

3.0V, SOT_{INY}TM 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.
- +1.5 V to +3.6V Single-Supply Operation
- TTL/CMOS-Logic Compatible
- -25dB Off-Isolation at 100KHz
- 1nA Max. Off-Leakage at +25°C
- Packaging (available Pb-free):
 - 6-pin Small Compact SOT-23
 - 6-contact Ultra Compact Thin Dual in-line Flat No Lead TDFN

Applications

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

Pin Description

Pin Number	Name	Description
1	COM	Analog Switch, Common
2	NO	Analog Switch, Normally Open
3	GND	Ground
4	$\overline{\text{IN}}$	Digital Control Input
5	IN	Digital Control Input
6	V _{CC}	Positive Supply Voltage

Note:

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

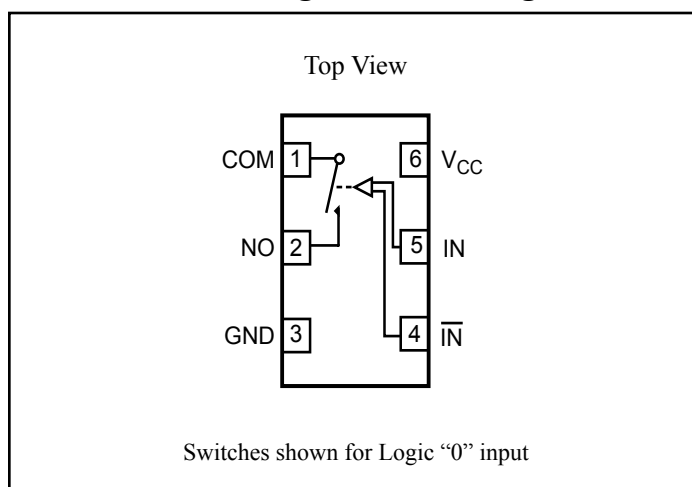
Description

PI3A4628 is a single-pole/single-throw (SPST) normally open (NO) analog switch that operates from a single +1.5V to +3.6V supply. The device has two control inputs.

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 the ultra compact TDFN and the small compact SOT-23 packages.

Functional Block Diagrams/Pin Configurations



Truth Table

$\overline{\text{IN}}$	IN	Switch State
1	0	OFF
1	1	OFF
0	0	ON
0	1	ON

Absolute Maximum Ratings

Voltages Referenced to GND

V_{CC} -0.5V to +3.6V

V_{IN}, V_{COM}, V_{NC}, V_{NO} (Note 1) -0.5V to V_{CC} +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_{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 +3.3V Supply

(V_{CC} = +3.3V ± 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	Ω
			Full			0.4	
On-Resistance Match Between Channels ⁽⁴⁾	ΔR _{ON}		25			0.05	
			Full			0.06	
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	
			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	-1		1	nA
			Full	-20		10	
COM On Leakage Cur- rent ⁽⁶⁾	I _{COM(ON)}	V _{CC} = 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) ($V_{CC} = +3.3V \pm 10\%$, $GND = 0V$, $V_{IH} = 1.4V$, $V_{IL} = 0.5V$)

Parameter	Symbol	Conditions	Temp. (°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units
Logic Input							
Input High Voltage	V _{IH}	Guaranteed Logic High Level	Full	1.4			V
Input Low Voltage	V _{IL}	Guaranteed Logic LowLevel				0.5	
Input Current with Volt- age High	I _{INH}	V _{IN} = 1.4V, all others = 0.5V		−1		1	μA
Input Current with Volt- age Low	I _{INL}	V _{IN} = 0.5V, all others = 1.4V		−1		1	
Dynamic							
Turn-On-Time	t _{ON}	V _{CC} = 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 = 100 KHz, Figure 4			-25		dB
NC or NO Capacitance	C _{NC/NO (OFF)}	f = 1MHz, Figure 5			130		pF
COM Off Capacitance	C _{COM (OFF)}				130		
COM On Capacitance	C _{COM (ON)}	f = 1MHz, Figure 6			270		
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}				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. $\Delta R_{ON} = R_{ON} \text{ Max.} - R_{ON} \text{ Min.}$
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 = $20\log_{10} [V_{COM} / (V_{NO} \text{ or } V_{NC})]$. See Figure 3.

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

Parameter	Symbol	Conditions	Temp. (°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units	
Analog Switch								
Analog Signal Range ⁽³⁾	V _{ANALOG}			0		V _{CC}	V	
On-Resistance	R _{ON}	V _{CC} = 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 _{CC} = 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 _{CC} = 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 LowLevel	Full			0.5		
Input High Current	I _{INH}	V _{IN} = 1.4V, all others = 0.5V	Full	−1		1	μA	
Input Low 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 ($V_{CC} = +1.8V \pm 10\%$, $GND = 0V$, $V_{IH} = 1.4V$, $V_{IL} = 0.5V$)

Parameter	Symbol	Conditions	Temp. (°C)	Min. ⁽¹⁾	Typ. ⁽²⁾	Max. ⁽¹⁾	Units
Analog Switch							
Analog Signal Range ⁽³⁾	V _{ANALOG}			0		V _{CC}	V
On-Resistance	R _{ON}	V _{CC} = 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 _{CC} = 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 _{CC} = 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	C _L -1nF, V _{GEN} = 0V, R _{GEN} = 0Ω, 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 LowLevel	Full			0.5	
Input High Current	I _{INH}	V _{IN} = 1.4V, all others = 0.5V	Full	−1		1	μA
Input Low 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

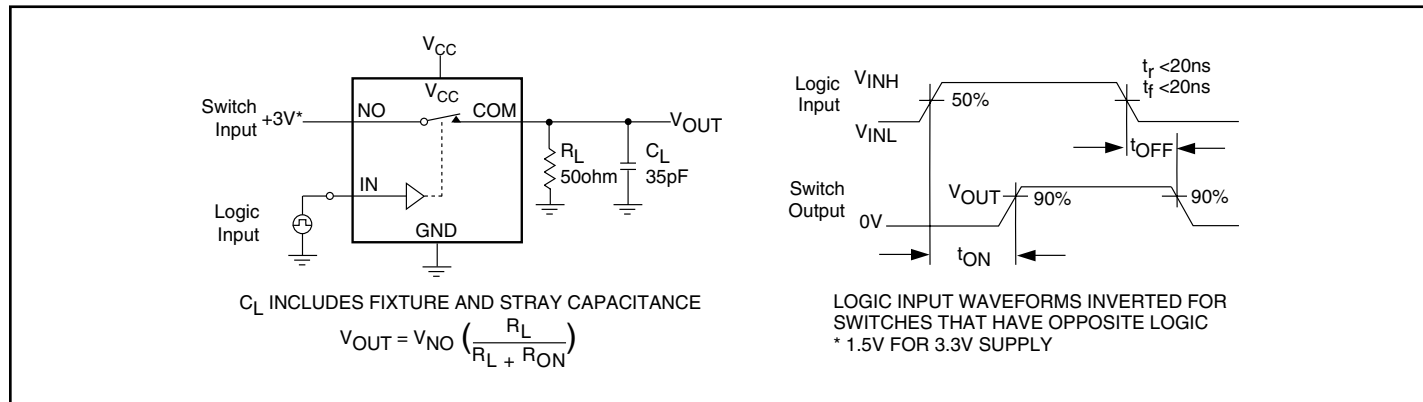


Figure 1. Switching Time

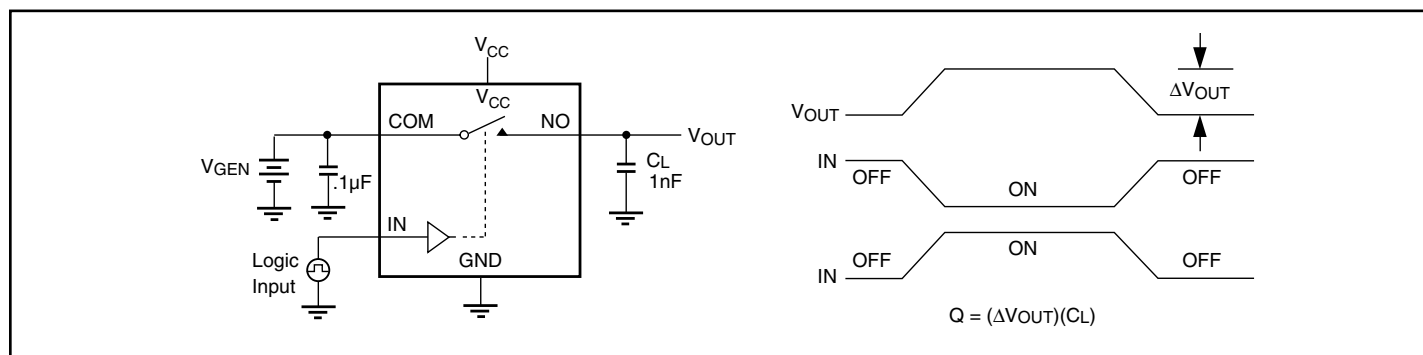


Figure 2. Charge Injection

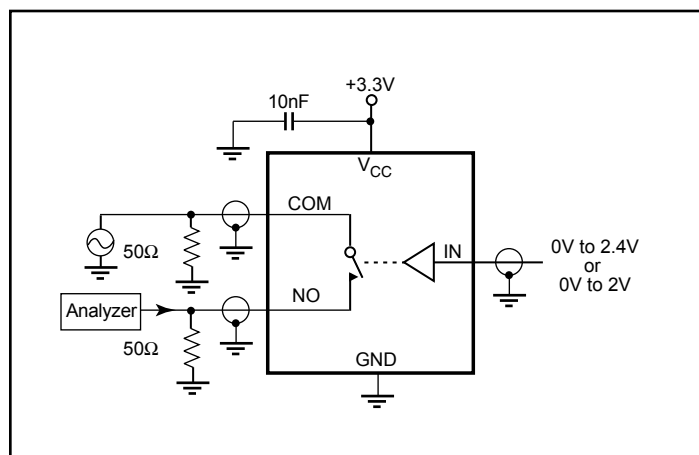


Figure 3. Off Isolation

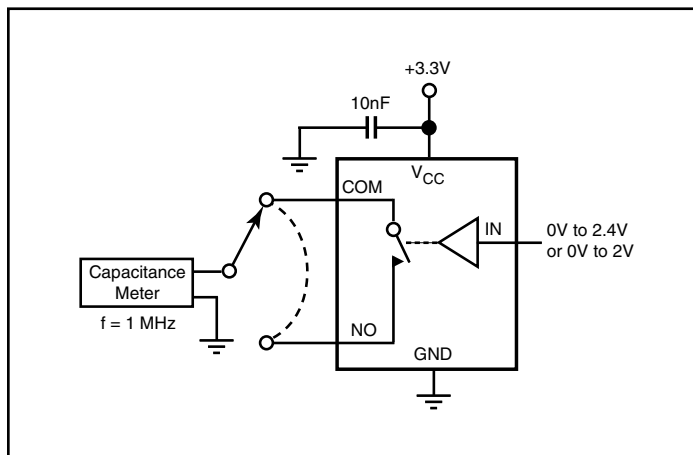
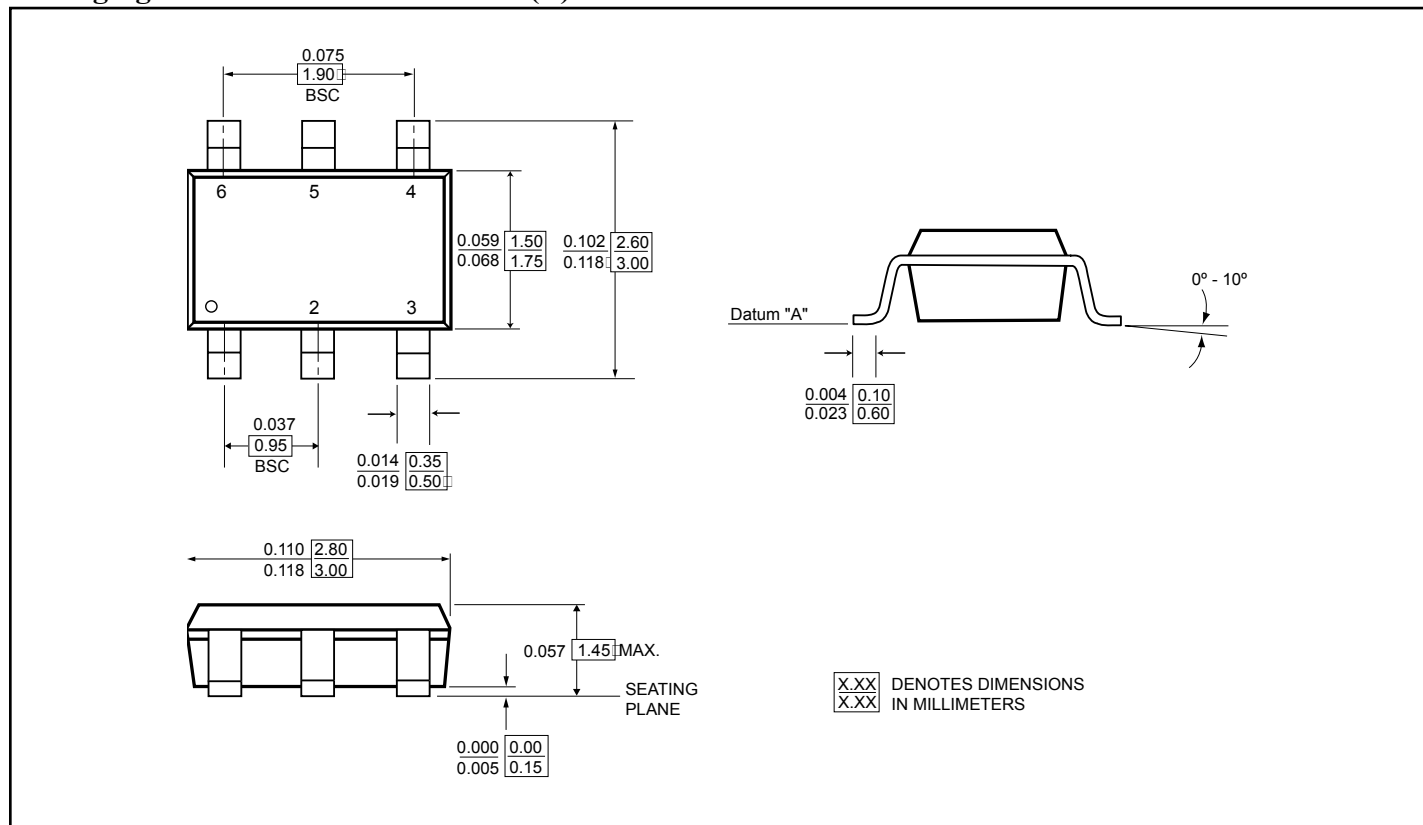
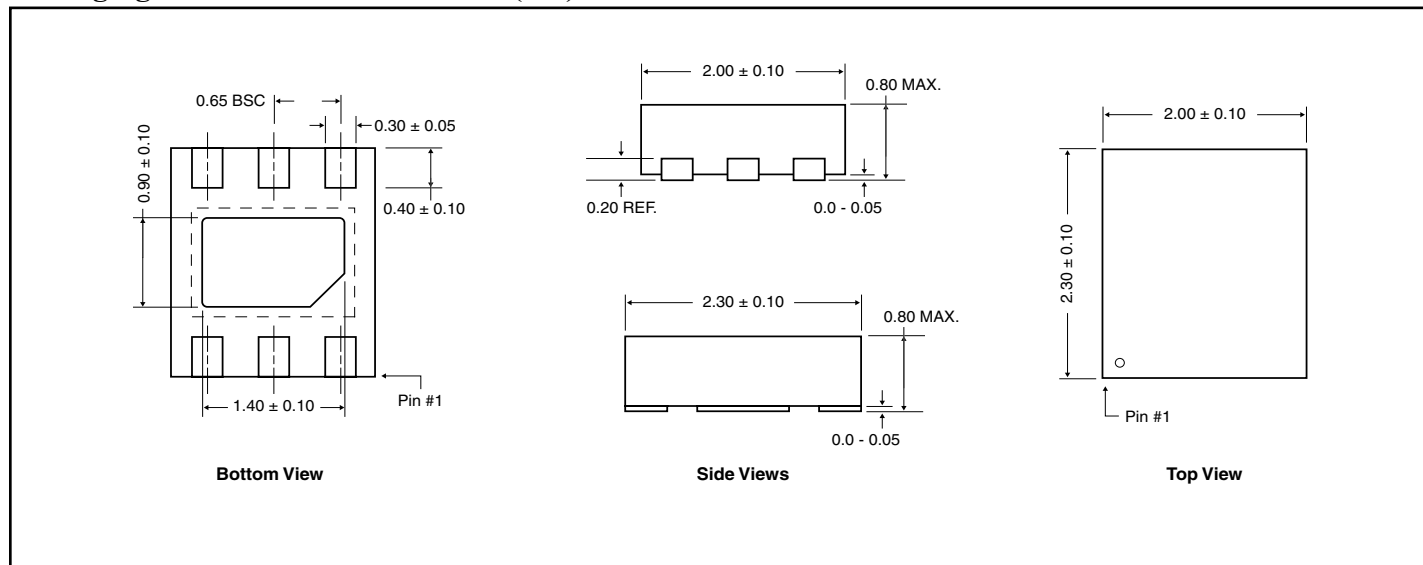


Figure 4. Channel On/Off Capacitance

Packaging Mechanical: 6-Pin SOT-23 (T)

Packaging Mechanical: 6-Pin TDFN (ZC)




Ordering Information

Ordering Code	Package Code	Package Description	Package Top Mark
PI3A4628TX	T	6-pin Small Compact, SOT-23	ZB
PI3A4628TEX	T	Pb-free and Green, 6-pin Small Compact, SOT-23	ZB
PI3A4628ZCEX	ZC	Pb-free and Green, 6-contact Small Compact, TDFN	ZB

Notes:

1. Thermal characteristics can be found on the company web site at <http://www.pericom.com/packaging/>
2. X = Tape/Reel