LSI/CSI

LSI Computer Systems, Inc. 1235 Walt Whitman Road, Melville, NY 11747 (631) 271-0400 FAX (631) 271-0405

LS7083
LS7084

QUADRATURE CLOCK CONVERTER

January 2009

FEATURES:
- x1 and x4 mode selection
- Up to 16MHz output clock frequency
- Programmable output clock pulse width
- On-chip filtering of inputs for optical or magnetic encoder applications.
- TTL and CMOS compatible I/Os
- +4.5V to +10V operation (V_{DD} - V_{SS})
- LS7083, LS7084 (DIP); LS7083-S, LS7084-S (SOIC) - **See Figure 1**

Applications:
- Interface incremental encoders to Up / Down Counters (See Figure 6A and Figure 6B)
- Interface rotary encoders to Digital Potentiometers (See Figure 7)

DESCRIPTION

The **LS7083** and **LS7084** are CMOS quadrature clock converters. Quadrature clocks derived from optical or magnetic encoders, when applied to the A and B inputs of the **LS7083** or **LS7084**, are converted to strings of Up Clocks and Down Clocks (**LS7083**) or to a Clock and an Up/Down direction control (**LS7084**). These outputs can be interfaced directly with standard Up/Down counters for direction and position sensing of the en-

PIN ASSIGNMENT - TOP VIEW

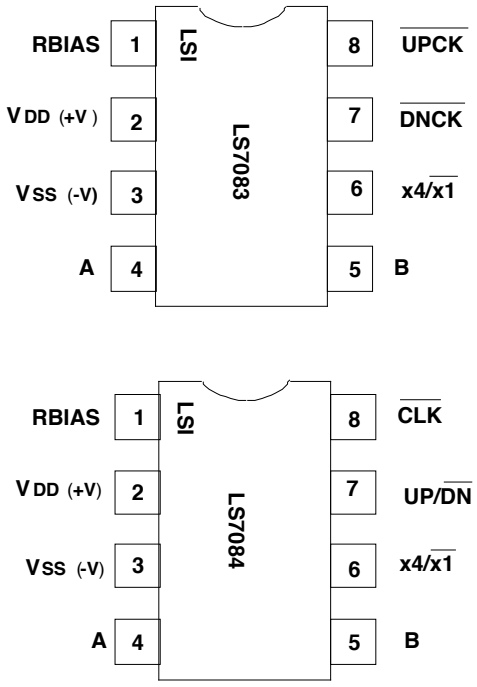


FIGURE 1

INPUT/OUTPUT DESCRIPTION:

RBIAS (Pin 1)
Input for external component connection. A resistor connected between this input and VSS adjusts the output clock pulse width (Tow). For proper operation, the output clock pulse width must be less than or equal to the A, B pulse separation ($T_{OW} \leq T_{PS}$).

V_{DD} (Pin 2)
Supply Voltage positive terminal.

V_{SS} (Pin 3)
Supply Voltage negative terminal**.**

A (Pin 4)
Quadrature Clock Input A. This input has a filter circuit to validate input logic level and eliminate encoder dither.

B (Pin 5)
Quadrature Clock Input B. This input has a filter circuit identical to input A.

x4/$\overline{x1}$ (Pin 6)
This input selects between x1 and x4 modes of operation. A high-level selects x4 mode and a low-level selects the x1 mode. In x4 mode, an output pulse is generated for every transition at either A or B input. In x1 mode, an output pulse is generated in one combined A/B input cycle. (See Figure 2.)

LS7083 - $\overline{DNCK}$ (Pin 7)
In LS7083, this is the DOWN Clock Output. This output consists of low-going pulses generated when A input lags the B input.

LS7084 - UP/$\overline{DN}$ (Pin 7)
In LS7084, this is the count direction indication output. When A input leads the B input, the UP/$\overline{DN}$ output goes high indicating that the count direction is UP. When A input lags the B input, UP/$\overline{DN}$ output goes low, indicating that the count direction is DOWN.

LS7083 - $\overline{UPCK}$ (Pin 8)
In LS7083, this is the UP Clock output. This output consists of low-going pulses generated when A input leads the B input.

LS7084N - $\overline{CLK}$ (Pin 8)
In LS7084, this is the combined UP Clock and DOWN Clock output. The count direction at any instant is indicated by the UP/$\overline{DN}$ output (Pin 7).

NOTE: For the **LS7084**, the timing of $\overline{CLK}$ and UP/$\overline{DN}$ requires that the counter interfacing with **LS7084** counts on the rising edge of the $\overline{CLK}$ pulses.

ABSOLUTE MAXIMUM RATINGS:

PARAMETER	SYMBOL	VALUE	UNITS
DC Supply Voltage	V_{DD} - V_{SS}	11.0	V
Voltage at any input	V_{IN}	V_{SS} - 0.3 to V_{DD} + 0.3	V
Operating temperature	T_A	0 to +70	°C
Storage temperature	T_{STG}	-55 to +150	°C

DC ELECTRICAL CHARACTERISTICS:

(All voltages referenced to V_{SS}, T_A = 0°C to 70°C.)

PARAMETER	SYMBOL	MIN	MAX	UNITS	CONDITION
Supply voltage	V_{DD}	4.5	10.0	V	-
Supply current	I_{DD}	-	6.0	μA	V_{DD} = 10V, All input frequencies = 0Hz RBIAS = 2MΩ
x4/$\overline{\text{x1}}$ Logic Low	V_{IL}	-	0.3V_{DD}	V	-
A, B Logic Low	V_{IL}	-	0.6	V	V_{DD} = 4.5V
		-	1.0	V	V_{DD} = 9V
		-	1.1	V	V_{DD} = 10V
x4/$\overline{\text{x1}}$ Logic High	V_{IH}	0.7V_{DD}	-	V	-
A, B Logic High	V_{IH}	3.1	-	V	V_{DD} = 4.5V
		5.0	-	V	V_{DD} = 9V
		5.6	-	V	V_{DD} = 10V
ALL OUTPUTS:					
Sink Current	I_{OL}	1.75	-	mA	V_{DD} = 4.5V
V_{OL} = 0.4V		5.0	-	mA	V_{DD} = 9V
		5.7	-	mA	V_{DD} = 10V
Source Current	I_{OH}	1.0	-	mA	V_{DD} = 4.5V
V_{OH} = V_{DD} - 0.5V		2.5	-	mA	V_{DD} = 9V
		3.0	-	mA	V_{DD} = 10V

TRANSIENT CHARACTERISTICS:

(T_A = 0°C to 70°C)

PARAMETER	SYMBOL	MIN	MAX	UNITS	CONDITION
A, B inputs:					
Validation Delay	T_{VD}	-	85	ns	V_{DD} = 10V
		-	100	ns	V_{DD} = 9V
		-	160	ns	V_{DD} = 4.5V
A, B inputs:					
Pulse Width	T_{PW}	T_{VD} + T_{OW}	Infinite	ns	-
A to B or **B to A**					
Phase Delay	T_{PS}	T_{OW}	Infinite	ns	-
A, B frequency	$f_{A, B}$	-	$\frac{1}{2T_{PW}}$	Hz	-
Input to Output Delay	T_{DS}	-	120	ns	V_{DD} = 10V
		-	150	ns	V_{DD} = 9V
		-	235	ns	V_{DD} = 4.5V Includes input validation delay
Output Clock Pulse Width	T_{OW}	50	-	ns	See Fig. 4 & 5

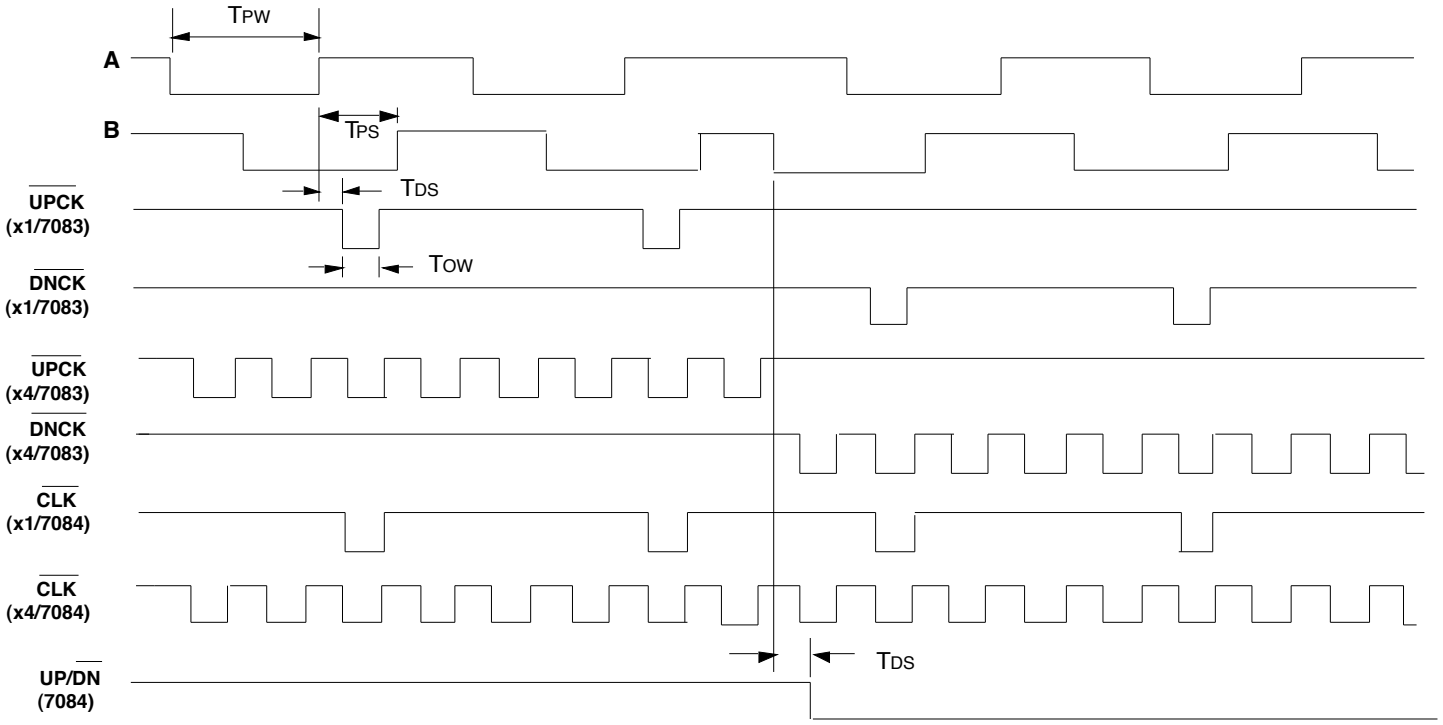


FIGURE 2. LS7083 / LS7084 INPUT / OUTPUT TIMING DIAGRAM

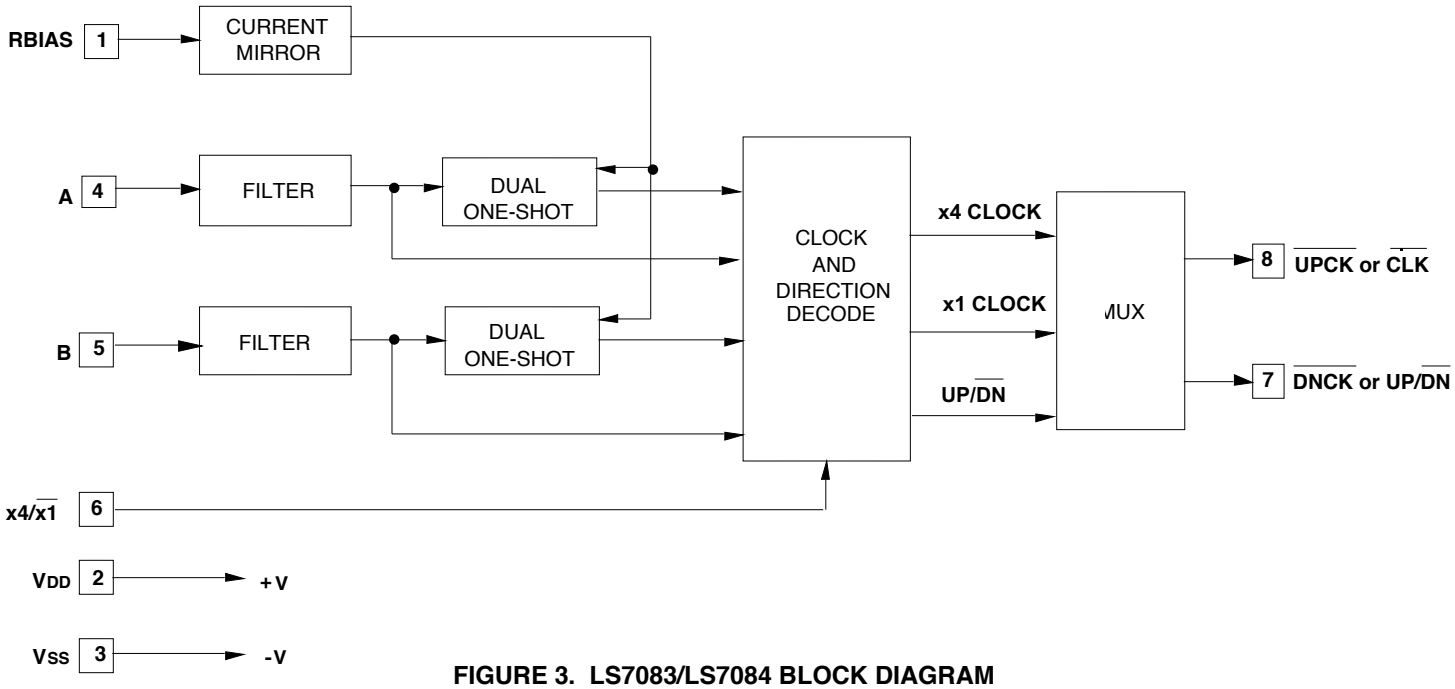


FIGURE 3. LS7083/LS7084 BLOCK DIAGRAM

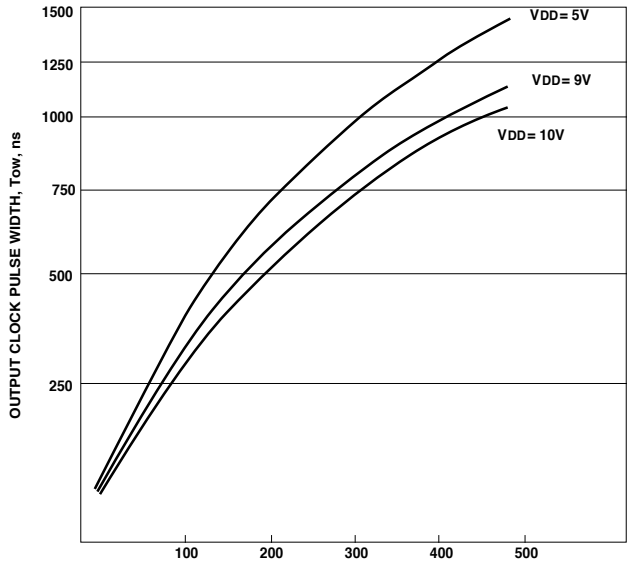


Figure 4. Tow vs RBIAS, kΩ

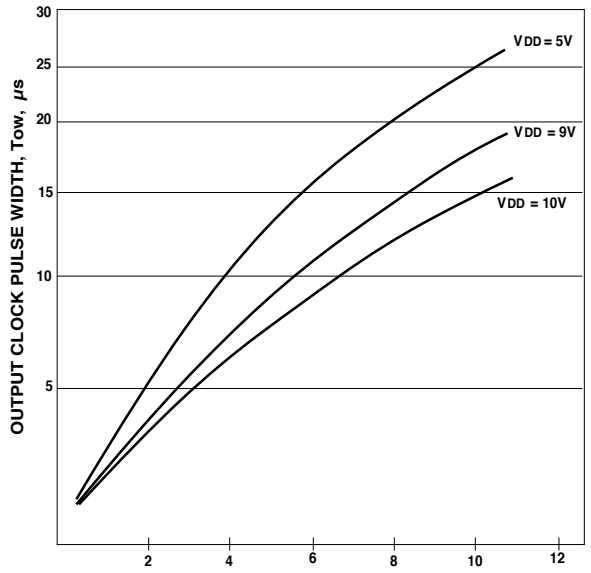


Figure 5. Tow vs RBIAS, MΩ

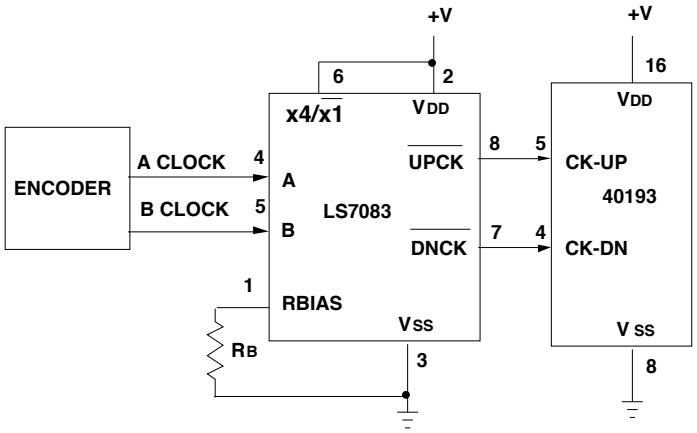


FIGURE 6A. TYPICAL APPLICATION FOR LS7083 IN x4 MODE

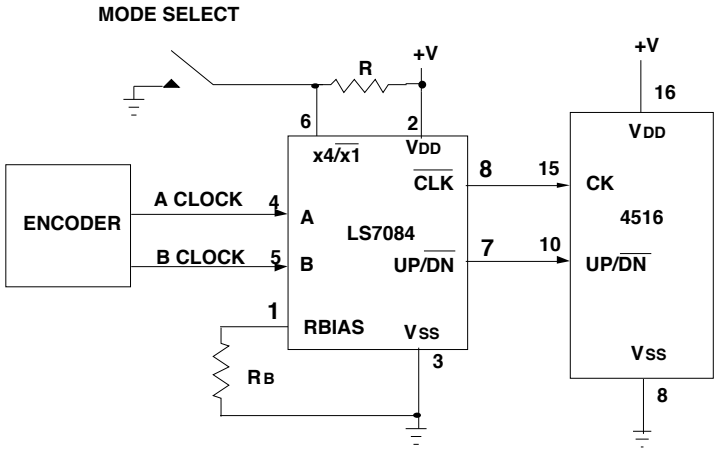
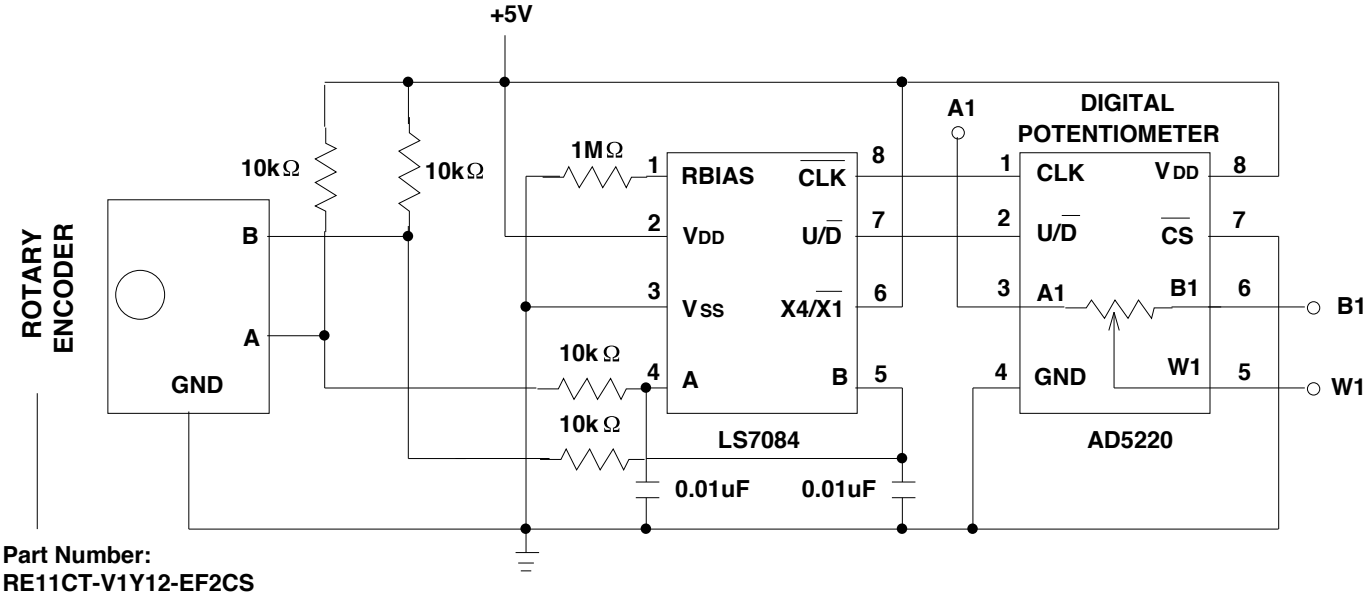


FIGURE 6B*. TYPICAL APPLICATION FOR LS7084 WITH X4/X1 MODE SELETION

*See NOTE at bottom right of Page 1



Part Number:
RE11CT-V1Y12-EF2CS

FIGURE 7. Rotary Encoder Control of Digital Potentiometer