

2:1 Mux/DeMux Gigabit Ethernet LAN Switch with Power-down Mode

Features

- 1:2 Gigabit LAN Switch
- Power-down support
- Low bit-to-bit skew: 200ps
- Very Low Crosstalk: -75dB @ 250MHz
- Status Indicator LEDs Switched with Ethernet pairs
- V_{DD} Operating Range: +3.0V to +3.6V
- Enhanced ESD Protection (on A, B, C, LED pins):
 - 8kV (contact)⁽¹⁾
 - 1.0kV (machine model),
 - 11kV (human body model)
- >650 MHz bandwidth
- Packaging:
 - 42-contact TQFN (3.5 x 9mm, 0.5 pitch)

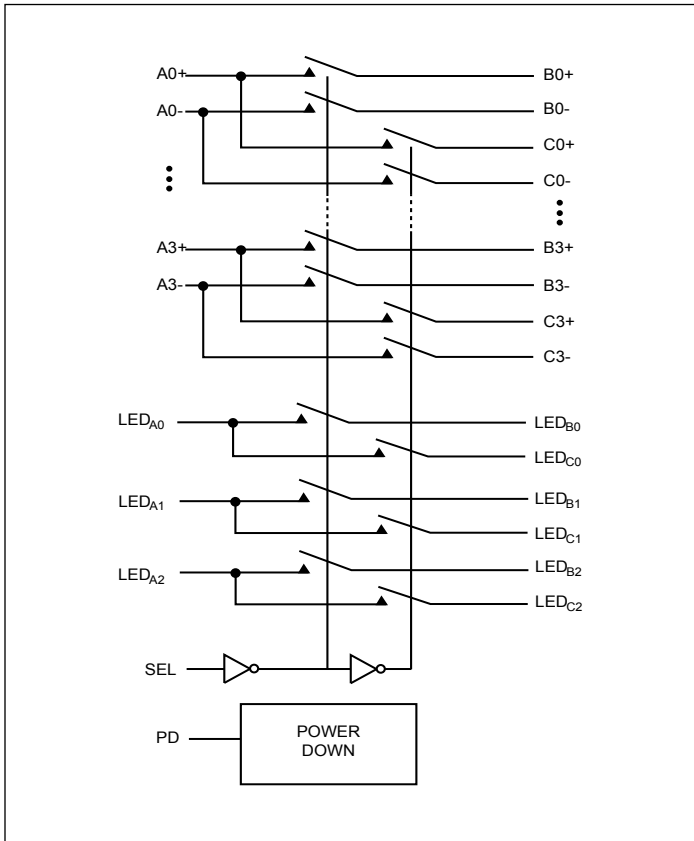
Description

The PI3L720 is a 8-Channel 2:1 multiplexer/demultiplexer LAN Switch with Hi-Z outputs. Industry leading advantages include a propagation delay of less than 250ps, resulting from its low channel resistance and I/O capacitance. The device multiplexes differential outputs from a Gigabit Ethernet transceiver (PHY) device to one of two corresponding B or C outputs. The switch is bidirectional and offers little or no attenuation of the high-speed signals at the outputs. It is designed for low bit-to-bit skew, high channel-to-channel noise isolation and is compatible with various standards, such as 10/100/1000 Base-T (Ethernet).

The PI3L720 provides a Power Down input (PD), which can put the device into standby mode (PD=1) while mobile, eliminating an external power switch.

Generally, this part can be used to replace mechanical relays in low-voltage LAN applications that interface a physical layer over CAT 5 or CAT 6 unshielded twisted pair cable through an isolation transformer.

Block Diagram



Applications

- Dual Physical Layer Device sharing to one interface connector, or one controller to dual connectors for docking
- Routes signals for 10/100/1000 Mbit Ethernet

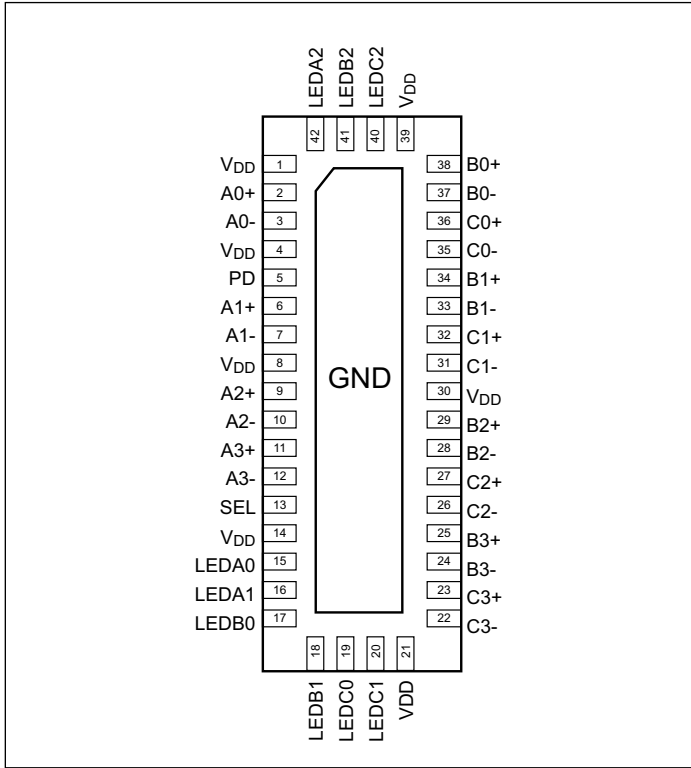
Truth Table

PD	SEL	Function
L	L	A _X to B _X ; LEDA _X to LEDB _X
L	H	A _X to C _X ; LEDA _X to LEDC _X
H	x	Hi-Z

Note:
1. IEC 6100-4-2

PI3L720

Pin Configuration (42-TQFN ZH, Top-Side View)



Pin Description

Pin Name	Description
A _X ⁺ , A _X ⁻	Port A DeMux I/O
B _X ⁺ , B _X ⁻	Port B Mux I/O
C _X ⁺ , C _X ⁻	Port C LED Mux I/O
GND	Ground
LED _{ZX}	LED I/O
PD	Power Down. Active high, with internal pull-down resistor
SEL	Select
V _{DD}	Power

Maximum Ratings

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

Storage Temperature.....	-65°C to +150°C
Supply Voltage to Ground Potential	-0.5V to +4.0V
DC Input Voltage.....	-0.5V to +5.5V
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 for 1000 Base-T Ethernet Switching over Operating Range

($T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{DD} = 3.3\text{V} \pm 10\%$)

Parameter	Description	Test Conditions ⁽¹⁾	Min.	Typ. ⁽²⁾	Max.	Units
V_{IH}	Input HIGH Voltage	Guaranteed HIGH level (Control Pins)	2.0	-	-	V
V_{IL}	Input LOW Voltage	Guaranteed LOW level (Control Pins)	-0.5	-	0.8	
V_{IK}	Clamp Diode Voltage	$V_{DD} = \text{Max.}, I_{IN} = -18\text{mA}$	-	-0.7	-1.2	
I_{IH}	Input HIGH Current	$V_{DD} = \text{Max.}, V_{IN} = V_{DD}$	-	-	± 2	μA
I_{IL}	Input LOW Current	$V_{DD} = \text{Max.}, V_{IN} = \text{GND}$	-	-	± 2	
R_{ON}	Switch On-Resistance ⁽³⁾	$V_{DD} = \text{Min.}, 1.5\text{V} \leq V_{IN} \leq V_{DD}$ $I_{IN} = -40\text{mA}$	-	4.0	6.5	Ohm
$R_{FLAT(ON)}$	On-Resistance Flatness ⁽³⁾	$V_{DD} = \text{Min.}, V_{IN} @ 1.5\text{V}$ and V_{DD} $I_{IN} = -40\text{mA}$	-	0.5	-	
ΔR_{ON}	On-Resistance match from center ports to any other port ⁽³⁾	$V_{DD} = \text{Min.}, 1.5\text{V} \leq V_{IN} \leq V_{DD}$ $I_{IN} = -40\text{mA}$	-	0.4	1.0	

DC Electrical Characteristics for 10/100 Base-T Ethernet Switching over Operating Range

($T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{DD} = 3.3\text{V} \pm 10\%$)

Parameter	Description	Test Conditions ⁽¹⁾	Min.	Typ. ⁽²⁾	Max.	Units
V_{IH}	Input HIGH Voltage	Guaranteed HIGH level (Control Pins)	2.0	-	-	V
V_{IL}	Input LOW Voltage	Guaranteed LOW level (Control Pins)	-0.5	-	0.8	
V_{IK}	Clamp Diode Voltage	$V_{DD} = \text{Max.}, I_{IN} = -18\text{mA}$	-	-0.7	-1.2	
I_{IH}	Input HIGH Current	$V_{DD} = \text{Max.}, V_{IN} = V_{DD}$	-	-	± 2	μA
I_{IL}	Input LOW Current	$V_{DD} = \text{Max.}, V_{IN} = \text{GND}$	-	-	± 2	
R_{ON}	Switch On-Resistance ⁽³⁾	$V_{DD} = \text{Min.}, 1.25\text{V} \leq V_{IN} \leq V_{DD}$ $I_{IN} = -10\text{mA}$ to -30mA	-	4.0	6.5	Ohm
$R_{FLAT(ON)}$	On-Resistance Flatness ⁽³⁾	$V_{DD} = \text{Min.}, V_{IN} @ 1.25\text{V}$ and V_{DD} $I_{IN} = -10\text{mA}$ to -30mA	-	0.5	-	
ΔR_{ON}	On-Resistance match from center ports to any other port ⁽³⁾	$V_{DD} = \text{Min.}, 1.25\text{V} \leq V_{IN} \leq V_{DD}$ $I_{IN} = -10\text{mA}$ to -30mA	-	0.4	1.0	

PI3L720

Capacitance ($T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{DD} = 3.3\text{V} \pm 10\%$)

Parameters ⁽⁴⁾	Description	Test Conditions ⁽¹⁾	Min.	Typ.	Max.	Units
C_{IN}	Input Capacitance	$V_{IN} = 0\text{V}, f = 1\text{MHz}$		2.0	3.0	pF
$C_{OFF(B1, B2)}$	Port B Capacitance, Switch OFF			3.0	6.0	
$C_{ON(A/B)}$	A/B Capacitance, Switch ON			8.0	11.0	

- Notes:**
- For max. or min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
 - Typical values are at $V_{DD} = 3.3\text{V}$, $T_A = 25^{\circ}\text{C}$ ambient and maximum loading.
 - Measured by the voltage drop between A and B pins at indicated current through the switch. ON resistance is determined by the lower of the voltages on the two (A & B) pins.
 - This parameter is determined by device characterization but is not production tested.

Power Supply Characteristics

Parameters	Description	Test Conditions ⁽¹⁾	Min.	Typ. ⁽²⁾	Max.	Units
$I_{DD-standby}^{(3)}$	Quiescent Power Supply Current	$V_{DD} = \text{Max.}, V_{IN} = \text{GND or } V_{DD}$	—	0.3	0.5	mA
$I_{DD-Active}^{(3)}$	Active Power Supply Current	$V_{DD} = \text{Max.}, V_{IN} = V_{DD} \text{ or } \text{GND}$		1.0	1.5	mA
$I_{DD-PD}^{(3)}$	Power Down Current	$\text{PD} = 1, V_{DD} = \text{MAX}, V_{IN} = V_{DD} \text{ or } \text{GND}$		0.15	0.25	mA

- Notes:**
- For max. or min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
 - Typical values are at $V_{DD} = 3.3\text{V}$, $T_A = 25^{\circ}\text{C}$ ambient and maximum loading..
 - Active power represents normal data communication. Standby power is when the device is enabled for operation but there is no LAN traffic (cable not connected). Power down current is the minimum power state used when not connected and mobile.
 - The bus 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 0.25ns 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 bus switch when used in a system is determined by the driving circuit on the driving side of the switch and its interactions with the load on the driven side.

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

Parameter	Description	Test Conditions ⁽¹⁾	Min.	Typ. ⁽²⁾	Max.	Units
X_{TALK}	Crosstalk ⁽³⁾	$R_L = 100\text{-Ohm}, f = 250\text{MHz}$	—	-75	—	dB
O_{IRR}	OFF Isolation ⁽³⁾		—	-35	—	
BW	Bandwidth -3dB ⁽³⁾	$R_L = 100\text{-Ohm}$	—	650	—	MHz

- Notes:**
- For max. or min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
 - Typical values are at $V_{DD} = 3.3\text{V}$, $T_A = 25^{\circ}\text{C}$ ambient and maximum loading..
 - Guaranteed by design.
 - The bus 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 0.25ns 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 bus switch when used in a system is determined by the driving circuit on the driving side of the switch and its interactions with the load on the driven side.

PI3L720

Switching Characteristics ($T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{DD} = 3.3\text{V} \pm 10\%$)

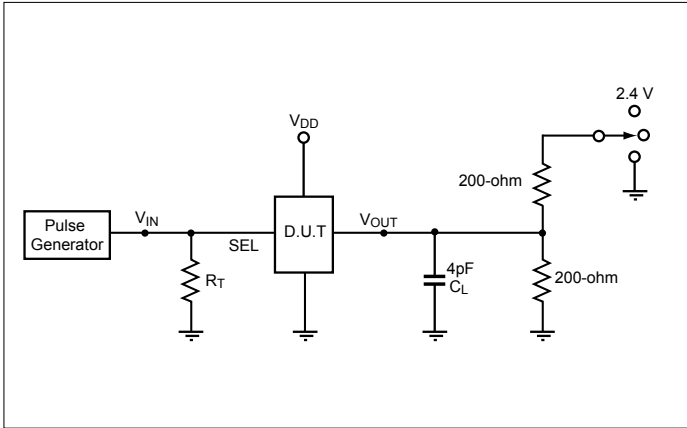
Parameter	Description	Min.	Typ. ⁽²⁾	Max.	Units
t_{PD}	Propagation Delay ^(3,4)	–	0.25		ns
t_{PZH} , t_{PZL}	Line Enable Time - SEL to A_N , B_N	0.5	–	15.0	
t_{PHZ} , t_{PLZ}	Line Disable Time - SEL to A_N , B_N	0.5	–	5.0	
$t_{SK(o)}$	Output Skew between center port to any other port ⁽³⁾	–	0.1	0.2	
$t_{SK(p)}$	Skew between opposite transitions of the same output ($t_{PHL} - t_{PLH}$) ⁽³⁾	–	0.1	0.2	
$t_{ON/OFF}$	Device enable / disable time from PD		100	200	

Notes:

1. For max. or min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{DD} = 3.3\text{V}$, $T_A = 25^{\circ}\text{C}$ ambient and maximum loading..
3. Guaranteed by design.
4. The bus 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 0.25ns 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 bus switch when used in a system is determined by the driving circuit on the driving side of the switch and its interactions with the load on the driven side.

PI3L720

Test Circuit for Electrical Characteristics



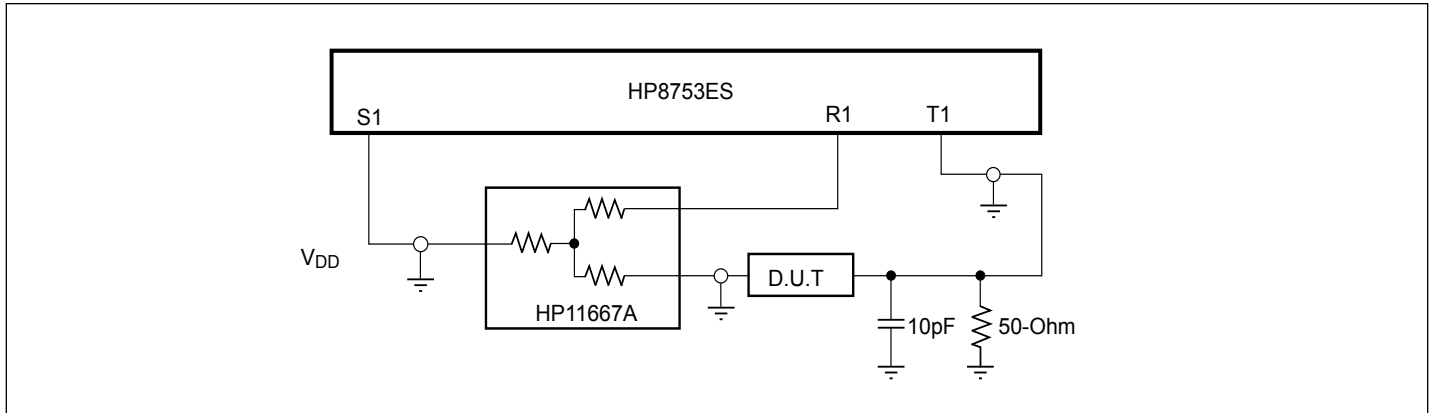
Notes:

- C_L = Load capacitance: includes jig and probe capacitance.
- R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator

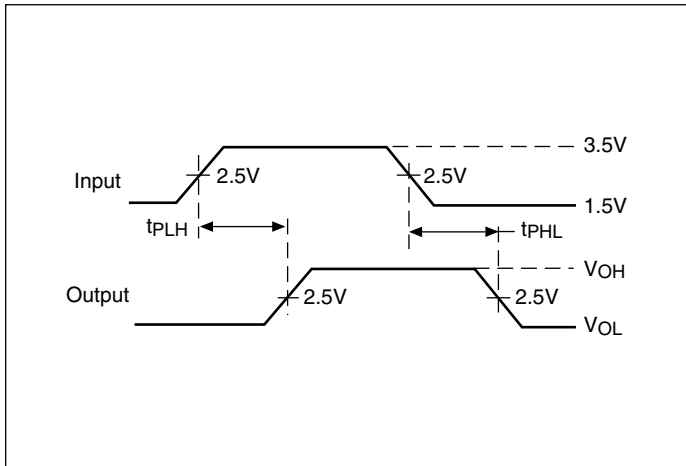
Switch Positions

Test	Switch
t_{PLZ} , t_{PZL} (output on B-side)	6.0V
t_{PHZ} , t_{PZH} (output on B-side)	GND
Prop Delay	Open

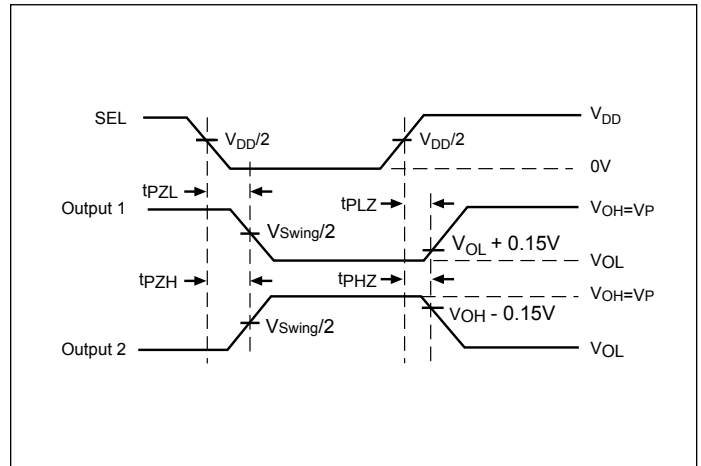
Test Circuit for Dynamic Electrical Characteristics



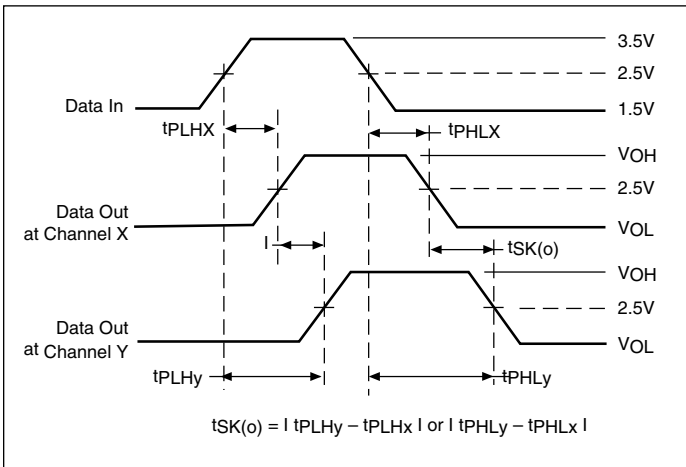
Switching Waveforms



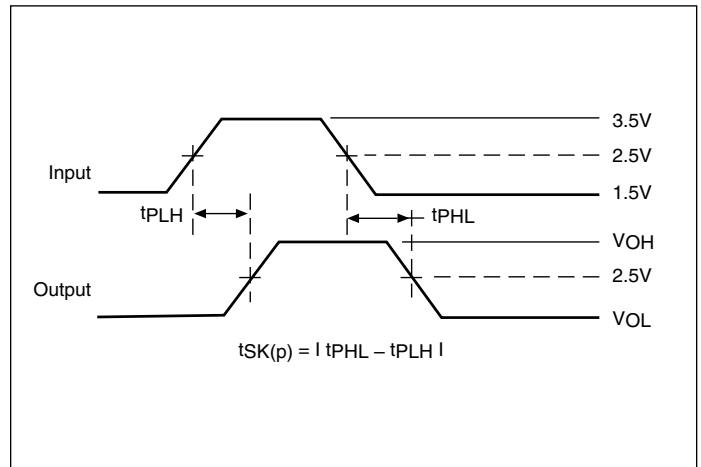
Voltage Waveforms Propagation Delay Times



Voltage Waveforms Enable and Disable Times



Output Skew - tSK(o)



Pulse Skew - tSK(p)

Notes:

- 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.
- All input impulses are supplied by generators having the following characteristics: PRR ≤ MHz, ZO = 50-Ohm, tr ≤ 2.5ns, tf ≤ 2.5ns.

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, the output enables or select pins may be driven low to 0V and high to 3.6V. Driving IN Rail-to-Rail[®] minimizes power consumption.

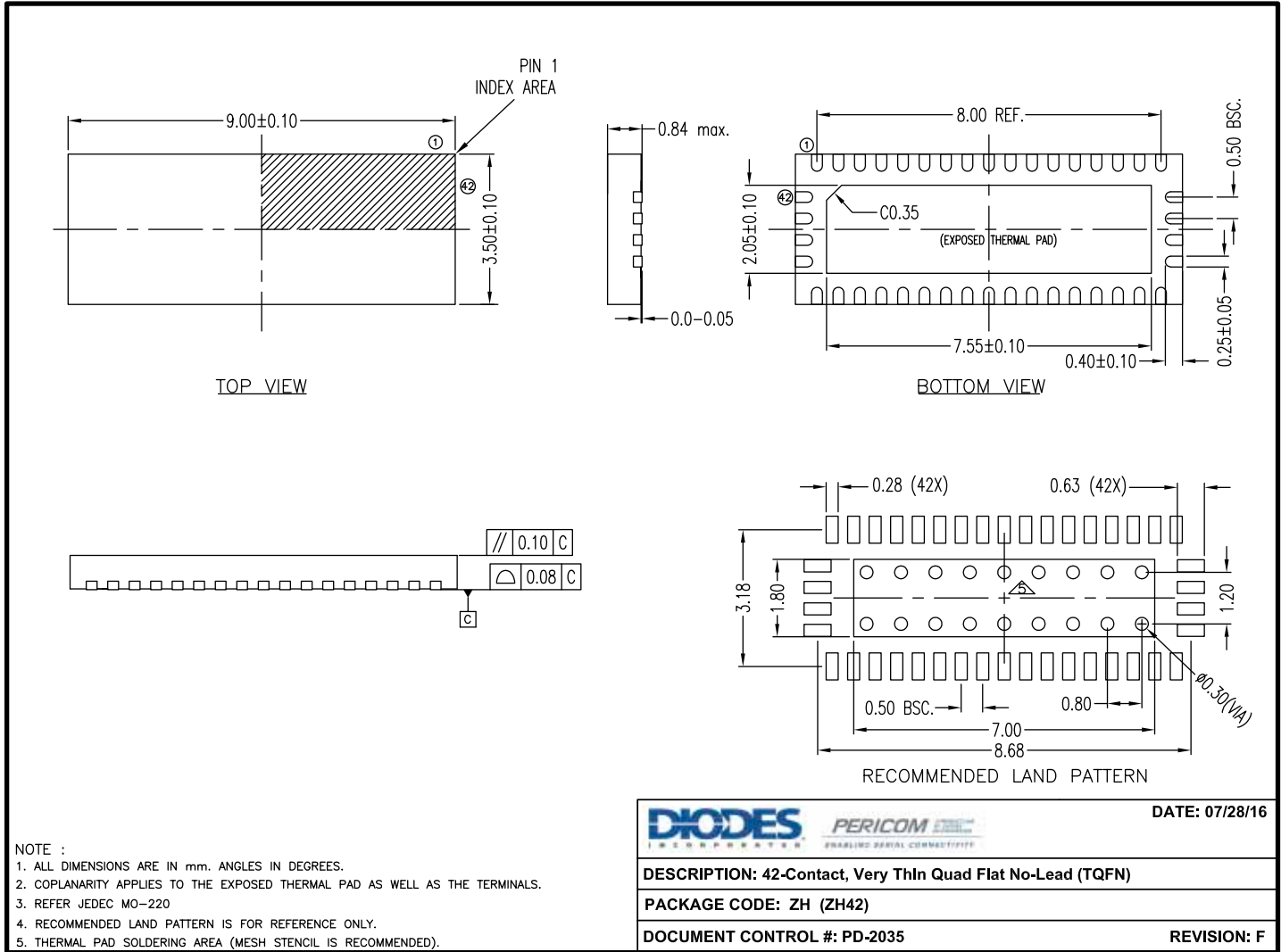
Power-Supply Sequencing

Proper power-supply sequencing is advised for all CMOS devices. It is recommended to always apply VDD before applying signals to the input/output or control pins.

Rail-to-Rail is a registered trademark of Nippon Motorola, Ltd

PI3L720

Packaging Mechanical: 42-Contact TQFN (ZH)



Note: For latest package info, please check: <http://www.pericom.com/support/packaging/packaging-mechanicals-and-thermal-characteristics/>

Ordering Information

Ordering Number	Package Code	Package Description
PI3L720ZHE	ZH	42-contact, Very Thin Quad Flat No-Lead (TQFN)
PI3L720ZHEX	ZH	42-contact, Very Thin Quad Flat No-Lead (TQFN), Tape & Reel

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Pb-free & Green
- Adding an X suffix = Tape/Reel

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and definitive format released by Diodes Incorporated.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2016, Diodes Incorporated
www.diodes.com

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Diodes Incorporated:](#)

[PI3L720ZHE](#) [PI3L720ZHEX](#)