PERICOM®

LVDS High-Speed Differential Line Receivers

Features

- Signaling Rates >400Mbps (200 MHz)
- Single 3.3V Power Supply Design
- Accepts ±350mV (typical) Differential Swing
- Maximum Differential Skew of 0.35ns
- Maximum Propagation Delay of 4.7ns
- Low Voltage TTL (LVTTL) Outputs
- Industrial Temperature Operating Range: -40°C to 85°C
- Open, Short, and Terminated Fail Safe
- Meets or Exceeds ANSI/TIA/EIA-644 LVDS Standard
- Packaging (Pb-free & Green available):
 -8-Pin SOIC (W)
  -8-Pin MSOP (U)

Description

The PI90LV9637 is a differential line receiver that use low-voltage differential signaling (LVDS) to support data rates in excess of 400 Mbps. These products are designed for applications requiring high-speed, low-power consumption and low noise generation.

A differential input signal (350mV) is translated by the device to 3V CMOS output level.

Applications

Applications include point-to-point and multidrop baseband data transmission over controlled impedance media of approximately 100-ohms. The transmission media can be printed circuit board traces, backplanes, or cables.

The PI90LV9637 provides new alternatives to RS-232, PECL, and ECL devices for high-speed, point-to-point interface applications.

PI90LV9637
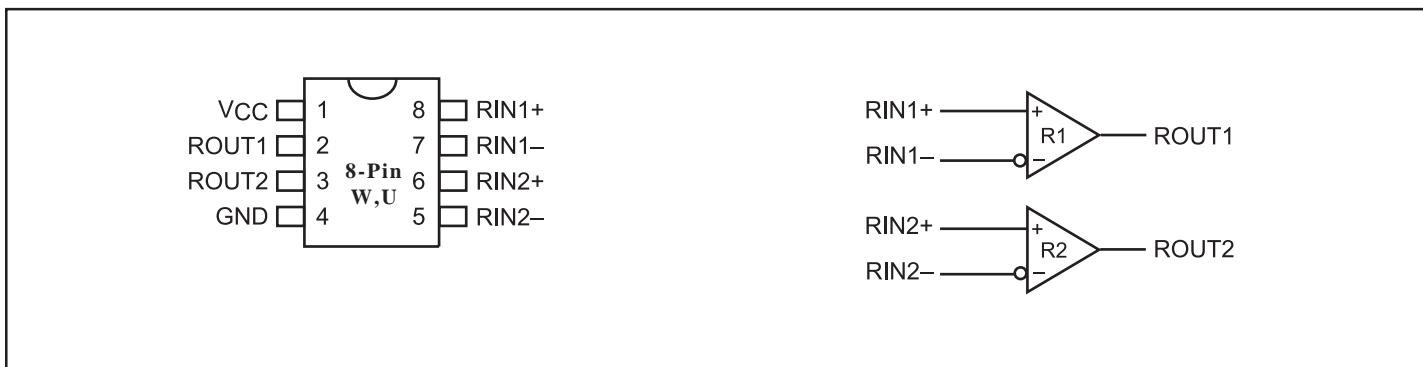
Absolute Maximum Ratings (see Note 1, Page 4)

Supply Voltage (V_{CC})	–0.3V to +4.0V
Input Voltage (R_{IN+}, R_{IN-})	–0.3V to +3.9V
Enable Input Voltage (EN)	–0.3V to (V_{CC}+0.3V)
Output Voltage (R_{OUT})	–0.3V to (V_{CC}+0.3V)
S Package	750mW
Derate S Package	8.2mW/°C above +25°C
Storage Temperature Range	–65°C to +150°C
Lead Temperature Range Soldering (4s)	+260°C
Maximum Junction Temperature	+150°C
ESD Rating	≥10kV

Note:
Stresses greater than those listed under Absolute 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.

Recommended Operating Condition

	Min.	Typ.	Max.	Units
Supply Voltage (V_{CC})	+3.0	+3.3	+3.6	V
Receiver Input Voltage	GND		+3.0	
Operating Free Air Temperature (T_A)	–40	+25	+85	°C

Function Table

Differential Inputs	Output
R_{IN+}, R_{IN-}	R_{OUT}
$V_{ID} \geq 100mV$	H
$-100mV < V_{ID} < 100mV$	?
$V_{ID} \leq -100mV$	L
Open	H

Pin Description

Name	Description
R_{OUT}	TTL/CMOS receiver output pins
R_{IN+}	Non-inverting receiver input pins
R_{IN-}	Inverting receiver input pins
GND	Ground pin
V_{CC}	Positive power supply pin, +3.3V ±10%

Electrical Characteristics

Over supply voltage and operating temperature ranges, unless otherwise specified. (Note 2)

Symbol	Parameter	Conditions		Pin	Min.	Typ.	Max.	Units
V_{TH}	Differential Input High Threshold	$Vcm = +1.2V^{(12)}$		R_{IN+}, R_{IN-}		+20	+100	mV
V_{TL}	Differential Input Low Threshold				−100	−20		
VCMR	Common-Mode Voltage Range	$V_{ID} = 200mV$ peak-to-peak$^{(5)}$			0.1		2.6	V
I_{IN}	Input Current	$V_{IN} = +2.8V$	$V_{CC} = +3.6$ or $0V$		−10	±1	+10	µA
		$V_{IN} = 0V$			−10	±1	+10	
		$V_{IN} = +3.6V$	$V_{CC} = 0V$		−20		+20	
V_{OH}	Output High Voltage	$I_{OH} = −0.4mA$, $V_{ID} = +200mV$		R_{OUT}	2.7	3.0		V
		$I_{OH} = −0.4mA$, Input terminated			2.7	3.0		
		$I_{OH} = −0.4mA$, Input shorted			2.7	3.0		
V_{OL}	Output Low Voltage	$I_{OL} = 2mA$, $V_{ID} = −200mV$				0.1	0.25	
I_{OS}	Output Short Circuit Current	Enabled, Vout = $0V^{(10)}$			−15	−48	−120	mA
I_{OZ}	Output Three-State Current	Disabled, $V_{OUT} = 0V$ or V_{CC}			−10	±1	+10	µA
V_{IH}	Input High Voltage			EN	2.0		V_{CC}	V
V_{IL}	Input Low Voltage				GND		0.8	
I_I	Input Current	$V_{IN} = 0V$ or V_{CC}, Other Input = V_{CC} or GND			−20	±1	+20	µA
V_{CL}	Input Clamp Voltage	$I_{CL} = −18mA$			−1.5	−0.8		V
I_{CC}	No Load Supply Current Receivers Enabled	$EN = V_{CC}$ or GND, Inputs Open		V_{CC}		10	15	mA
		EN = 2.4V or 0.5V, Inputs Open				10	15	
I_{CCZ}	No Load Supply Current Receivers Disabled	EN = GND, Inputs Open				7	10	
C_W	Input Capacitance					5	10	pF

Switching Characteristics

Over supply voltage and operating temperature ranges, unless otherwise specified. (Notes 3,4,7,8)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
t_{PHLD}	Differential Propagation Delay High to Low (V_{CM} = 1.23V)		1.8		4.7	
t_{PLHD}	Differential Propagation Delay Low to High (V_{CM} = 1.23V)		1.8		4.7	
t_{SKD1}	Differential Pulse Skew | t_{PHLD} - t_{PLHD} |[6]		0	0.1	0.5	
t_{SKD2}	Differential Channel-to-Channel Skew-same device[7]	C_L = 10pF V_{ID} = 200mV (Figures 1 & 2)	0	0.1	0.5	
t_{SKD3}	Differential Part-to-Part Skew[8]				1.0	
t_{SKD4}	Differential Part-to-Part Skew[9]				1.5	ns
t_{TLH}	Rise Time			0.35	1.2	
t_{THL}	Fall Time			0.35	1.2	
t_{PHZ}	Disable Time High to Z	R_L = 2kΩ		8	12	
t_{PLZ}	Disable Time Low to Z			6	12	
t_{PZH}	Enable Time Z to High	C_L = 10pF (Figures 3 & 4)		11	17	
t_{PZL}	Enable Time Z to Low			11	17	
f_{MAX}	Maximum Operating Frequency[13]	All channels switching		250		MHz

Notes:

1. "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" specifies conditions of device operation.

2. Current into device pins is defined as positive. Current out of device pins is defined as negative. All voltages are referenced to ground unless otherwise specified.

3. All typicals are given for: V_{CC} = +3.3V, T_A = +25°C.

4. Generator waveform for all tests unless otherwise specified: f = 1 MHz, Z_O = 50Ω, t_R and t_F (0% to 100%) ≤ 3ns for R_{IN}.

5. The VCMR range is reduced for larger V_{ID}. Example : if V_{ID} = 400mV, the VCMR is 0.2V to 2.2V. The fail-safe condition with inputs shorted is valid over a common-mode range of 0V to 2.3V. A V_{ID} up tp V_{CC} - 0V may be applied to the R_{IN+} / R_{IN-} inputs with the Common-Mode voltage set to V_{CC}/2. Propagation delay and Differential Pulse skew decrease when VID is increased from 200mV to 400mV. Skew specifications apply for 200mV ≤ V_{ID} ≤ 800mV over the common mode range.

6. tskd1 is the magnitude difference in differential propagation delay time between the positive going edge and the negative going edge of the same channel.

7. t_{SKD2}, Channel-to-Channel Skew, is defined as the difference between the propagation delay of one channel and that of the others on the same chip with any event on the inputs.

8. t_{SKD3}, Part-to-Part Skew, is the differential Channel-to-Channel skew of any event between devices. This specification applies to devices at the same V_{CC}, and within 5ºC of each other within the operating temperature range.

9. t_{SKD4}, Part-to-Part Skew, is the differential Channel-to-Channel skew of any event between devices. This specification applies to devices over recommended operating temperature and voltage ranges, and across process distribution. tskd4 is defined as lMax - Mini differential propagation delay.

10. Output short circuit current (I_{OS}) is specified as magnitude only, minus sign indicates direction only. Only one output should be shorted at a time, do not exceed maximum junction temperature specification.

11. C_L includes probe and jig capacitance.

12. V_{CC} is always higher than R_{IN+} and R_{IN-} voltage. R_{IN-} and R_{IN+} are allowed to have a voltage range -0.2V to V_{CC}- V_{ID}/2. However, to be compliant with AC specifications, the common voltage range 0.1V to 2.3V.

13. fmax generator input conditions: t_R = t_F < 1ns, (0% to 100%), 50% duty cycle, differential (1.05V to1.35V peak to peak). Output Criteria: duty cycle = 60%/40%, V_{OL} (max 0.4V), V_{OH} (min 2.7V), Load = 10pF (stray plus probes).
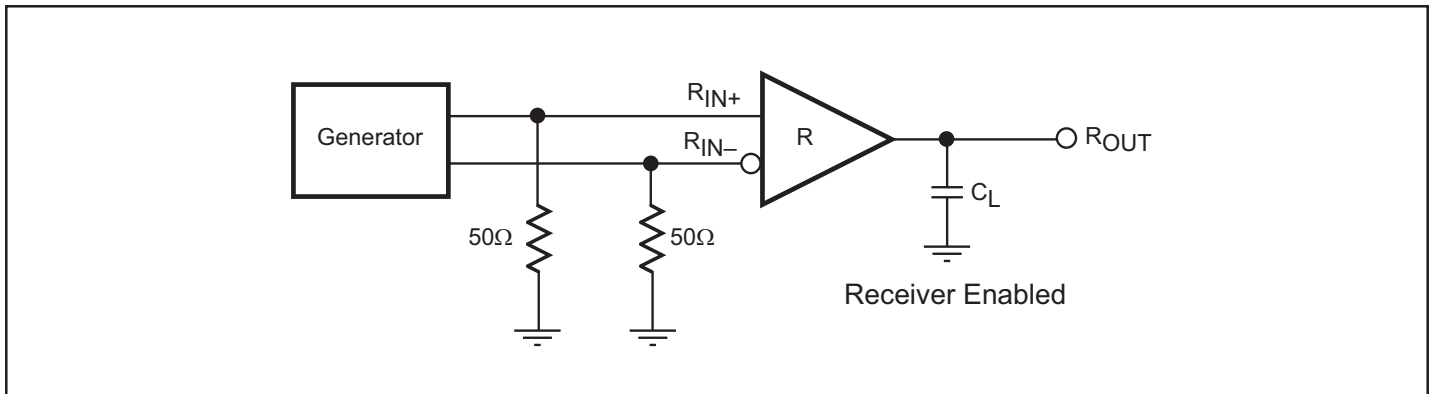
Parameter Measurement Information

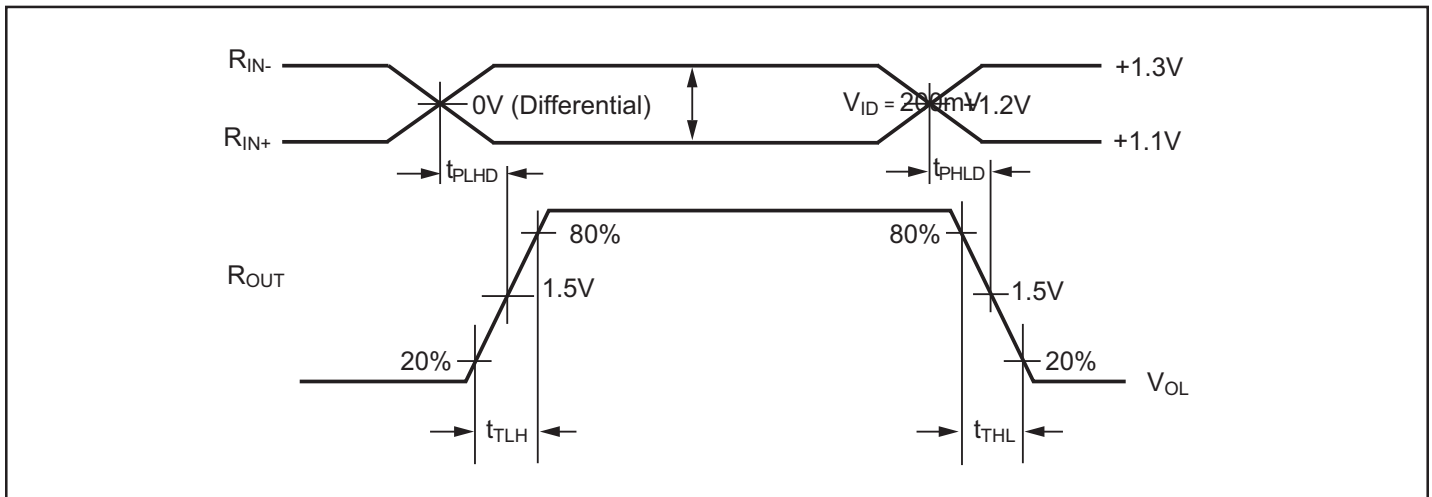**Figure 1. Receiver Propagation Delay and Transition Time Test Circuit**

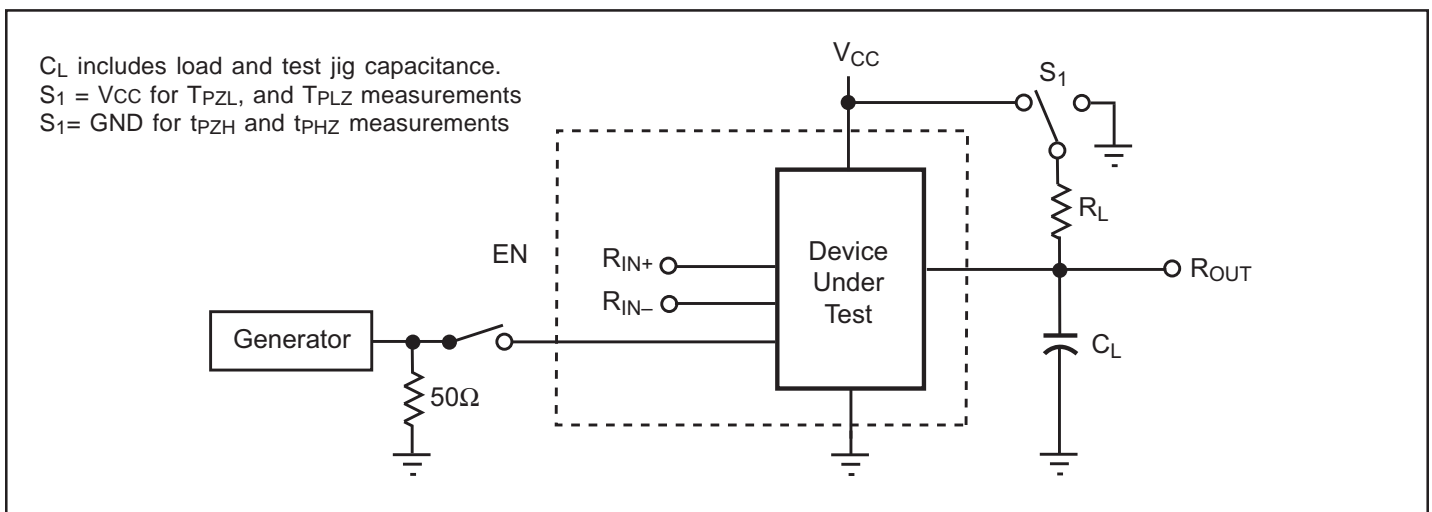**Figure 2. Receiver Propagation Delay and Transition Time Waveforms**
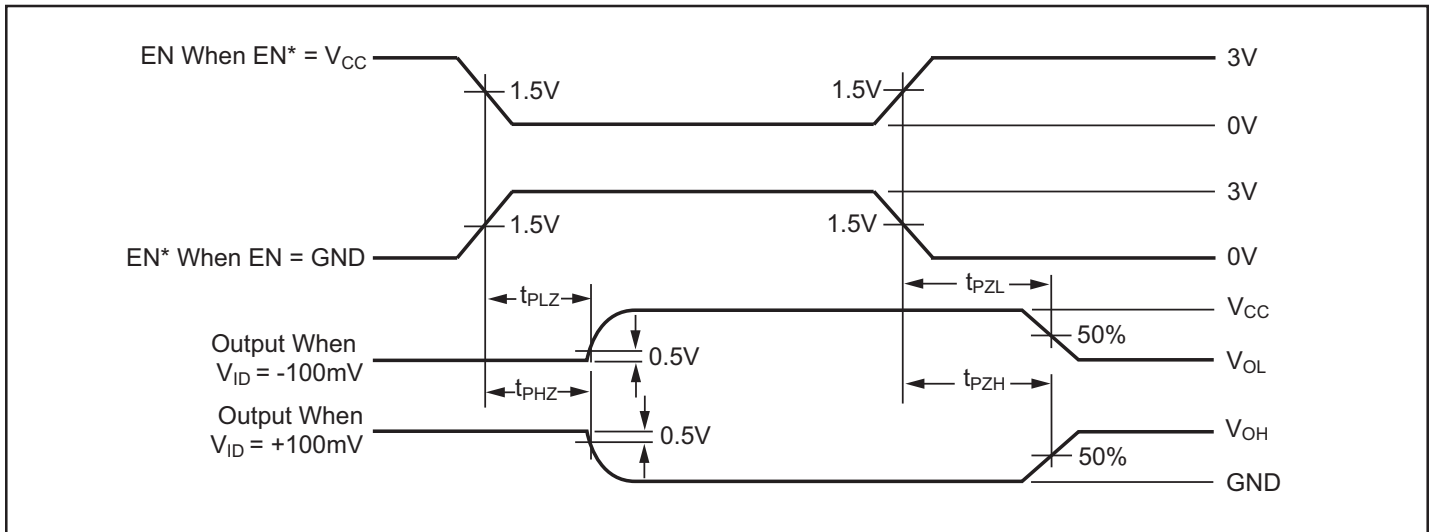

Figure 3. Receiver Three-State Delay Test Circuit

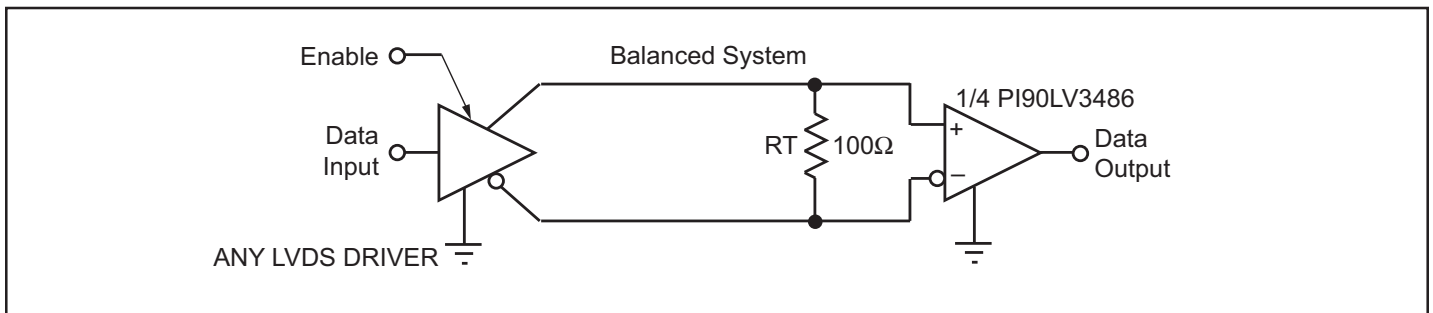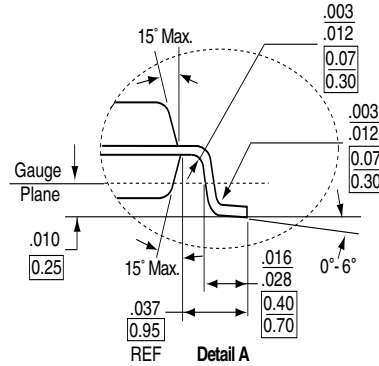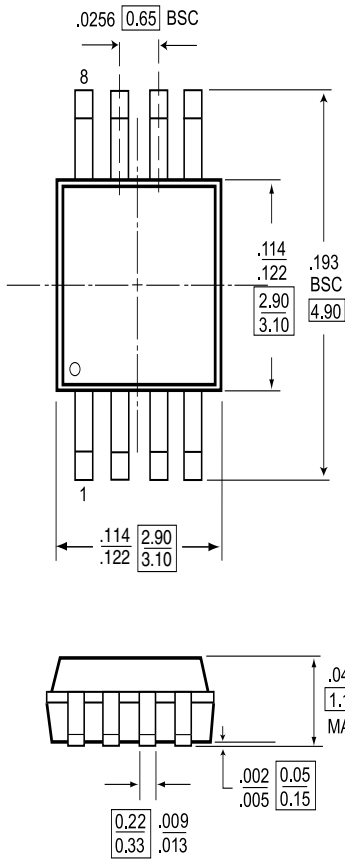**Figure 4. Receiver Three-State Delay Waveforms**

Figure 5. Point-to-Point Application

Packaging Mechanical: 8-Pin MSOP (U)

DOCUMENT CONTROL NO.
PD - 1261
REVISION: E
DATE: 03/09/05

.0256 | 0.65 | BSC

8

.114 / .122 | 2.90 / 3.10

.193 BSC / 4.90

1

.114 / .122 | 2.90 / 3.10

.003 / .012 | 0.07 / 0.30

15˚ Max.

Gauge Plane

.003 / .012 | 0.07 / 0.30

.010 | 0.25

15˚ Max.

.037 | 0.95
REF

.016 / .028 | 0.40 / 0.70

0˚- 6˚

Detail A

.112 / .120 | 2.85 / 3.05

15° MAX

Detail A

15° MAX

.114 / .122 | 2.90 / 3.10

.043 | 1.10 MAX

.002 / .005 | 0.05 / 0.15

0.22 / 0.33 | .009 / .013
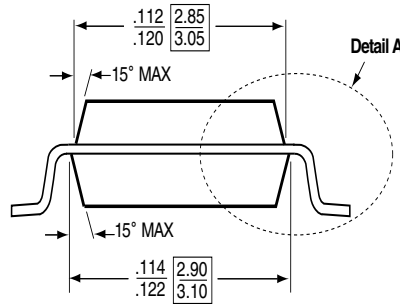
X.XX DENOTES DIMENSIONS
X.XX IN MILLIMETERS

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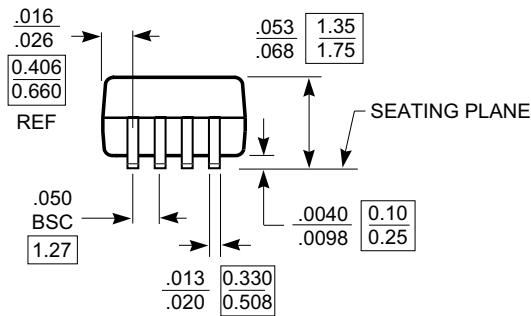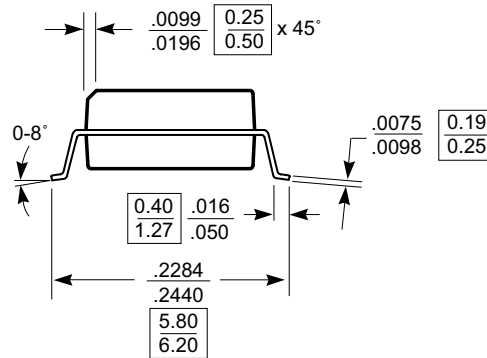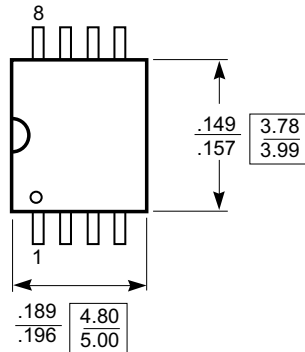**DESCRIPTION: 8-Pin Mini Small Outline Package, MSOP**

PACKAGE CODE: U

Notes:
1) Controlling Dimensions inMillimeters
2) Ref. JEDEC MO-187E/AA

Packaging Mechanical: 8-Pin SOIC (W)

DOCUMENT CONTROL NO.
PD - 1001

REVISION: F
DATE: 03/09/05

8

.149 / .157 → 3.78 / 3.99

.0099 / .0196 → 0.25 / 0.50 x 45°

1

.189 / .196 → 4.80 / 5.00

0-8°

.0075 / .0098 → 0.19 / 0.25

.40 / 1.27   .016 / .050

.2284 / .2440 → 5.80 / 6.20

.016 / .026
0.406 / 0.660
REF

.053 / .068 → 1.35 / 1.75

SEATING PLANE

.050
BSC
1.27

.0040 / .0098 → 0.10 / 0.25

.013 / .020 → 0.330 / 0.508

X.XX	DENOTES DIMENSIONS
X.XX	IN MILLIMETERS

Notes:
1) Controlling dimensions in millimeters.
2) Ref: JEDEC MS-012D/AA

PERICOM®

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DESCRIPTION: 8-Pin, 150-Mil Wide, SOIC

PACKAGE CODE: W

Ordering Information

Ordering Code	Package Code	Package Type
PI90LV9637U	U	8-pin MSOP
PI90LV9637UE	U	Pb-free & Green, 8-pin MSOP
PI90LV9637WE	W	Pb-free & Green, 8-pin SOIC

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

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SN75LVDS82DGGR SN75LVDS86ADGGG4 MC100LVEL16DTR2G SN75LVDS82DGGG4 PI90LV028AWE 701798X 701798XB
DS1489AM 5962-9164001MFA DS3486M/NOPB DS34LV86TM SN75107AD SN75107AN SN75107ANE4 SN75107BD SN75107BDR
SN75107BN SN75115D SN75115N SN75115NE4 SN75115NSR SN75124N SN75140P SN75140PSR SN75154D SN75154N SN75182D
SN75182DR SN75182N