

Features

- CMOS Technology for Bus and Analog Applications
- Low On-Resistance: 0.4Ω (+2.7V Supply)
- Wide V_{CC} Range: +1.5V to +4.2V
- Low Power Consumption : 5μW
- Rail-to-Rail switching throughout Signal Range
- Fast Switching Speed: 20ns max. at 3.3V
- High Off Isolation: -27dB at 100 KHz
- -41dB (100 KHz) Crosstalk Rejection Reduces Signal Distortion
- Extended Industrial Temperature Range: -40°C to 85°C
- Packaging:
 - Pb-free & Green, 12-pin TDFN (ZG)
 - Pb-free & Green, 12-pin TDFN (ZE)

Applications

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

Pin Description

Pin Number	Name	Description
8, 11	NO _x	Data Port (Normally Open)
3, 6	GND	Ground
2, 5	NC _x	Data Port (Normally Closed)
1, 4	COM _x	Common Output/Data Port
9, 12	V _{CCx}	Postive Power Supply ⁽²⁾
7, 10	IN _x	Logic Control

Notes:

1. x = 0 or 1
2. V_{CC0} ad V_{CC1} are not internally connected. Each must be powered seperately.

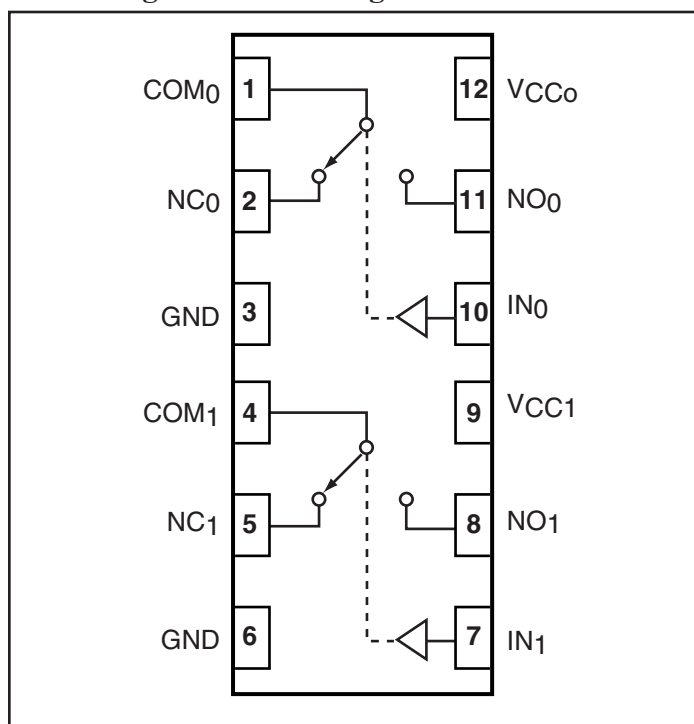
Description

The PI3A3160 is a fast Dual 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, +1.5V to +4.2V, the switch has an On-Resistance of 0.4Ω at 3.0V.

Control inputs, IN, tolerates input drive signals up to 3.3V, independent of supply voltage.

PI3A3160 is a lower voltage and On-Resistance replacement for the PI5A3158.

Block Diagram / Pin Configuration



Function Table

Logic Input	Function
0	NC _x Connected to COM _x
1	NO _x Connected to COM _x

Absolute Maximum Ratings

Voltages Referenced to GND

V_{CC} -0.5V to +4.4V

V_{IN} , V_{COM} , V_{NC} , V_{NO} ⁽¹⁾ -0.5V to V_{+} +0.3V
or 30mA, whichever occurs first

Current (any terminal)..... ±200mA

Peak Current, COM, NO, NC
(Pulsed at 1ms, 10% duty cycle)..... ±400mA

Thermal Information

Continuous Power Dissipation

SOT23 (derate 7.1mW/°C above +70°C)..... 0.5W

Storage Temperature -65°C to +150°C

Lead Temperature (soldering, 10s) +300°C

Note 1: Signals on NC, NO, COM, or IN exceeding V_{CC} or GND are clamped by internal diodes. Limit forward diode current to 30mA.

Caution: Stresses beyond those listed under “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.

Electrical Specifications - Single +4.2V Supply

($V_{CC} = +4.2V \pm 5\%$, $GND = 0V$, $V_{IH} = 1.6V$, $V_{IL} = 0.7V$)

Parameter	Symbol	Conditions	Temp. (°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units
Analog Switch							
Analog Signal Range ⁽³⁾	V_{ANALOG}		Full	0		V_{CC}	V
On Resistance	R_{ON}	$V_{CC} = 4.0V$, $I_{COM} = 99mA$, $V_{IN} = 0V$ to V_{CC}	25		0.4	0.45	Ω
On-Resistance Match Between Channels ⁽⁴⁾	ΔR_{ON}		Full			0.6	
On-Resistance Flatness ⁽⁵⁾	$R_{FLAT(ON)}$	$V_{CC} = 4.0V$, $I_{COM} = 100mA$	25			0.08	
			Full			0.09	
NO or NC Off Leakage Current ⁽⁶⁾	$I_{NO(OFF)}$ or $I_{NC(OFF)}$	$V_{CC} = 4.2V$	25	-100		100	nA
			Full		-400		
COM On Leakage Current ⁽⁶⁾	$I_{COM(ON)}$	$V_{CC} = 4.2V$	25	-200		200	
			Full		-400		

Electrical Specifications - Single +3.3V Supply

($V_{CC} = +3.3V \pm 10\%$, $GND = 0V$, $V_{IH} = 1.4V$, $V_{IL} = 0.5V$)

Parameter	Symbol	Conditions	Temp. (°C)	Min. (1)	Typ. (2)	Max. (1)	Units	
Analog Switch								
Analog Signal Range (3)	V_{ANALOG}		Full	0		V_{CC}	V	
On Resistance	R_{ON}	$V_{CC} = 2.7V$, $I_{COM} = 100mA$, V_{NO} or $V_{NC} = +1.5V$	25		0.4	0.45	Ω	
On-Resistance Match Between Channels (4)	ΔR_{ON}		Full			0.6		
		25			0.08			
		Full			0.09			
On-Resistance Flatness (5)	$R_{FLAT(ON)}$	$V_{CC} = 2.7V$, $I_{COM} = 100mA$, V_{NO} or $V_{NC} = 0.8V, 2.0V$	25			0.1	Ω	
			Full			0.1		
NO or NC Off Leakage Current (6)	$I_{NO(OFF)}$ or $I_{NC(OFF)}$	$V_{CC} = 3.3V$, $V_{COM} = 0V$, V_{NO} or $V_{NC} = +2.0V$	25	-100		100		nA
			Full		-400			
COM On Leakage Current (6)	$I_{COM(ON)}$	$V_{CC} = 3.3V$, $V_{COM} = +2.0V$, V_{NO} or $V_{NC} = +2.0V$	25	-200		200		
			Full		-400		400	

Electrical Specifications - Single +4.2V Supply

($V_{CC} = +4.2V \pm 5\%$, $GND = 0V$, $V_{IH} = 1.6V$, $V_{IL} = 0.7V$)

Description	Parameters	Test Conditions	Temp (°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units	
Logic Input								
Input High Voltage	V_{IH}	Guaranteed logic High Level	Full	1.6			V	
Input Low Voltage	V_{IL}	Guaranteed logic Low Level				0.7		
Input Current with Voltage High	I_{INH}	$V_{IN} = 1.4V$, all others = 0.5V		-1		1	μA	
Input Current with Voltage Low	I_{INL}	$V_{IN} = 0.5V$, all other = 1.4V		-1		1		
Dynamic								
Turn-On Time	t_{ON}	$V_{CC} = 4.2V$, V_{NO} or $V_{NC} = 2.0V$, Figure 1	25			20	ns	
			Full			25		
Turn-Off Time	t_{OFF}		25			12		
			Full			15		
Break-Before-Make	t_{BBM}	V_{NO} or $V_{NC} = 1.5V$, $R_L = 50\Omega$, $C_L = 35pF$, See Figure 8	25	1	12			
			Full	1				
Charge Injection ⁽³⁾	Q		$C_L = 1nF$, $V_{GEN} = 0V$, $R_{GEN} = 0\Omega$, Figure 2	25		100		pC
Off Isolation ⁽⁷⁾	O_{IRR}		$R_L = 50\Omega$, $f = 100KHz$, Figure 3			-27		dB
Cross Talk ⁽⁸⁾	X_{TALK}	$R_L = 50\Omega$, $f = 100KHz$, Figure 4			-41			
NC or NO Capacitance	$C_{(OFF)}$	$f = 1MHz$, Figure 5			56		pF	
COM Off Capacitance	$C_{COM(OFF)}$				56			
COM On Capacitance	$C_{COM(ON)}$		$f = 1MHz$, Figure 6			160		
Supply								
Power-Supply Range	V_{CC}		Full	1.5		3.6	V	
Positive Supply Current	I_{CC}	$V_{CC} = 3.6V$, $V_{IN} = 0V$ or V_{CC}	25			0.3	μA	

Notes:

- The algebraic convention, where most negative value is a minimum and most positive is a maximum, is used in this data sheet.
- Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.
- Guaranteed by design.
- $\Delta R_{ON} = R_{ON \text{ max.}} - R_{ON \text{ min.}}$
- Flatness is defined as the difference between the maximum and minimum value of On-Resistance measured.
- Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25°C.
- Off Isolation = $20\log_{10} [V_{COM} / (V_{NO} \text{ or } V_{NC})]$. See Figure 4.
- Between any two switches. See Figure 5.

Electrical Specifications - Single +3.3V Supply

 ($V_{CC} = +3.3V \pm 10\%$, $GND = 0V$, $V_{IH} = 1.4V$, $V_{IL} = 0.5V$)

Description	Parameters	Test Conditions	Temp (°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units	
Logic Input								
Input High Voltage	V_{IH}	Guaranteed logic High Level	Full	1.4			V	
Input Low Voltage	V_{IL}	Guaranteed logic Low Level				0.5		
Input Current with Voltage High	I_{INH}	$V_{IN} = 1.4V$, all others = 0.5V		-1		1	μA	
Input Current with Voltage Low	I_{INL}	$V_{IN} = 0.5V$, all other = 1.4V		-1		1		
Dynamic								
Turn-On Time	t_{ON}	$V_{CC} = 3.3V$, V_{NO} or $V_{NC} = 2.0V$, Figure 1	25			20	ns	
			Full			25		
Turn-Off Time	t_{OFF}		25			12		
			Full			15		
Break-Before-Make	t_{BBM}	V_{NO} or $V_{NC} = 1.5V$, $R_L = 50\Omega$, $C_L = 35pF$, See Figure 8	25	1	12			
			Full	1				
Charge Injection ⁽³⁾	Q		$C_L = 1nF$, $V_{GEN} = 0V$, $R_{GEN} = 0\Omega$, Figure 2	25		100		pC
Off Isolation ⁽⁷⁾	O_{IRR}		$R_L = 50\Omega$, $f = 100KHz$, Figure 3			-27		dB
Cross Talk ⁽⁸⁾	X_{TALK}	$R_L = 50\Omega$, $f = 100KHz$, Figure 4			-41			
NC or NO Capacitance	$C_{(OFF)}$	$f = 1MHz$, Figure 5			56		pF	
COM Off Capacitance	$C_{COM(OFF)}$				56			
COM On Capacitance	$C_{COM(ON)}$		$f = 1MHz$, Figure 6			160		
Supply								
Power-Supply Range	V_{CC}		Full	1.5		3.6	V	
Positive Supply Current	I_{CC}	$V_{CC} = 3.6V$, $V_{IN} = 0V$ or V_{CC}	25			0.3	μA	

Notes:

- The algebraic convention, where most negative value is a minimum and most positive is a maximum, is used in this data sheet.
- Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.
- Guaranteed by design.
- $\Delta R_{ON} = R_{ON} \text{ max.} - R_{ON} \text{ min.}$
- Flatness is defined as the difference between the maximum and minimum value of On-Resistance measured.
- Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25°C.
- Off Isolation = $20\log_{10} [V_{COM} / (V_{NO} \text{ or } V_{NC})]$. See Figure 4.
- Between any two switches. See Figure 5.

Electrical Specifications - Single +2.5V Supply

($V_{CC} = +2.5V \pm 10\%$, $GND = 0V$, $V_{IH} = 1.4V$, $V_{IL} = 0.5V$)

Description	Parameters	Test Conditions	Temp.(°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units
Analog Switch							
Analog Signal Range ⁽³⁾	V_{ANALOG}			0		V_{CC}	V
On Resistance	R_{ON}	$V_{CC} = 2.5V$, $I_{COM} = 80mA$, V_{NO} or $V_{NC} = 1.8V$	25			0.5	Ω
			Full			0.55	
On-Resistance Match Between Channels ⁽⁴⁾	ΔR_{ON}		25			0.09	
			Full			0.09	
On-Resistance Flatness ⁽⁵⁾	$R_{FLAT(ON)}$	25			0.1		
		Full			0.1		
Dynamic							
Turn-On Time	t_{ON}	$V_{CC} = 2.5V$, V_{NO} or $V_{NC} = 1.8V$, Figure 1	25			20	ns
			Full			30	
Turn-Off Time	t_{OFF}		25			12	
			Full			15	
Break-Before-Make	t_{BBM}	V_{NO} or $V_{NC} = 1.5V$, $R_L = 50\Omega$, $C_L = 35pF$, See Figure 8	25	1	15		
Charge Injection ⁽³⁾	Q	$C_L = 1nF$, $V_{GEN} = 0V$, $R_{GEN} = 0V$, Figure 2	25		60		
Logic Input							
Input HIGH Voltage	V_{IH}	Guaranteed logic high level	Full	1.4			V
Input LOW Voltage	V_{IL}	Guaranteed logic Low level	Full			0.5	
Input HIGH Current	I_{INH}	$V_{IN} = 1.4V$, all others = 0.5V	Full	-1		1	μA
Input HIGH Current	I_{INL}	$V_{IN} = 0.5V$, all others = 1.4V	Full	-1		1	

Notes:

1. The algebraic convention, where most negative value is a minimum and most positive is a maximum, is used in this data sheet.
2. Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.
3. Guaranteed by design.
4. $\Delta R_{ON} = R_{ON} \text{ max.} - R_{ON} \text{ min.}$
5. Flatness is defined as the difference between the maximum and minimum value of On-Resistance measured.

Electrical Specifications - Single +1.8V Supply

($V_{CC} = +1.8V \pm 10\%$, $GND = 0V$, $V_{INH} = 1.4V$, $V_{INL} = 0.5V$)

Description	Parameters	Test Conditions	Temp.(°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units
Analog Switch							
Analog Signal Range ⁽³⁾	V_{ANALOG}			0		V_{CC}	V
On-Resistance	R_{ON}	$V_{CC} = 1.8V$, $I_{COM} = 60mA$, V_{NO} or $V_{NC} = 1.5V$	25			0.55	Ω
			Full			0.7	
On-Resistance Match Between Channels ⁽⁴⁾	ΔR_{ON}		25			0.03	
			Full			0.03	
On-Resistance Flatness ⁽⁵⁾	$R_{FLAT(ON)}$	$V_{CC} = 1.8V$, $I_{COM} = 60mA$, V_{NO} or $V_{NC} = 0.8V, 1.5V$	25			0.9	
			Full			1.1	
Dynamic							
Turn-On Time	t_{ON}	$V_{CC} = 1.8V$, V_{NO} or $V_{NC} = 1.5V$, Figure 1	25			40	ns
			Full			50	
Turn-Off Time	t_{OFF}		25			12	
			Full			15	
Break-Before-Make	t_{BBM}	V_{NO} or $V_{NC} = 1.5V$, $R_L = 50\Omega$, $C_L = 35pF$, See Figure 8	25	1	30		
Charge Injection ⁽³⁾	Q	$C_L = 1nF$, $V_{GEN} = 0V$, $R_{GEN} = 0V$, Figure 2	25		40		pC
Logic Input							
Input HIGH Voltage	V_{IH}	Guaranteed logic high level	Full	1.4			V
Input LOW Voltage	V_{IL}	Guaranteed logic Low level	Full			0.5	
Input HIGH Current	I_{INH}	$V_{IN} = 1.4V$, all others = 0.5V	Full	-1		1	μA
Input HIGH Current	I_{INL}	$V_{IN} = 0.5V$, all others = 1.4V	Full	-1		1	

Notes:

1. The algebraic convention, where most negative value is a minimum and most positive is a maximum, is used in this data sheet.
2. Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.
3. Guaranteed by design.
4. $\Delta R_{ON} = R_{ON} \text{ max.} - R_{ON} \text{ min.}$
5. Flatness is defined as the difference between the maximum and minimum value of On-Resistance measured.

Test Circuits/Timing Diagrams

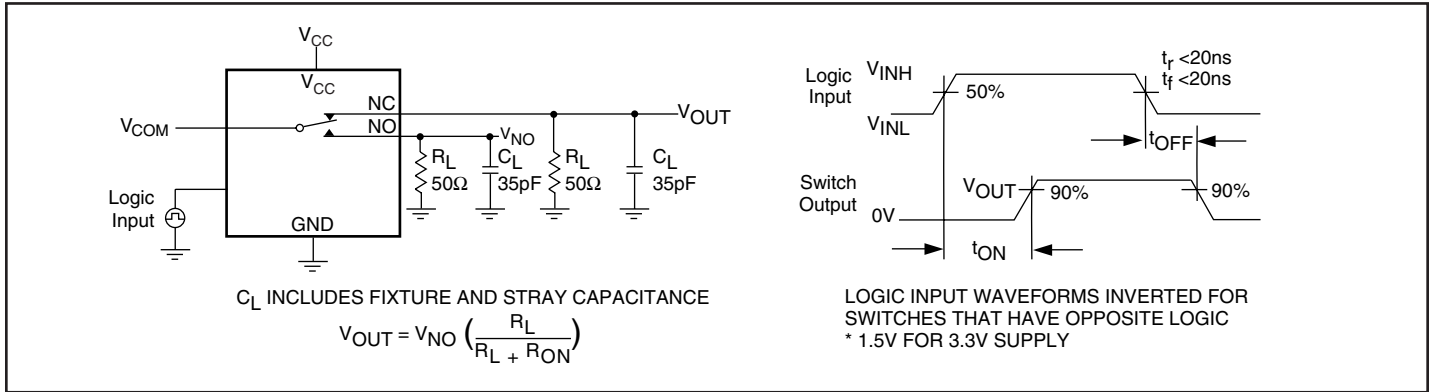


Figure 1. Switching Time

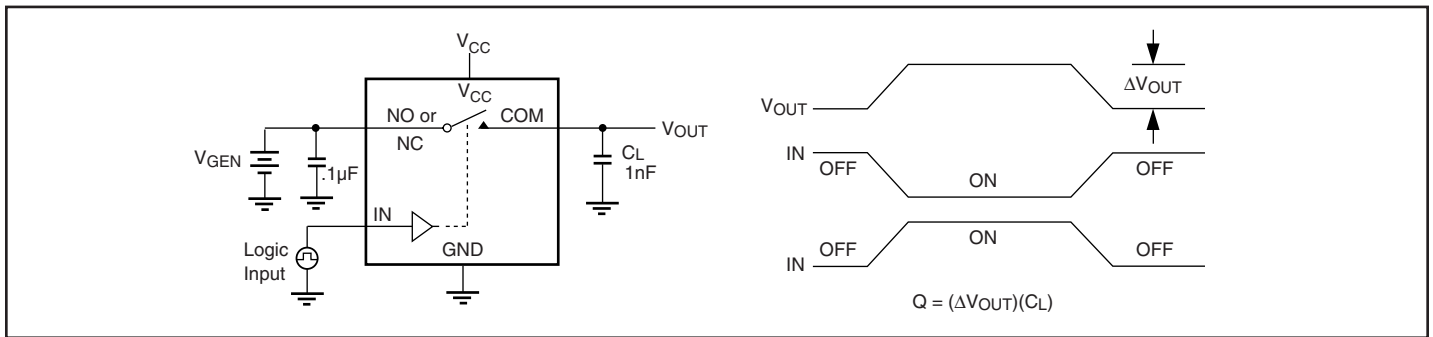


Figure 2. Charge Injection

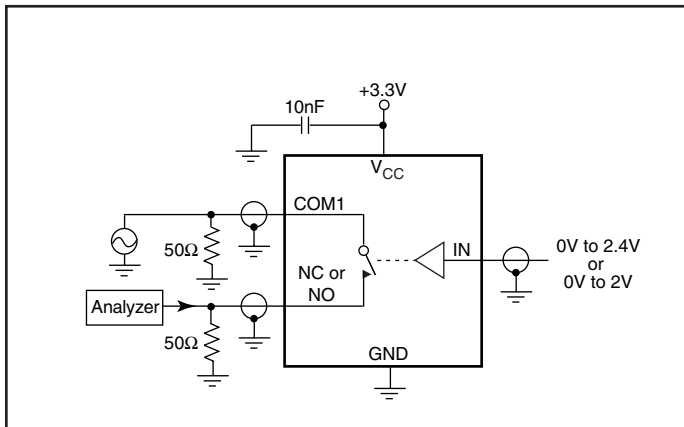


Figure 3. Off Isolation

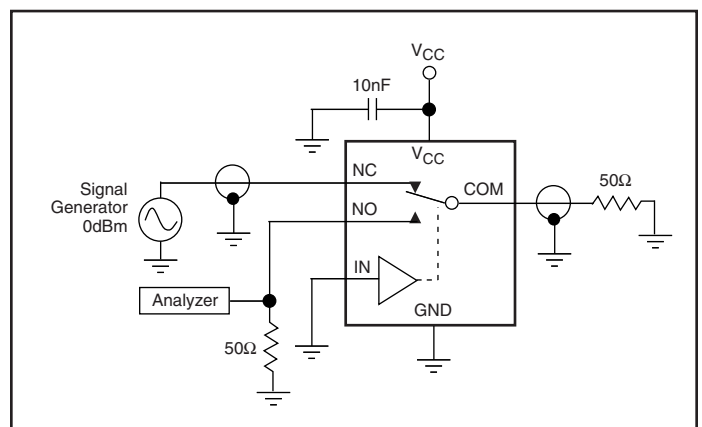


Figure 4. Crosstalk

Test Circuits/Timing Diagrams (continued)

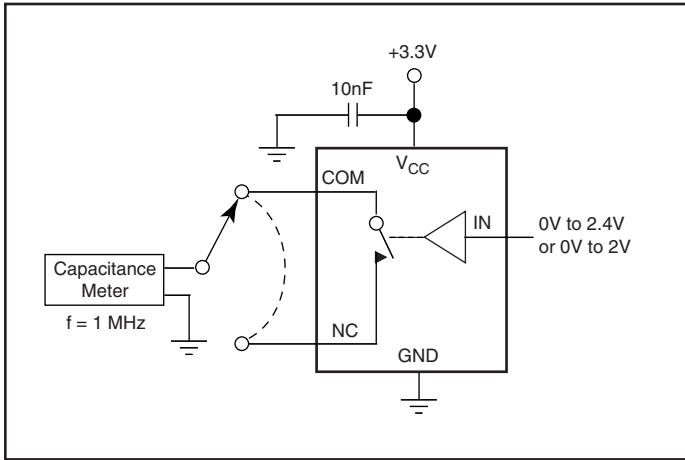


Figure 5. Channel-Off Capacitance

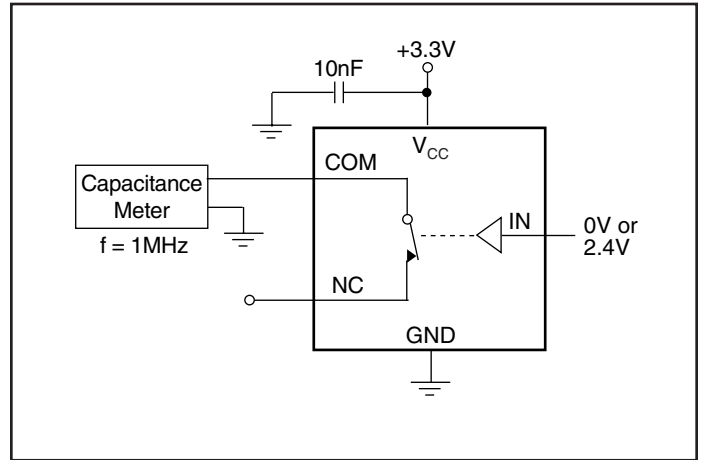


Figure 6. Channel-On Capacitance

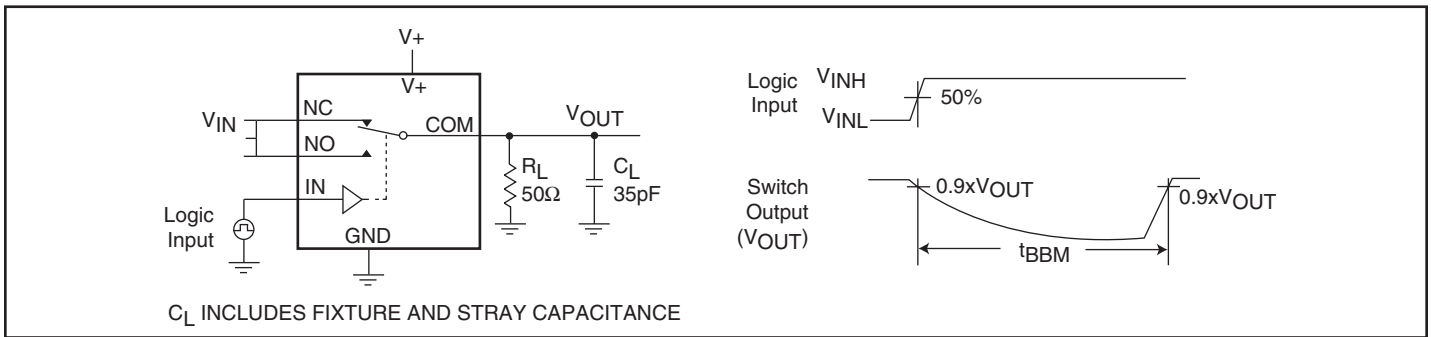
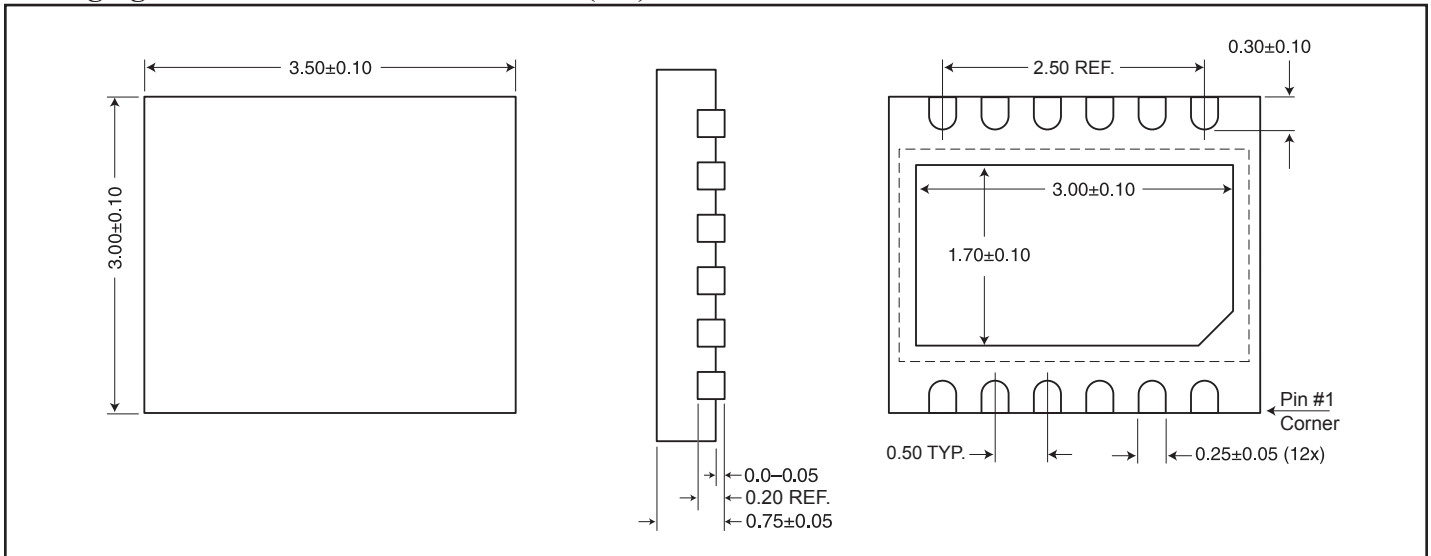
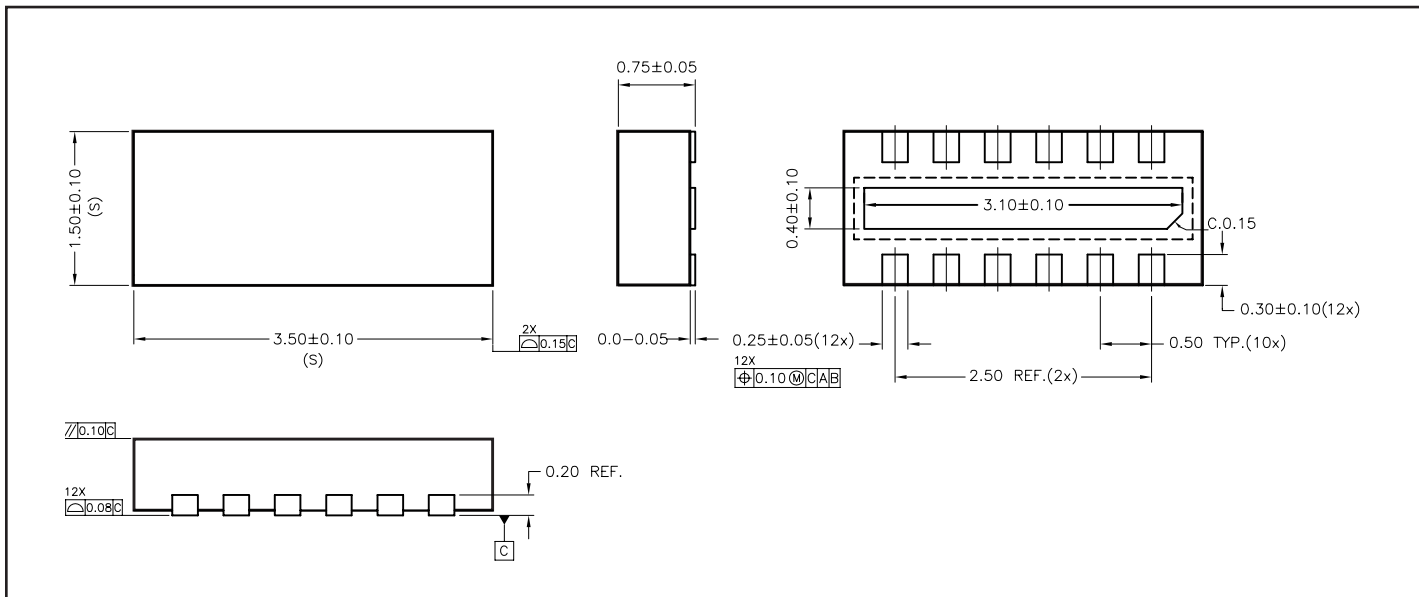


Figure 8. Break Before Make Diagram

Packaging Mechanical: 12-Contact TDFN (ZE)



Packaging Mechanical: 12-Contact TDFN (ZG)



Ordering Information

Ordering Code	Package Code	Package Description	Top Mark
PI3A3160ZEEX	ZE	Pb-free & Green, 12-contact TDFN	YI
PI3A3160ZGEX	ZG	Pb-free & Green, 12-contact TDFN	YI

Notes:

1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
2. X = Tape/Reel
3. Number of transistors = TBD