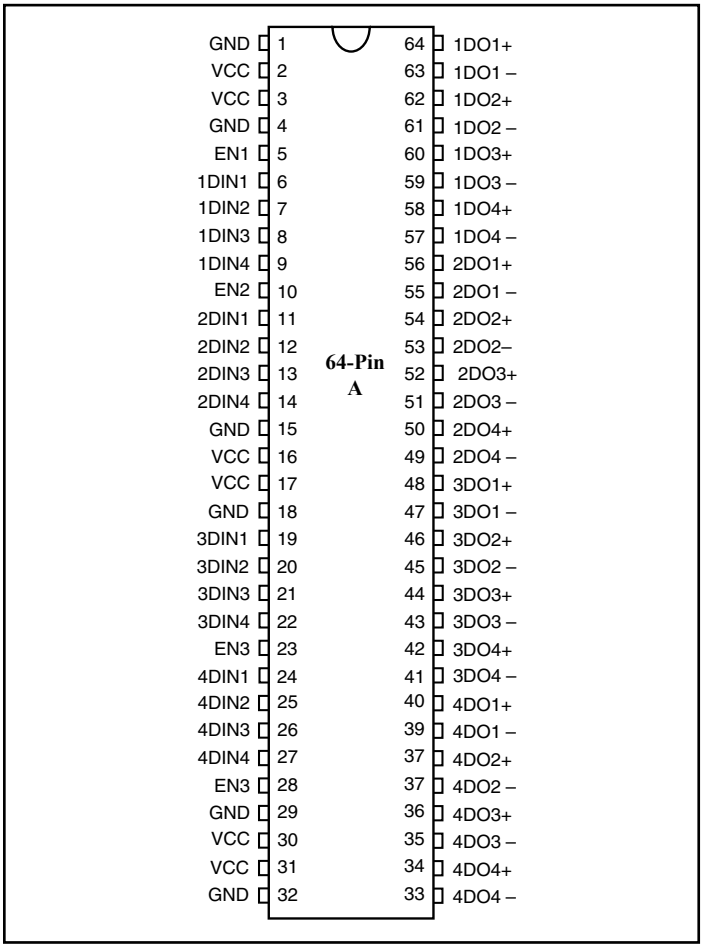
PI90LV387/ PI90LVB387

High-Speed Differential Line Drivers

Features

- Sixteen line drivers meet or exceed the requirements of the ANSI EIA/TIA-644 Standard
- Designed for signaling rates up to 500 Mbps with very low radiation (EMI)
- Low voltage differential signaling with typical output voltage of 350mV into :
  – 100Ω load (PI90LV387)
  – 50Ω load (PI90LVB387)
- Propagation delay times less than 2.6ns
- Output skew is less than 150ps
- Part-to-part skew is less than 1.5ns
- 35mW total power dissipation in each driver operating at 200 MHz
- Bus-pin ESD protection exceeds 10kV
- Low voltage TTL (LVTTL) logic inputs are 5V tolerant
- Packaging (Pb-free & Green available):
  -64-Pin TSSOP (A)

Pin Diagram



Description

PI90LV387/ PI90LVB387 consists of sixteen differential line drivers that implement the electrical characteristics of low-voltage differential signaling (LVDS). This signaling technique lowers output voltage levels to reduce power, increase switching speeds, and allow operation with a 3V supply rail.

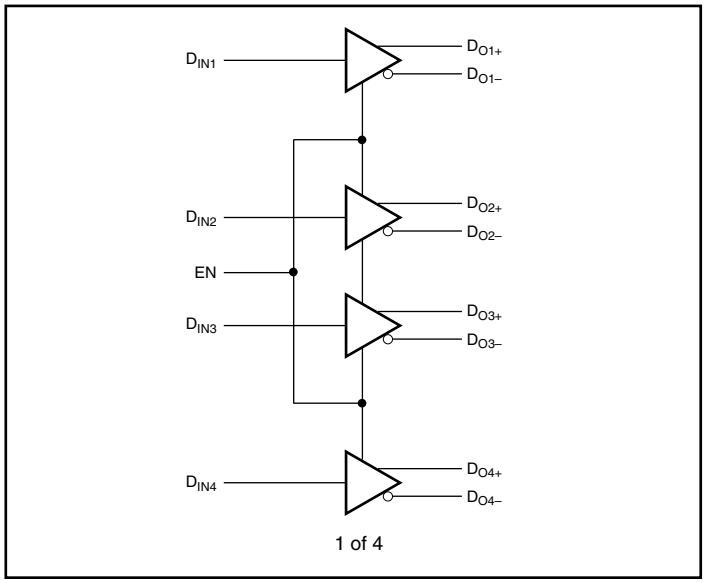
The intended application of this device and signaling technique is for point-to-point baseband (single termination) and multipoint (double termination) data transmission over a controlled impedance media of approximately 100Ω and 50Ω (LVB387). The transmission media may be printed-circuit board traces, backplanes, or cables. The large number of drivers integrated into the same substrate, with the low pulse skew of balanced signaling, allows extremely precise timing alignment of clock and data for synchronous parallel data transfers. When used with its companion 16-channel receivers, the PI90LV386 or PI90LVT386, over 400 million data transfers per second in single-edge clocked systems are possible with very little power.

(Note: The ultimate rate and distance of data transfer is dependent upon attenuation characteristics of the media, the noise coupling to the environment, and other system characteristics.)

The drivers are enabled in groups of five. When disabled, driver outputs are at a high impedance. Each driver input (D_{IN}) and enable (EN) have an internal pulldown that drives the input to a low level when open circuited.

The parts are characterized for operation from –40°C to 85°C.

Block Diagram



Absolute Maximum Ratings

(Over Operating Free-Air Temperature, unless otherwise noted)(1)

Supply Voltage Range, V_{CC}(2)	–0.5V to 4V
Voltage Range: Inputs	–0.5V to 6V
D_{O+} or D_{O-}	–0.5V to 4V
Electrostatic Discharge(3):	
(D_{O+},D_{O-} and GND)	Class 3, A: 10kV, B:700V
(All Pins)	Class 3, A: 8kV, B:600V
Continuous Power Dissipation	(see dissipation rating table)
Storage Temperature Range	–65°C to 150°C
Lead Temperature 1.6mm (1/16 inch) from case for 10 seconds	260°C

Notes:

1. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to Absolute-Maximum-Rated conditions for extended periods may affect device reliability.
2. All voltage values, except differential I/O bus voltages, are with respect to ground terminal.
3. Tested in accordance with MIL-STD-883C Method 3015.7

Recommended Operating Conditions

	Min.	Nom.	Max.	Units
Supply Voltage, V_{CC}	3.0	3.3	3.6	V
High-level Input Voltage, V_{IH}	2.0			
Low-level Input Voltage, V_{IL}			0.8	
Operating free-air temperature, T_A	-40		85	ºC

Driver Function Table

Differential Input	Enables	Outputs	
D_{IN}	EN	D_{OUT+}	D_{OUT-}
H	H	H	L
L	H	L	H
X	L	Z	Z
Open	H	L	H

Notes:

1. H = high level,
   L = low level,
   X = irrelevent,
   Z = high impedance (off)

Electrical Characteristics Over Recommended Operating Conditions (unless otherwise noted)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Units
$\lvert V_{OH} \rvert$	Differential output voltage magnitude	R_L = 50Ω (LVB) R_L = 100Ω (LV) See Figure 1 and 2		247	340	454	mV
$\Delta\lvert V_{OH} \rvert$	Change in differential output voltage magnitude between logic states			-50		50	
$V_{OC(SS)}$	Steady-state common-mode output voltage	See Figure 3	LV	1.125		1.375	V
			LVB	1.000		1.375	
$\Delta V_{OC(SS)}$	Change in Steady-state common-mode output voltage between logic states	See Figure 3		-50		50	mV
$V_{OC(PP)}$	Peak-to-peak common-mode output voltage				50	150	
I_{CC}	Supply Current	R_L = 50Ω (LVB) R_L = 100Ω (LV) Enabled, V_{IN} = GND or V_{CC}	LV		60	78	mA
			LVB		122	190	
I_{IH}	High-Level input current	V_{IH} = 2V			3	20	µA
I_{IL}	Low-level input current	V_{IL} = 0.8V			2	10	
I_{OS}	Short-circuit output current	V_{ODOUT+} or V_{ODOUT-} = 0V	LV			±24	mA
			LVB			±48	
		V_{OD} = 0V	LV			±12	
			LVB			±24	
I_{OZ}	High-impedance output current	V_O = 0V or V_{CC}				±1	µA
$I_{O(OFF)}$	Power-off output current	V_{CC} = 0V, V_O = 2.4V				±1	
C_{IN}	Input capacitance	V_I = 0.4 sin (4E6πt) + 0.5V			6		pF
C_O	Output capacitance	V_I = 0.4 sin (4E6πt) + 0.5V, Disabled			9.4		

Note:
1. All typical values are at 25°C and with a 3.3V supply.

Switching Characteristics (Over Recommended Operating Conditions, unless otherwise noted)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
t_{PHL}	Propagation delay time low-to-high level outputs	R_L = 50Ω (LVB) R_L = 100Ω (LV) C_L = 10pF See Figure 4	0.9	1.8	2.6	ns
t_{PHL}	Propagation delay time, high-to-low-level outputs		0.9	1.8	2.6	
t_r	Differential outpu sign rise time		0.4	0.8	1.3	
t_f	Differential output signal fall time		0.4	0.8	1.3	
$t_{sk(p)}$	Pulse skew (| tphl - tphl |)			150	500	ps
$t_{sk(o)}$	Output skew(2)			80	150	
$t_{sk(pp)}$	Part-to-part skew (3)				1.5	
t_{PZH}	Propagation delay time, high impdeance-to high-level output	See Figure 5		4.5	6.7	ns
t_{PZL}	Propagation delay time, high impdeance-to low-level output			3.5	5.1	
t_{PHZ}	Propagation delay time, high-level-to-high-impdeance output			3.1	4.6	
t_{PLZ}	Propagation delay time, low-level-to-high-impdeance output			3.1	4.6	
f_{MAX}	Maximum operating frequency			250		MHz

Notes:
1. All typical values are at 25°C and with a 3.3V supply
2. $t_{sk(o)}$ is the magnitude of the time difference between the t_{PLH} or t_{PHL} of all drivers of a single device with all of their inputs connected together.
3. $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits

Parameter Measurement Information

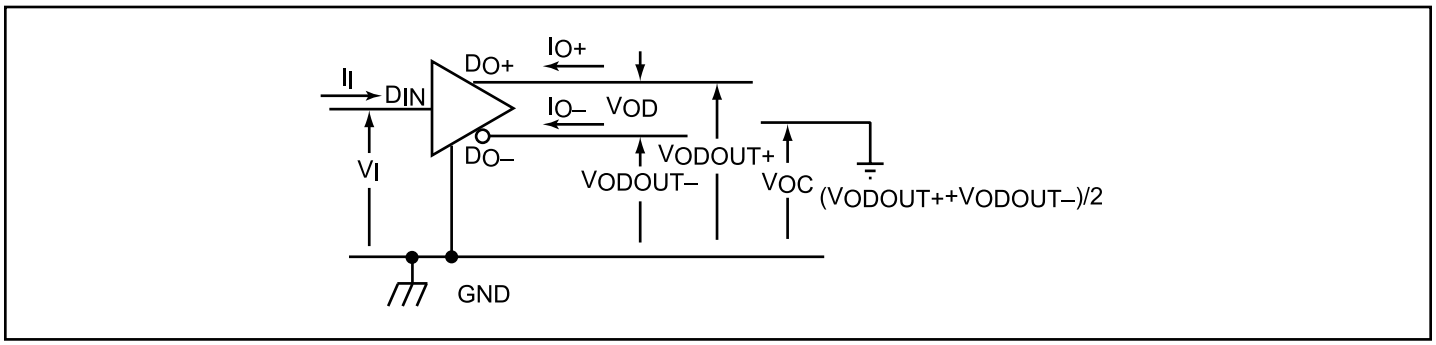


Figure 1. Voltage and Current Definitions

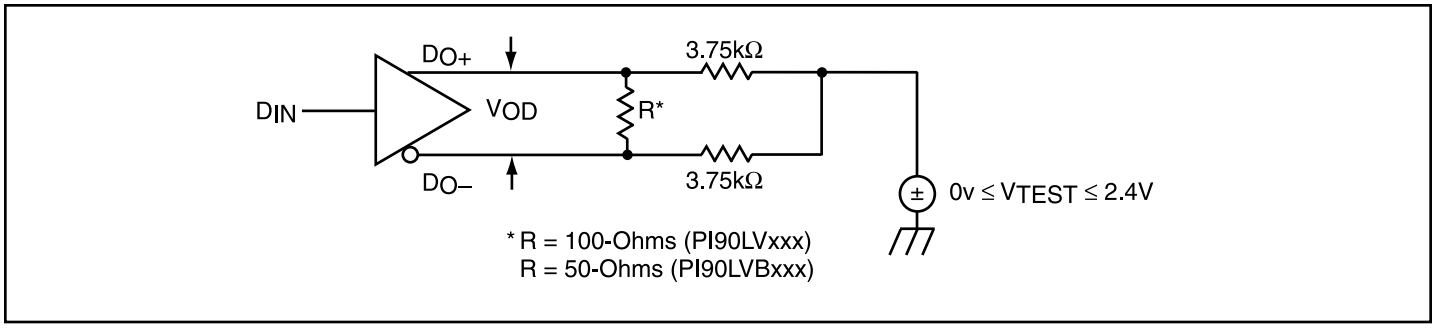


Figure 2. V_{OD} Test Circuit

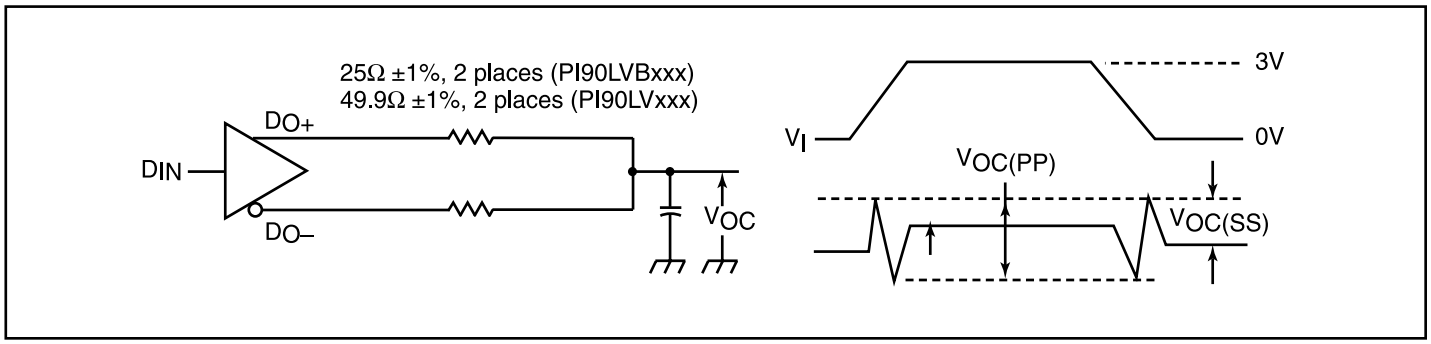


Figure 3. Test Circuit & Definitions for the Driver Common-Mode Output Voltage

Note:

1. All input pulses are supplied by a generator having the following characteristics: t_r or $t_f \leq 1$ns, Pulse Repetition Rate (PRR) = 50 Mpps, Pulse width = 10 ±0.2ns. C_L includes instrumentation and fixture capacitance within 0.06m of the D.U.T. The measurement of VOC(PP) is made on test equipment with a –3dB bandwidth of at least 300MHz.

Parameter Measurement Information (continued)

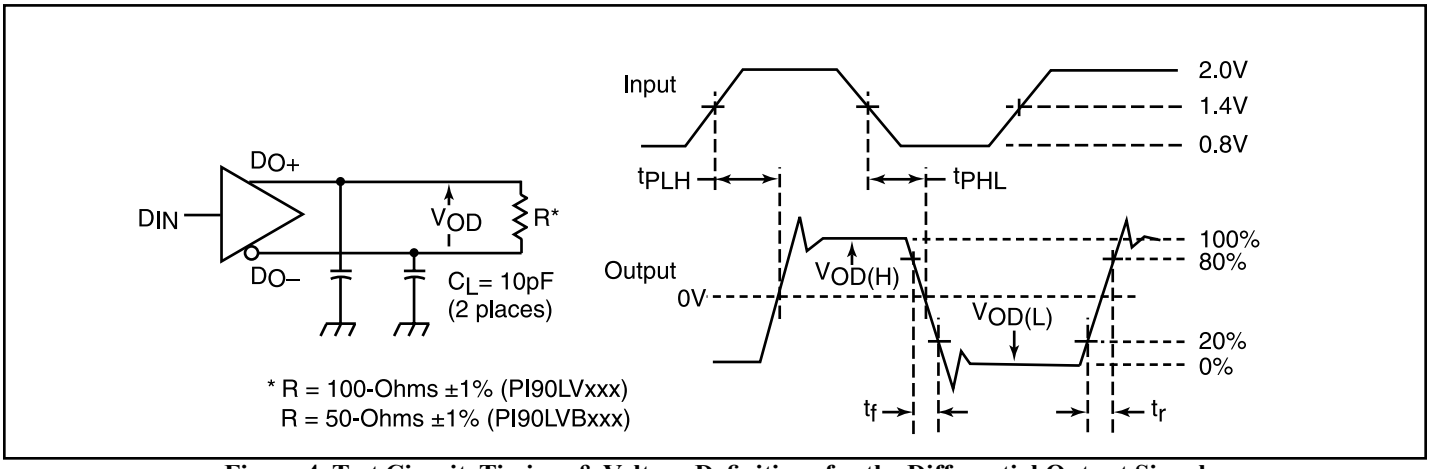
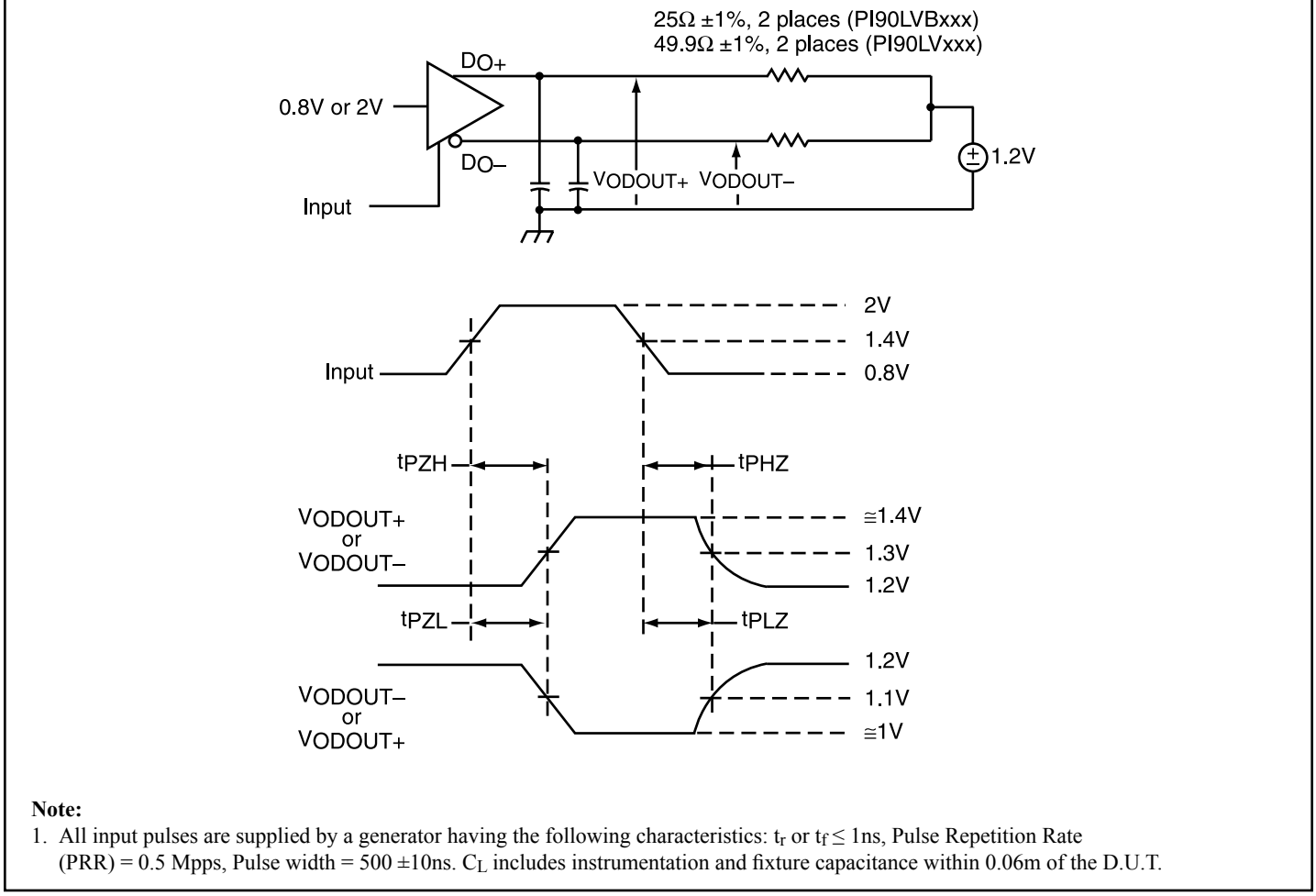


Figure 4. Test Circuit, Timing, & Voltage Definitions for the Differential Output Signal

Note:

1. All input pulses are supplied by a generator having the following characteristics: t_r or $t_f \leq 1$ns, Pulse Repetition Rate (PRR) = 15 Mpps, Pulse width = 10 ±0.2ns. C_L includes instrumentation and fixture capacitance within 0.06m of the D.U.T.

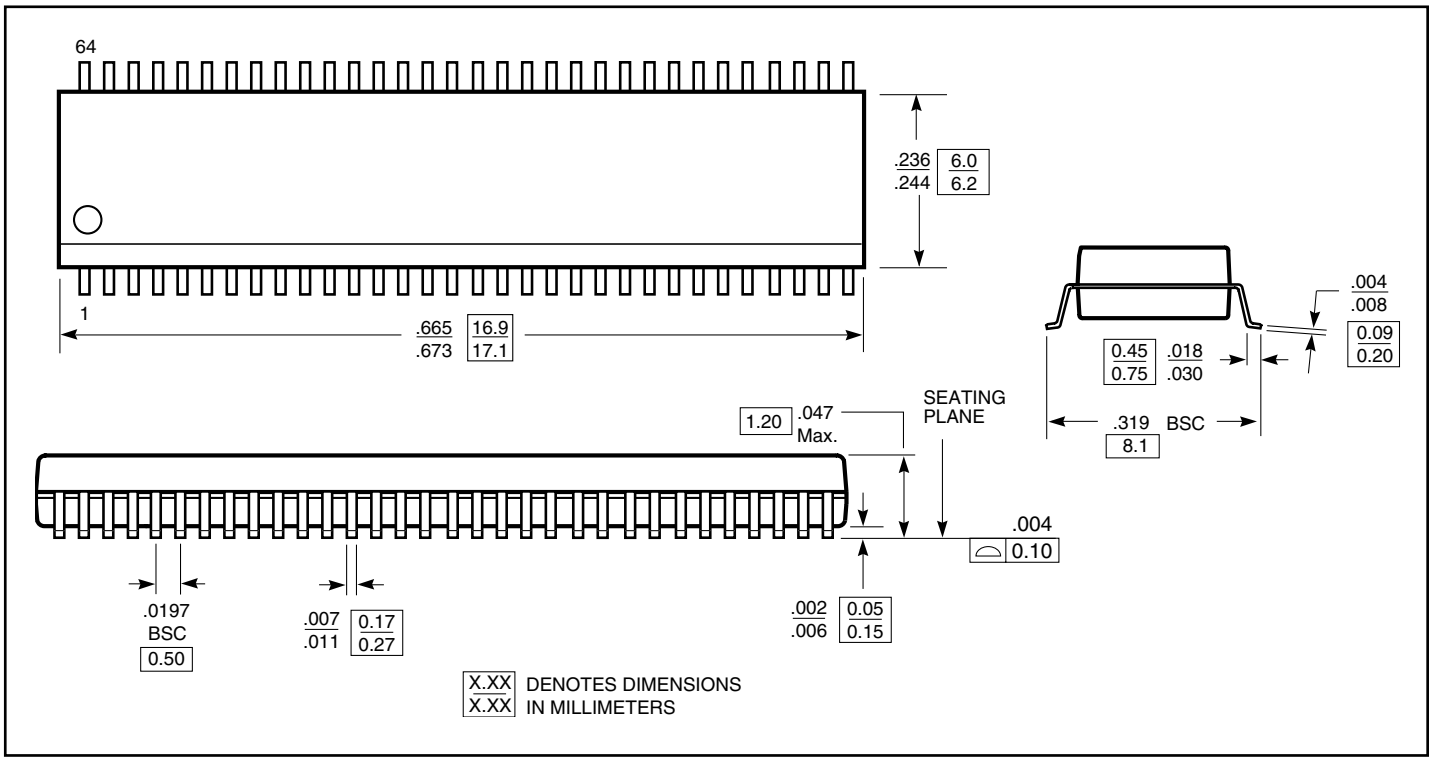


Note:

1. All input pulses are supplied by a generator having the following characteristics: t_r or $t_f \leq$ 1ns, Pulse Repetition Rate (PRR) = 0.5 Mpps, Pulse width = 500 ±10ns. C_L includes instrumentation and fixture capacitance within 0.06m of the D.U.T.

Figure 5. Enable & Disable Time Circuit & Definitions

Packaging Mechanical: 64-Pin TSSOP (A)



Ordering Information

Ordering Code	Package Code	Package Type
PI90LV387A	A	64-pin TSSOP
PI90LV387AE	A	Pb-free & Green, 64-pin TSSOP
PI90LVB387A	A	64-pin TSSOP
PI90LVB387AE	A	Pb-free & Green, 64-pin TSSOP

Notes:

1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
2. Number of Transistors = TBD