

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

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

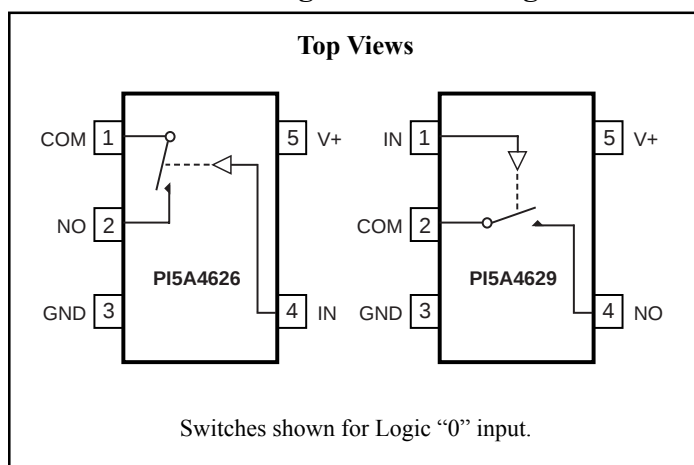
Pin Description

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

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.

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 +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:

- 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.
- ΔR_{ON} = R_{ON} max. - R_{ON} 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 = 20log₁₀ [V_{COM} / (V_{NO} or V_{NC})]. See Figure 3.
- 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

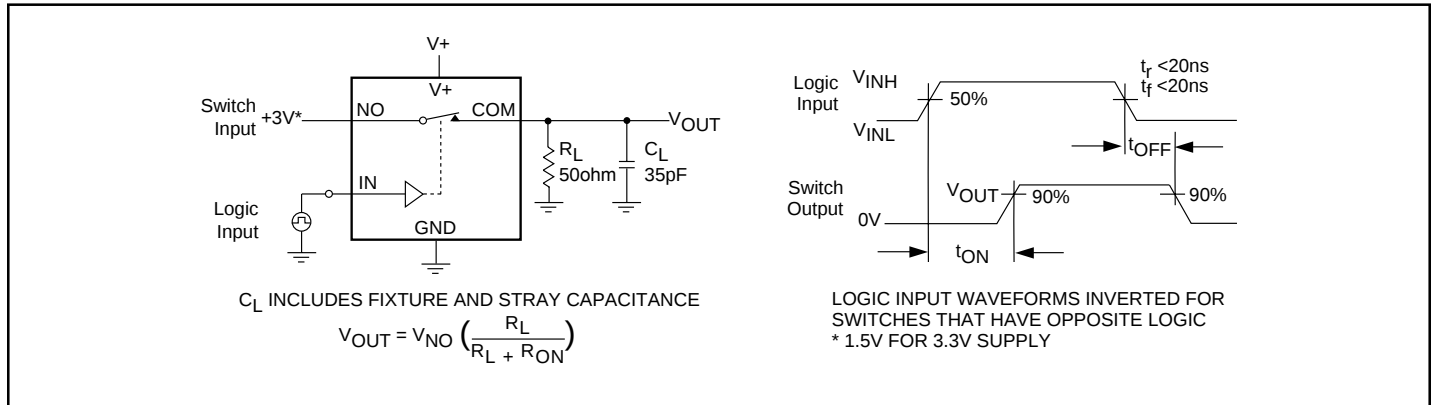


Figure 1. Switching Time

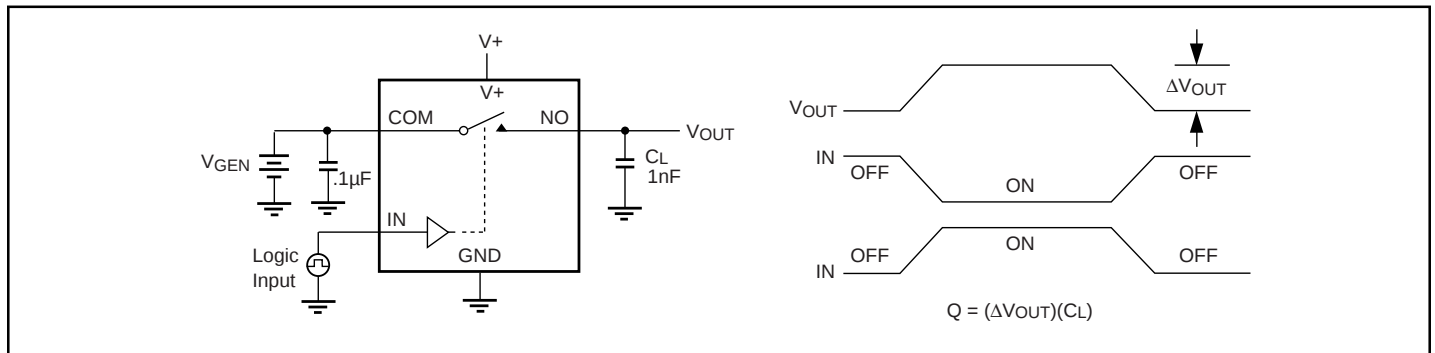


Figure 2. Charge Injection

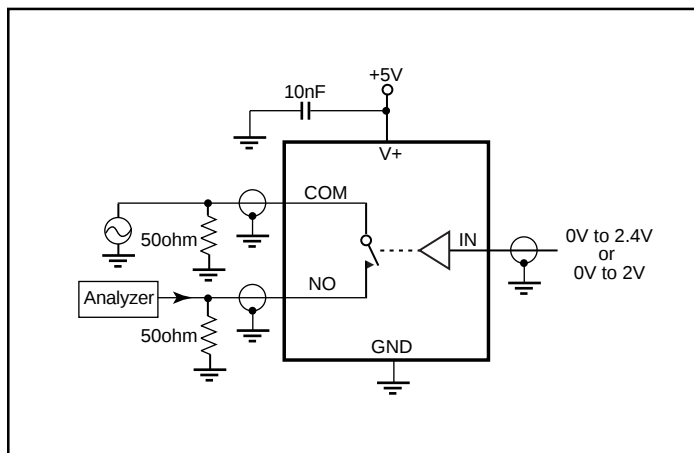


Figure 3. Off Isolation/On-Channel Bandwidth

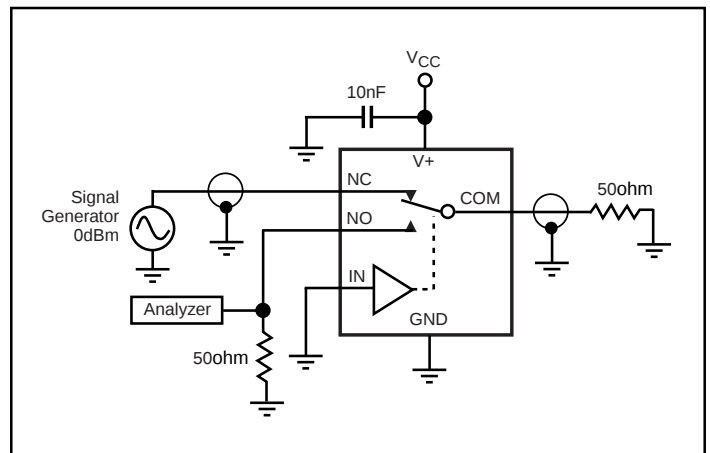


Figure 4. Crosstalk

Test Circuits/Timing Diagrams (continued)

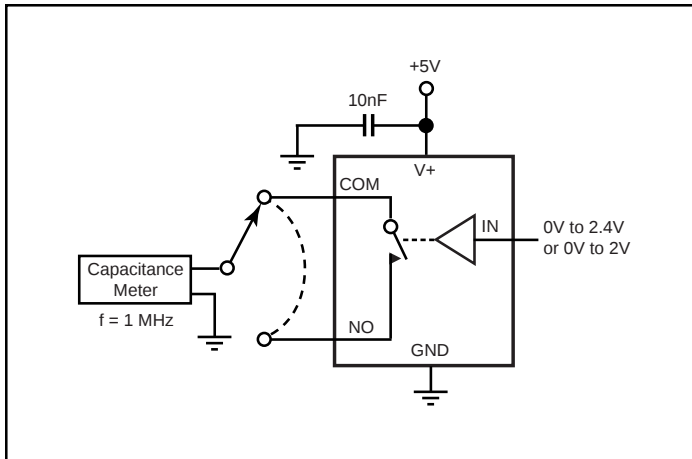


Figure 5. Channel On/Off Capacitance

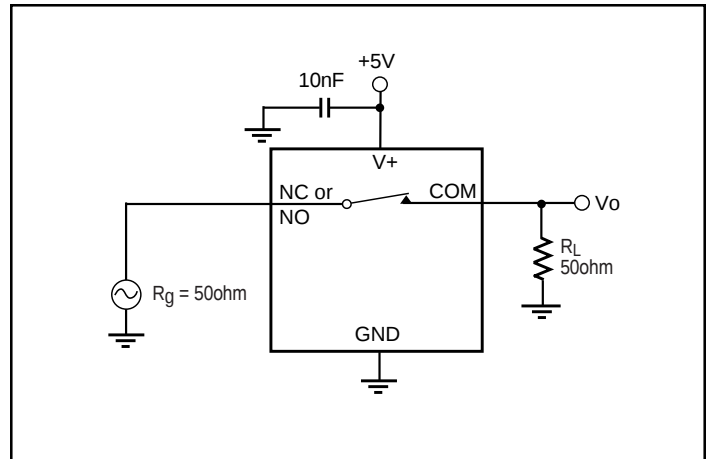
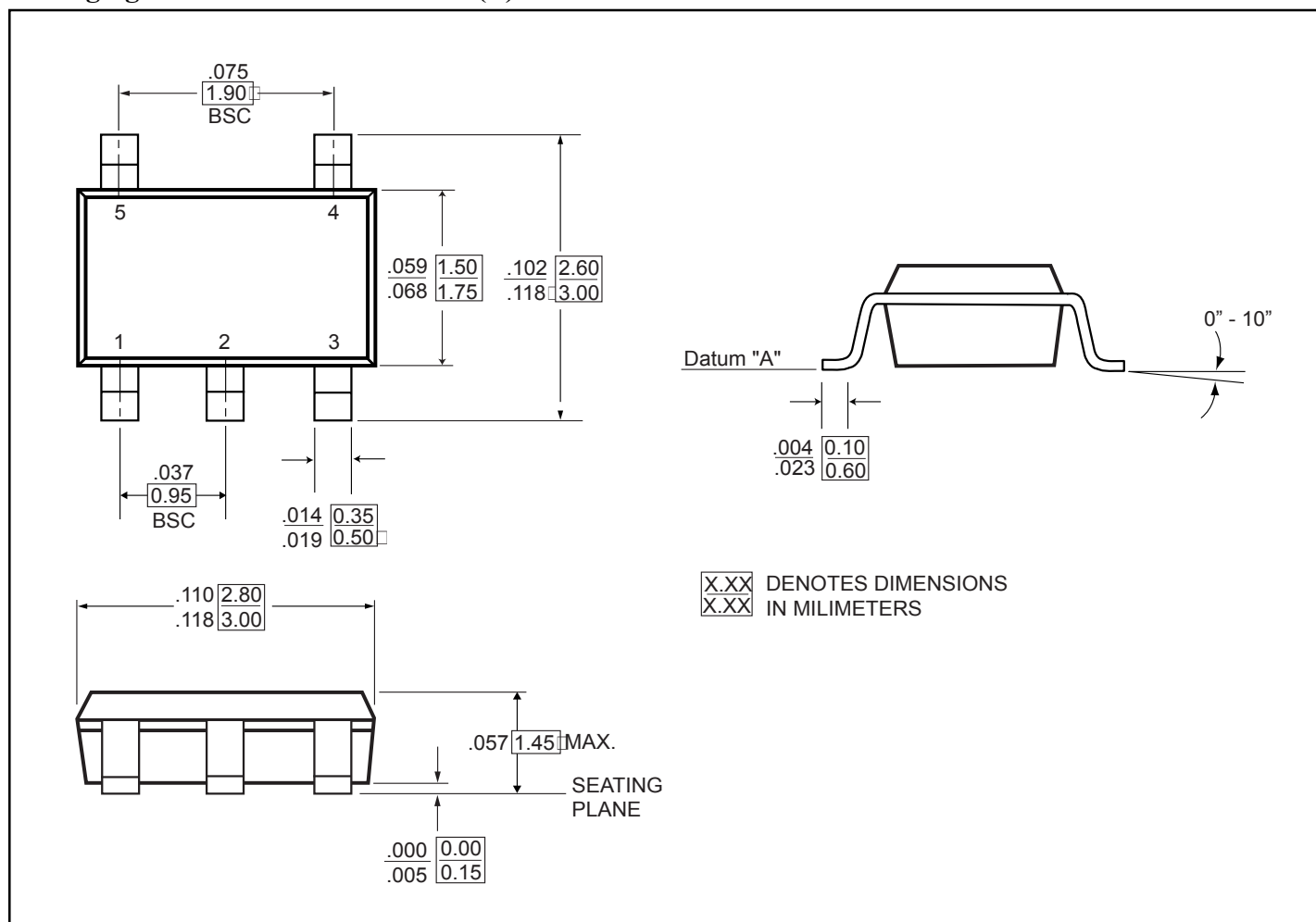


Figure 6. Bandwidth

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

Ordering Information

Ordering Code	Package Code	Package Description	Top Marking
PI5A4626TX	T	5-pin SOT-23	ZI
PI5A4629TX	T	5-pin SOT-23	ZH

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- X = Tape and reel
- Number of transistors: 604 (both devices)