

## 1.8/3.3V High-Bandwidth 6-channel, 2:1 Mux/DeMux with switched Pull-ups

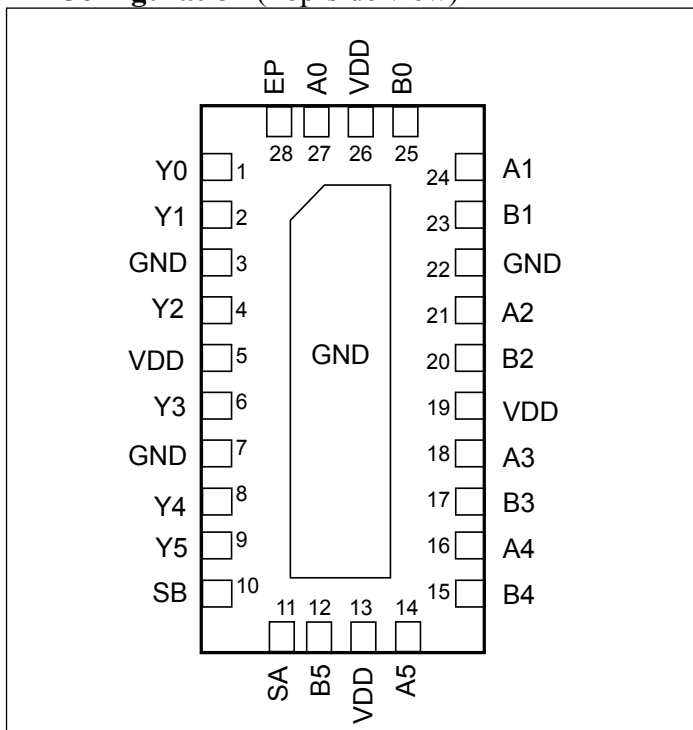
### Features

- Near-Zero propagation delay
- 5Ω switches connect inputs to outputs
- Signal passing bandwidth, 400 MHz
- Rail-to-Rail™ switching
- 1.8V to 3.3V supply voltage operation
- Supports live insertion and hot-swap
- Industrial operating temperature: -40°C to +85°C
- 2KV ESD HBM
- Latch-up performance >250mA per JESD17
- Packaging: 28-contact TQFN (3.5 x 5.0, 0.5mm pad pitch)

### Applications

- Memory card switching
- Photo printers
- Mobile devices

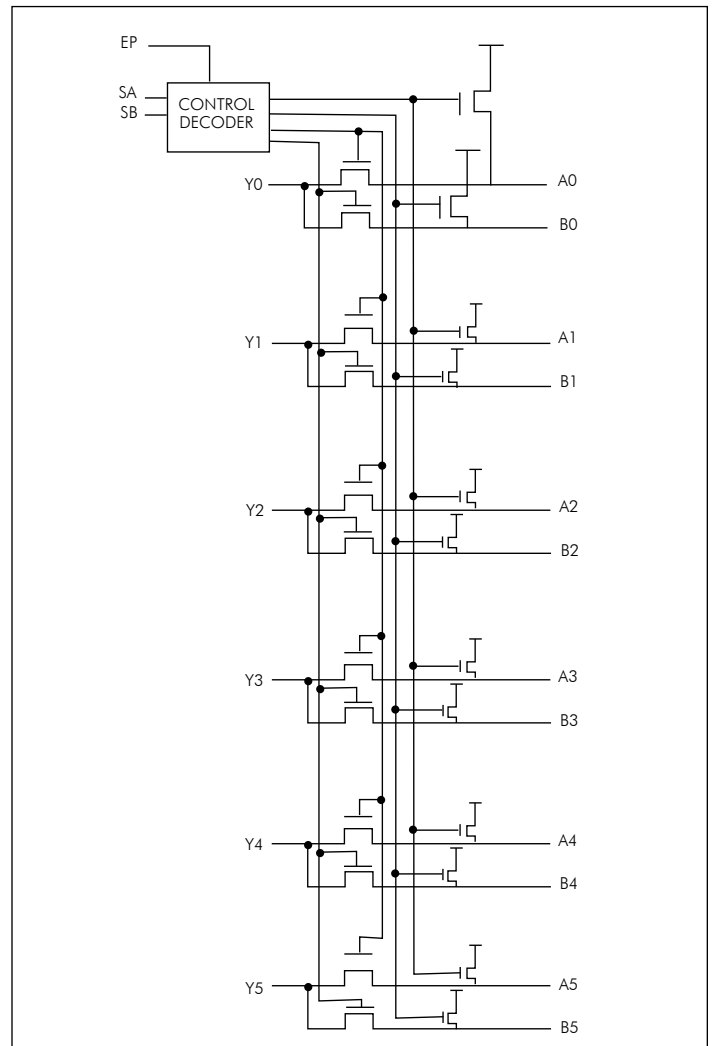
### Pin Configuration (Top-side view)



### Description

The PI3G612 is a 3-port, 6-channel, 1:2 multiplexer/demultiplexer. It features switched 100 K-Ohm active pull-ups on output ports A and B to prevent disconnected floating signals and thereby reduce system noise and power. The Y port can be connected to either the A or B ports, or alternatively both ports can be isolated, disconnected, or all connected. When the EP pin is low, the pull-up transistors are off. When EP is high, the pull-up transistors are on. If EP is not connected, an internal pull-down will turn the pull-up off. If pull-ups are not used, EP should be connected to ground. The PI3G612 has a wide operating voltage range, very low power consumption and small packaging suitable for mobile, and handheld equipment.

### Block Diagram



**Pin Description**

Pin Name	Description
A <sub>X</sub> , B <sub>X</sub> , Y <sub>X</sub>	Data I/O
SA, SB	Channel Select Inputs
EP	Pull-ups Enable
GND	Ground
V <sub>DD</sub>	Power

**Truth Table**

Control Inputs			Switch State <sup>1</sup>		Pullup State	Function <sup>2</sup>
EP	SB	SA	B <sub>x</sub>	A <sub>x</sub>		
0	0	0	Open	Open	Off	Y, A, B all disconnected and Hi-Z
0	0	1	Open	Closed	Off	Y=A, B =Hi-Z
0	1	0	Closed	Open	Off	Y=B, A =Hi-Z
0	1	1	Closed	Closed	Off	Y=A=B
1	0	0	Open	Open	On	Y, A, B all disconnected; Y=Hi-Z; A & B pull to V <sub>DD</sub>
1	0	1	Open	Closed	On	Y=A; A & B pull to V <sub>DD</sub>
1	1	0	Closed	Open	On	Y=B; A& B pull to V <sub>DD</sub>
1	1	1	Closed	Closed	On	Y=A=B; A& B pull to V <sub>DD</sub>

**Notes:**

1. For the group of 6 transistor switches connecting to the A<sub>x</sub> or B<sub>x</sub> signals.
2. Function for stand-alone device (no other signal source connected)

### Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature .....	-65°C to +150°C
Ambient Temperature with Power Applied .....	-40°C to +85°C
Supply Voltage to Ground Potential .....	-0.5V to +4.6V
DC Input Voltage .....	-0.5V to +6.0V
DC Output Current.....	120mA
Power Dissipation .....	0.5W

**Note:**

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

### DC Electrical Characteristics, 3.3V Supply (Over the Operating Range, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ , $V_{DD} = 3.3\text{V} \pm 10\%$ )

Parameters	Description	Test Conditions <sup>(1)</sup>	Min.	Typ. <sup>(2)</sup>	Max.	Units
$V_{IH}$	Input HIGH Voltage	Guaranteed Logic HIGH Level	2.0			V
$V_{IL}$	Input LOW Voltage	Guaranteed Logic LOW Level	-0.5		0.8	
$V_{IK}$	Clamp Diode Voltage	$V_{DD} = \text{Min.}, I_{IN} = -18 \text{ mA}$		-0.75	-1.2	
$I_{IH}$	Input HIGH Current	$V_{DD} = \text{Max.}, V_{IN} = V_{DD}$			$\pm 1$	$\mu\text{A}$
$I_{IL}$	Input LOW Current	$V_{DD} = \text{Max.}, V_{IN} = \text{GND}$			$\pm 1$	
$I_{OZH}$	High Impedance Output Current	$0 \leq Y, I_n \leq V_{DD}$			$\pm 25$	
$R_{ON}$	Switch On-Resistance <sup>(3)</sup>	$V_{DD} = \text{Min.}, V_{IN} = 0\text{V},$ $I_{ON} = 24\text{mA}$		2	3.3	Ohm
		$V_{DD} = \text{Min.}, V_{IN} = 2.4\text{V}, I_{ON} = 12 \text{ mA}$		2.6	4.3	

### DC Electrical Characteristics, 1.8V Supply (Over Operating Range, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ , $V_{DD} = 1.8\text{V} \pm 10\%$ )

Parameters <sup>(4)</sup>	Description	Test Conditions <sup>(1)</sup>	Min.	Typ. <sup>(2)</sup>	Max.	Units
$V_{IH}$	Input HIGH Voltage	Guaranteed Logic HIGH Level	1.1	-	$V_{DD} + 0.3$	V
$V_{IL}$	Inout LOW Voltage	Guaranteed Logic LOW Level	-0.3	-	0.5	
$V_{IK}$	Clamp Diode Voltage	$V_{DD} = \text{Max.}, I_{IN} = -6\text{mA}$	-	-0.7	-1.8	
$I_{IH}$	Input HIGH Current	$V_{DD} = \text{Max.}, V_{IN} = V_{DD}$	-	-	$\pm 1$	$\mu\text{A}$
$I_{IL}$	Input LOW Current	$V_{DD} = \text{Max.}, V_{IN} = \text{GND}$	-	-	$\pm 1$	
$I_{OZH}$	High Impedance Current	$0 \leq Y, I_n \leq V_{DD}$	-	-	$\pm 10$	
$R_{ON}$	Switch On-Resistance <sup>(3)</sup>	$V_{DD} = 1.5\text{V}, V_{IN} = 0\text{V},$ $I_{ON} = 24\text{mA}$	-	2.6	4	Ohm
		$V_{DD} = 1.5\text{V}, V_{IN} = 1.3\text{V},$ $I_{ON} = 12\text{mA}$	-	5.5	8	

**Notes:**

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at nominal  $V_{DD}$ ,  $T_A = 25^\circ\text{C}$  ambient and maximum loading.
3. Measured by the voltage drop between Y and In pin at indicated current through the switch. On-Resistance is determined by the lower of the voltages on the two (Y, In) pins.
4. This parameter is determined by device characterization but is not production tested.

**Capacitance** ( $T_A = 25^\circ\text{C}$   $f = 1\text{ MHz}$ )

Parameters	Description	Test Conditions	Typ.	Units
$C_{IN}$	Input Capacitance (Control)	$V_{IN} = 0\text{V}$	2	pF
$C_{OFF(IN)}$	In Capacitance, Switch Off		4	
$C_{ON}$	In Capacitance, Switch On		15	

**Power Supply Characteristics**

Parameters	Description	Test Conditions <sup>(1)</sup>	Min.	Typ.	Max.	Units
$I_{CC}$	Quiescent Power Supply Current $V_{control}$ (EP, SB, SA) = GND or $V_{DD}$	$V_{DD} = 3.3\text{ V}$			120	$\mu\text{A}$
		$V_{DD} = 1.8\text{ V}$			10	

**Notes:**

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.

**Dynamic Electrical Characteristics Over the Operating Range** ( $T_A = -40^\circ$  to  $+85^\circ$ ,  $V_{DD} = 3.3\text{V} \pm 10\%$ )

Parameter	Description	Test Condition	Min.	Typ.	Max.	Units
BW	-3dB Bandwidth	See Test Diagram ( $C_L = 0\text{pF}$ )		400		MHz

**Switching Characteristics over 3.3V Operating Range**

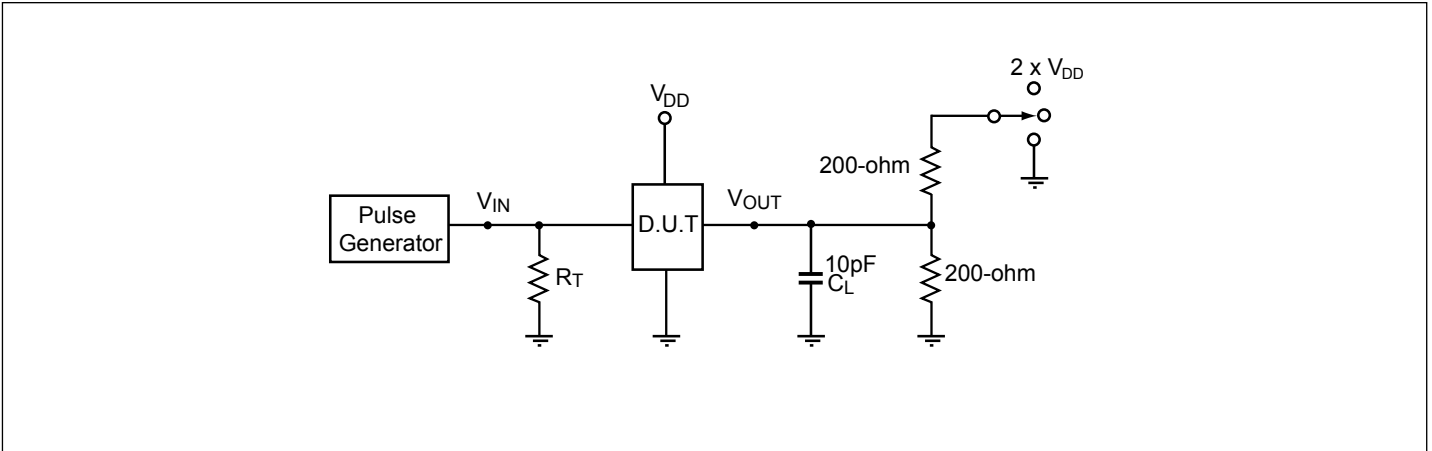
Parameters	Description	Conditions <sup>(1)</sup>	Min.	Max.	Units
$t_{PLH}$ $t_{PHL}$	Propagation Delay <sup>(2,3)</sup> Y to (A or B), (A or B) to Y	See Test Diagram		0.3	ns
$t_{PZH}$ $t_{PZL}$	Enable Time S to (Y, A or B)	See Test Diagram	1.5	10	
$t_{PHZ}$ $t_{PLZ}$	Disable Time S to (Y, A or B)		1.5	10	

**Switching Characteristics over 1.8V Operating Range**

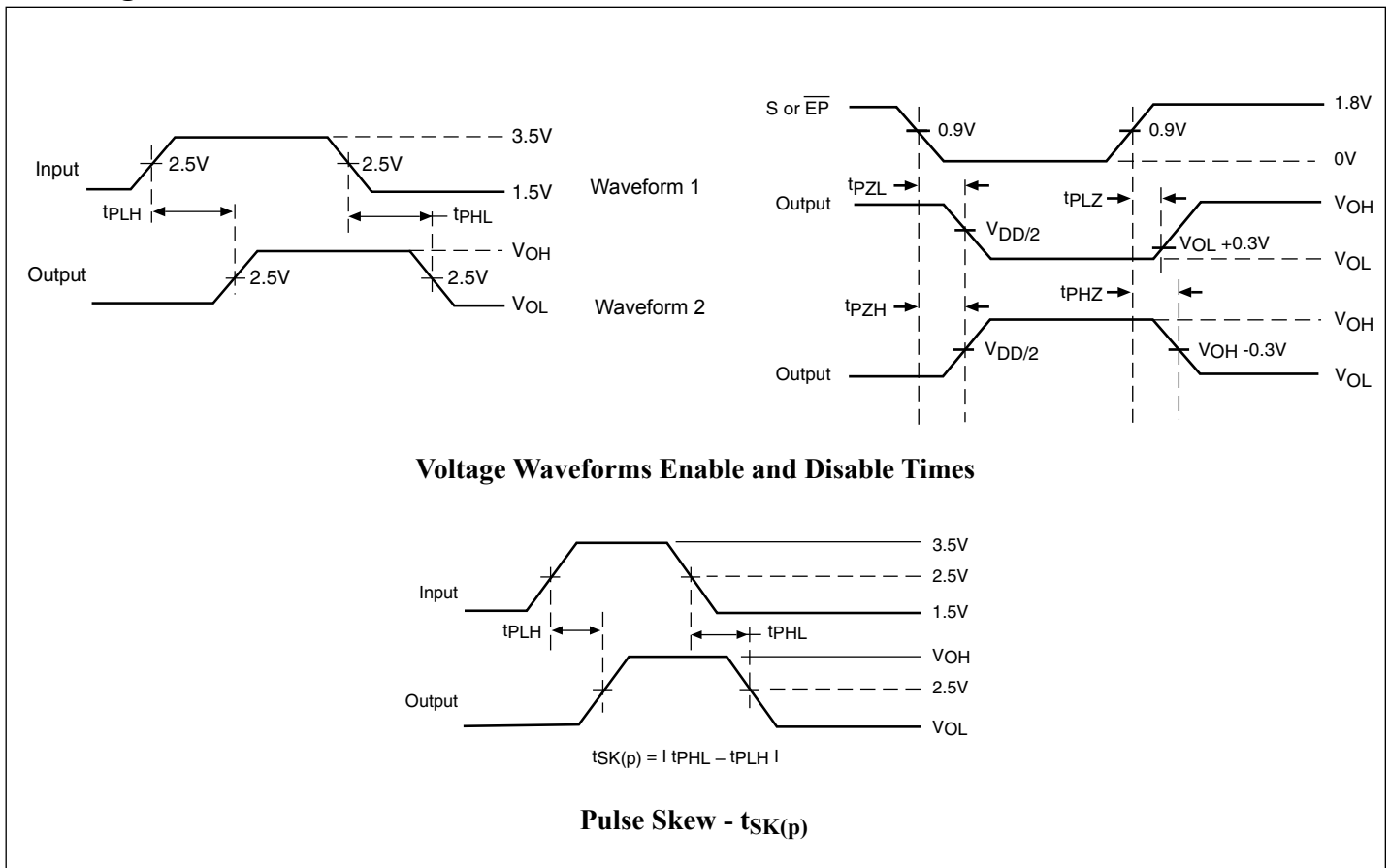
Parameters	Description	Conditions <sup>(1)</sup>	Min.	Max.	Units
$t_{PLH}$ $t_{PHL}$	Propagation Delay <sup>(2,3)</sup> Y to (A, or B), or (A, or B) to Y	See Test Diagram		0.3	ns
$t_{PZH}$ $t_{PZL}$	Enable Time S to (Y, A, or B)	See Test Diagram	1.5	25.0	
$t_{PHZ}$ $t_{PLZ}$	Disable Time S to (Y, A, or B)		1.5	25.0	

**Notes:**

- See test circuit and waveforms.
- This parameter is guaranteed but not tested on Propagation Delays.
- The switch contributes no propagational delay other than the RC delay of the On-Resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 0.30ns for 10pF load. Since this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagational delay to the system. Propagational delay of the switch when used in a system is determined by the driving circuit on the driving side of the switch and its interaction with the load on the driven side.

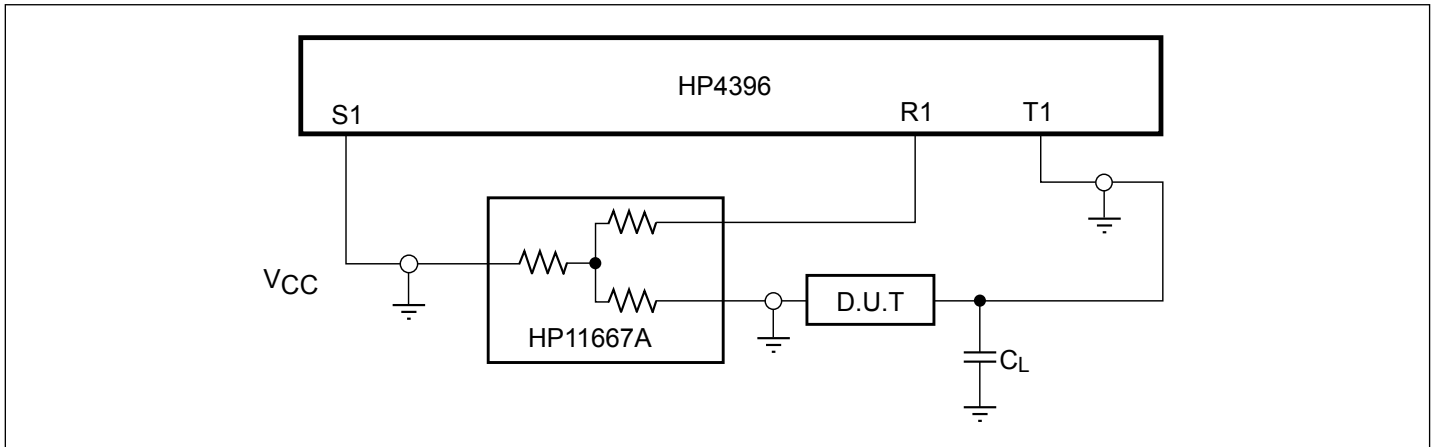
**Test Circuit for Electrical Characteristics<sup>(1-5)</sup>**

**Notes:**

1.  $C_L$  = Load capacitance: includes jig and probe capacitance.
2.  $R_T$  = Termination resistance: should be equal to  $Z_{OUT}$  of the Pulse Generator
3. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.  
Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
4. All input impulses are supplied by generators having the following characteristics:  $PRR \leq \text{MHz}$ ,  $Z_O = 50\Omega$ ,  $t_R \leq 2.5\text{ns}$ ,  $t_F \leq 2.5\text{ns}$ .
5. The outputs are measured one at a time with one transition per measurement.

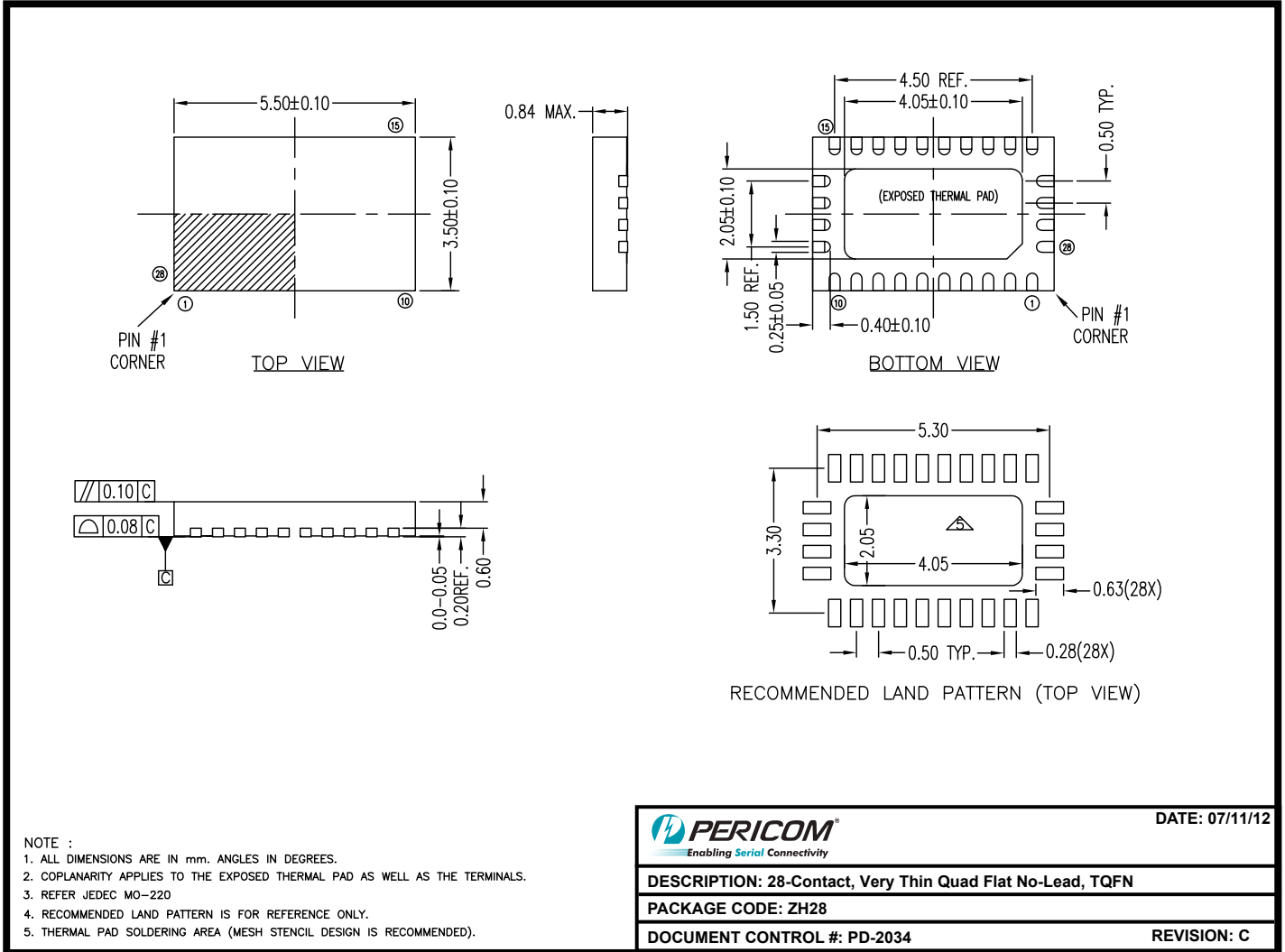
**Switching Waveforms**


**Switch Positions**

Test	Switch
$t_{PLZ}, t_{PZL}$	$2 \times V_{DD}$
$t_{PHZ}, t_{PZH}$	GND
Prop Delay	Open

**Test Circuit for Dynamic Electrical Characteristics**

**Applications Information**
**Logic Inputs**

The logic control inputs can be driven up to 3.6V regardless of the supply voltage. For example, given a +3.3V supply, SA or SB may be driven LOW to 0V and HIGH to 3.6V. Driving SA or SB Rail-to-Rail<sup>®</sup> minimizes power consumption.

**Packaging Mechanical: 28-pin TQFN (ZH)**


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

**Ordering Information**

Ordering Code	Package Code	Package Description
PI3G612ZHE	ZH	28-contact, Very Thin Quad Flat No-Lead (TQFN)

**Notes:**

- Thermal characteristics can be found on the company web site at [www.pericom.com/packaging/](http://www.pericom.com/packaging/)
- E = Pb-free and Green
- X suffix = Tape/Reel