

Dual SPDT Analog Switch with -1.5V Signal Support, and Integrated Pop-Sound Elimination Circuit

Features

- CMOS Technology for Bus and Analog Applications
- Low On-Resistance: 0.6Ω.
- Wide V_{DD} Range: 2.8 to 4.2
- High Off Isolation: -80dB @ 100kHz
- Crosstalk Rejection Reduces Signal Distortion: -80dB @ 100kHz
- Input signals can be from -1.5V up to VDD without distortion.
- Break-Before-Make Switching
- Extended Industrial Temperature Range: -40°C to 85°C
- Packaging (Pb-free & Green): -10-contact TQFN (ZM10) 1.4 × 1.8

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

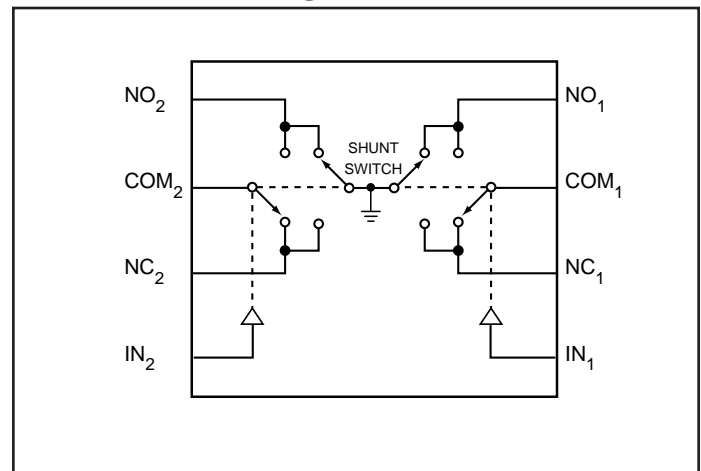
Description

Pericom Semiconductor's PI3A268SC 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.

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

With the use of 3rd party headsets, AC coupling is required to protect against EOS damage caused by DC offsets. Pericom's PI3A268SC can support these AC coupled audio signals, since the switch can tolerate signals down to -1.5V without a negative power supply.

Functional Block Diagram



Pin Description

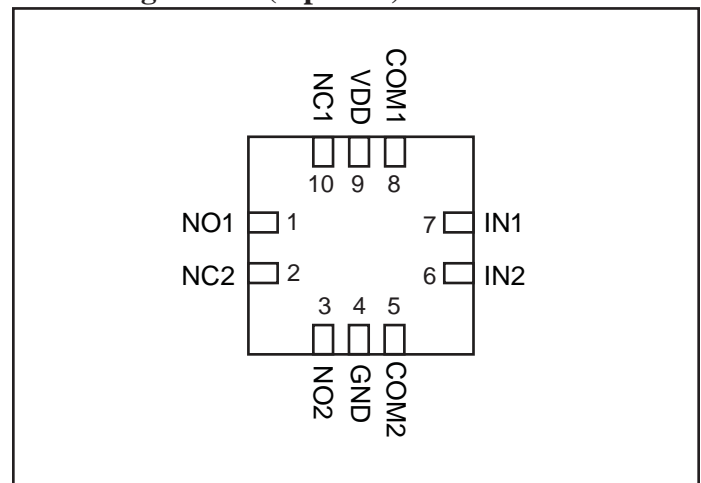
Pin #	Name	Description
1, 3	NO _X	Data Port (Normally open)
4	GND	Ground
2, 10	NC _X	Data Port (Normally closed)
5, 8	COM _X	Common Output / Data Port
9	V _{DD}	Positive Power Supply
6, 7	IN _X	Logic Control

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⁾	Recommended Operating Conditions⁽³⁾
Supply Voltage V_{DD} 2.5V to 4.6V	Supply Voltage Operating (V_{DD}) 2.8V to 4.2V \pm 5%
DC Control Switch Voltage (V_{INX}) 0V to 5.0V	Control Input Voltage (V_{IN}) 0V to V_{DD}
DC Input Voltage (V_{IN}) ⁽²⁾ -1.5V to V_{DD}	Switch Input Voltage (V_{INPUT}) -1.5V to V_{DD}
Continuous Current NO_NC_COM_ \pm 300mA	Operating Temperature (T_A) -40°C to +85°C
Peak Current NO_NC_COM_ (pulsed at 1ms 50% duty cycle) \pm 400mA	Input Rise and Fall Time (t_r, t_f) Control Input $V_{DD} = 2.3V - 3.6V$ 0ns/V to 10ns/V
Peak Current NO_NC_COM_ (pulsed at 1ms 10% duty cycle) \pm 500mA	Thermal Resistance (θ_{JA}) 350°C/W
Storage Temperature Range (T_{STG}) -65°C to +150°C	Lead Temperature (soldering 10s) +300°C
Junction Temperature under Bias (T_J) 150°C	Bump Temperature (soldering notes) Infrared (15s) +220°C
Junction Lead Temperature (T_L) (Soldering, 10 seconds) 260°C	Vapor Phase (60ns) +215°C

Notes:

- "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.
- The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.
- Control input must be held HIGH or LOW; it must not float.

Power Supply

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Current	I_{CC}	$V_{DD} = 2.7V, V_{IN} = 0V$ to V_{DD}			20	μA
		$V_{DD} = 3.3V, V_{IN} = 0V$ to V_{DD}			36	μA
		$V_{DD} = 4.2V, V_{IN} = 0V$ to V_{DD}			80	μA

DC Electrical Characteristics

 ($V_{DD} = 2.7V$ to $3.3V$, $T_A = -40^{\circ}C$ to $85^{\circ}C$, unless otherwise noted. Typical values are at $25^{\circ}C$.)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Analog Switch						
Analog Signal Range	V_{NO} , V_{NC} , V_{COM}		-1.5		V_{DD}	V
NC On-Resistance	$R_{ON(NC)}$	$V_{DD} = 2.7V$, $I_{COM} = 100mA$, $V_{NC} = -1.5V$ to V_{DD}		0.7		Ω
NO On-Resistance	$R_{ON(NO)}$	$V_{DD} = 2.7V$, $I_{COM} = 100mA$, $V_{NO} = -1.5V$ to V_{DD}		0.7		
On-Resistance Match Between Channels	ΔR_{ON}	$V_{DD} = 2.7V$, $I_{COM} = 100mA$, V_{NO} or $V_{NC} = -1.5V$ to V_{DD}		0.1		
NC On-Resistance Flatness	$R_{ONF(NC)}$	$V_{DD} = 2.7V$, $I_{COM} = 100mA$, $V_{NC} = -1.5V$ to V_{DD}		0.2		
NO On-Resistance Flatness	$R_{ONF(NO)}$	$V_{DD} = 2.7V$, $I_{COM} = 100mA$, $V_{NO} = -1.5V$ to V_{DD}		0.2		
NO or NC Off Leakage Current	$I_{OFF(NO)}$ or $I_{OFF(NC)}$	$V_{DD} = 3.3V$, V_{NO} or $V_{NC} = -1.5V$ to $+3.3V$	-400		400	nA
Shunt resistance	R_{SH}	$V_{DD} = 3.3V$		100K		Ω
COM On Leakage Current	$I_{COM(ON)}$	$V_{DD} = 3.3V$, V_{NO} or $V_{NC} = 0.3V$, $V_{COM} = 3V$, $0.3V$, or floating	-250		250	nA
Total Harmonic Distortion	THD	Load = 8Ω pulled to GND, $V_{DD} = 2.7V$, freq = 20Hz to 20KHz, $V_{input} = 2V_{PP}$		0.04		%
		Load = 16Ω pulled to GND, $V_{DD} = 2.7V$, freq = 20Hz to 20KHz, $V_{input} = 2V_{PP}$		0.035		
Digital I/O						
Input Logic High	V_{IH}		1.3			V
Input Logic Low	V_{IL}				0.6	
Input Hysteresis	V_H	$V_{DD} = 2.7V$		100		mV
IN Input Leakage Current	I_{IN}	$V_{IN} = 0$ or V_{DD}	-0.5		0.5	μA

DC Electrical Characteristics

 ($V_{DD} = 3.3V$ to $4.4V$, $T_A = -40^{\circ}C$ to $85^{\circ}C$, unless otherwise noted. Typical values are at $25^{\circ}C$.)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Analog Switch						
Analog Signal Range	V_{NO} , V_{NC} , V_{COM}		-1.5		V_{DD}	V
NC On-Resistance	$R_{ON(NC)}$	$V_{DD} = 4.2V$, $I_{COM} = 100mA$, $V_{NC} = -1.5V$ to V_{DD}		0.6		Ω
NO On-Resistance	$R_{ON(NO)}$	$V_{DD} = 4.2V$, $I_{COM} = 100mA$, $V_{NO} = -1.5V$ to V_{DD}		0.6		
On-Resistance Match Between Channels	ΔR_{ON}	$V_{DD} = 4.2V$, $I_{COM} = 100mA$, V_{NO} or $V_{NC} = -1.5V$ to V_{DD}		0.1		
NC On-Resistance Flatness	$R_{ONF(NC)}$	$V_{DD} = 4.2V$, $I_{COM} = 100mA$, $V_{NC} = -1.5V$ to V_{DD}		0.2		
NO On-Resistance Flatness	$R_{ONF(NO)}$	$V_{DD} = 4.2V$, $I_{COM} = 100mA$, $V_{NO} = -1.5V$ 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 $V_{NC} = -1.5V$ to $+3.3V$	-700		700	
COM On Leakage Current	$I_{COM(ON)}$	$V_{DD} = 4.2V$, V_{NO} or $V_{NC} = 0.3V$, $V_{COM} = 3V$, $0.3V$, or floating	-550		550	
Total Harmonic Distortion	THD	Load = 8Ω pulled to GND, $V_{DD} = 3.3V$, freq = 20Hz to 20KHz, $V_{input} = 2V_{PP}$		0.025		%
		Load = 16Ω pulled to GND, $V_{DD} = 3V$, freq = 20Hz to 20KHz, $V_{input} = 2V_{PP}$		0.02		
Digital I/O						
Input Logic High	V_{IH}		1.3			V
Input Logic Low	V_{IL}				0.6	
Input Hysteresis	V_H	$V_{DD} = 4.2V$		150		mV
IN Input Leakage Current	I_{IN}	$V_{IN} = 0$ or V_{DD}	-0.5		0.5	μA

Switch and AC Characteristics

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Turn-On Time	t_{ON}	$V_{DD} = 2.7V$, V_{NO} or $V_{NC} = 1.5V$, $R_L = 50\Omega$, $C_L = 35pF$, <i>See Test Circuit Figure 1 & 2.</i>			65	ns
Turn-Off Time	t_{OFF}	$V_{DD} = 2.7V$, V_{NO} or $V_{NC} = 1.5V$, $R_L = 50\Omega$, $C_L = 35pF$, <i>See Test Circuit Figure 1 & 2.</i>			65	
Break-Before-Make Delay	t_{BBM}	$V_{DD} = 2.7V$, V_{NO} or $V_{NC} = 1.5V$, $R_L = 50\Omega$, $C_L = 35pF$, <i>See Test Circuit Figure 3.</i>			20	
Charge Injection	Q	<i>See Test Circuit Figure 4.</i>		35		pC
Off-Isolation	O_{IRR}	$C_L = 5pF$, $R_L = 50\Omega$, $f = 100kHz$, $V_{COM} = 1 V_{RMS}$, <i>See Test Circuit Figure 5.</i>		-80		dB
Crosstalk	X_{TALK}	$C_L = 5pF$, $R_L = 50\Omega$, $f = 100kHz$, $V_{COM} = 1 V_{RMS}$, <i>See Test Circuit Figure 6.</i>		-80		
3dB Bandwidth	f_{3dB}	<i>See Test Circuit Figure 9.</i>		130		MHz

Capacitance

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
NC Off Capacitance	$C_{NC(OFF)}$	$f = 1MHz$, <i>See Test Circuit Figure 7.</i>		15		pF
NO Off Capacitance	$C_{NO(OFF)}$	$f = 1MHz$, <i>See Test Circuit Figure 7.</i>		15		
NC On Capacitance	$C_{NC(ON)}$	$f = 1MHz$, <i>See Test Circuit Figure 8.</i>		50		
NO On Capacitance	$C_{NO(ON)}$	$f = 1MHz$, <i>See Test Circuit Figure 8.</i>		50		

Test Circuits and Timing Diagrams

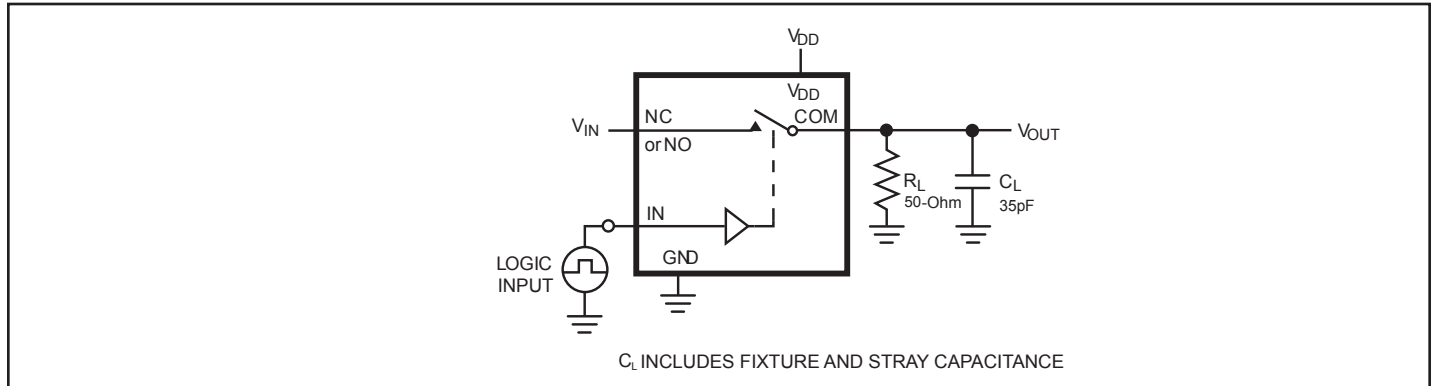


Figure 1. AC Test Circuit

Notes:

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

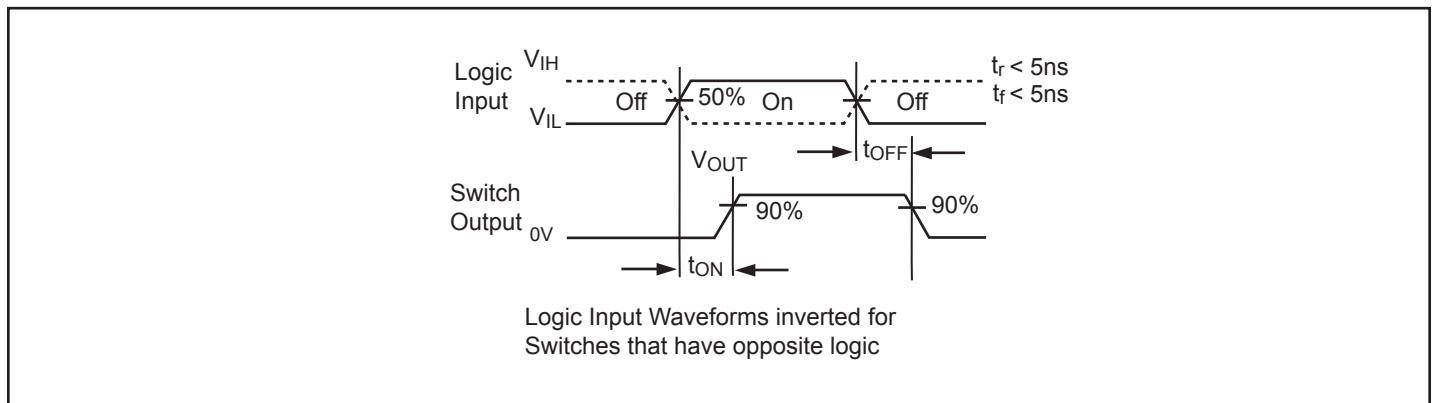


Figure 2. AC Waveforms

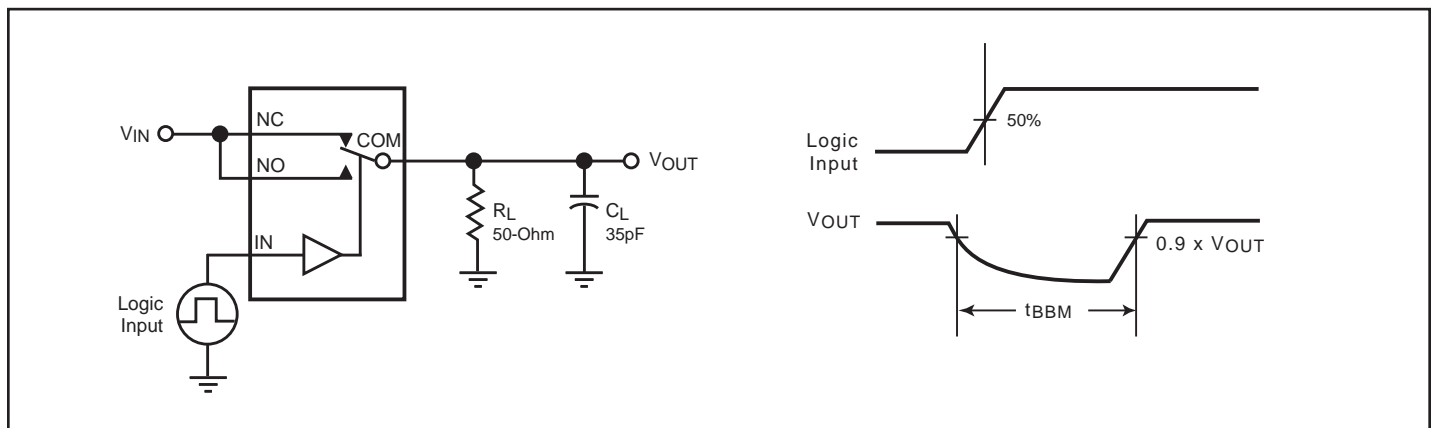


Figure 3. Break Before Make Interval Timing

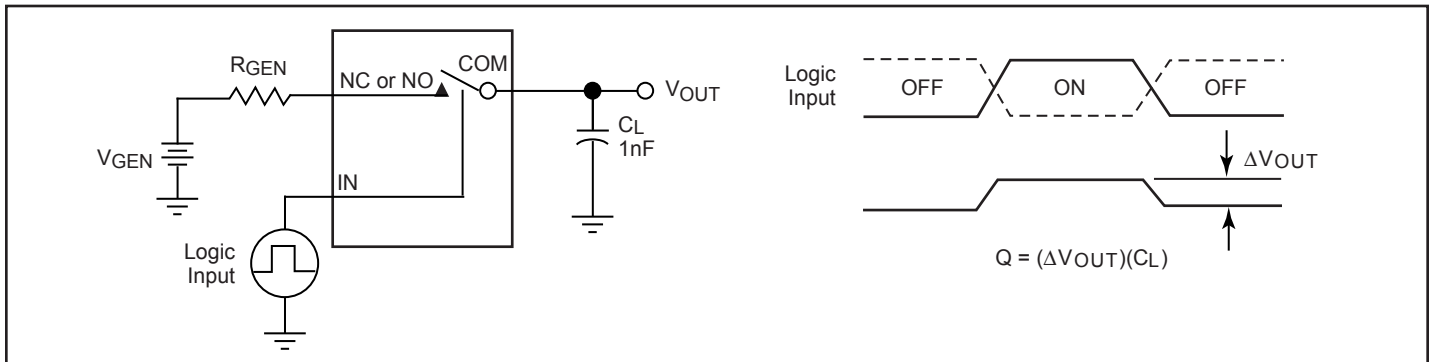


Figure 4. Charge Injection Test

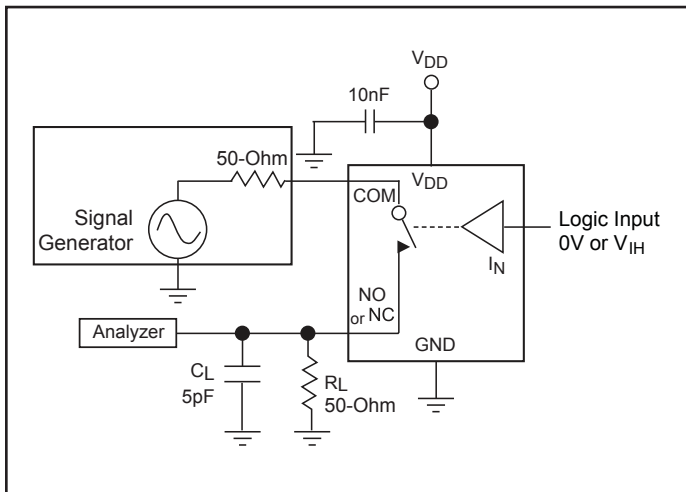


Figure 5. Off Isolation

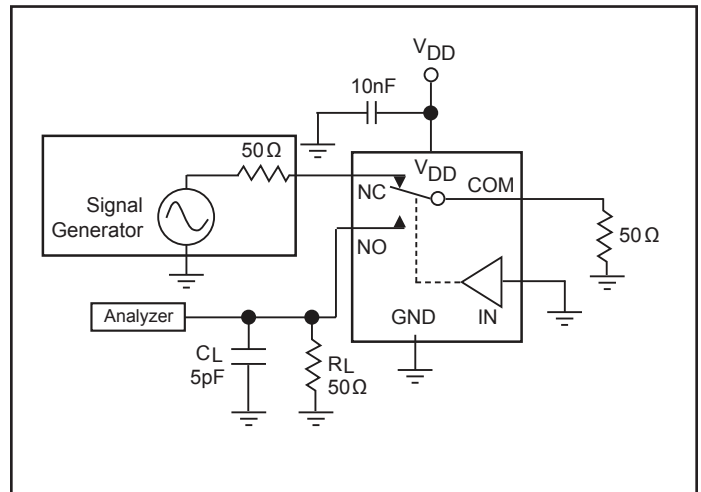


Figure 6. Crosstalk

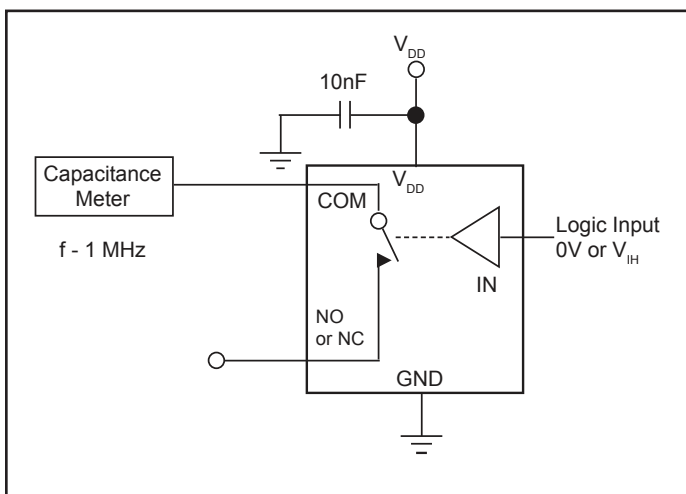


Figure 7. Channel Off Capacitance

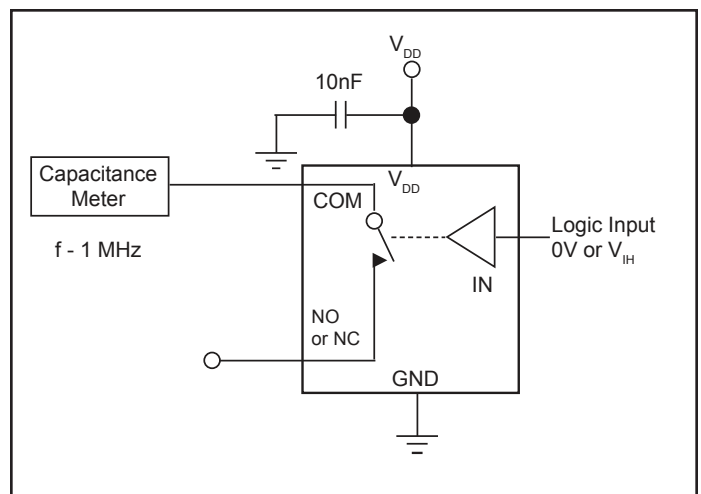


Figure 8. Channel On Capacitance

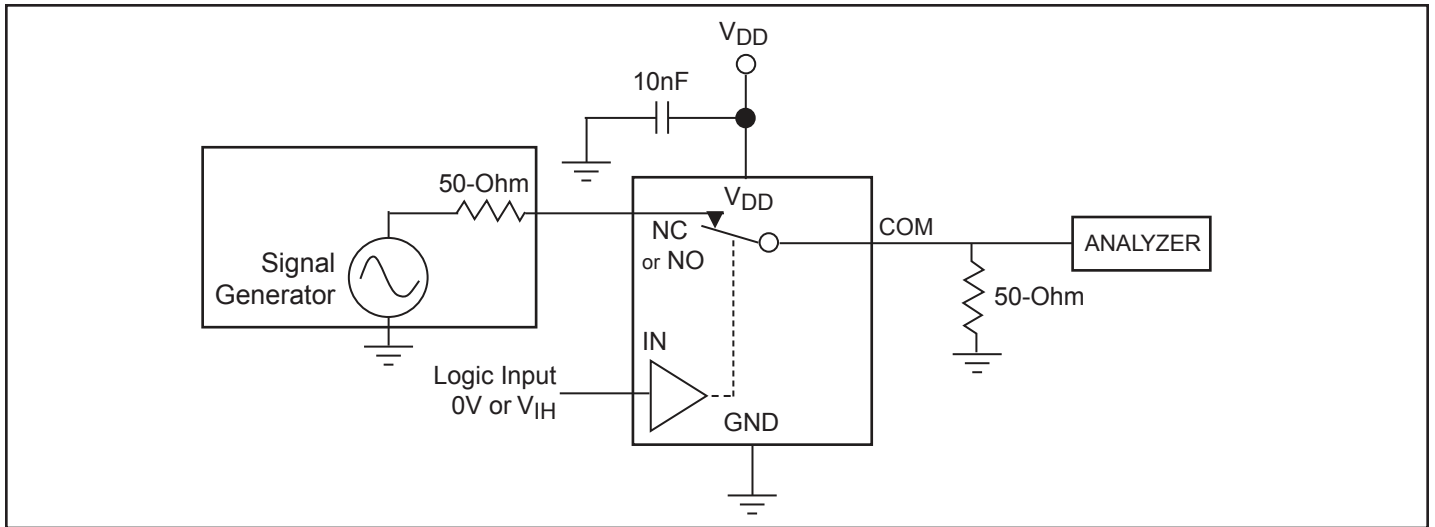
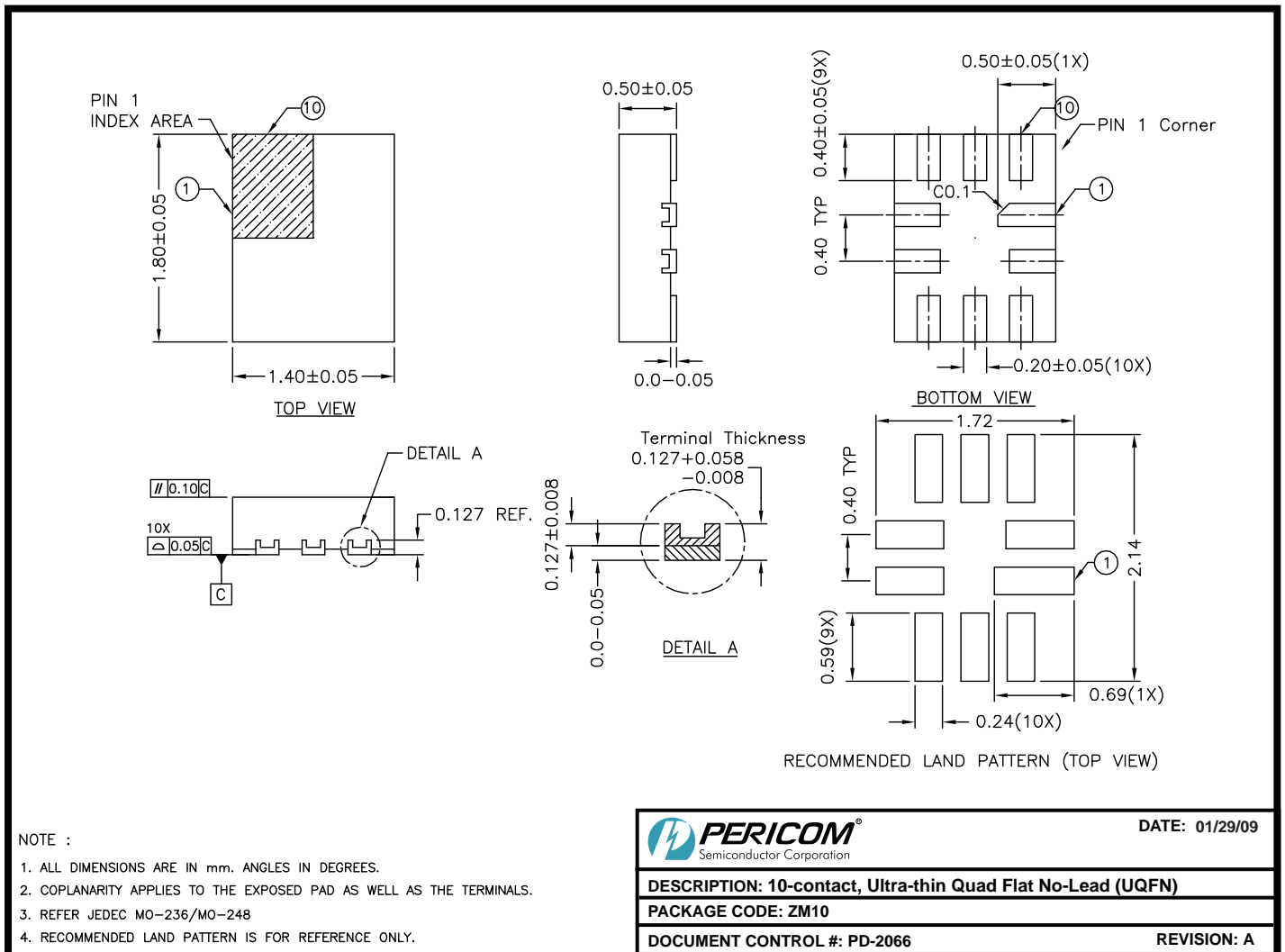


Figure 9. Bandwidth

Packaging Mechanical: 10-pin TQFN (ZM10)



09-0072

Ordering Information

Ordering Code	Packaging Code	Package Type	Top Mark
PI3A268SCZME	ZM	1.4 X 1.8, Pb-Free & Green, 10-contact TQFN	FC

Notes:

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