

### Product Features

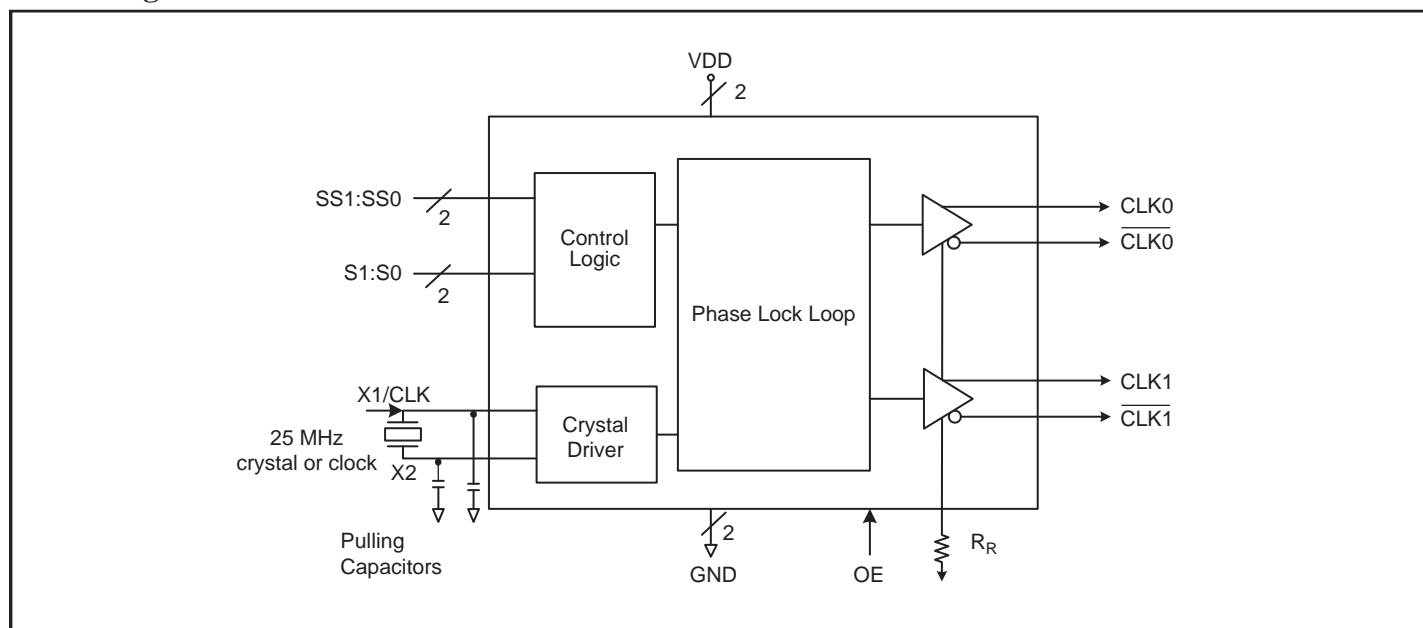
- LVDS compatible outputs
- Supply voltage of 3.3V  $\pm$ 10%
- 25MHz input frequency
- HCSL outputs, 0.7V Current mode differential pair
- Jitter 60ps cycle-to-cycle (typ)
- Spread of  $\pm$ 0.25%, -0.5%, -0.75%, and no spread
- Industrial temperature range
- Packaging: (Pb-free and Green)  
—16-pin, 173 mils wide TSSOP

### Description

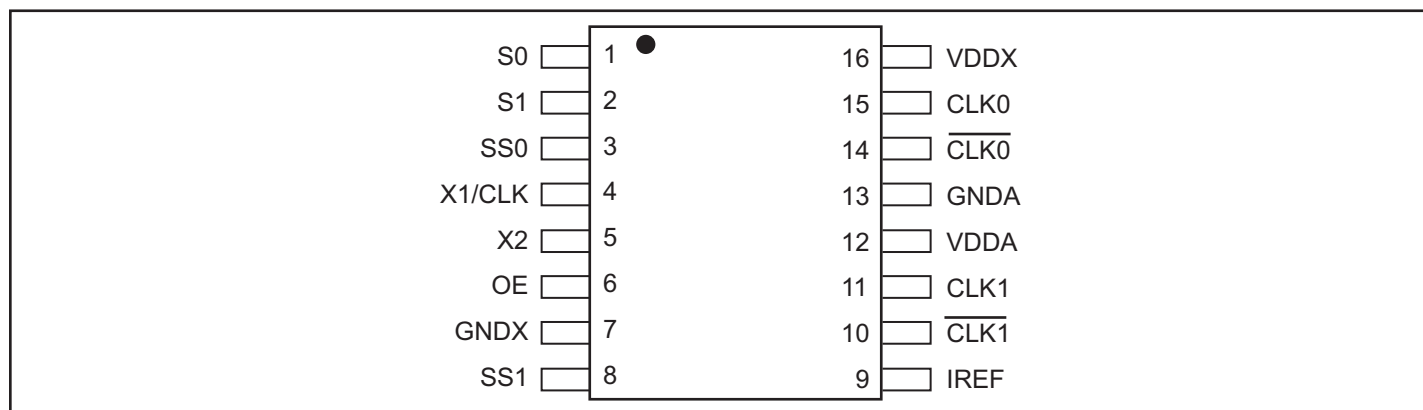
The PI6C557-03 is a spread spectrum clock generator supporting PCI Express and Ethernet requirements. The device is used for PC or embedded systems to substantially reduce Electromagnetic Interference (EMI).

The PI6C557-03 provides two differential (HCSL) spread spectrum outputs. The PI6C557-03 is configured to select spread and clock selection. Using Pericom's patented Phase-Locked Loop (PLL) techniques, the device takes a 25MHz crystal input and produces two pairs of differential outputs (HCSL) at 25MHz, 100MHz, 125MHz and 200MHz clock frequencies. It also provides spread selection of  $\pm$ 0.25%, -0.5%, -0.75%, and no spread.

### Block Diagram



### Pin Configuration



**Pin Description**

Pin #	Pin Name	I/O Type	Description
1	S0	Input	Select pin 0 (Internal pull-up resistor). See Table 1.
2	S1	Input	Select pin 1 (Internal pull-up resistor). See Table 1.
3	SS0	Input	Spread Select pin 0 (Internal pull-up resistor). See Table 2.
4	X1/CLK	Input	Crystal or clock input. Connect to a 25MHz crystal or single ended clock.
5	X2	Output	Crystal connection. Leave unconnected for clock input.
6	OE	Input	Output enable. Internal pull-up resistor.
7	GNDX	Power	Crystal ground pin.
8	SS1	Input	Spread Select pin 1 (Internal pull-up resistor). See Table 2.
9	IREF	Output	Precision resistor attached to this pin is connected to the internal current reference.
10	CLK1	Output	HCSL compliment clock output
11	CLK1	Output	HCSL clock output
12	VDDA	Power	Connect to a +3.3V source.
13	GND A	Power	Output and analog circuit ground.
14	CLK0	Output	HCSL compliment clock output
15	CLK0	Output	HCSL clock output
16	VDDX	Power	Connect to a +3.3V source.

**Table 1: Output Select Table**

S1	S0	CLK(MHz)
0	0	25
0	1	100
1	0	125
1	1	200

**Table 2: Spread Selection Table**

SS1	SS0	Spread
0	0	Center $\pm 0.25$
0	1	Down -0.5
1	0	Down -0.75
1	1	No Spread

## Application Information

### Decoupling Capacitors

Decoupling capacitors of 0.01 $\mu$ F should be connected between each VDD pin and the ground plane and placed as close to the VDD pin as possible.

### Crystal

Use a 25MHz fundamental mode parallel resonant crystal with less than 300PPM of error across temperature.

### Crystal Capacitors

$C_L$  = Crystals's load capacitance in pF

Crystal Capacitors (pF) =  $(C_L - 8) * 2$

For example, for a crystal with 16pF load caps, the external effective crystal cap would be 16 pF.  $(16-8)*2=16$ .

### Current Source (Iref) Reference Resistor - $R_R$

If board target trace impedance is 50 $\Omega$ ,

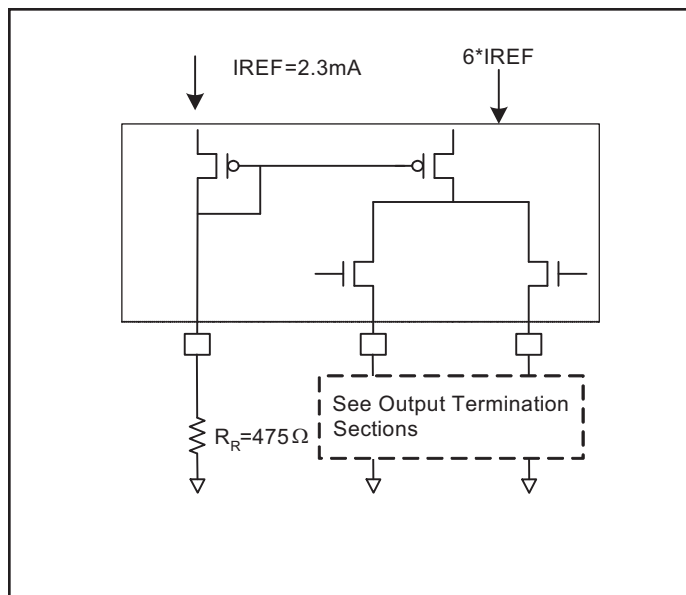
then  $R_R = 475\Omega$  providing an IREF of 2.32 mA. The output current ( $I_{OH}$ ) is 6\*IREF.

### Output Termination

The PCI-Express differential clock outputs of the PI6C557-03 are open source drivers and require an external series resistor and a resistor to ground. These resistor values and their allowable locations are shown in detail in the PCI-Express Layout Guidelines section.

The PI6C557-03 can be configured for LVDS compatible voltage levels. See the LVDS Compatible Layout Guidelines section.

## Output Structures



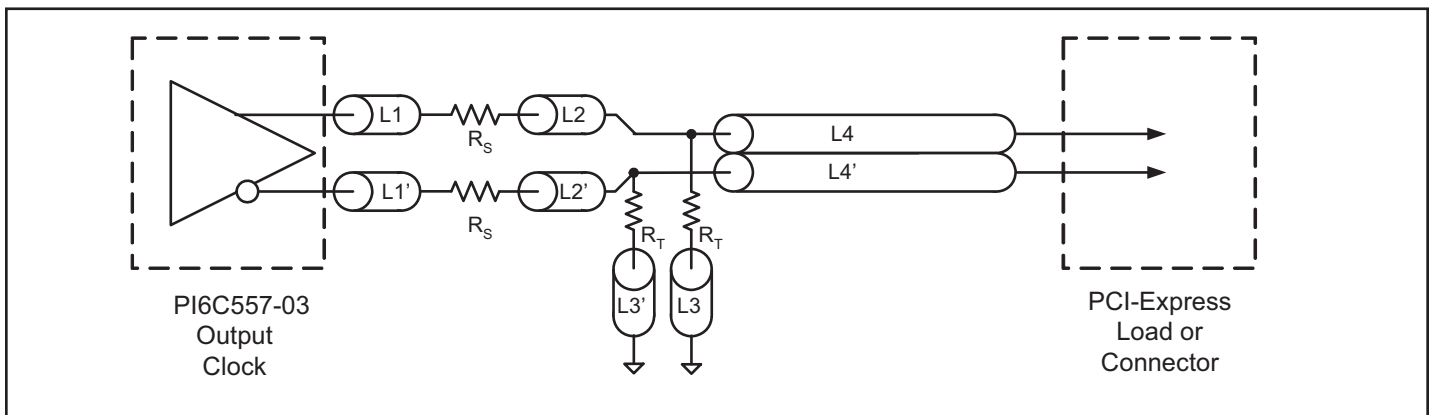
## PCI-Express Layout Guidelines

Common Recommendations for Differential Routing	Dimension or Value	Unit
L1 length, route as non-coupled 50Ω trace.	0.5 max	inch
L2 length, route as non-coupled 50Ω trace.	0.2 max	inch
L3 length, route as non-coupled 50Ω trace.	0.2 max	inch
$R_S$	33	Ω
$R_T$	49.9	Ω

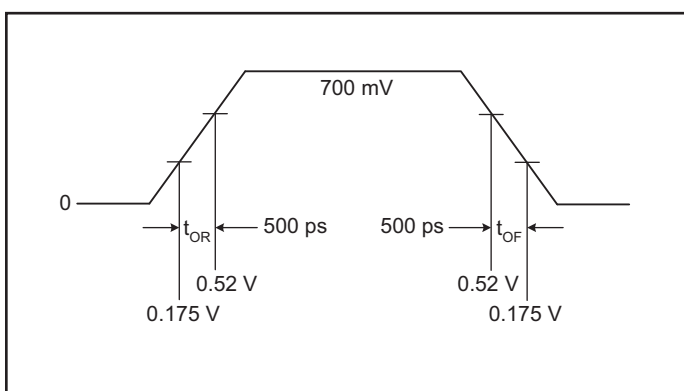
Differential Routing on a Single PCB	Dimension or Value	Unit
L4 length, route as coupled microstrip 100Ω differential trace.	2 min to 16 max	inch
L4 length, route as coupled stripline 100Ω differential trace.	1.8 min to 14.4 max	inch

Differential Routing to a PCI Express connector	Dimension or Value	Unit
L4 length, route as coupled microstrip 100Ω differential trace.	0.25 min to 14 max	inch
L4 length, route as coupled stripline 100Ω differential trace.	0.225 min to 12.6 max	inch

## PCI-Express Device Routing



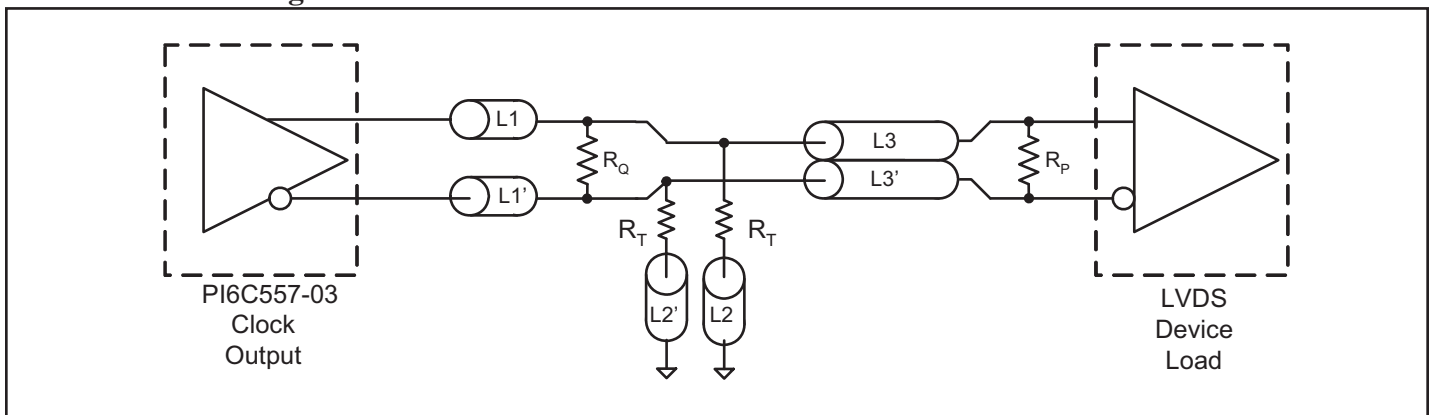
## Typical PCI-Express (HCSL) Waveform



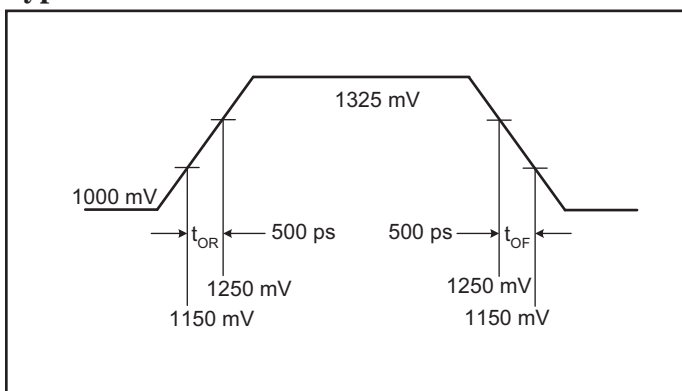
### Application Information

LVDS Recommendations for Differential Routing	Dimension or Value	Unit
L1 length, route as non-coupled 50Ω trace.	0.5 max	inch
L2 length, route as non-coupled 50Ω trace.	0.2 max	inch
$R_p$	100	$\Omega$
$R_Q$	100	$\Omega$
$R_T$	150	$\Omega$
L3 length, route as non-coupled 50Ω trace.		
L3 length, route as non-coupled 50Ω trace.		

### LVDS Device Routing



### Typical LVDS Waveform



## Electrical Specifications

### Maximum Ratings

Supply Voltage to Ground Potential.....	5.5V
All Inputs and Outputs.....	-0.5V to V <sub>DD</sub> +0.5V
Ambient Operating Temperature .....	-40 to +80°C
Storage Temperature .....	-65 to +150°C
Junction Temperature .....	150°C
Soldering Temperature .....	260°C

**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.

### Recommended Operation Conditions

Parameter	Min.	Typ.	Max.	Unit
Ambient Operating Temperature	-40		+85	°C
Power Supply Voltage (measured in respect to GND)	+3.0		+3.6	V

### DC Characteristics (V<sub>DD</sub> = 3.3V ±10%, T<sub>A</sub> = -40°C to +85°C)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit	
V <sub>DD</sub>	Supply Voltage		3.0	3.3	3.60	V	
V <sub>IH</sub>	Input High Voltage <sup>(1)</sup>	S0, S1, OE, CLK, SS0, SS1	2.0		V <sub>DD</sub> +0.3	V	
V <sub>IL</sub>	Input Low Voltage <sup>(1)</sup>	S0, S1, OE, CLK, SS0, SS1	GND -0.3		0.8	V	
I <sub>IL</sub>	Input Leakage Current	0 < V <sub>in</sub> < V <sub>DD</sub>	With input pull-up and pull-downs	-20		20	μA
			Without input pull-up and pull-downs	-5		5	
I <sub>DD</sub>	Operating Supply Current	R <sub>L</sub> = 50Ω, C <sub>L</sub> = 2pF			65	mA	
I <sub>DDOE</sub>		OE = LOW			35	mA	
C <sub>IN</sub>	Input Capacitance	Input pin capacitance			7	pF	
C <sub>OUT</sub>	Output Capacitance	Output pin capacitance			6	pF	
L <sub>PIN</sub>	Pin Inductance				5	nH	
R <sub>OUT</sub>	Output Resistance	CLK Outputs	3.0			kΩ	

**Notes:**

1. Single edge is monotonic when transitioning through region.

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$F_{IN}$	Input Frequency			25		MHz
$V_{OUT}$	Output Frequency		25		200	MHz
$V_{OH}$	Output High Voltage <sup>(1,2)</sup>	@VDD = 3.3V	660	700	850	mV
$V_{OL}$	Output Low Voltage <sup>(1,2)</sup>		-150	0		mV
$V_{CPA}$	Crossing Point Voltage <sup>(1,2)</sup>	Absolute	250	350	550	mV
$V_{CN}$	Crossing Point Voltage <sup>(1,2,4)</sup>	Variation over all edges			140	mV
$J_{CC}$	Jitter, Cycle-to-Cycle <sup>(1,3)</sup>			60	100	ps
MF	Modulation Frequency	Spread Spectrum	30	31.5	33	kHz
$t_{OR}$	Rise Time <sup>(1,2)</sup>	From 0.175V to 0.525V	175	332	700	ps
$t_{OF}$	Fall Time <sup>(1,2)</sup>	From 0.525V to 0.175V	175	344	700	ps
$\Delta T_{R/\Delta T}$	Rise/Fall Time Variation <sup>(1,2)</sup>				125	ps
$T_{SKEW}$	Skew between outputs	VDD/2			50	ps
$T_{DUTY-CYCLE}$	Duty Cycle <sup>(1,3)</sup>		45		55	%
$T_{OE}$	Output Enable Time <sup>(5)</sup>	All outputs		0.1		$\mu s$
$T_{OT}$	Output Disable Time <sup>(5)</sup>	All outputs		0.1		$\mu s$
$t_{STABLE}$	From power-up to VDD=3.3V		1.6	3.0		ms
$t_{SPREAD}$	Setting period after spread change			3.0		ms

**Notes:**

- $R_L = 50\Omega$  with  $C_L = 2$  pF and  $R_R = 475\Omega$
- Single-ended waveform
- Differential waveform
- Measured at the crossing point
- CLK pins are tri-stated when OE is LOW

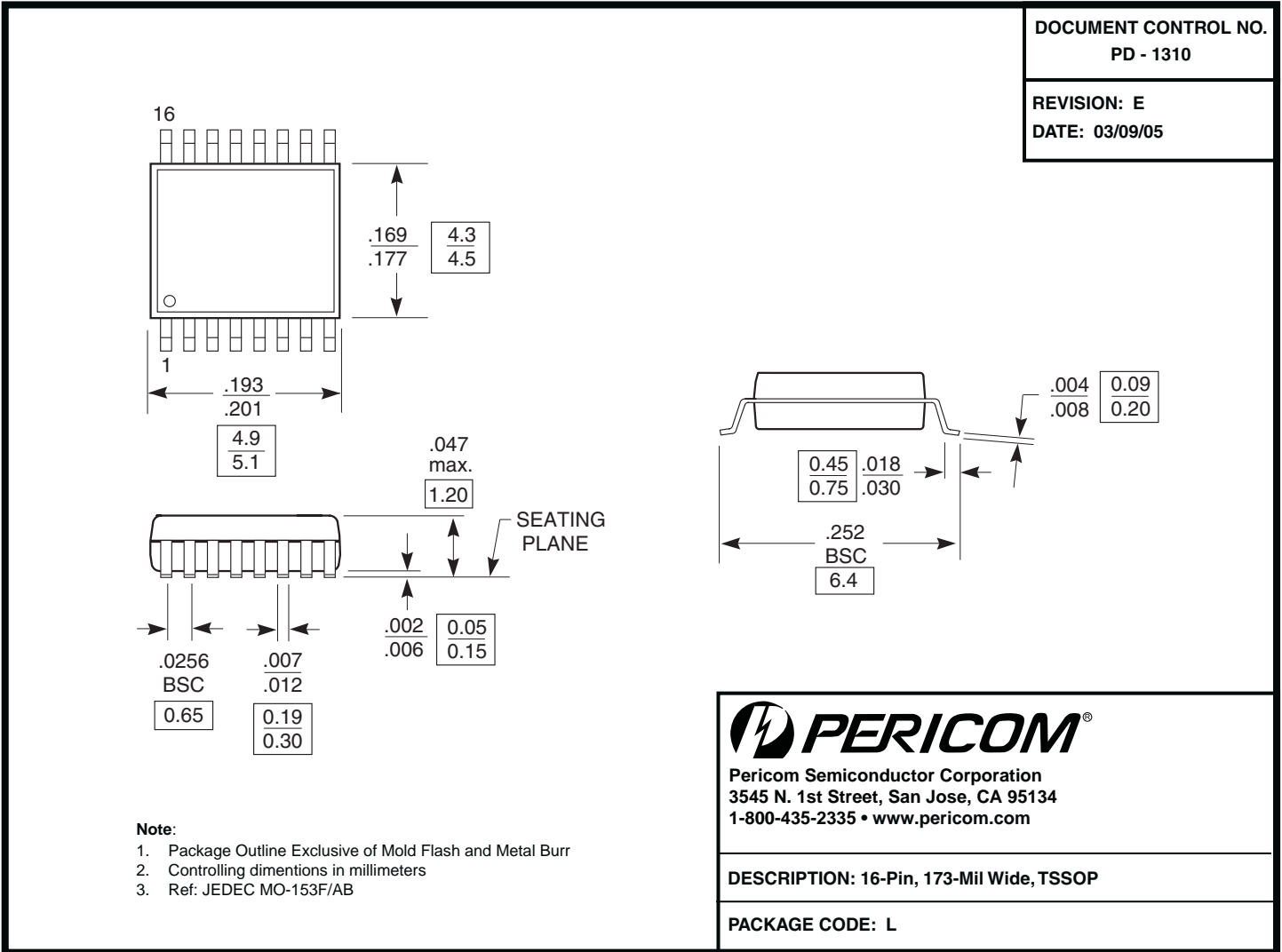
**Thermal Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$\theta_{JA}$	Thermal Resistance Junction to Ambient	Still air			90	$^\circ C/W$
$\theta_{JC}$	Thermal Resistance Junction to Case				24	$^\circ C/W$

**Recommended Crystal Specification**

Pericom recommends SRX7278 for optimum performance.

Parameter	Value	Units
Mode of Oscillation	Fundamental AT	
Frequency	25	MHz
Frequency Tolerance	$\pm 20$	PPM
Temperature and Aging Stability	$\pm 30$	
Load Cap	20	pF
Equivalent Series Resistance	35	$\Omega$
Drive Level	100	mW



**Ordering Information<sup>(1-3)</sup>**

Ordering Code	Package Code	Package Type
PI6C557-03LE	L	Pb-free & Green, 16-Pin TSSOP

**Note:**

1. Thermal characteristics and package top marking information can be found at <http://www.pericom.com/packaging/>
2. E = lead-free and green packaging
3. Adding an X suffix = tape/reel