SOTINY™ Low Voltage Dual SPDT Analog Switch
2:1 Mux/DeMux Bus Switch

Features

- CMOS Technology for Bus and Analog Applications
- Low On-Resistance: 8Ω at 3.0V
- Wide V_{CC} Range: 1.65V to 5.5V
- Rail-to-Rail Signal Range
- Control Input Overvoltage Tolerance: 5.5V min.
- Fast Transition Speed: 5.2ns max. at 5V
- High Off Isolation: 57dB at 10MHz
- 54dB (10MHz) Crosstalk Rejection Reduces Signal Distortion
- Break-Before-Make Switching
- High Bandwidth: 250 MHz
- Extended Industrial Temperature Range: –40°C to 85°C
- Packaging (Pb-free & Green available):
  -12-contact TDFN (ZA)

Applications

- Cell Phones
- PDAs
- Portable Instrumentation
- Battery Powered Communications
- Computer Peripherals

Pin Description

Pin Number	Name	Description
8, 11	$_1B_X$	Data port (Normally Open)
3, 6	GND	Ground
2, 5	$_0B_X$	Data port (Normally Closed)
1, 4	A_X	Common Output/data port
9, 12	V_{CC}	Positive Power Supple
7, 10	S_X	Logic Controll

Notes:
1. x = 0 or 1

Logic Function Table

Logic Input(s)	Function
0	$_0B_X$ Connection to A_X
1	$_1B_X$ Connected to A_X

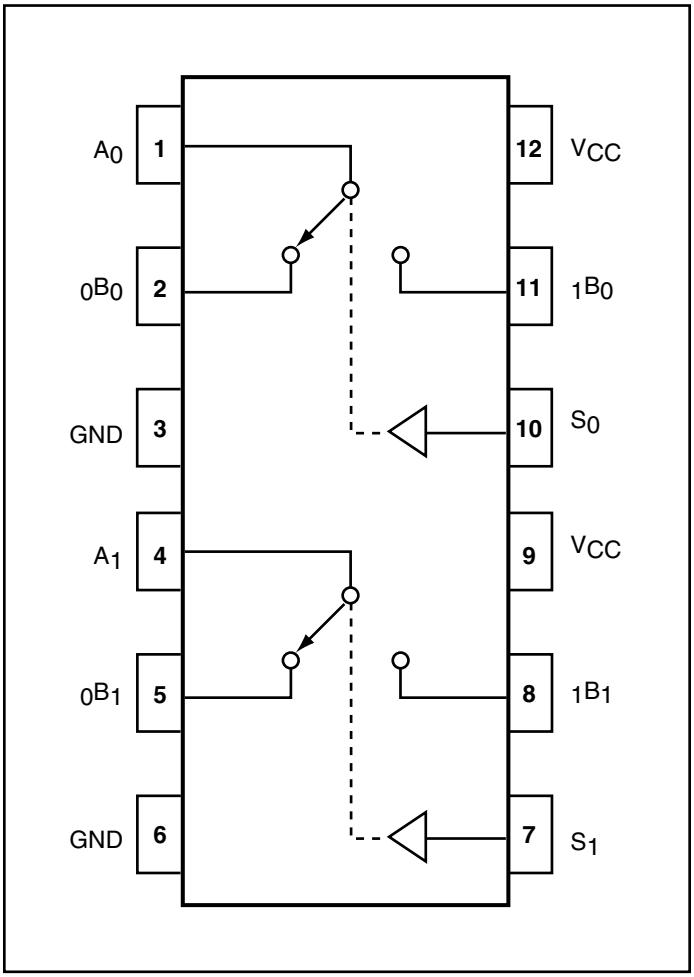
Description

The PI5A3158 is a dual high-bandwidth, fast single-pole double-throw (SPDT) CMOS switch. It can be used as an analog switch or as a low-delay bus switch. Specified over a wide operating power supply voltage range, 1.65V to 5.5V, the PI5A3158 has a maximum On-Resistance of 12Ω at 1.65V, 9Ω at 2.3V & 6Ω at 4.5V.

Break-before-make switching prevents both switches being enabled simultaneously. This eliminates signal disruption during switching.

The control input, S, tolerates input drive signals up to 5.5V, independent of supply voltage.

Connection Diagram



Absolute Maximum Ratings(1)

Supply Voltage V_{CC} ..... –0.5V to +7V
DC Switch Voltage (V_S)(2) ..... –0.5V to V_{CC} +0.5V
DC Input Voltage (V_{IN})(2) ..... –0.5V to +7.0V
DC Output Current (V_{OUT}) 128mA
DC V_{CC} or Ground Current (I_{CC}/I_{GND}) ..... ±100mA
Storage Temperature Range (T_{STG}) ..... –65°C to +150°C
Junction Temperature under Bias (T_J) ..... 150°C
Junction Lead Temperature (T_L)
(Soldering, 10 seconds) ..... 260°C
Power Dissipation (P_D) @ +85°C 180mW

Recommended Operating Conditions(3)

Supply Voltage Operating (V_{CC}) . . . . . 1.65V to 5.5V
Control Input Voltage (V_{IN}) . . . . . 0V to V_{CC}
Switch Input Voltage (V_{IN}) . . . . . 0V to V_{CC}
Output Voltage (V_{OUT}) . . . . . 0V to V_{CC}
Operating Temperature (T_A) . . . . . –40°C to +85°C
Input Rise and Fall Time (t_r,t_f)
Control Input V_{CC} = 2.3V - 3.6V. . . . . 0ns/V to 10ns/V
Control Input V_{CC} = 4.5V - 5.5V. . . . . 0ns/V to 5ns/V
Thermal Resistance (θ_{JA}) . . . . . 350°C/W

Notes:

1. Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied.
2. The input and output negative voltage ratings may be exceeded if the inut and output diode current ratings are observed.
3. . . . . Control input must be held HIGH or LOW; it must not float.

DC Electrical Characteristics (Over the Operating temperature range, T_A = –40°C to 85°C)

Parameters	Description	Test Conditions	Supply Voltage	Temp	Min.	Typ.	Max.	Units
V_{IAR}	Analog Input Signal Range		V_{CC}	T_A = 25ºC & -40ºC to 85ºC	0		V_{CC}	V
R_{ON}	On-Resistance (4)	I_O = 30mA, V_{IN} = 0V	4.5V	T_A = 25ºC		4	6	Ω
		I_O = -30mA, V_{IN} = 2.4V				5	8	
		I_O = -30mA, V_{IN} = 4.5V				8	13	
R_{ON}		I_O = 30mA, V_{IN} = 0V	4.5V	T_A = -40ºC to 85ºC			6	
		I_O = -30mA, V_{IN} = 2.4V					8	
		I_O = -30mA, V_{IN} = 4.5V					13	
R_{ON}		I_O = 24mA, V_{IN} = 0V	3.0V	T_A = 25ºC		5	8	
		I_O = -24mA, V_{IN} = 3.0V				12	19	
R_{ON}		I_O = 24mA, V_{IN} = 0V	3.0V	T_A = -40ºC to 85ºC			8	
		I_O = -24mA, V_{IN} = 3.0V					19	
R_{ON}		I_O = 24mA, V_{IN} = 0V	2.3V	T_A = 25ºC		6	9	
		I_O = -24mA, V_{IN} = 2.3V				16	24	
R_{ON}		I_O = 24mA, V_{IN} = 0V	2.3V	T_A = -40ºC to 85ºC			9	
		I_O = -24mA, V_{IN} = 2.4V					24	
R_{ON}		I_O = 24mA, V_{IN} = 0V	1.65V	T_A = 25ºC		8	12	
		I_O = -24mA, V_{IN} = 1.65V				27	39	
R_{ON}		I_O = 24mA, V_{IN} = 0V	1.65V	T_A = -40ºC to 85ºC			12	
		I_O = -24mA, V_{IN} = 1.65V					39	

DC Electrical Characteristics (Over the Operating temperature range, T_A = –40°C to 85°C) (continued)

Parameters	Description	Test Conditions	Supply Voltage	Temp	Min.	Typ.	Max.	Units
ΔR_{ON}	On-Resistance Match Between Channels(4, 5, 6)	I_A = -30mA, V_{BN} = 3.15V	4.5V	T_A = 25ºC		0.15		Ω
		I_A = -24mA, V_{BN} = 2.1V	3.0V			0.2		
		I_A = -8mA, V_{BN} = 1.6V	2.3V			0.3		
		I_A = -4mA, V_{BN} = 1.15V	1.65V			0.3		
R_{ONF}	On-Resistance Flatness(4, 5, 7)	I_A = -30mA, 0 ≤ V_{BN} ≤ V_{CC}	5.0V	T_A = 25ºC		6		
		I_A = -24mA, 0 ≤ V_{BN} ≤ V_{CC}	3.3V			12		
		I_A = -8mA, 0 ≤ V_{BN} ≤ V_{CC}	2.5V			22		
		I_A = -4mA, 0 ≤ V_{BN} ≤ V_{CC}	1.8V			90		
V_{IH}	Input High Voltage	Logic High Level	V_{CC} = 1.65V to 1.95V	T_A = -40ºC to 85ºC	0.75 V_{CC}			V
			V_{CC} = 2.3V to 5.5V		0.7 V_{CC}			
V_{IL}	Input Low Voltage	Logic LowLevel	V_{CC} = 1.65V to 1.95V					
			V_{CC} = 2.3V to 5.5V					
	Input Leakage Curent	0 ≤ V_{IN} ≤ 5.5V	V_{CC} ≤ 0V ≤ 5.5V	T_A = 25ºC			±0.1	µA
				T_A = -40ºC to 85ºC			±1.0	
I_{OFF}	OFF State Leakage Current	0 ≤ V_{IN} ≤ 5.5V	V_{CC} ≤ 1.65V ≤ 5.5V	T_A = 25ºC			±0.1	
				T_A = -40ºC to 85ºC			±10	
I_{CC}	Quiescent Supply Current	All Channels ON or OFF, V_{IN} = V_{CC} or GND, I_{OUT} = 0	V_{CC} = 5.5V	T_A = 25ºC			2	
				T_A = -40ºC to 85ºC			20	

Notes:

4. Measured by voltage drop between A and B pins at the indicated current through the device. On-Resistance is determined by the lower of the voltages on two ports (A or B).
5. Parameter is characterized but not tested in production.
6. ΔR_{ON} = R_{ON} max – R_{ON} min. measured at identical V_{CC}, temperature and voltage levels.
7. Flatness is defined as difference between maximum and minimum value of On-Resistance over the specified range of conditions.
8. Guaranteed by design.

Capacitance(12)

Parameters	Description	Test Conditions	Supply Voltage	Temp	Min.	Typ.	Max.	Units
C_{IN}	Controll Input	f = 1 MHz(12)	V_{CC} = 5.0V	T_A = 25ºC		2.3		pF
C_{IO-B}	For B Port, Switch OFF					6.5		
C_{IOA-ON}	For A Port, Switch ON					18.5		

Switch and AC Characteristics

Parameters	Description	Test Conditions	Supply Voltage	Temp	Min.	Typ.	Max.	Units
t_{PLH} t_{PHL}	Propagation Delay: A to Bn	See test circut diagram 1 and 2 V_I Open(10)	V_{CC} = 2.3V to 2.7V	T_A = 25ºC & -40ºC to 85ºC		1.2		
			V_{CC} = 3.0V to 3.6V			0.8		
			V_{CC} = 4.5V to 5.5V			0.3		
t_{PZL} t_{PZH}	Output Enable Turn ON Time: A to Bn	See test circut diagram 1 and 2 V_I = 2 V_{CC} for t_{PZL}, V_I = 0V for t_{PZH}	V_{CC} = 1.65V to 1.95V	T_A = 25ºC	7		23	
			V_{CC} = 2.3V to 2.7V		3.5		13	
			V_{CC} = 3.0V to 3.6V		2.5		6.9	
			V_{CC} = 4.5V to 5.5V		1.7		5.2	
t_{PZL} t_{PZH}	Output Enable Turn ON Time: A to Bn	See test circut diagram 1 and 2 V_I = 2 V_{CC} for t_{PZL}, V_I = 0V for t_{PZH}	V_{CC} = 2.5V	T_A = 25ºC & -40ºC to 85ºC			24	
			V_{CC} = 3.3V				14	
			V_{CC} = 3.0V to 3.6V				7.6	
			V_{CC} = 4.5V to 5.5V				5.7	
t_{PLZ} t_{PHZ}	Output Disable-Turn OFF Time: A to Bn	See test circut diagram 1 and 2 V_I = 2 V_{CC} for t_{PZL}, V_I = 0V for t_{PZH}	V_{CC} = 1.65V to 1.95V	T_A = 25ºC	3		12.5	
			V_{CC} = 2.3V to 2.7V		2		7	
			V_{CC} = 3.0V to 3.6V		1.5		5	
			V_{CC} = 4.5V to 5.5V		0.8		3.5	
t_{PLZ} t_{PHZ}	Output Disable-Turn OFF Time: A to Bn	See test circut diagram 1 and 2 V_I = 2 V_{CC} for t_{PZL}, V_I = 0V for t_{PZH}	V_{CC} = 2.5V	T_A = 25ºC & -40ºC to 85ºC			13	
			V_{CC} = 3.3V				7.5	
			V_{CC} = 3.0V to 3.6V				5.3	
			V_{CC} = 4.5V to 5.5V				3.8	
t_{BM}	Break Before Make Time	See Test Circut diagram 9.(9)	V_{CC} = 2.5V	T_A = 25ºC & -40ºC to 85ºC	0.5			
			V_{CC} = 3.3V		0.5			
			V_{CC} = 3.0V to 3.6V		0.5			
			V_{CC} = 4.5V to 5.5V		0.5			
Q	Charge Injection	C_L = 0.1nF, V_{GEN} = 0V, R_{GEN} = 0Ω, See test circut 4	V_{CC} = 5.0V	T_A = 25ºC		7		pC
			V_{CC} = 3.3V			3		
O_{IRR}	Off Isolation	R_L = 50Ω, V_{GEN} = 0V, R_{GEN} = 0Ω, See test circut 5(11)	V_{CC} = 1.65V to 5.5V	T_A = 25ºC		-57		dB
X_{TALK}	Crosstalk Isolation	See test circut 6	V_{CC} = 1.65V to 5.5V	T_A = 25ºC		-54		
f_{3dB}	-3dB Bandwidth	See test circut 9	V_{CC} = 1.65V to 5.5V	T_A = 25ºC		250		MHz

Notes:

9. Guaranteed by design.
10. Guaranteed by design but not production tested. The device contributes no other propagation delay other than the RC delay of the switch On-Resistance and the 50pF load capacitance, whne driven by an ideal voltage source with zero output impedance.
11. Off Isolation = 20 Log_{10} [V_A / V_{Bn}] and is measured in dB.
12. T_A = 25°C, f = 1MHz. Capacitance is characterized but not tested in production.

Test Circuits and Timing Diagrams

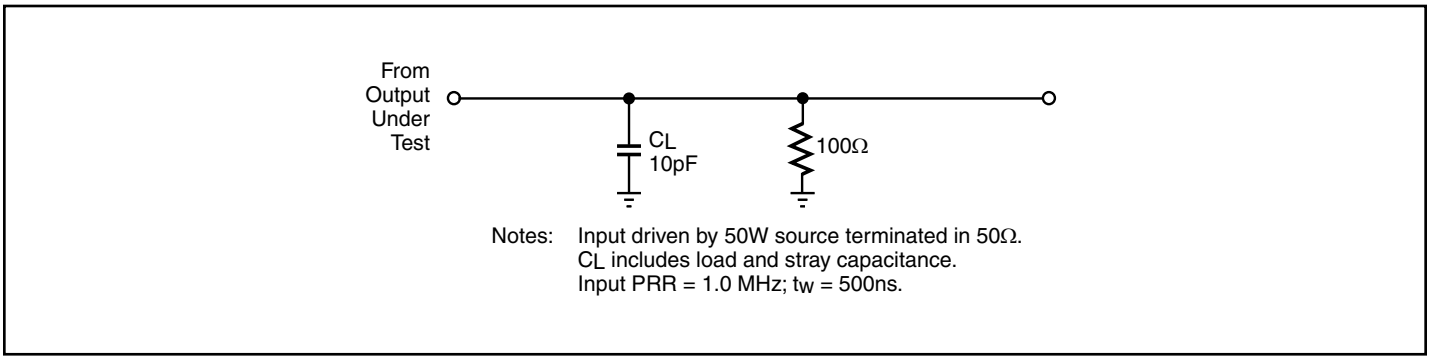


Figure 1. AC Test Circuit

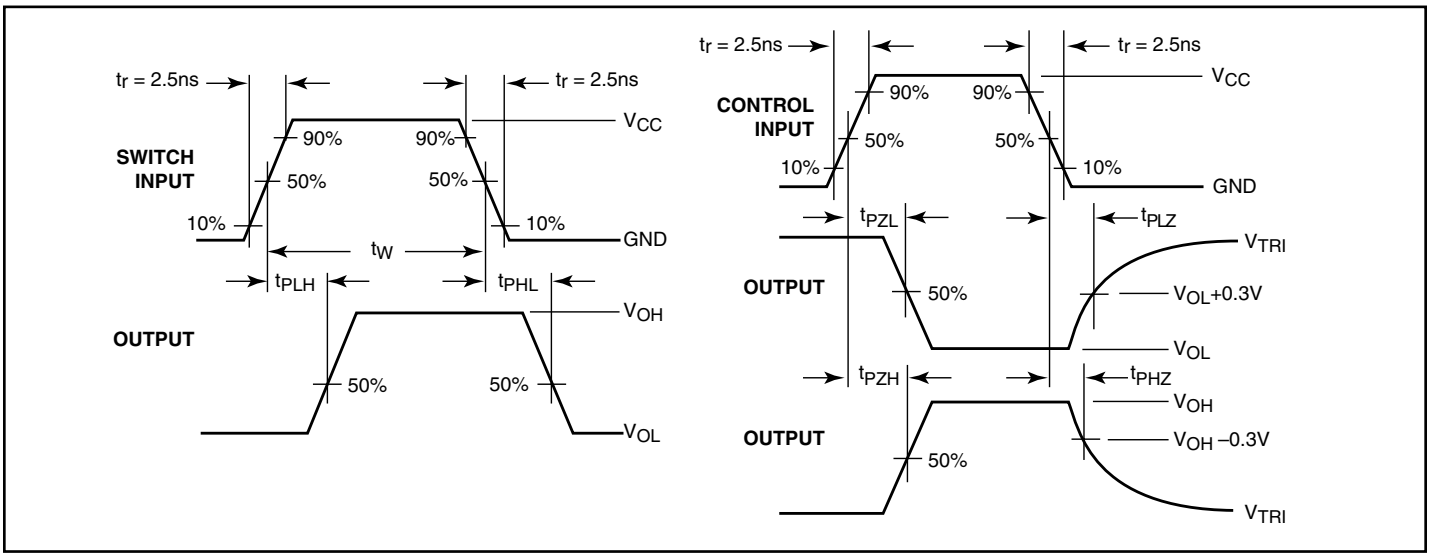


Figure 2. AC Waveforms

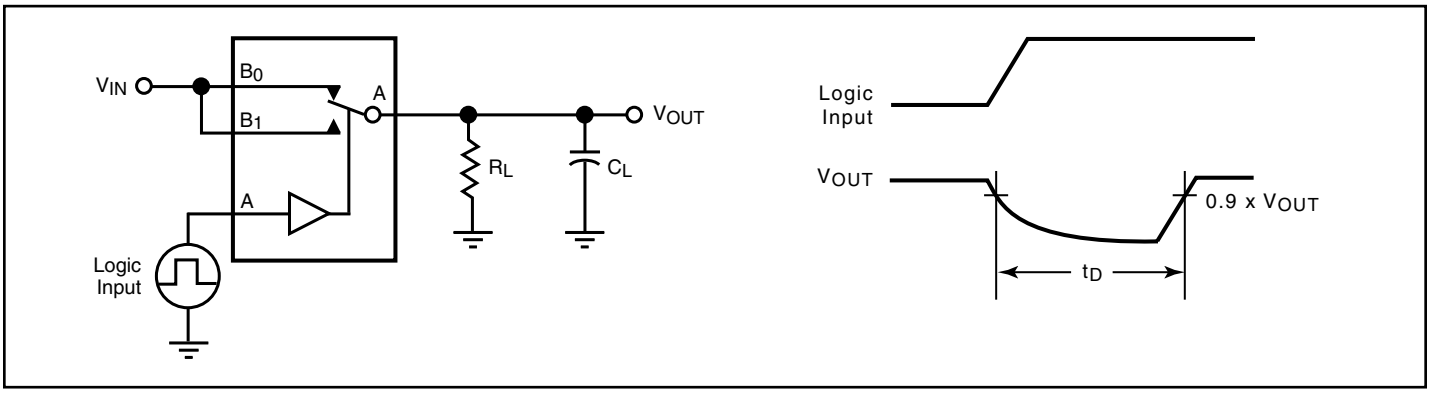


Figure 3. Break Before Make Interval Timing

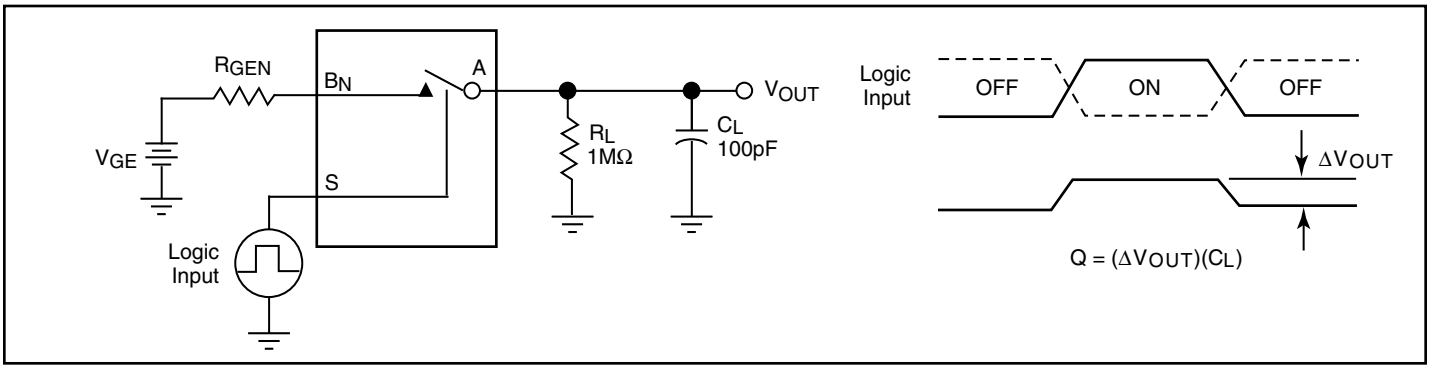


Figure 4. Charge Injection Test

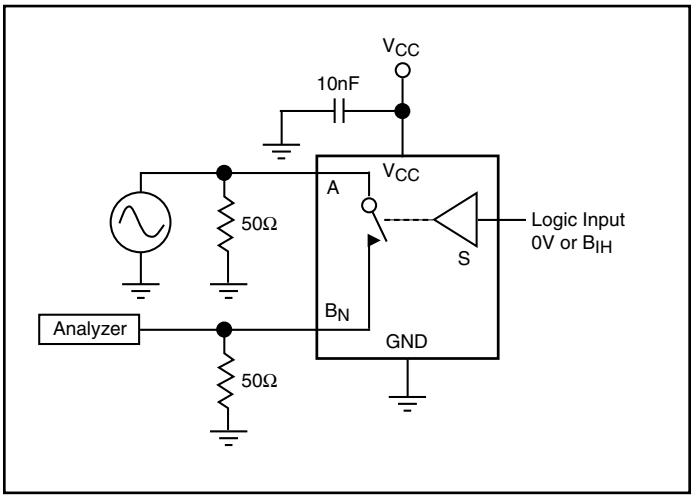


Figure 5. Off Isolation

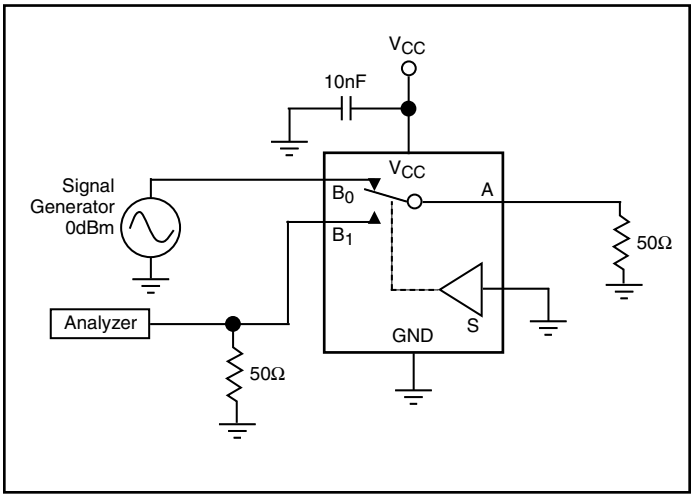


Figure 6. Crosstalk

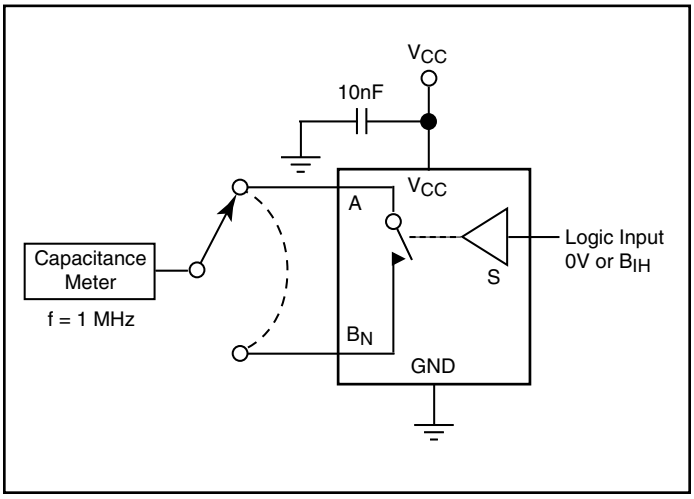


Figure 7. Channel Off Capacitance

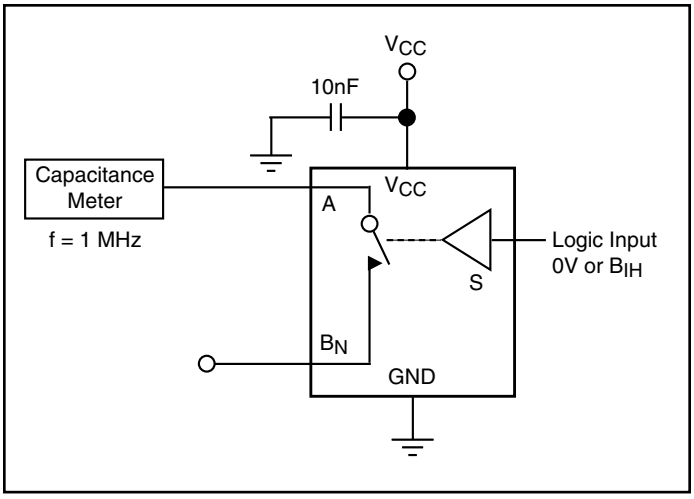


Figure 8. Channel On Capacitance

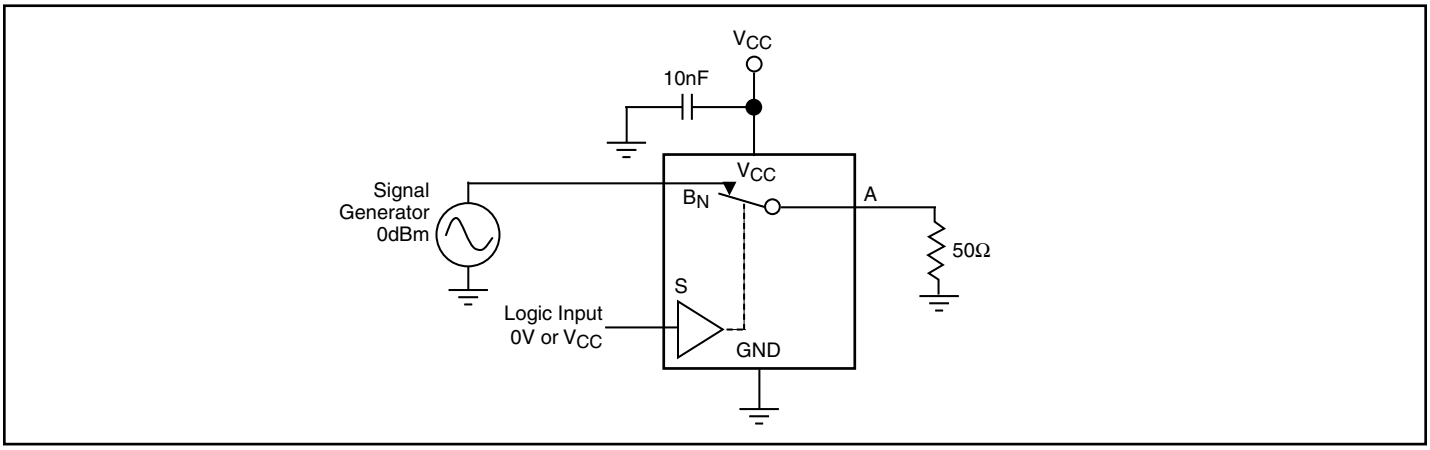
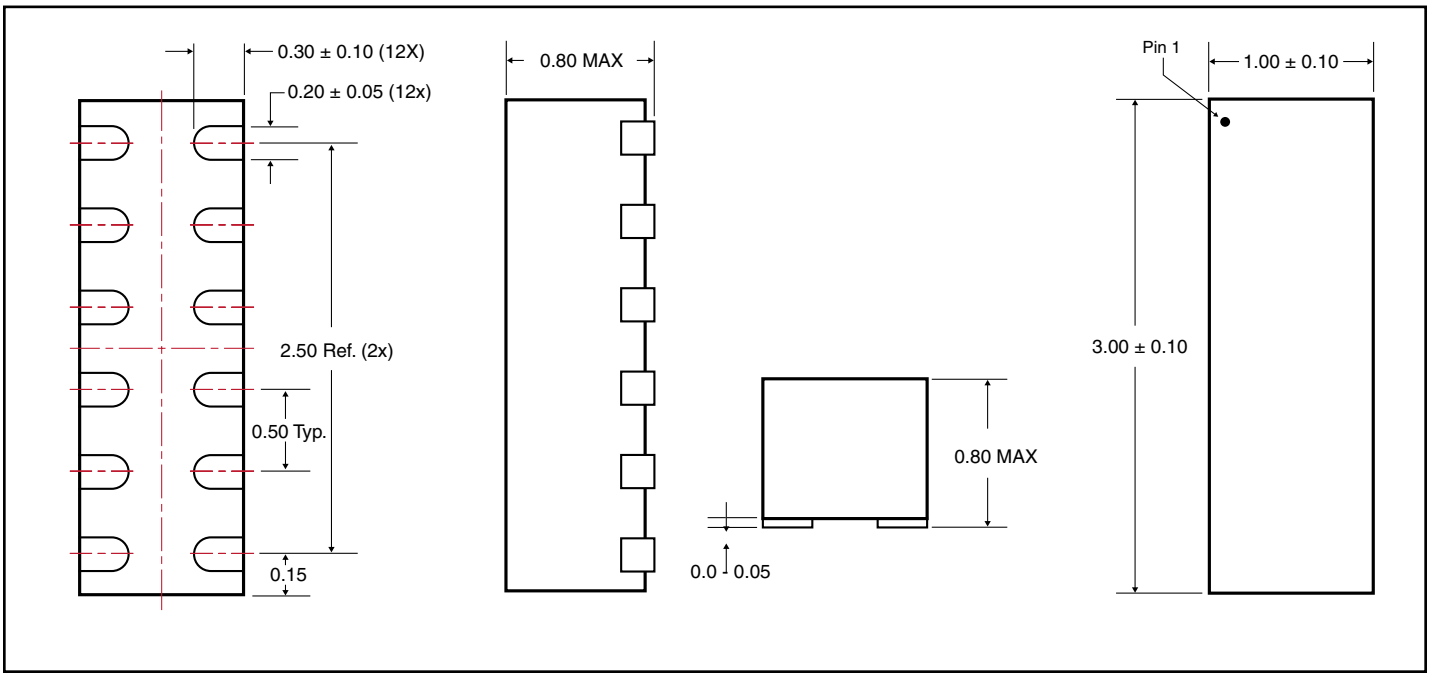


Figure 9. Bandwidth

Packaging Mechanical : 12-contact TDFN (ZA)



Ordering Information

Ordering Code	Packaging Code	Package Type
PI5A3158ZA(1)	ZA	12-contact TDFN
PI5A3158ZAE	ZA	Pb-free & Green, 12-contact TDFN

Notes:
1. This product has always shipped as only a lead free product, but since it was introduced prior to Pericom's strategy of adding an E to all Green/ Lead free parts many customers order it without the E suffix. Please migrate new designs and qualification to include the E suffix. Pericom at this point in time will continue to offer devices marked both ways, but may at a later date eliminate the non-E part number.
2. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/