PERICOM®

PI3V312

Low On-Resistance, 3.3V High-Bandwidth 4-Port, 2:1 Mux/DeMux VideoSwitch

Features

- Near-Zero propagation delay
- 5Ω switches connect inputs to outputs
- High signal passing bandwidth (500MHz)
- Beyond Rail-to-Rail switching
- 5V I/O tolerant with 3.3V supply
- 1.8V, 2.5V and 3.3V supply voltage operation
- Hot insertion capable
- Industrial operating temperature: -40ºC to +85ºC
- 2KV ESD Protection (human body model)
- Latch-up performance >250mA per JESD17
- Packaging (Pb-free & Green):
  – 16-pin QSOP (Q)
 – 16-pin TSSOP (L)
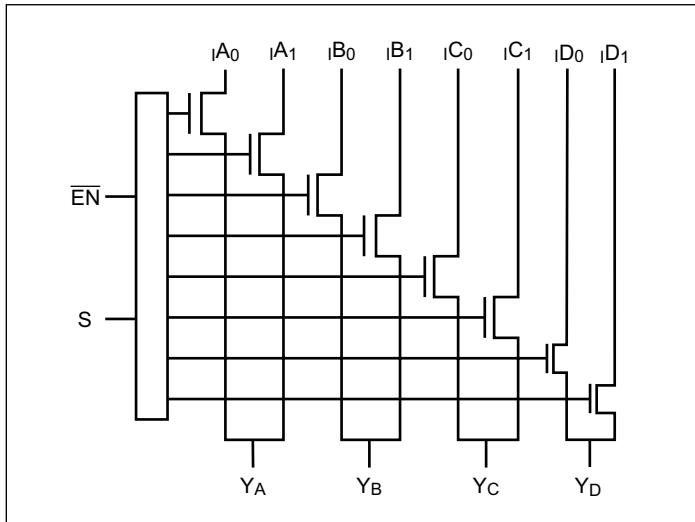
Description

Pericom Semiconductor's PI3V312 is a 4-port, 2:1 Multiplexer/ Demultiplexer with 3-state outputs. The switch introduces no additional ground bounce noise or propagation delay.

Low On-Resistance and High bandwidth make it ideal for video and other applications. Also this device has exceptionally low crosstalk and off-isolation, which is far greater than most analog switches offered today. A single 3.3V supply is all that is required for operation.

The PI3V312 offers a high-performance (500MHz), low-cost solution to switch between video signals that have high bandwidth.

Block Diagram

Pin Configuration
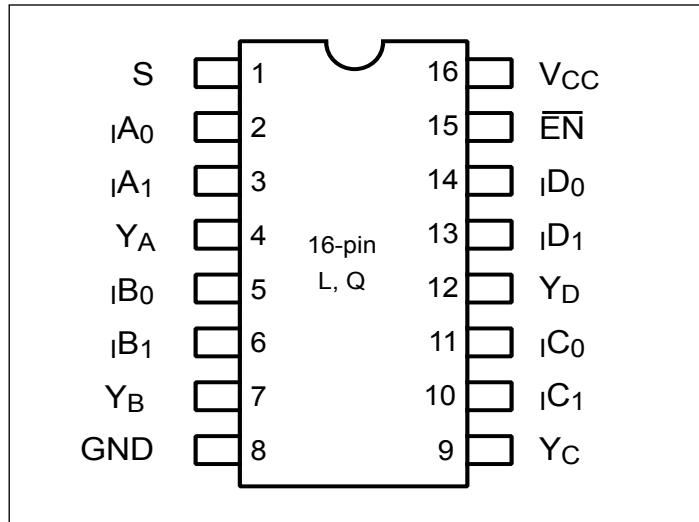
Truth Table[1]

$\overline{EN}$	S	Y_A	Y_B	Y_C	Y_D	Function
H	X	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Disable
L	L	IA0	IB0	IC0	ID0	S=0
L	H	IA1	IB1	IC1	ID1	S=1

Notes:
1. H=High Voltage Level
   L=Low Voltage Level

Pin Description

Pin Name	Description
$_IA_N$ to $_ID_N$	Data Inputs
S	Select Inputs
$\overline{EN}$	Enable
Y_A to Y_D	Data Outputs
GND	Ground
V_{CC}	Power

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 Operating Range, T_A = –40°C to +85°C, V_{CC} = 3.3V ± 10%)

Parameters	Description	Test Conditions[1]	Min.	Typ[2]	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_{CC} = Min., I_{IN} = –18 mA		-1.3	–1.8	
I_{IH}	Input HIGH Current	V_{CC} = Max., V_{IN} = V_{CC}			±1	µA
I_{IL}	Input LOW Current	V_{CC} = Max., V_{IN} = GND			±1	
I_{OZH}	High Impedance Output Current	0 ≤ Y, I$_N$ ≤ V_{CC}			±1	
R_{ON}	Switch On-Resistance[4]	V_{CC} = Min., V_{IN} = 0V, I_{ON} = 48 mA or -64mA		4	6	Ω
		V_{CC} = Min., V_{IN} = 3.6V, I_{ON} = -15 mA		5	8	

DC Electrical Characteristics, 2.5V Supply (Over Operating Range, T_A = –40°C to +85°C, V_{CC} = 2.5V ± 10%)

Parameters[5]	Description	Test Conditions	Min.	Typ.	Max.	Units
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level	1.8	–	V_{CC} + 0.3	V
V_{IL}	Inout LOW Voltage	Guaranteed Logic LOW Level	–0.3	–	0.8	
V_{IK}	Clamp Diode Voltage	V_{CC} = Max., I_{IN} = –6mA	–	–0.7	–1.8	
I_{IH}	Input HIGH Current	V_{CC} = Max., V_{IN} = V_{CC}	–	–	±1	µA
I_{IL}	Input LOW Current	V_{CC} = Max., V_{IN} = GND	–	–	±1	
I_{OZH}	High Impedance Current[3]	0 ≤ Y, I$_N$ ≤ V_{CC}	–	–	±1	
R_{ON}	Switch On-Resistance[4]	V_{CC} = Min., V_{IN} = 0V, I_{ON} = –48mA	–	6	8	Ω
		V_{CC} = Min., V_{IN} = 2.25V, I_{ON} = -15mA	–	7	14	

Capacitance (T_A = 25°C f = 1 MHz)

Parameters[5]	Description	Test Conditions	Typ.	Units
C_{IN}	Input Capacitance		3.0	
$C_{OFF(IN)}$	In Capacitance, Switch Off	V_{IN} = 0V	3.5	pF
$C_{OFF(Y)}$	Y Capacitance, Switch Off		7.0	
C_{ON}	Y/In Capacitance, Switch On		10.0	

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_{CC} = 3.3V, T_A = 25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. 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.
5. 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_{CC}	Quiescent Power Supply Current	V_{CC} = 3.6V, V_{IN} = GND or V_{CC}			0.5	mA

Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at V_{CC} = 3.3V, +25°C ambient.

Dynamic Electrical Characteristics Over the Operating Range (T_A = -40° to +85°, V_{CC} = 3.3V ± 10%)

Parameter	Description	Test Condition	Min.	Typ.	Max.	Units
X_{TALK}	Crosstalk	See Test Diagram (f = 100MHz)		-60		dB
O_{IRR}	Off-Isolation	See Test Diagram (f = 100MHz)		-60		dB
BW	-3dB Bandwidth	See Test Diagram; C_L = 0pF	100	500		MHz

Switching Characteristics over 3.3V Operating Range

Parameters	Description	Conditions[1]	Com. Min.	Com. Typ.	Com. Max.	Units
t_{PLH} t_{PHL}	Propagation Delay[2,3] Y to In, In to Y	See Test Diagram			0.3	
t_{PZH} t_{PZL}	Enable Time S or $\overline{EN}$ to Y or In	See Test Diagram	1.5		9.0	ns
t_{PHZ} t_{PLZ}	Disable Time S or $\overline{EN}$ to Y or In		1.5		9.0	

Switching Characteristics over 2.5V Operating Range

| Parameters	Description	Conditions[1]	Com.		Units
			Min.	**Max.**	
t_{PLH} t_{PHL}	Propagation Delay[2,3] Y to In, In to Y	See Test Diagram		0.3	
t_{PZH} t_{PZL}	Enable Time S or $\overline{EN}$ to Y or In	See Test Diagram	1.5	15.0	ns
t_{PHZ} t_{PLZ}	Disable Time S or $\overline{EN}$ to Y or In		1.5	12.0	

Notes:
1. See test circuit and waveforms.
2. This parameter is guaranteed but not tested on Propagation Delays.
3. 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.

Bandwidth vs Capacitance
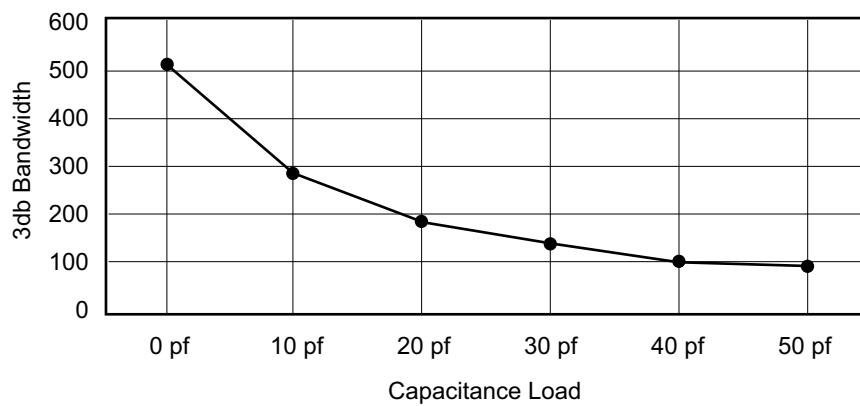
Test Circuit for Electrical Characteristics[1]
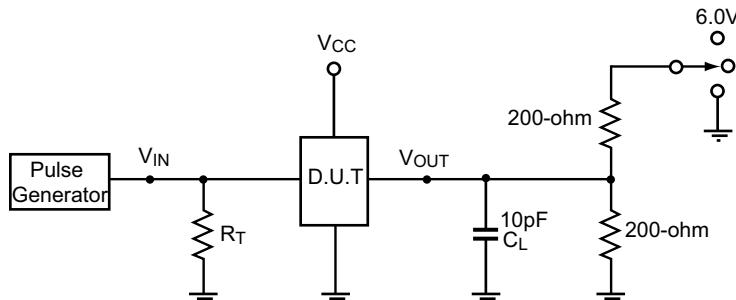

Notes:
1. C_L = Load capacitance: includes jig and probe capacitance.
2. R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator
3. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
   Waveform 2 is for 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 ≤ MHz, Z_O = 50Ω, t_R ≤ 2.5ns, t_F ≤ 2.5ns.
5. The outputs are measured one at a time with one transition per measurement.

Switch Positions

| Test	Switch
t_{PLZ}, t_{PZL}	6.0V
t_{PHZ}, t_{PZH}	GND
Prop Delay	Open

Test Circuit for Dynamic Electrical Characteristics

ⱷ PERICOM®
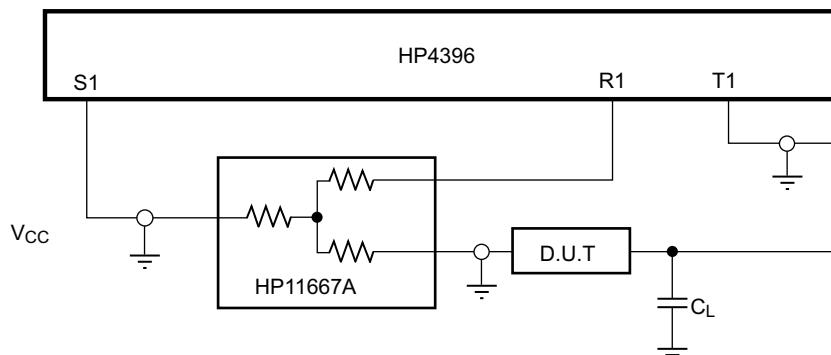
Crosstalk (V$_{CC}$ = 3.3V, 25°C)
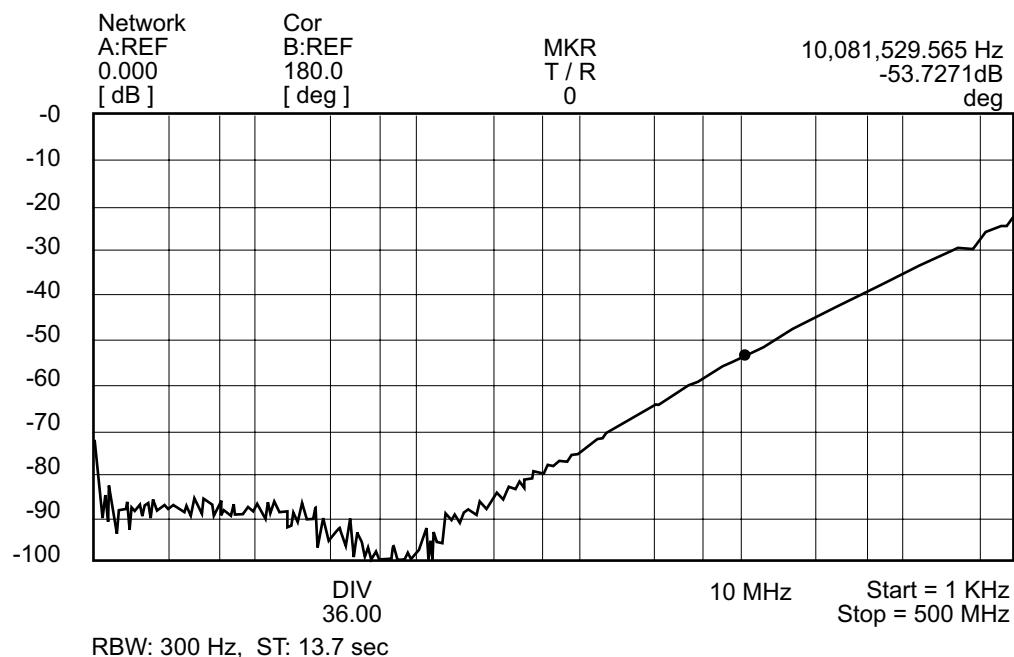
Off Isolation (V$_{CC}$ = 3.3V, 25°C)
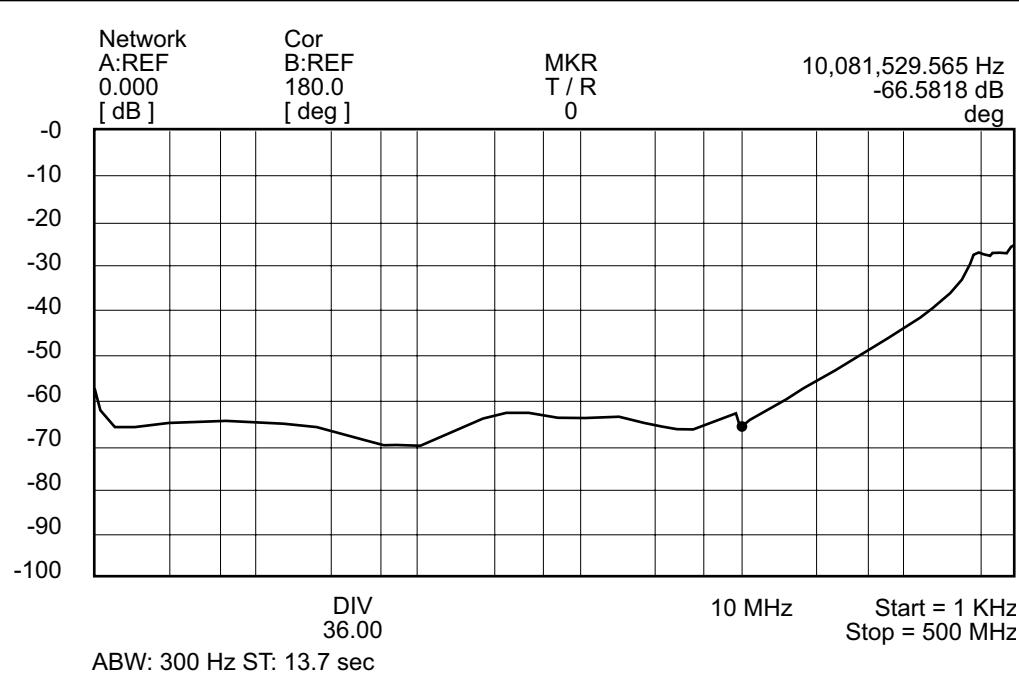
Switching Waveforms
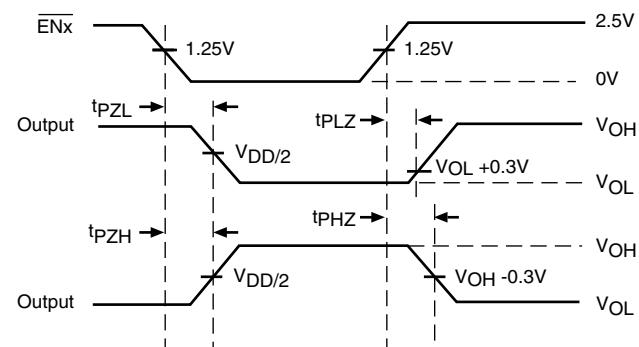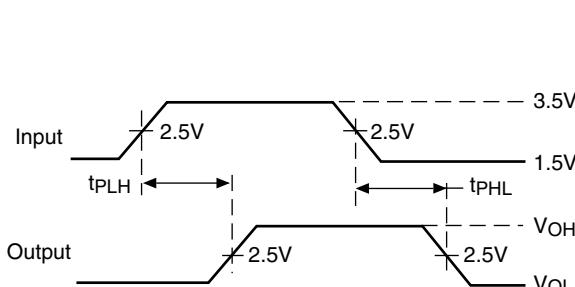
Voltage Waveforms Enable and Disable Times

$$t_{SK(p)} = |\, t_{PHL} - t_{PLH}\, |$$
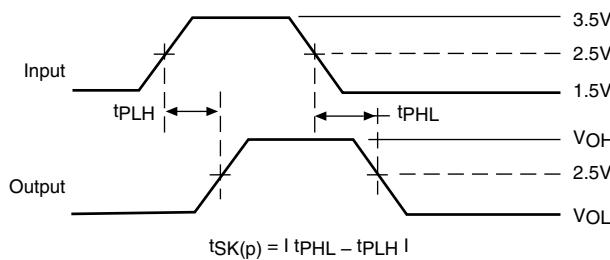
Pulse Skew - $t_{SK(p)}$

Applications Information

Logic Inputs

The logic control inputs can be driven upto 3.6V regardless of the supply voltage. For example, given a +3.3V supply, $\overline{EN}$ maybe driven LOW to 0V and HIGH to 3.6V. Driving $\overline{EN}$ Rail-to-Rail® minimizes power consumption.

Hot Insertion

For Datacom and Telecom applications that have ten or more volts passing through the backplane, a high voltage from the power supply may be seen at the device input pins during hot insertion. The PI3V312 device have maximum limits of 6V and 120mA for 20ns. If the power is higher or applied for a longer time or repeatedly reaches the maximum limits, the devices can be damaged.

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Packaging Mechanical: 16-pin QSOP (Q)
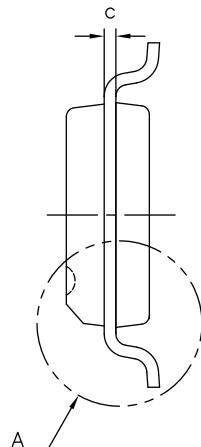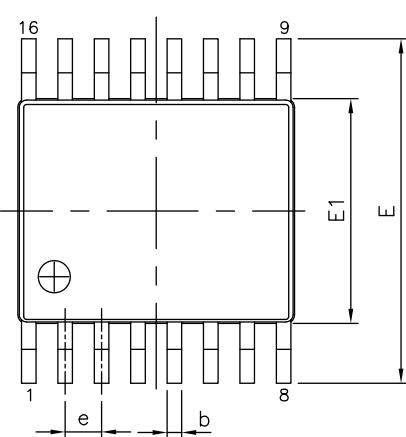
SYMBOLS	MIN.	NOM.	MAX.
A	—	—	0.069
A1	0.004	—	0.0098
A2	0.049	—	—
b	0.008	—	0.012
c	0.004	—	0.010
D	0.189	0.193	0.197
E1	0.150	0.154	0.158
E	0.228	0.236	0.244
L	0.016	—	0.050
L1	0.041 REF.		
e	0.025 BSC.		
θ°	0	—	8

UNIT : INCH

⊡ 0.004 C

SEATING PLANE

C

DETAIL A

GAUGE PLANE
SEATING PLANE

PERICOM®
Enabling Serial Connectivity

DATE: 04/08/16

DESCRIPTION: 16-Pin, 150mil Wide QSOP

PACKAGE CODE: Q (Q16)

DOCUMENT CONTROL #: PD-1201

REVISION: H
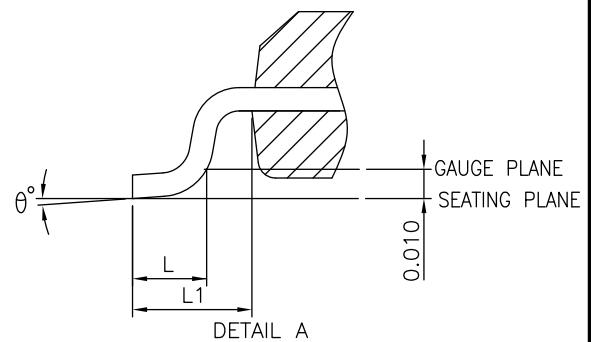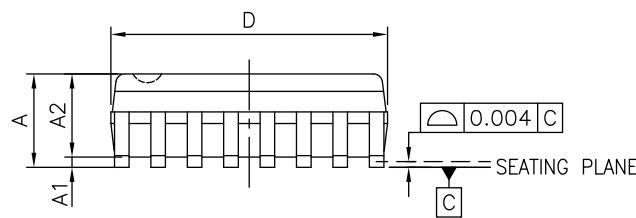
NOTES:
1. ALL DIMENSIONS IN INCH. ANGLES IN DEGREES.
2. JEDEC MO-137E
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

16-0056

PERICOM®

Packaging Mechanical: 16-pin TSSOP (L)
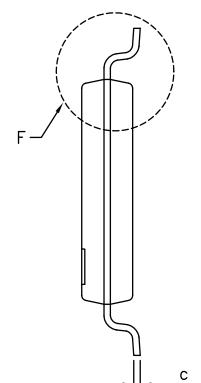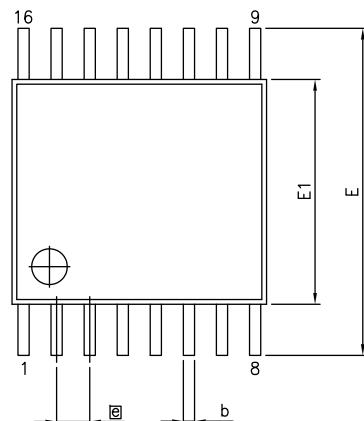
SYMBOLS	MIN.	NOM.	MAX.
A	–	–	1.20
A1	0.05	–	0.15
A2	0.80	1.00	1.05
b	0.19	–	0.30
c	0.09	–	0.20
D	4.90	5.00	5.10
E1	4.30	4.40	4.50
E	6.20	6.40	6.60
e	0.65 BSC		
L1	1.00 REF		
L	0.45	0.60	0.75
S	0.20	–	–
θ	0°	–	8°
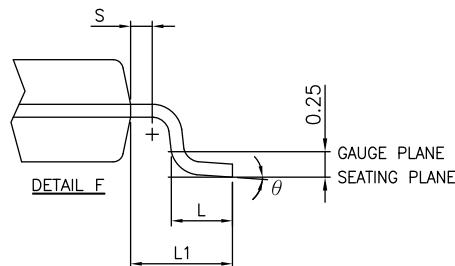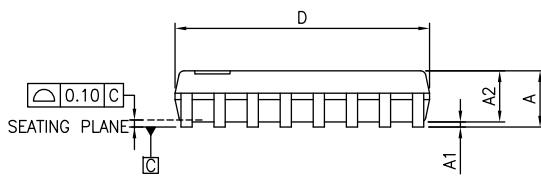
NOTES:
1. ALL DIMENSIONS IN MILLIMETERS. ANGLES IN DEGREES.
2. JEDEC MO−153F
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

16-0061

PERICOM® Enabling Serial Connectivity

DATE: 03/24/16

DESCRIPTION: 16-Pin, 173mil Wide TSSOP

PACKAGE CODE: L (L16)

DOCUMENT CONTROL #: PD-1310   REVISION: G

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

Ordering Information

Ordering Code	Packaging Code	Package Description
PI3V312QE	Q	16-pin, 150-Mil Wide (QSOP)
PI3V312QEX	Q	16-pin, 150-Mil Wide (QSOP), Tape & Reel
PI3V312LE	L	16-pin, 173 Mil Wide (TSSOP)
PI3V312LEX	L	16-pin, 173 Mil Wide (TSSOP), Tape & Reel

NOTES:

1. Thermal characteristics can be found on the company web site at www.pericom.com/package

2. E = Pb-free and Green

3. Adding an X suffix = Tape/Reel

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MC74LVX4066DR2 NCN2411MTTWG NLVHC4052ADTR2G TMUXHS221NKGR TMUX7221DGSR TMUX8213PWR 74HC4052BZX
ADG1408SRUZ-EP-RL7 ADG1408YRUZ-REEL 74HC4067PW-Q100J TMUX2889YBHR HD3SS213ZXHR TMUXHS4412RUAR
TMUXHS221NKGT TMUX131RMGR TMUX6209PWR MAX4052AESE+T MAX306EUI+T TMUX4827YBHR TMUXHS4412IRUAR
TS3DV642RUARQ1 PI3L500-AZFEX PI3WVR31310AZLEX PI3V312QEX PI3B3257QEX-2017 TC7W53FK,LF 74LVC1G3157GM,132
74LVC2G53DC,125 ADG439FBRZ-REEL PI5V330SQE CD4053BM96 CBTL06GP213EEJ 74LVC1G53DC,125 74LVC1G3157GM,115
MAX4634ETB+T