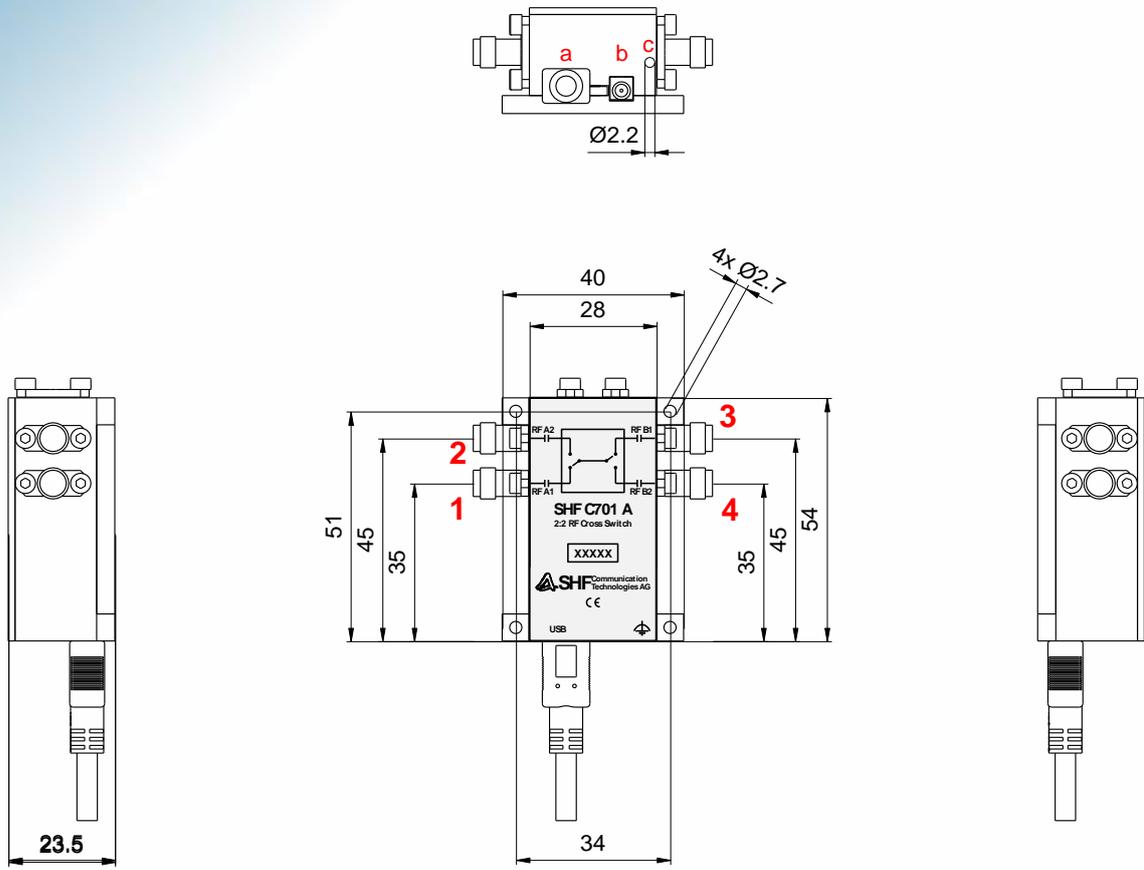
64 Gbps output signal



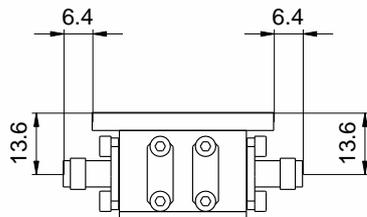
64 Gbps output signal – Option LFC



Outline Drawing – Module



Pos	Port	Connector
1	RF A1	1.85mm (V) female
2	RF A2	1.85mm (V) female
3	RF B1	1.85mm (V) female
4	RF B2	1.85mm (V) female



All dimensions are in mm

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