

SOTINY™ Low-Voltage, Single-Supply, 1-Ohm SPST CMOS Analog Switches

Features

- 1-Ohm max. ON-Resistance
- 0.15-Ohm max. ON-Resistance Flatness at +25°C
- Fast Switching
 $t_{ON} = 50\text{ns max.}$
 $t_{OFF} = 50\text{ns max.}$
- +1.8V to +5.5V Single-Supply Operation
- TTL/CMOS-Logic Compatible
- -57dB Off-Isolation at 1MHz
- 4nA max. Off-Leakage at +25°C
- Package: 5-Pin SOT-23

Description

PI5A4626/PI5A4629, single-pole/single-throw (SPST) analog switches that operate from a single +1.8V to +5.5V supply, are normally open (NO). The PI5A4629 pinout is optimized for the highest SOT-23 package off-isolation available.

These switches have 1-ohm max ON-resistance (R_{ON}), with 0.12-ohm max R_{ON} flatness over the analog signal range when powered from a +5V supply. Leakage currents are 0.5nA and fast switching times are less than 50ns. They are packaged in a compact 5-pin SOT-23 package.

Applications

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

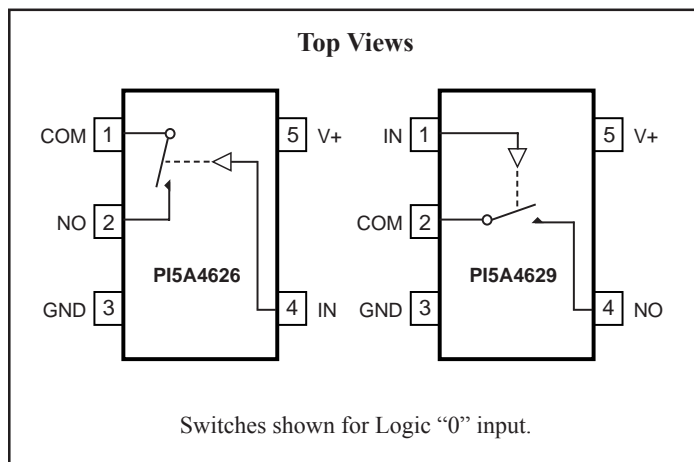
Pin Description

Pin		Name	Function
4626	4629		
1	2	COM	Analog Switch, Common
2	4	NO	Analog Switch, Normally Open
3	3	GND	Ground
4	1	IN	Digital Control Input
5	5	V+	Positive Supply Voltage

Note:

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

Functional Block Diagrams/Pin Configurations



Truth Table

Input	Switch State
	PI5A4626 / PI5A4629
LOW	OFF
HIGH	ON

Absolute Maximum Ratings

Voltages Referenced to GND

V+ -0.5V to +5.5V

V_{IN}, V_{COM}, V_{NC}, V_{NO} (Note 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

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.

Thermal Information

Continuous Power Dissipation

SOT-23 (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+ or GND are clamped by internal diodes. Limit forward diode current to 30mA.

Electrical Specifications - Single +5V Supply

(V+ = +5V ± 10%, GND = 0V, V_{INH} = 2.4V, V_{INL} = 0.8V)

Parameter	Description	Test Conditions	Temp.(°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units
Analog Switch							
Analog Signal Range ⁽³⁾	V _{ANALOG}		Full	0		V+	V
On Resistance	R _{ON}	V+ = 4.5V, I _{COM} = -30mA, V _{NO} or V _{NC} = -2.5V	25		0.5	0.9	Ohm
			Full			1.1	
On-Resistance Match Between Channels ⁽⁴⁾	ΔR _{ON}		25		0.03	0.05	
			Full			0.10	
On-Resistance Flatness ⁽⁵⁾	R _{FLAT(ON)}	V+ = 5V, I _{COM} = -30mA, V _{NO} or V _{NC} = 1V, -2.5V, 4V	25		0.08	0.12	
			Full			0.15	
NO or NC Off Leakage Current ⁽⁶⁾	I _{COM(OFF)} or I _{NC(OFF)}	V+ = 5.5V, V _{COM} = 0V, V _{NO} or V _{NC} = 4.5V	25	2	0.01	2	nA
			Full	-20		20	
COM On Leakage Current ⁽⁶⁾	I _{COM(ON)}	V+ = 5.5V, V _{COM} = +4.5 V _{NO} or V _{NC} = +4.5V	25	-4		4	
			Full	-40	0.3	40	

Electrical Specifications - Single +5V Supply (continued)

(V+ = + 5V ± 10%, GND = 0V, VINH = 2.4V, VINL = 0.8V)

Parameter	Symbol	Conditions	Temp(°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units	
Logic Input								
Input High Voltage	V _{IH}	Guaranteed logic High Level	Full	2.4			V	
Input Low Voltage	V _{IL}	Guaranteed logic Low Level				0.8		
Input Current with Voltage High	I _{INH}	V _{IN} = 2.4V, all others = 0.8V		−1	0.005	1	μA	
Input Current with Voltage Low	I _{INL}	V _{IN} = 0.8V, all others = 2.4V		−1	0.005	1		
Dynamic								
Turn-On Time	t _{ON}	V+= 5V, V _{NO} or V _{NC} = 2.5V, Figure 1	25		20	35	ns	
			Full			40		
Turn-Off Time	t _{OFF}		25		15	20		
			Full			35		
Charge Injection ⁽³⁾	Q	C _L = 1nF, V _{GEN} = 0V, R _{GEN} = 0 Ohm, Figure 2	25		40		pC	
Off Isolation	OIRR	R _L = 50 Ohms, f = 1MHz, Figure 3			−57		dB	
Crosstalk ⁽⁸⁾	X _{TALK}	R _L = 50 Ohms, f = 1MHz, Figure 4			−57			
NC or NO Capacitance	C _(OFF)	f = 1MHz, Figure 5			83		pF	
COM Off Capacitance	C _{COM(OFF)}				83			
COM On Capacitance	C _{COM(ON)}	f = 1MHz, Figure 6			170			
Supply								
Power-Supply Range	V+	V _{CC} = 5.5V, V _{IN} = 0V or V+	Full	1.8		5.5	V	
Positive Supply Current	I+				0.5	1	μA	

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. ΔRON = RON max. - RON 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 +25°C.
7. Off Isolation = 20log₁₀ [V_{COM} / (V_{NO} or V_{NC})]. See Figure 3.
8. Between any two switches. See Figure 4.

Electrical Specifications - Single +3.3V Supply

(V+ = +3.3V ± 10%, GND = 0V, V_{INH} = 2.0V, V_{INL} = 0.6V)

Parameter	Description	Test Conditions	Temp.(°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units	
Analog Switch								
Analog Signal Range ⁽³⁾	V _{ANALOG}			0		V+	V	
On Resistance	R _{ON}	V+=3V, I _{COM} = −24mA, V _{NO} or V _{NC} = 2.0V	25		1.0	1.8	Ohm	
			Full			2.2		
On-Resistance Match Between Channels ⁽⁴⁾	Δ R _{ON}	V+=3.3V, I _{COM} = −24mA, V _{NO} or V _{NC} = 0.8V, 2.0V	25		0.04	0.5		
			Full		0.11			
On-Resistance Flatness ^(3,5)	R _{FLAT(ON)}		25		0.17	0.2		
			Full		0.25			
Dynamic								
Turn-On Time	t _{ON}		V+=3.3V, V _{NO} or V _{NC} = 2.0V, Figure 1	25		30	40	ns
		Full				55		
Turn-Off Time	t _{OFF}	25			20	25		
		Full				40		
Charge Injection ⁽³⁾	Q	C _L = 1nF, V _{GEN} = 0V, R _{GEN} = 0V, Figure 2	25		30		pC	
Supply								
Positive Supply Current	I+	V+=3.6V, V _{IN} = 0V or V+ All channels on or off	Full		0.5	1	μA	
Logic Input								
Input HIGH Voltage	V _{IH}	Guaranteed logic high level	Full	2			V	
Input LOW Voltage	V _{IL}	Guaranteed logic Low level	Full			0.6		
Input HIGH Current	I _{INH}	V _{IN} =2.4V, all others = 0.8V	Full	−1		1	μA	
Input HIGH Current	I _{INL}	V _{IN} =0.8V, all others =2.4V	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. ΔR_{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 +2.5V Supply

(V+ = +2.5V ± 10%, GND = 0V, V_{INH} = 1.8V, V_{INL} = 0.6V)

Paramenter	Description	Test Conditions	Temp.(°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units	
Analog Switch								
Analog Signal Range ⁽³⁾	V _{ANALOG}			0		V+	V	
On Resistance	R _{ON}	V+=2.5V, I _{COM} = −8mA, V _{NO} or V _{NC} = 1.8V	25		1.5	2	Ohm	
			Full			2.7		
On-Resistance Match Between Channels ⁽⁴⁾	Δ R _{ON}	V+=2.5V, I _{COM} = −8mA, V _{NO} or V _{NC} = 0.8V,1.8V	25		0.13	0.16		
			Full		0.2			
On-Resistance Flatness ^(3,5)	R _{FLAT(ON)}		25		0.25	0.3		
			Full		0.45			
Dynamic								
Turn-On Time	t _{ON}		V+=2.5V, V _{NO} or V _{NC} = 1.8V, Figure 1	25		40	55	ns
		Full				70		
Turn-Off Time	t _{OFF}	25			30	40		
		Full				55		
Charge Injection ⁽³⁾	Q	C _L = 1nF, V _{GEN} = 0V, R _{GEN} = 0V, Figure 2	25		20		pC	
Supply								
Positive Supply Current	I+	V+=2.75V, V _{IN} = 0V or V+ All channels on or off	Full		0.5	1	μA	
Logic Input								
Input HIGH Voltage	V _{IH}	Guaranteed logic high level	Full	1.8			V	
Input LOW Voltage	V _{IL}	Guaranteed logic Low level	Full			0.6		
Input HIGH Current	I _{INH}	V _{IN} =2.0V, all others = 0.8V	Full	−1		1	μA	
Input HIGH Current	I _{INL}	V _{IN} =0.8V, all others =2.0V	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. ΔR_{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+ = +1.8V ± 10%, GND = 0V, V_{INH} = 1.5V, V_{INL} = 0.6V)

Parameter	Description	Test Conditions	Temp.(°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units	
Analog Switch								
Analog Signal Range ⁽³⁾	V _{ANALOG}			0		V+	V	
On Resistance	R _{ON}	V+=1.8V, I _{COM} = −2mA, V _{NO} or V _{NC} = 1.5V	25		2.0	4	Ohm	
			Full			5		
On-Resistance Match Between Channels ⁽⁴⁾	ΔR _{ON}	V+=1.8V, I _{COM} = −2mA, V _{NO} or V _{NC} = 0.6V,1.5V	25		0.44	0.6		
			Full		0.7			
On-Resistance Flatness ^(3,5)	R _{FLAT(ON)}		25		0.5	0.6		
			Full		0.9			
Dynamic								
Turn-On Time	t _{ON}		V+=1.8V, V _{NO} or V _{NC} = 1.5V, Figure 1	25		65	70	ns
		Full				95		
Turn-Off Time	t _{OFF}	25			40	55		
		Full				70		
Charge Injection ⁽³⁾	Q	C _L = 1nF, V _{GEN} = 0V, R _{GEN} = 0V, Figure 2	25		10		pC	
Supply								
Positive Supply Current	I+	V+=2.0V, V _{IN} = 0V or V+ All channels on or off	Full		0.5	1	μA	
Logic Input								
Input HIGH Voltage	V _{IH}	Guaranteed logic high level	Full	1.5			V	
Input LOW Voltage	V _{IL}	Guaranteed logic Low level	Full			0.6		
Input HIGH Current	I _{INH}	V _{IN} =1.5V, all others = 0.8V	Full	−1		1	μA	
Input HIGH Current	I _{INL}	V _{IN} =0.8V, all others =1.5V	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. ΔR_{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

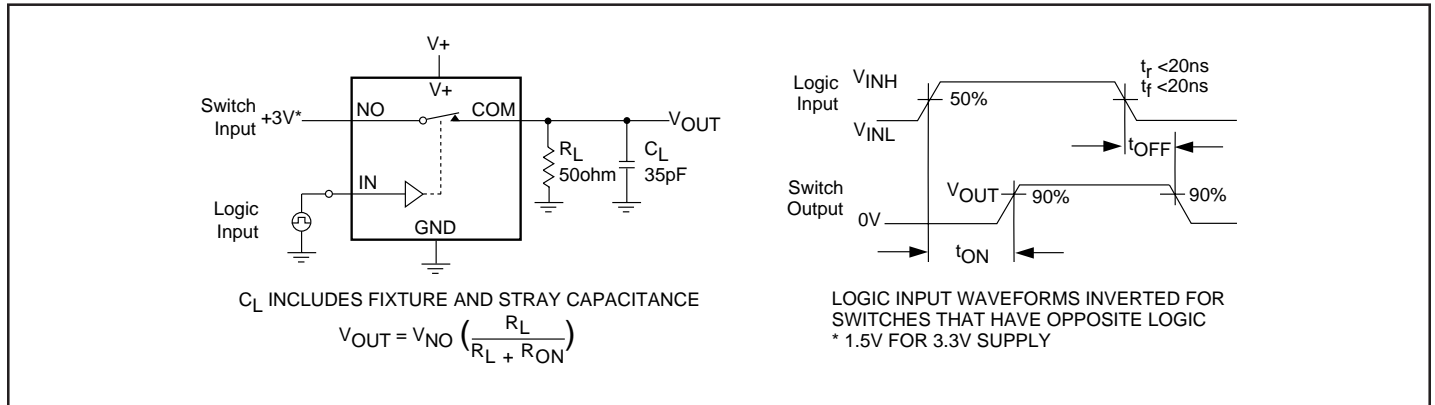


Figure 1. Switching Time

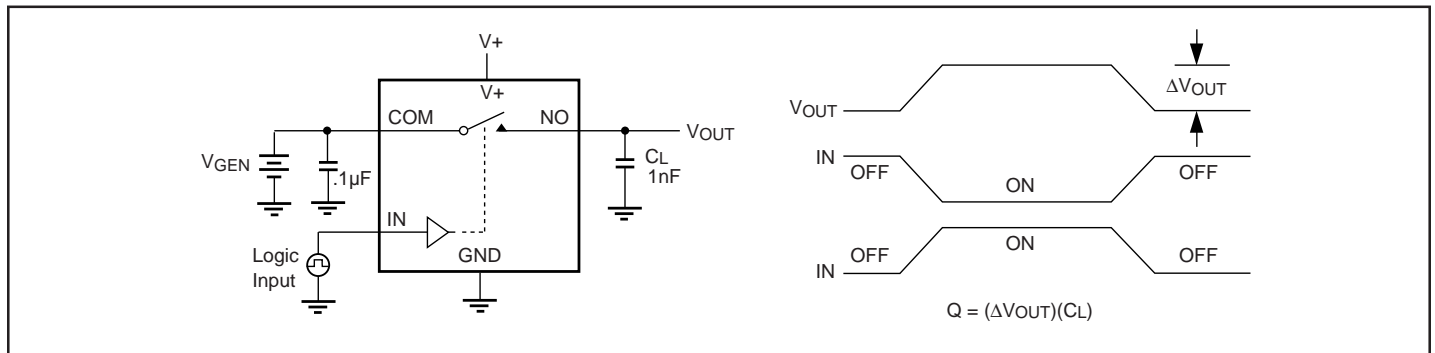


Figure 2. Charge Injection

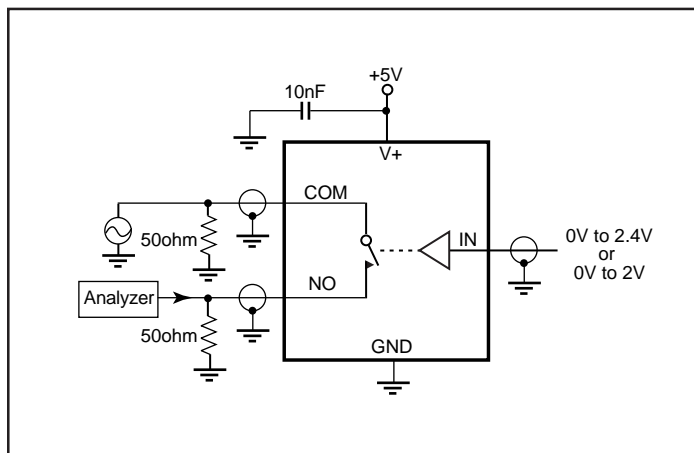


Figure 3. Off Isolation/On-Channel Bandwidth

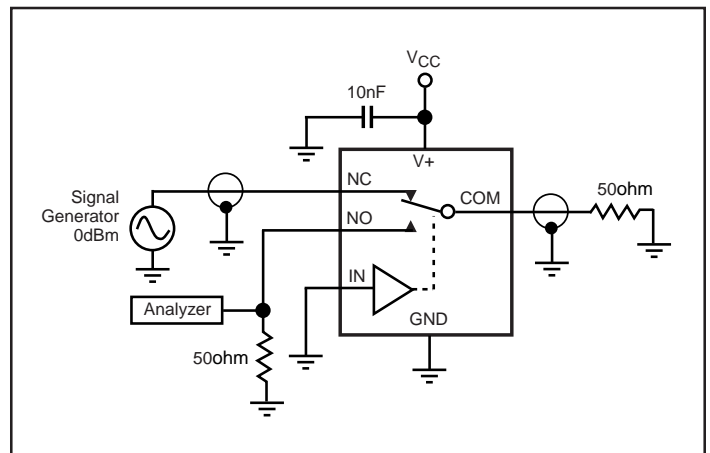


Figure 4. Crosstalk

Test Circuits/Timing Diagrams (continued)

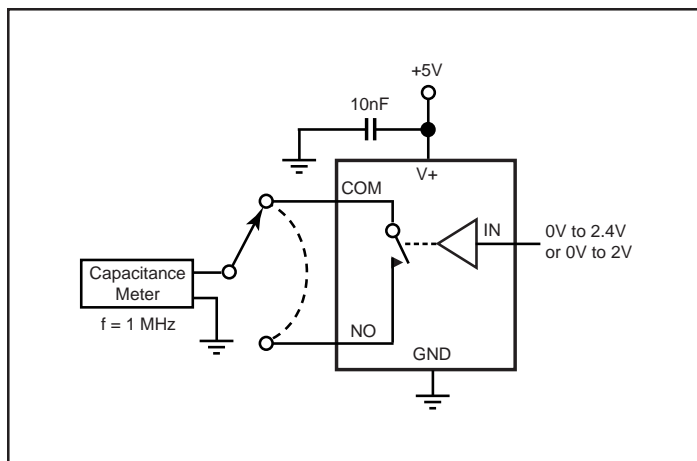


Figure 5. Channel On/Off Capacitance

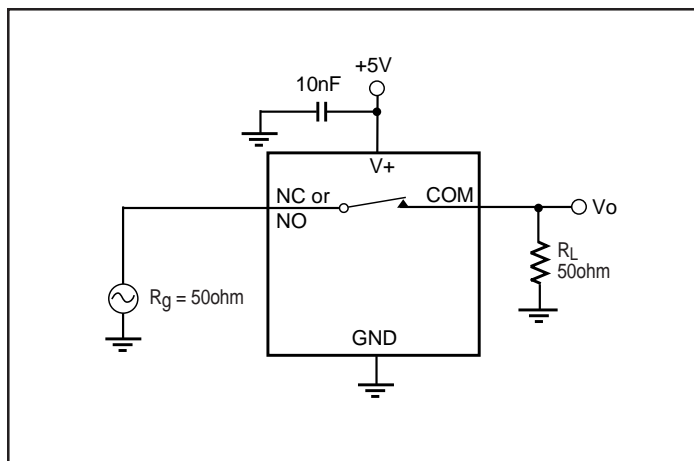
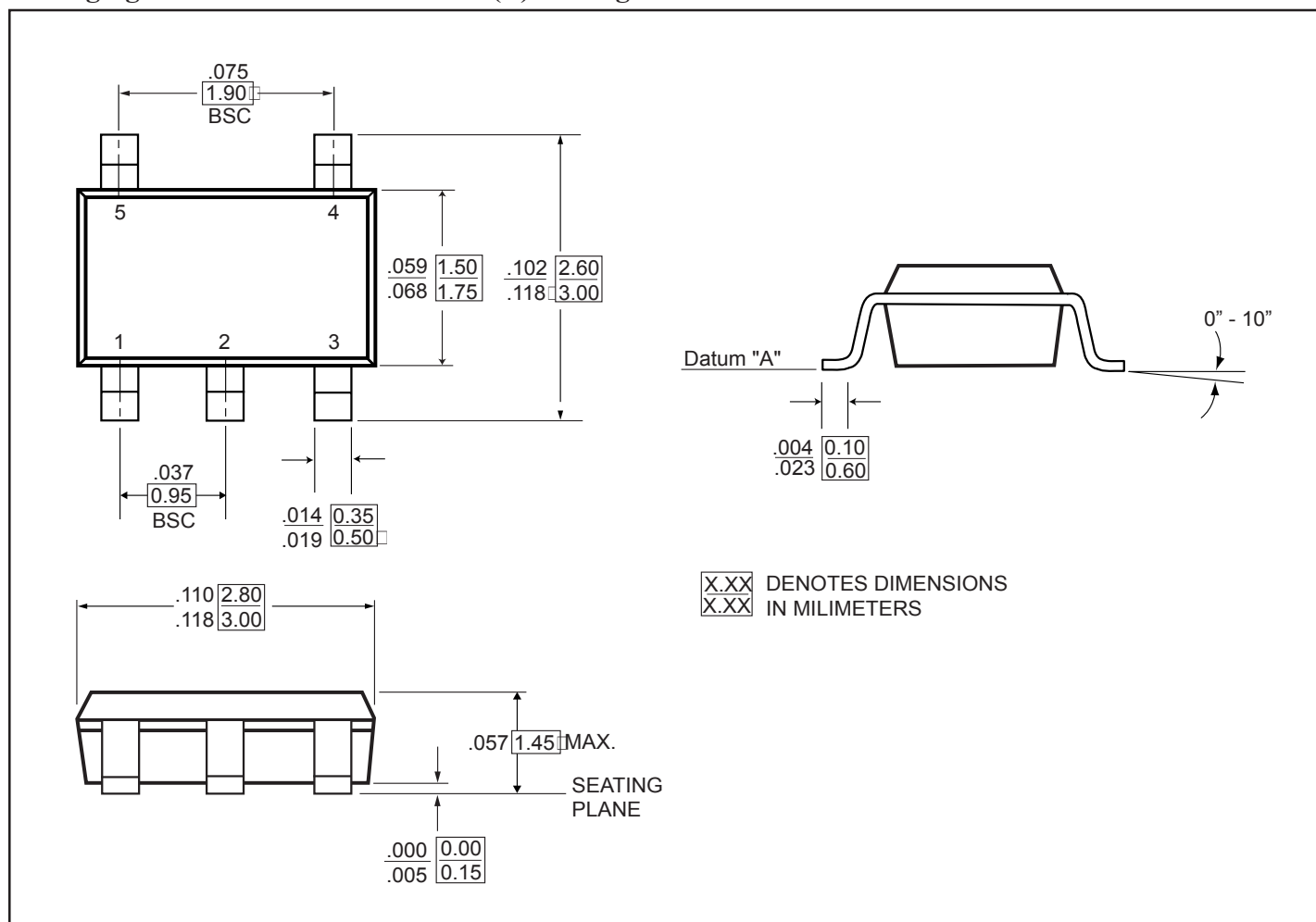


Figure 6. Bandwidth

Packaging Mechanical: 5-Pin SOT-23 (T) Package



Thermal Characteristics can be found on the world wide web at : <http://www.pericom.com/packaging/mechanicals.php>
 Number of transistors: 604 (both devices)

Ordering Information

Part Number	Package	Package Top Mark
PI5A4626TX	SOT-23	A1A
PI5A4629TX		A1D