

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

Features

- CMOS Technology for Bus and Analog Applications
- Low ON Resistance: 0.8-ohm at $V_{DD} = 4.5V$
- Wide V_{DD} Range: 1.65V to 5.5V
- Rail-to-Rail Signal Range
- Control Input Over voltage Tolerance: 5.5V min.
- Fast Transition Speed: 5.2ns max. at 5V
- High Off Isolation: -62dB at 1MHz
- -70dB (1MHz) Crosstalk Rejection Reduces Signal Distortion
- Break-Before-Make Switching
- High Bandwidth: 55 MHz
- Extended Industrial Temperature Range: $-40^{\circ}C$ to $85^{\circ}C$
- Improved Direct Replacement for NLAS5123
- Packaging (Pb-free & Green available):
 - 6-pin TDFN (1.2mm x 1.0mm)

Applications

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

Pin Description

Name	Description
NC, NO, COM	Data Ports
IN	Control Input

Truth Table

Control Input	Function
L	NC Connected to COM
H	NO Connected to COM

H = HIGH Logic Level.

L = LOW Logic Level.

Description

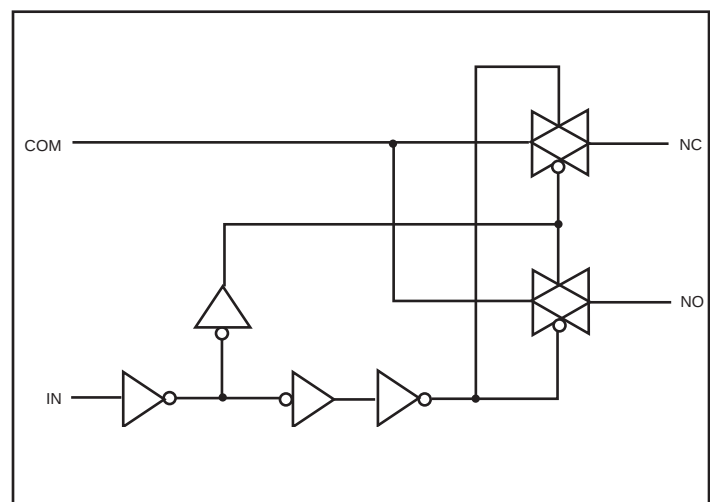
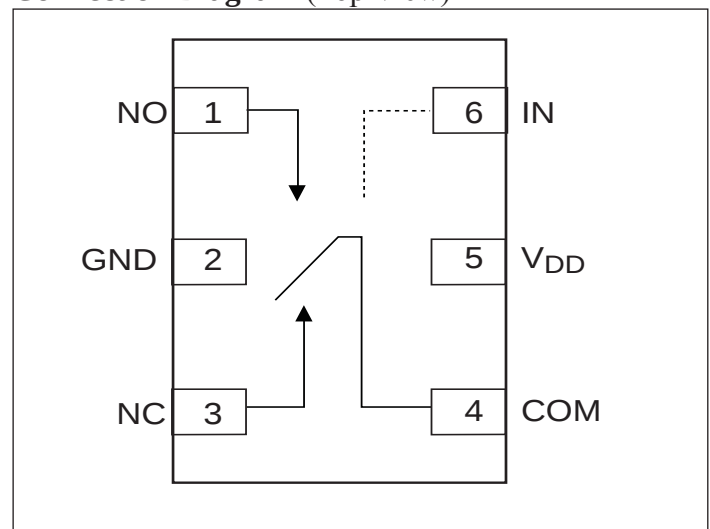
The PI5A123 is a low R_{ON} , fast single-pole double-throw (SPDT) CMOS switch. It can be used as an analog switch or as a low-delay bus switch. Specified over a wide operating power supply voltage range, 1.65V to 5.5V, the PI5A123 has a maximum ON resistance of 2-Ohms.

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

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

PI5A123 is an improved direct replacement for the NLAS5123.

Connection Diagram (Top View)



Absolute Maximum Ratings⁽¹⁾

Supply Voltage V_{DD}	-0.5V to +7V
DC Switch Voltage (V_S) ⁽²⁾	-0.5V to V_{DD} +0.5V
DC Input Voltage (V_{IN}) ⁽²⁾	-0.5V to +7.0V
DC Output Current (V_{OUT}).....	128mA
Continuous DC current from COM to NC/NO.....	+/-300mA
Peak Current from COM to NC/NO, 10 duty cycles.....	+/-500mA
Continuous DC current into COM/NC/NO with respect to V_{DD} or GND +/-100mA	
Storage Temperature Range (T_{STG}).....	-65°C to +150°C
Junction Temperature Range (T_J).....	150°C
Junction Lead Temperature (T_L) (Soldering, 10 seconds).....	260°C
Power Dissipation (P_D) @ +85°C.....	180mW

Absolute Maximum Ratings⁽³⁾

Supply Voltage Range (V_{DD}).....	1.65V to 5.5V
Control Input Voltage (V_{IN}).....	0V to V_{DD}
Switch Input Voltage (V_{IN}).....	0V to V_{DD}
Output Voltage (V_{OUT}).....	0V to V_{DD}
Operating Temperature (T_A).....	-40°C to +85°C
Input Rise and Fall Time (t_r , t_f) Control Input V_{DD} = 2.3V - 3.6V.....	0ns/V to 10ns/V
Control Input V_{DD} = 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 input and output diode current ratings are observed.
3. Control input must be held HIGH or LOW; it must not float.

DC Electrical Characteristics

Symbol	Parameter	Test Conditions	VDD (V)	$T_A = +25^\circ\text{C}$			$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$		Unit
				Min	Typ	Max	Min	Max	
V_{IH}	HIGH Level Input Voltage		2.7 4.5				1.4 1.5		V
V_{IL}	LOW Level Input Voltage		2.7 4.5					0.6 0.8	
I_{IN}	Input Leakage Current	$0 \leq V_{IN} \leq 5.5V$	0~5.5			± 0.1		± 1	μA
I_{OFF}	OFF State Leakage Current ⁽⁵⁾	$0 \leq \text{NO, NC, COM} \leq V_{DD}$	5.5	-2.0		+2.0		± 20	nA
I_{ON}	ON State Leakage Current ⁽⁵⁾	$0 \leq \text{NO, NC, COM} \leq V_{DD}$	5.5	-4.0		+4.0		± 40	
R_{ON}	Switch On Resistance ⁽²⁾	$I_O = 100 \text{ mA}$, $V_{IS} = 0V$ to V_{DD}	2.7			1.5		2.0	Ohm
		$I_O = 100 \text{ mA}$, $V_{IS} = 0V$ to V_{DD}	4.5			0.8		1.2	
I_{DD}	Quiescent Supply Current All Channels ON or OFF	$V_{IN} = V_{DD}$ or GND, or 2V or 1.5V, $I_{OUT} = 0$	5.5			20		30	μA
ΔR_{ON}	On Resistance Match Between Channels ^(2, 3, 4)	$I_A = 100 \text{ mA}$, $V_{IS} = 1.5 \text{ V}$	2.7		0.15				Ohm
		$I_A = 100 \text{ mA}$, $V_{IS} = 2.5 \text{ V}$	4.5		0.12			0.15	

Symbol	Parameter	Test Conditions	VDD (V)	T _A = +25°C			T _A = – 40°C to +85°C		Unit
				Min	Typ	Max	Min	Max	
R _{flat}	On Resistance Flatness (2, 3, 5)	I _A = 100 mA, V _{IS} = 0 V to V _{DD}	2.7		0.1				Ohm
		I _A = 100 mA, V _{IS} = 0 V to V _{DD}	4.5		0.3			0.4	

Notes:

- Measured by the voltage drop between NC/NO and COM pins as the indicated current through the switch. On Resistance is determined by the lower of the voltages on the two (NO, NC, COM).
- Parameter is characterized but not tested in production.
- $\Delta R_{ON} = R_{ON \text{ max}} - R_{ON \text{ min}}$ measured at identical V_{DD}, temperature and voltage levels.
- Flatness is defined as the difference between the maximum and minimum value of On Resistance over the specified range of conditions.
- Guaranteed by design
- The parameter is guaranteed by design but not tested.

Capacitance

Symbol	Parameter	Test Conditions	Typ.	Max	Unit
C _{IN}	IN Pin Input Capacitance	V _{DD} = 0V, f = 1 MHz	2.0		pF
C _{NC/NO}	NC, NO Port Off Capacitance	V _{DD} = 4.5V, f = 1 MHz	20		
C _{COM}	COM Port Capacitance when Switch is Enabled	V _{DD} = 4.5V, f = 1 MHz	55		

Note:

- T_A = +25°C, f = 1 MHz, Capacitance is characterized but not tested in production.

AC Electrical Characteristics

Symbol	Parameter	Test Conditions	VDD (V)	T _A = +25°C			T _A = – 40°C to +85°C		Unit
				Min	Typ	Max	Min	Max	
t _{PHL} t _{PLH}	Propagation Delay Bus-to-bus ⁽²⁾	V _{IN} = V _{IH} or V _{IL}	2.7 4.5			2.0 0.3			ns
t _{ON}	Output Enable Time Turn On Time (COM to NO, NC)	V _{IS} = 1.5 V, R _L = 50-Ohm, C _L = 35pF	2.7			35		50	
		V _{IS} = 3.0 V, R _L = 50-Ohm, C _L = 35pF	4.5			30		45	
t _{OFF}	Output Enable Time Turn On Time (COM to NO, NC)	V _{IS} = 1.5 V, R _L = 50-Ohm, C _L = 35pF	2.7			25		33	
		V _{IS} = 3.0 V, R _L = 50-Ohm, C _L = 35pF	4.5			20		30	
t _{BBM}	Break Before Make Time ⁽¹⁾	V _{IS} = 1.5 V, R _L = 50-Ohm, C _L = 35pF	2.7	0.5			40		
			4.5	0.5			30		
Q	Charge Injection ⁽¹⁾	C _L = 1.0 nF, V _{GEN} = 0 V, R _{GEN} = 0-Ohm	2.7 4.5		26 48				pC
O _{IRR}	Off Isolation ⁽³⁾	R _L = 50-Ohm, f = 1.0 MHz	2.7 – 5.5		–62				dB

Symbol	Parameter	Test Conditions	VDD (V)	T _A = +25°C			T _A = – 40°C to +85°C		Unit
				Min	Typ	Max	Min	Max	
X _{talk}	Crosstalk	R _L = 50-Ohm, f = 1.0 MHz	2.7 – 5.5		–70				dB
BW	–3 dB Bandwidth	R _L = 50-Ohm	2.7 – 5.5		55				MHz
THD	Total Harmonic Distortion ⁽¹⁾	R _L = 600-Ohm, 0.5V _{P-P} f = 20Hz to 20kHz	2.7 – 5.5		0.012				%

Notes:

1. Guaranteed by design
2. The parameter is guaranteed by design but not tested. The bus switch contributes no propagation delay other than the RC delay of the On Resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage source (zero output impedance).
3. Off Isolation = 20 log₁₀ [V_{COM}/V_{NO,NC}].

Test Circuits and Timing Diagrams

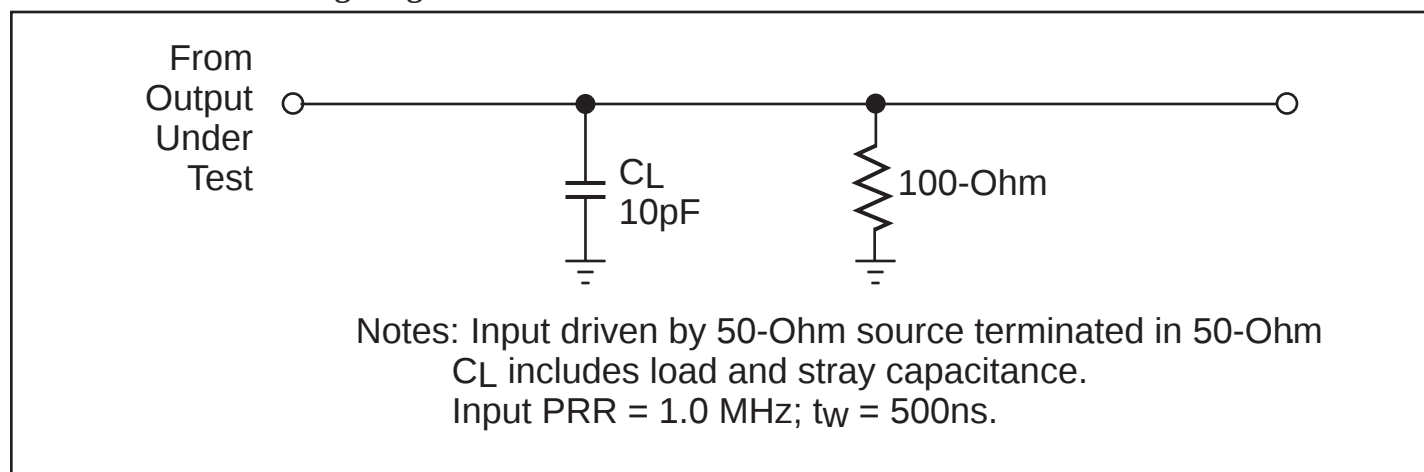


Figure 1. AC Test Circuit

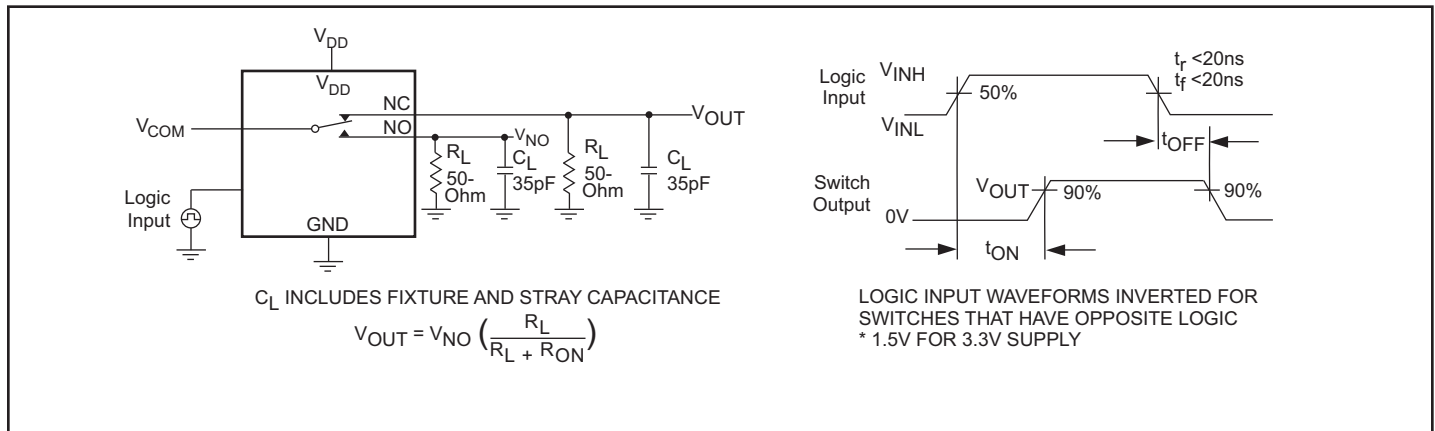


Figure 2. Switching Time

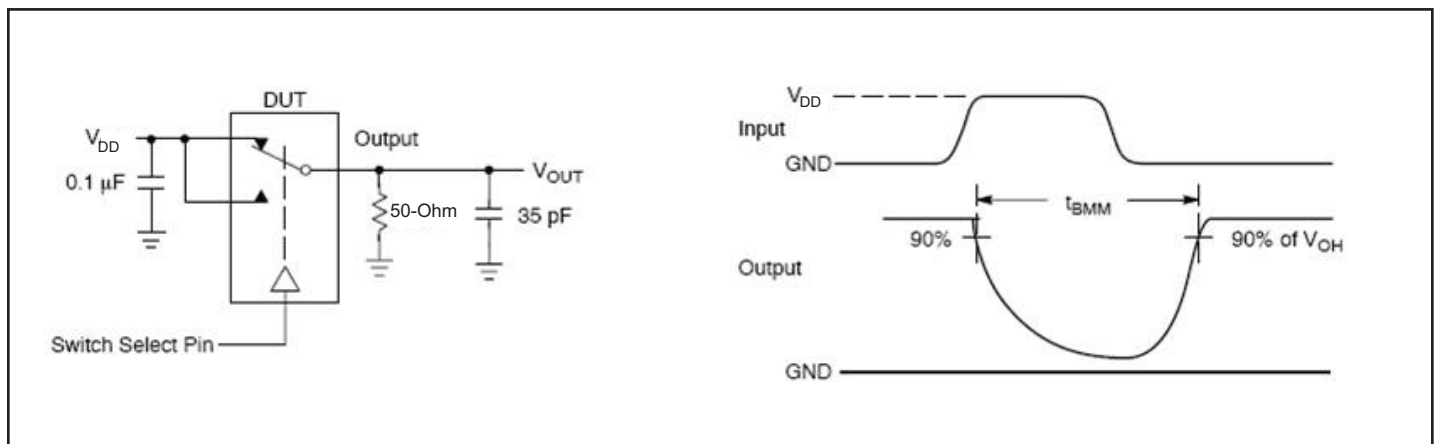


Figure 3. t_{BMM} (Time Break-Before-Make)

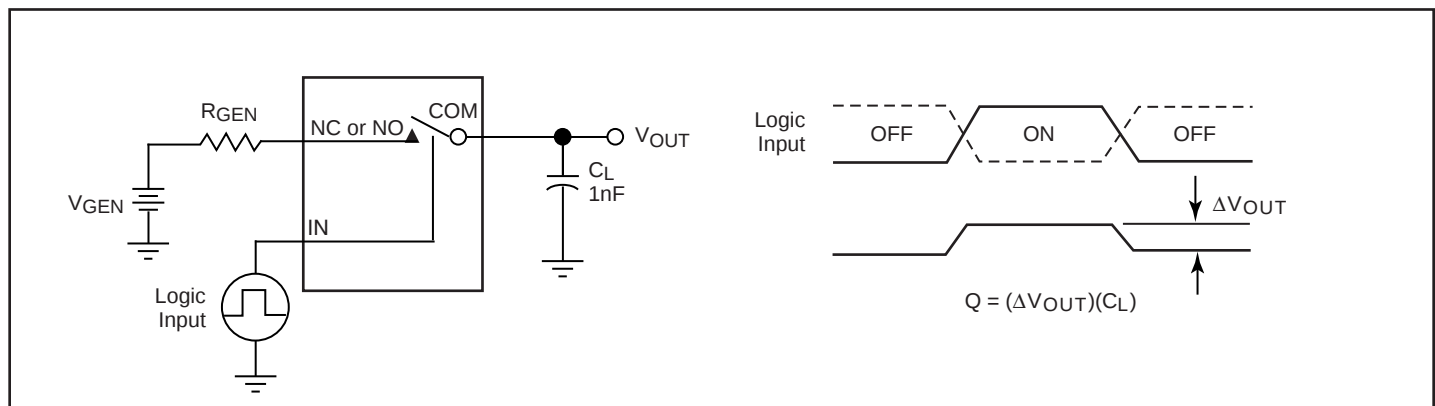


Figure 4. Charge Injection

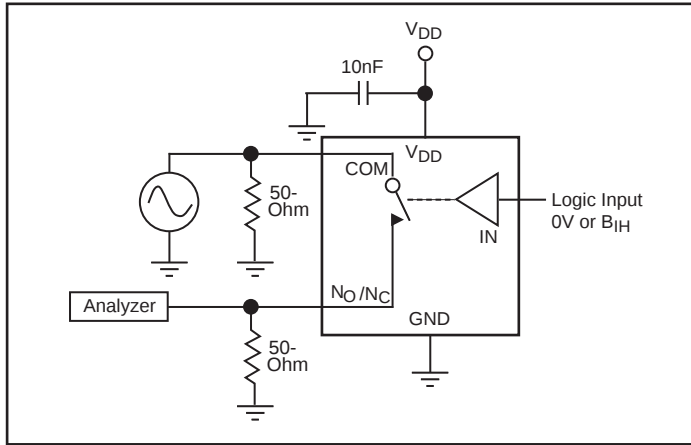


Figure 5. Off Isolation

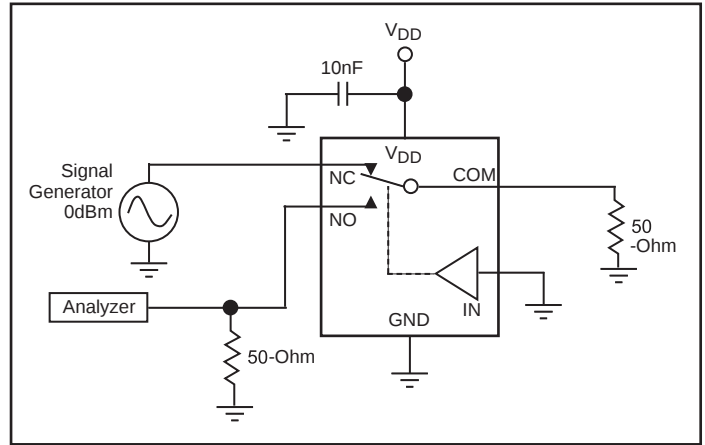


Figure 6. Crosstalk

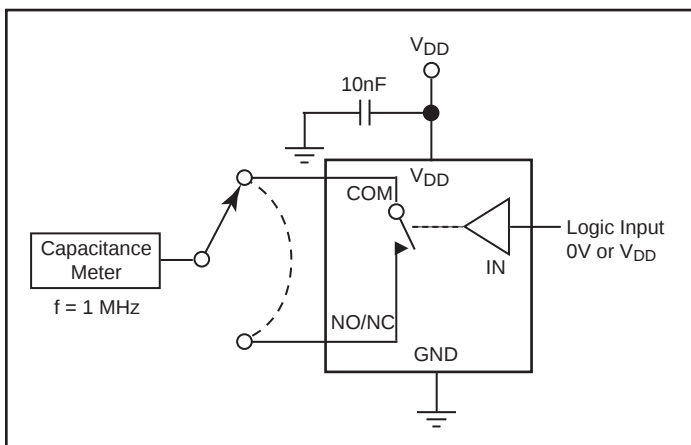


Figure 7. Channel OFF Capacitance

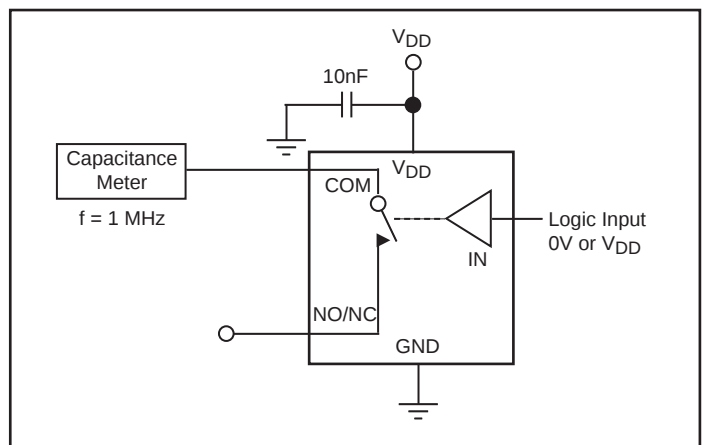


Figure 8. Channel ON Capacitance

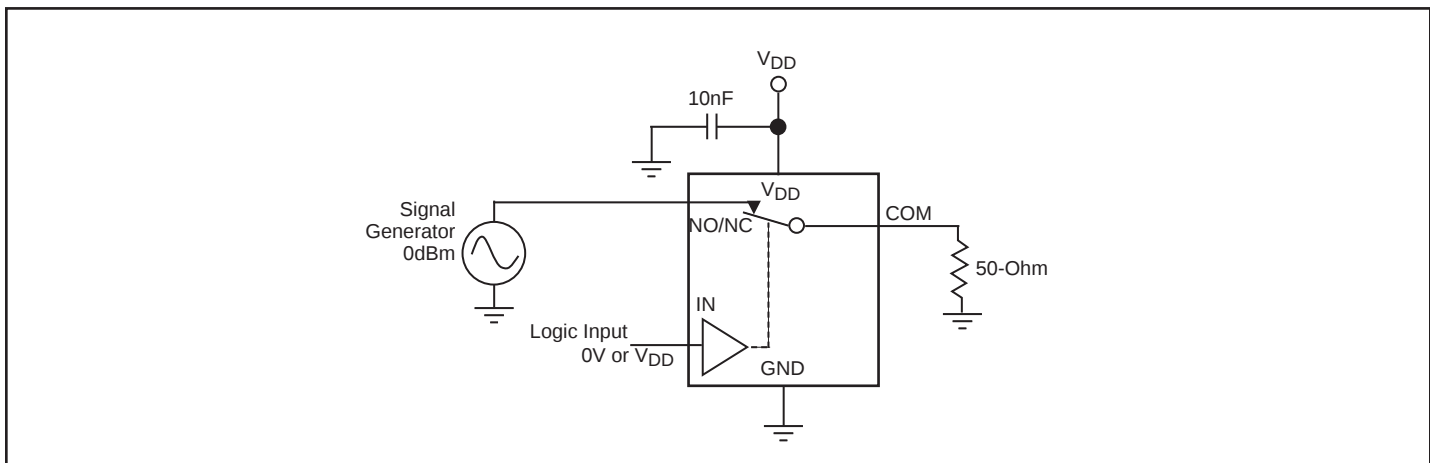
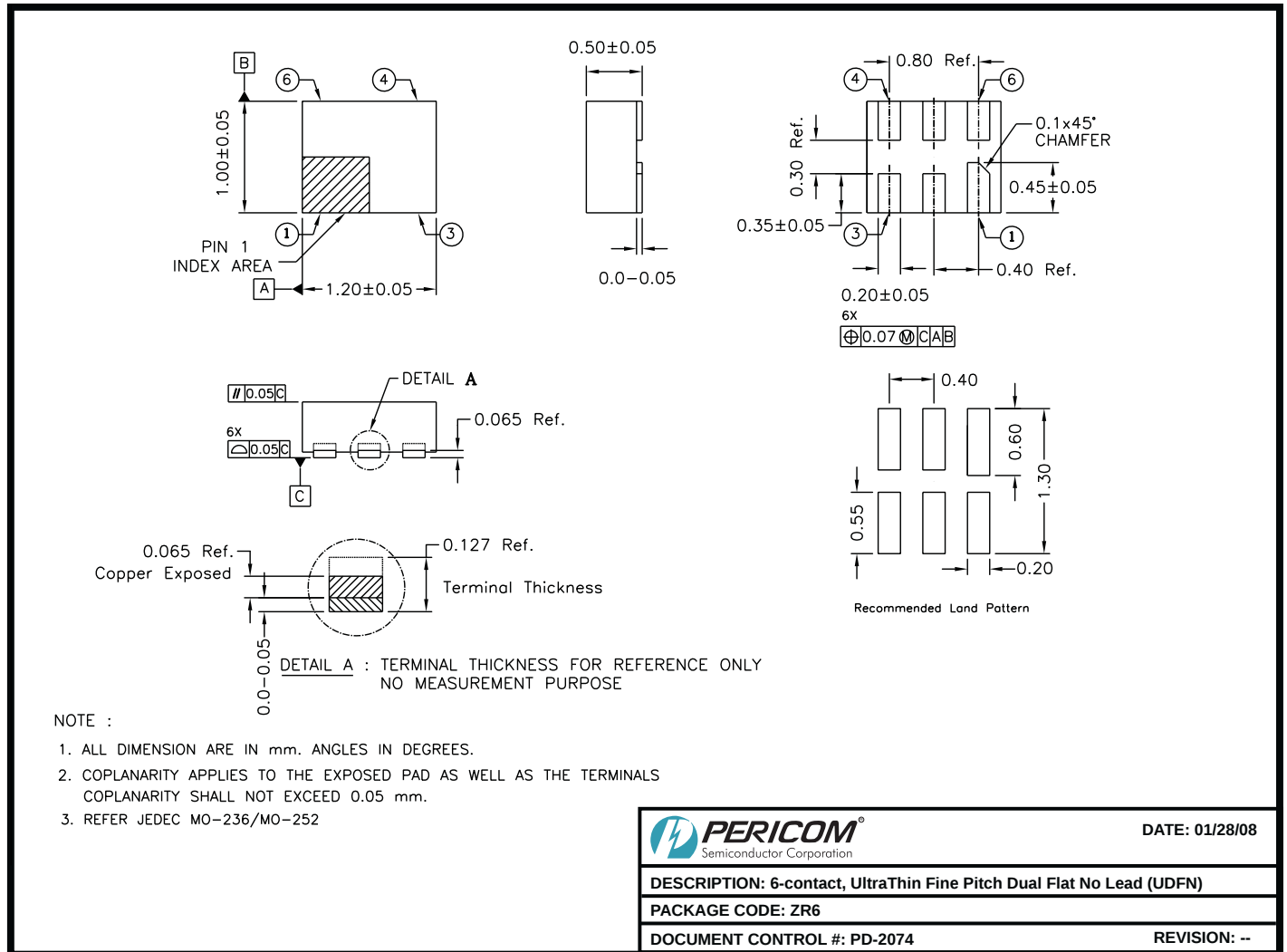


Figure 9. Bandwidth

Package Mechanical: 6-Pin TDFN



08-0035

Ordering Information⁽¹⁻³⁾

Ordering Code	Package Code	Package Description	Top Mark
PI5A123ZRE	ZR	6-pin TDFN, Pb-Free and Green	L

Notes:

1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
2. E = Pb-free and Green
3. Adding an X suffix = Tape/Reel