PERICOM®

PI3V713

3.3V, 7-Channel Analog Video Switch with Automatic Switching

Features

- Designed specifically to switch VGA signals
- 7-Channels for VGA signals (R,G,B, Hsync, Vsync, DDC Data, and DDC CLK)
- Automatic or manual switching supported
  - –Forces re-read of EDID when automatically switching
- V_{DD} = 3.3V +/-10%
- DDC path will operate as a 5V to 3.3V level shifter
- H/V output buffer with +/-24mA drive
- ESD tolerance on video I/O pins is up to 12kV HBM per JEDEC standard
- -3dB BW of 1.7GHz (typ)
- Low Xtalk, (-38dB typ)
- Low and Flat ON-STATE resistance (R_{on} = 4.8-Ohm, R_{on}(Flat) = 0.5ohm, typ)
- Low input/output capacitance (Con = 5.6pF, typ)
- Packaging (Pb-free and Green):
  - –32-contact TQFN (ZLE)

Applications

- Routes physical layer signals for high bandwidth digital video
- Monitor detection supports automatic switching

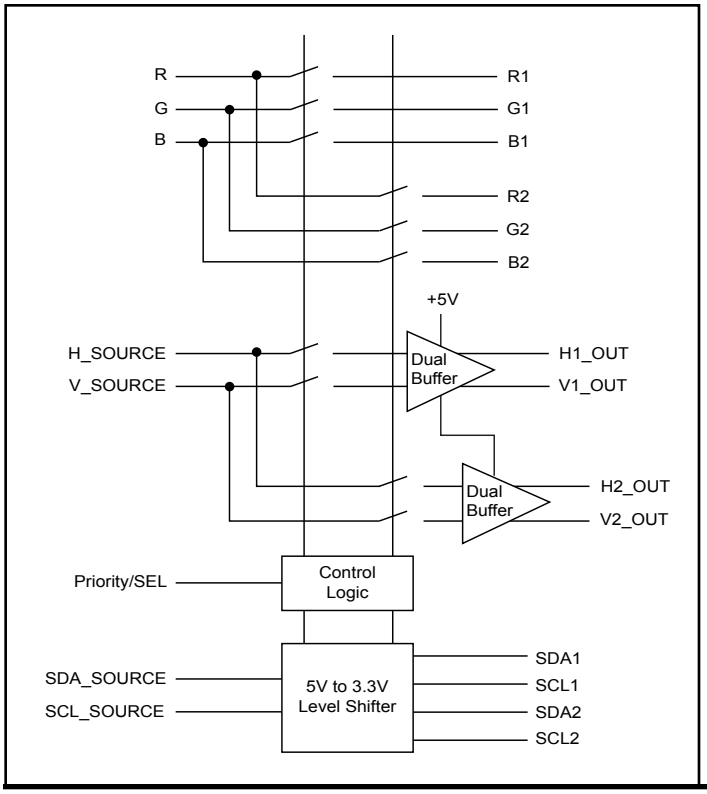
Description

Pericom's PI3V713 is a 7-channel video mux/demux used to switch between multiple VGA sources or end points. In a notebook application where analog video signals are found in both the notebook and the dock, a switch solution is required to switch between the two video port locations. With the high bandwidth of ~1.7GHz, the signal integrity will remain strong even through the long FR4 trace between the notebook and the docking station. In addition to high signal performance, the video signals are also protected against high ESD with integrated diodes to V_{DD} and GND that will support up to12kV HBM ESD protection.

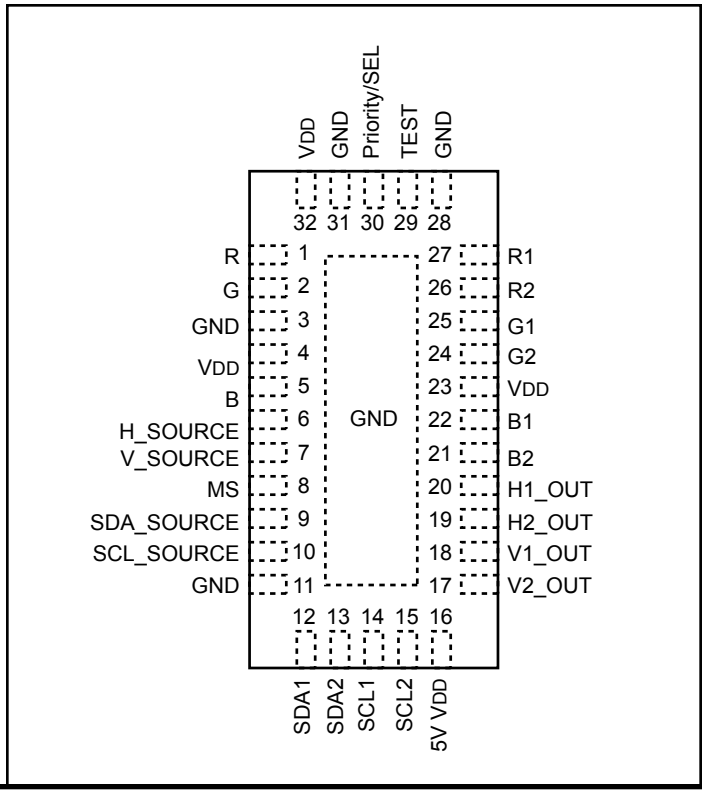
Application

Routing VGA signals with low signal attenuation and high ESD.

Block Diagram



Pin Diagram



Pin Description

Pin Number	Pin Name	Pin Type	Description
1	R	I/O	Red signal from VGA Transmitter
2	G	I/O	Green signal from VGA Transmitter
3	GND	Ground	Ground
4	V_{DD}	Power	3.3V +/-10% power rail
5	B	I/O	Blue signal from VGA Transmitter
6	H_SOURCE	I	Horizontal Synchronous signal from VGA Transmitter
7	V_SOURCE	I	Vertical Synchronous signal from VGA Transmitter
8	MS	I	"Mode Select pin, Internal pull-down If LOW, part is configured in automatic switching mode If HIGH, part is configured in manual switching mode"
9	SDA_SOURCE	I/O	DDC, data signal from VGA Transmitter
10	SCL_SOURCE	I/O	DDC, clock signal from VGA Transmitter
11	GND	Ground	Ground
12	SDA1	I/O	DDC, data signal for VGA output port 1
13	SDA2	I/O	DDC, data signal for VGA output port 2
14	SCL1	I/O	DDC, clock signal for VGA output port 1
15	SCL2	I/O	DDC, clock signal for VGA output port 2
16	5V V_{DD}	Power	5V +/-10% Power rail
17	V2_OUT	O	Vertical Synchronous buffered signal for VGA output port 2
18	V1_OUT	O	Vertical Synchronous buffered signal for VGA output port 1
19	H2_OUT	O	Horizontal Synchronous buffered signal for VGA output port 2
20	H1_OUT	O	Horizontal Synchronous buffered signal for VGA output port 1
21	B2	I/O	Blue signal for VGA port 2, 150 Ohm Internal pull-down
22	B1	I/O	Blue signal for VGA port 1, 150 Ohm Internal pull-down
23	V_{DD}	Power	3.3V +/-10% power rail
24	G2	I/O	Green signal for VGA port 2, 150 Ohm Internal pull-down
25	G1	I/O	Green signal for VGA port 1, 150 Ohm Internal pull-down
26	R2	I/O	Red signal for VGA port 2, 150 Ohm Internal pull-down
27	R1	I/O	Red signal for VGA port 1, 150 Ohm Internal pull-down
28	GND	Ground	Ground
29	TEST	Input	Description is TEST pin to enable TEST mode. IF this pin is LOW, then test mode is enabled. For normal usage disable TEST mode by holding this pin high, or floating. There is an internal 100Kohm pull-up on this pin
30	Priority/SEL	I	Control signal. If MS pin is LOW, then this pin acts as a priority pin If MS pin is HIGH, then this pin acts as a port select pin If pin 30 is LOW, port 1 is chosen If pin 30 is HIGH, port 2 is chosen Definition of chosen depends on the function of pin 30. For example, if the function is priority, then chosen means "chosen as highest priority"
31	GND	Ground	Ground
32	VDD	Power	3.3V +/-10% power rail

Maximum Ratings

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

Storage Temperature.....–65°C to +150°C
Supply Voltage to Ground Potential.....–0.5V to +4.0V
DC Input Voltage.....–0.5V to +5.5V
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.

Truth Table

MS (Internal pull-down)	Switching Mode (1)	Pin 30 Role	SEL	Priority	Result
0	Automatic Switching	Priority Pin	N/A	0	Port1 has priority
0	Automatic Switching	Priority Pin	N/A	1	Port 2 has priority
1	Manual Switching	SEL pin	0	N/A	Port 1 is active
1	Manual Switching	SEL pin	1	N/A	Port 2 is active

Notes:
1. Automatic switching is achieved through monitor detection. Please see page 7 for a more detailed explanation of automatic switching.

DC Electrical Characteristics for Video Switching over Operating Range

(T_A = –40°C to +85°C, V_{DD} = 3.3V ±10% , V_{DD5} = 5V)

Parameters	Description	Test Conditions(1)	Min.	Typ.(2)	Max.	Units
V_{IH}	Input HIGH Voltage (SEL/Priority and MS pins)	Guaranteed HIGH level	2	-	-	V
V_{IL}	Input LOW Voltage (SEL/Priority, and MS pins)	Guaranteed LOW level	–0.5	-	0.8	
V_{IK}	Clamp Diode Voltage	V_{DD} = Max., I_{SELx} = –18mA	-	–0.8	–1.2	
I_{IH}	Input HIGH Current (SEL/Priority)	V_{DD} = Max., V_{SELx} = V_{DD}	-	-	±5	µA
I_{IL}	Input LOW Current (SEL/Priority)	V_{DD} = Max., V_{SELx} = GND	-	-	±5	
$I_{OFF\_H/V/DDC}$	Power Down Leakage Current for H/V and DDC channels only	V_{DD} = 0V, V_B = 0V, $V_A \leq 3.6$	-	-	±5	
R_{ON}	Switch On-Resistance for RGB path (3)	V_{DD} = Min., 0V ≤ V_{input} ≤ 1.2V, I_{input} = –40mA	-	4.8	5.6	Ω
$R_{FLAT(ON)}$	On-Resistance Flatness for RGB path (4)	V_{DD} = Min., V_{input} @ 0V and 1.2V, I_{input} = –40mA	-	0.5	+1	
ΔR_{ON}	On-Resistance match from center ports to any other port (RGB path only)(4)	V_{DD} = Min., 0V ≤ V_{input} ≤ 1.2V, I_{input} = –40mA	-	0.1	1	
$V_{OH\ (H/V)}$	Output high for H/V signals	V_{DD5} = 5V, I_{OH} = -24mA	3.0		V_{DD5}	V
$V_{OL\ (H/V)}$	Output low for H/V signals	V_{DD5} = 5V, I_{OL} = 24mA	0		0.8	
R_{PD}	RGB1/2 pull-down resistance	Vdd = 3.3V, 5V Vdd = 5V, MS = x, SEL = x	135	160	180	

Capacitance (T_A = 25°C, f = 1MHz)

Parameters[4]	Description	Test Conditions[1]	Typ.[2]	Units
C_{IN}	Input Capacitance		2.0	pF
C_{OFF}	RGB Capacitance, Switch OFF		2.4	
C_{ON}	RGB Switch Capacitance, Switch ON		5.6	

Notes:
1. For max. or min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{DD} = 3.3V, T_A = 25°C ambient and maximum loading.
3. Measured by the voltage drop between input and output pins at indicated current through the switch. On-Resistance is determined by the lower of the voltages on the two pins.
4. This parameter is determined by device characterization but is not production tested.

Power Supply Characteristics

Parameters	Description	Test Conditions[1]	Min.	Typ.[2]	Max.	Units
I_{CC} _3.3V rail	Quiescent Power Supply Current for 3.3V power rail	V_{DD} = Max., V_{DD} = 3.6V, 5V V_{DD} = 5.5V V_{SEL} = GND or V_{DD}	-	250	500	µA
I_{CC}_5V V_{DD}	Quiescent Power supply current for 5V V_{DD}	5V V_{DD} = 5.5V, V_{DD} = 3.6V, V_{SEL}= GND or V_{DD}		100	500	nA

Notes:
1. For max. or min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{DD} = 3.3V, T_A = 25°C ambient and maximum loading.

Dynamic Electrical Characteristics Over the Operating Range (T_A=-40º to +85ºC, V_{DD}=3.3V±10%, GND=0V)

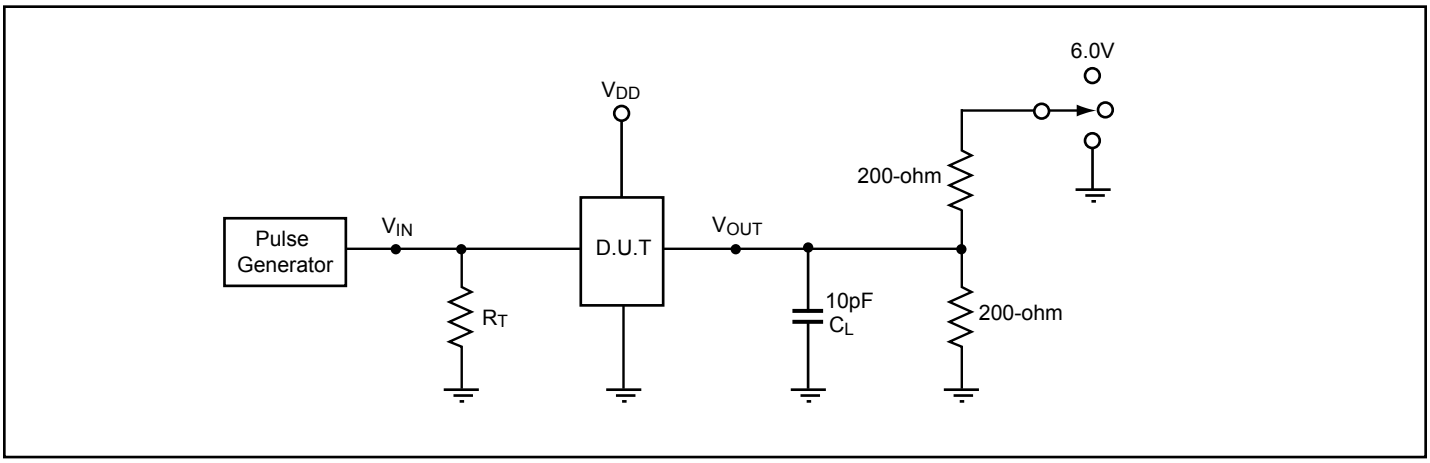
Parameters	Description	Test Conditions		Min.	Typ.[2]	Max.	Units
X_{TALK}	Crosstalk	f = 250MHz, See Fig. 2		-	- 46	-	dB
O_{IRR}	OFF Isolation	f = 250MHz, See Fig. 3		-	- 38	-	
BW	Bandwidth –3dB	See Fig. 1		-	1.7	-	GHz
I_{LOSS}	Insertion Loss for RGB path	with 75-Ohm load	Freq = 10MHz (VGA)		-1.77		dB
			Freq = 100MHz (XGA)		-1.88		
			Freq = 300MHz (UXGA)		-2.09		

Switching Characteristics

Parameters	Description	Min.	Typ.[2]	Max.	Units
t_{PD}	Propagation Delay[2,3]	-	0.25		ns
t_{PZH}, t_{PZL}	Line Enable Time - SEL to Input, Output	0.5	-	15	
t_{PHZ}, t_{PLZ}	Line Disable Time - SEL to Input, Output	0.5	-	10	
$t_{SK(p)}$	Skew between opposite transitions of the same output (t_{PHL} - t_{PLH}) [2]	-	0.1	0.2	
Trise (H/V)	Horizontal/Vertical synchronous output rise time (H1_out, V1_out, H2_out, and V2_out)		1.5		
Tfall (H/V)	Horizontal/Vertical synchronous output fall time (H1_out, V1_out, H2_out, and V2_out)		1.6		

Notes:
1. For max. or min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Guaranteed by design.
3. The switch contributes no propagational delay other than the RC delay of the On-Resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 0.25ns for 10pF load. Since this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagational delay to the system. Propagational delay of the bus switch when used in a system is determined by the driving circuit on the driving side of the switch and its interactions with the load on the driven side.

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. All input impulses are supplied by generators having the following characteristics: f = 10 MHz, $Z_O = 50\Omega$, $t_R \leq 2.5$ns, $t_F \leq 2.5$ns.
4. The outputs are measured one at a time with one transition per measurement.

Switch Positions

Test	Switch
t_{PLZ}, t_{PZL} (output on I-side)	6.0V
t_{PHZ}, t_{PZH} (output on I-side)	GND
Prop Delay	Open

Test Circuit for Dynamic Electrical Characteristics

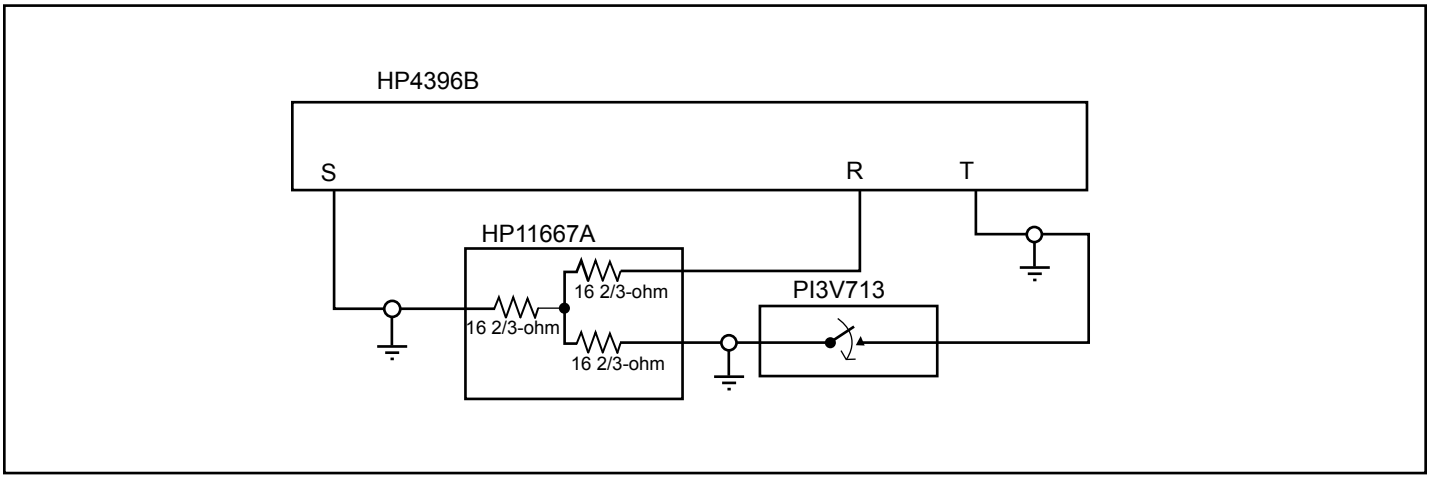


Figure 1. Bandwidth -3dB Testing

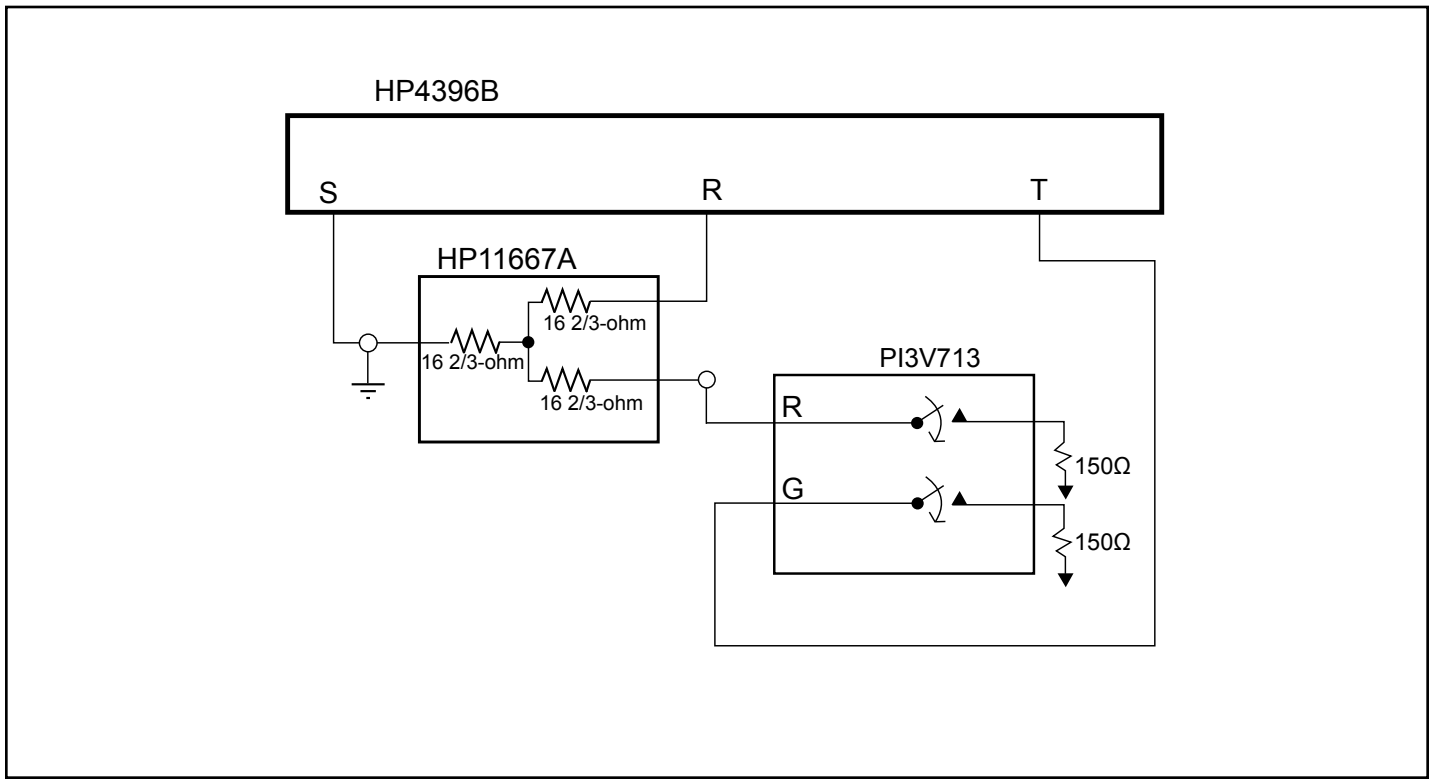


Figure 2. Crosstalk Test Setup

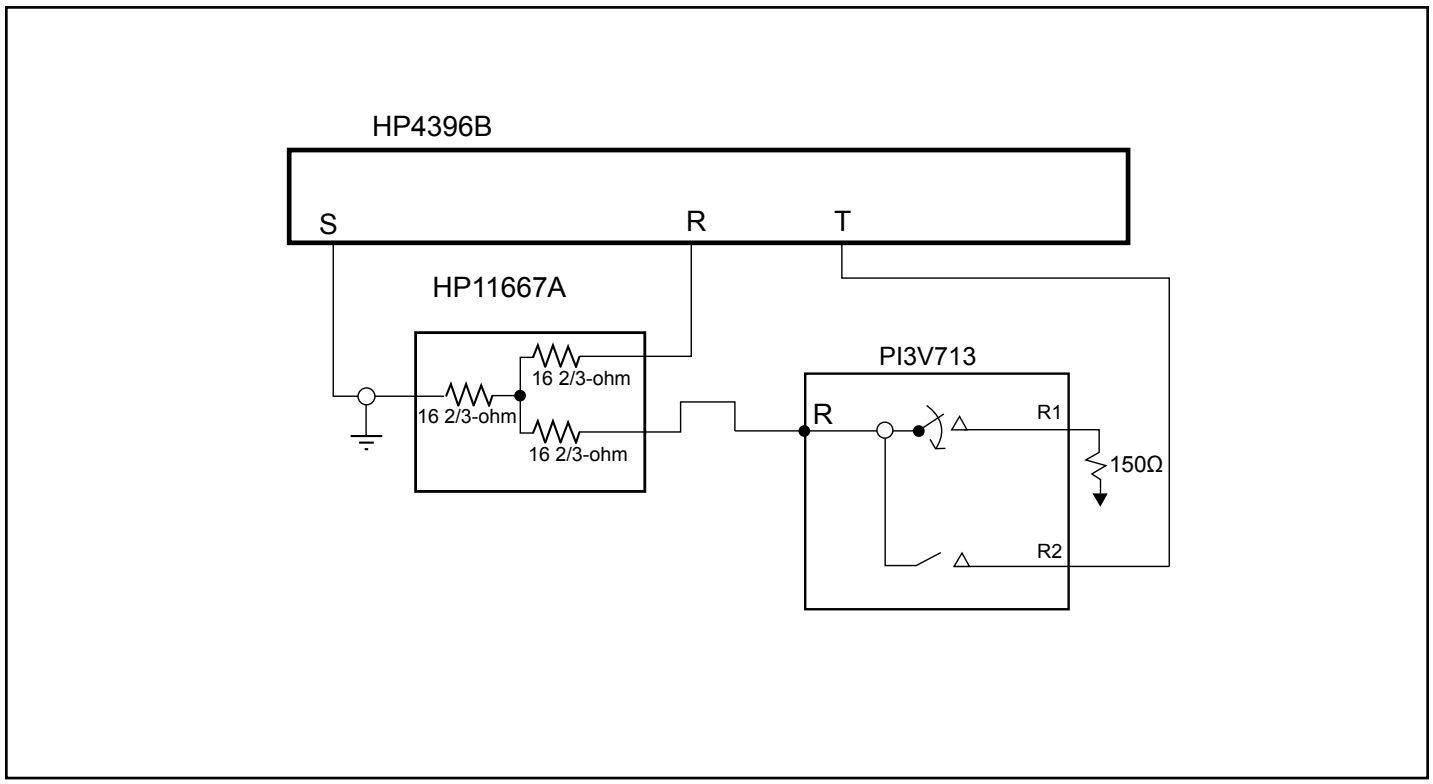
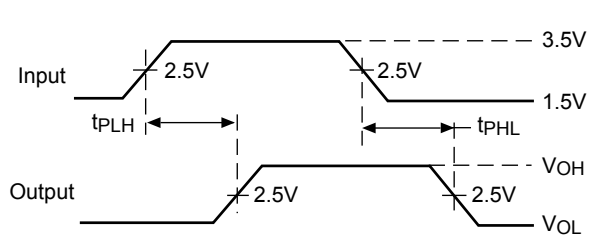
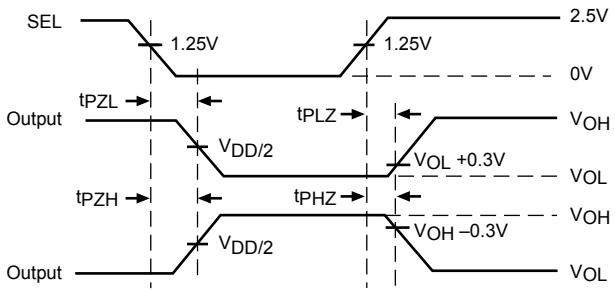


Figure 3. Off Isolation Test Setup

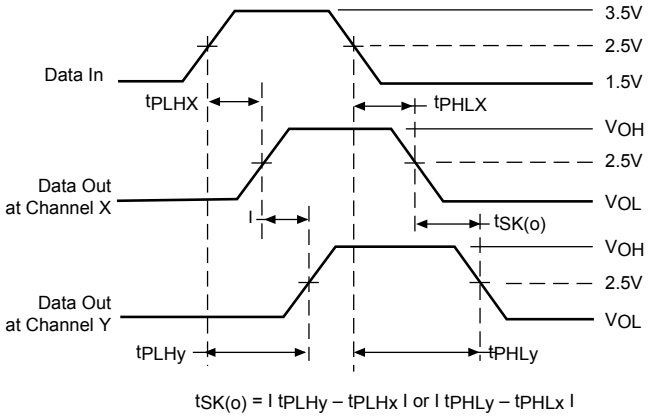
Switching Waveforms



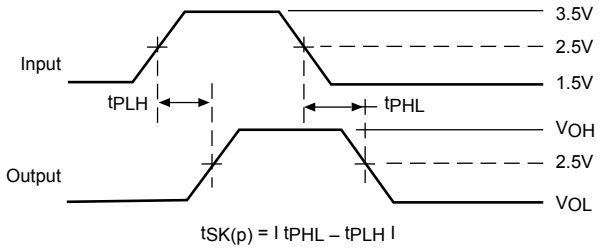
Voltage Waveforms Propagation Delay Times



Voltage Waveforms Enable and Disable Times



Output Skew - $t_{SK(o)}$



Pulse Skew - $t_{SK(p)}$

Applications Information

Logic Inputs

The logic control inputs can be driven up to +3.6V regardless of the supply voltage. For example, given a +3.3V supply, the output enables or select pins may be driven low to 0V and high to 3.6V. Driving IN Rail-to-Rail® minimizes power consumption.

Automatic Switching Explanation

When PI3V713 is used as a 1:2 demux with one source and 2 monitors, the device can automatically route the single video source to the required monitor output.

The determination scheme is based on 2 points.

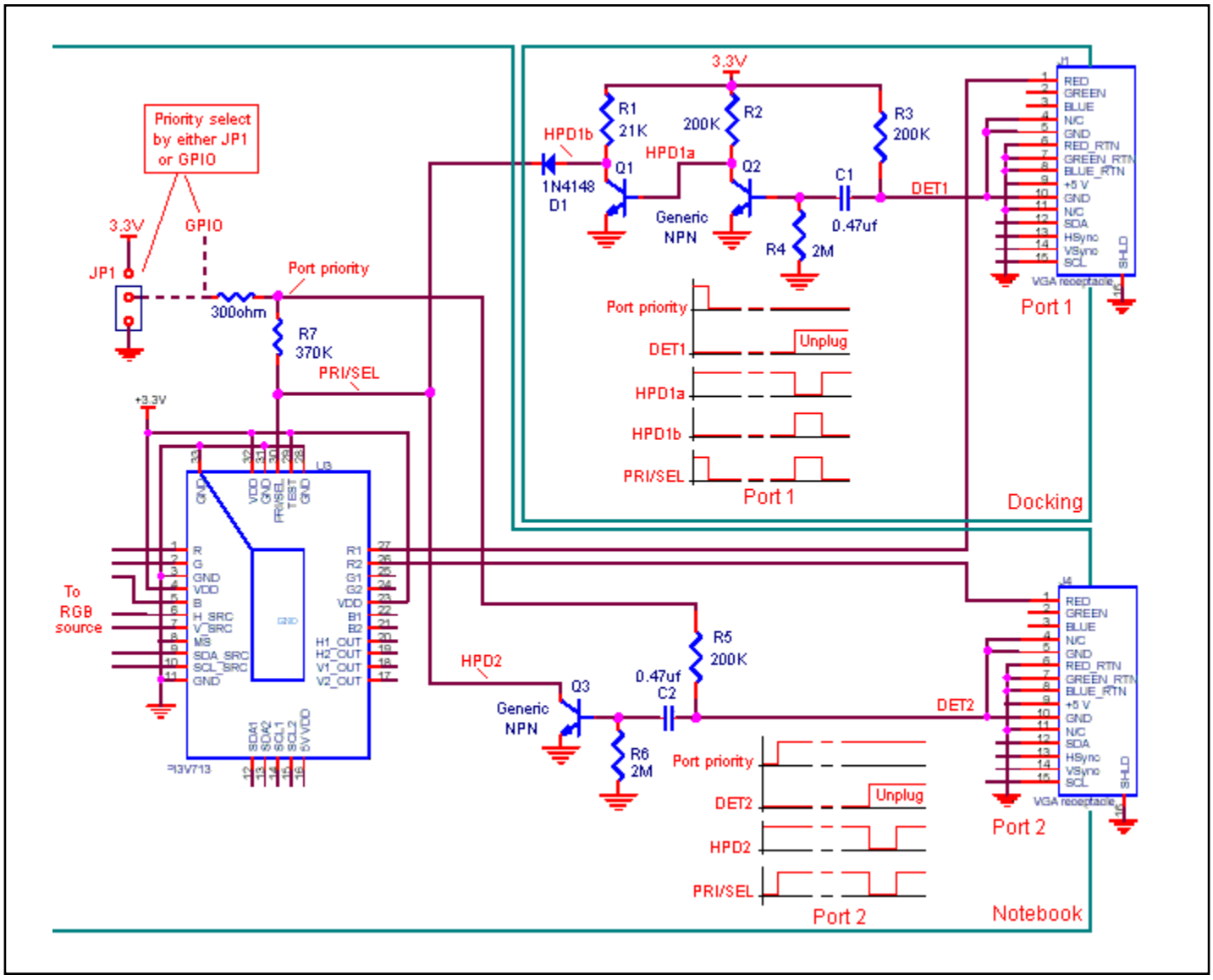
1) The connection status of the monitors

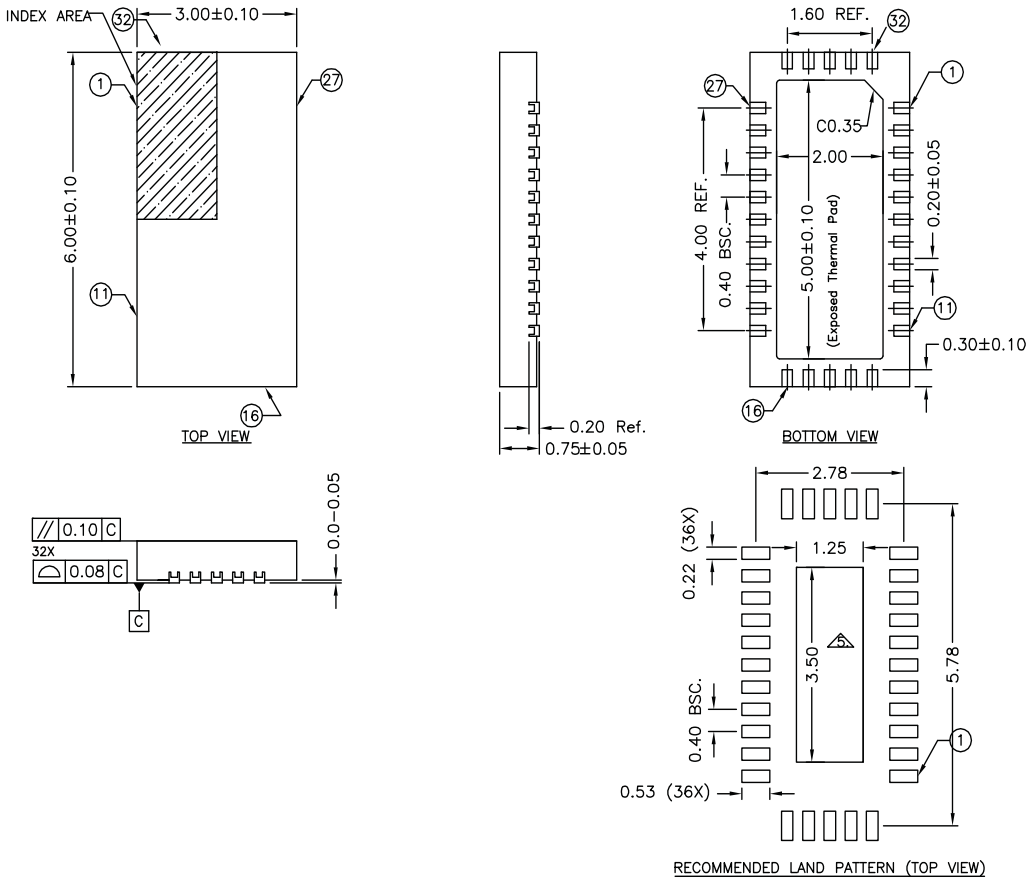
2) The status of pin 30 (priority pin)

PI3V713 detects each output to determine if a monitor is plugged in or not. If only one monitor is plugged in, then the video source will be automatically routed to that port.

If a monitor is connected to BOTH output ports, then the priority input pin (pin 30) is used to determine the winning route the video signal should be routed towards. In automatic switching mode there is a minimum of 3 second delay time when switching between

port 1 and port 2. During this delay time, all I/O pins are in Hi-Z state. In order to utilize the full extent of this feature, the following recommended application circuit should be followed:





NOTE :

1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES.
2. COPLANARITY APPLIES TO THE EXPOSED THERMAL PAD AS WELL AS THE TERMINALS.
3. REFER JEDEC MO–220.
4. RECOMMENDED LAND PATTERN IS FOR REFERENCE ONLY.
5. THERMAL PAD SOLDERING AREA

PERICOM® Enabling Serial Connectivity

DATE: 10/09/09

DESCRIPTION: 32-contact, Thin Fine Pitch Quad Flat No-Lead (TQFN)

PACKAGE CODE: ZL (ZL32)

DOCUMENT CONTROL #: PD-2044 **REVISION: A**

09-0125

Note:

- For latest package info, please check: http://www.pericom.com/products/packaging/mechanicals.php

Ordering Information

Ordering Code	Package Code	Package Description
PI3V713ZLE	ZL	Pb-free & Green, 32-pin TQFN

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- "E" denotes Pb-free and Green
- Adding an "X" at the end of the ordering code denotes tape and reel packaging