

High Speed 2:1 Multiplexer

MUX-56

Overview

General Description

The MUX-56 is the high speed [ADSANTEC 5153](#) SiGe 2:1 multiplexer (MUX) chip in a connectorized module. The multiplexer is a high speed, high isolation 2:1 serializer that has DC to 56 Gb/s output data rate. The device can also be operated as a DC to 40 Gb/s (20 GHz) high isolation digital signal selector switch. The MUX-56 can be operated single ended or differentially. The MUX-56 is suitable for laboratory testing and use in test equipment.



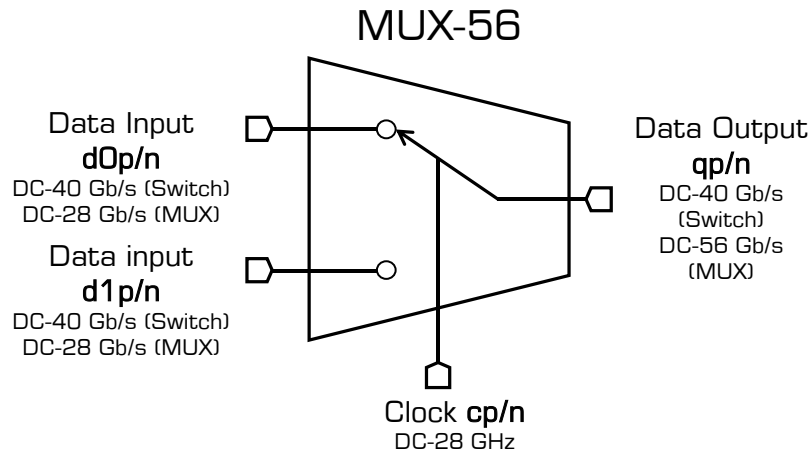
Features

- 56 Gb/s output data rate as a MUX
- Single Ended or Differential Operation
- Low Jitter

Applications

- Test Instrumentation
- High Speed Serializer/Deserializer
- Fiber Optic Test Systems

Functional Block Diagram



Part Ordering Options

Part Number	Description	Size	Green Status	Product Lifecycle ¹	Reliability ²
MUX-56	Connectorized Module	1.05" x 1.05" x 0.56"	RoHS	Active	Commercial
ASNT-5153	Surface Mount	10 mm x 10 mm x 1.205 mm		See adsantec.com	

¹ See Product Lifecycle section for a detailed description.

² See Reliability Qualification Level section for a detailed description.

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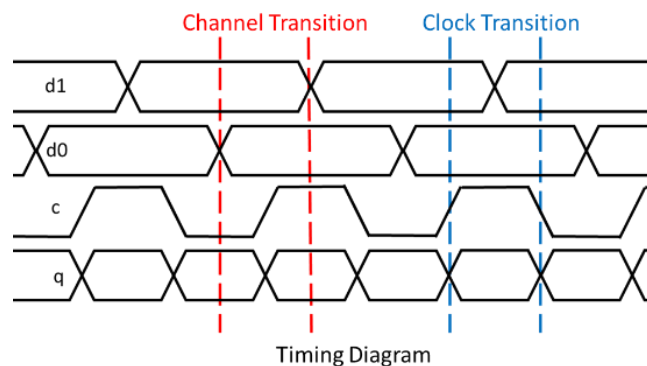
Application Information

Overview

The MUX-56 is a high speed multiplexer module designed for use in a laboratory or test equipment environment. The module consists of an ASNT-5153 broadband digital 2:1 multiplexer/selector chip fabricated in a SiGe process that is packaged with broadband bias circuitry and input/output connections to support operation up to 56 Gb/s on the output. The selector circuit can operate from DC-28 GHz, allowing operation as either multiplexer (with high frequency clock signal) or selector (with DC clock signal). All ports can be operated single ended or differentially with or without 50Ω loads and DC blocks ([DCZM29F29](#) and [DCZM24F24](#) DC blocks are recommended).

Operation as a Multiplexer

To operate as a multiplexer, connect ports d1 and d0 to high speed signals. The clock signal c, d0, and d1 must all share a clock source so they have exactly equal frequency and phase. The precise timing of the input signals is critical, as each zero crossing of the clock will cause the output signal to switch between input values. If the clock is not aligned with the input, or if the inputs are not out of phase with each other, erroneous output signals will occur. Below is the recommended timing diagram for operation as a MUX.



The duty cycle of the clock should be between 45% and 55%. The duty cycle can be adjusted by biasing the dcp and dcn pins between 0 and -3.3 V. If duty cycle adjustment is not required these pins may be left unconnected.

Operation as a Switch/Selector

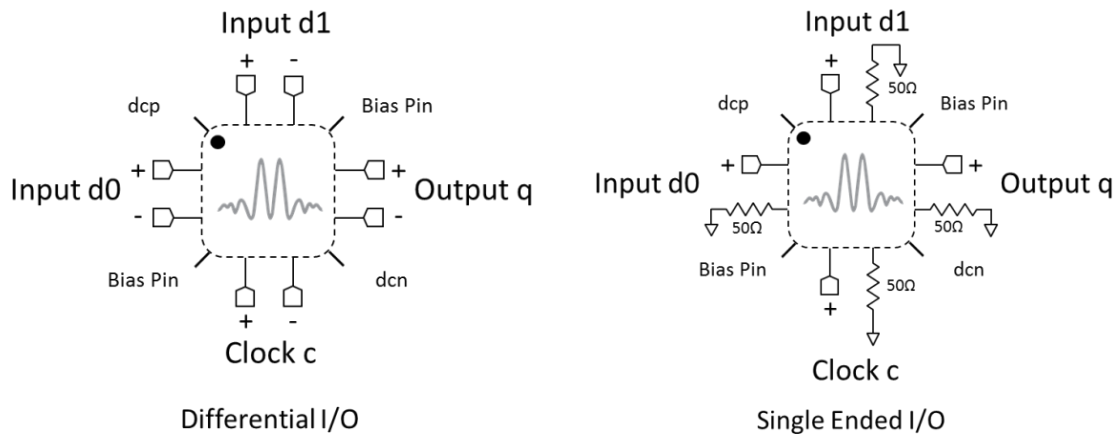
To operate as a selector, connect ports d1 and d0 to the desired signals and cp/cn or dcp/dcn to DC control voltages. Signals d0 and d1 do not need to have a common clock source or data rate. There are two ways to control the selection of the data path. The first is to apply a DC or low frequency bias directly to cp and/or cn. When the differential voltage $cp - cn > 0$ the MUX-56 will select d0, and when $cp - cn < 0$ the MUX-56 will select d1. Isolation will increase as the differential voltage increases to a maximum with approximately 100 mV of differential voltage.

The second way to control the data path selection is with the dcp and dcn pins. These pins connect to cp and cn with a 1kΩ resistor, creating a voltage divider on these pins. Application of -1V to dcp or dcn will create a voltage of approximately -50 mV on the cp or cn pins.

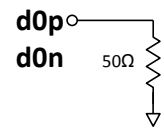
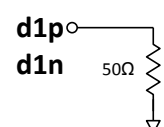
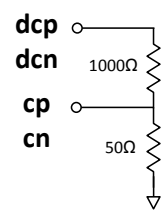
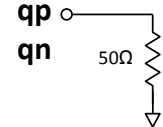
Port Configurations and Functions

Port Diagram

A top view of the MUX-56 package is shown below. The device is designed to work optimally with differential input and output signals, but can be used single ended with unused ports (either one) terminated in a 50Ω load. When used as a switch, the clock **c** is biased with a bias tee or using the internal dcp/dcn clock control voltage pins.



Port Functions

Port	Function (Multiplexer)	Function (Switch)	Description	Equivalent Circuit
d0n d0p	DC-28 Gb/s Data Input	DC-40 Gb/s selected for cp-cn > 0	d0 is a differential data input. Each port is terminated in 50Ω.	
d1n d1p	DC-28 Gb/s Data Input	DC-40 Gb/s selected for cp-cn < 0	d1 is a differential data input. Each port is terminated in 50Ω.	
cp cn	DC-28 GHz Clock Input	Differential Selector Voltage	Vcp-Vcn controls which signal is selected. When a synchronous signal at twice the data input frequency is provided, the device operates as a multiplexer. At lower frequencies it operates as a switch that can be controlled directly from cp/cn or indirectly from dcp/dcn.	
dcp dcn	Clock control voltage	Differential Selector Voltage		
qp qn	DC-56 GB/s Data Output	DC-40 Gb/s Data Output	Q is a differential data output. DC common mode voltage that can be blocked or terminated in a 50Ω load.	

Specifications

Operating Conditions

Maximum/Minimum indicate limits, beyond which damage may occur to the device. Typical indicates recommended range. If typical value is not given, all values provide equivalent performance.

Parameter	Minimum	Typical	Maximum
DC parameters			
Supply Voltage (V)	-3.1	-3.3	-3.6
Supply Current (mA)		152	
Power Consumption (mW)		500	550
High Speed Inputs			
Differential Input Voltage Swing ports d0, d1, c (mV peak-peak)	50		800
Input Datarate as a Switch ports d0, d1 (Gb/s)	DC		40
Input Datarate as a Multiplexer ports d0, d1 (Gb/s)	DC		28
Input Common Mode Voltage Ports d0, d1, c (mV)	-800		0
Input Voltage Ports dcp/n (V)	-3.3		0
High Speed Outputs			
Differential Output Voltage Swing port q (mV peak-peak)		600	
Output Datarate as a Multiplexer port q (Gb/s)	DC		56
Output Common Mode Voltage Port q (mV)		300	

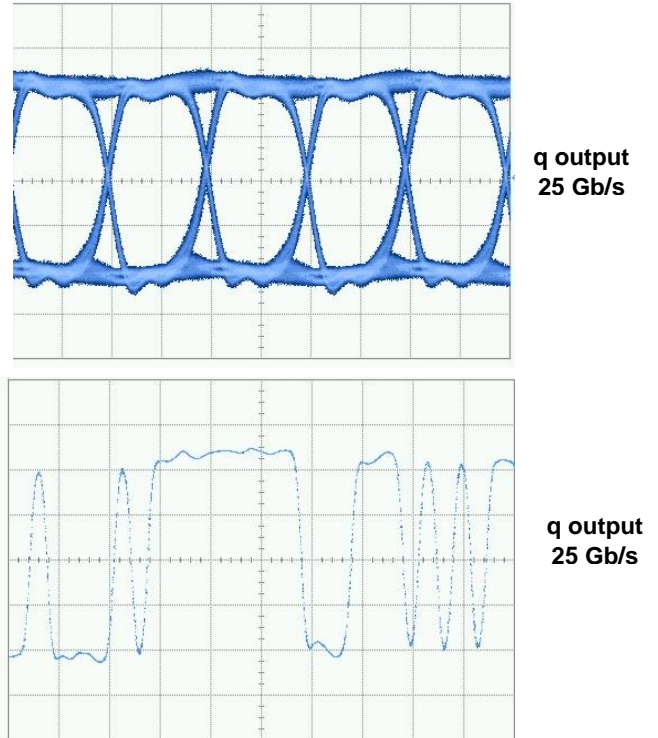
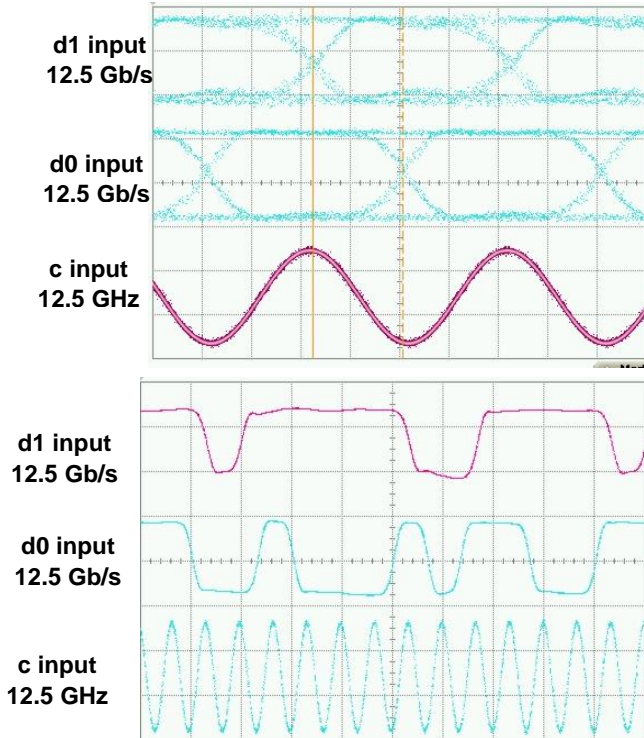
Sequencing, DC Blocking, and Termination Requirements

There is no requirement to apply power to the ports in a specific order.

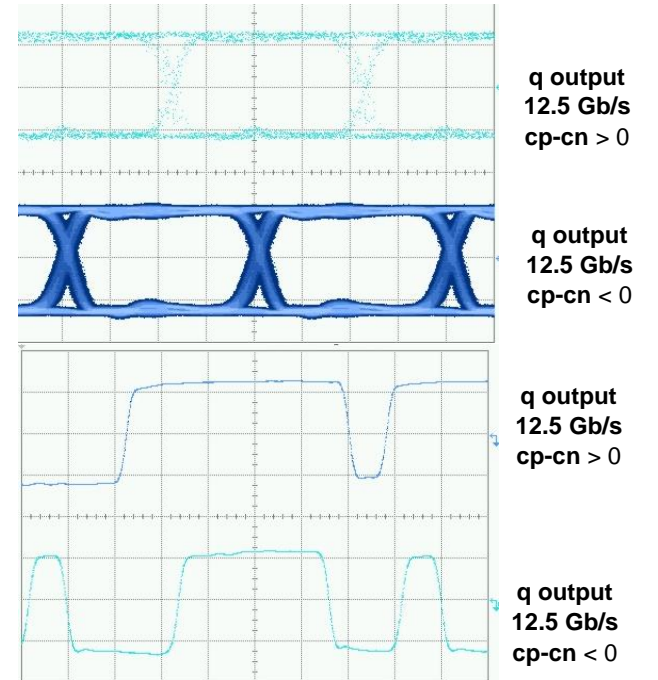
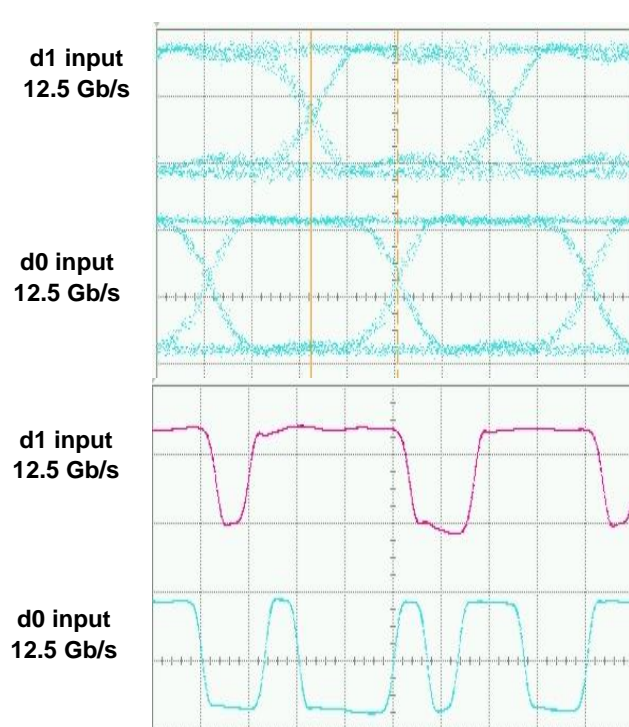
If operating single ended, a 50Ω termination on the unused output port will significantly improve performance. Input ports may be terminated to improve noise performance.

DC blocks are required on inputs when common mode voltage will exceed maximum or minimum ratings. DC blocks are optional on output ports.

Typical High Speed Data Plots

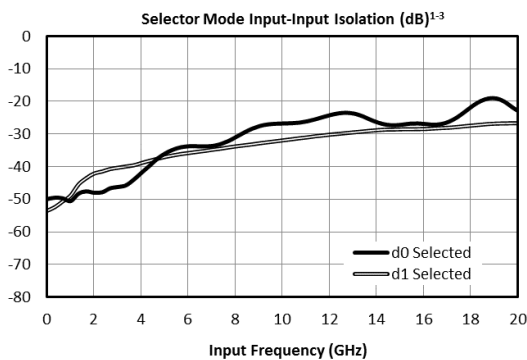
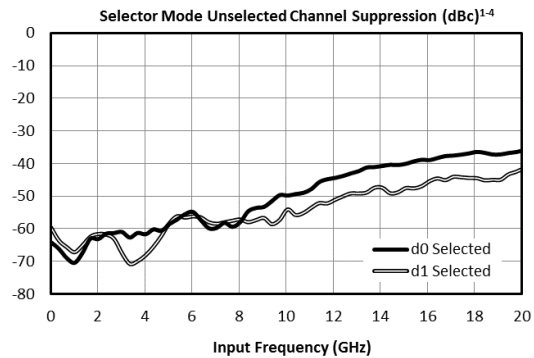
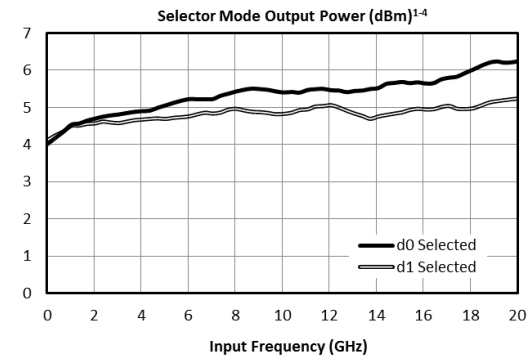


As a Multiplexer



As a Switch

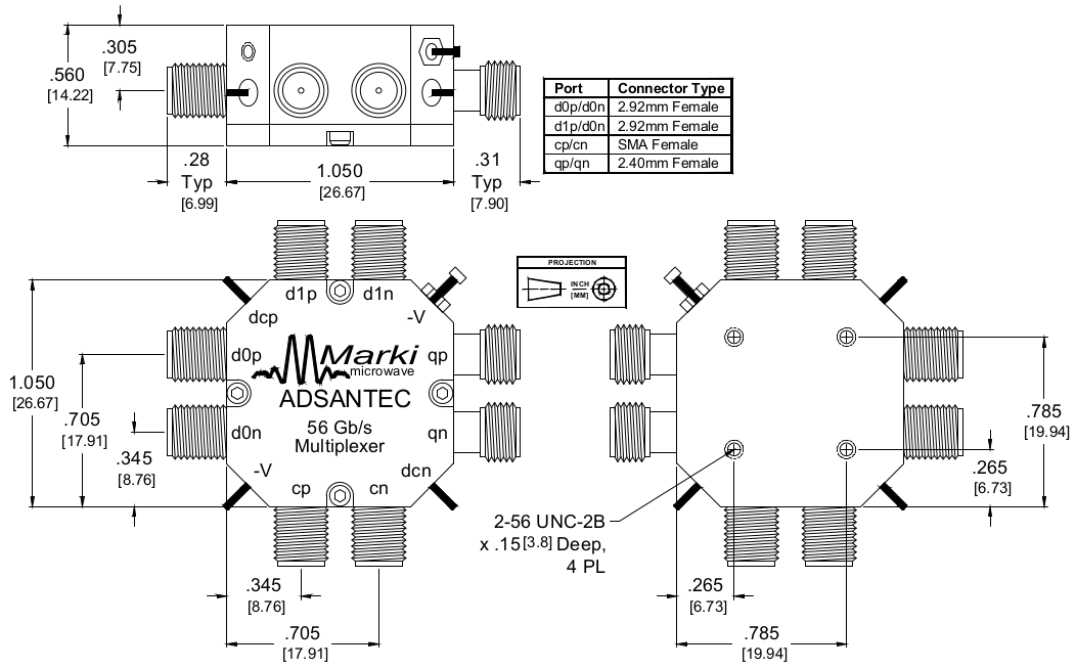
Frequency Domain Plots



1. Output power varies with input power. The input power must be sufficient to saturate the multiplexer.
2. Measurements were taken in a single ended configuration using the positive channel input and the negative channel terminated in a 50Ω load.
3. Selector mode data taken using the [BT-0026](#) to provide the DC connection to stationary power supply.
4. Output power and Unselected Channel Suppression taken at -15dBm input power. Results vary with input power.

Mechanical Data

Package Outline Drawing



Package Information

Parameter	Details	Rating
Connector Torque	Maximum Acceptable Torque on Connectors	8 in-lb
ESD	Human Body Model (HBM), per MIL-STD-750, Method 1020	TBD
Moisture Level Sensitivity		TBD
Weight		TBD

Product Status Information

Product Lifecycle

The following are definitions for the Product Lifecycle:

- Pre-release (PRE):** The product has not yet been released. It is in process of qualification for release and the datasheet is subject to change.
- Active:** The product is in active production and is recommended for design-in.
- Not Recommended for New Design (NRND):** The product is in active, but is not recommended for new design-in. In most cases, a newer generation of products has been released and is recommended.

- End of Life (EOL):** A lifetime buy has been announced for the product; the plan for this product is to become obsolete.
- Obsolete (OBS):** This product is no longer available.

Reliability Qualification Level

The following are definitions for the Reliability Qualification Level:

- Lab:** The product is intended for laboratory use only, and is expected to *not* pass high reliability testing.
- Commercial:** Operating reliability with respect to temperature, humidity, pressure, altitude, mechanical shock, vibration, thermal shock, life, etc are unknown. While these tests have not been performed, the product is not known to fail these tests unless noted. Environmental reliability characterization is performed for high volume products and when sponsored by a customer.
- HiRel:** The product may be used in a High Reliability application; a High Reliability Qualification Report is available on the product's web page, or upon request.
- Not Applicable (N/A):** The Reliability Quality Level is not applicable to this product, e.g. for an Evaluation Module.

Green Status

- Non-RoHS:** This product does not comply with the RoHS directive due to the use of leaded solder.
- RoHS:** This product does comply with the RoHS directive.

Revision History

5/30/17 Initial Datasheet release Rev-

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