

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)

$_0B_1$ 1B1 ₂B₁ ₃В1 ⊿B1 ₅B₁ $_6B_1$ ₇B₁ A_0 ₀B₂ $_1B_2$ A₁ . 2B2 A₂ ₃В2 A_3 $_4B_2$ A_4 ₅B₂ A_5 A₆- $_6B_2$ A_7 ₇B₂ ₀B₃ $_1B_3$ ₂B₃ ₃B₃ $_4B_3$ $_5B_3$ ₆B₃ ₇B₃ S1 S₂ CONTROL S_3 LOGIC S₄

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.

Pin Description

_		
Vss D	1	
V _{DD} C	2	63 🛛 Vss
Vss 🛙	3	62 0B1
Vss [4	61 1 1B1
Vss 🛙	5	60 2 2B1
S1 [6	59 🛛 3B1
S2 [7	58 🛛 0B2
VDD C	8	57 🛛 1B2
A0 C	9	56 🛛 2B2
A1 [10	55 🛛 3B2
A2 [11	54 🛛 Vss
Аз [12	53 🛛 VDD
VDD [13	52 0B3
Vss 🕻	14	51 🛛 1 ^B 3
VDD [15	50 2 ^B 3
Vod [16	49 3B3
Vss [17	48 4 ^{B1}
V _{DD} [18	47 🛛 5B1
S3 [19	46 🛛 6 ^B 1
S4 [20	45 🛛 7B1
Vod 🛛	21	44 🛛 4B2
A4 [22	43 5B2
A5 [23	42 🛛 6 ^B 2
A6 [24	41 7 ^{B2}
A7 [25	
VDD C	26	39 4 ^{B3}
Vss D	27	38 🗗 5 ^B 3
Vss 🛙	28	37 🗗 6B3
Vss [29	36 7 ^{B3}
Vss [30	35 🛛 Vss
V _{DD} C	31	34 🛛 Vss
V _{SS} [32	33 D VDD

Block Diagram



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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 ($T_A = -40^{\circ}C$ to $+85^{\circ}C$)

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 _{IL} ⁽³⁾	Input LOW Voltage	Guaranteed LOW level	$-0.5 + V_{SS}$		$0.35(V_{DD}-V_{SS})+V_{SS}$	V
VIK	Clamp Diode Voltage	V _{DD} =Max., I _{IN} =-18mA		$-0.7+V_{SS}$	$-1.2+V_{SS}$	
IIH	Input HIGH Current	V _{DD} =Max., V _{IN} =V _{DD}			±5	
IIL	Input LOW Current	V _{DD} =Max., V _{IN} =V _{SS}			±5	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 $T_A = 25^{\circ}C$ 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	$V_{DD} = Max., V_{IN} = V_{DD} \text{ or } V_{SS}$		450		μΑ

Notes:

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

2. Typical values are at $T_A = 25^{\circ}C$ 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, @ 1.65Gbps		-30		dD
O _{IRR}	OFF Isolation	See Fig. 2 for Measurement Setup, @ 1.65Gbps		-35		uВ
DR	Data Rate			1.65		Gbps

Notes:

1. Guaranteed by design.

2. Typical values are at $T_A = 25^{\circ}C$ ambient and maximum loading.

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

Paramenter	Description ⁽¹⁾	Min.	Max.	Units
tpZH, tpZL	Line Enable Time - SEL to A _N , B _N	0.5	8.0	nC
tp _{HZ} , tPLZ	Line Disable Time - SEL to A_N , B_N	0.5	4.0	115

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





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: $PRR \le MHz$, $Z_O = 50\Omega$, $t_R \le 2.5ns$, $t_F \le 2.5ns$.
- 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 x (V _{DD} - V _{SS})
t _{PHZ} , t _{PZH} (output on B-side)	V _{SS}
Prop Delay	Open

Test Circuit for Dynamic Electrical Characteristics





Switching Waveforms



Voltage Waveforms Enable and Disable Times



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



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