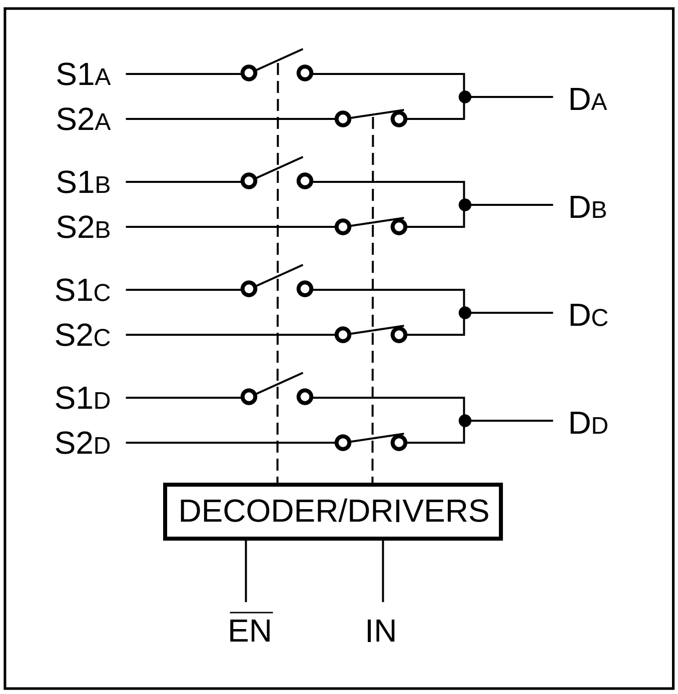
Low ON Resistance Wideband/Video Quad 2-Channel MUX/DEMUX

Product Features:

- High-performance, low-cost solution to switch between video sources
- Wide bandwidth: 200 MHz
- Low ON-resistance: 3Ω
- Low crosstalk at 10 MHz: –58 dB
- Ultra-low quiescent power (0.1 µA typical)
- Single supply operation: +5.0V
- Fast switching: 10 ns
- High-current output: 100 mA
- Packages available:
  - 16-pin 300-mil wide plastic SOIC (S)
  - 16-pin 150-mil wide plastic SOIC (W)
  - 16-pin 150-mil wide plastic QSOP (Q)

Functional Block Diagram



Truth Table

EN	IN	ON Switch
0	0	S1A, S1B, S1C, S1D
0	1	S2A, S2B, S2C, S2D
1	X	Disabled

Product Description:

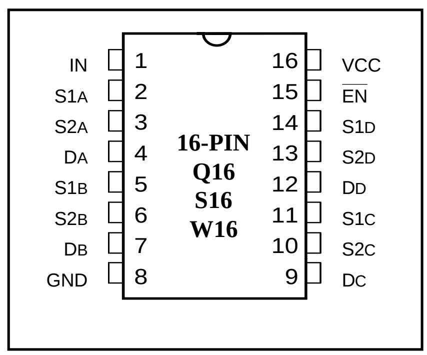
Pericom Semiconductor's PI5V series of mixed signal video circuits are produced in the Company's advanced CMOS low-power technology, achieving industry leading performance.

The PI5V330 is a true bidirectional Quad 2-channel multiplexer/demultiplexer that is recommended for both RGB and composite video switching applications. The VideoSwitch™ 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 PI5V330 offers a high-performance, low-cost solution to switch between video sources. The application section describes the PI5V330 replacing the HC4053 multiplier and buffer/amplifier.

16-Pin Product Configuration



Product Pin Description

Pin Name	Description
S1A, S2A S1B, S2B S1C, S2C S1D, S2D	Analog Video I/O
IN	Select Input
EN	Enable
DA, DB, DC, DD	Analog Video I/O
GND	Ground
VCC	Power

Maximum Ratings

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

Storage Temperature	–65°C to +150°C
Ambient Temperature with Power Applied	–40°C to +85°C
Supply Voltage to Ground Potential (Inputs & Vcc Only)	–0.5V to +7.0V
Supply Voltage to Ground Potential (Outputs & D/O Only)	–0.5V to +7.0V
DC Input Voltage	–0.5V to +7.0V
DC Output Current	120 mA
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 Electrical Characteristics (Over the Operating Range, T_A = –40°C to +85°C, V_{CC} = 5V ±5%)

Parameters	Description	Test Conditions[1]	Min.	Typ[2]	Max.	Units
V_{ANALOG}	Analog Signal Range		0	—	2.0	V
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level	2.0	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW Level	–0.5	—	0.8	V
I_{IH}	Input HIGH Current	V_{CC} = Max., V_{IN} = V_{CC}	—	—	±1	µA
I_{IL}	Input LOW Current	V_{CC} = Max., V_{IN} = GND	—	—	±1	µA
I_O	Analog Output Leakage Current	0 ≤S1, S2 or D ≤V_{CC}, Switch Off	—	—	±1	µA
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –18 mA	—	–0.7	–1.2	V
I_{OS}	Short Circuit Current[3]	S1, S2, D = 0V V_{CC}	100	—	—	mA
V_H	Input Hysteresis at Control Pins		—	150	—	mV
R_{ON}	Switch On Resistance[4]	V_{CC} = Min., V_{IN} = 1.0V R_L = 75Ω, I_{ON} = 13 mA	—	3	7	Ω
		V_{CC} = MIN., V_{IN} = 2.0V R_L = 75Ω, I_{ON} = 26 mA	—	7	10	Ω

Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at Vcc = 5.0V, T_A = 25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. 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°C to +85°C, V_{CC} = 5V ±5%)

Parameter	Description	Test Conditions	Min.	Typ.	Max.	Unit
t_{ON}	Turn On Time	R_L = 75Ω, C_L = 20 pF, see Fig. 6	—	2.5	5	ns
t_{OFF}	Turn Off Time	R_L = 75Ω, C_L = 20 pF, see Fig. 6	—	1.1	5	ns
B_W(1)	–3 dB Bandwidth	R_L = 150Ω, see Fig. 7	180	—	—	MHz
X_{TALK}	Crosstalk	R_{IN} = 10Ω; R_L = 150Ω, 10 MHz, see Fig. 7	—	–58	—	dB
D_G	Differential Gain	R_L = 150Ω, f = 3.58 MHz, see Fig. 5	—	0.64	—	%
D_P	Differential Phase	R_L = 150Ω, f = 3.58 MHz, see Fig. 5	—	0.27	—	Deg.
C_{IN}(1)	Input/Enable Capacitance	V_{IN} = 0V, f = 1 MHz	—	—	6	pF
C_{OFF}(1)	Capacitance, Switch Off	V_{IN} = 0V, f = 1 MHz	—	—	6	pF
C_{ON}(1)	Capacitance, Switch On	V_{IN} = 0V, f = 1 MHz	—	—	8	pF
O_{IRR}	Off Isolation	R_L = 150Ω, 10 MHz, see Fig. 7	—	–38	—	dB

Notes:
1. 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}	Quiescent Power Supply Current	V_{CC} = Max.	IN = GND or V_{CC}	—	0.1	3.0	µA
ΔI_{CC}	Supply Current per Input @ TTL HIGH	V_{CC} = Max.	IN = 3.4V(3)	—	—	2.5	mA
I_{CCD}	Supply Current per Input per MHz(4)	V_{CC} = Max., S1, S2, and D Pins Open $\overline{EN}$ = 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 Vcc = 5.0V, +25°C ambient.
3. Per TTL driven input (V_{IN} = 3.4V, control inputs only); S1, S2, and D pins do not contribute to Icc.
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:

Symbol	Description
R_{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 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).

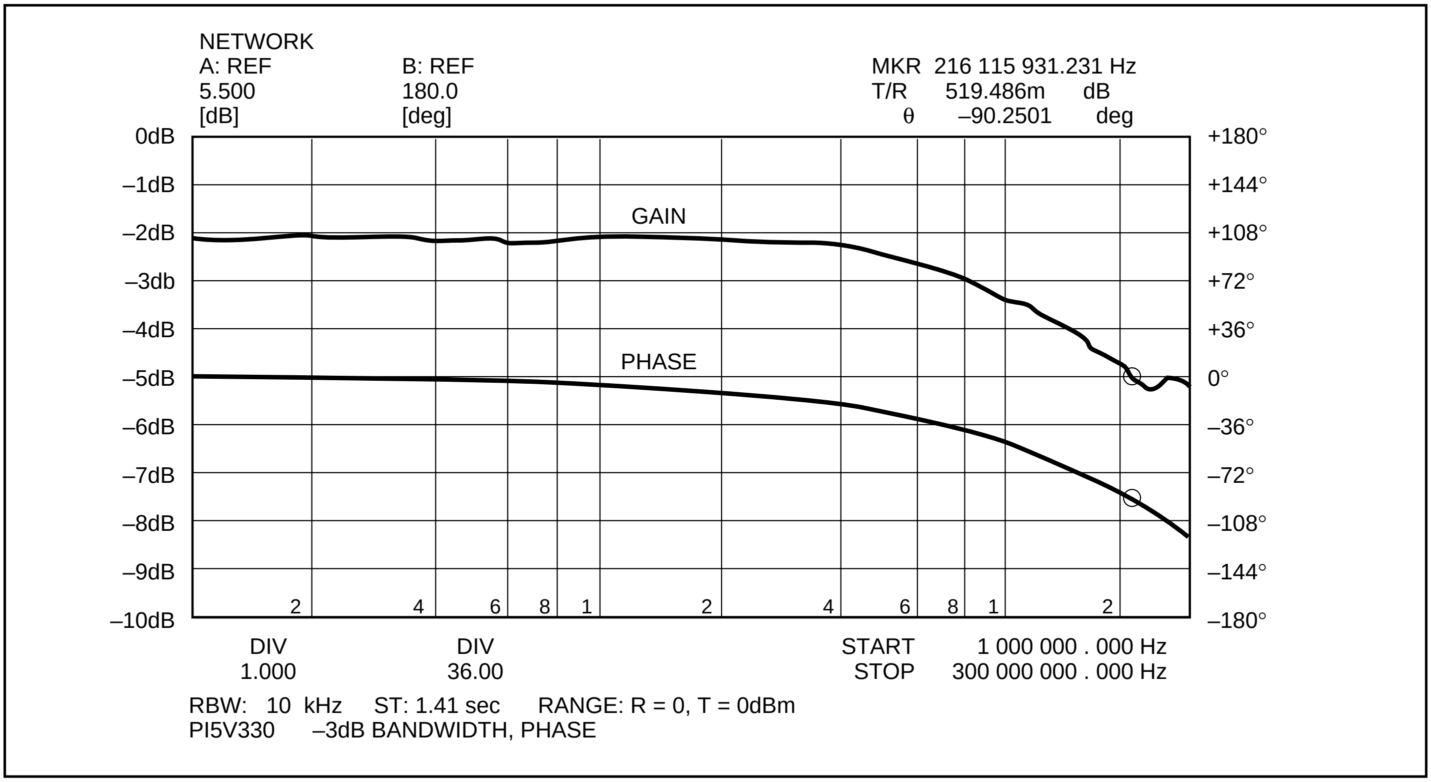


Figure 1. Gain/Phase vs Frequency

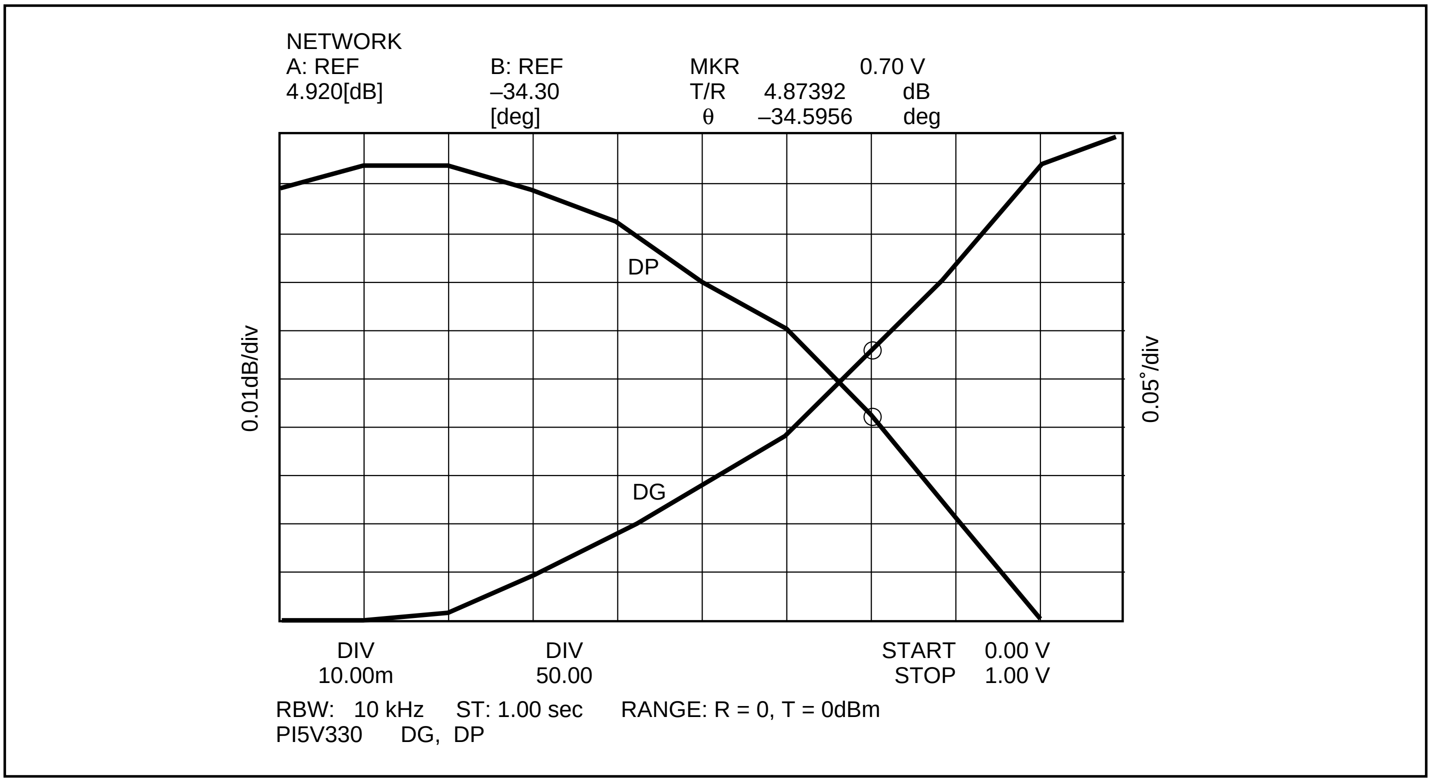


Figure 2. Differential Phase/Gain vs V_{BIAS}

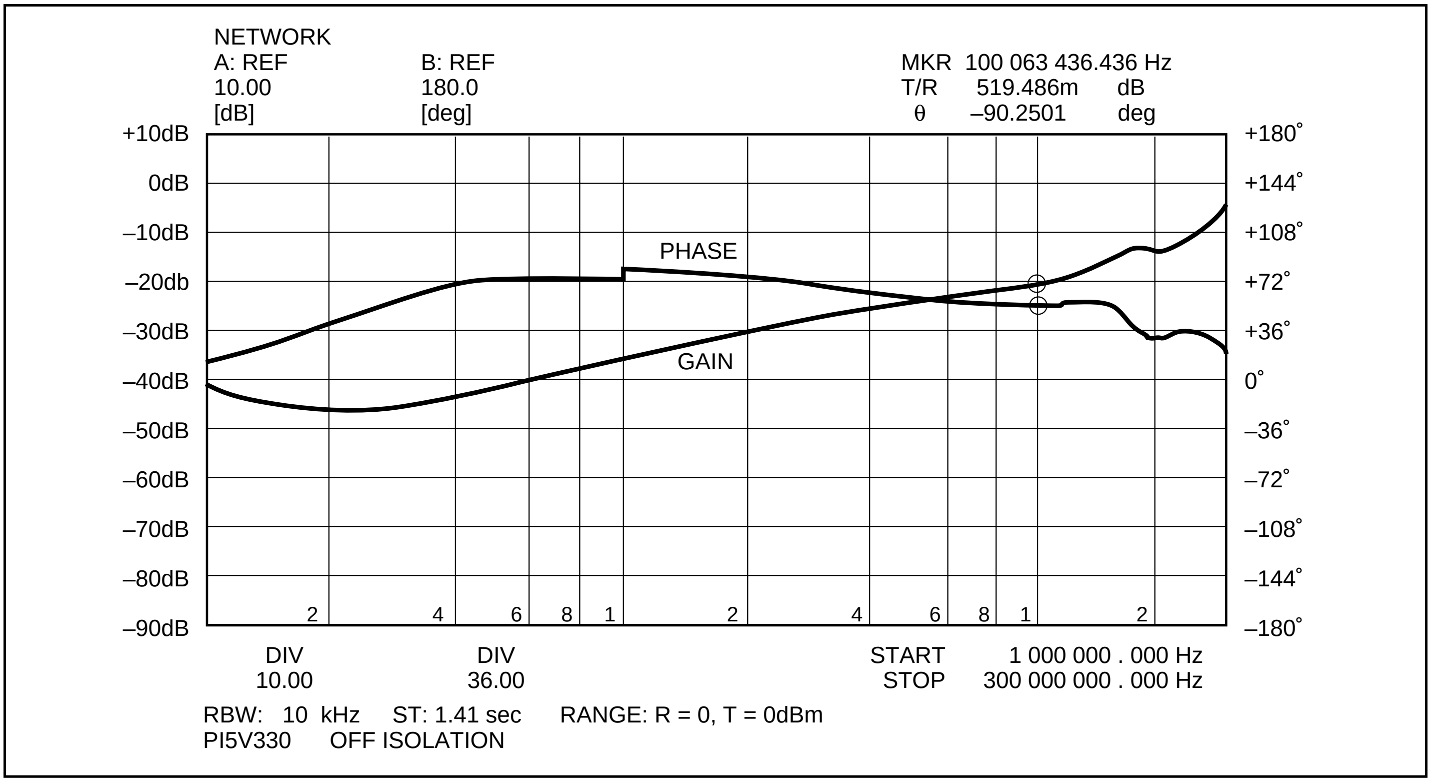


Figure 3. Off Isolation vs Frequency

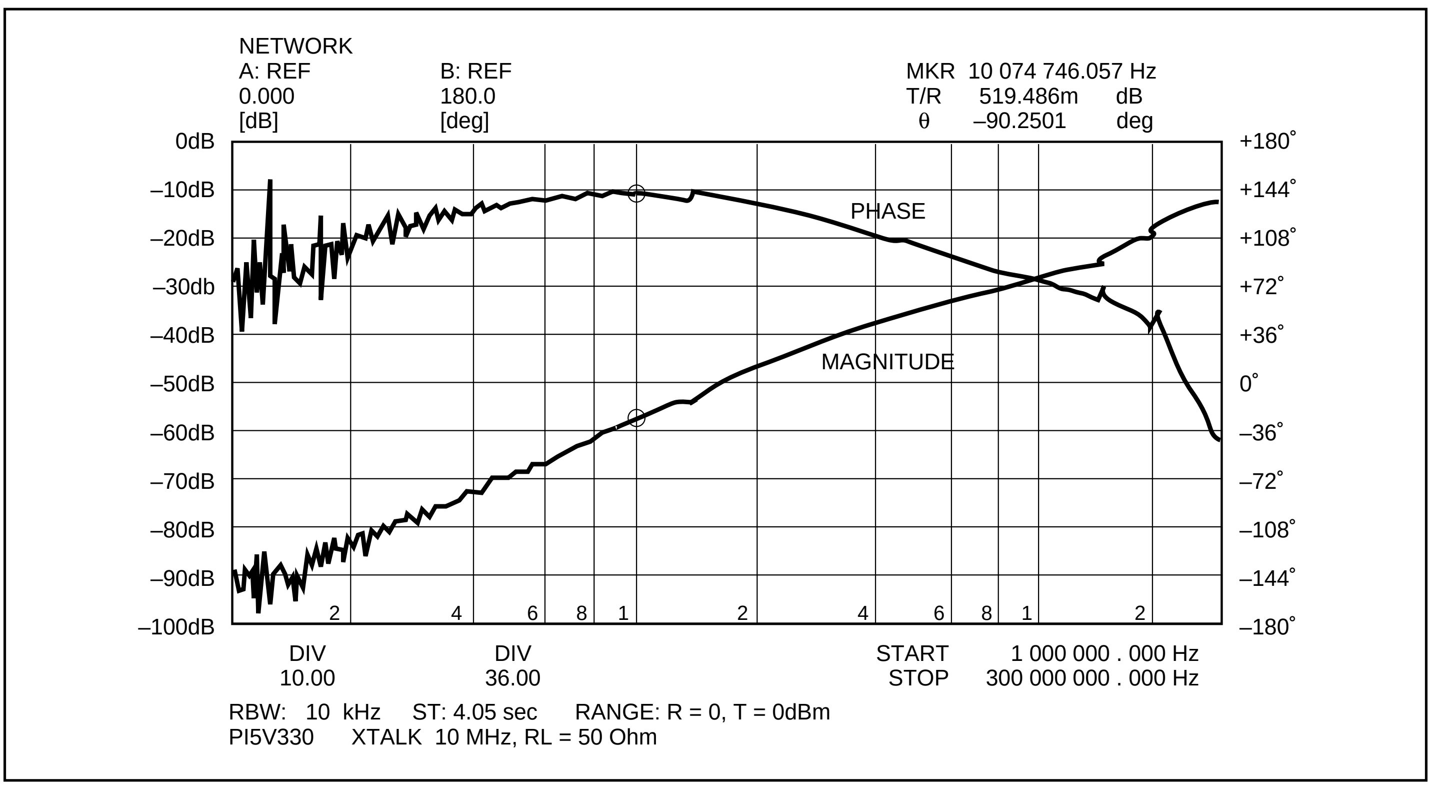


Figure 4. Crosstalk vs Frequency

Test Circuits

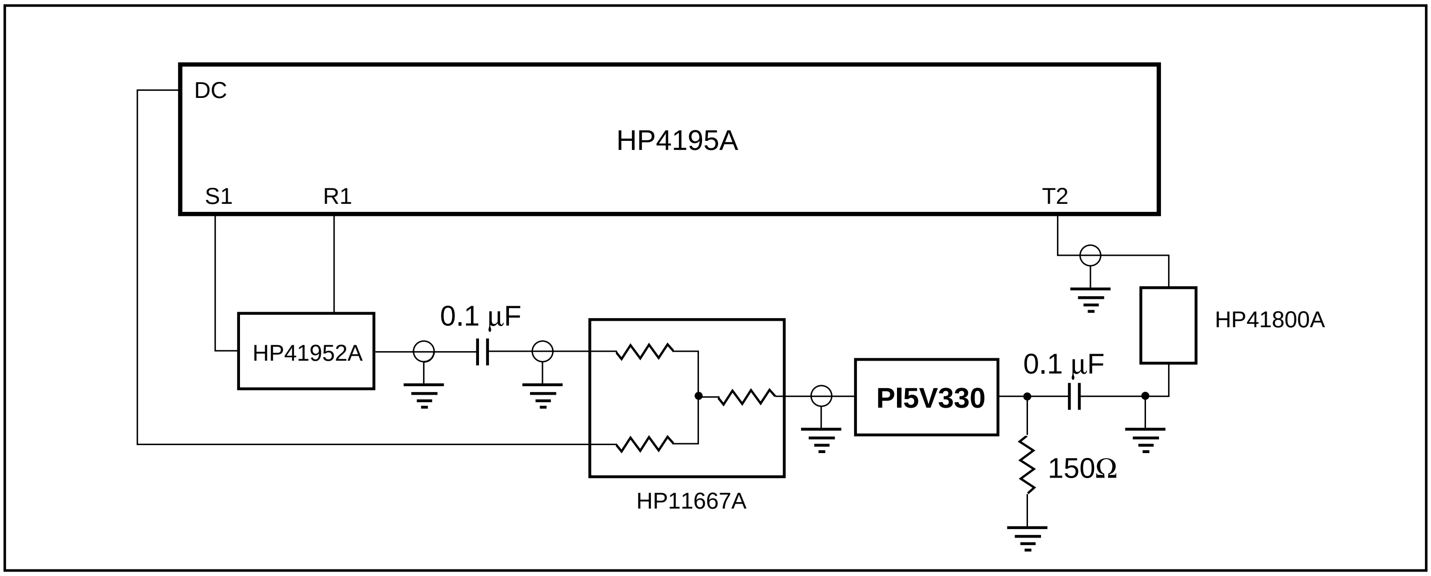


Figure 5. Differential Gain/Phase

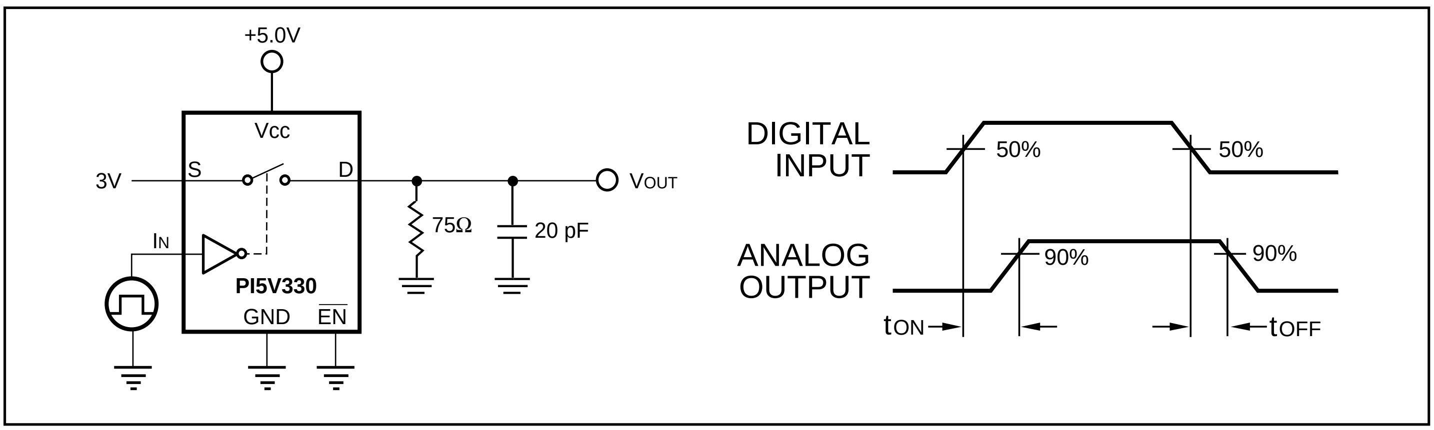


Figure 6. Switching Time

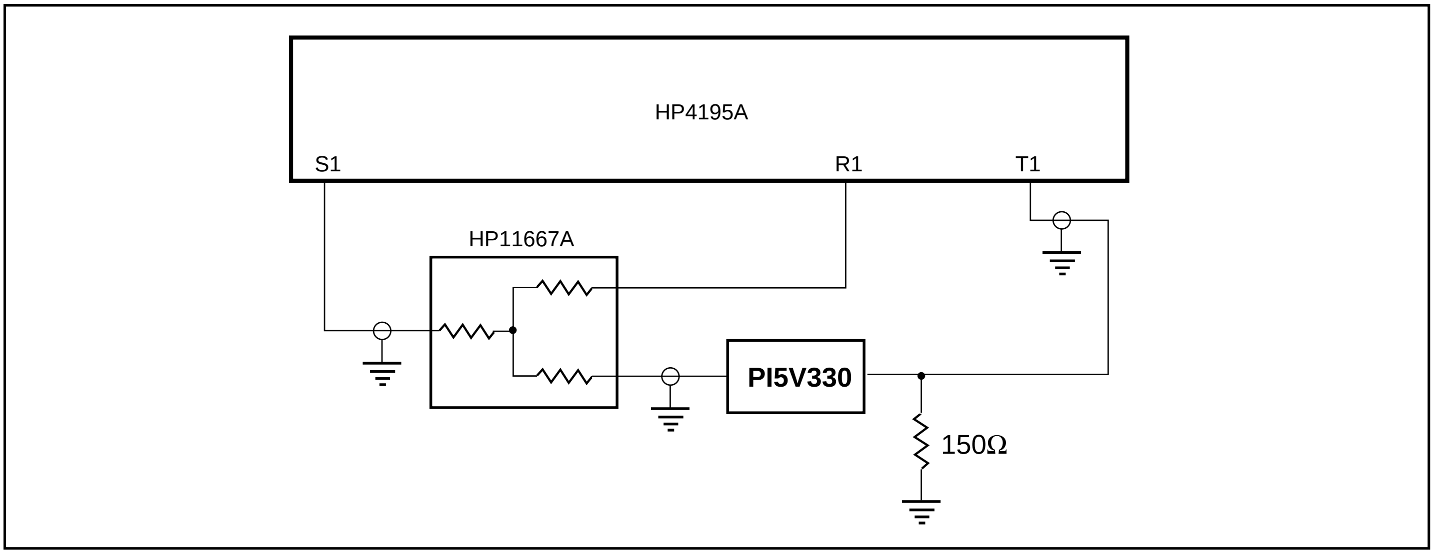


Figure 7. Gain/Phase, Crosstalk, Off-Isolation