A product Line of
Diodes Incorporated

PI3A223

Small Plastic Package, Dual SPDT Analog Switch

Features

- CMOS Technology for Bus and Analog Applications
- Low On-Resistance: 0.6Ω
- Wide V_{DD} Range: 2.7V to 4.2V ±10%
- Rail-to-Rail Signal Range
- High Off Isolation: -75dB @ 100kHz
- Crosstalk Rejection Reduces Signal Distortion: -77dB @ 100kHz
- Break-Before-Make Switching
- Extended Industrial Temperature Range: –40°C to 85°C
- Packaging (Pb-free & Green):
  - –10-contact UQFN (ZM10)

Applications

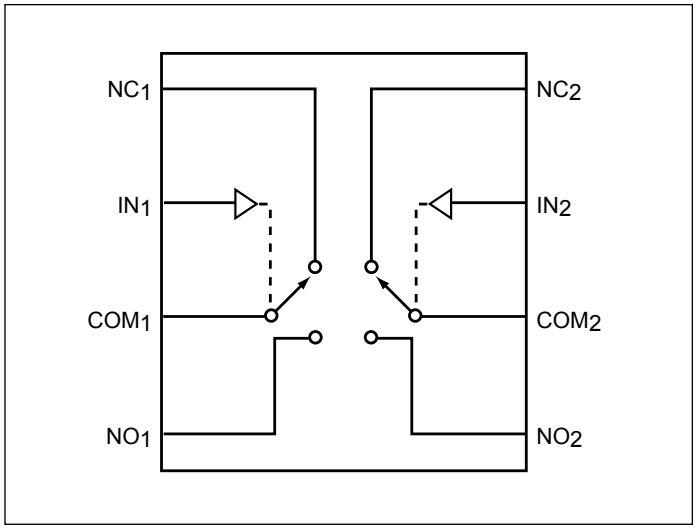
- Cell Phones
- PDAs
- MP3 players
- Portable Instrumentation
- Computer Peripherals
- Speaker Headset Switching
- Power Routing
- Relay Replacement
- Audio and Video Signal Routing
- PCMCIA Cards
- Modems

Description

The PI3A223 is a dual, 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, 2.7V to 4.2V, the PI3A223 has an On-Resistance of 0.6Ω at +2.7V.

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

Functional Block Diagram



Pin Description

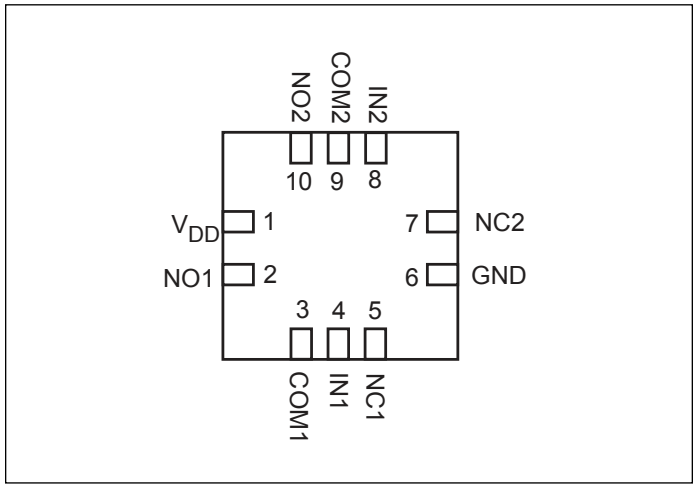
Pin #	Name	Description
2, 10	NO_X	Data Port (Normally open)
6	GND	Ground
5, 7	NC_X	Data Port (Normally closed)
3, 9	COM_X	Common Output / Data Port
1	V_{DD}	Positive Power Supply
4, 8	IN_X	Logic Control

Logic Function Table

Logic Input (IN_X)	Function
0	NC_X Connected to COM_X
1	NO_X Connected to COM_X

Note: x = 1 or 2

Pin Configuration (top view)



Absolute Maximum Ratings(1)

Supply Voltage V_{DD} ..... –0.5V to 4.6V
Control Input Voltage (VINx) ..... 0V to 5V
DC Input Voltage (V_{INPUT})(2) ..... –0.5V to 4.6V
Continuous Current NO_NC_COM_ ..... ±300mA
Peak Current NO_NC_COM_
(pulsed at 1ms 50% duty cycle) ..... ±400mA
Peak Current NO_NC_COM_
(pulsed at 1ms 10% duty cycle) ..... ±500mA
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 250mW

Recommended Operating Conditions(3)

Supply Voltage Operating (V_{DD}) . . . . . 2.7V to 4.2V ±10%
Control Input Voltage (V_{IN}) . . . . . 0V to V_{DD}
Switch Input Voltage (V_{INPUT}) . . . . . -0.3V 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
Thermal Resistance (θ_{JA}) . . . . . 350°C/W
Lead Temperature (soldering 10s) . . . . . +300°C
Bump Temperature (soldering notes)
Infared (15s) . . . . . +220°C
Vapor Phase (60ns) . . . . . +215°C

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 +3V Supply

(V_{DD} = 2.7V to 3.3V, T_A = –40°C to 85°C, unless otherwise noted. Typical values are at 3V and +25°C.)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Analog Switch						
Analog Signal Range	V_{NO} , V_{NC} , V_{COM}		-0.3		V_{DD}	V
NC On-Resistance	$R_{ON(NC)}$	V_{DD} = 2.7V, I_{COM} = 100mA, V_{NC} = 0 to V_{CC}		0.6	0.8	Ω
NO On-Resistance	$R_{ON(NO)}$	V_{DD} = 2.7V, I_{COM} = 100mA, V_{NO} = 0 to V_{CC}		0.6	0.8	
On-Resistance Match Between Channels	ΔR_{ON}	V_{DD} = 2.7V, I_{COM} = 100mA, V_{NO} or VNC = 1.5V		0.01	0.06	
NC On-Resistance Flatness	$R_{ONF(NC)}$	V_{DD} = 2.7V, I_{COM} = 100mA, V_{NC} = 0 to V_{CC}			0.2	
NO On-Resistance Flatness	$R_{ONF(NO)}$	V_{DD} = 2.7V, I_{COM} = 100mA, V_{NO} = 0 to V_{CC}			0.2	
NO or NC Off Leakage Current	$I_{OFF (NO)}$ or $I_{OFF (NC)}$	V_{DD} = 3.3V, V_{NO} or V_{NC} = 3V, 0.3V, V_{COM} = 0.3V, 3V	-400		400	nA
COM On Leakage Current	$I_{COM (ON)}$	V_{DD} = 3.3V, V_{NO} or V_{NC} = 3V, 0.3V, V_{COM} = 3V, 0.3V, or floating	-160		160	
Total Harmonic Distortion	THD	Load = 16Ω , V_{DD} = 2.7V, Vinput = 1.5Vpp , Frequency = 20Hz to 20KHz		0.03		%
Total Harmonic Distortion	THD	Load = 8Ω , V_{DD} = 2.7V, Vinput = 1.5Vpp , Frequency = 20Hz to 20KHz		0.035		

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Digital I/O						
Input Logic High	V_{IH}		1.3			V
Input Logic Low	V_{IL}				0.6	
Input Hysteresis	V_H	V_{DD} = 3.3V		100		mV
IN Input Leakage Current	I_{IN}	V_{IN} = 0 or V_{CC}	-0.5		0.5	µA
Supply Current	I_{CC}	V_{DD} = 3.6V, V_{IN} = 0 or V_{DD}		3	7	

DC Electrical Characteristics +4.2V Supply

(V_{DD} = 4.2V, T_A = –40°C to 85°C, unless otherwise noted. Typical values are at +25°C.)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Analog Switch						
Analog Signal Range	V_{NO} , V_{NC} , V_{COM}		-0.3		V_{DD}	V
NC On-Resistance	$R_{ON(NC)}$	V_{DD} = 4.2V, I_{COM} = 100mA, V_{NC} = 0 to V_{DD}		0.6	0.8	Ω
NO On-Resistance	$R_{ON(NO)}$	V_{DD} = 4.2V, I_{COM} = 100mA, V_{NO} = 0 to V_{DD}		0.6	0.8	
On-Resistance Match Between Channels	ΔR_{ON}	V_{DD} = 4.2V, I_{COM} = 100mA, V_{NO} or VNC = 1.5V		0.01	0.06	
NC On-Resistance Flatness	$R_{ONF(NC)}$	V_{DD} = 4.2V, I_{COM} = 100mA, V_{NC} = 0 to V_{DD}			0.2	
NO On-Resistance Flatness	$R_{ONF(NO)}$	V_{DD} = 4.2V, I_{COM} = 100mA, V_{NO} = 0 to V_{DD}			0.2	
NO or NC Off Leakage Current	$I_{OFF (NO)}$ or $I_{OFF (NC)}$	V_{DD} = 4.2V, V_{NO} or V_{NC} = 3V, 0.3V, V_{COM} = 0.3V, 3V	-400		400	nA
COM On Leakage Current	$I_{COM (ON)}$	V_{DD} = 4.2V, V_{NO} or V_{NC} = 3V, 0.3V, V_{COM} = 3V, 0.3V, or floating	-160		160	
Total Harmonic Distortion	THD	Load = 16Ω , V_{DD} = 4.2V, Vinput = 2.0Vpp , Frequency = 20Hz to 20KHz		0.06		%
Total Harmonic Distortion	THD	Load = 8Ω , V_{DD} = 4.2V, Vinput = 2.0Vpp , Frequency = 20Hz to 20KHz		0.065		
Digital I/O						
Input Logic High	V_{IH}		1.3			V
Input Logic Low	V_{IL}				0.6	
Input Hysteresis	V_H	V_{DD} = 4.2V		100		mV
IN Input Leakage Current	I_{IN}	V_{IN} = 0 or V_{DD}	-0.5		0.5	µA
Supply Current	I_{CC}	V_{DD} = 4.2V, V_{IN} = 0 or V_{DD}		3.5	10	

Switch and AC Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Turn-On Time	t_{ON}	V_{DD} = 2.7V, V_{NO} or V_{NC} = 1.5V, R_L = 50Ω, C_L = 35pF, *See Test Circuit Figure 1 & 2.*		15	25	ns
Turn-Off Time	t_{OFF}	V_{DD} = 2.7V, V_{NO} or V_{NC} = 1.5V, R_L = 50Ω, C_L = 35pF, *See Test Circuit Figure 1 & 2.*		4	10	
Break-Before-Make Delay	t_{BBM}	V_{DD} = 2.7V, V_{NO} or V_{NC} = 1.5V, R_L = 50Ω, C_L = 35pF, *See Test Circuit Figure 3.*			20	
Charge Injection	Q	COM = 0, R_S = 0, C_L = 1nF, V_{DD} = 3.3V or 4.2V *See Test Circuit Figure 4.*		55		pC
Off-Isolation	O_{IRR}	C_L = 5pF, R_L = 50Ω, f = 100kHz, V_{COM} = 1 V_{RMS}, V_{DD} = 3.3V *See Test Circuit Figure 5.*		-77		dB
Crosstalk	X_{TALK}	C_L = 5pF, R_L = 50Ω, f = 100kHz, V_{COM} = 1 V_{RMS}, V_{DD} = 3.3V *See Test Circuit Figure 6.*		-77		
3dB Bandwidth	f_{3dB}	*See Test Circuit Figure 9.*, V_{DD} = 3.3V		65		MHz

Capacitance

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NC Off Capacitance	$C_{NC\ (OFF)}$	f = 1MHz, *See Test Circuit Figure 7.*		31		pF
NO Off Capacitance	$C_{NO\ (OFF)}$	f = 1MHz, *See Test Circuit Figure 7.*		31		
NC On Capacitance	$C_{NC\ (ON)}$	f = 1MHz, *See Test Circuit Figure 8.*		90		
NO On Capacitance	$C_{NO\ (ON)}$	f = 1MHz, *See Test Circuit Figure 8.*		90		

Test Circuits and Timing Diagrams

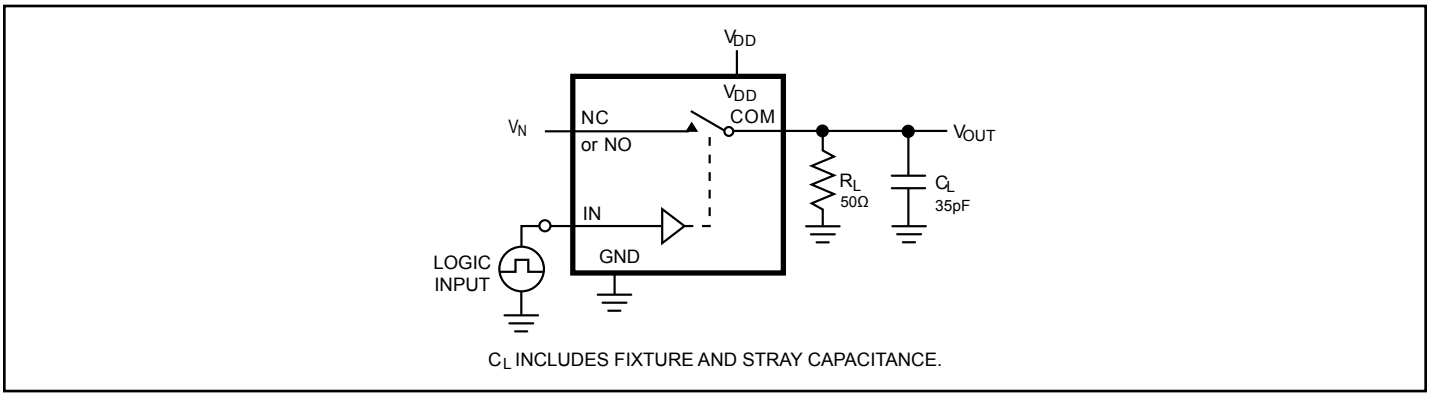


Figure 1. AC Test Circuit

Note:

1. Unused input (NC or NO) must be grounded.

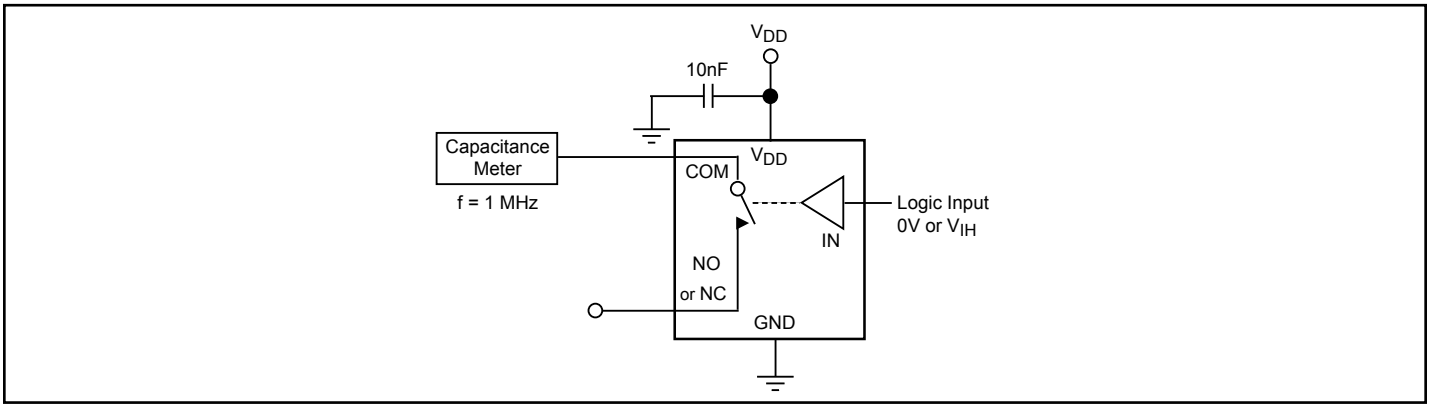


Figure 2. AC Waveforms

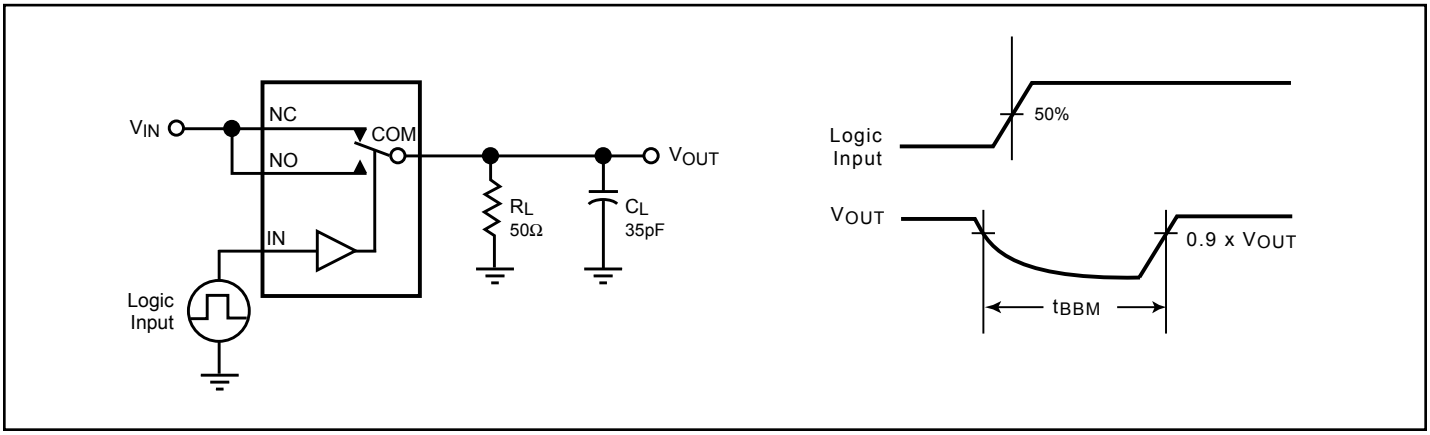


Figure 3. Break Before Make Interval Timing

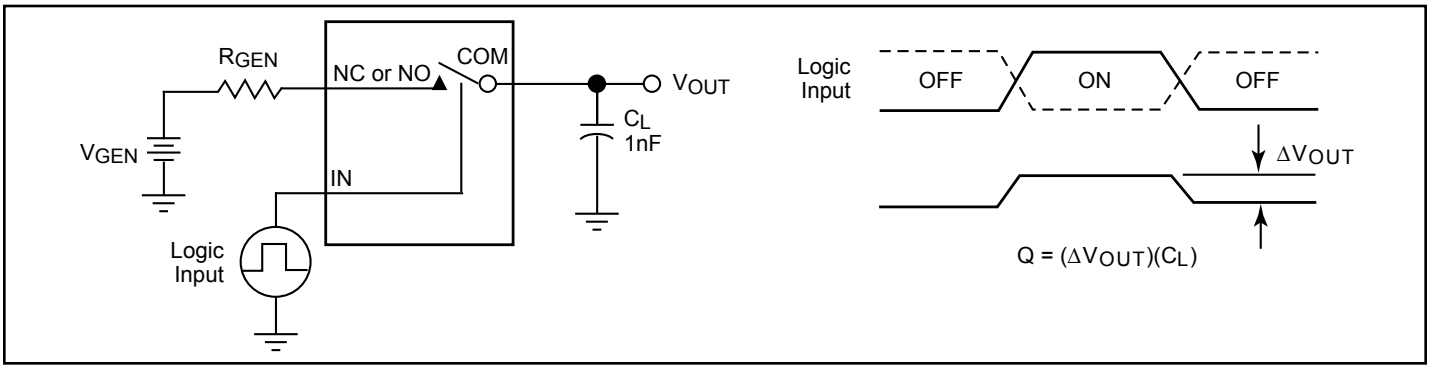


Figure 4. Charge Injection Test

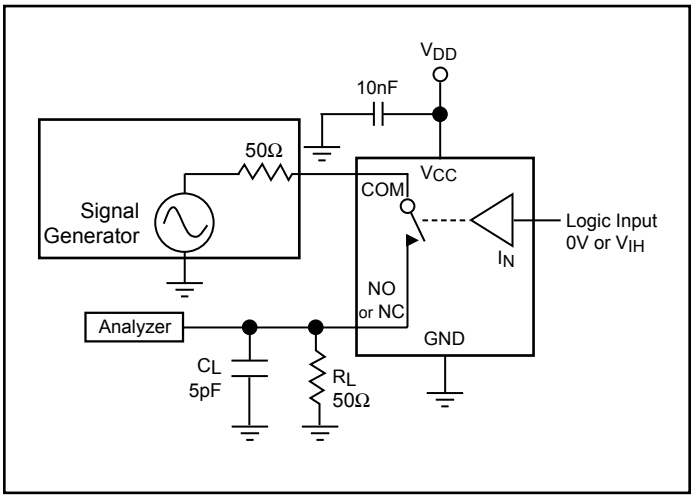


Figure 5. Off Isolation

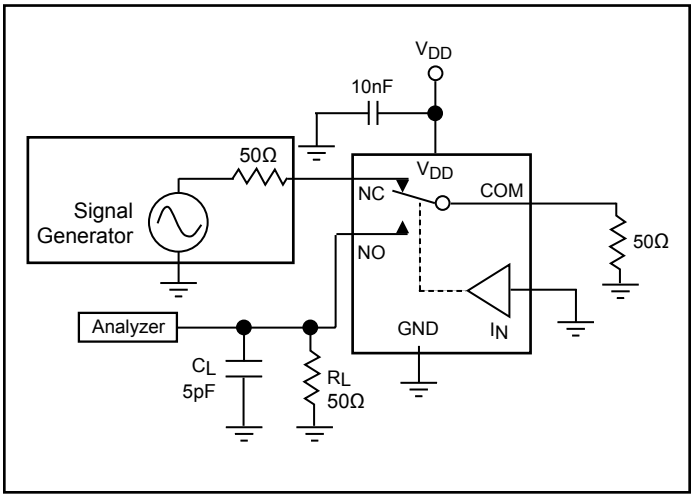


Figure 6. Crosstalk

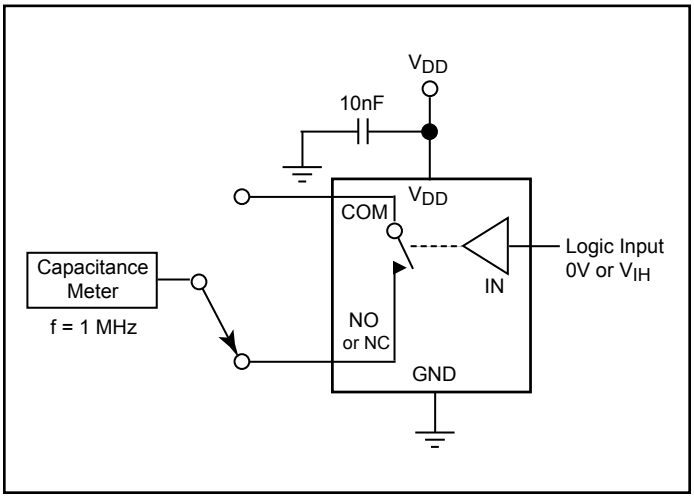


Figure 7. Channel Off Capacitance

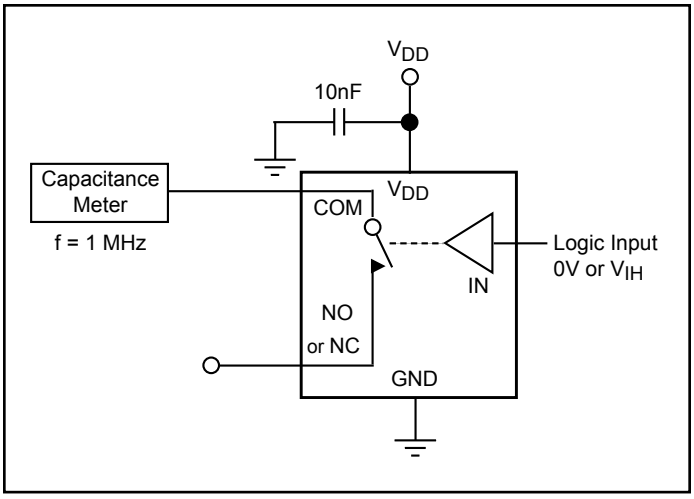


Figure 8. Channel On Capacitance

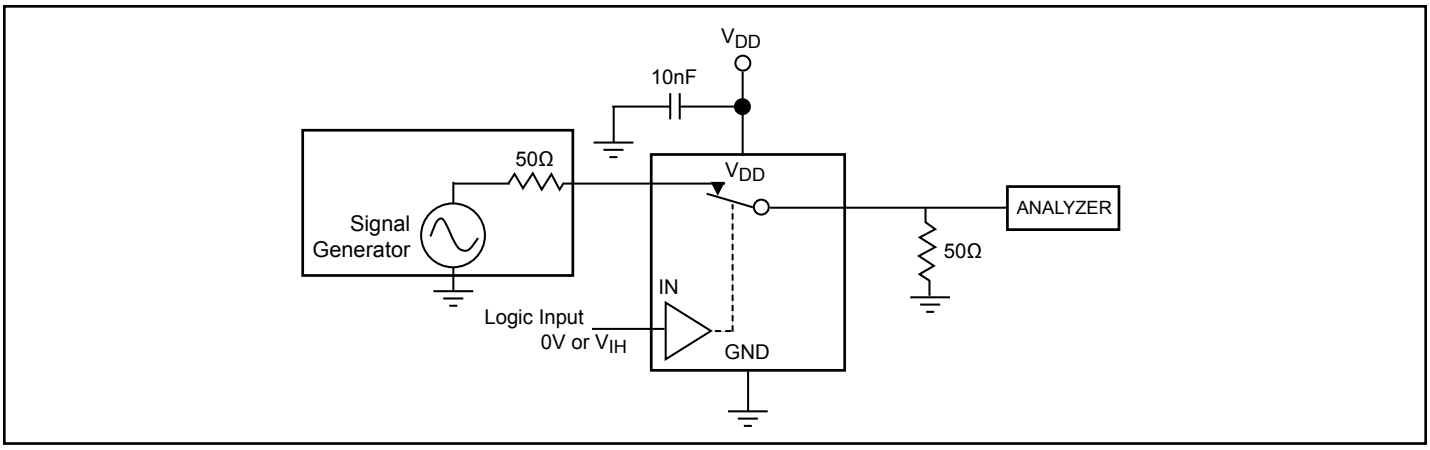


Figure 9. Bandwidth

Ordering Information

Ordering Code	Packaging Code	Package Type	Top Mark
PI3A223ZMEX	ZM	10-contact, Ultra-thin Quad Flat No-Lead (UQFN), Tape & Reel	GD

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Pb-free & Green
- X suffix = Tape/Reel

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes Incorporated.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

www.diodes.com