TV-DST Industrial Low Latency 4K Codec Board

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Photo

Key Features

- Support multiple Video Codecs, color space 4:2:0/ 4:2:2/4:4:4 optional
  H.264 --- High compression rate, from 1:50 to 1:300
  DSC – Visual Lossless, compress rate 1:4
  JPEG-XS – Near Visual Lossless, compress rate up to 1:16
- Ultra Low Latency, Total Codec latency: minimal 1/8 frame for DSC and JPEG-XS, minimal 1/2 frame for H.264
- 4K60/50/30/25/24, 1080p60/50/30/25/24 resolution
- 12G SDI RX/TX, 4K60/8K30 DisplayPort RX/TX
- Compact size (80x100mm)
- Optional software stream player on Windows and Android
- Stream Interface 1: Giga Ethernet
- Stream Interface 2: SPI data width 8bit, optional
- IEC 61000-4-2 Level 4 ESD Protection on 12G-SDI, DP, HDMI and FPC connectors
- Boot time less than 100ms
- Size is 80x100mm, with 4 M2.5 screw holes to install

Hardware Components
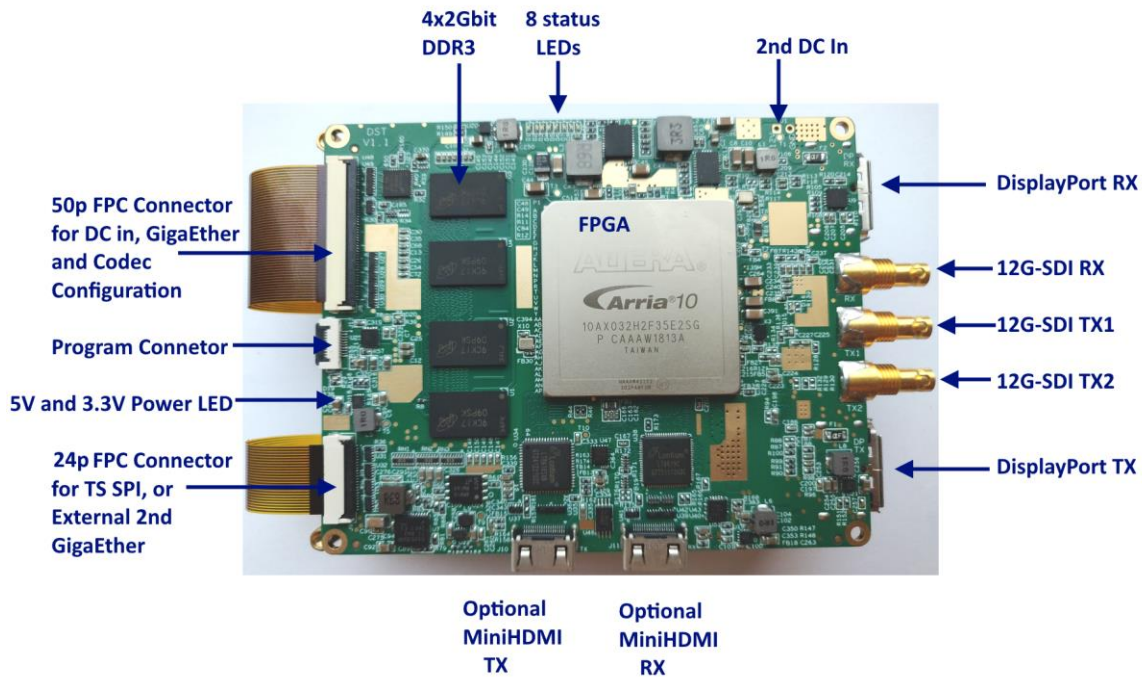
- FPGA is Intel Arria10
- On board 4x2Gbit DDR3
- Two DisplayPort Connectors, one RX and one TX
- Three 12G HD-BNC connectors, one RX and two TX, the video output of two TX are identical (to support two 12G SDI monitors)
- 50p FPC connector with multiple function, PIN1 is marked by a small silkscreen triangle
  - DC IN (10~30V)
  - GigaEther PHY interface, the default bitstream channel
    (It can be configured to FastEther PHY mode in firmware if FastEther is preferred interface)
  - Configuration and GPIO pins as settings (for those versions of firmware supporting configurations)
  - JTAG signals to program firmware
- 24p FPC connector, PIN1 is marked by a small silkscreen triangle. *Can be used as TS SPI interface or RGMII to External 2nd GigaEthernet by different firmware, Optional*
- 5V LED D19, 3.3V LED D20, they should be on if the board is Power On
- 2nd DC In (10~30V) connector J1, usually No need to use, just in case some users need another option to supply power
- Program connector with JTAG signals in it to program firmware into flash, this is the 2nd way to program firmware, in some situation this is more convenient than 50p FPC connector

- 8 LED status LED to indicate working status of Encoder/Decoder
- 12G-SDI TX status LED (D15)
- 12G-SDI RX status LED (D16)

Note: Power above 30V will Damage DST board

Board Types

DST can be manufactured in 4 types, with different connectors (and related interface chips) soldered on board

In following table, a cell "Y" means the connector of that column is soldered on board, a blank means the connector is not soldered on board

Board Type	DisplayPort RX	DisplayPort TX	12G-SDI RX	12G-SDI TX	HDMI RX	HDMI TX
Encoder	Y		Y			
Decoder		Y		Y		
Loop	Y	Y	Y	Y		
Full	Y	Y	Y	Y	Y	Y

- If you just need Encoder function of a board, choose "Encoder"
- If you just need Decoder function of a board, choose "Decoder"
- If you need Encoder function with video loop output, choose "Loop"
- If you need a Loop board with MiniHDMI interface, choose "Full"

LED Status

Encoder Board

LED0	On: DDR controller is initialized successfully Off: DDR controller is not working
LED1	On: ERROR, Entropy FIFO overflows Off: Good
LED2	After power ON, LED2 is ON at first, then will be OFF is input signal (SDI or HDMI) is good
LED3	Flashing: The encoder is outputting stream Off: No stream is outputting
LED4	connect to Vsync signal of video inputting interface
LED5	connect to Data Enable (or Href) signal of video inputting interface
LED6	Flashing: Firmware is optimized for video quality at low bitrate, at a cost of smaller higher latency

	Off: Firmware is optimized for lowest latency, and can be configured to very high bitrate for visual lossless quality
LED7	Reserved

Decoder Board

LED0	On: DDR controller is initialized successfully Off: DDR controller doesn't work
LED1	
LED2	Off: All received ethernet packets have no CRC32 error On: After One or more ethernet packets CRC32 error detected, will be On for a few seconds, then will be off again
LED3	Off: All received ethernet packets are consecutive, no packets dropping On: One or more ethernet packets dropping detected, will be On for a few seconds then will be Off again
LED4	Reserved
LED5	On: Ethernet RX fifo overflows Off: Good
LED6	Flashing: Firmware is optimized for video quality at low bitrate, at a cost of smaller higher latency Off: firmware is optimized for lowest latency, and can be configured to very high bitrate for visual lossless quality
LED7	On: Input stream is detected OFF: No input stream detected

PIN Assignment of 50P FPC Connector

PIN	Function	Direction	Voltage
1	GigaEther P0 (FastEther mode TX+)	IO	Differential
2	GigaEther N0 (FastEther mode TX-)	IO	Differential
3	GND		
4	GigaEther P1 (FastEther mode RX+)	IO	Differential
5	GigaEther N1 (FastEther mode RX-)	IO	Differential
6	GND		
7	GigaEther P2	IO	Differential
8	GigaEther N2	IO	Differential
9	GND		
10	GigaEther P3	IO	Differential
11	GigaEther N3	IO	Differential
12	GND		
13	GigaEther LED active	Output	2.5V
14	SPI_MISO or DIP4	IO	2.5V
15	SPI_MOSI or DIP3	IO	2.5V
16	SPI_nCS or DIP2	Input	2.5V
17	SPI_CLK or DIP1	Input	2.5V

18	3.3V DC Output	Output	3.3V
19	GND		
20	GND		
21	GND		
22	GND		
23	DC input	Input	10~30V
24	DC input	Input	10~30V
25	DC input	Input	10~30V
26	DC input	Input	10~30V
27	DC input	Input	10~30V
28	DC input	Input	10~30V
29	GND		
30	GND		
31	GND		
32	GND		
33	2.5V DC Ouput	Output	2.5V
34	SPI_DIP_SEL, (need support by firmware) pullup to 3.3V: config firmware by DIP pulldown: config firmware by SPI bus	Input	2.5V
35	RSTN, to reset the board, low active	Input	2.5V
36	DIP5	Input	2.5V
37	DIP6	Input	2.5V
38	DIP7	Input	2.5V
39	DIP8	Input	2.5V
40	DIP9	Input	2.5V
41	DIP10	Input	2.5V
42	SWIM to configure MCU for hdmi rx chip	IO	3.3V
43	NRST to configure MCU for hdmi rx chip	Input	3.3V
44	2.5V GPIO_1	IO	2.5V
45	JTAG PGM	IO	2.5V
46	JTAG TDO	IO	2.5V
47	JTAG TMS	IO	2.5V
48	JTAG TDI	IO	2.5V
49	GND		
50	JTAG TCK	Input	2.5V

*Note1: GigaEther PHY schematics on board, the PHY chip is **AR8035***

Note2: The maximum current of 3.3V output (pin18) and 2.5V output (pin33) is 500mA

PIN Assignment of 24P FPC Connector

The 24P FPC connector can be used as three different interfaces by different firmware as defined in following table, All signals voltage is **1.8V**:

PIN	Function as RMII of FastEther Interface	Function as RGMII of 2nd GigaEther Interface	Function as TS SPI Interface	Direction

1	GND	GND	GND	
2		TX_GCLK		Output
3	GND	GND	GND	
4	RMII_REF_CLK	RX_CLK	TS_CLK	IO
5	GND	GND	GND	
6	RX_DV	RX_DV	TS_VALID	Input
7	GND	GND	GND	
8		RX_D3	TS_SYNC	Input
9	RMII_RXER	RX_D2	TS_DATA7	Input
10	GND	GND	GND	
11	RX_D1	RX_D1	TS_DATA6	Input
12	RX_D0	RX_D0	TS_DATA5	Input
13	GND	GND	GND	
14		TX_D3	TS_DATA4	Output
15		TX_D2	TS_DATA3	Output
16	GND	GND	GND	
17	TX_D1	TX_D1	TS_DATA2	Output
18	TX_D0	TX_D0	TS_DATA1	Output
19	GND	GND	GND	
20	TX_EN	TX_EN	TS_DATA0	Output
21	RSTN_ETH	RSTN_ETH		Output
22	GND	GND	GND	
23	MDC	MDC		IO
24	MDIO	MDIO		IO

Note1: Microchip KSZ8081/KSZ8091 is recommended as the FastEther PHY to be connected, it supports 1.8V IO voltage
*Note2: AR8035/8033 is recommended as the 2nd GigaEther PHY to be connected, they support 1.8V IO voltage*

Base Board TDST

To test the DST board (also called main board), a base board TDST is required

The size of TDST is same as DST (80x100), and TDST has 4 M2.5 screw holes at exactly the same location of DST.
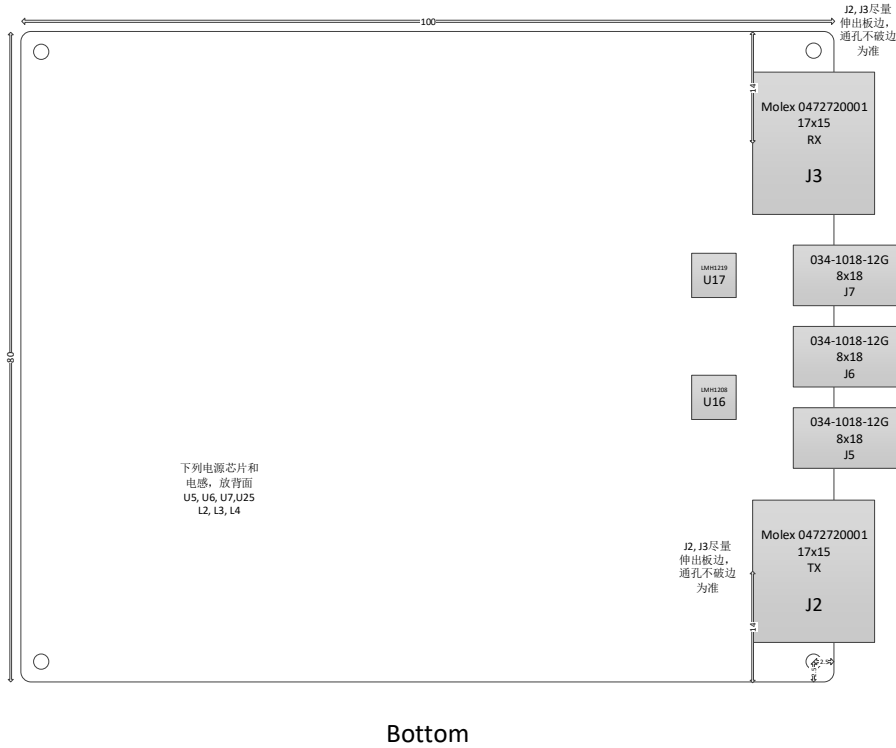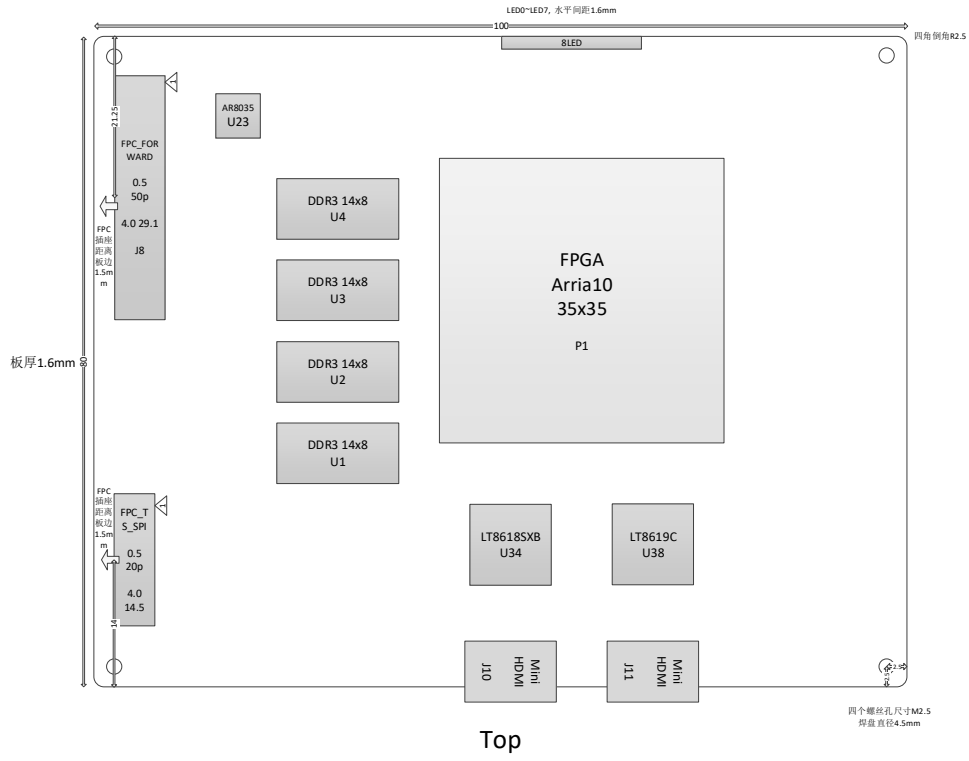
the main board should be stacked above the base board with Four sets of M2.5 screws and nuts.
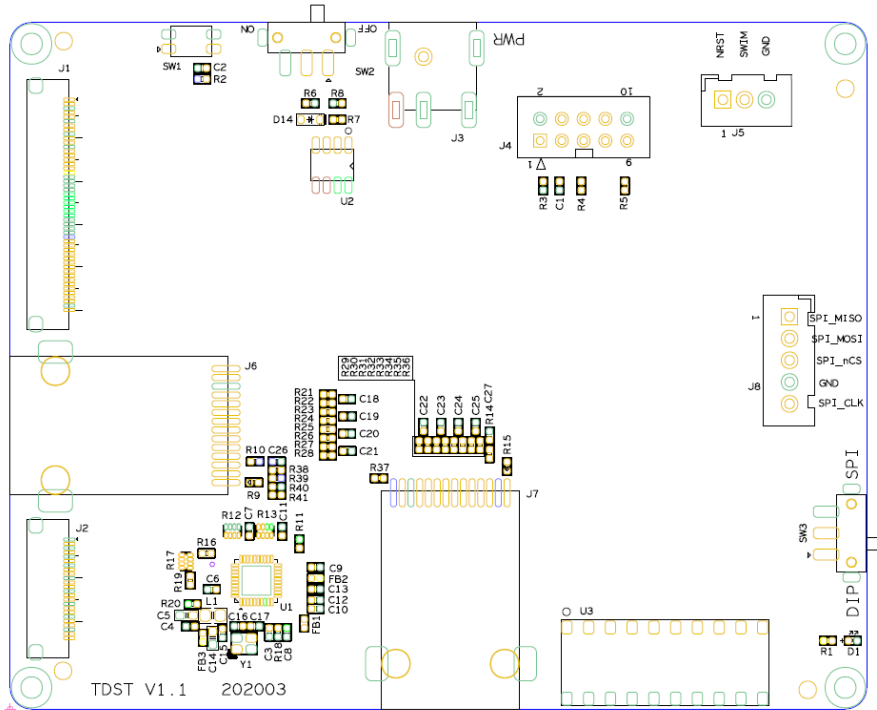
Following components are on TDST:

- One Power connector (J3), standard DC 5.5*2.1, valid power voltage is 10~30V
- One Power on/off switch (SW2)
- One Power on LED (D1)
- 10 DIPs (U3), to configure firmware in mainboard if it supports DIP settings
- Main RJ45 jack (J6) to connects GigaEthernet PHY on main board
- One DIP/SPI selector (SW3)
- One Intel USB Blaster JTAG connector (J4) to program firmware into main board
- One reset button (SW1) to reset the mainboard manually during test
-
- One 50p FPC connector to connect main board's 50 FPC connector.
  A 50p, 0.5mm pitch, 50mm or longer (max 150mm), FPC or FFC is used to connect base and main board.

- One 24p FPC connector
- Optional RJ45 jack (J7) as a 2nd GigaEthernet interface for some versions of firmware

Size

LED0~LED7，水平间距1.6mm

100

8LED

四角倒角R2.5

AR8035
U23

FPC_FOR
WARD

0.5
50p

4.0 29.1

J8

2.125

FPC
插座
距离
板边
1.5m
m

DDR3 14x8
U4

DDR3 14x8
U3

DDR3 14x8
U2

DDR3 14x8
U1

FPGA
Arria10
35x35

P1

板厚1.6mm

80

FPC
插座
距离
板边
1.5m
m

FPC_T
S_SPI

0.5
20p

4.0
14.5

14

LT8618SXB
U34

LT8619C
U38

J10

Mini
HDMI

J11

Mini
HDMI

4.5
2.5

四个螺丝孔尺寸M2.5
焊盘直径4.5mm

Top

100

J2, J3尽量
伸出板边，
通孔不破边
为准

14

Molex 0472720001
17x15
RX

J3

50

LMH1219
U17

034-1018-12G
8x18
J7

034-1018-12G
8x18
J6

10

80

LMH1208
U16

034-1018-12G
8x18
J5

下列电源芯片和
电感，放背面
U5, U6, U7,U25
L2, L3, L4

J2, J3尽量
伸出板边，
通孔不破边
为准

Molex 0472720001
17x15
TX

J2

14

4.5
2.5

50

Bottom

Parameters

Operation Temperature Range	-40 ~ 85 Celsius (both main and base boards)
Power consumption	Encoder board: 8.5W Decoder board: 7.5W