![PERICOM®]

PI3HDMI1212-A

High-performance HDMI™ 1.3 Compatible Signal Switch w/ Integrated Side-band Signal Support

Features

- 4-Differential Channel 2:1 Mux/DeMux + 4-Channel 2:1 Mux/DeMux
- Deep Color™ Support
- Data Rate: 4.0Gbps for high speed data channels
- Clock rate max support @ 340MHz
- Supports both AC coupled and DC coupled signals
- Switching speed: 4ns
- Isolation: -40dB@1GHz for high-speed channels
- Integrated ESD protection
- High-speed data bits & clock:
  - 12kV HBM per JESD22 standard
  - 8kV contact per IEC61000-4-2 standard
- Side band signal bits: 2kV HBM
- Low bit-to-bit skew
- Enable/Disable time: 9ns
- Targeted for MUX applications only
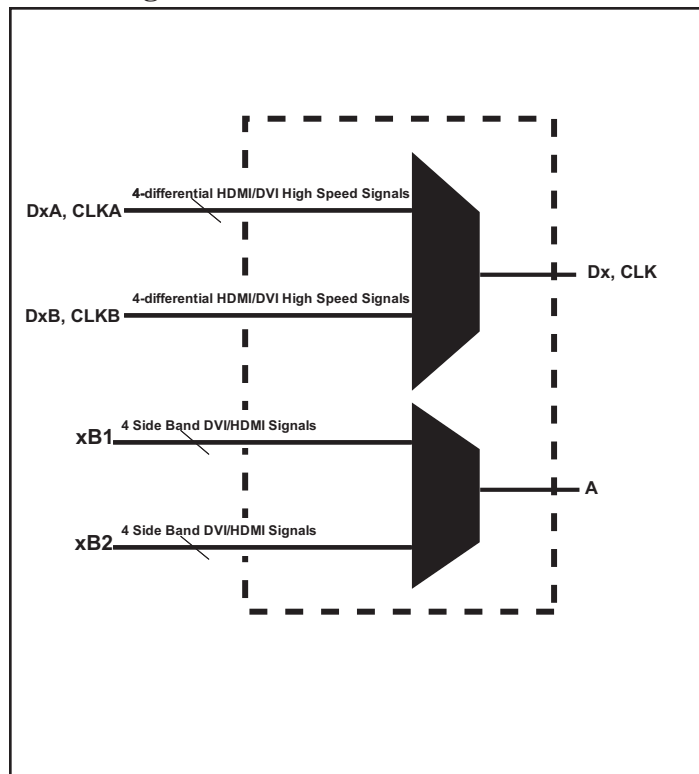- Packaging (Pb-free & Green):
  —80-pin BQSOP (B)

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 PI3HDMI1212-A is a 2-to-1 HDMI™ Mux/DeMux Switch. The device multiplexes differential signals to one of two corresponding HDMI™ inputs. 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 4.0Gbps 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.

PI3HDMI1212-A was designed specifically to meet ATC-Sink requirements. Therefore, Pericom recommends locating this switch at the sink to switch between multiple sources.

Block Diagram

Pin Description

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Truth Table

SEL(pin11)	Function[1]
L	$CLK \rightarrow CLKA$
L	$D_x \rightarrow D_xA$
H	$D_x \rightarrow D_xB$
H	$CLK \rightarrow CLKB$

$\overline{EN}$(pin40)	IN(pin36)	Function[2]
L	L	$A_n \rightarrow {}_nB_1$
L	H	$A_n \rightarrow {}_nB_2$
H	X	$A_n = {}_nB_1 = {}_nB_2 = H_1-Z$

Note:
1) x=0,1,2,3
2) n=0,1,2,3

Pin Description

Pin Name	Description
$V_{DD}33$	3.3V Power supply
CP	Tie this pin to GND via 0.1µF capacitor for optimal operation
$V_{DD}50$	5.0V Power supply
Dx	High Speed TMDS signal I/O
DxA, DxB	High Speed TMDS signal I/O
SEL	High Speed Signal Control
IN	Side Band Signal Control
Ax, xB1, xB2	Side Band Signal I/O
GND	GND pin
EN\	Global Enable for Side Band Signals
CLK, CLKA/B	TMDS CLK signal I/O

Maximum Ratings

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

Storage Temperature..–65°C to +150°C

DC Input Voltage for side band signals.................-0.5V to 5.5V
DC Output Current...20mA
Power Dissipation...0.5W
Supply Voltage $V_{DD}33$...3.0V to 3.6V
Supply Voltage $V_{DD}50$.....................................4.2V to 5.5V

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

Paramenter	Description	Min.	Max.	Units
V_{DD}^{33}	3.3V Power Supply	3.0	3.6	V
V_{DD}^{50}	5.0 Power Supply	4.2	5.5	V

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DC Electrical Characteristics for Switching over Operating Range

$(T_A = -40°C$ to $+85°C)$ for high speed only

Parameter	Description	Test Conditions	Min.	Typ[2]	Max.	Units
$V_{IH_{SEL}}$[3]	Input HIGH Voltage	Guaranteed HIGH level	2.8			
$V_{IL_{SEL}}$[3]	Input LOW Voltage	Guaranteed LOW level			2.0	V
$V_{IK_{HS}}$[4]	Clamp Diode Voltage	V_{DD}=Max., I_{IN}=−18mA			0.9	

Notes:

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.

2. Typical values are at $T_A = 25°C$ ambient and maximum loading.

3. $V_{IH_{SEL}}$ + $V_{IL_{SEL}}$ are for SEL input only (pin 11)

DC Electrical Characteristics for Switching over Operating Range

$(T_A = -40°C$ to $+85°C)$ for side band signals only

Parameter	Description	Test Conditions	Min.	Typ[2]	Max.	Units
$V_{IH_{IN}}$[3]	Input HIGH Voltage	Guaranteed HIGH level	2.1			
$V_{IL_{IN}}$[3]	Input LOW Voltage	Guaranteed LOW level			0.8	V
$V_{IK_{SB}}$[4]	Clamp Diode Voltage	V_{DD}=Max., I_{IN}=−18mA			-0.5	
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:

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.

2. Typical values are at $T_A = 25°C$ ambient and maximum loading.

3. $V_{IH_{IN}}$ + $V_{IL_{IN}}$ are for IN 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}		11	15	mA

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

## Dynamic Electrical Characteristics Over the Operating Range (T_A= -40º to +85ºC)

| Parameter	Description	Test Conditions	Min.	Typ.[3]	Max.	Units
$X_{TALK_{HS}}$[1]	Crosstalk	See Fig. 1 for Measurement Setup, f = 1.65Gbps		-30		dB
$X_{TALK_{SB}}$[2]		f =10MHz		-62		
$O_{IRR_{HS}}$[1]	OFF Isolation	See Fig. 2 for Measurement Setup, f = 1.65Gbps		-40		
$O_{IRR_{SB}}$[2]		10MHz		-67		
BW_{HS}[1]Data	-3dB Bandwith			2.3		GHz
IL_{HS}[1]	Insertion Loss	@1.65 Gbps (8-bit deep color)		-0.5		dB
		@2.0625 Gbps (10-bit deep color)		-0.75		
		@2.25 Gbps (12-bit deep color)		-1.0		
		@3.3 Gbps (16-bit deep color)		-1.84		
BW_{Clock}	-3dB Bandwidth			1.7		GHz

Notes:
1. High-speed data path only
2. Side-band signal path only
3. Typical values are @ T_A = 25˚C ambient
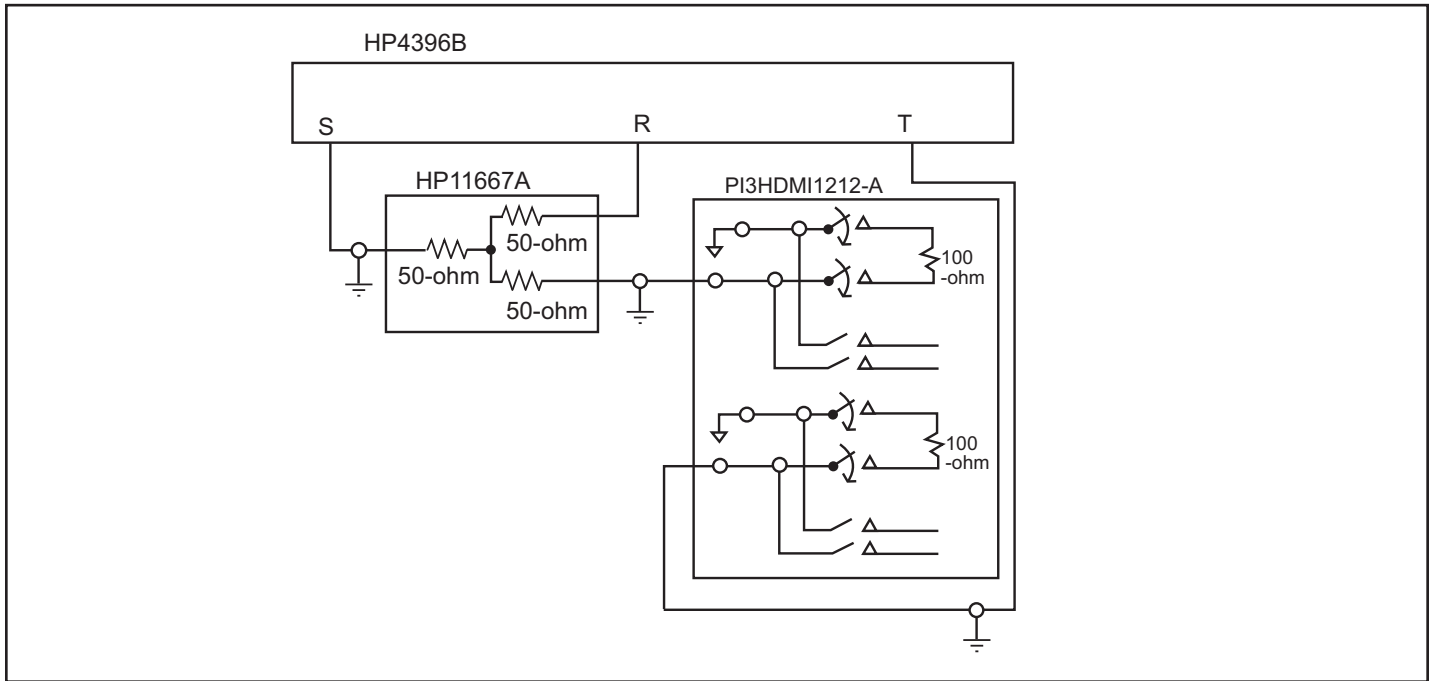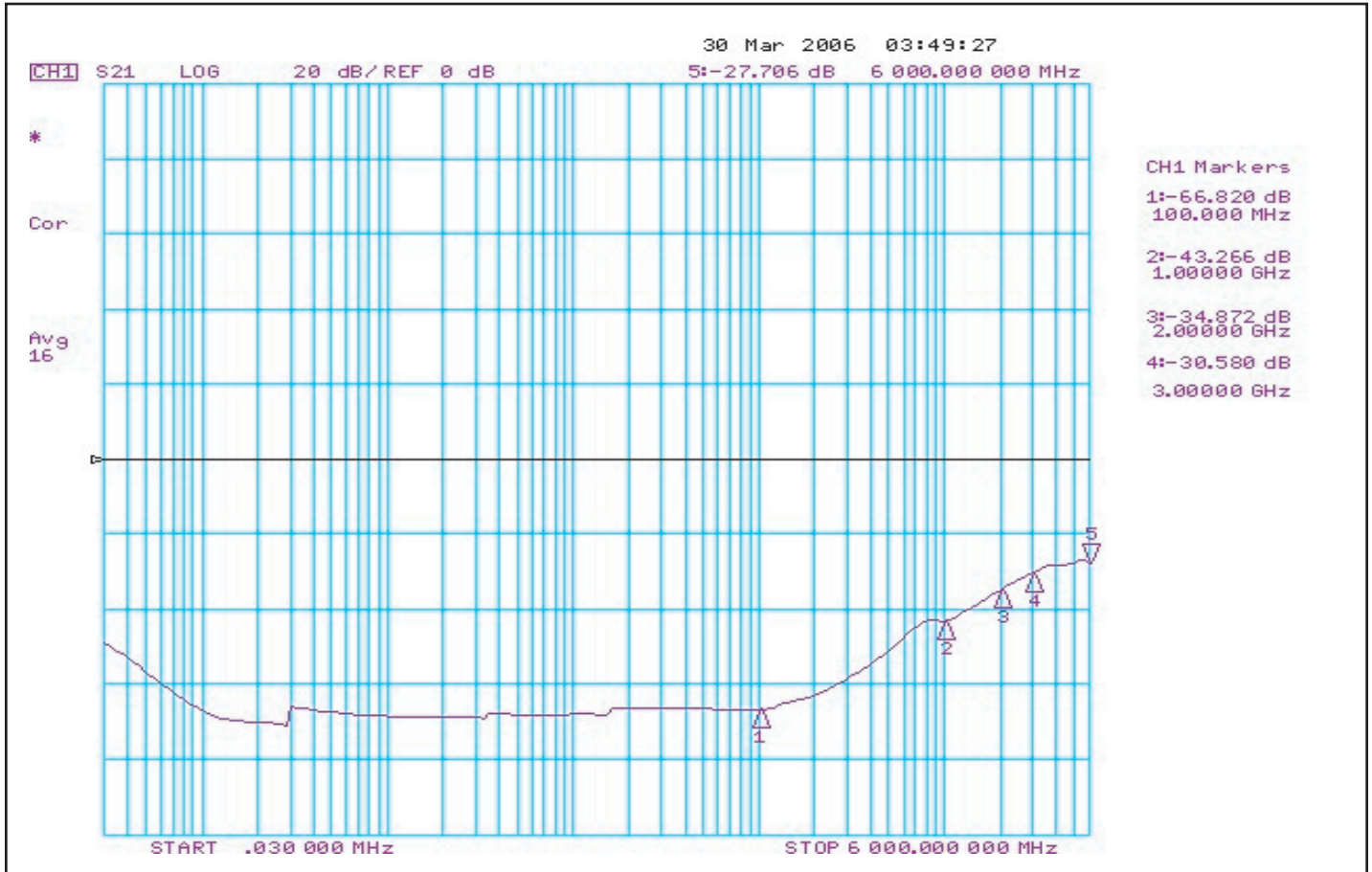
Fig 1. Crosstalk Setup
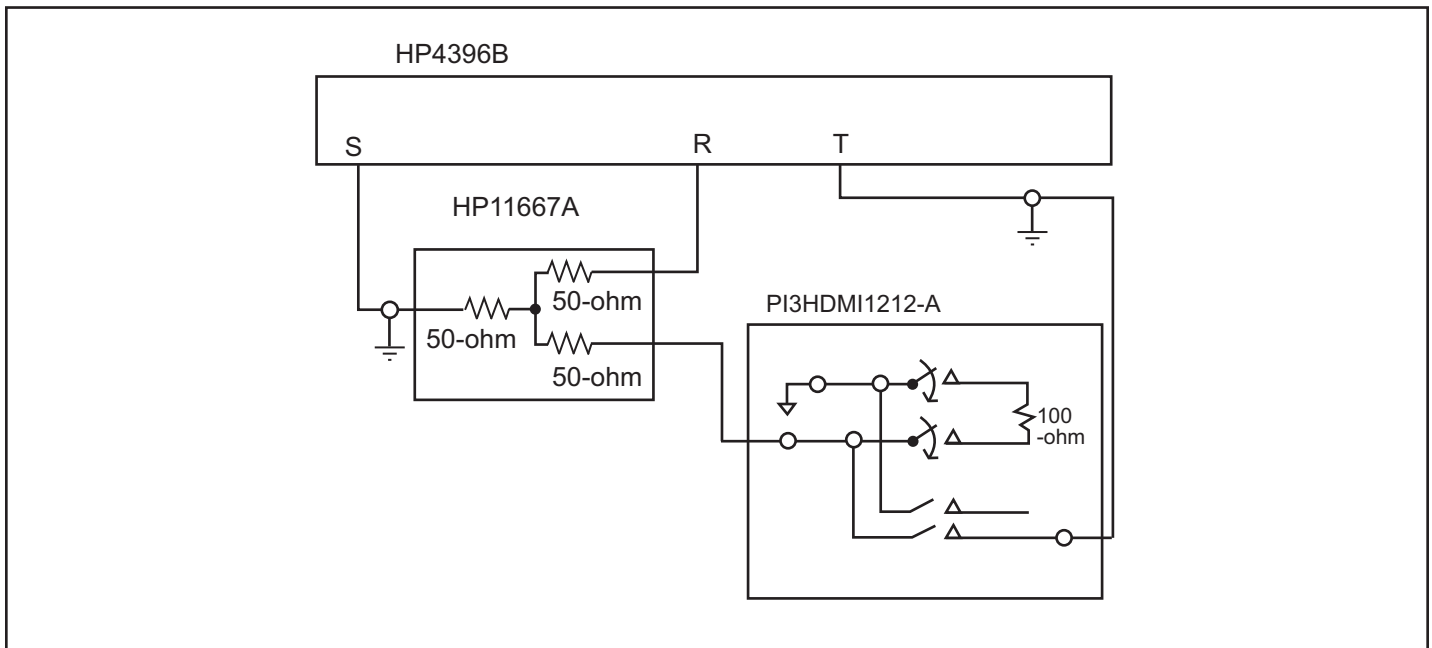
Fig 2. Off-isolation setup

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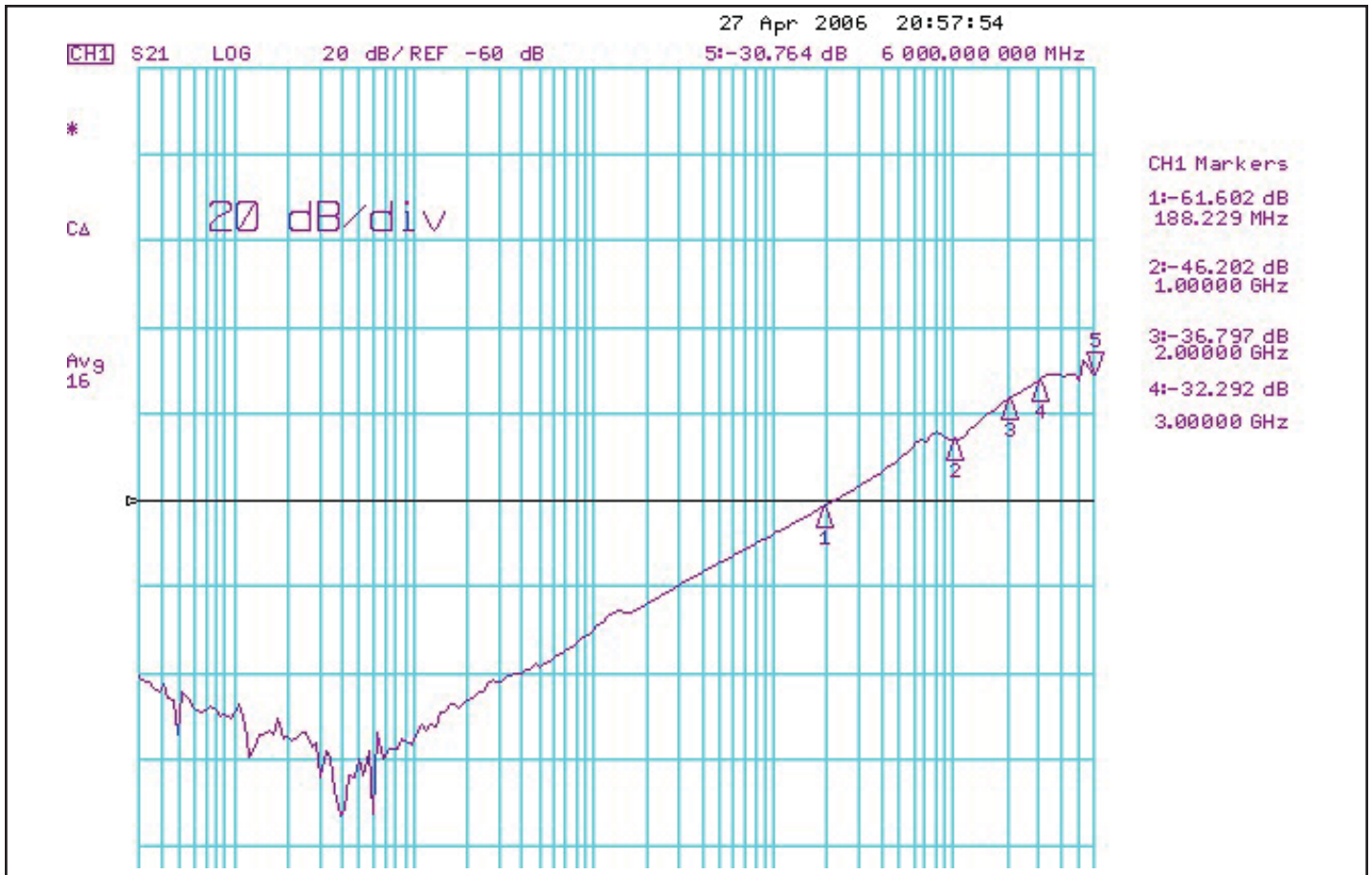
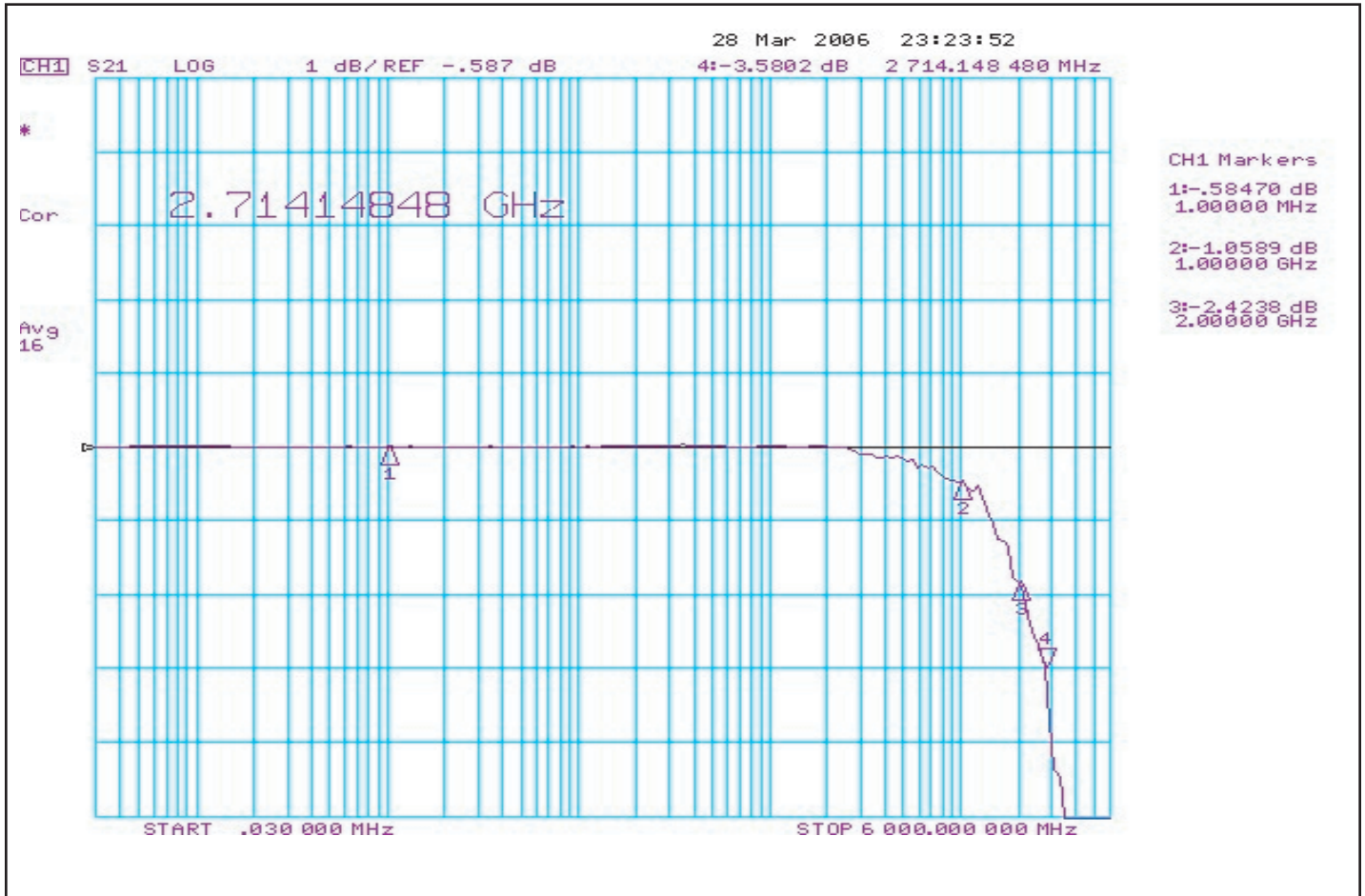**Fig 3. Crosstalk for High-speed data signals only**

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Fig 4. Off Isolation for high-speed data signals only

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Fig 4. Insertion loss for high-speed data signals only

Switching Characteristics $(T_A = -40°$ to $+85°C$, $V_{DD}33 = 3.3V \pm 10\%$, $V_{DD}50 = 5.0V \pm 10\%$

Parameter	Description	Min.	Typ.[2]	Max.	Units
t_{PZH}, t_{PZL}	Line Enable Time - SEL to A_N, B_N	0.5		8.0	ns
t_{PHZ}, t_{PLZ}	Line Disable Time - SEL to A_N, B_N	0.5		4.0	

Notes:
1. For measurement setup, please see "Test Circuit For Electrical Characteristic" on page 6, and "Switching waveforms" on page 7

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## Test Circuit for Electrical Characteristics[1]
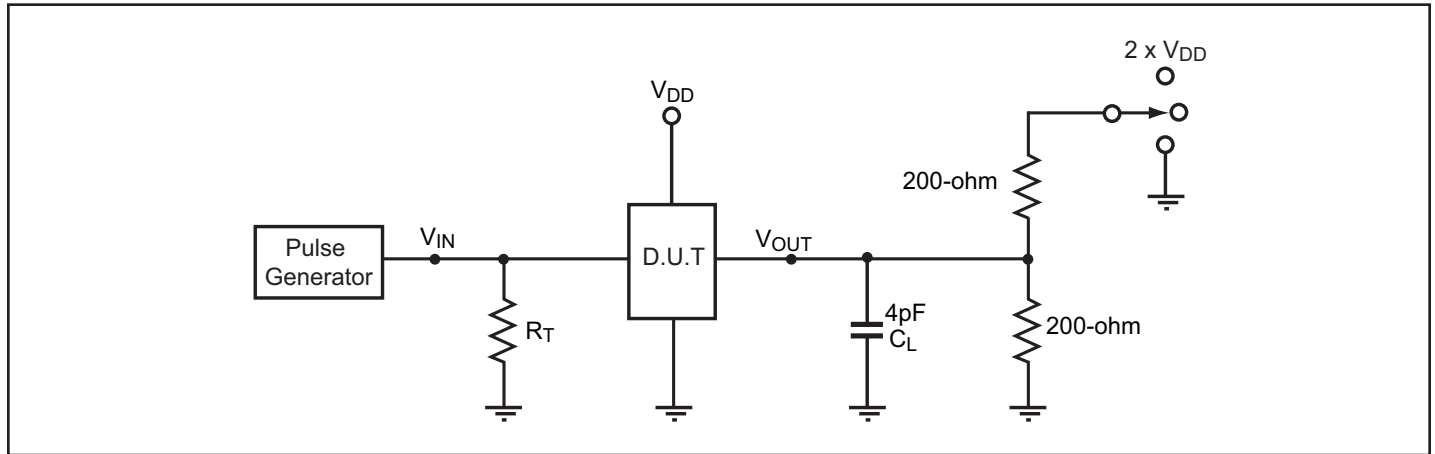
Notes:
1. C_L = Load capacitance: includes jig and probe capacitance.
2. R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator
3. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
   Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
4. All input impulses are supplied by generators having the following characteristics: PRR ≤ MHz, $Z_O = 50\Omega$, $t_R \leq 2.5$ns, $t_F \leq 2.5$ns.
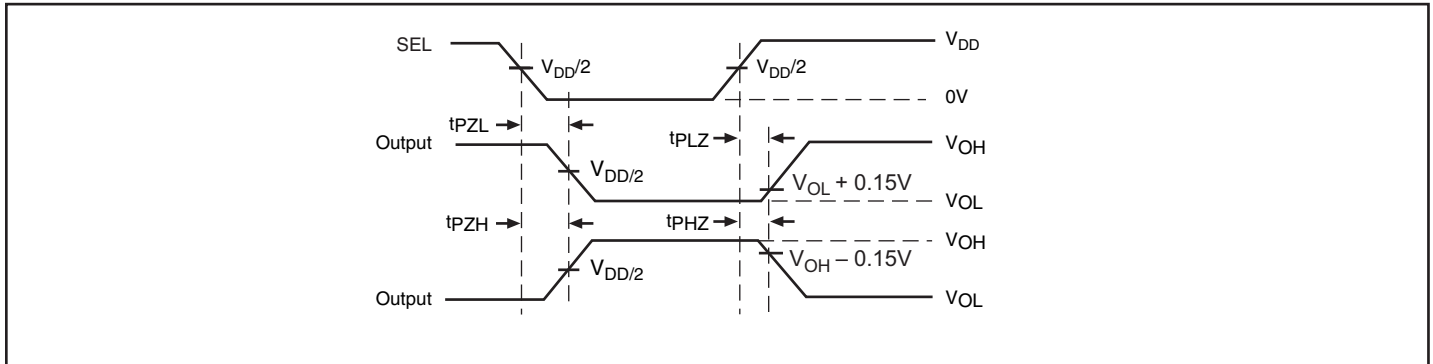5. The outputs are measured one at a time with one transition per measurement.

Switch Positions

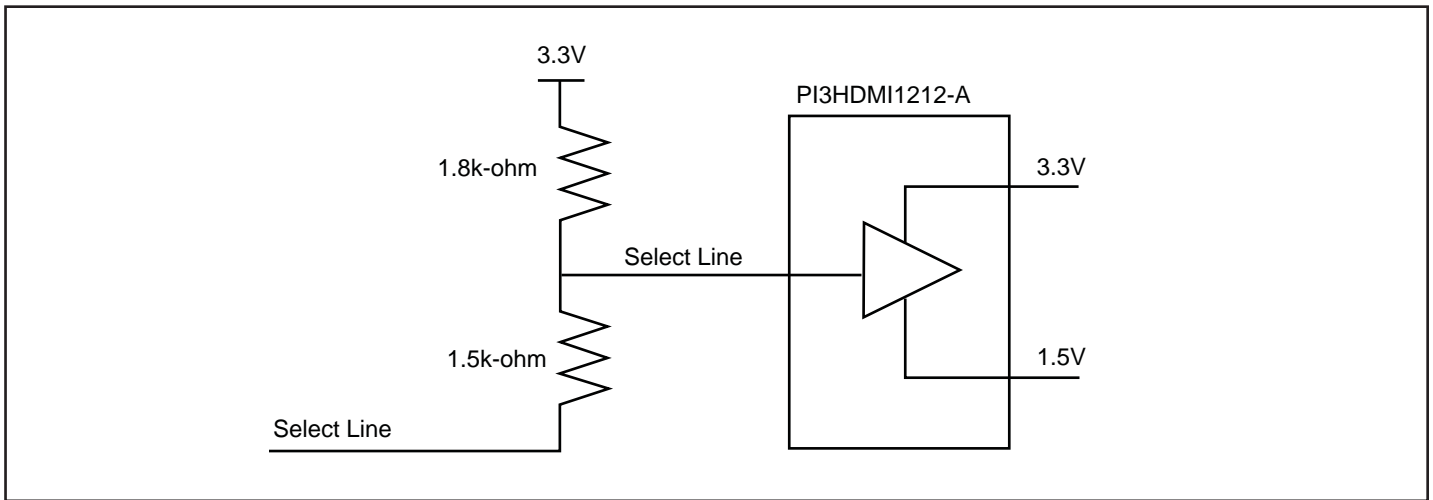| Test	Switch
t_{PLZ}, t_{PZL} (output on B-side)	2 x (V_{DD}33)
t_{PHZ}, t_{PZH} (output on B-side)	GND
Prop Delay	Open

Test Circuit for Dynamic Electrical Characteristics

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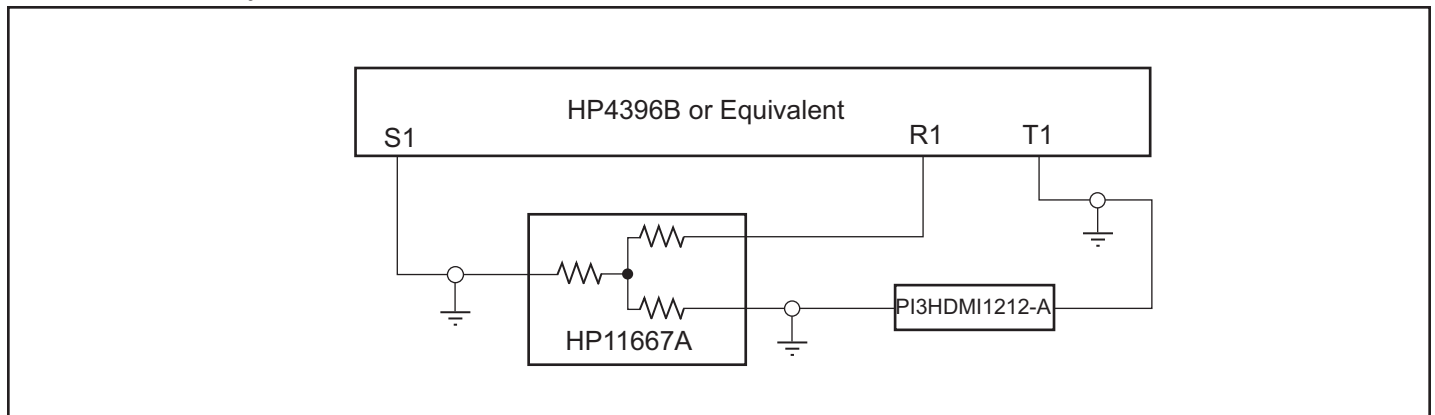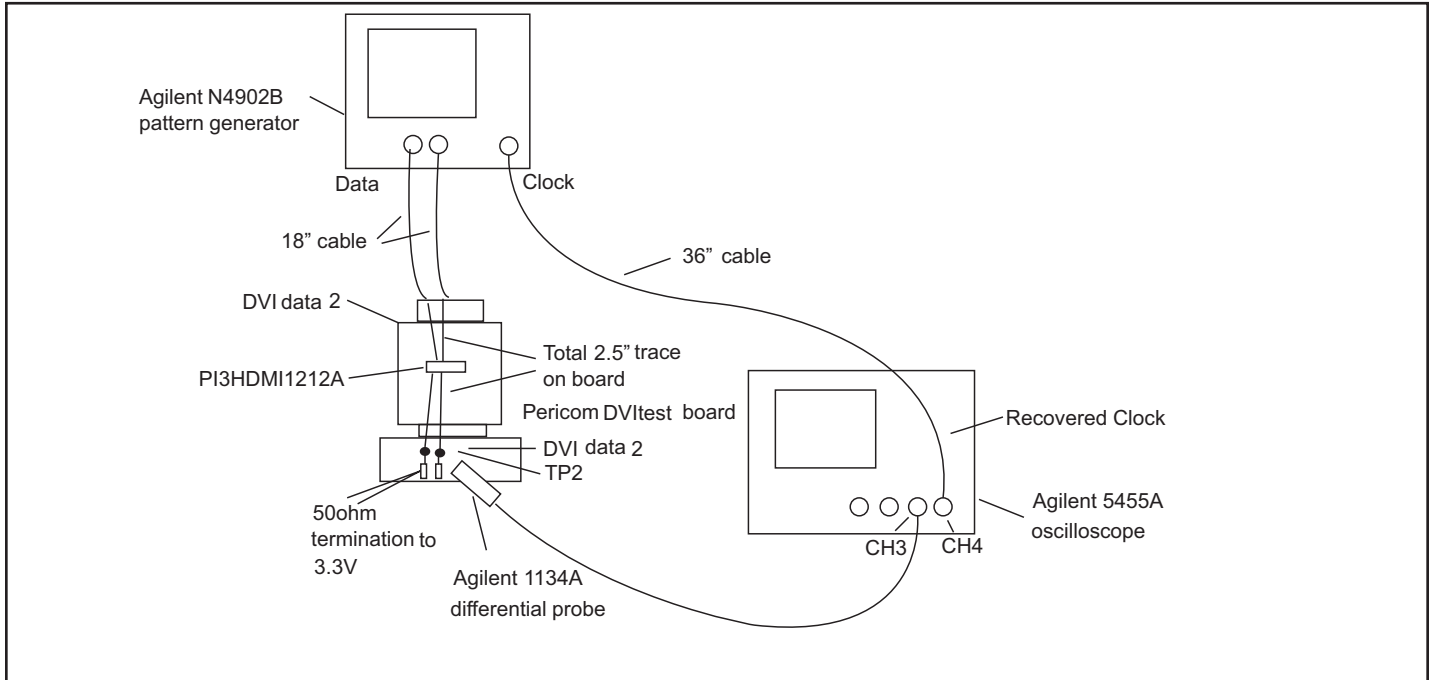
Switching Waveforms

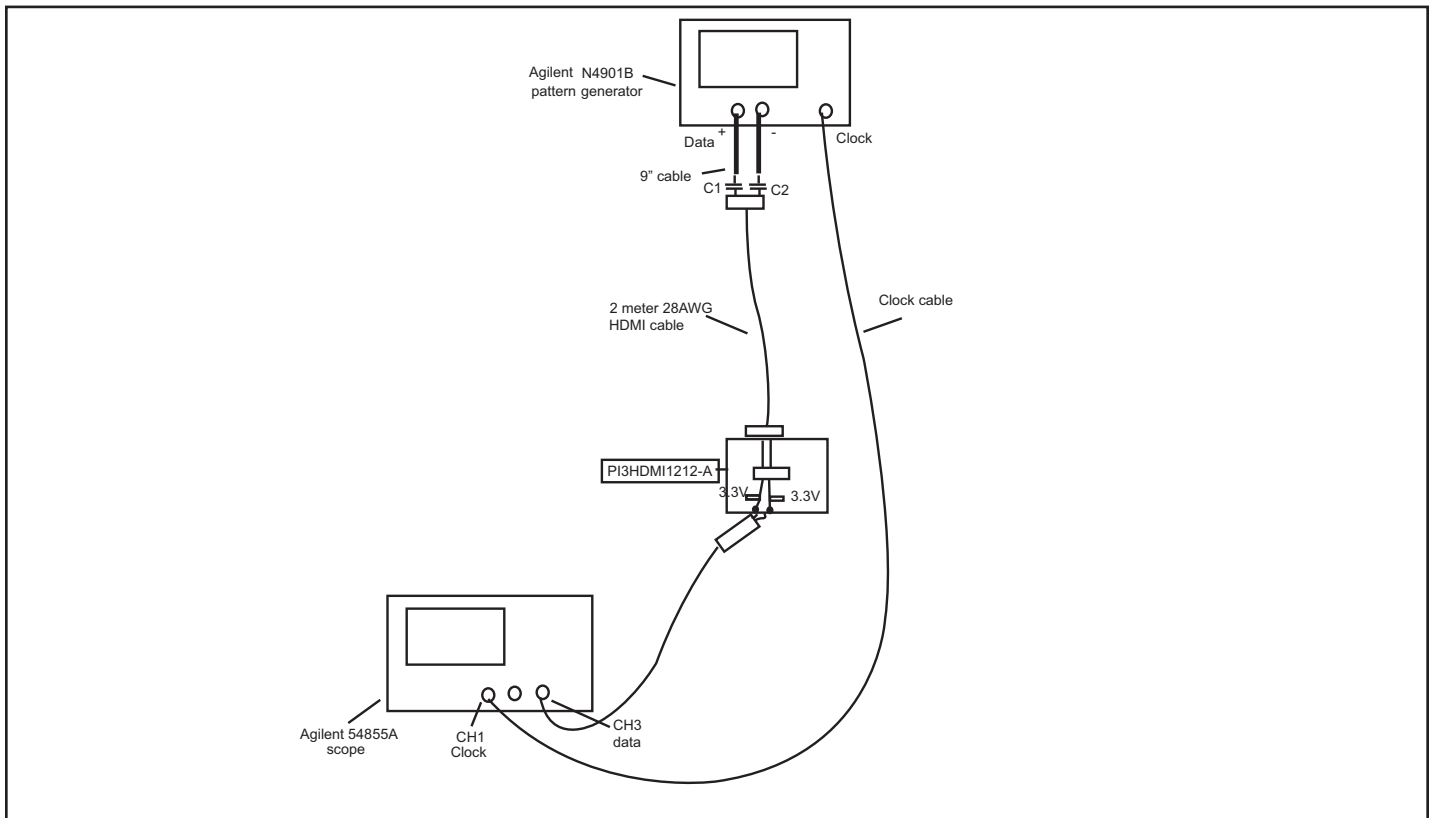**Voltage Waveforms Enable and Disable Times**

Example of a circuit that needs to be connected to the SEL pin (11) of the PI3HDMI1212-A of our device:

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Application Test Results

Figure 1. TMDS TP2 Tx eye compliance test setup

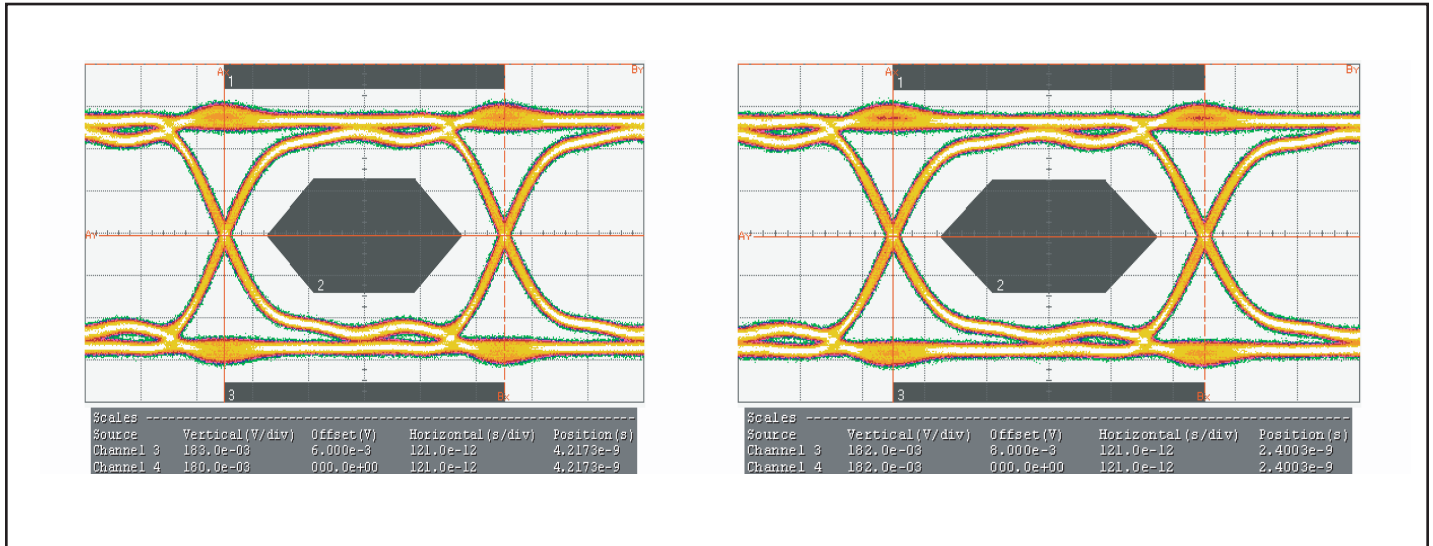**Figure 2. TMDS TP3 Rx "switch at receiver" eye compliance test setup**

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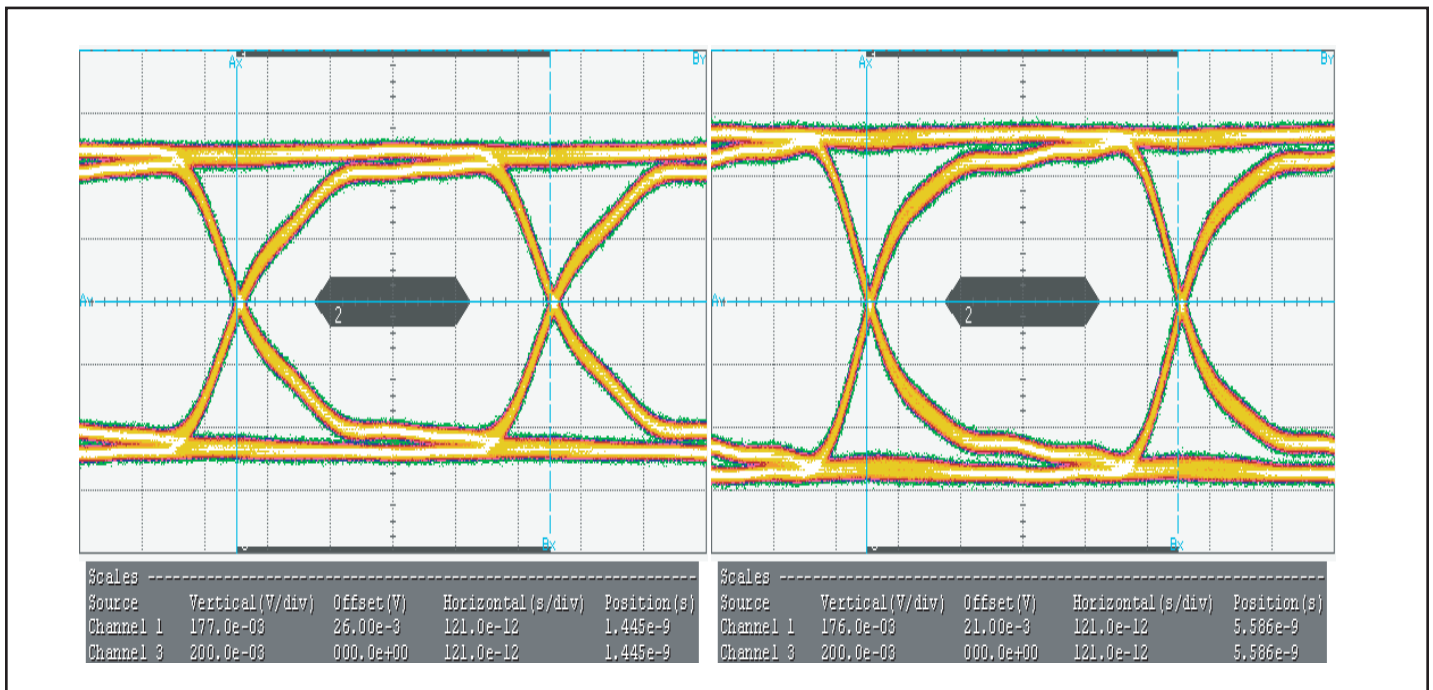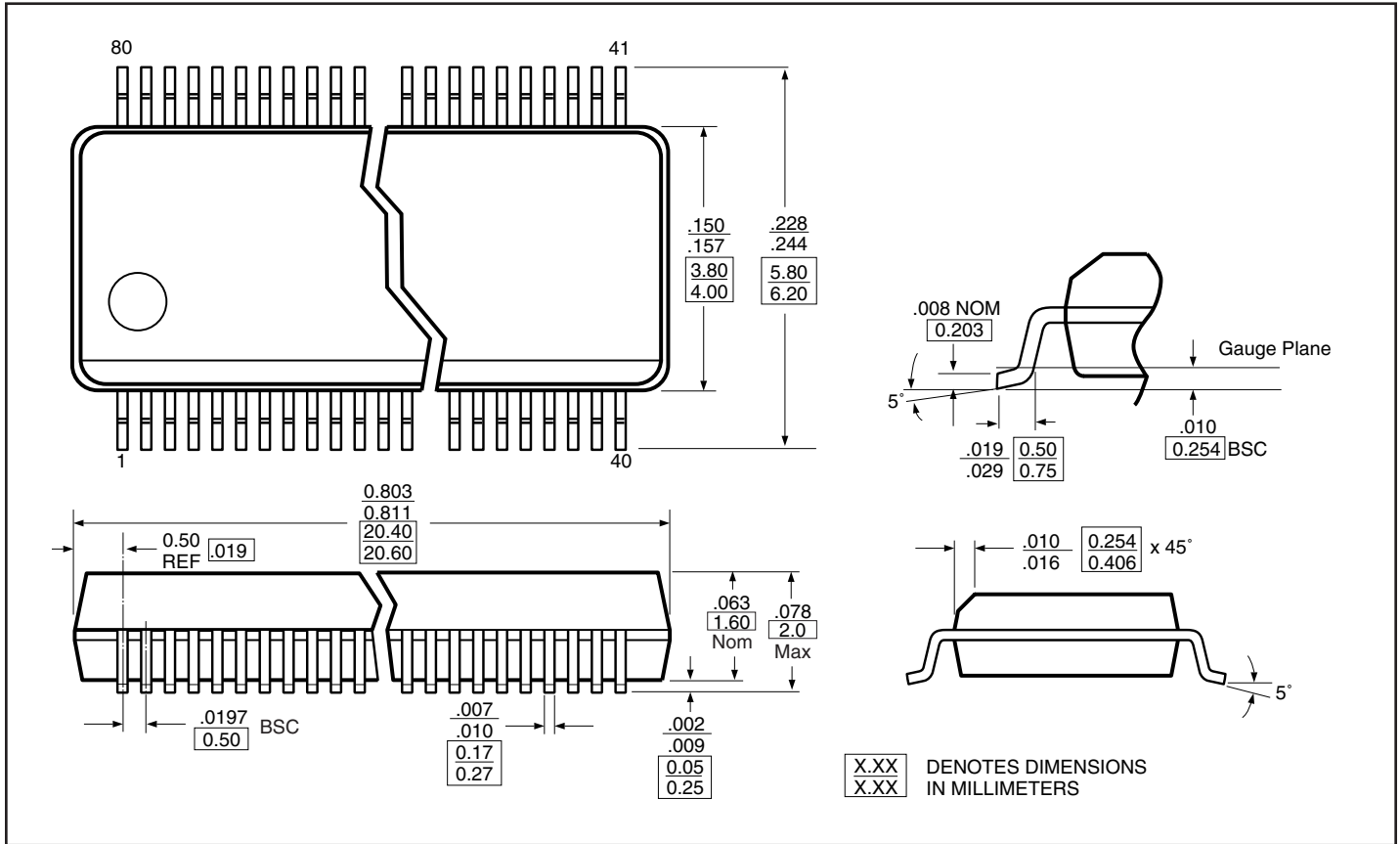

Figure 4. TP3 (Rx) - "Switch at receiver side" with 2-meter cable eye-measurements (left is with switch, right is without switch), refer to figure 2 for the test set up.

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Packaging Mechanical: 80-pin BQSOP (B)

Ordering Information

Ordering Code	Package Code	Package Description
PI3HDMI1212-ABE	B	Pb-free & Green, 80-pin BQSOP

Notes:

1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
2. E = Pb-free and Green
3. X Suffix = Tape/Reel
4. HDMI & Deep Color are trademarks of Silicon Image

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