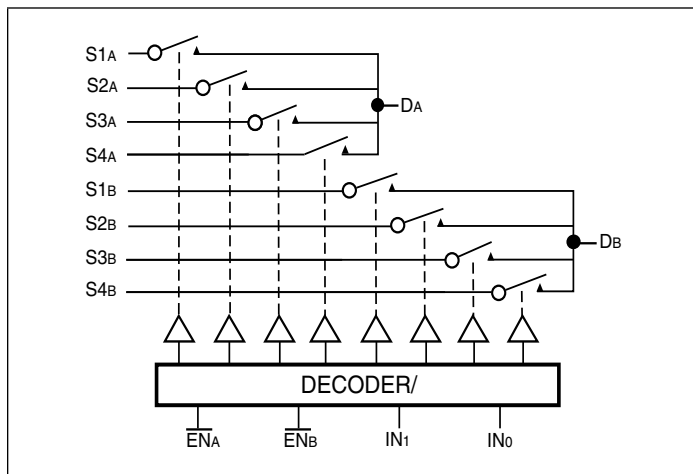


## Low On-Resistance Wideband/Video Dual 4-Channel Mux/DeMux

### Features

- High-performance, low-cost solution to switch between video sources
- Wide bandwidth: 150 MHz
- Low On-Resistance:  $3\Omega$
- Low crosstalk at 10 MHz:  $-58\text{dB}$
- Ultra-low quiescent power ( $0.1\mu\text{A}$  typical)
- Single supply operation:  $+5.0\text{V}$
- Fast switching:  $10\text{ns}$
- High-current output:  $100\text{mA}$
- Functionally equivalent to QS4A210
- Packaging (Pb-free & Green):
  - 16-pin 150-mil wide plastic QSOP (Q)

### Block Diagram



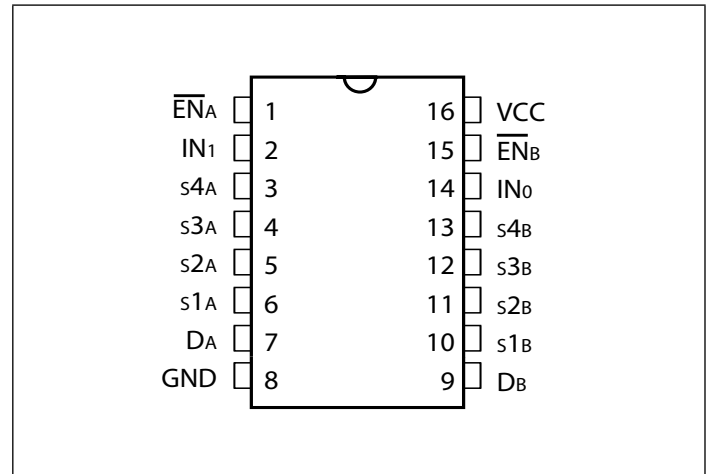
### Description

Pericom Semiconductor's PI5V331 is a true bi directional Dual 4-channel multiplexer/demultiplexer that is recommended for both S-Video or composite video switching applications. The switch can be driven from a current output RAMDAC or voltage output composite video source.

Low On-resistance and wide bandwidth make it ideal for video and other applications. Also this device has exceptionally high current capability which is far greater than most analog switches offered today. A single 5V supply is all that is required for operation.

The PI5V331 offers a high-performance, low-cost solution to switch between video sources.

### Pin Configuration (16-Pin QSOP)



### Truth Table

$\overline{\text{EN}}_A$	$\overline{\text{EN}}_B$	$\text{IN}_1$	$\text{IN}_0$	ON Switch
1	X	X	X	Disabled A
X	1	X	X	Disabled B
0	0	0	X	$\text{S1}_A - \text{D}_A, \text{S1}_B - \text{D}_B$
0	0	0	0	$\text{S2}_A - \text{D}_A, \text{S2}_B - \text{D}_B$
0	0	1	1	$\text{S3}_A - \text{D}_A, \text{S3}_B - \text{D}_B$
0	0	1	X	$\text{S4}_A - \text{D}_A, \text{S4}_B - \text{D}_B$

### Pinout Table

Pin Name	Description
$\text{S1}_A, \text{S2}_A, \text{S3}_A, \text{S4}_A, \text{S1}_B, \text{S2}_B, \text{S3}_B, \text{S4}_B$	Analog Video I/O (Usually Inputs)
$\text{S}_0, \text{S}_1$	Select Input
$\overline{\text{EN}}_A, \overline{\text{EN}}_B$	Enable
$\text{D}_A, \text{D}_B$	Analog Video I/O (Usually Outputs)
GND	Ground
$\text{V}_{\text{CC}}$	Power

### Absolute Maximum Ratings (Over operating free-air temperature range)

Parameter	Min.	Max.	Units
Storage temperature	-65	150	°C
Ambient Temperature with Power Applied	-40	85	
Supply Voltage to Ground Potential (Inputs & V <sub>CC</sub> Only)	-0.5	7.0	V
Supply Voltage to Ground Potential (Outputs & D/O Only)	-0.5	7.0	
DC Input Voltage	-0.5	7.0	
DC Output Current	-	120	mA
Power Dissipation	-	500	mW

Stress beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device.

### DC Electrical Characteristics (Over the Operating Range, T<sub>A</sub> = -40°C to +85°C, V<sub>CC</sub> = 5V ±5%)

Parameters	Description	Test Conditions <sup>(1)</sup>	Min	Typ <sup>(2)</sup>	Max	Units
V <sub>ANALOG</sub>	Analog Signal Range		0		2.0	V
V <sub>IH</sub>	Input HIGH Voltage	Guaranteed Logic HIGH level	2.0			
V <sub>IL</sub>	Input LOW Voltage	Guaranteed Logic LOW Level	-0.5		0.8	
I <sub>IH</sub>	Input HIGH Current	V <sub>CC</sub> = Max., V <sub>IN</sub> = V <sub>CC</sub>			±1	μA
I <sub>IL</sub>	Input LOW Current	V <sub>CC</sub> = Max., V <sub>IN</sub> = GND			±1	
I <sub>O</sub>	Analog Output Leakage Currnet	0 ≤ S1, S2, or D ≤ V <sub>CC</sub> , Switch OFF			±1	
V <sub>IK</sub>	Clamp Diode Voltage	V <sub>CC</sub> = Min., I <sub>IN</sub> = -18mA		-0.7	-1.2	V
I <sub>OS</sub>	Short Circuit Current <sup>(3)</sup>	S1, S2, D = 0V V <sub>CC</sub>	100			mA
V <sub>H</sub>	Input Hysteresis at Control Pins			150		mV
R <sub>ON</sub>	Switch On-Resistance	V <sub>CC</sub> = MIN., V <sub>OUT</sub> = 0.975V R <sub>L</sub> = 75Ω, I <sub>ON</sub> = 13 mA		3	7	Ω
		V <sub>CC</sub> = MIN., V <sub>OUT</sub> = 1.95V R <sub>L</sub> = 75Ω, I <sub>ON</sub> = 26 mA		7	10	

#### Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at V<sub>CC</sub> = 5.0V, T<sub>A</sub> = 25°C ambient and maximum loading.
- Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
- Measured by the voltage drop between S1, S2, and D I/O pins at indicated current through the switch. On-Resistance is determined by the lower of the voltages on the S1, S2, and D I/O pins.

**Dynamic Characteristics** (Over the Operating Range,  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ,  $V_{CC} = 5V \pm 5\%$ )

Parameters	Description	Test Conditions <sup>(1)</sup>	Min	Typ	Max	Units
$T_{ON}$	Turn On Time	$R_L = 70\Omega$ , $C_L = 20\text{PF}$ , See Fig. 2		2.5	5	ns
$T_{OFF}$	Turn Off Time	$R_L = 70\Omega$ , $C_L = 20\text{PF}$ , See Fig. 2		1.1	5	
$BW^{(1)}$	-3dB Bandwidth	$R_L = 150\Omega$ , See Fig. 3	150			MHz
$X_{TALK}$	Crosstalk	$R_{IN} = 10\Omega$ ; $R_L = 150\Omega$ , 10MHz, See Fig. 3		-58		dB
$D_G$	Differential Gain	$R_L = 150\Omega$ , $f = 3.58\text{ MHz}$ , See Fig. 1		0.64		%
$D_P$	Differential Phase	$R_L = 150\Omega$ , $f = 3.58\text{ MHz}$ , See Fig. 1		0.27		Deg.
$C_{IN}^{(1)}$	Input/Enable Capacitance	$V_{IN} = 0V$ , $f = 1\text{ MHz}$			6	pF
$C_{OFF}^{(1)}$	Capacitance, Switch Off	$V_{IN} = 0V$ , $f = 1\text{ MHz}$			6	
$C_{ON}^{(1)}$	Capacitance, Switch On	$V_{IN} = 0V$ , $f = 1\text{ MHz}$			20	
$O_{IRR}$	Off Isolation	$R_L = 150\Omega$ , 10MHz, See Fig 3		-38		dB

**Notes:**

1. This parameter is determined by device characterization but is not production tested.

**Power Supply Characteristics**

Parameters	Description	Test Conditions <sup>(1)</sup>		Min	Typ <sup>(2)</sup>	Max	Units
$I_{CC}$	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$	$I_N = \text{GND or } V_{CC}$		0.1	3.0	$\mu\text{A}$
$\Delta I_{CC}$	Supply Current per Input @ TTL HIGH	$V_{CC} = \text{Max.}$	$I_N = 3.4V^{(3)}$			2.5	mA
$I_{CCD}$	Supply Current per Input per MHz <sup>(4)</sup>	$V_{CC} = \text{Max.}$ , S1, S2 and D Pins Open $\overline{EN} = \text{GND}$ Control Input Toggling 50% Duty Cycle				0.25	mA/ MHz

**Notes:**

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

2. Typical values are at  $V_{CC} = 5.0V$ ,  $+25^{\circ}\text{C}$  ambient and maximum loading.

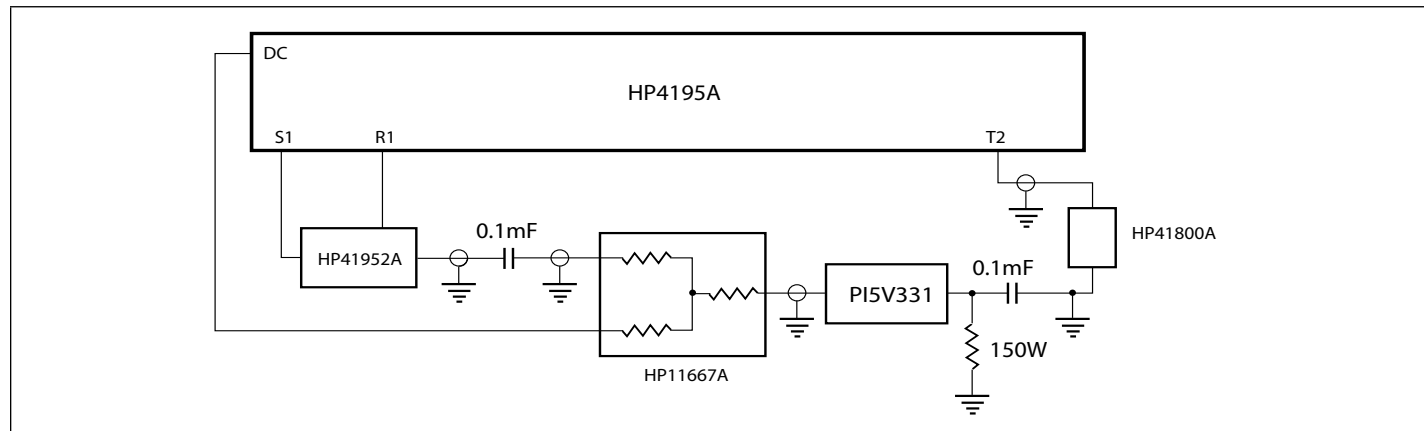
3. Per TTL driven input ( $V_{IN} = 3.4V$ , control inputs only); S1, S2, and D pins do not contribute to  $I_{CC}$ .

4. This current applies to the control inputs only and represent the current required to switch internal capacitance at the specified frequency. The S1, S2, and D I/O pins generate no significant AC or DC currents as they transition. This parameter is not tested, but is guaranteed by design.

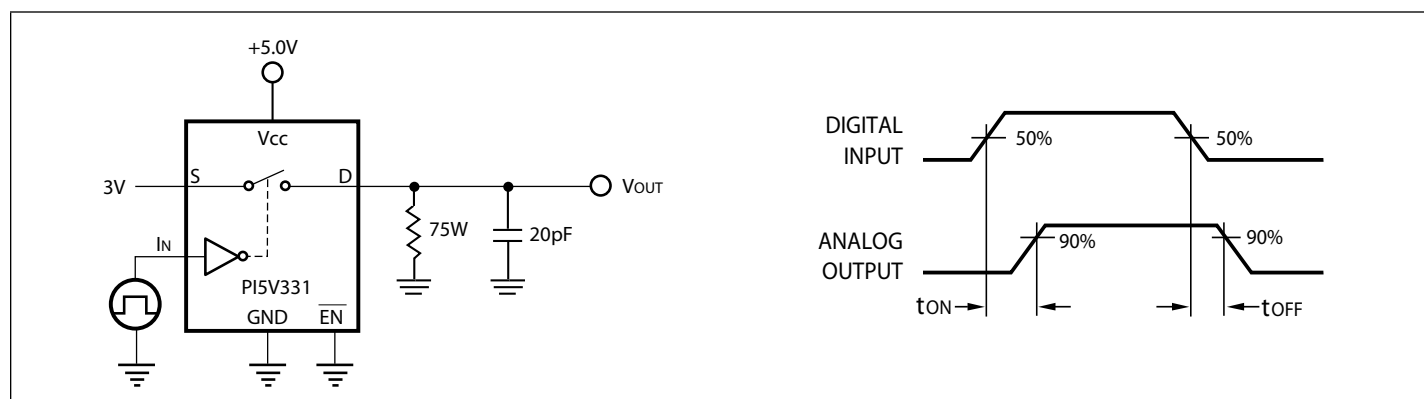
## Definitions

Parameters	Description
$T_{ON}$	Resistance between source and drain with switch in the ON state.
$I_O$	Output leakage current measured at S1, S2, and D with the switch OFF.
$V_{IN}$	Digital voltage at the IN pin that selects between S1 and S2 analog inputs.
$V_{EN}$	A voltage that ENABLES the chip.
$C_{IN}$	Capacitance at the digital inputs.
$C_{OFF}$	Capacitance at analog I/O (S1, S2, D) with switch OFF.
$C_{ON}$	Capacitance at analog I/O (S1, S2, D) with switch ON.
$V_{IH}$	Minimum input voltage for logic HIGH.
$V_{IL}$	Minimum input voltage for logic LOW.
$I_{IH}$ ( $I_{IL}$ )	Input current of the digital input.
$I_{OS}$	Minimum short circuit current for S1, S2 and D.
$t_{ON}$	Propagation delay measured between 50% of the digital input to 90% of the analog output when switch is turned ON. The peak analog voltage is 0.714V.
$t_{OFF}$	Propagation delay measured between 50% of the digital input to 90% of the analog output when switch is turned OFF. The peak analog voltage is 0.714V.
$B_W$	Frequency response of the switch in the ON state measured at 3dB down.
$X_{TALK}$	Is an unwanted signal coupled from channel to channel. Measured in -dB. $X_{TALK} = 20 \text{ LOG } V_{OUT}/V_{IN}$ . This is non-adjacent crosstalk.
$D_G$	Differential gain is the difference measurement between two bias levels, for instance analog input signals of 0V to 0.714V.
$D_P$	Differential phase is the difference measurement between two bias levels, for instance analog input signals of 0V to 0.714V.
$O_{IRR}$	Off isolation is the resistance (measured in -dB) between the input and output with the switch off (NO).

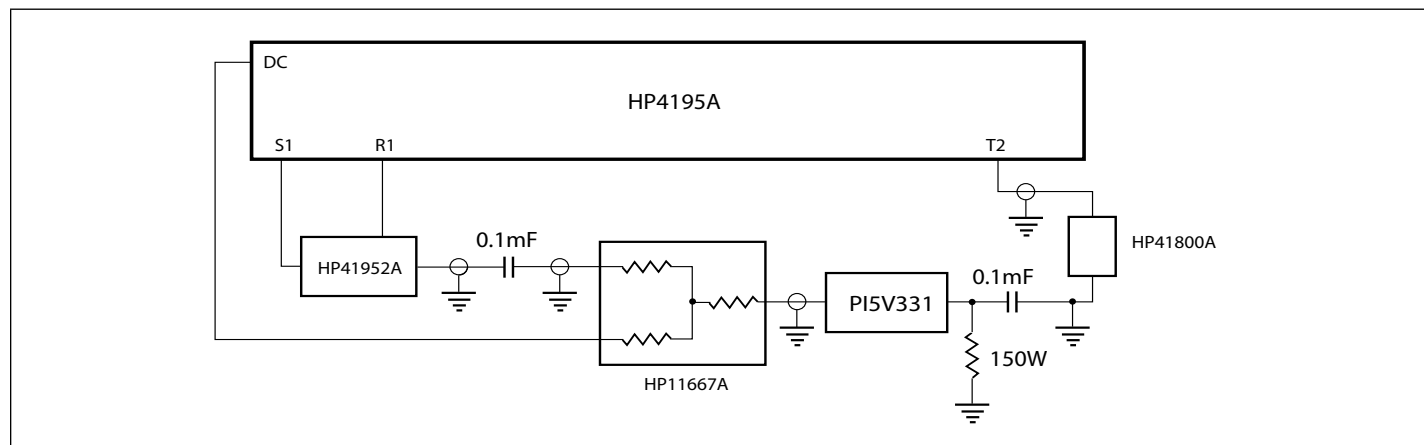
## Test Circuits



**Figure 1. Differential Gain/Phase**



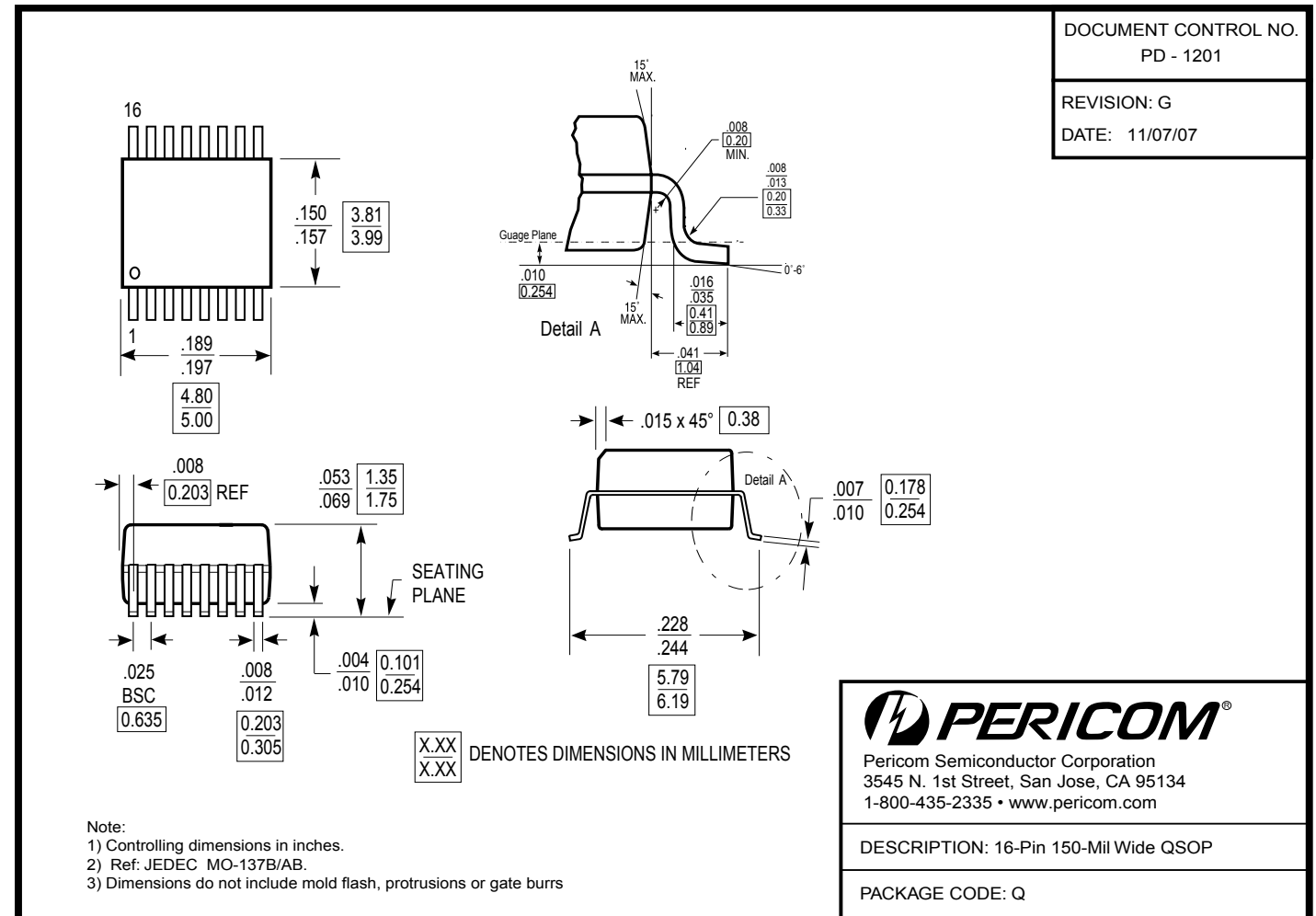
**Figure 2. Switching Time**



**Figure 3. Gain/Phase, Crosstalk, Off-Isolation**



**Packaging Mechanical: 16-Pin QSOP (Q)**



**Ordering Information**

Ordering Code	Package Code	Package Type
PI5V331QE	Q	Pb-free & Green, 16-pin 150-mil wide QSOP

1. Thermal characteristics can be found on the company web site at [www.pericom.com/packaging/](http://www.pericom.com/packaging/)
2. "E" denotes Pb-free and Green
3. Adding an "X" at the end of the ordering code denotes tape and reel packaging

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