Datasheet

SHF 11221 A

120 Gbps 1:2 Demultiplexer
Description

The SHF 11221 A is a 1:2 demultiplexer operating at bit rates up to 120 Gbps for use in broadband test setups and telecom transmission systems. The module essentially is a high sensitivity 1:2 demultiplexer extended by an automated delay line for computer-controlled sampling time adjustments.

The threshold and time delay position can be controlled to explore the error characteristics of the input NRZ signal. At each position, the demultiplexer outputs two half speed NRZ signals to be further processed by an error analyzer.

For BER measurements, the module is optimized to operate with the SHF 11104 A Error analyzer.

Features

- Broadband operation up to 120 Gbps
- Differential data input
- Quarter-clock system
- Data Input Sensitivity <110 mV (single ended)
- Single ended data outputs
- Time delay and threshold adjustment via software
- Graphical eye scan for signal visualization

Applications

- 100, 200, 400 Gbps and 1 Tbps system evaluation & development
- Broadband test and measurement equipment

Block Diagram
Ease of Use

Housed in a small benchtop case, this remote head can be easily embedded in the customer’s test environment close to the DUT.

The SHF 11221 A requires a clock signal at quarter the input bit rate as master clock. The operation can be controlled by the Demultiplexer GUI in the SHF BERT Control Center (BCC) or via simple text commands for integration in other software environments.

In the Demultiplexer GUI, the built-in eye scan function has the capability to map out an eye pattern of the input NRZ signal, as well as to execute a fast “Auto-search” to determine the threshold and delay of the input.

For BER measurements, a dual channel SHF 11104 A error analyzer is required. The measurement software has been tailored to integrate the over-all operation with the SHF 11104 A, and combine the BER data taken from the two demultiplexed channels.

BCC SHF 11221 A Demultiplexer GUI, showing the eye scan of an 120 Gbps NRZ signal
### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Input Voltage</td>
<td>mV</td>
<td>V(_{\text{data in}})</td>
<td></td>
<td></td>
<td>900</td>
<td>Peak-to-Peak</td>
</tr>
<tr>
<td>Clock Input Voltage</td>
<td>mV</td>
<td>V(_{\text{clk in}})</td>
<td></td>
<td></td>
<td>900</td>
<td>Peak-to-Peak</td>
</tr>
<tr>
<td>External DC Voltage on RF Clock Input Port</td>
<td>V</td>
<td>V(_{\text{DCin}})</td>
<td>-3</td>
<td></td>
<td>+3</td>
<td>AC coupled input</td>
</tr>
<tr>
<td>External DC Voltage on RF Data Input Ports</td>
<td>V</td>
<td>V(_{\text{DCin}})</td>
<td>-3</td>
<td></td>
<td>+3</td>
<td>AC coupled input</td>
</tr>
<tr>
<td>External DC Voltage on RF Output Ports</td>
<td>V</td>
<td>V(_{\text{DCout}})</td>
<td>-3</td>
<td></td>
<td>+3</td>
<td>AC coupled input</td>
</tr>
<tr>
<td>DC Supply Voltage</td>
<td>V</td>
<td>V(_{\text{cc}})</td>
<td></td>
<td></td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>
## Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Parameters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Input Data Rate</td>
<td>GBaud</td>
<td>R\text{in, min}</td>
<td></td>
<td></td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Maximum Input Data Rate</td>
<td>GBaud</td>
<td>R\text{in, max}</td>
<td></td>
<td></td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Minimum Clock Input Frequency</td>
<td>GHz</td>
<td>F\text{in, min}</td>
<td></td>
<td></td>
<td>15</td>
<td>quarter of the input bit rate</td>
</tr>
<tr>
<td>Maximum Clock Input Frequency</td>
<td>GHz</td>
<td>F\text{in, max}</td>
<td></td>
<td></td>
<td>30</td>
<td>quarter of the input bit rate</td>
</tr>
<tr>
<td>Clock Input Voltage</td>
<td>mV_{pp}</td>
<td>V\text{clk in}</td>
<td>300</td>
<td></td>
<td>800</td>
<td>Peak-to-Peak; 500 mV recommended</td>
</tr>
<tr>
<td>Data Input Voltage</td>
<td>mV</td>
<td>V\text{data in}</td>
<td>400</td>
<td></td>
<td>800</td>
<td>Eye Amplitude; Single-ended</td>
</tr>
<tr>
<td>Data Input Sensitivity</td>
<td>mV</td>
<td></td>
<td>60</td>
<td>80</td>
<td>110</td>
<td>≤ 80 Gbps</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt; 80 Gbps</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt; 100 Gbps</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Eye height, Single-ended; On scope display; See page 7</td>
</tr>
<tr>
<td>Delay / Clock Phase Adjustment</td>
<td>ps</td>
<td></td>
<td>0</td>
<td></td>
<td>60</td>
<td>Adjustable in 0.1 ps steps</td>
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<tr>
<td><strong>Output Parameters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Output Voltage</td>
<td>mV</td>
<td>V\text{Out}</td>
<td>350</td>
<td>400</td>
<td></td>
<td>Eye Amplitude; Single-ended</td>
</tr>
<tr>
<td>Clock Output Voltage</td>
<td>mV_{pp}</td>
<td>V\text{Clkout}</td>
<td>450</td>
<td>600</td>
<td></td>
<td>Peak-to-Peak</td>
</tr>
<tr>
<td>Del. Clock Output Voltage</td>
<td>mV_{pp}</td>
<td>V\text{Clkout}</td>
<td>450</td>
<td>600</td>
<td></td>
<td>Peak-to-Peak</td>
</tr>
<tr>
<td>Connectors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.85 mm (V) male</td>
</tr>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>V</td>
<td>V\text{c}</td>
<td>+11.5</td>
<td>+12</td>
<td>+12.5</td>
<td>2.1 mm DC Power Jack; +12V switching power supply is included</td>
</tr>
<tr>
<td>Supply Current</td>
<td>mA</td>
<td>I\text{c}</td>
<td></td>
<td></td>
<td>1670</td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>W</td>
<td>P\text{d}</td>
<td></td>
<td></td>
<td>20</td>
<td>@ V\text{c} = +12 V</td>
</tr>
<tr>
<td>Height</td>
<td>mm</td>
<td>H</td>
<td></td>
<td></td>
<td>58.9</td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>mm</td>
<td>W</td>
<td></td>
<td></td>
<td>221.4</td>
<td></td>
</tr>
<tr>
<td>Depth</td>
<td>mm</td>
<td>D</td>
<td></td>
<td></td>
<td>177</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>kg</td>
<td>m</td>
<td>1.75</td>
<td>2</td>
<td></td>
<td>without power supply with power supply</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>°C</td>
<td>T</td>
<td>10</td>
<td></td>
<td>35</td>
<td>Ambient temperature</td>
</tr>
</tbody>
</table>

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Typical Output Eye Diagrams

The measurements below had been performed using a SHF 603 B MUX (PRBS $2^{31}-1$) and a Keysight DCA-X N1000 A with Precision Timebase and 70 GHz Sampling Head (80N01). The outputs of the demultiplexer module had been connected by 10 dB attenuators to the DSA input.

Out A @ 60 Gbps Output Bitrate  Out A @ 50 Gbps Output Bitrate  Out A @ 40 Gbps Output Bitrate

Out B @ 60 Gbps Output Bitrate  Out B @ 50 Gbps Output Bitrate  Out B @ 40 Gbps Output Bitrate
Typical Performance

The measurements shown below had been performed using a SHF C603 B MUX (PRBS $2^{31}-1$), a SHF 11104 A Error Analyzer, a Keysight DCA-X N1000 A with Precision Timebase and 70 GHz Sampling Head (80N01) to determine the eye height of the input signal. For the sensitivity measurement the input signal had been reduced until a BER limit of $<10^{-9}$ was achieved.

![Data Input Sensitivity Graph](image-url)
All dimensions in mm