3.0V, SOTiny™ Single-Supply 0.4Ω SPST (NO) CMOS Analog Switch

Features

- Low On-Resistance: 0.4Ω Max (+2.7V Supply)
- 0.1Ω Max. On-Resistance Flatness at +25°C
- Fast Switching: 10ns Max.
- +1.5V to +3.6V Single-Supply Operation
- TTL/CMOS-Logic Compatible
- –25dB Off-Isolation at 100kHz
- 1nA Max. Off-Leakage at +25°C
- Packaging (Pb-free & Green available):
  – 5-pin Small Compact SOT23 (T)

Description

PI3A4626 is a single-pole/single-throw (SPST) normally open (NO) analog switch that operates from a single +1.5V to +3.6V supply.

The switch has 0.4Ω Max On-Resistance (R_{ON}), with 0.1Ω Max R_{ON} flatness over the analog signal range when powered from a +3.0V supply. Leakage currents are less than 2nA and fast switching times are less than 10ns.

To minimize PC board area use, the device is available in a small compact SOT23 package.

Applications

- Cellular Phones
- Communications Circuits
- Battery-Operated Equipment
- DSL Modems
- Audio and Video Signal Routing
- PCMCIA Cards

Pin Description

SOT23	Name	Function
1	COM	Analog Switch, Common
2	NO	Analog Switch, Normally Open
3	GND	Ground
4	IN	Digital Control Input
5	V_{DD}	Positive Supply Voltage
-	N.C.	No Internal Connection

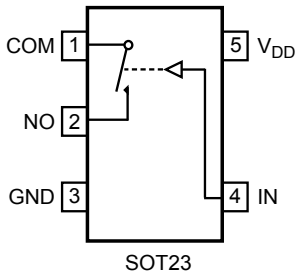
Note:
1. NO and COM pins are identical and interchangeable. Any pin may be considered as an input or an output; signals pass.

Truth Table

Input	Switch State
LOW	OFF
HIGH	ON

Block Diagrams/Pin Configurations

Top Views



SOT23

Absolute Maximum Ratings

Voltages Referenced to GND
V_{DD} ..... –0.5V to +3.6V
V_{IN}, V_{COM}, V_{NC}, V_{NO} (1) ..... –0.5V to V_{DD} +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/ºC above +70ºC) 0.5W
Storage Temperature ..... –65ºC to +150ºC
Lead Temperature (soldering, 10s) ..... +300ºC

Note:

1. Signals on NC, NO, COM, or IN exceeding V_{DD} 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 +3.3V Supply

(V_{DD} = +3.3V ± 10%, GND = 0V, V_{IH} = 1.4V, V_{IL} = 0.5V)

Description	Parameters	Test Conditions	Package	Temp.(°C)	Min.(1)	Typ.(2)	Max.(1)	Units
Analog Switch								
Analog Signal Range(3)	V_{ANALOG}			Full	0		V_{DD}	V
On Resistance	R_{ON}	V_{DD} = 2.7V, I_{COM} = 100mA, V_{NO} or V_{NC} = +1.5V		25			0.4	Ω
			SOT23	Full			0.5	
On-Resistance Match Between Channels(4)	ΔR_{ON}			25			0.05	
				Full			0.06	
On-Resistance Flatness(5)	$R_{FLAT(ON)}$	V_{DD} =2.7V I_{COM} = 100mA, V_{NO} or V_{NC} =0.8V, 2.0V		25			0.1	
				Full			0.1	
NO or NC Off Leakage Current(6)	$I_{COM(OFF)}$ or $I_{NC(OFF)}$	V_{DD} =3.3V, V_{COM} = 0V,V_{NO} or V_{NC} = +2.0V		25	–1		1	nA
				Full	–20		10	
COM On Leakage Current(6)	$I_{COM(ON)}$	V_{DD} =3.3V, V_{COM} = +2.0V, V_{NO} or V_{NC} = + 2.0V		25	–2		2	
				Full	–20		20	

Electrical Specifications - Single +3.3V Supply (continued)

(V_{DD} = + 3.3V ± 10%, GND = 0V, V_{IH} = 1.4V, V_{IL} = 0.5V)

Description	Parameters	Test Conditions	Temp (ºC)	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_{DD} = 3.3V, V_{NO} or V_{NC} = 2.0V, Figure 1	25			10	ns
			Full			10	
Turn-Off Time	t_{OFF}		25			10	
			Full			10	
Charge Injection(3)	Q	C_L = 1nF, V_{GEN} = 0V, R_{GEN} = 0Ω, Figure 2	25		50		pC
Off Isolation(7)	O_{IRR}	R_L = 50Ω, f = 100kHz, Figure 3			-25		dB
NC or NO Capacitance	$C_{(OFF)}$	f = 1 MHz, Figure 4			130		pF
COM Off Capacitance	$C_{COM(OFF)}$				130		
COM On Capacitance	$C_{COM(ON)}$	f = 1 MHz, Figure 4			270		
Supply							
Power Supply Range	V_{DD}		Full	1.5		3.6	V
Positve Supply Current	I_{CC}	V_{DD} = 3.6V, V_{IN} = 0V or V_{DD}				100	nA

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. $\Delta R_{ON} = R_{ON}$ Max. - R_{ON} Min.
5. Flatness is defined as the difference between the maximum and minimum value of On-Resistance measured.
6. Leakage parameters are 100% tested at maximum rated hot temperature and guaranteed by correlation at +25ºC.
7. Off Isolation = $20\log_{10}$ [V_{COM} / (V_{NO} or V_{NC})]. See Figure 3.

Electrical Specifications - Single +2.5V Supply

(V_{DD} = +2.5V ± 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_{DD}	V
On-Resistance	R_{ON}	V_{DD} = 2.5V, I_{COM} = –8mA, V_{NO} or V_{NC} = 1.8V	25			0.4	Ω
			Full			0.4	
On-Resistance Match Between Channels(4)	ΔR_{ON}	V_{DD} = 2.5V, I_{COM} = –8mA, V_{NO} or V_{NC} = 0.8V, 1.8V	25			0.05	
			Full			0.06	
On-Resistance Flatness(5)	$R_{FLAT(ON)}$		25			0.1	
			Full			0.1	
Dynamic							
Turn-On Time	t_{ON}	V_{DD} = 2.5V, V_{NO} or V_{NC} = 1.8V, Figure 1	25			10	ns
			Full			15	
Turn-Off Time	t_{OFF}		25			10	
			Full			10	
Charge Injection(3)	Q	C_L = 1nF, V_{GEN} = 0V, R_{GEN} = 0V, Figure 2	25		42		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. $\Delta R_{ON} = R_{ON}$ max. - R_{ON} min.
5. Flatness is defined as the difference between the maximum and minimum value of On-Resistance measured.

Electrical Specifications - Single +1.8V Supply

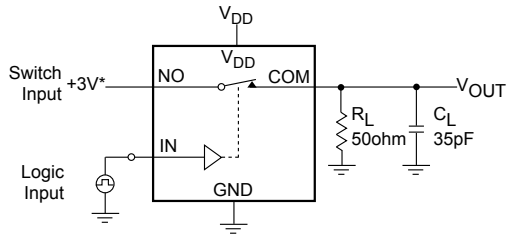
(V_{DD} = +1.8V ± 10%, GND = 0V, V_{IH} = 1.4V, V_{IL} = 0.5V)

Description	Parameters	Test Conditions	Temp.(°C)	Min.(1)	Typ.(2)	Max.(1)	Units
Analog Switch							
Analog Signal Range(3)	V_{ANALOG}			0		V_{DD}	V
On-Resistance	R_{ON}	V_{DD} = 1.8V, I_{COM} = –4mA, V_{NO} or V_{NC} = 1.5V	25			0.4	Ω
			Full			0.8	
On-Resistance Match Between Channels(4)	ΔR_{ON}	V_{DD} = 1.8V, I_{COM} = –4mA, V_{NO} or V_{NC} = 0.8V,1.5V	25			0.05	
			Full			0.06	
On-Resistance Flatness(5)	$R_{FLAT(ON)}$		25			0.4	
			Full			0.6	
Dynamic							
Turn-On Time	t_{ON}	V_{DD} = 1.8V, V_{NO} or V_{NC} = 1.5V, Figure 1	25			15	ns
			Full			15	
Turn-Off Time	t_{OFF}		25			10	
			Full			15	
Charge Injection(3)	Q	CL = 1nF, V_{GEN} = 0V, R_{GEN} = 0V, Figure 2	25		29		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:

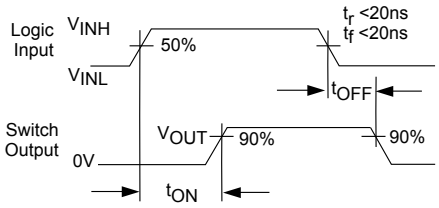
1. The algebraic convention, where most negative value is a minimum and most positive is a maximum, is used in this data sheet.
2. Typical values are for DESIGN AID ONLY, not guaranteed or subject to production testing.
3. Guaranteed by design.
4. $\Delta R_{ON} = R_{ON}$ max. - R_{ON} min.
5. Flatness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

Test Circuits/Timing Diagrams



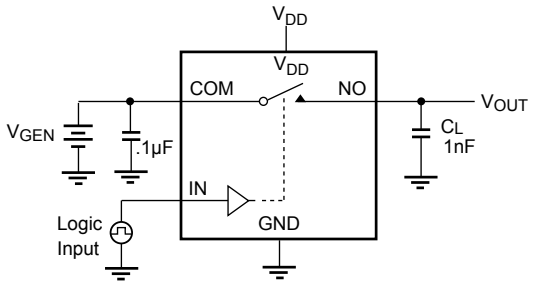
C_L INCLUDES FIXTURE AND STRAY CAPACITANCE

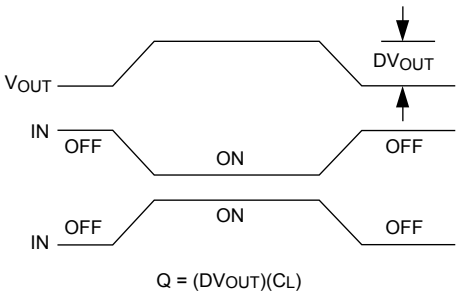
$$V_{OUT} = V_{NO}\left(\frac{R_L}{R_L + R_{ON}}\right)$$



LOGIC INPUT WAVEFORMS INVERTED FOR SWITCHES THAT HAVE OPPOSITE LOGIC
* 1.5V FOR 3.3V SUPPLY

Figure 1. Switching Time





$Q = (DV_{OUT})(C_L)$

Figure 2. Charge Injection

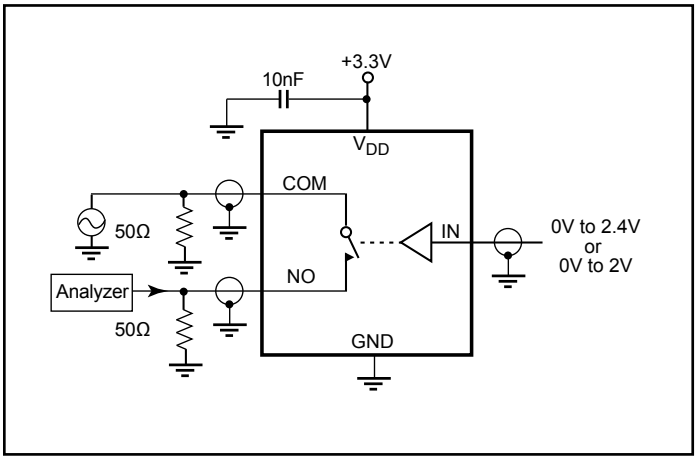


Figure 3. Off Isolation

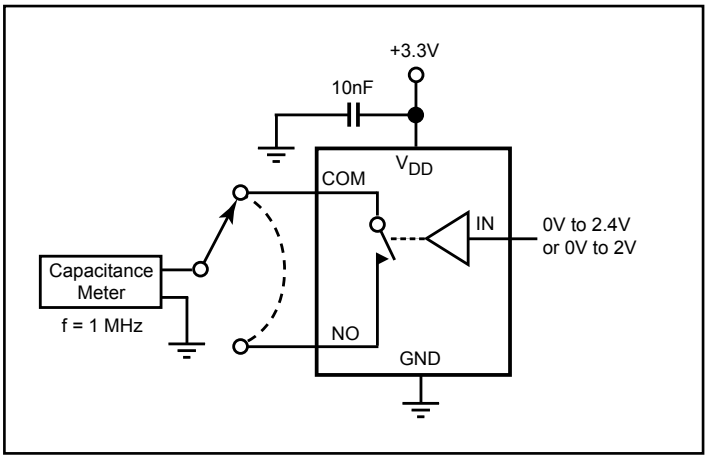
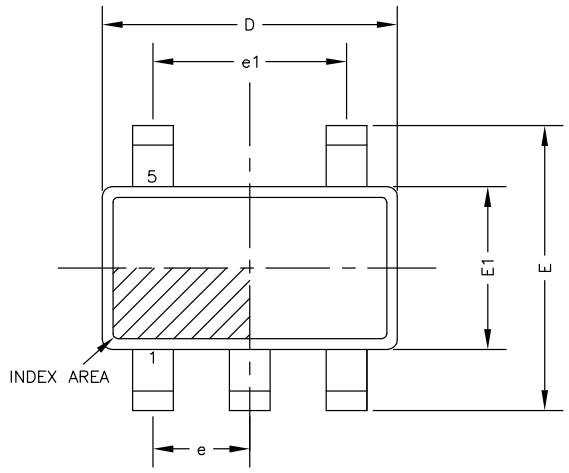
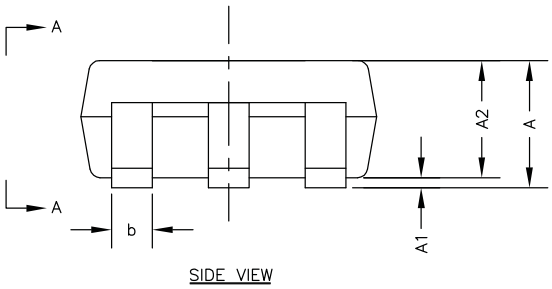


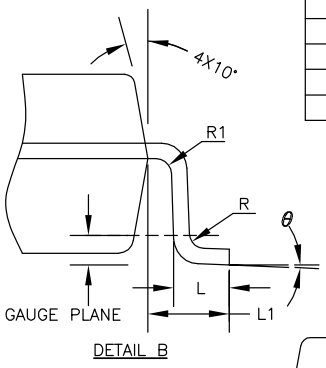
Figure 4. Channel On/Off Capacitance

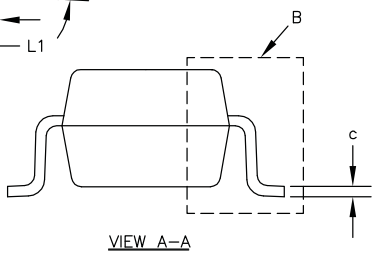
Packaging Mechanical: 5-Pin SOT23 (T)



SYMBOLS	MIN.	NOM.	MAX.
A	–	–	1.45
A1	0.00	–	0.15
A2	0.90	1.15	1.30
b	0.35	--	0.50
c	0.08	--	0.22
D	2.80	2.90	3.00
E	2.60	2.80	3.00
E1	1.50	1.60	1.75
L	0.30	0.45	0.60
L1	0.60 REF		
R	0.10	--	--
R1	0.10	--	0.25
θ	0°	4°	8°
e	0.95 BSC		
e1	1.90 BSC		







NOTE :
1. ALL DIMENSIONS IN MILLIMETERS. ANGLES IN DEGREES.
2. DIMENSIONS EXCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
3. REFER EIAJ SC74A AND JEDEC MO–178.

PERICOM® Enabling Serial Connectivity

DATE: 10/19/09

DESCRIPTION: 5-pin, Small Outline Transistor Plastic Package (SOT23)

PACKAGE CODE: T (T5)

DOCUMENT CONTROL #: PD-1911 REVISION: C

09-0130

Note:

- For latest package info, please check: http://www.pericom.com/products/packaging/mechanicals.php

Ordering Information

Ordering Code	Packaging Code	Package Description	Top Mark
PI3A4626TEX	T	Pb-free & Green, 5-pin Small Compact SOT23	ZD

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