

August 1996-4

## FEATURES

- Four Copies of CPU Clock (Selectable 50, 60 or 66 MHz)
- Six Copies of Bus Clock ( Sync. CPU Clock/2)
- One USB Clock @ 48 MHz
- Three Copies of Reference Clock @ 14.31818 MHz
- Supports the Intel Triton PCI Chipset and Aladdin Platform

- Synchronous Clocks Skew Less Than  $\pm 250$  ps
- Reference 14.31818 MHz Xtal Oscillator
- Glitch-free Clock Start/Stop
- 3V to 5.5V Power Supply Range
- 28 pin SOIC or SSOP Package
- Test Mode Supported

## GENERAL DESCRIPTION

The ST49C159-65 is a frequency generator designed to satisfy the multiple frequency clock needs of Pentium™ and Pentium Pro™ based motherboards. The ST49C159-65 is specifically configured according to INTEL specifications to be optimized for use with the next

generation Intel Triton™ and Mars PCI chipset with USB support. Intel PCI chipset. It also satisfies the clocking requirements of many popular RISC and CISC processor system configurations including 486, Power PC™. EXAR has designed the ST49C159-65 to be easily customized for other customer system configurations.

## ORDERING INFORMATION

Part No.	Package	Operating Temperature Range
ST49C159CT28-65	28 Lead 5.3 mm SSOP	0°C to +70°C
ST49C159CF28-65	28 Lead 300 Mil Jedec SOIC	0°C to +70°C

## BLOCK DIAGRAM

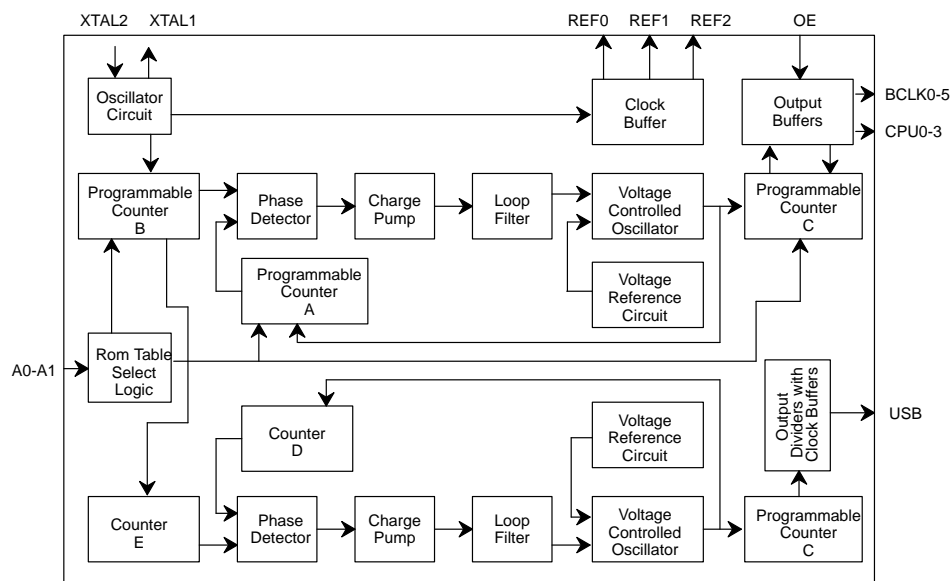
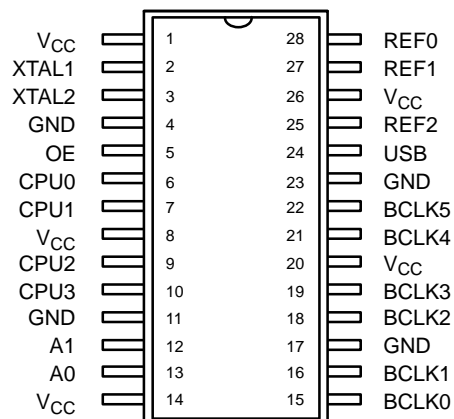


Figure 1. Block Diagram

## PIN CONFIGURATION



28 Lead SOIC, SSOP (Jedec, 0.300")

## PIN DESCRIPTION

Symbol	Pin #	Type	Description
XTAL1	2	O	Crystal or external clock input.
XTAL2	3	I	Crystal output pin.
A0	13 <sup>1</sup>	I	CPU clock frequency select address 0.
A1	12 <sup>1</sup>	I	CPU clock frequency select address 1.
CPU0-3	6, 7, 9,10	O	Selectable CPU clock output.
BCLK0-5	15,16,18, 19,21,22	O	Selectable Bus clock output.
USB	24	O	USB clock, 48 MHz clock output.
REF2	25	O	14.318 MHz reference clock output
REF0	28	O	14.318 MHz reference clock output.
REF1	27	O	14.318 MHz reference clock output.
OE	5 <sup>1</sup>	I	Output enable (active high). Three states outputs when low.
V <sub>CC</sub>	8,20,26	I	Supply voltage. Single +3 to +5.5 volts.
V <sub>CC</sub>	1, 14	I	Supply voltage. Single +3 to +5.5 volts.
GND	17, 23	O	Signal ground.
GND	4,11	O	Signal ground.

**Notes**<sup>1</sup>Has internal pull-up resistor.

## DC ELECTRICAL CHARACTERISTICS

Test Conditions:  $T_A = 0$  to  $70^\circ\text{C}$ ,  $V_{CC} = 3.3 - 5.0\text{V} \pm 10\%$  Unless Otherwise Specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
$V_{IL}$	Input Low Level			0.8	V	$I_{OL} = 15\text{ mA}$ , CPU & BCLK $I_{OH} = -30\text{ mA}$ , CPU & BCLK $I_{OL} = 12.5\text{ mA}$ , Fix Clocks $I_{OH} = -20\text{ mA}$ , Fix Clocks Except Pin 2, $V_{IN} = 0$ Except Pin 2, $V_{IN} = V_{CC}$ No Load @ 66 MHz
$V_{IH}$	Input High Level	2.0			V	
$V_{OL}$	Output Low Level <sup>1</sup>			0.4	V	
$V_{OH}$	Output High Level <sup>1</sup>	2.4			V	
$V_{OL2}$	Output Low Level <sup>1</sup>			0.4	V	
$V_{OH2}$	Output High Level <sup>1</sup>	2.4			V	
$I_{IL}$	Input Low Current	-40			$\mu\text{A}$	
$I_{IH}$	Input High Current			40	$\mu\text{A}$	
$I_{CC}$	Operating Current		50	160	mA	
$R_{IN}$	Internal Pull-up Resistance <sup>1</sup>	150	300	600	k $\Omega$	

### Notes

<sup>1</sup>Parameters is guaranteed by design and characterization, Not 100% tested in production.

## AC ELECTRICAL CHARACTERISTICS

Test Conditions:  $T_A = 0$  to  $70^\circ\text{C}$ ,  $V_{CC} = 3.3\text{V} \pm 10\%$  Unless Otherwise Specified

Symbol	Parameter	Min.	Typ.	Max.	Unit	Conditions
	Output Rise Time <sup>1</sup>		0.8	1.7	ns	0.8V - 2.0V, 20pF, CPU & BCLK
	Output Fall Time <sup>1</sup>		0.7	1.6	ns	2.0V - 0.8V, 20pF, CPU & BCLK
	Duty Cycle <sup>1, 2</sup>	45	48/52	55	%	1.4V switch point, load = 20pF
	Output Rise Time		1.0	2.0	ns	0.8-2.0 V, 20 pF, REF0-2, USB
	Output Fall Time		0.9	1.9	ns	2.0-0.8 V, 20 pF, REF0-2, USB
	Jitter 1 Sigma <sup>1</sup>		$\pm 1$	$\pm 3$	%	REF0-2, BCLK, USB, load=20 pF
	Jitter Absolute <sup>1</sup>		$\pm 2$	$\pm 5$	%	REF0-2, USB, load=20 pF
	Input Frequency <sup>1</sup>		14.318		MHz	
	Input Clock Rise Time <sup>1</sup>			20	ns	
	Jitter 1 Sigma <sup>1</sup>		50	150	ps	CPU, BCLK, load=20 pF $F_{OUT} > 20\text{ MHz}$
	Jitter Absolute <sup>1</sup>	-250		+250	ps	CPU, BCLK, load= 20 pF $F_{OUT} > 20\text{ MHz}$
	Clock Skew Between CPU Outputs <sup>1</sup>		100	$\pm 250$	ps	1.4V switch point, load=20 pF
	Clock Skew Between BCLK Outputs <sup>1</sup>	-500		+500	ps	1.4V switch point, load=20 pF
	Clock Skew Between CPU and BCLK (CPU Ahead) <sup>1</sup>	1	2.5	5	ns	1.4V switch point, load=20 pF

### Notes

<sup>1</sup> Parameters is guaranteed by design and characterization, Not 100% tested in production.

<sup>2</sup> Except reference clock which is 40%-60%.

**ABSOLUTE MAXIMUM RATINGS**

Supply Voltage ..... 7 Volts  
 Voltage at Any Pin ..... GND-0.3V to  $V_{CC} + 0.3V$   
 Operating Temperature ..... 0°C to +70°C

Storage Temperature ..... -40°C to +150°C  
 Package Dissipation ..... 500 mW

**ST49C159-65 ACTUAL OUTPUT FREQUENCIES**  
 (Using 14.318 MHz Input. All Frequencies in MHz).

A1	A0	CPU 0-3	BCLK 0-5	REF 0-2	USB
0	0	50	25	14.3	48
0	1	66	33	14.3	48
1	0	60	30	14.3	48
1	1	Exclk/2	Exclk/4	Exclk	Exclk/2

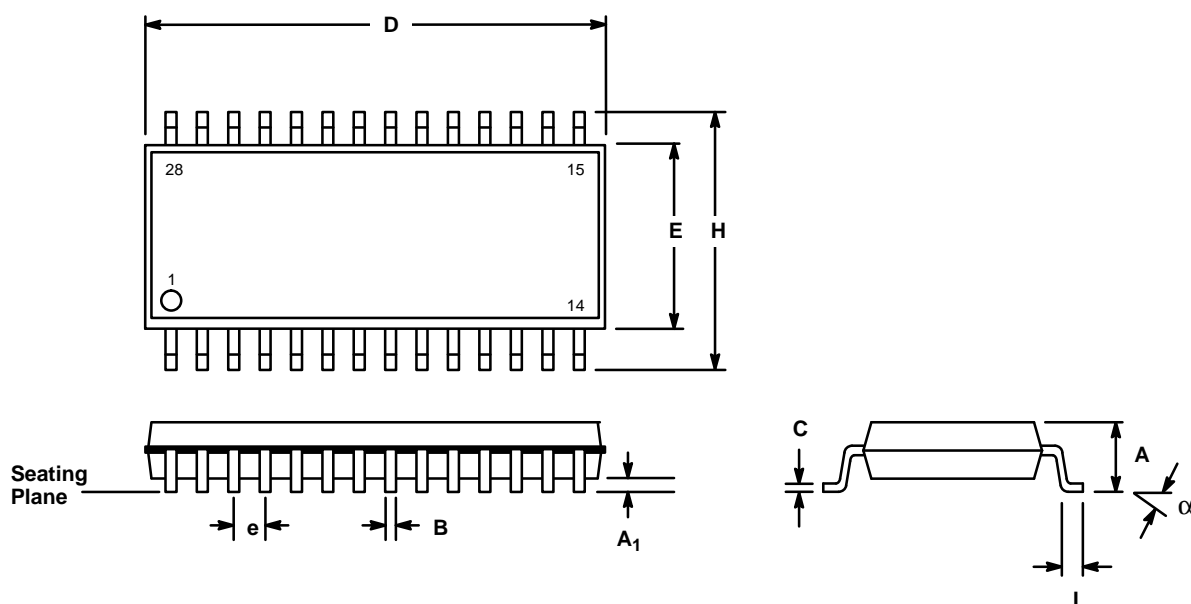
**FREQUENCY TRANSITIONS**

The ST49C159-65 is designed to provide smooth, glitch-free frequency transitions on the CPU and BCLK clocks when the frequency select pins are changed.

# Notes

## 28 LEAD SMALL OUTLINE (300 MIL JEDEC SOIC)

Rev. 1.00

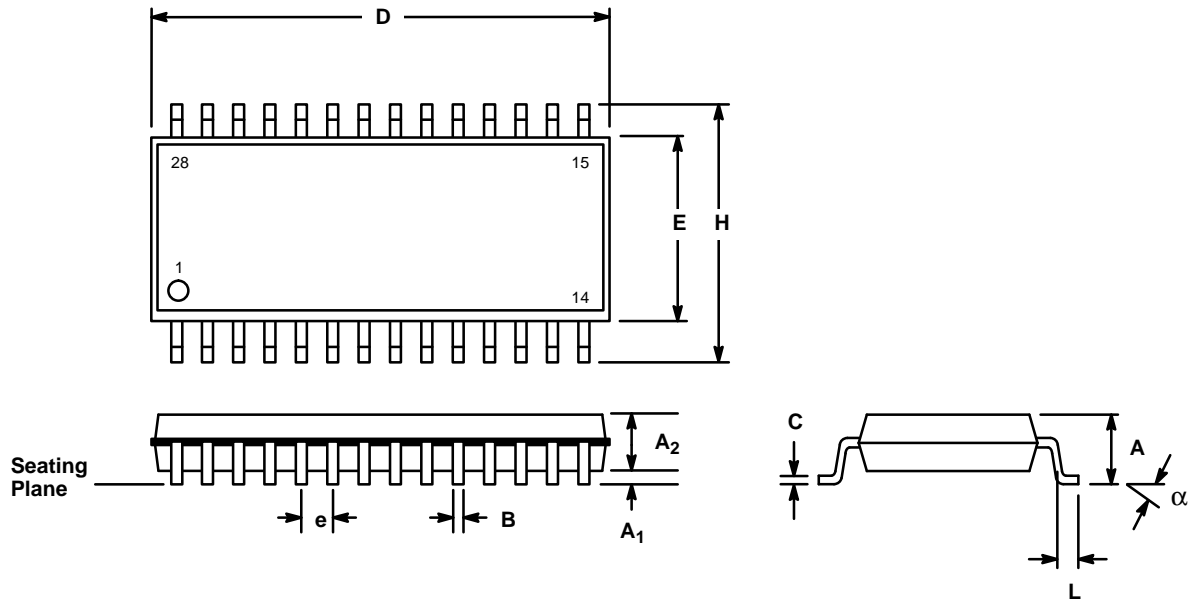


SYMBOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.093	0.104	2.35	2.65
A1	0.004	0.012	0.10	0.30
B	0.013	0.020	0.33	0.51
C	0.009	0.013	0.23	0.32
D	0.697	0.713	17.70	18.10
E	0.291	0.299	7.40	7.60
e	0.050 BSC		1.27 BSC	
H	0.394	0.419	10.00	10.65
L	0.016	0.050	0.40	1.27
α	0° 8°		0° 8°	

Note: The control dimension is the millimeter column

**28 LEAD SHRINK SMALL OUTLINE PACKAGE  
(5.3 mm SSOP)**

*Rev. 1.00*



SYMBOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.066	0.084	1.67	2.13
A <sub>1</sub>	0.002	0.010	0.05	0.25
A <sub>2</sub>	0.064	0.074	1.62	1.88
B	0.009	0.015	0.22	0.38
C	0.004	0.008	0.09	0.20
D	0.390	0.414	9.90	10.50
E	0.197	0.221	5.00	5.60
e	0.0256 BSC		0.65 BSC	
H	0.292	0.323	7.40	8.20
L	0.025	0.041	0.63	1.03
α	0°	8°	0°	8°

*Note: The control dimension is the millimeter column*

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