PERICOM®

PI3HDMI413

4-Differential Channel, 3:1 Mux/DeMux, DVI/HDMI Compliant Signal Switch based on TMDS Signaling Standard

Features

- 4-Differential Channel 3:1 Mux/DeMux
- TMDS Signaling
- Data Rate: 1.65Gbps
- Crosstalk: -30dB@1.65Gbps
- Switching speed: 4ns
- Isolation: -35dB@1.65Gbps
- 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
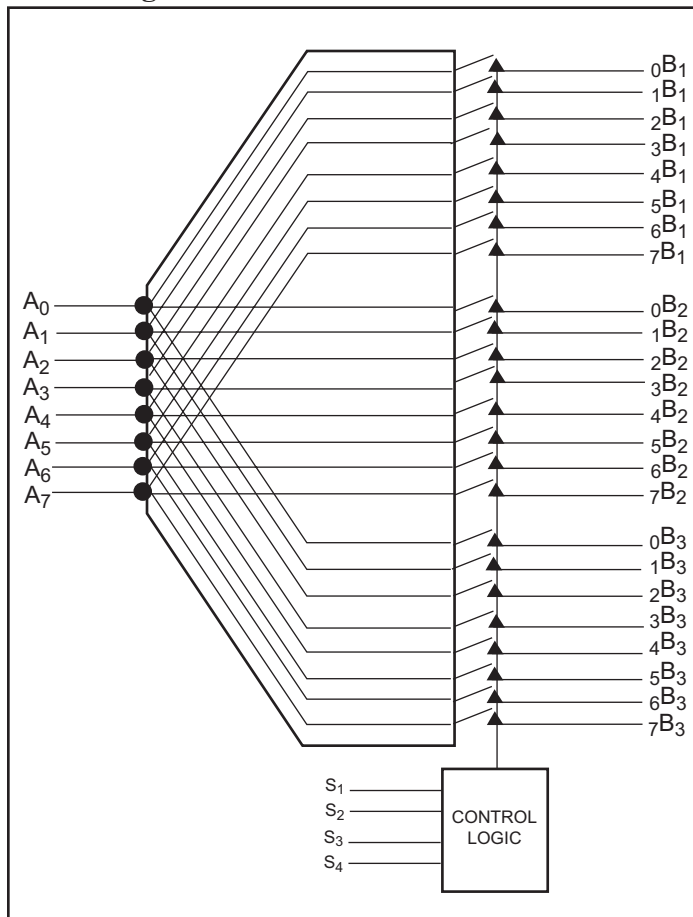- Packaging (Pb-free & Green):
  64-pin TSSOP (A)

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 PI3HDMI413 is a 12- to 4-Differential Channel Mux/DeMux Switch. The device multiplexes differential signals to one of three 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.

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 Description

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Truth Table for X=[0,3]

S2	S1	Function
0	0	Ax = xB$_1$
0	1	Ax = xB$_2$
1	0	Ax = xB$_3$
1	1	Ax = Hi-Z

Truth Table for X=[4,7]

S4	S3	Function
0	0	Ax = xB$_1$
0	1	Ax = xB$_2$
1	0	Ax = xB$_3$
1	1	Ax = Hi-Z

Pin Description

Pin #	Pin Name	Description
2,8,13,15,16,18,21,26, 31,33,40,53,64	V$_{DD}$	+ Power supply 3.30
1,3,4,5,14,17,27,28,29, 30,32,34,35,54,63	V$_{SS}$	- Power supply
6,7,19,20	Sx	Select pin, see truth table
9,10,11,12,22-25,36- 39,41-52,55-62	xBy & Ax	Differential data signals

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

Paramenter	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)

Paramenter	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}		450		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= -40º to +85ºC)

| Parameter[1]	Description	Test Conditions	Min.	Typ.[2]	Max.	Units
X_{TALK}	Crosstalk	See Fig. 1 for Measurement Setup, @ 1.65Gbps		-30		dB
O_{IRR}	OFF Isolation	See Fig. 2 for Measurement Setup, @ 1.65Gbps		-35		
DR	Data Rate			1.65		Gbps

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

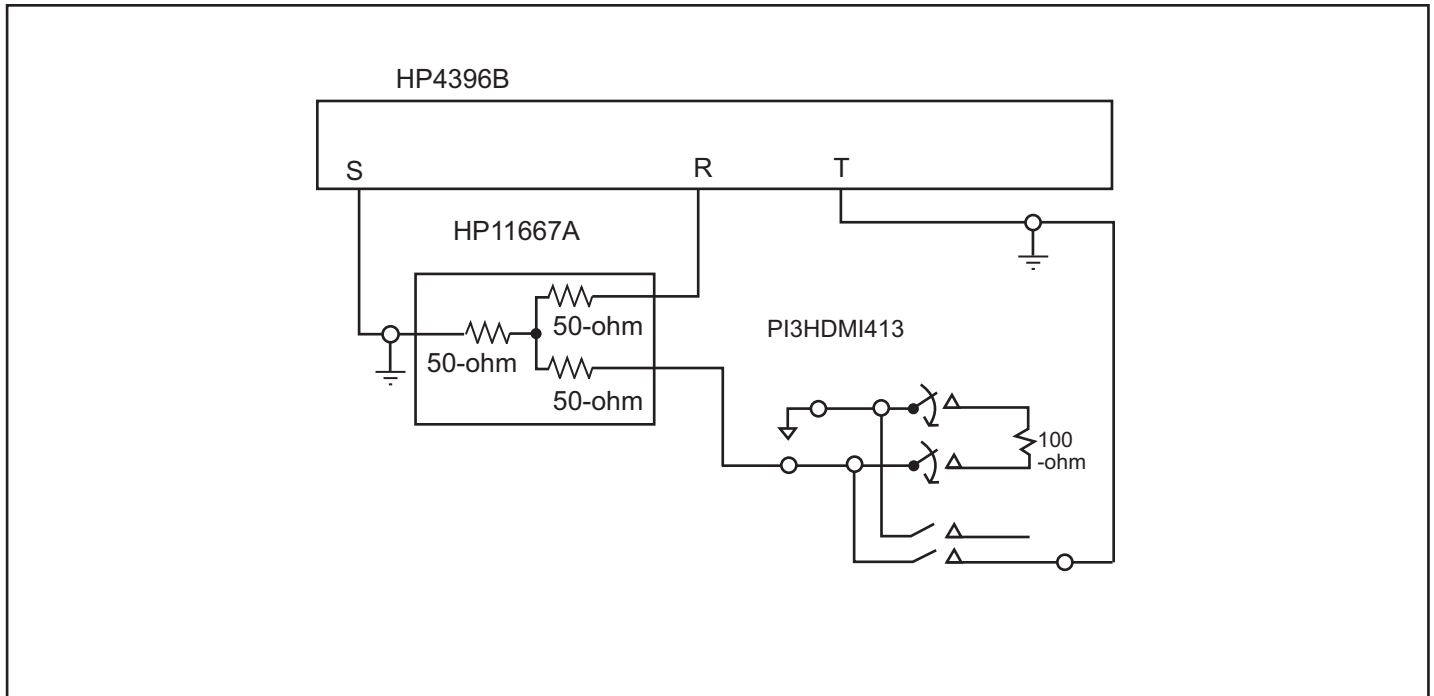## Switching Characteristics (T_A= -40º to +85ºC, V_{SS}=0V, V_{DD}=1.8V ±10%)

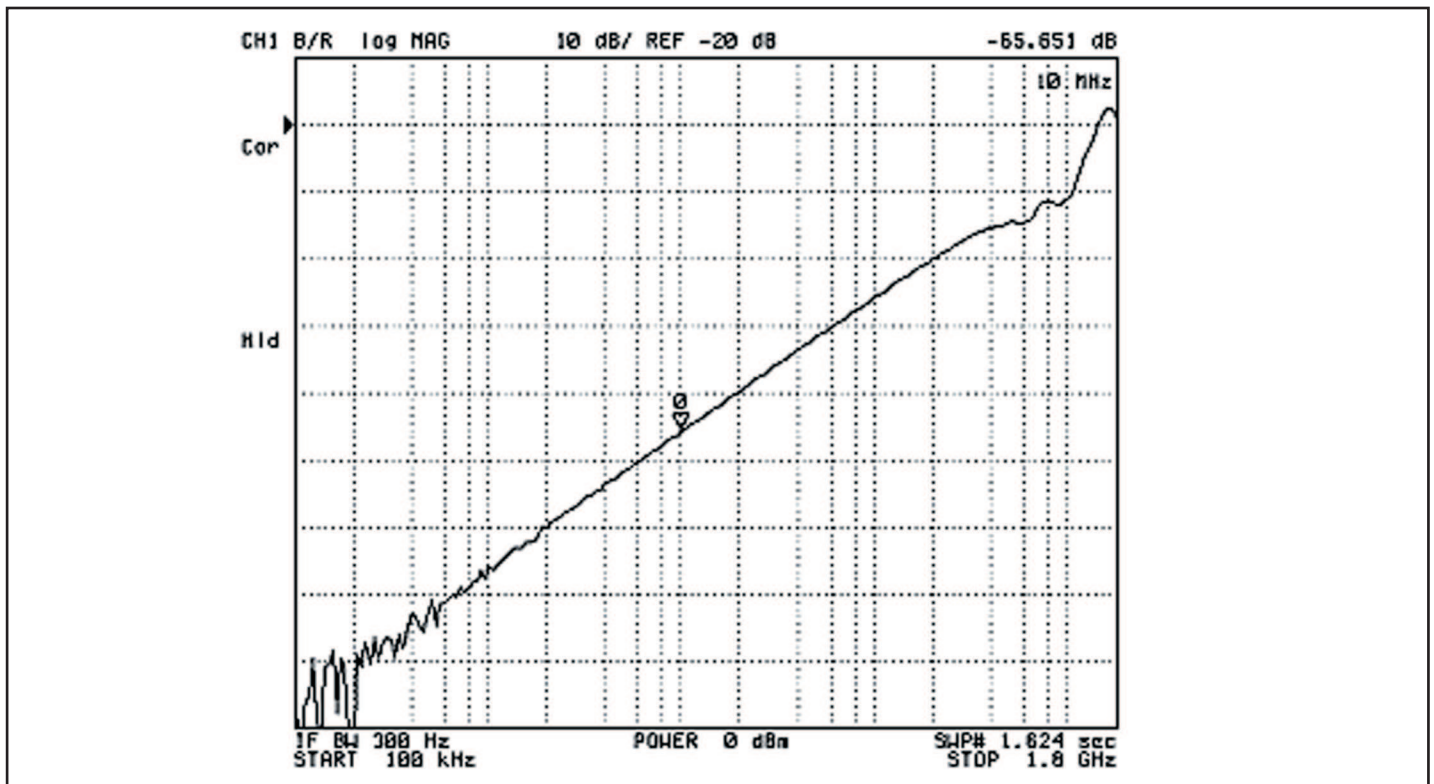| Parameter	Description[1]	Min.	Max.	Units
t_{PZH}, t_{PZL}	Line Enable Time - SEL to A_N, B_N	0.5	8.0	nS
t_{PHZ}, t_{PLZ}	Line Disable Time - SEL to A_N, B_N	0.5	4.0	

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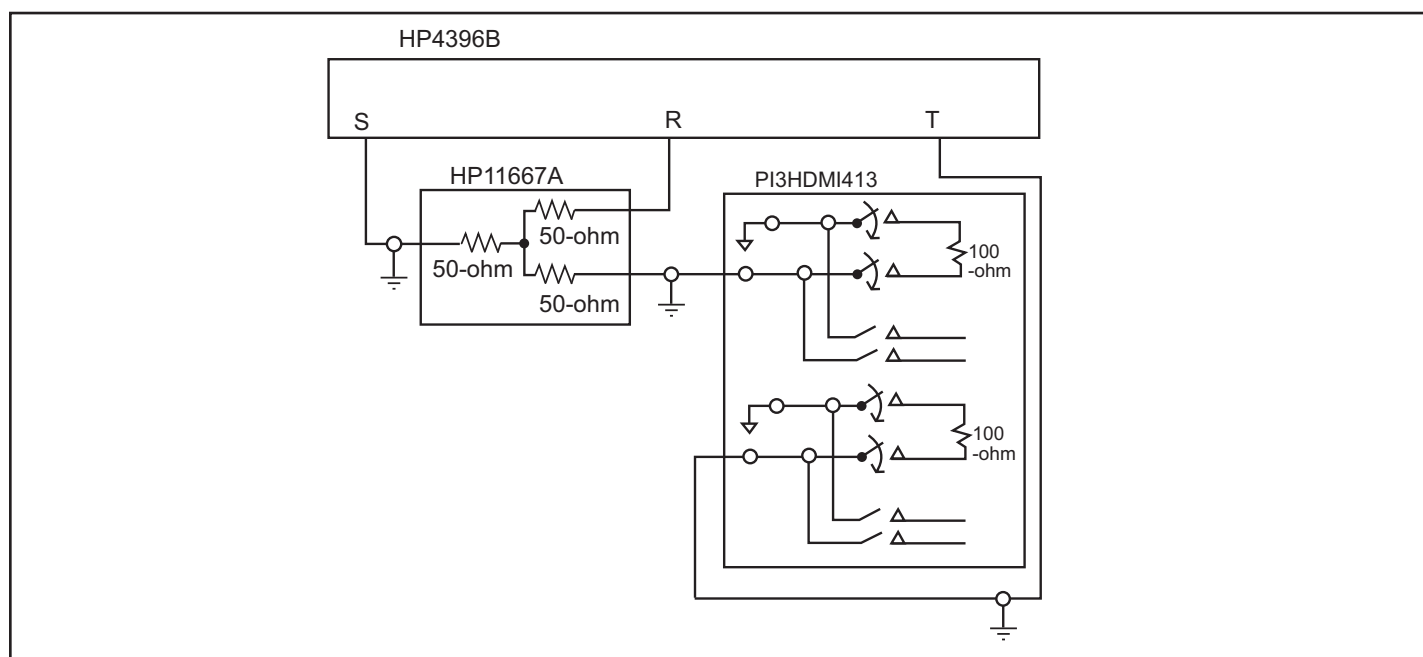
Fig 1. Crosstalk Setup

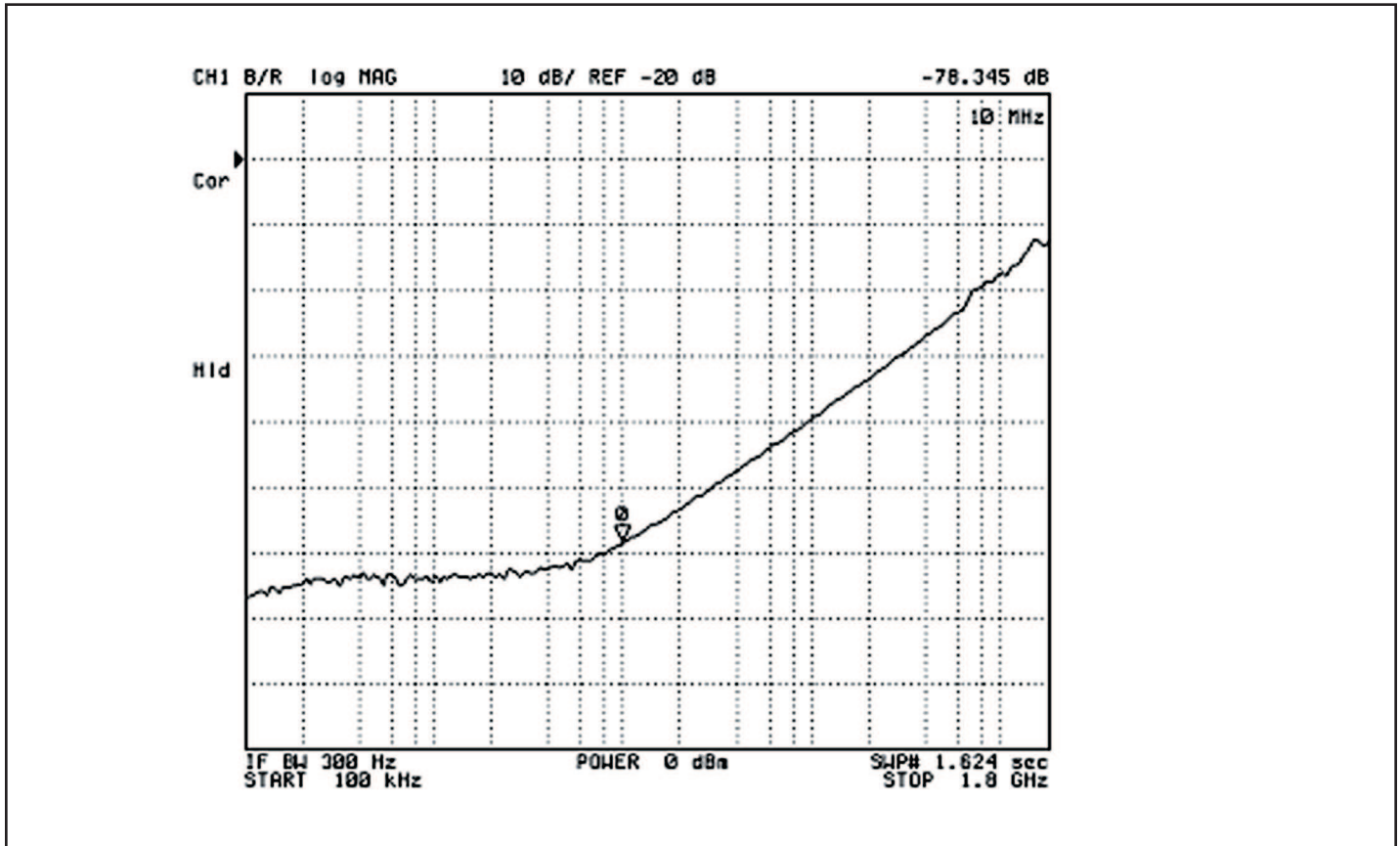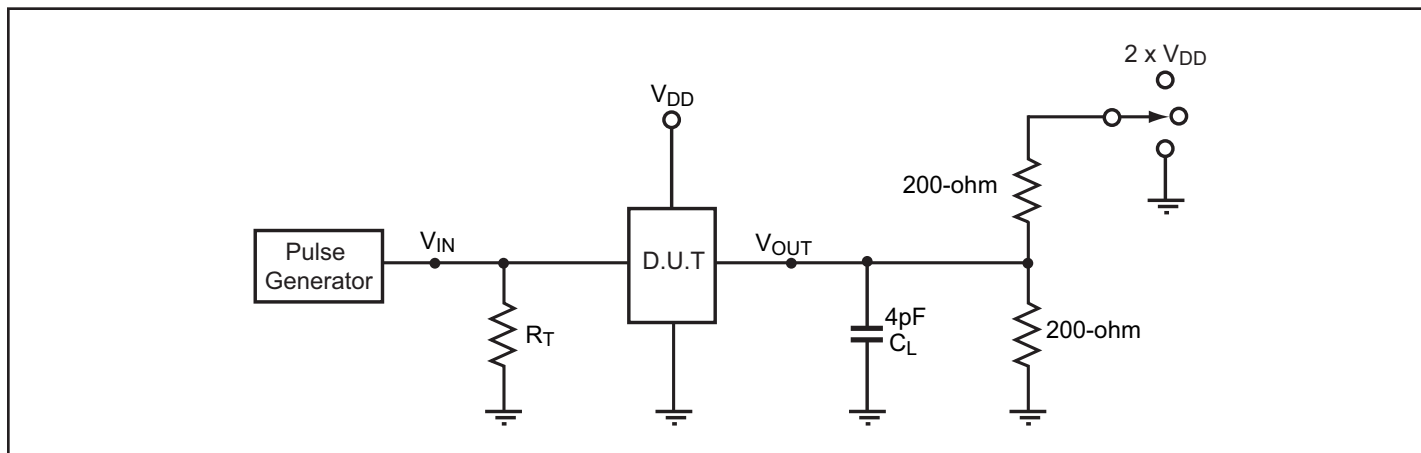**Fig 2. Off-isolation setup**

**Fig 3. Crosstalk**

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Fig 4. Off Isolation

## 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: $PRR \leq MHz$, $Z_O = 50\Omega$, $t_R \leq 2.5ns$, $t_F \leq 2.5ns$.
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)	$2 \times (V_{DD} - V_{SS})$
t_{PHZ}, t_{PZH} (output on B-side)	V_{SS}
Prop Delay	Open

Test Circuit for Dynamic Electrical Characteristics

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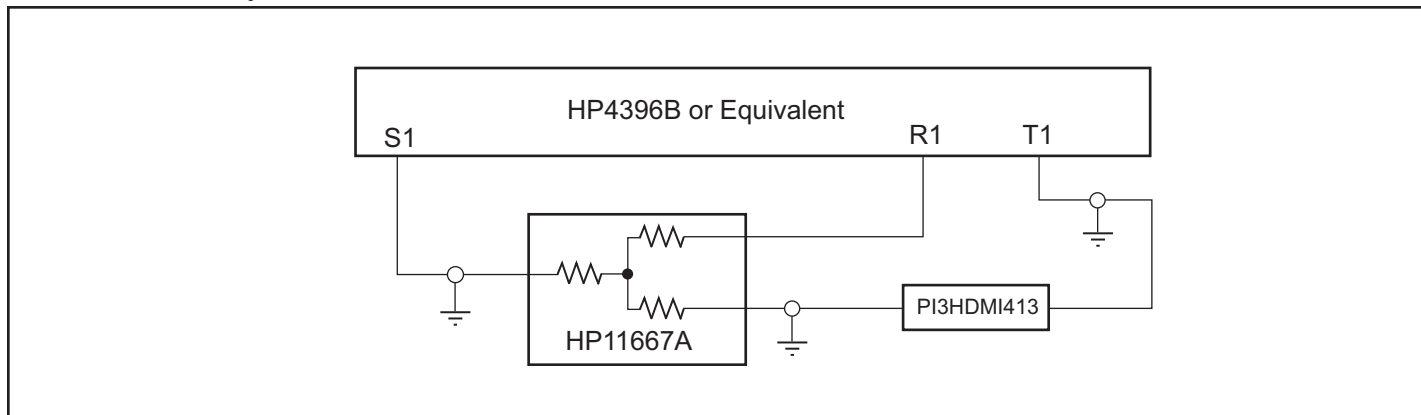
Switching Waveforms
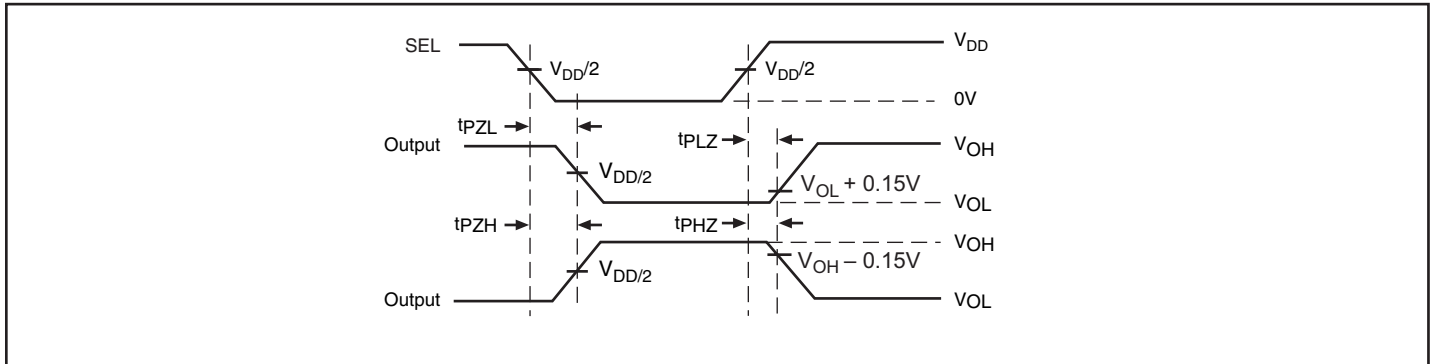
Voltage Waveforms Enable and Disable Times
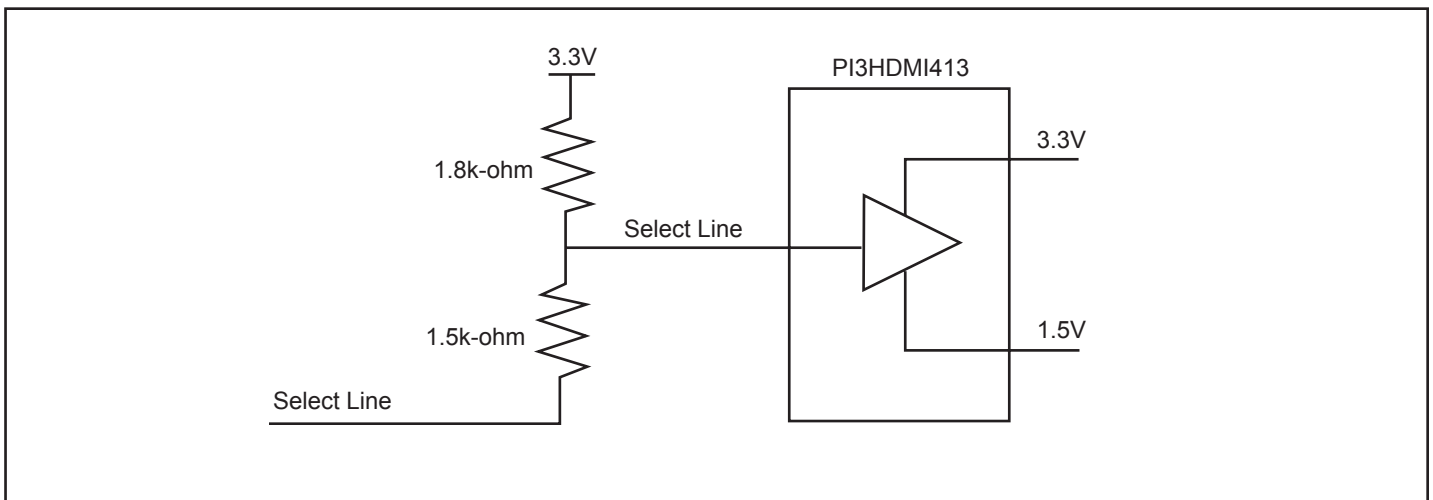
Example of a circuit that needs to be connected to the select lines of our device:

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Packaging Mechanical: 64-pin TSSOP (A)
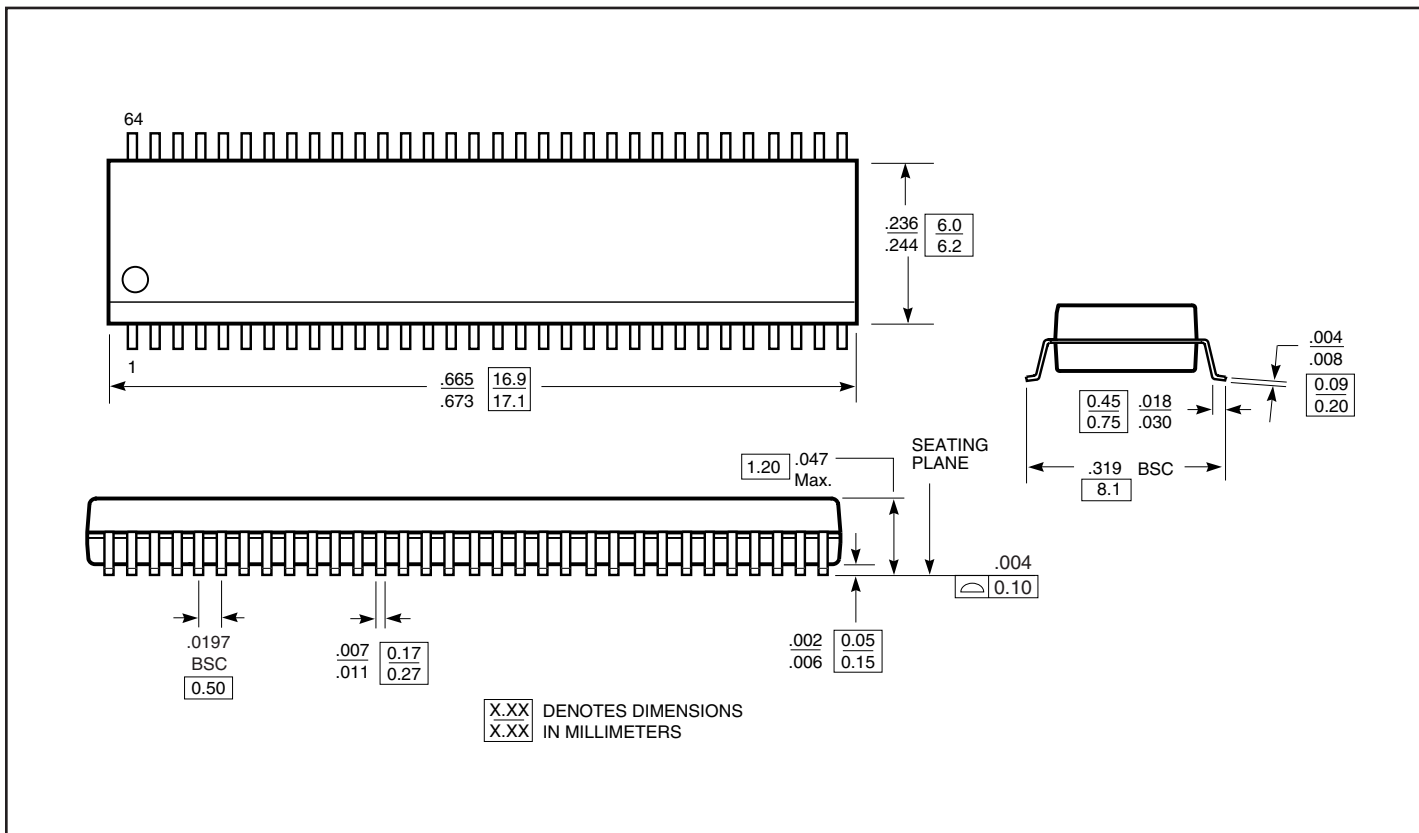
Ordering Information

Ordering Code	Package Code	Package Description
PI3HDMI413AE	A	Pb-free & Green, 64-pin TSSOP

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