

4-Differential Channel, 4:1 Mux/DeMux, DVI/HDMI Compliant Signal Switch

Features

- 4-Differential Channel 4:1 Mux/DeMux
- HDMI 1.1 & 1.2 compatible
- Supports both AC coupled & DC coupled signals
- Data Rate: 4.0 Gbps
- Crosstalk: -30dB @ 2.0Gbps
- Switching speed: 4ns
- Isolation: -35dB @ 2.0Gbps
- ESD: Data bits @ 8kV contact
- Near-Zero Prop Delay: 250ps max.
- Low bit-to-bit skew
- Hot-insertion capable
- Enable/Disable Time: 9ns
- Bidirectional
- Packaging (Pb-free & Green): 80-pin BQSOP (B80)

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 PI3HDMI414 is a 16- to 4-Differential Channel Mux/DeMux Switch. The device multiplexes differential signals to one of four 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 4.0 Gbps provides the resolution required by the next generation HDTV and PC graphics.

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 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, Game Console, Set-top box, etc.

Pin Description

Pin Name	Description
V _{DD}	+ Power supply
V _{SS}	- Power supply
S _x	Select pin, see truth table
xBy & Ax	Differential data signals

Pin Description

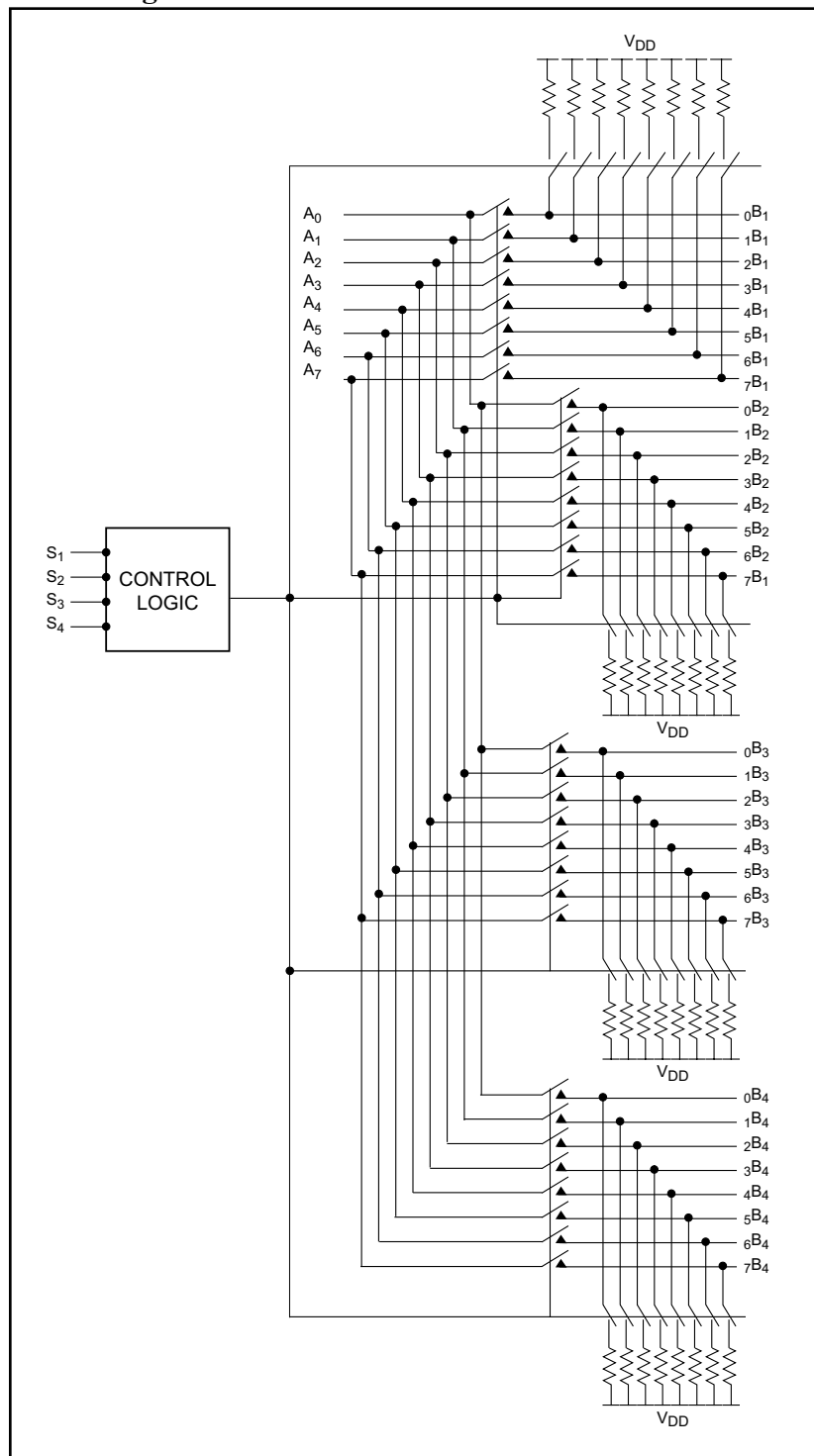
VDD	1	80	VDD
VSS	2	79	0B1
VSS	3	78	1B1
S1	4	77	2B1
S2	5	76	3B1
VSS	6	75	0B2
VDD	7	74	1B2
VSS	8	73	2B2
VSS	9	72	3B2
A0	10	71	VSS
A1	11	70	VDD
VDD	12	69	0B3
VSS	13	68	1B3
A2	14	67	2B3
A3	15	66	3B3
VDD	16	65	0B4
VSS	17	64	1B4
VSS	18	63	2B4
VSS	19	62	3B4
VDD	20	61	VDD
VDD	21	60	VDD
VSS	22	59	4B1
VSS	23	58	5B1
S3	24	57	6B1
S4	25	56	7B1
VSS	26	55	4B2
VDD	27	54	5B2
VSS	28	53	6B2
VSS	29	52	7B2
A4	30	51	VSS
A5	31	50	VDD
VDD	32	49	4B3
VSS	33	48	5B3
A6	34	47	6B3
A7	35	46	7B3
VDD	36	45	4B4
VSS	37	44	5B4
VSS	38	43	6B4
VSS	39	42	7B4
VDD	40	41	VDD

Truth Table for X = [0, 3]

S2	S1	Function
0	0	A _x = xB ₁
0	1	A _x = xB ₂
1	0	A _x = xB ₃
1	1	A _x = xB ₄

Truth Table for X = [4, 7]

S4	S3	Function
0	0	A _x = xB ₁
0	1	A _x = xB ₂
1	0	A _x = xB ₃
1	1	A _x = xB ₃

Block Diagram


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} -0.5V to V _{DD} +0.5V
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 ⁽¹⁾	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:

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} + 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}		400		μA

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 = -40° to +85°C)

Parameter ⁽¹⁾	Description	Test Conditions	Min.	Typ. ⁽²⁾	Max.	Units
X _{TALK}	Crosstalk	See Fig. 1 for Measurement Setup, @ 2.0 Gbps		-30		dB
O _{IRR}	OFF Isolation	See Fig. 2 for Measurement Setup, @ 2.0 Gbps		-35		
DR	Data Rate			4		Gbps

Notes:

1. Guaranteed by design.
2. Typical values are at T_A = 25°C ambient and maximum loading.

Switching Characteristics (T_A = -40° to +85°C, V_{SS}=0V, V_{DD}=1.8V ±10%)

Parameter	Description ⁽¹⁾	Min.	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	

Note:

1. For measurement setup, please see “Test Circuit For Electrical Characteristic” and “Switching Waveforms” on the following pages.

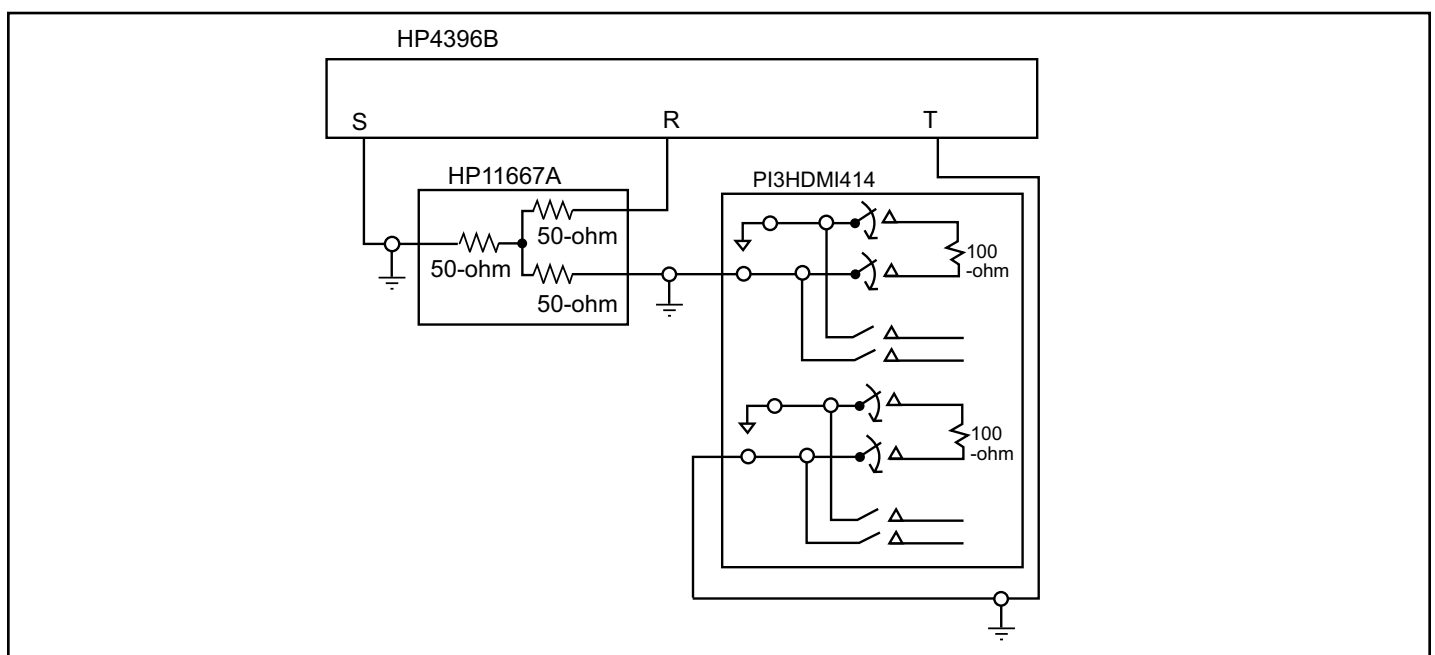


Fig 1. Crosstalk Setup

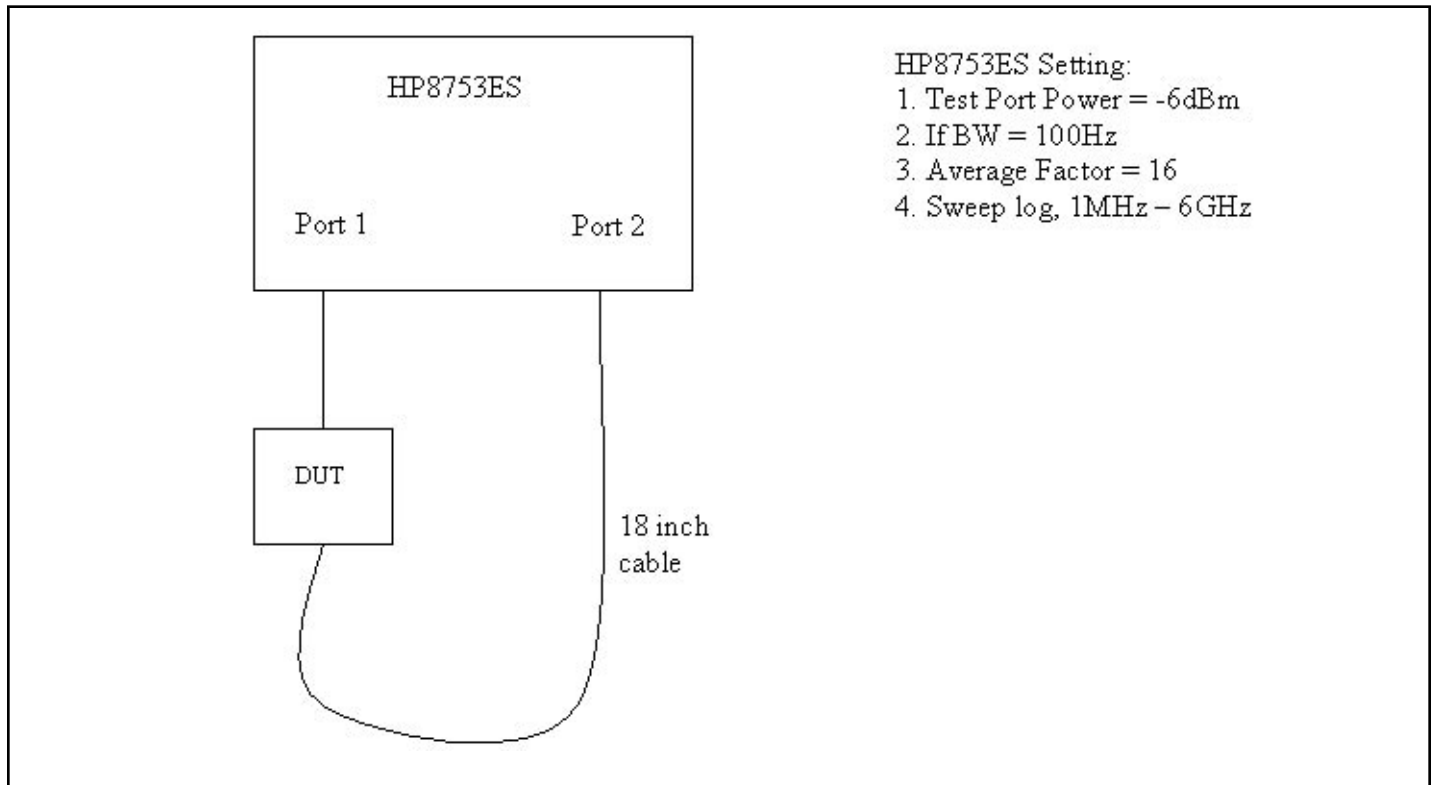


Fig 2. Off Isolation Measurement

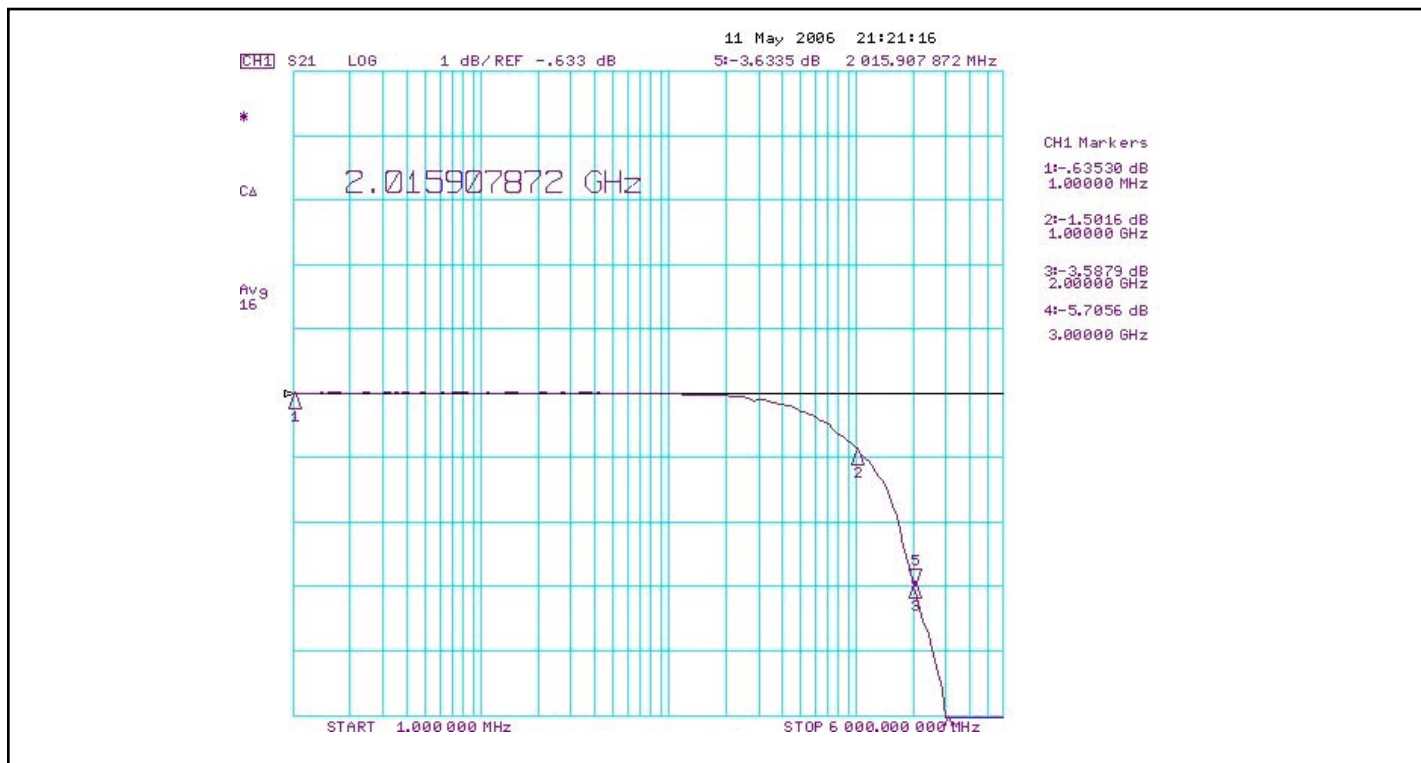


Fig 3. Insertion Loss Plot from 1MHz to 6.0GHz, Vdd=1.8V, Vss = 0V
Average Factor = 16; Power = 6dBm; IF Bandwidth = 100Hz; # of Points = 201

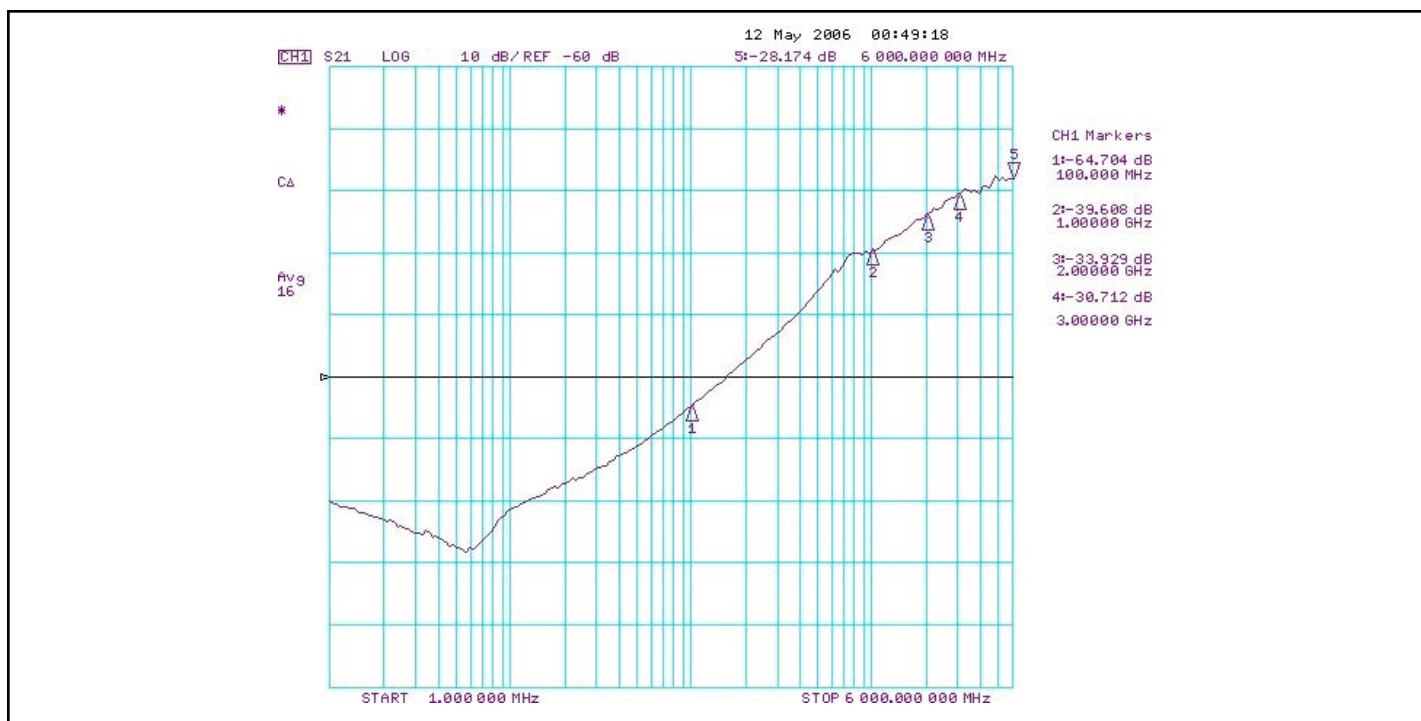


Fig 4. Off Isolation Plot from 1MHz to 6.0GHz, Vdd=1.8V, Vss = 0V
Average Factor = 16; Power = -6dBm; IF Bandwidth = 100Hz; # of Points = 201

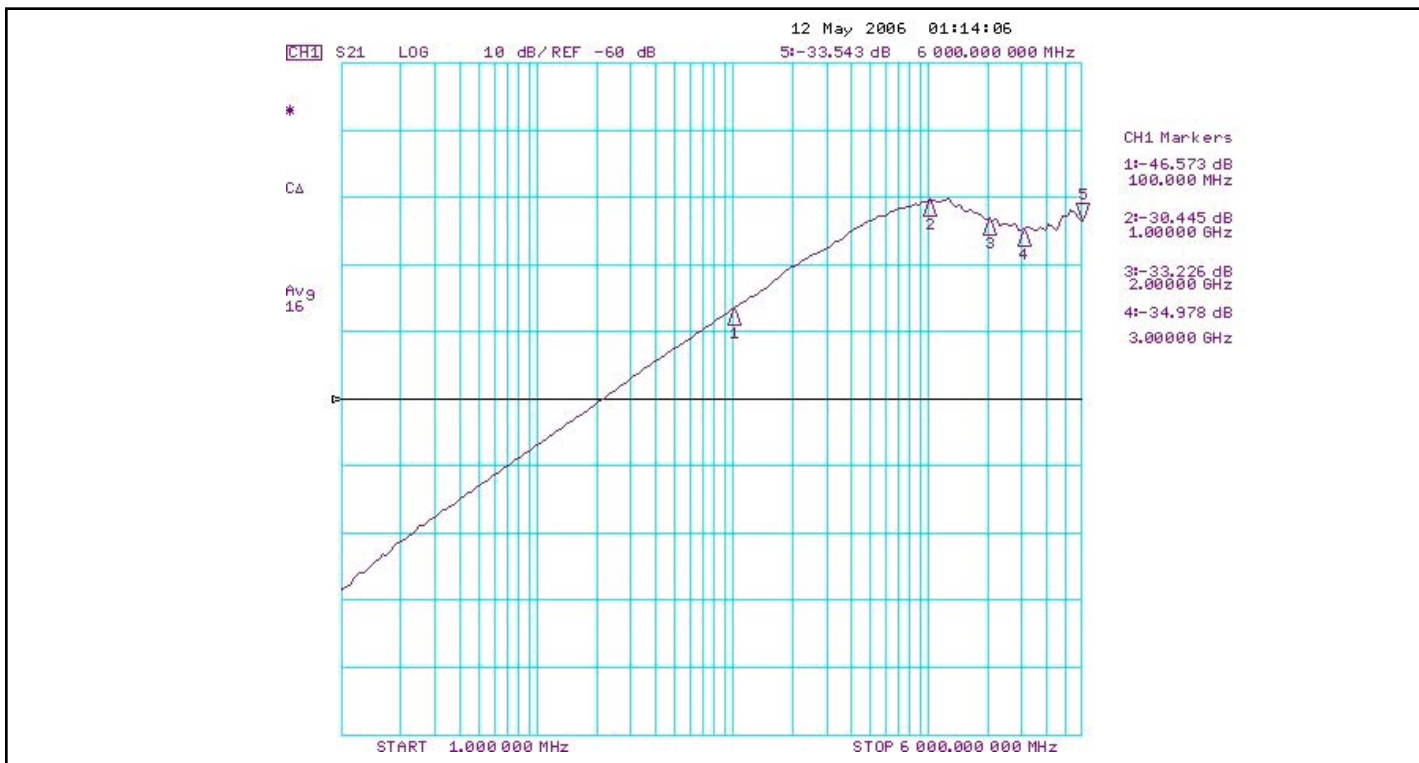
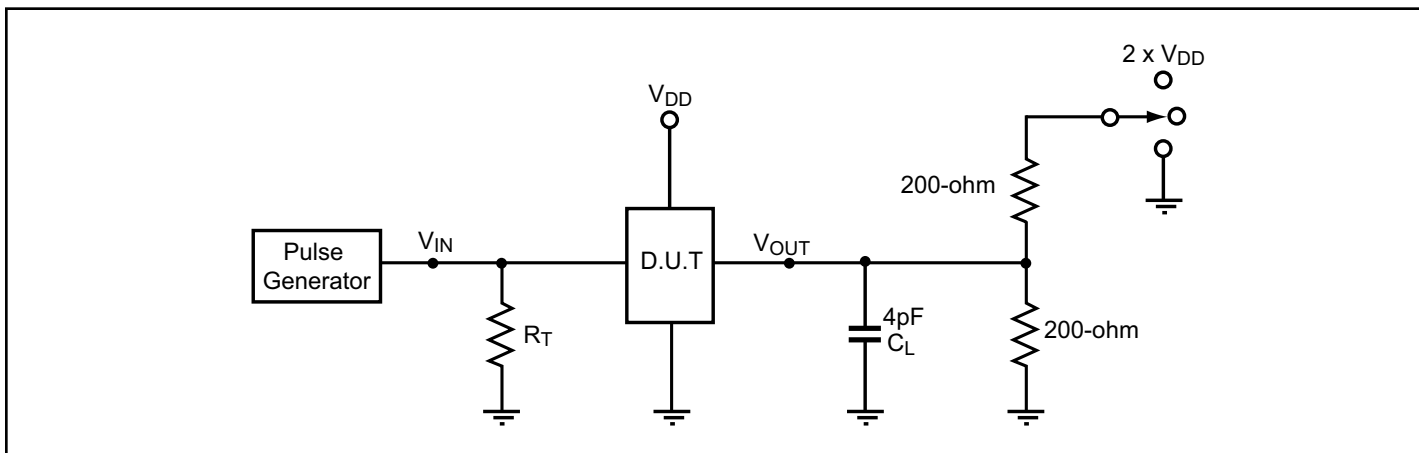


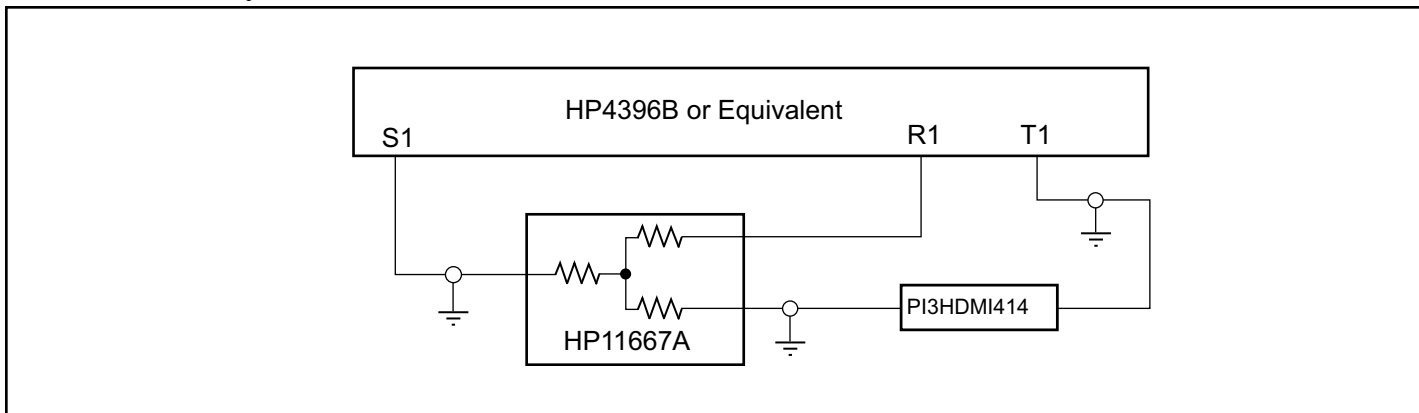
Fig 5. Crosstalk Plot from 1MHz to 6.0GHz, Vdd=1.8V, Vss = 0V
Average Factor = 16; Power = -6dBm; IF Bandwidth = 100Hz; # of Points = 201

Test Circuit for Electrical Characteristics^(1,2,3,4)

Notes:

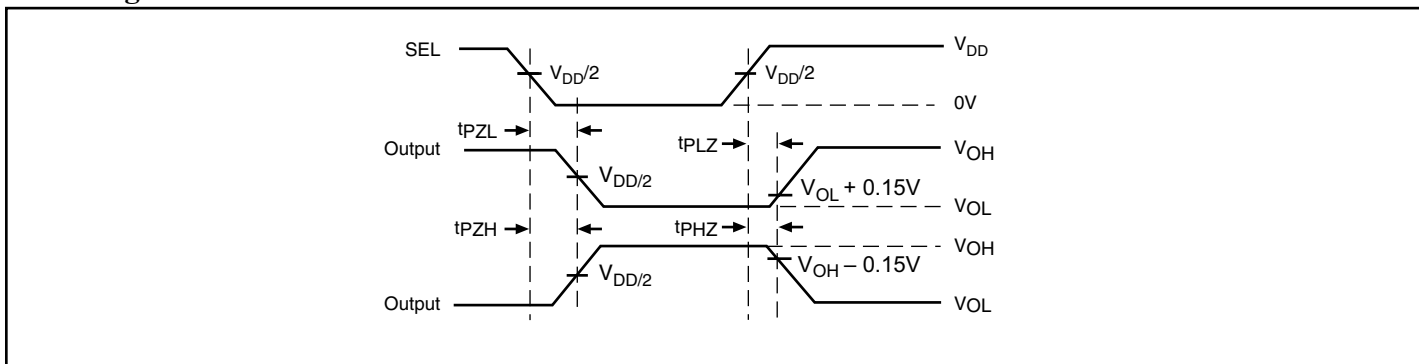
1. C_L = Load capacitance: includes jig and probe capacitance.
2. R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator
3. All input impulses are supplied by generators having the following characteristics: $PRR \leq \text{MHz}$, $Z_O = 50\Omega$, $t_R \leq 2.5\text{ns}$, $t_F \leq 2.5\text{ns}$.
4. The outputs are measured one at a time with one transition per measurement.

Switch Positions

Test	Switch
t_{PLZ} , t_{PZL}	$2 \times (V_{DD} - V_{SS})$
t_{PHZ} , t_{PZH}	V_{SS}
Prop Delay	Open

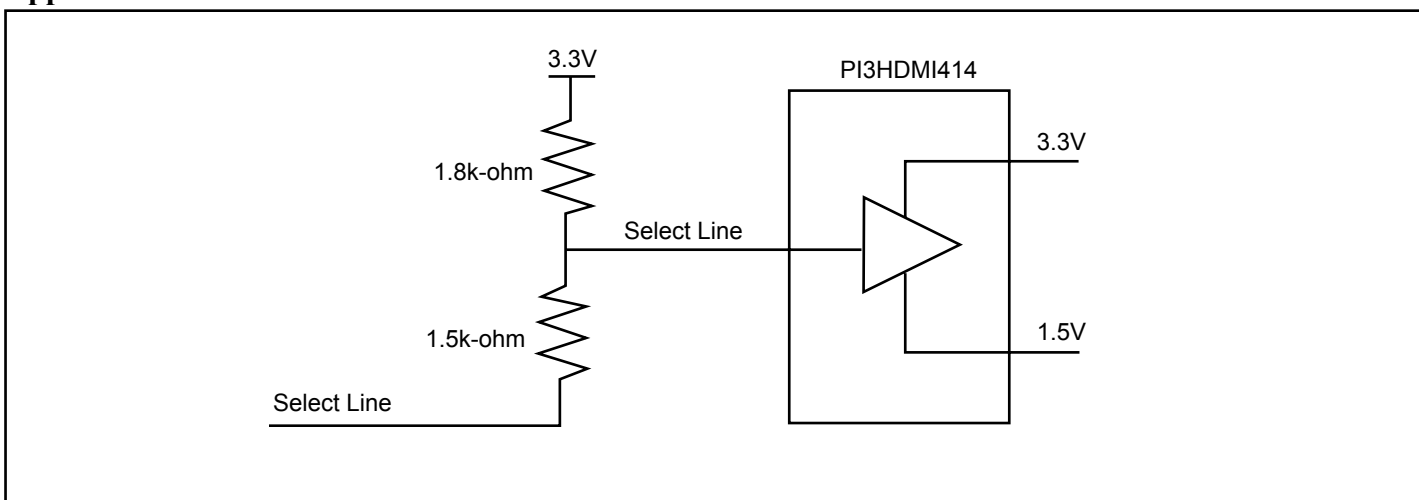
Test Circuit for Dynamic Electrical Characteristics


Switching Waveforms

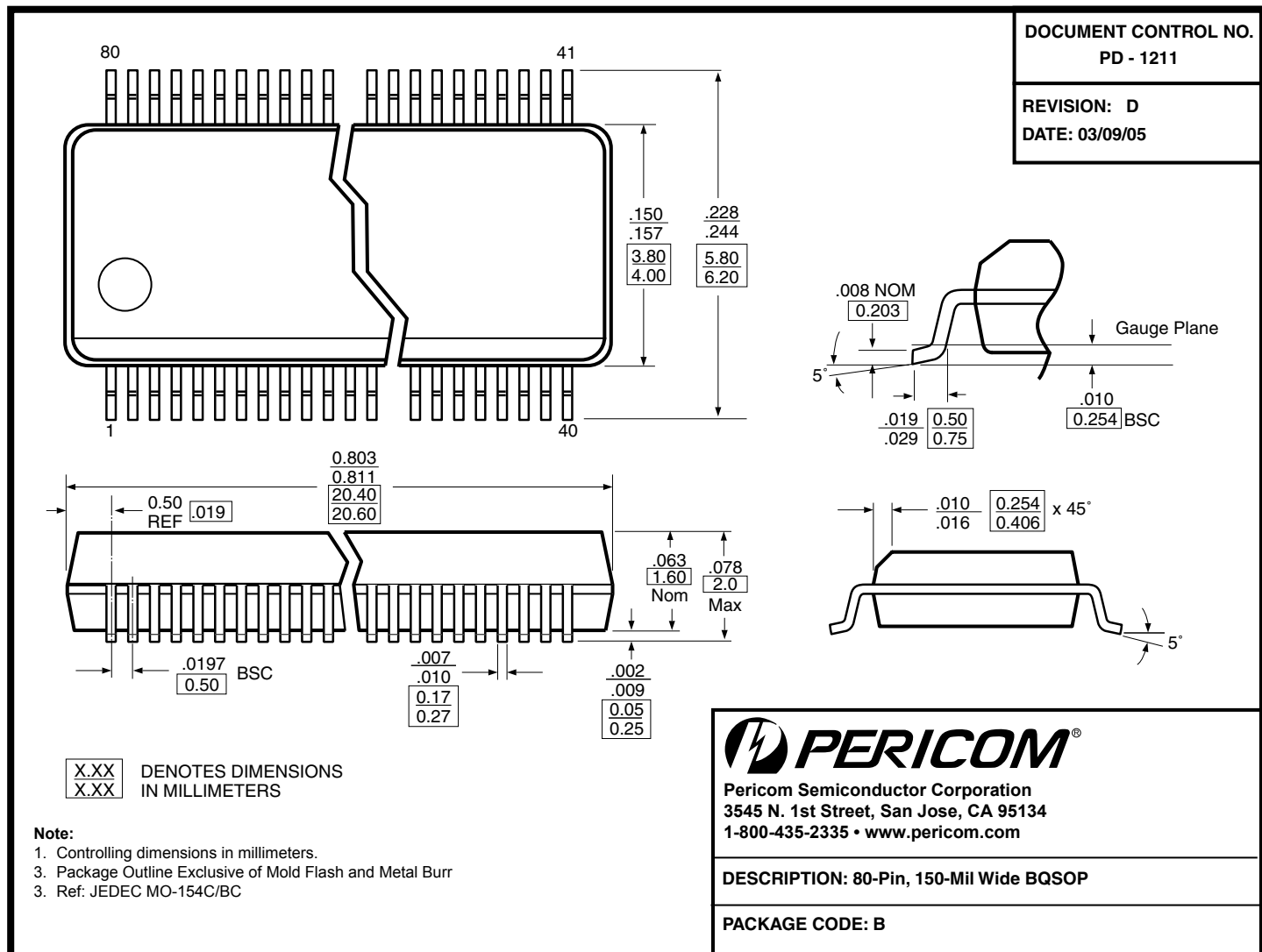


Voltage Waveforms Enable and Disable Times

Application Information



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



Ordering Information

Ordering Code	Package Code	Package Description
PI3HDMI414BE	B	Pb-free & Green, 80-pin BQSOP

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Pb-free & Green
- Adding X suffix = Tape/Reel