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DS21610

Clock Rate Adapter

FEATURES

- Direct replacement for LXP610SE
- Converts E-carrier clock rates to T-carrier clock rates
- Converts T-carrier clock rates to E-carrier clock rates
- Low output jitter
- Multiple output clocks synchronized to input clock
- 8kHz frequency locked output for all modes of operation
- No external components required
- 16-pin SOIC
- Industrial temperature range



ORDERING INFORMATION

DS21610SN	16-pin SOIC	(-40°C to +85°C)
DS21610N	8-pin DIP	(-40°C to +85°C)
DS21610QN	28-pin PLCC	(-40°C to +85°C)

DESCRIPTION

The DS21610 is a multi-rate, low jitter, clock adapter which converts E-carrier and T-carrier clocks to multiple PDH carrier clock rates. Two clock outputs are available which are frequency locked to the input clock. The clock outputs along with an 8 kHz frame sync output can be phased aligned to a frame sync input. The device is backward compatible to the LXP610 and operates from a single 5V supply. All modes of operation include a standard 8 kHz output.

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1. REVISION HISTORY

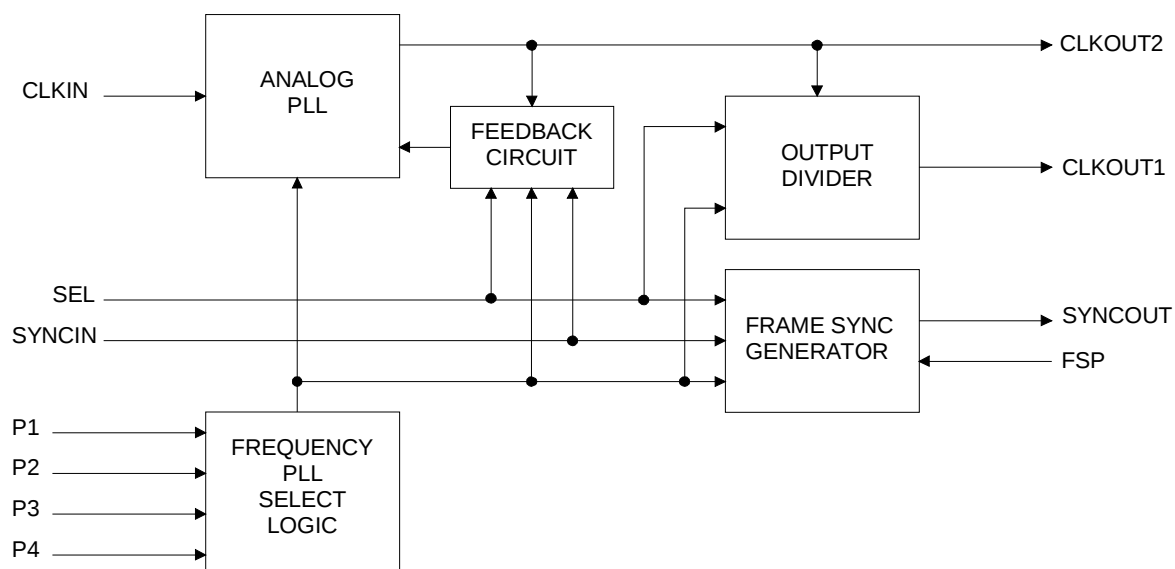
DATE	COMMENTS
9-01-00	Preliminary release
11-27-00	Remove references to 3 volt operation
12-06-00	Add FSP pin to block diagram

2. FUNCTIONAL DESCRIPTION

A clock input at CLKIN is converted to various clocks available on CLKOUT1 and CLKOUT2. Additionally, an 8 kHz clock locked to CLKIN and SYNCIN (if present) is always available at the SYNCOUT pin. The pulse width of the SYNCOUT, is selectable. It can be one or one half the clock period of CLKIN, centered on the rising edge of CLKIN. Pins P1 through P4 are used to select the various clock rates and operational modes. Table 3-1 and Table 3-2 list the various operational modes of the DS21610.

CLKIN, CLKOUT1 and CLKOUT2 are always frequency locked. They can all be phase locked to a system frame sync pulse. A frame sync pulse applied to SYNCIN will cause CLKIN and CLKOUT1 and CLKOUT2 to be phased locked to that sync pulse. This will cause the clocks to have a fixed alignment at the frame sync boundaries. The signal applied to SYNCIN can be 8 kHz or some integer sub-rate such as 1, 2 or 4 kHz. Phase synchronization will occur within a maximum of 500ms when SYNCIN is 8 kHz.

FIGURE 2-1 BLOCK DIAGRAM OF THE DS21610



2.1 PIN FUNCTION DESCRIPTION

Signal Name: **CLKIN**
 Signal Description: **Clock Input**
 Signal Type: **Input**
 Reference Clock Input. CLKOUT1 and CLKOUT2 will be referenced to this clock

Signal Name: **CLKOUT1**
 Signal Description: **Clock Output 1**
 Signal Type: **Output**
 T1 or E1 carrier clock output referenced to CLKIN

Signal Name: **CLKOUT2**
 Signal Description: **Clock Output 2**
 Signal Type: **Output**
 T1 or E1 carrier clock output referenced to CLKIN

Signal Name: **P1 TO P4**
 Signal Description: **Program Pins 1 -4**
 Signal Type: **Input**
 Used to select the various combination of clock and sync outputs.

Signal Name: **SEL**
 Signal Description: **Clock Mode Select**
 Signal Type: **Output**
 T-carrier / E-carrier mode select

Signal Name: **SYNCIN**
 Signal Description: **Synchronization Input**
 Signal Type: **Input**
 Used to synchronize the clock outputs and SYNCOUT to CLKIN and SYNCIN.

Signal Name: **SYNCOUT**
 Signal Description: **Synchronization Output**
 Signal Type: **Output**
 An 8kHz output that will be synchronized to the clock outputs and SYNCIN (if present).

Signal Name: **FSP**
 Signal Description: **Frame Synchronization Pulse Polarity**
 Signal Type: **Input**
 Used to change the polarity of the SYNCOUT output.

Signal Name: **VDD**
 Signal Description: **Positive Supply**
 Signal Type: **Supply**
 5.00 volts +/-5%

Signal Name: **VSS**

Signal Description: **Signal Ground**
Signal Type: **Supply**
Ground

TABLE 2-1 PIN DESCRIPTION SORTED BY PIN NUMBER

PIN #	PIN NAME	TYPE	DESCRIPTION
1	P3	I	Program pin 3
2	SYNCOUT	O	Synchronization Pulse Output
3	N/C	-	NO CONNECT
4	CLKOUT2	O	Clock 2 Output
5	CLKIN	I	Clock Input
6	N/C	-	NO CONNECT
7	CLKOUT1	O	Clock 1 Output
8	P1	I	Program pin 1
9	VSS	-	Ground
10	P2	I	Program pin 2
11	N/C	-	NO CONNECT
12	SEL	I	Clock Mode Select
13	FSP	I	Frame Sync Polarity
14	SYNCIN	I	Synchronization Pulse Input
15	P4	I	Program pin 4
16	VDD	-	Positive supply

2.2 COMPATIBILITY TO LXP610SE

The DS21610S is pin compatible to the LXP610SE.

TABLE 2-2 PIN NAME CROSS-REFERENCE TO LXP610SE

PIN #	DS21770S PIN NAME	LXP610SE PIN NAME	DESCRIPTION
1	P3	P3	Program pin 3
2	SYNCOUT	FSO	Synchronization Pulse Output
3	N/C	N/C	NO CONNECT
4	CLKOUT2	HFO	Clock 2 Output
5	CLKIN	CLKI	Clock Input
6	N/C	N/C	NO CONNECT
7	CLKOUT1	CLKO	Clock 1 Output
8	P1	P1	Program pin 1
9	VSS	GND	Ground
10	P2	P2	Program pin 2
11	N/C	N/C	NO CONNECT
12	SEL	SEL	Clock Mode Select
13	FSP	FSP	Frame Sync Polarity
14	SYNCIN	FSI	Synchronization Pulse Input
15	P4	P4	Program pin 4
16	VDD	VCC	Positive supply

3. OPERATION

TABLE 3-1 PROGRAM PIN FUNCTIONS (SEL = 0)

P4	P3	P2	P1	CLKIN	CLKOUT1	CLKOUT2	SYNCOUT
0	0	0	0	1.544	2.048	6.144	LONG
0	0	0	1	3.088	2.048	8.192	SHORT
0	0	1	0	1.544	2.048	6.144	LONG
0	0	1	1	1.544	2.048	8.192	SHORT
0	1	0	0	1.544	2.560	7.860	LONG
0	1	0	1	6.176	4.096	8.192	LONG
0	1	1	0	1.544	2.560	7.860	LONG
0	1	1	1	6.176	2.048	8.192	SHORT
1	0	0	0	3.088	2.048	6.144	LONG
1	0	0	1	3.088	4.096	8.192	LONG
1	0	1	0	3.088	2.048	6.144	LONG
1	0	1	1	1.544	4.096	8.192	LONG
1	1	0	0	6.176	2.560	7.860	LONG
1	1	0	1	6.176	4.096	8.192	LONG
1	1	1	0	6.176	2.560	7.860	LONG
1	1	1	1	6.176	4.096	8.192	LONG

TABLE 3-2 PROGRAM PIN FUNCTIONS (SEL = 1)

P4	P3	P2	P1	CLKIN	CLKOUT1	CLKOUT2	SYNCOUT
0	0	0	0	2.048	3.088	6.176	LONG
0	0	0	1	2.048	3.088	6.176	LONG
0	0	1	0	2.048	1.544	6.176	LONG
0	0	1	1	2.048	1.544	6.176	LONG
0	1	0	0	2.560	1.544	7.720	LONG
0	1	0	1	8.192	3.088	6.176	LONG
0	1	1	0	2.560	1.544	7.720	LONG
0	1	1	1	8.192	1.544	6.176	LONG
1	0	0	0	2.048	3.088	6.176	LONG
1	0	0	1	4.096	3.088	6.176	LONG
1	0	1	0	2.048	3.088	6.176	LONG
1	0	1	1	4.096	1.544	6.176	LONG
1	1	0	0	2.560	1.544	7.720	LONG
1	1	0	1	8.192	3.088	6.176	LONG
1	1	1	0	2.560	1.544	7.720	LONG
1	1	1	1	8.192	1.544	6.176	LONG

4. JITTER SPECIFICATIONS

TABLE 4-1 OUTPUT JITTER SPECIFICATIONS, CLKOUT1 = 1.544 MHZ

FREQUENCY BAND	TR62411 SPECIFICATION	TYPICAL	MAX	UNIT
No Bandlimiting	0.050		0.020	UI _{pp}
10 Hz to 40 kHz	0.025		0.010	UI _{pp}
8 kHz to 40 kHz	0.025		0.012	UI _{pp}

NOTE:

CLKIN = 2.048 MHz or 4.096 MHz

TABLE 4-2 OUTPUT JITTER SPECIFICATIONS, CLKOUT1 = 2.048 MHZ

FREQUENCY BAND	G.823 SPECIFICATION	TYPICAL	MAX	UNIT
20 Hz to 100 kHz	0.025		0.010	UI _{pp}
18 kHz to 100 kHz	0.025		0.012	UI _{pp}

NOTE:

CLKIN = 1.544 MHz

FIGURE 4-1 NOMINAL JITTER TRANSFER (1.544 MHZ CLKIN TO 2.048 MHZ CLKOUT1)

JITTER T RANSFER DATA NOT YET AVAILABLE

FIGURE 4-2 NOMINAL JITTER TRANSFER (1.544 MHZ CLKIN TO 2.048 MHZ CLKOUT1)

JITTER T RANSFER DATA NOT YET AVAILABLE

5. OPERATING PARAMETERS

ABSOLUTE MAXIMUM RATINGS*

Voltage on Any Pin Relative to Ground	-1.0V to +6.0V
Operating Temperature for DS21610SN	-40°C to +85°C
Storage Temperature	-55°C to +125°C

* This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

RECOMMENDED DC

OPERATING CONDITIONS

(-40°C to +85°C)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Logic 1	V_{IH}	2.0		5.5	V	
Logic 0	V_{IL}	-0.3		+0.8	V	
Supply for 5V Operation	V_{DD}	4.75	5	5.25	V	1

CAPACITANCE

($t_A = 25^\circ\text{C}$)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Input Capacitance	C_{IN}		5		pF	
Output Capacitance	C_{OUT}		7		pF	

DC CHARACTERISTICS

(-40°C to +85°C; $V_{DD} = 5.0V \pm 5\%$)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Supply Current @ 5V	I_{DD}			8	mA	3
Input Leakage	I_{IL}	-1.0		+1.0	μA	2
Output Leakage	I_{LO}			1.0	μA	
Output Current (2.4V)	I_{OH}	-1.0			mA	
Output Current (0.4V)	I_{OL}	+4.0			mA	

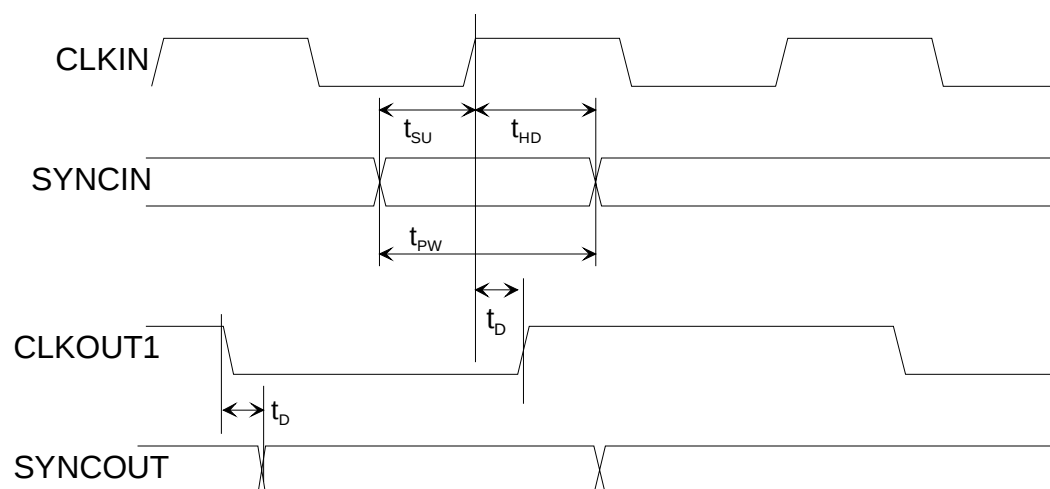
NOTES:

1. Applies to V_{DD} .
2. $0.0V < V_{IN} < V_{DD}$.
3. Outputs open

5.1 TIMING

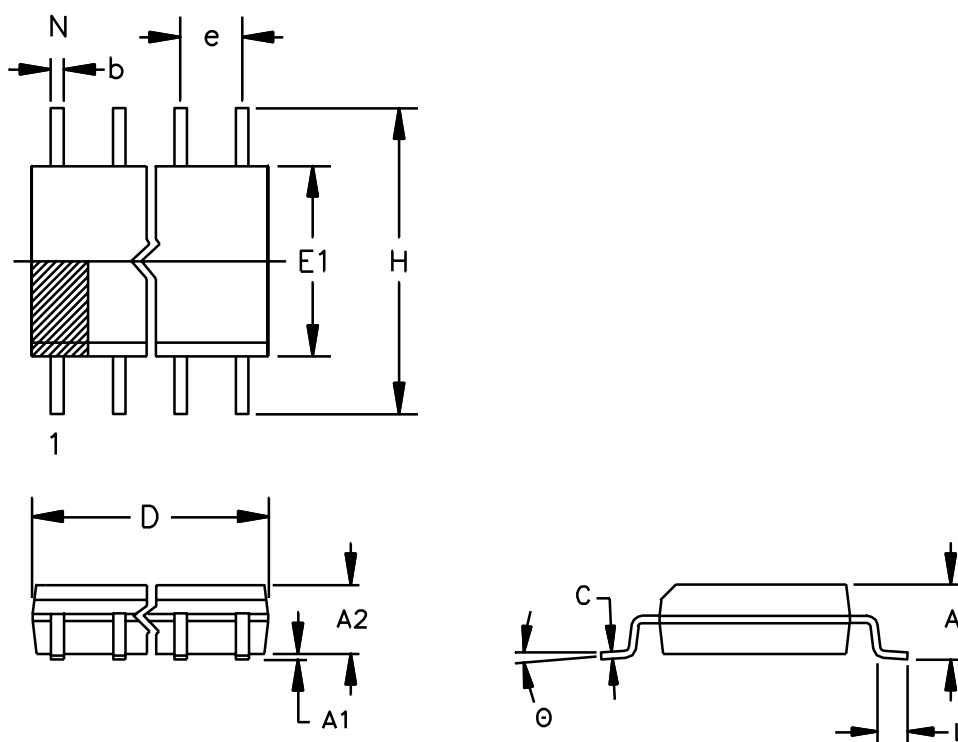
TABLE 5-1 AC TIMING

PARAMETER	SYMBOL	MIN	TYPICAL	MAX	UNIT
Capture range on CLKIN		+/- 10000			ppm
Lock Range on CLKIN		+/- 10000			ppm
CLKIN duty cycle		35		65	%
SYNCIN setup to CLKIN rising	t_{SU}				ns
SYNCIN hold after CLKIN rising	t_{HD}				ns
SYNCIN pulse width	t_{PW}				ns
CLKOUT1 – 3 delay from CLKIN rising	t_D				ns



6. PACKAGE SPECIFICATIONS

FIGURE 6-1 PACKAGE OUTLINE SOIC 16 PIN 0.300" BODY



LTR	MIN	MAX	
A	IN. MM	0.094 2.39	0.105 2.67
A1	IN. MM	0.004 0.102	0.012 0.30
A2	IN. MM	0.089 2.26	0.095 2.41
b	IN. MM	0.013 0.33	0.020 0.51
C	IN. MM	0.009 0.229	0.013 0.33
D	IN. MM	0.398 10.11	0.412 10.46
e	IN. MM	.050 1.27	BSC BSC
E1	IN. MM	0.290 7.37	0.300 7.62
H	IN. MM	0.398 10.11	0.416 10.57
L	IN. MM	0.016 0.40	0.040 1.02
Θ		0°	8°

THE CHAMFER ON THE BODY IS OPTIONAL. IF IT IS NOT PRESENT, A TERMINAL 1 IDENTIFIER MUST BE POSITIONED IN THE HATCHED ZONE.