



PI3HDMI412-A

4-Differential Channel, 2:1 Mux/DeMux, DVI/HDMI Compliant Signal Switch based on TMDS Signaling Standard

Features

- 4-Differential Channel 2:1 Mux/DeMux
- TMDS Signaling
- Data Rate: 1.65Gbps
- Crosstalk: -25dB@825MHz
- Switching speed: 4ns
- Isolation: -30dB@825MHz
- ESD: Data bits @ 8kV HBM, select bit @ 2 kV HBM
- Near-Zero Prop Delay: 250ps max.
- Low bit-to-bit skew
- Hot insertion capable
- Enable/Disable Time: 9ns
- Bidirectional
- Packaging (Pb-free & Green):
 - 42-pin TQFN (ZH)
 - 48-pin BQSOP (B)

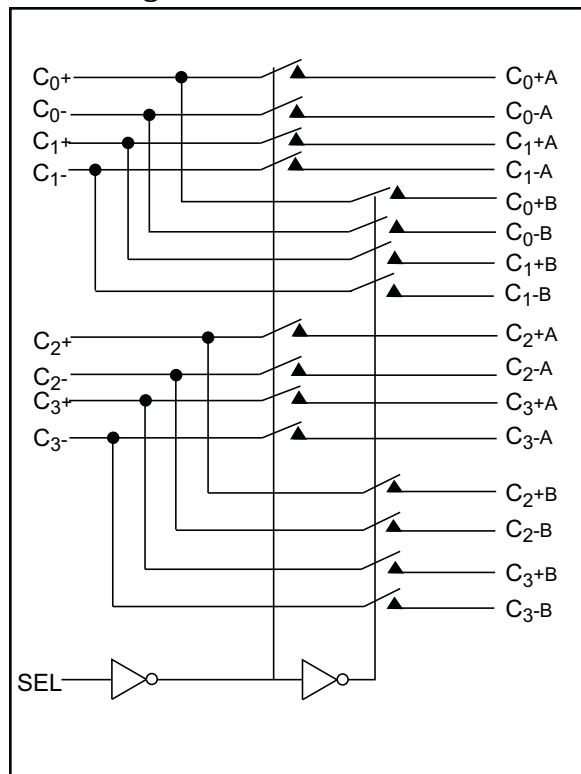
Description

Pericom Semiconductor's PI3HDMI series of switch circuits are targeted for high-resolution video networks that are based on DVI/HDMI standards, and TMDS signal processing. The PI3HDMI412-A is a 8- to 4-Channel Mux/DeMux Switch. The device multiplexes differential signals to one of two corresponding outputs. The switch is bidirectional and offers little or no attenuation of the high-speed signals at the outputs. It is designed for low bit-to-bit skew and high channel-to-channel noise isolation.

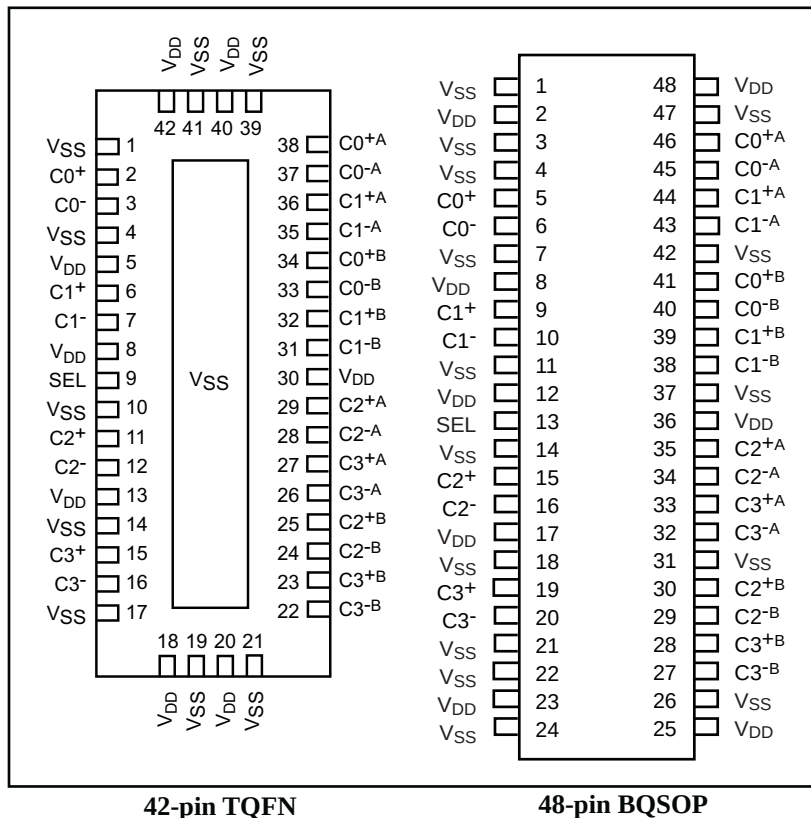
The maximum DVI/HDMI data rate of 1.65Gbps provides the resolution required by the next generation HDTV and PC graphics. Three differential channels are used for data (video signals for DVI or audio/video signals for HDMI), and one differential channel is used for Clock for decoding the TMDS signals at the outputs.

Because of its passive bidirectional feature, this switch can be used either at the video drivers side or at the receiver side. For PC graphics applications, the device sits at the drivers side to switch between multiple display units such as PC LCD monitor, projector, TV, etc. For consumer video applications, the device sits at the receiver end to switch between the source components such as DVD, D-VHS, STB, etc.

Block Diagram



Pin Descriptions (Top View)



**Truth Table**

Function	SEL
N to N ^A	L
N to N ^B	H

Pin Description

Pin #	Pin Name	Description
5, 8, 13, 18, 20, 30, 40, 42	V _{DD}	+ Power supply 3.30
1, 4, 10, 14, 17, 19, 21, 39, 41	V _{SS}	- Power supply
9	SEL	Select pin, see truth table
2, 3, 6, 7, 11, 12, 15, 16, 31-38, 22-29	CX ^{tx}	Data + Clk bits for TMDS signal

Maximum Ratings

(Above which useful life may be impaired. For user guidelines, not tested.)

Storage Temperature.....	-65°C to +150°C
Supply Voltage to V _{SS} Potential.....	-0.5V to +2.5V
DC Input Voltage	V _{SS} to V _{DD}
DC Output Current.....	120mA
Power Dissipation.....	0.5W

Note:

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

DC Power Supply Characteristics

Parameter	Description	Min.	Max.	Units
V _{DD}	Positive Power Supply	3.0	3.6	V
V _{SS}	Negative Power Supply	1.5	1.6	V

DC Electrical Characteristics for Switching over Operating Range (T_A = -40°C to +85°C)

Parameter	Description	Test Conditions	Min.	Typ ⁽²⁾	Max.	Units
V _{IH} ⁽³⁾	Input HIGH Voltage	Guaranteed HIGH level	0.65(V _{DD} -V _{SS})+V _{SS}			V
V _{IL} ⁽³⁾	Input LOW Voltage	Guaranteed LOW level	-0.5+V _{SS}		0.35(V _{DD} -V _{SS})+V _{SS}	
V _{IK}	Clamp Diode Voltage	V _{DD} =Max., I _{IN} =-18mA		-0.7+V _{SS}	-1.2+V _{SS}	
I _{IH}	Input HIGH Current	V _{DD} =Max., V _{IN} =V _{DD}			±5	μA
I _{IL}	Input LOW Current	V _{DD} =Max., V _{IN} =V _{SS}			±5	

Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at T_A = 25°C ambient and maximum loading.
- V_{IH} + V_{IL} are for SEL input only.



Power Supply Characteristics

Parameters	Description	Test Conditions ⁽¹⁾	Min.	Typ. ⁽²⁾	Max.	Units
I _{CC}	Quiescent Power Supply Current	V _{DD} = Max., V _{IN} = V _{DD} or V _{SS}		200		μA

Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at T_A = 25°C ambient and maximum loading.

Dynamic Electrical Characteristics Over the Operating Range (T_A = -40° to +85°C)

Parameter	Description	Test Conditions	Min.	Typ. ⁽²⁾	Max.	Units
X _{TALK}	Crosstalk	See Fig. 1 for Measurement Setup, f = 825 MHz		-25		dB
O _{IRR}	OFF Isolation	See Fig. 2 for Measurement Setup, f = 825 MHz		-30		
DR	Data Rate				4.0	Gbps

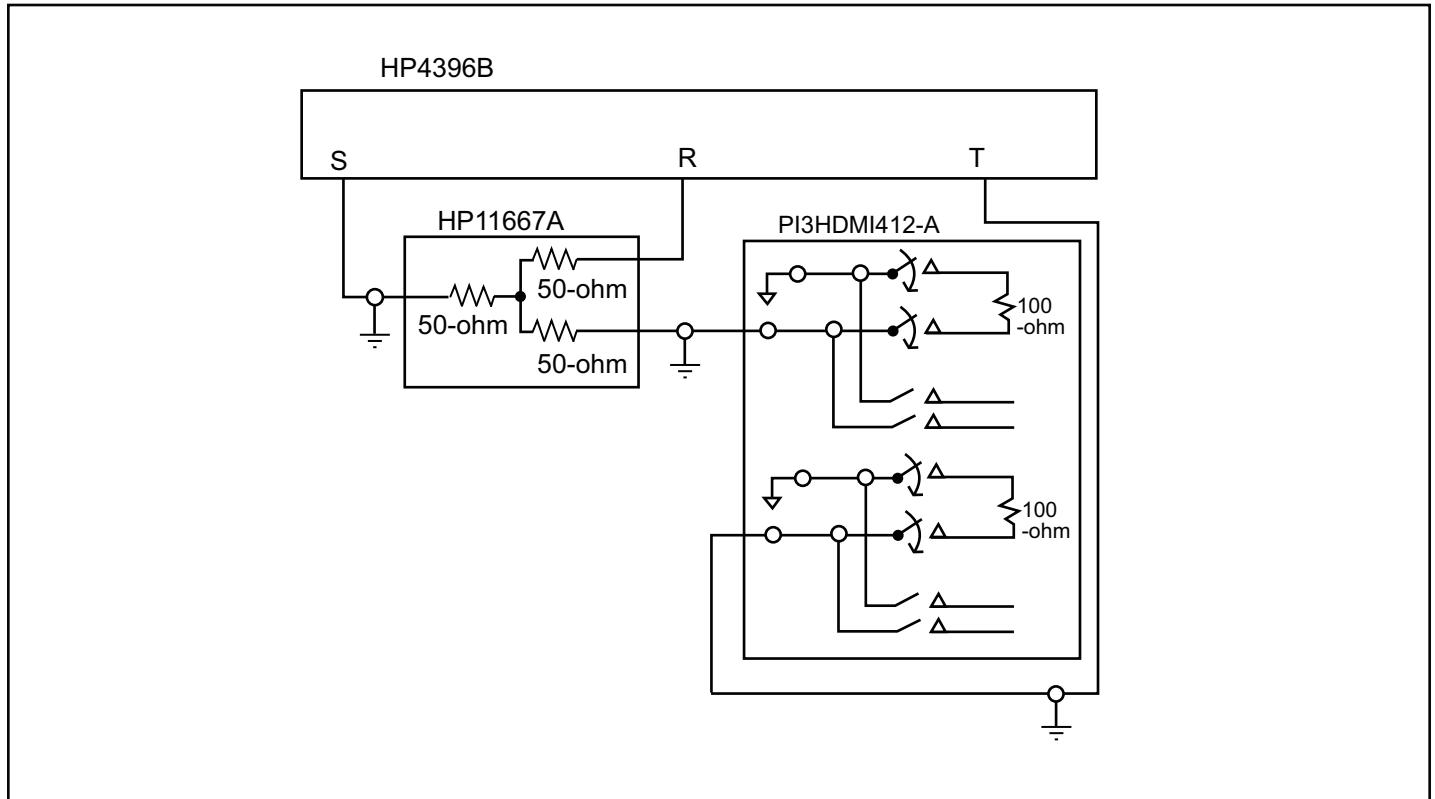


Fig 1. Crosstalk Setup

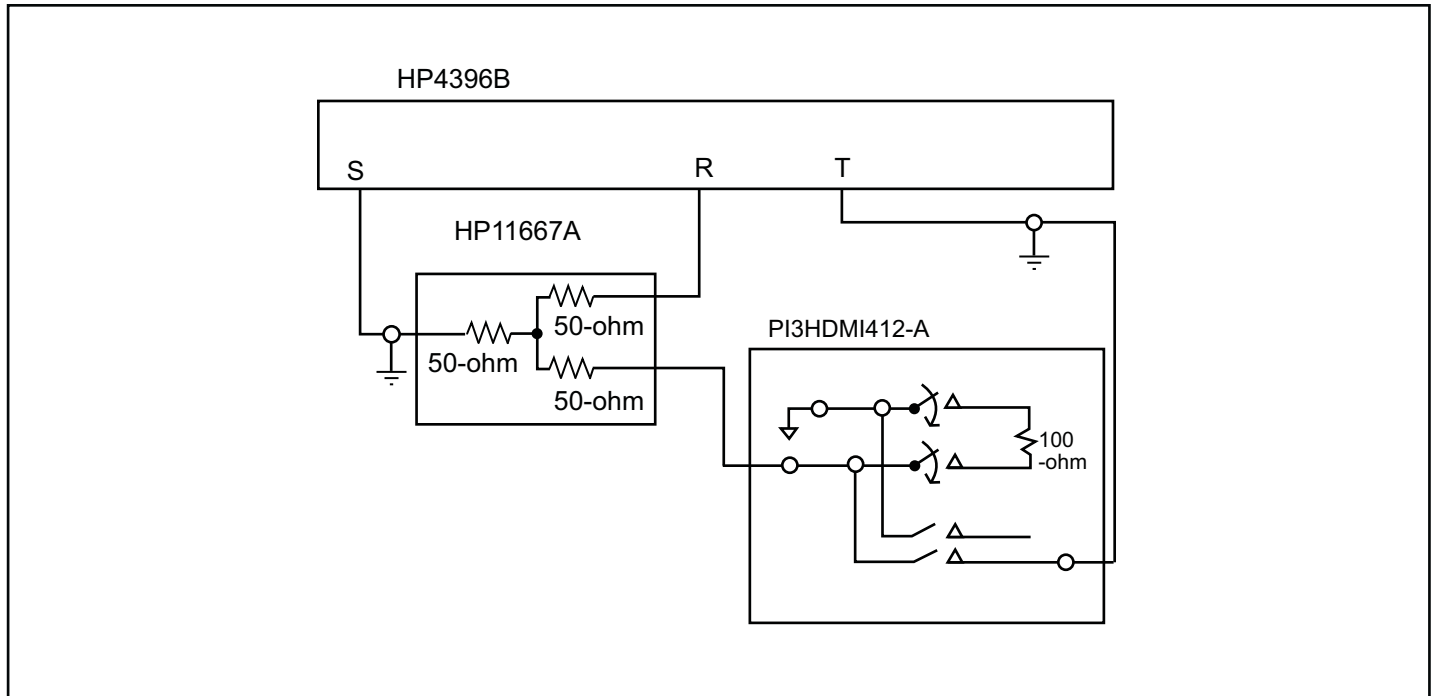


Fig 2. Off-isolation setup

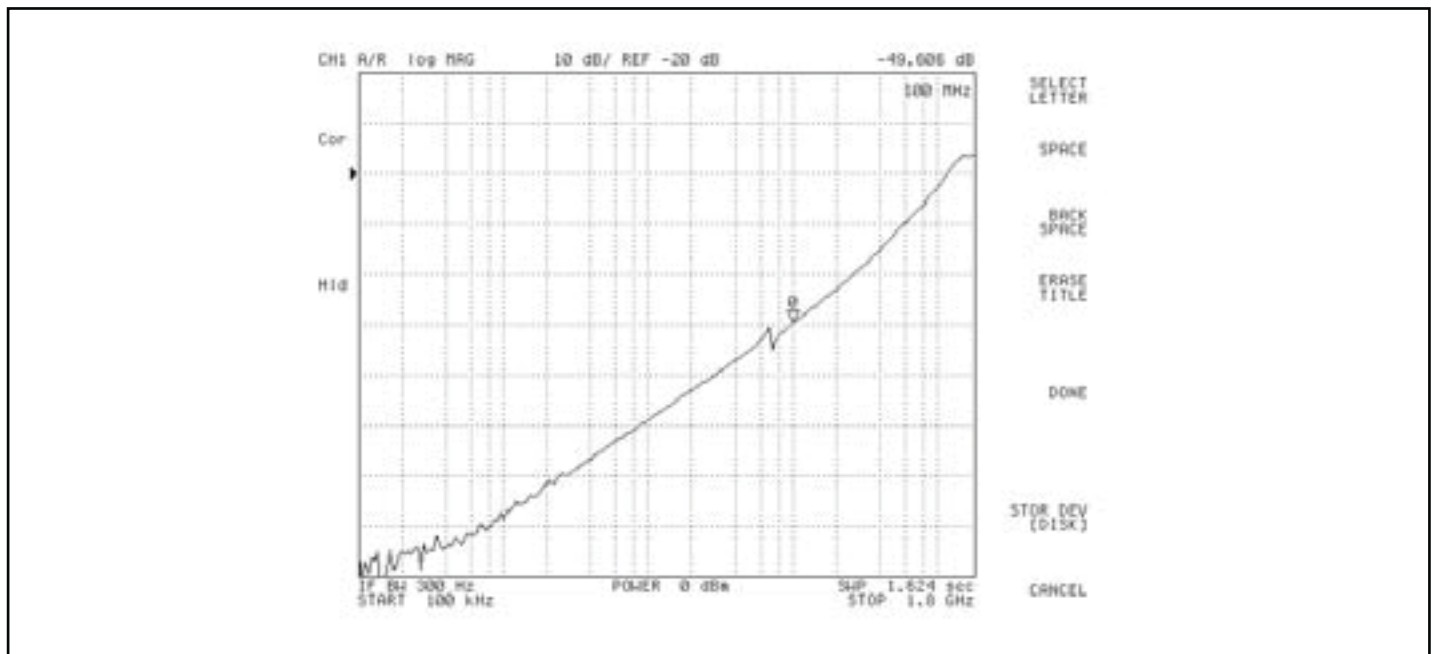
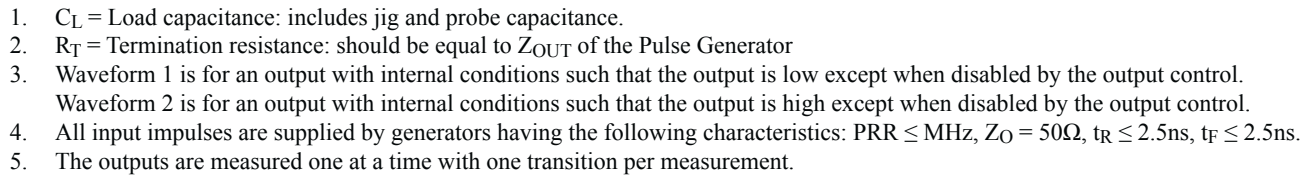


Fig 3. Crosstalk

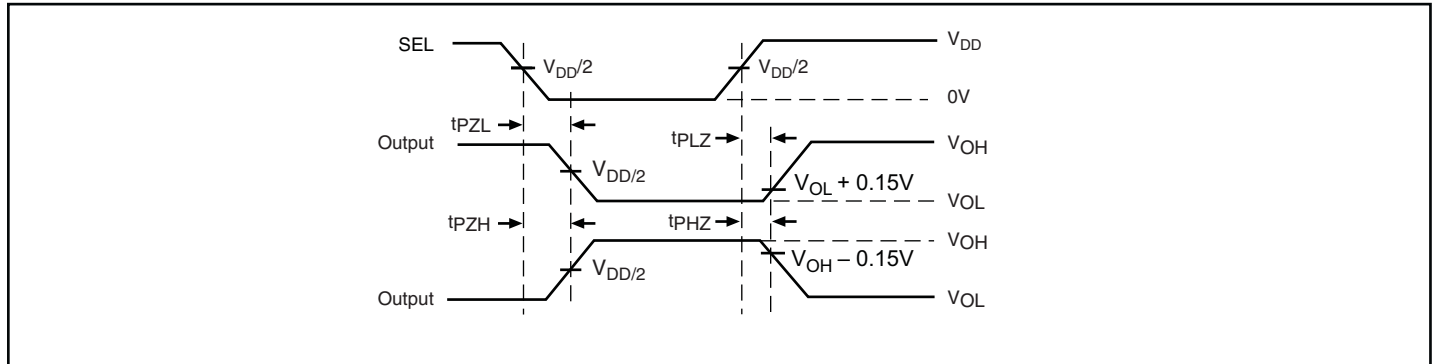


Test	Switch
t _{PLZ} , t _{PZL} (output on B-side)	2 x (V _{DD} - V _{SS})
t _{PHZ} , t _{PZH} (output on B-side)	V _{SS}
Prop Delay	Open

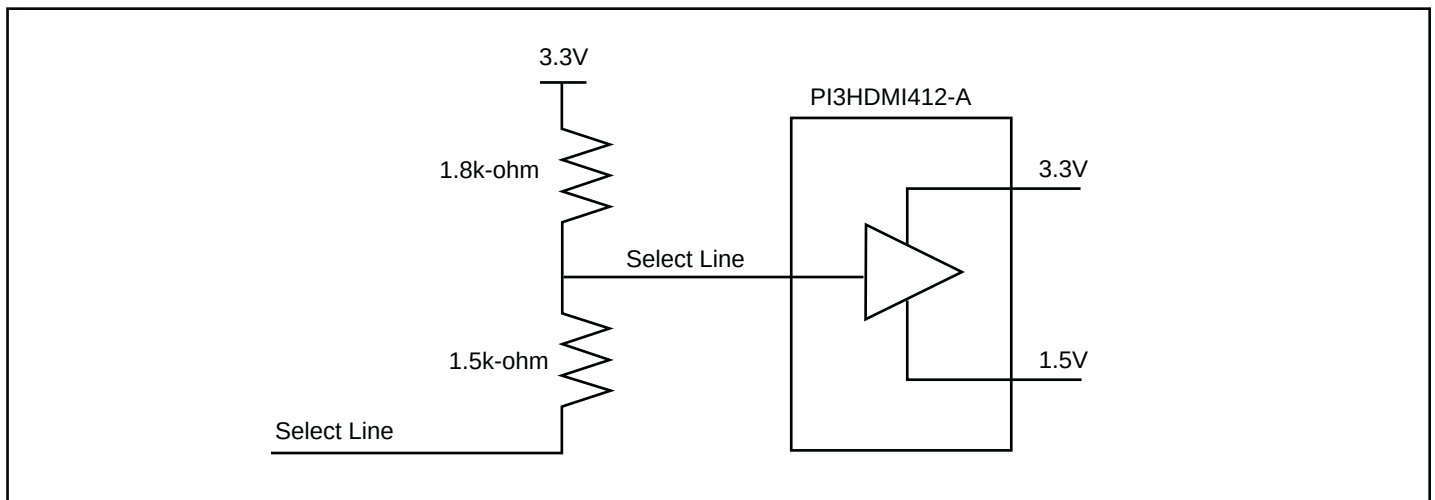
The schematic diagram illustrates the calibration setup for the HP4396B. It features a main block labeled 'HP4396B or Equivalent' with three terminals: S1, R1, and T1. Terminal S1 is connected to a ground symbol through a switch. Terminal R1 is connected to a switch that can route the signal either directly to the output or through a network of resistors labeled 'HP11667A'. Terminal T1 is connected to a ground symbol through a switch. The output of the resistor network is connected to a block labeled 'PI3HDMI412-A', which is then connected to a ground symbol through a switch.



Switching Waveforms



Voltage Waveforms Enable and Disable Times



Example of a circuit that needs to be connected to the select lines of our device:

Application Test Results

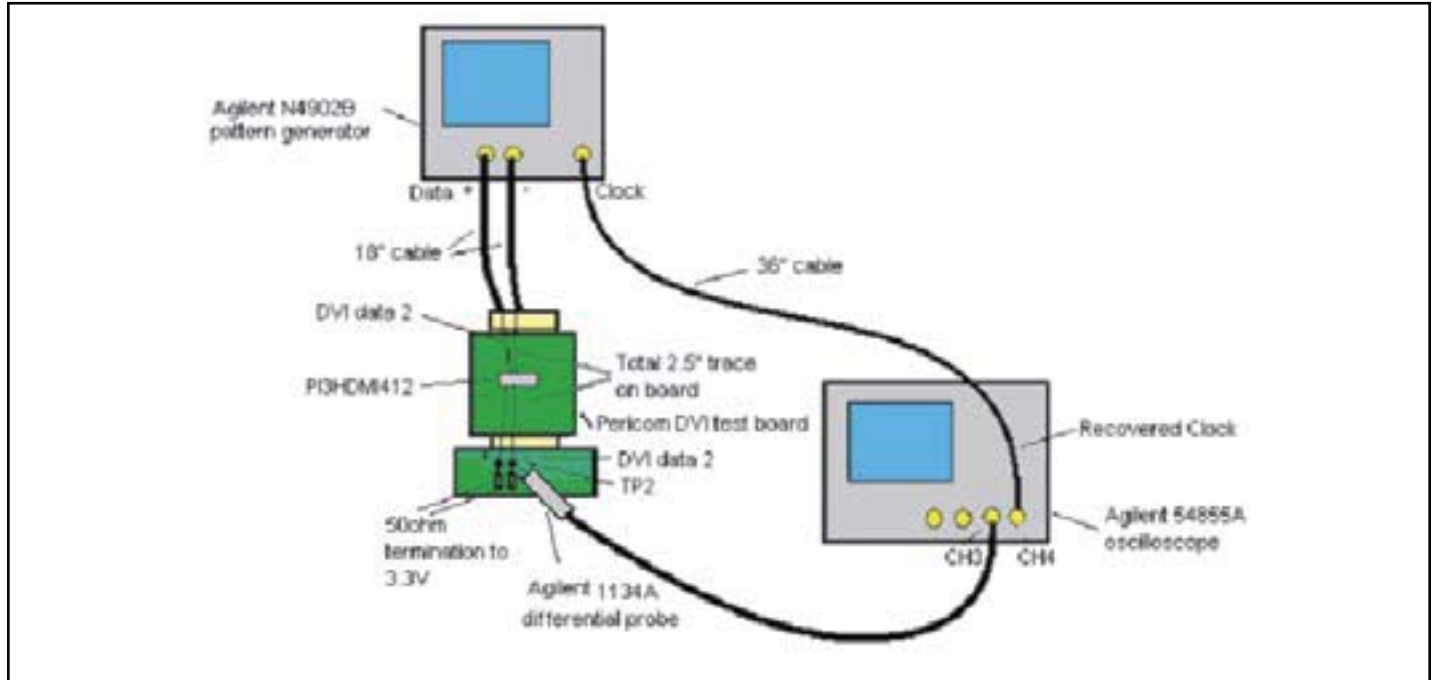


Figure 1. TMDS TP2 Tx eye compliance test setup

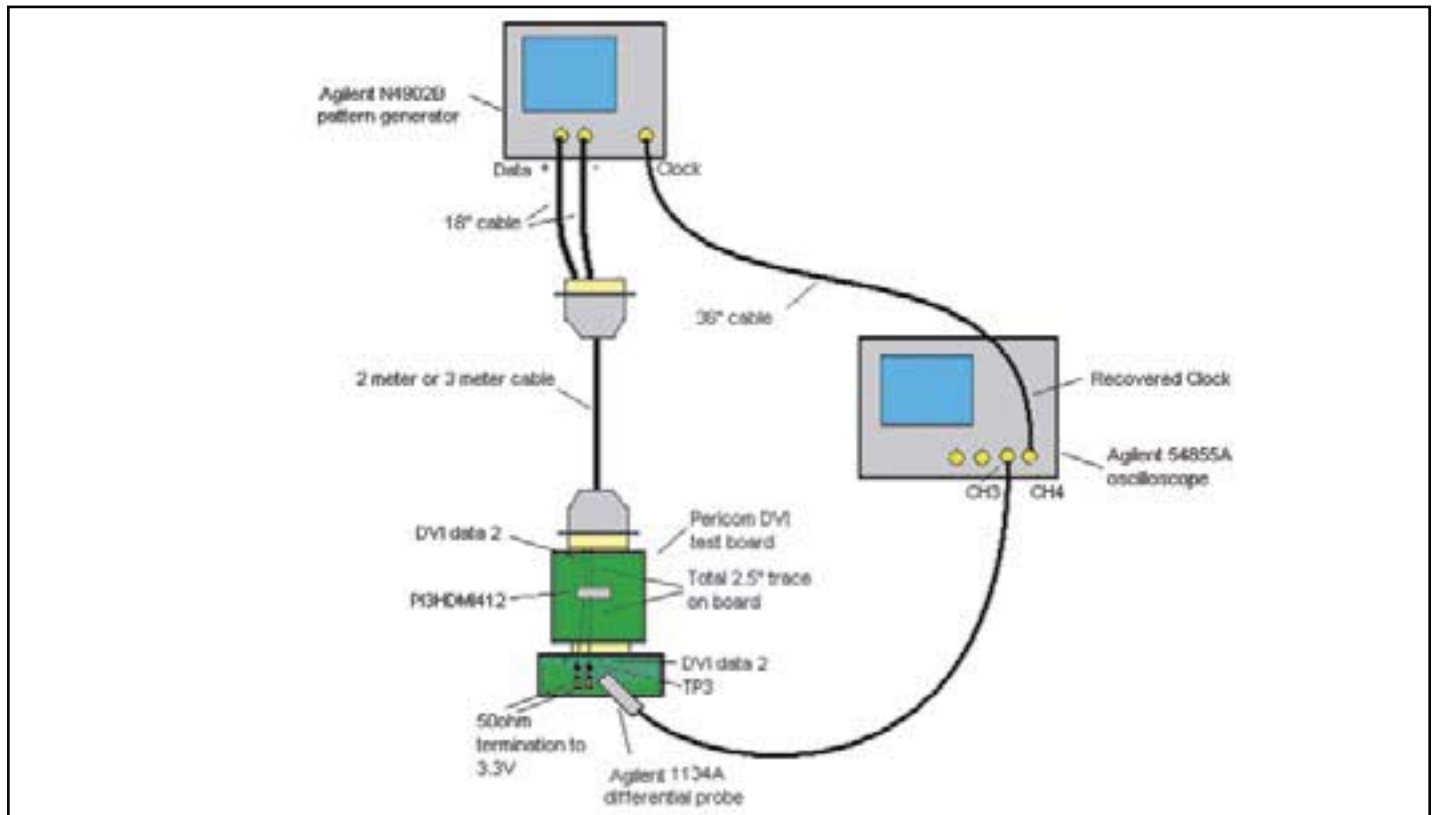


Figure 2. TMDS TP3 Rx "switch at receiver" eye compliance test setup

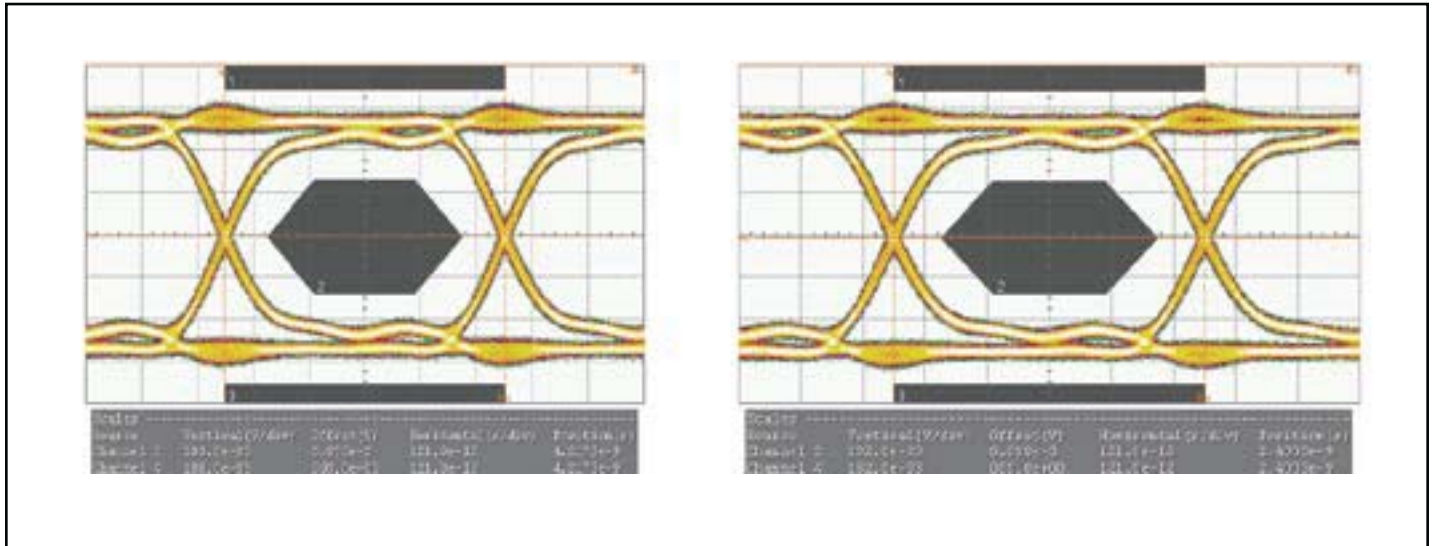


Figure 3. TP2 (Tx) eye-measurements (left is with switch, right is without switch), refer to figure 1 for the test set up

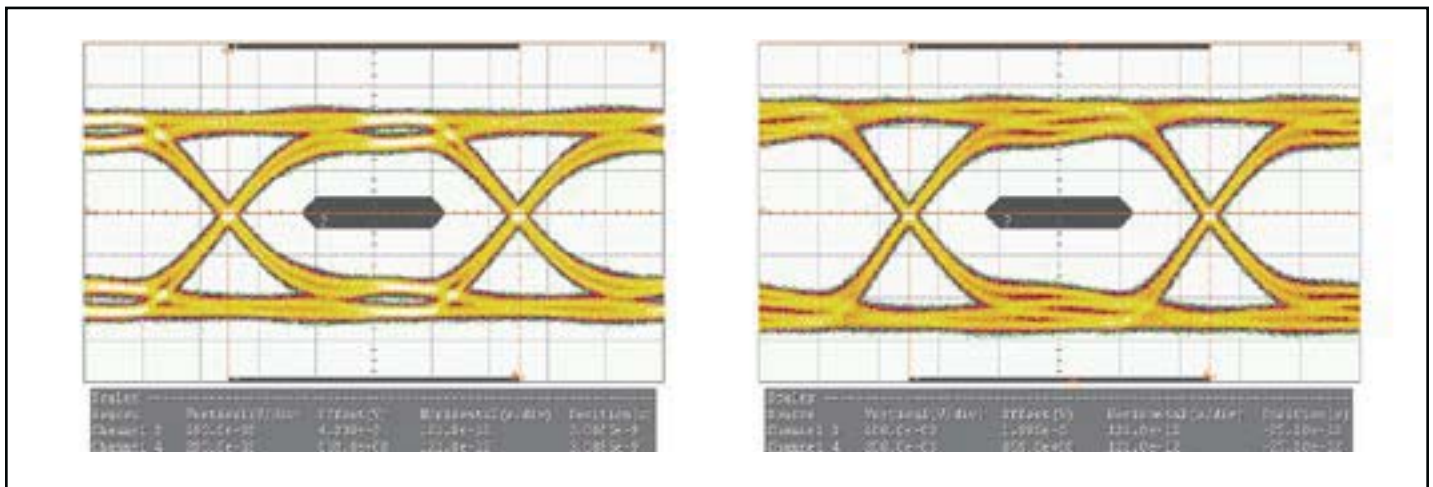
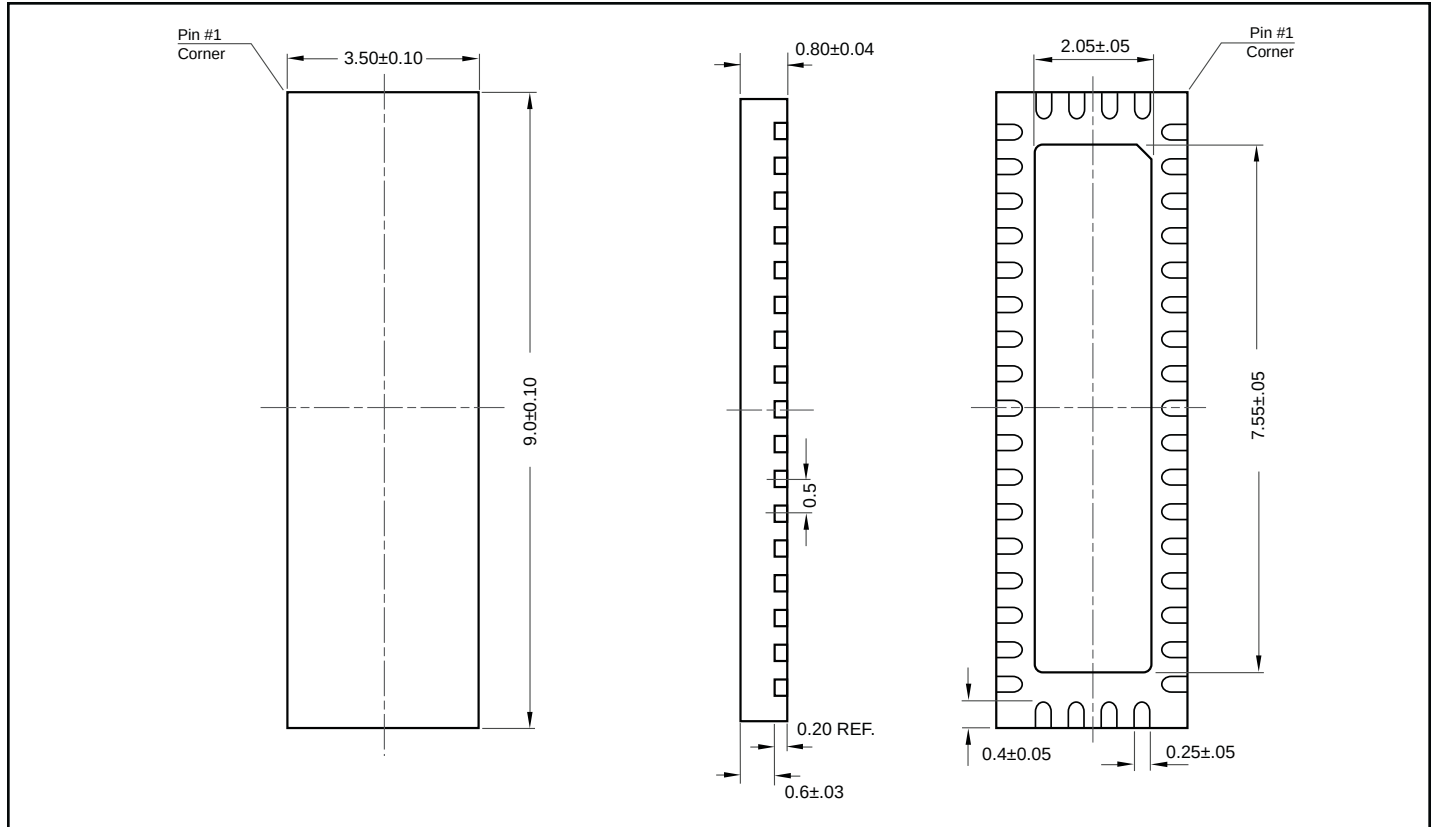


Figure 4. TP3 (Rx) - "Switch at receiver side" with 2-meter cable eye-measurements (left is with switch, right is without switch), refer to figure 2 for the test set up.



Packaging Mechanical: 42-pin TQFN (ZH)



Packaging Mechanical: 48-pin BQSOP (B)

