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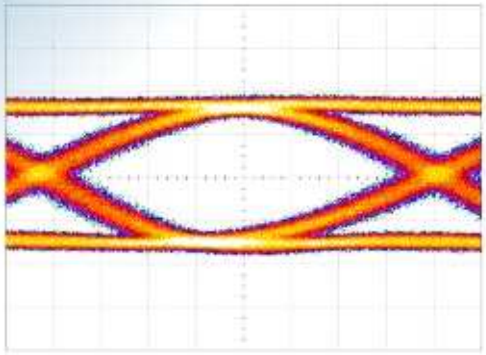
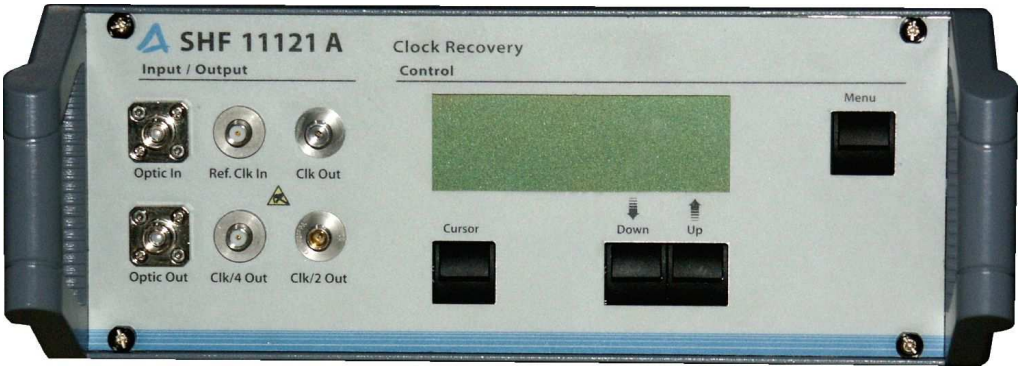


Datasheet

SHF 11121A

40 – 43 Gbps Clock Recovery Module with Optical Front End



Description

The SHF 11121A Clock Recovery is designed to extract and synchronize the clock from an optical data stream. It is a clock recovery unit including an optical receiver. The module operates at bit rates from 39.8 to 43.1 Gbps.

By using a tap coupler, the optical input signal appears at the optical output with only minimum attenuation.

The extracted optical signal is converted by a receiver to an electrical signal which is processed by the clock recovery circuit.

The clock recovery circuit contains two separate VCOs which allow operation in two bands. The lower band spans the range between 39.8 and 41.6 Gbps and the higher band spans the range between 41.6 and 43.1 Gbps.

Due to the circuit concept a reference frequency of bit rate divided by either 64, 32 or 16 must be applied to the unit. For better convenience reference oscillators for three standard bit rates (39.813 Gbps, 42.656 Gbps and 43.018 Gbps) are included.

The SHF 11121A can be operated locally by the front panel or remote via Ethernet-connection from a PC running the SHF BERT-Control Center. Its programming features allow automated measurements using test programs like Agilent VEE or National Instruments LabView.

The module is a compact solution which offers superb performance while including easy to use features.

Features

Optical Receiver

- Optical through port with minimal attenuation
- High optical sensitivity
- ASK NRZ, RZ and CS-RZ capable

Clock Recovery

- Operating bit rate range from 39.8 to 43.1 Gbps (this includes OC-768 with and without FEC)
- Clock output frequency at half and quarter of the nominal input data bit rate
- Local or remote operation via Ethernet-connection to a PC (SHF BERT Control Center)

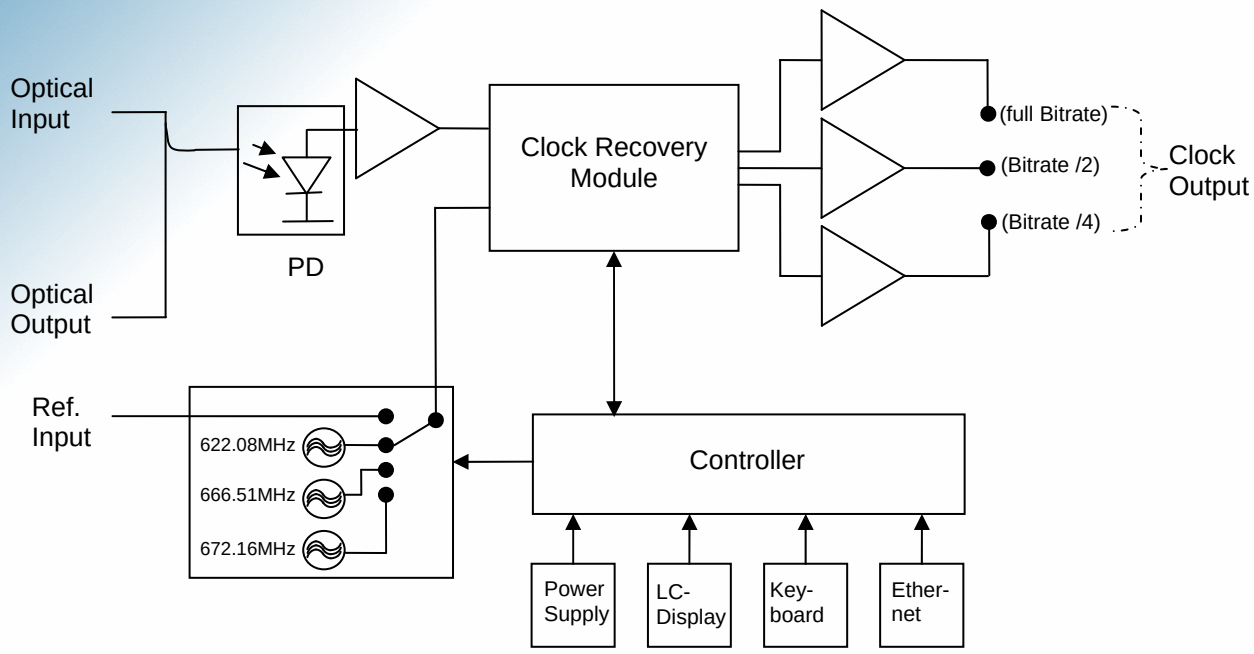
Options

- Option C40: Full clock output

Applications

- R&D for optical communication systems at bit rates from 40 to 43 Gbps
- Characterization of high speed optical components
- Bit error rate testing
- Optical component and fiber loop testing
- Optical transmitter testing

Block Diagram



Precautions with optical connectors

The fiber optic connectors must be kept clean in order to ensure best performance of the SHF 11121A.

Contaminated or damaged fiber ends result in performance degradation. Cover connectors with dust caps when they are not in use.

The following cleaning procedure is recommended for the connector interface of the SHF 11121A and the external connectors attached to these ports.

- Before cleaning, the external connectors should be detached from the SHF 11121A.
- To clean the fiber-end face, use a new natural cotton swab that is moistened with isopropyl alcohol.
- We recommend that no other solvents are used to clean the optical surfaces.
- Move the swab back and forth across the fiber end face several times applying a gentle pressure.
- Afterwards dry the fiber end face with a clean dry cotton swab or lens paper.
- Do not press the swab or lens paper too hard onto the fiber end face. This may damage the surface.
- Use clean dry compressed air (free of dust, water and oil) to blow away any remains from the fiber end face. Nitrogen gas can also be used.

Never exceed the max. ratings of the optical input power.

Specifications – SHF 11121A

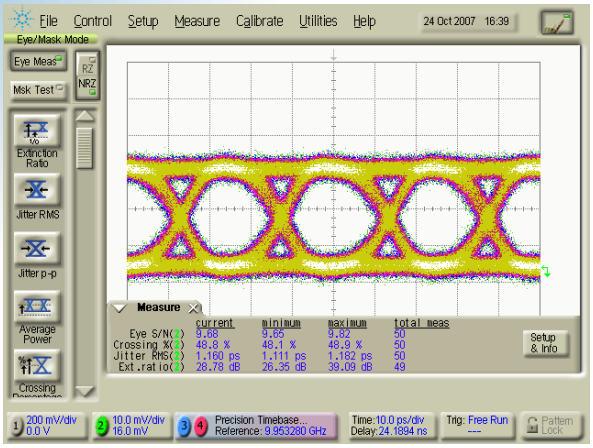
Parameter	Unit	Min.	Typ.	Max.	Comment
Optical Data Input					
Optical Input and Output connectors			FC/PC		
Operating bit rate VCO 1 VCO 2	Gbps	 39.8 41.6		 41.6 43.1	
Optical insertion loss	dB dB			1 1	1310 nm 1552 nm
Absolute max. optical input power	dBm			+6 +12	mean power peak power
Optical input dynamic range @ 1552 nm	dBm	-3		+3	NRZ, mean power
Reference Clock Input					
Input Frequency (Bit Rate / 64 mode) (Bit Rate / 32 mode) (Bit Rate / 16 mode)	GHz	 0.622 1.244 2.488		 0.674 1.348 2.696	
Input Voltage	mV_{pp}	400		800	
Connector	Ω		50		SMA-female
Internal Reference Clock					
Clock 1	MHz		622.080		39.81312 Gbps
Clock 2	MHz		666.514		42.65692 Gbps
Clock 3	MHz		672.163		43.01841 Gbps

Parameter	Unit	Min.	Typ.	Max.	Comment
Clock /4 Output (quarter bit rate)					
Output Frequency	GHz	9.95		10.775	
Output Voltage	mV_{pp}	400		800	
Connector	Ω		50		SMA- female
RMS-Jitter	fs		550	700	on scope display, measured with Agilent 86100A with precision time base, 0 dBm mean input power, data signal jitter ≤ 1 ps
Half Clock Output (half bit rate)					
Output Frequency	GHz	19.9		21.55	
Output Voltage	mV_{pp}	500		1000	
Connector	Ω		50		K-female
RMS-Jitter	fs		500	700	on scope display, measured with Agilent 86100A with precision time base, 0 dBm mean input power, data signal jitter ≤ 1 ps
Full Clock Output (optional, full bit rate)					
Output Frequency	GHz	39.8		43.1	
Output Voltage	mV_{pp}	500		1000	
Connector	Ω		50		V-female
RMS-Jitter	fs		500	700	on scope display, measured with Agilent 86100A with precision time base, 0 dBm mean input power data signal jitter ≤ 1 ps
General Data					
Power Supply	V	90		240	47… 63Hz
Power Consumption	W		20		230 V
Weight	kg		3.8		
Dimensions (WxHxD)	mm				235 x 110 x 355
Operating temperature	℃	10		35	
Storage temperature	℃	-20		70	
Network Connection	Mbps		10 / 100		Ethernet, RJ-45 connector

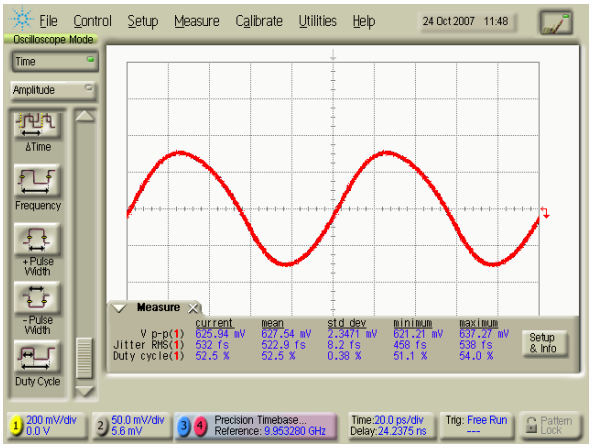
Test Results

Typical clock output signals, 0 dBm optical input power, PRBS 2^{31}-1

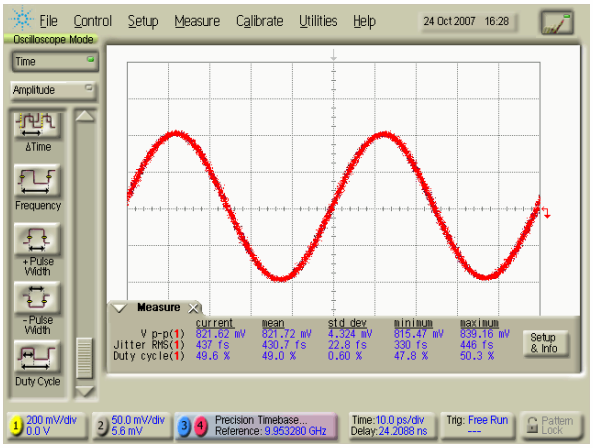
39.813 Gbps with Internal Reference 1



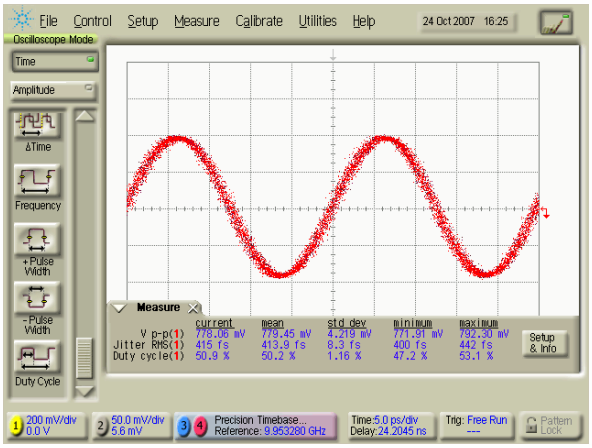
Data In @ 39.813 Gbps



Clk/4 Out @ 39.813 Gbps

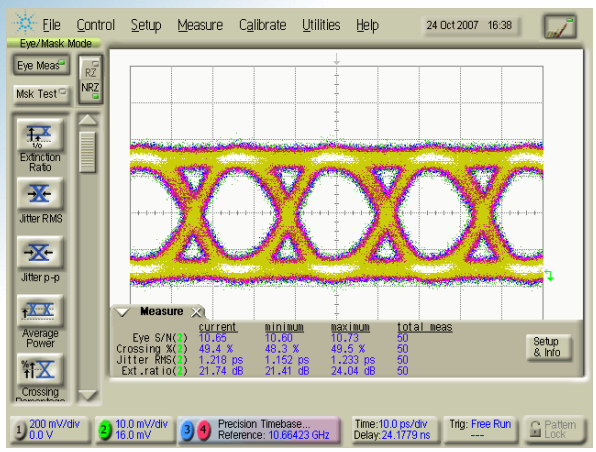


Clk/2 Out @ 39.813 Gbps

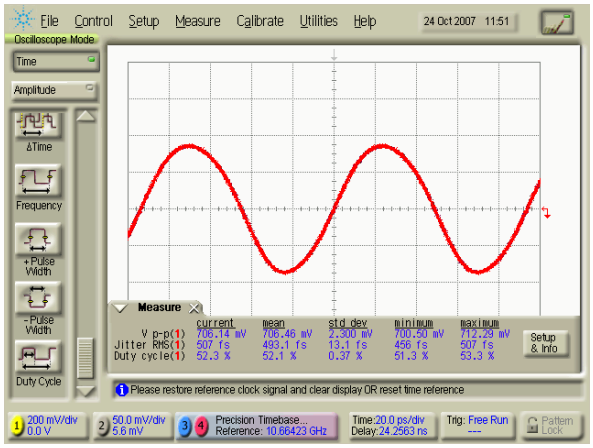


Clk Out @ 39.813 Gbps

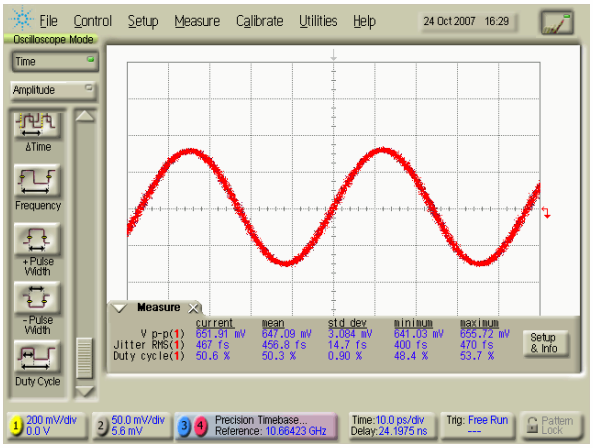
42.656 Gbps with Internal Reference 2



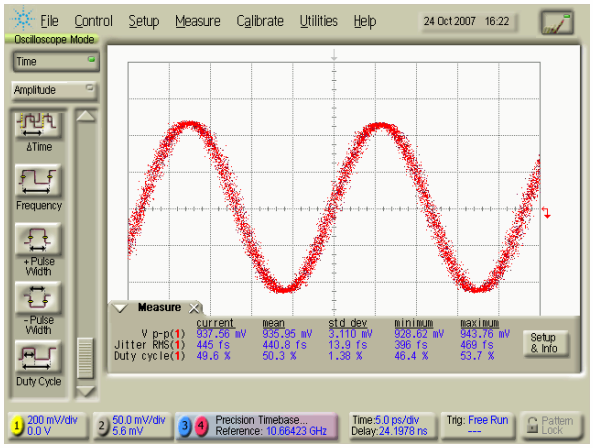
Data In @ 42.656 Gbps



Clk/4 Out @ 42.656 Gbps

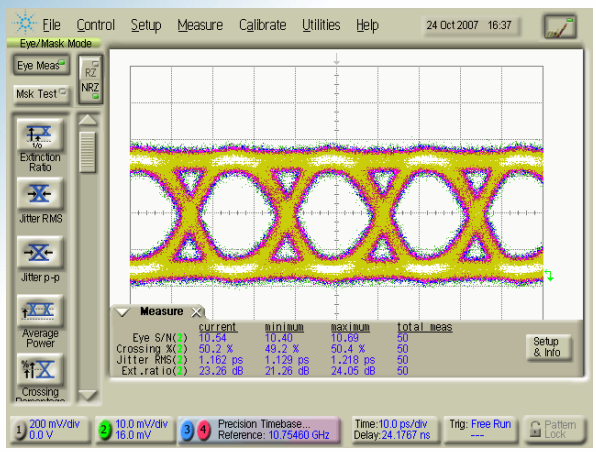


Clk/2 Out @ 42.656 Gbps

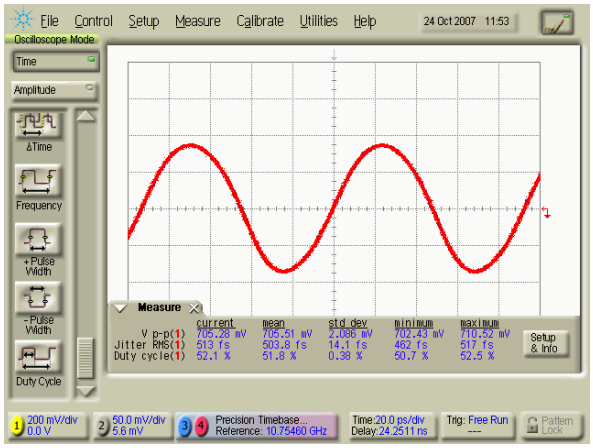


Clk Out @ 42.656 Gbps

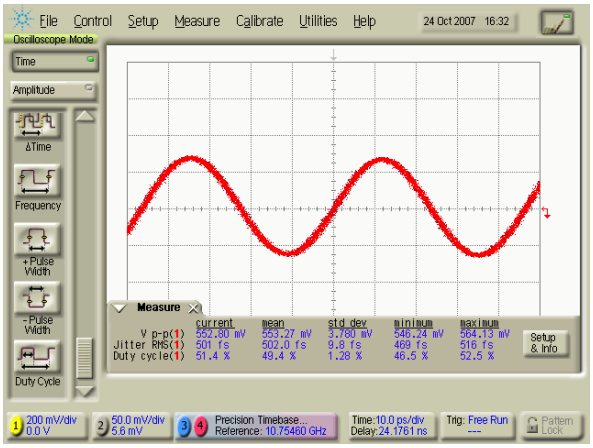
43.018 Gbps with Internal Reference 3



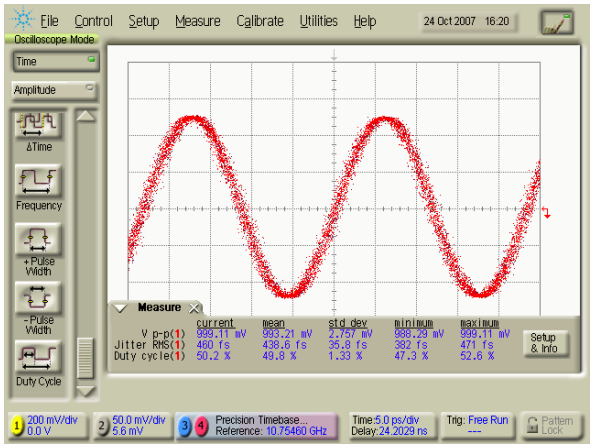
Data In @ 43.018 Gbps



Clk/4 Out @ 43.018 Gbps



Clk/2 Out @ 43.018 Gbps



Clk Out @ 43.018 Gbps