

## Pentium<sup>®</sup> Processor Compatible Clock Synthesizer/Driver

### Features

- Multiple clock outputs to meet requirements of most Pentium<sup>®</sup> motherboards
  - Four pin-selectable CPU clocks @ 66.66 MHz, 60.0 MHz, and 50.0 MHz for support of Intel Triton™ PCiset based PC
  - 55.0 MHz pin-selectable CPU clock also available (-2 option only)
  - Six PCI clocks at 1/2 CPU Clock frequency
  - One I/O clock @ 24 MHz
  - One Keyboard Controller clock @ 12 MHz (-1 option) or one Universal Serial Bus clock @ 48 MHz (-2 option)
  - Two Ref. clocks @ 14.318 MHz
  - Ref. 14.318 MHz Xtal oscillator input
- CPU clock jitter ≤ 200 ps cycle-to-cycle
- Low skew outputs
  - ≤ 250 ps between CPU clocks
  - ≤ 250 ps between PCI clocks
  - ≤ 500 ps between CPU and PCI clocks (-2 option)
  - CPU clock leads PCI clock by +1 ns min. to +4 ns max. (-1 option)

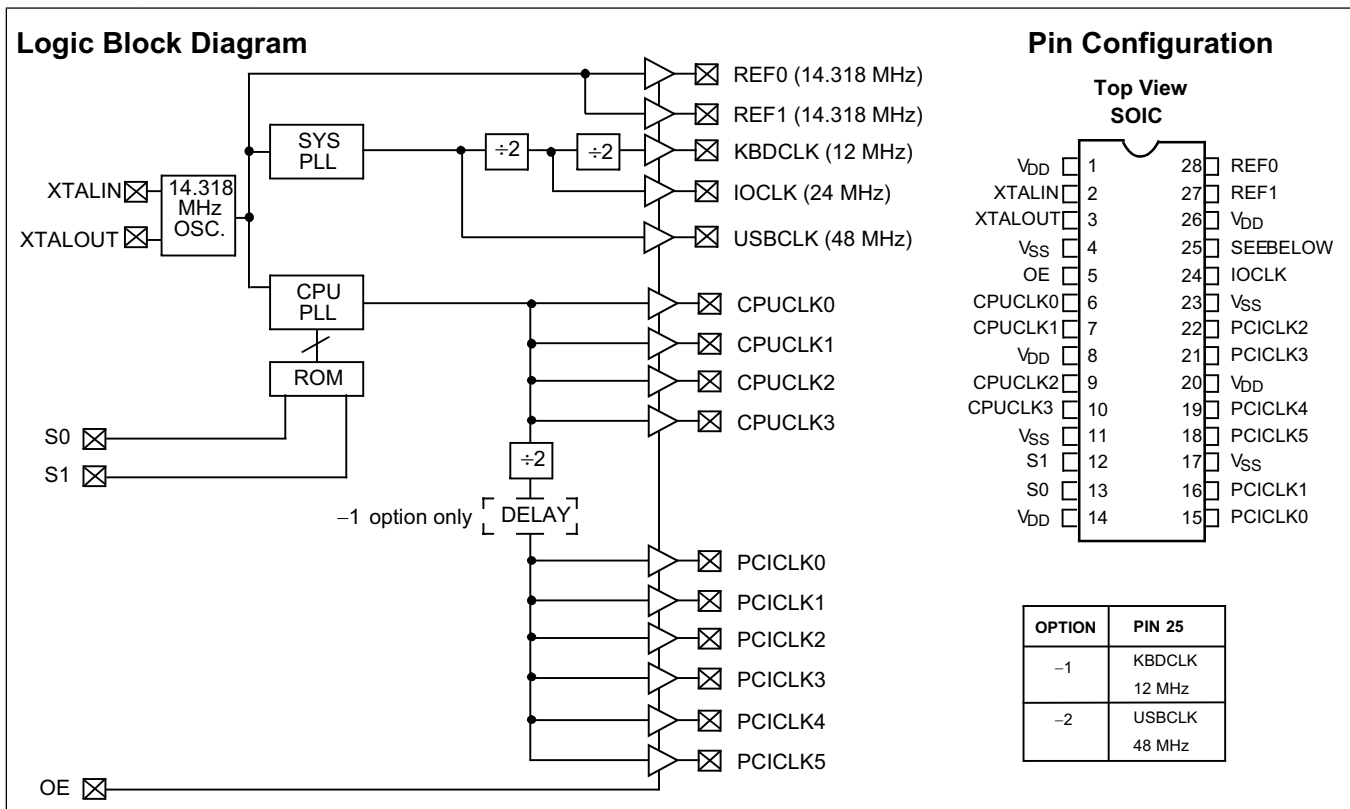
- Freq. stability = 0.01% (max.)
- Output duty cycle 45% min. to 55% max.
- Test mode support (-1 option only)
- 3.3V or 5.0V operation
- Internal pull-up resistors on S0, S1, and OE inputs

### Functional Description

The CY2254A is a Clock Synthesizer/Driver that provides the multiple clocks required for a Pentium-based PC. The CY2254A has low-skew outputs (≤ 250 ps between the CPU Clocks, ≤ 250 ps between the PCI Clocks). In addition, the CY2254A CPU clock outputs have less than 200 ps cycle-to-cycle jitter. Finally, both the PCI and CPU clock outputs meet the 1 V/ns slew rate requirement of a Pentium processor-based system.

The CY2254A accepts a 14.318 MHz reference signal as its input. The CY2254A has 2 PLLs, one of which generates the CPU and PCI clocks, and the other generates the I/O and Keyboard Controller or USB clocks. The CY2254A runs off either a 3.3V or 5V supply.

The CY2254A is available in two options. The -1 option supports the Intel Triton PCiset and provides a 12 MHz keyboard clock on pin 25. The -2 option provides a 48 MHz USB clock on pin 25 and supports the Cyrix<sup>®</sup> M1 processor.



**Pin Summary**

Name	-1	-2	Description
V <sub>DD</sub>	1	1	Voltage supply
XTALIN <sup>[1]</sup>	2	2	Reference crystal input
XTALOUT <sup>[1]</sup>	3	3	Reference crystal feedback
V <sub>SS</sub>	4	4	Ground
OE	5	5	Output Enable, Active HIGH (internal pull-up resistor to V <sub>DD</sub> )
CPUCLK0	6	6	CPU clock output
CPUCLK1	7	7	CPU clock output
V <sub>DD</sub>	8	8	Voltage supply
CPUCLK2	9	9	CPU clock output
CPUCLK3	10	10	CPU clock output
V <sub>SS</sub>	11	11	Ground
S1	12	12	CPU clock select input, bit 1 (internal pull-up resistor to V <sub>DD</sub> )
S0	13	13	CPU clock select input, bit 0 (internal pull-up resistor to V <sub>DD</sub> )
V <sub>DD</sub>	14	14	Voltage supply
PCICLK0	15	15	PCI clock output
PCICLK1	16	16	PCI clock output
V <sub>SS</sub>	17	17	Ground
PCICLK5	18	18	PCI clock output
PCICLK4	19	19	PCI clock output
V <sub>DD</sub>	20	20	Voltage supply
PCICLK3	21	21	PCI clock output
PCICLK2	22	22	PCI clock output
V <sub>SS</sub>	23	23	Ground
IOCLK	24	24	I/O clock output (24 MHz)
KBDCLK	25		Keyboard controller clock output (12 MHz)
USBCLK		25	Universal Serial Bus clock output (48 MHz)
V <sub>DD</sub>	26	26	Voltage supply
REF1	27	27	Reference clock output (14.318 MHz)
REF0	28	28	Reference clock output (14.318 MHz)

**Function Table**

Option	OE	S0	S1	XTALIN	CPUCLK	PCICLK	Ref. Clock Output	IOCLK	KBDCLK -1 only	USBCLK -2 only
-1,-2	0	X	X	14.318 MHz	High-Z	High-Z	High-Z	High-Z	High-Z	High-Z
-1,-2	1	0	0	14.318 MHz	50.0 MHz	25.0 MHz	14.318 MHz	24 MHz	12 MHz	48 MHz
-1,-2	1	0	1	14.318 MHz	60.0 MHz	30.0 MHz	14.318 MHz	24 MHz	12 MHz	48 MHz
-1,-2	1	1	0	14.318 MHz	66.66 MHz	33.33 MHz	14.318 MHz	24 MHz	12 MHz	48 MHz
-1	1	1	1	TCLK <sup>[2]</sup>	TCLK/2	TCLK/4	TCLK	TCLK/4	TCLK/8	
-2	1	1	1	14.318 MHz	55.0 MHz	27.5 MHz	14.318 MHz	24 MHz		48 MHz

**Note:**

- For best accuracy, use a parallel-resonant crystal, C<sub>LOAD</sub> = 17 pF.
- TCLK is a test clock on XTALIN (pin 2) during test mode.

**PCI Clock Driver Strength Requirements**

- Matched impedances on both rising and falling edges on the output drivers
- Output impedance: 25Ω (typical) measured at 1.5V
- Maximum output impedance: 40Ω measured at 1.5V

**CPU Clock Driver Strength Requirements**

- Matched impedances on both rising and falling edges on the output drivers
- Output impedance: 25Ω (typical) measured at 1.5V
- Maximum output impedance: 40Ω measured at 1.5V

**Maximum Ratings**

(Above which the useful life may be impaired. For user guidelines, not tested.)

Supply Voltage.....	-0.5 to +7.0V
Input Voltage .....	-0.5V to V <sub>DD</sub> + 0.5
Storage Temperature (Non-Condensing) ....	-65°C to +150°C
Junction Temperature.....	+150°C
Package Power Dissipation.....	1W
Static Discharge Voltage.....	>2000V (per MIL-STD-883, Method 3015)

**Operating Conditions<sup>[3]</sup>**

Parameter	Description	Min.	Max.	Unit
V <sub>DD</sub>	Supply Voltage 3.3V	3.135	3.6	V
	Supply Voltage 5.0V	4.5	5.5	V
T <sub>A</sub>	Operating Ambient Temperature	0	70	°C
C <sub>L</sub>	Max. Capacitive Load on CPUCLK		20	pF
	PCICLK		30	
	IOCLK		20	
	KBDCLK / USBCLK		20	
	REF0		30	
	REF1		15	
f <sub>(REF)</sub>	Reference Frequency, Oscillator Nominal Value	14.318	14.318	MHz
t <sub>PU</sub>	Power-up time for all VDD's to reach minimum specified voltage (power ramps must be monotonic)	0.05	50	ms

**Electrical Characteristics** V<sub>DD</sub> = 3.135V – 3.6V, or 5.0V ±10%, T<sub>A</sub> = 0°C to +70°C

Parameter	Description	Test Conditions			Min.	Max.	Unit
V <sub>IH</sub>	High-level Input Voltage	Except Crystal Inputs			2.0		V
V <sub>IL</sub>	Low-level Input Voltage	Except Crystal Inputs				0.8	V
V <sub>OH</sub> <sup>[4]</sup>	High-level Output Voltage	V <sub>DD</sub> = V <sub>DD</sub> Min.	I <sub>OH</sub> = 6 mA	CPUCLK	2.4		V
			I <sub>OH</sub> = 12 mA	PCICLK, REF0			
			I <sub>OH</sub> = 4 mA	KBDCLK, USBCLK			
			I <sub>OH</sub> = 8 mA	REF1			
V <sub>OL</sub> <sup>[4]</sup>	Low-level Output Voltage	V <sub>DD</sub> = V <sub>DD</sub> Min.	I <sub>OL</sub> = 6 mA	CPUCLK		0.4	V
			I <sub>OL</sub> = 12 mA	PCICLK, REF0			
			I <sub>OL</sub> = 4 mA	KBDCLK, USBCLK			
			I <sub>OL</sub> = 8 mA	REF1			
I <sub>IH</sub>	Input High Current	V <sub>IH</sub> = V <sub>DD</sub> , V <sub>DD</sub> = 3.3V				5	μA
		V <sub>IH</sub> = V <sub>DD</sub> , V <sub>DD</sub> = 5.0V					
I <sub>IL</sub>	Input Low Current	V <sub>IL</sub> = 0 V, V <sub>DD</sub> = 3.3V				100	μA
		V <sub>IL</sub> = 0 V, V <sub>DD</sub> = 5.0V					
I <sub>OZ</sub>	Output Leakage Current	Three-state			-10	+10	μA
I <sub>DD</sub>	Power Supply Current	V <sub>DD</sub> = 3.6V, V <sub>IN</sub> = 0 or V <sub>DD</sub>				90	mA
		V <sub>DD</sub> = 5.5V, V <sub>IN</sub> = 0 or V <sub>DD</sub>					

**Electrical Characteristics**  $V_{DD} = 3.135V - 3.6V$ , or  $5.0V \pm 10\%$ ,  $T_A = 0^\circ C$  to  $+70^\circ C$  (continued)

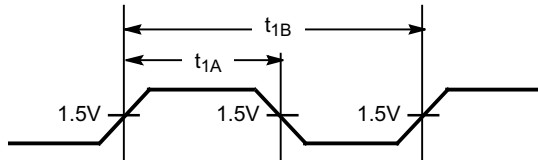
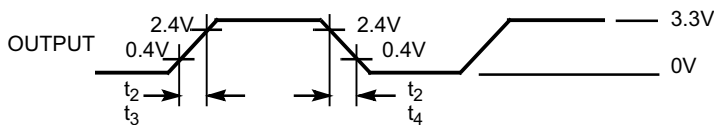
Parameter	Description	Test Conditions	Min.	Max.	Unit
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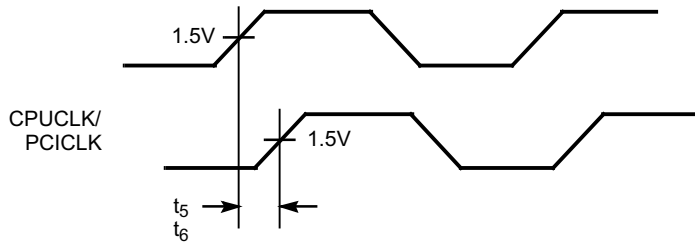
**Note:**

3. Electrical parameters are guaranteed with these operating conditions.
4. Guaranteed by design, not tested.

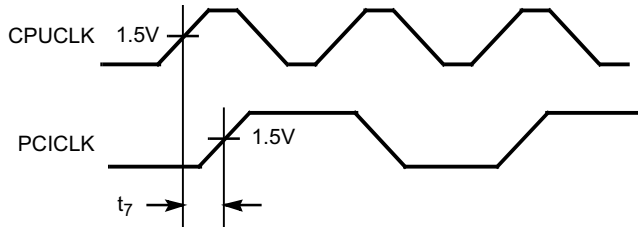
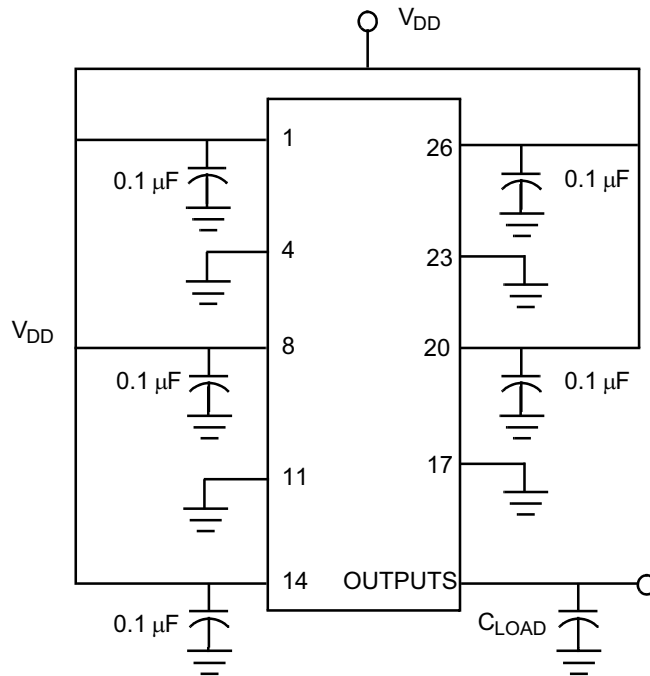
**Switching Characteristics<sup>[5]</sup>**

Parameter	Output	Name	Description	Min.	Max.	Unit
$t_1$	All	Output Duty Cycle <sup>[6]</sup>	$t_1 = t_{1A} \div t_{1B}$	45%	55%	
$t_2^{[4]}$	CPUCLK, PCICLK	Output Rising and Falling Edge Rate	Measured between 0.4 and 2.4V	1		V/ns
$t_3^{[4]}$	REF, KBDCLK, USBCLK	Rise Time	Measured between 0.4 and 2.4V		4	ns
$t_4^{[4]}$	REF, KBDCLK, USBCLK	Fall Time	Measured between 2.4 and 0.4V		4	ns
$t_5^{[4]}$	CPUCLK	CPU-CPU Clock Skew	Measured at 1.5V		250	ps
$t_6^{[4]}$	PCICLK	PCI-PCI Clock Skew	Measured at 1.5V		250	ps
$t_7^{[4]}$	CPUCLK, PCICLK	CPU-PCI Skew	Measured at 1.5V (-1 option)	1	4	ns
			Measured at 1.5V (-2 option)		500	ps
$t_8^{[4]}$	CPUCLK	Cycle-Cycle Clock Jitter	CPU Clock Jitter		200	ps

**Switching Waveforms**
**Duty Cycle Timing**

**All Outputs Rise/Fall Time**


**Switching Waveforms** (continued)**Clock Skew****Note:**

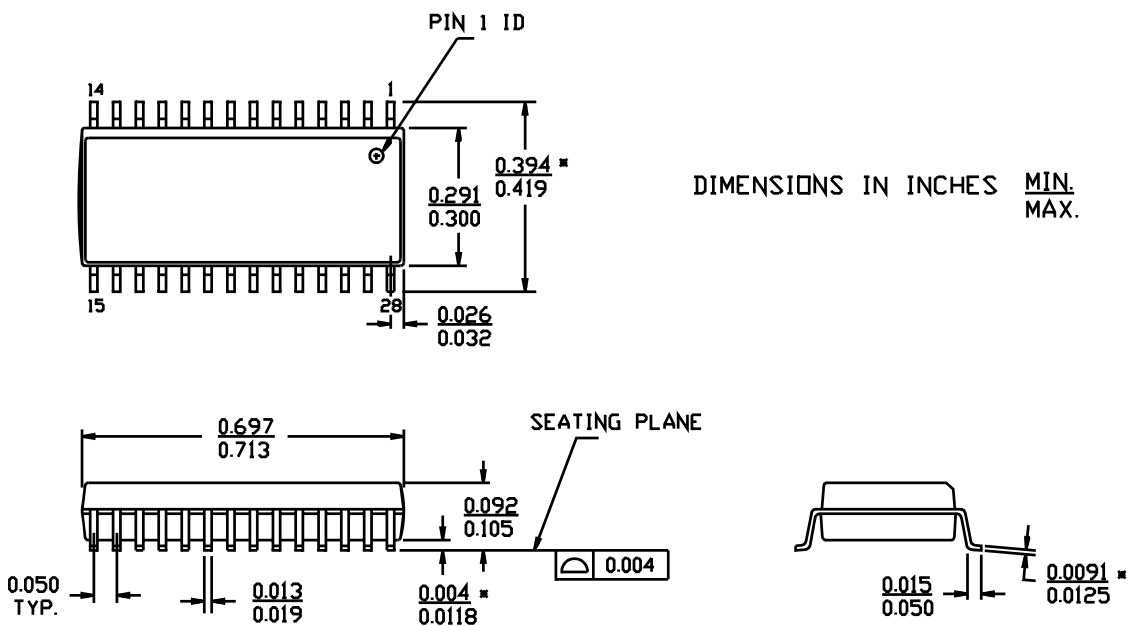
5. All parameters specified with outputs fully loaded.
6. Duty cycle is measured at 1.5V.

**Switching Waveforms (continued)**
**CPU-PCI Clock Skew**

**Test Circuit**


**Note:** All capacitors should be placed as close to each pin as possible.

**Ordering Information**

Ordering Code	Package Name	Package Type	Operating Range
CY2254ASC-1	S21	28-Pin SOIC	Commercial
CY2254ASC-2	S21	28-Pin SOIC	Commercial

**Package Drawing and Dimensions**
**28-Lead (300-Mil) Molded SOIC S21**


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