



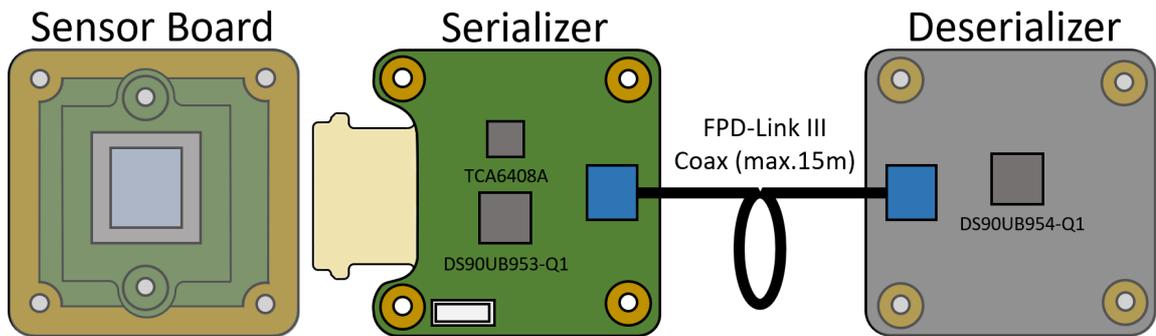
MSER-FPD 1.30



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1 Introduction

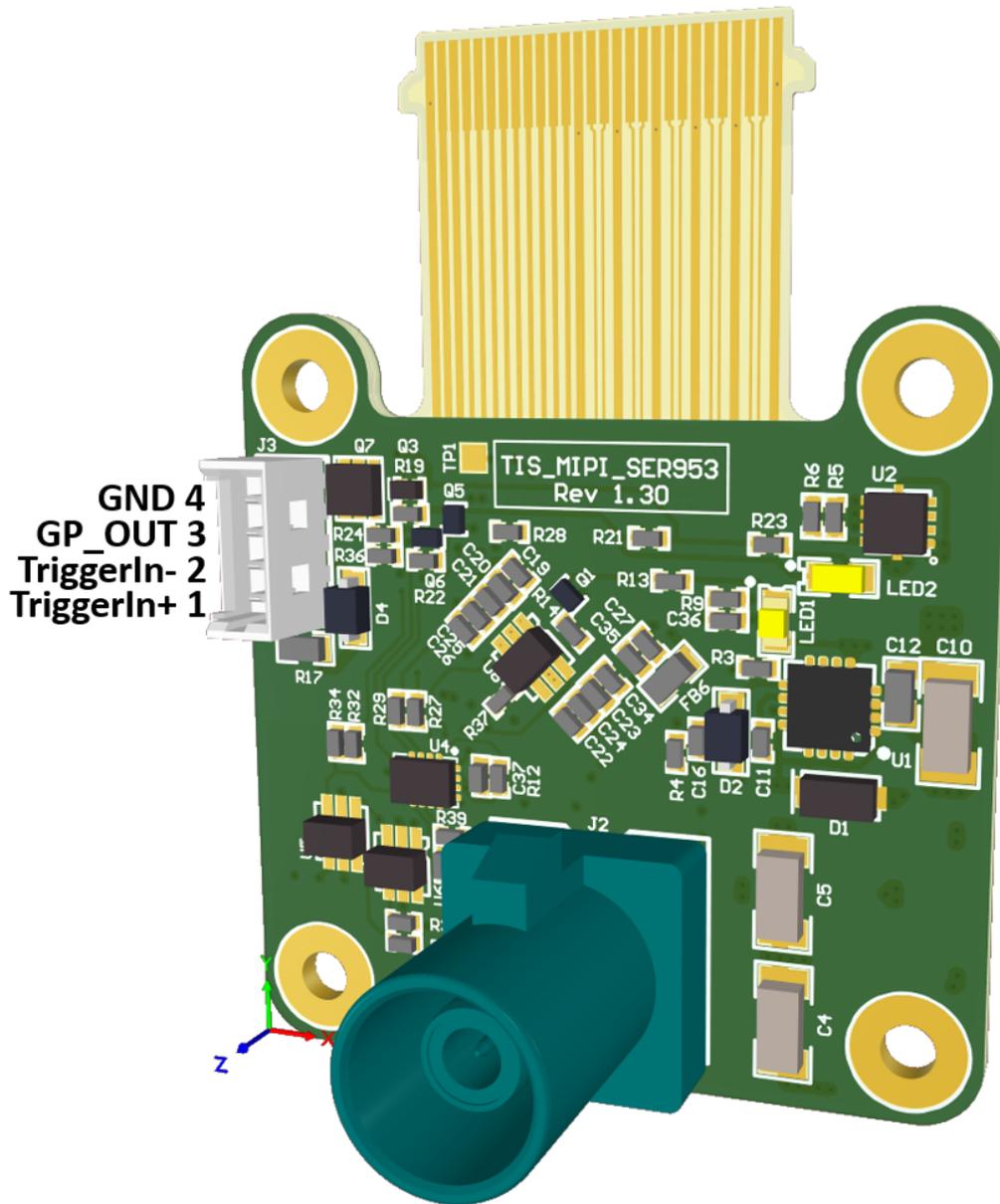
This document describes the function of the MSER-FPD MIPI serializer board which is based on the Texas Instruments MIPI-to-FPD-Link III serializer chip, DS90UB953-Q1. The camera-side serializer board and platform-side deserializer board enable distances of up to 15m between any TISMIPI sensor and embedded system using a coaxial cable. The connection of these components is shown below:



The document "Deserializer Design Recommendations" contains important information required to create a custom deserializer design using the TI DS90UB954-Q1 chip.

2 MSER-FPD Rev 1.30

The MSER-FPD board (Rev. 1.30) is shown below:



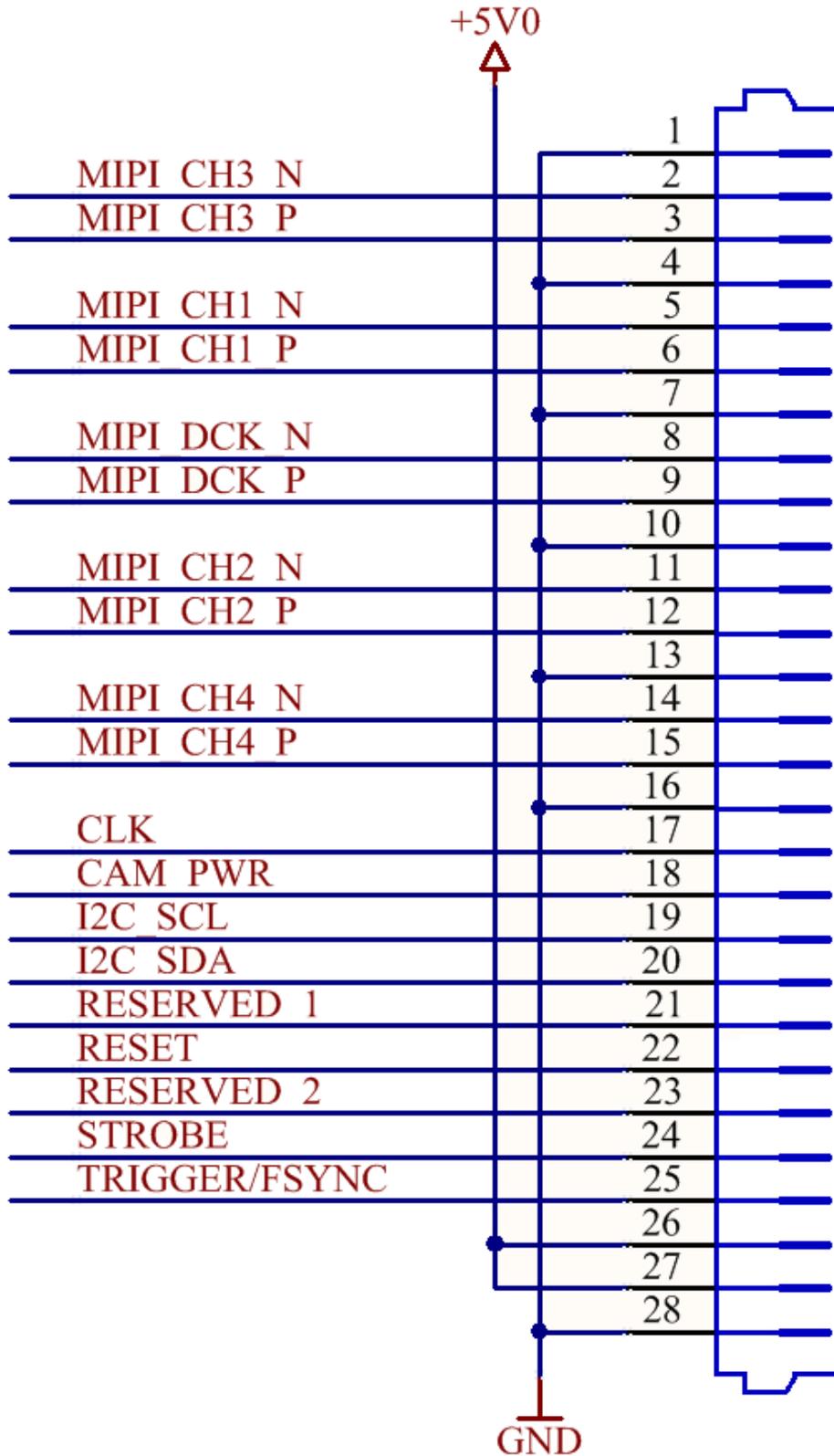
2.1 FAKRA Connector

The manufacturer part number of the Adam Tech FAKRA connector is RF55-28Z-T-00-50-G-SH. The recommended cable type is RG-174 with 50 Ohm impedance. Please contact The Imaging Source for available assembled cables.



2.2 Flex Cable Connection with Stiffener on the MSER-FPD

The flex cable connection with stiffener has the following pinout:





#	Name	Type	Description
1	GND	GND	Ground
2	MIPI_CH3_N	I	MIPI CSI-2 input
3	MIPI_CH3_P	I	MIPI CSI-2 input
4	GND	GND	Ground
5	MIPI_CH1_N	I	MIPI CSI-2 input
6	MIPI_CH1_P	I	MIPI CSI-2 input
7	GND	GND	Ground
8	MIPI_DCK_N	I	MIPI CSI-2 input
9	MIPI_DCK_P	I	MIPI CSI-2 input
10	GND	GND	Ground
11	MIPI_CH2_N	I	MIPI CSI-2 input
12	MIPI_CH2_P	I	MIPI CSI-2 input
13	GND	GND	Ground
14	MIPI_CH4_N	I	MIPI CSI-2 input
15	MIPI_CH4_P	I	MIPI CSI-2 input
16	GND	GND	Ground
17	CLK	O	Reference clock output
18	CAM_PWR	O	High active camera power enable signal
19	I2C_SCL	I/O	I2C Serial clock
20	I2C_SDA	I/O	I2C Serial data
21	RESERVED_1	I/O	Reserved pin 1
22	RESET	O	Reset sensor to default state when low
23	RESERVED_2	I/O	Reserved pin 2
24	STROBE	I	CMOS sensor strobe signal input
25	TRIGGER/FSYNC	O	Trigger signal output
26	+5V_VDD	PWR	5V ($\pm 10\%$) power supply



#	Name	Type	Description
27	+5V_VDD	PWR	5V ($\pm 10\%$) power supply
28	GND	GND	Ground



2.3 I/O Signals of MSER-FPD

The connected I/O signals on the serializer chip DS90UB953-Q1 (Texas Instruments) are listed in the following table:

Pin	Name	Dir	Description
17 (GPIO0)	STROBE	I	Strobe signal from sensor board
18 (GPIO1)	TRIGGER_SER	I	External trigger signal from serializer board
27 (GPIO2)	TRIGGER	O	Trigger signal from deserializer board
28 (GPIO3)	RESERVED1_ GPIO3	I/O	Reserved signal

Since the DS90UB953-Q1 serializer chip does not have enough free I/O-pins, an I2C I/O expander (Texas Instruments TCA6408A) has been placed on the board. The following table shows which I/O signals on the flex cable connection are connected directly to the DS90UB953-Q1 and which signals are controlled by the I2C I/O expander:

Pin	Name	Dir	Description	Pin at DS90UB953	Pin at I2C I/O Expander
17	CLK	O	Sensor clock	CLK_OUT (19)	
18	CAM_PWR	O	Camera power enable, active high		GPIO0 (Pin 2)
19	I2C_SCL	I/O	I2C-Bus, clock	I2C_SCL (24)	
20	I2C_SDA	I/O	I2C-Bus, data	I2C_SDA (23)	
21	RESERVED_1	I/O	Reserved	GPIO3 (28)	
22	RESET	O	Sensor reset signal, active low		GPIO1 (Pin 3)
23	RESERVED_2	I/O	Reserved		GPIO7 (Pin 10)
24	STROBE	I	Sensor strobe signal	GPIO0 (17)	
25	TRIGGER	O	Sensor trigger signal	GPIO2 (27)	

All I/Os have the same I/O voltage of 1.8V.



2.4 I2C I/O Expander Configuration

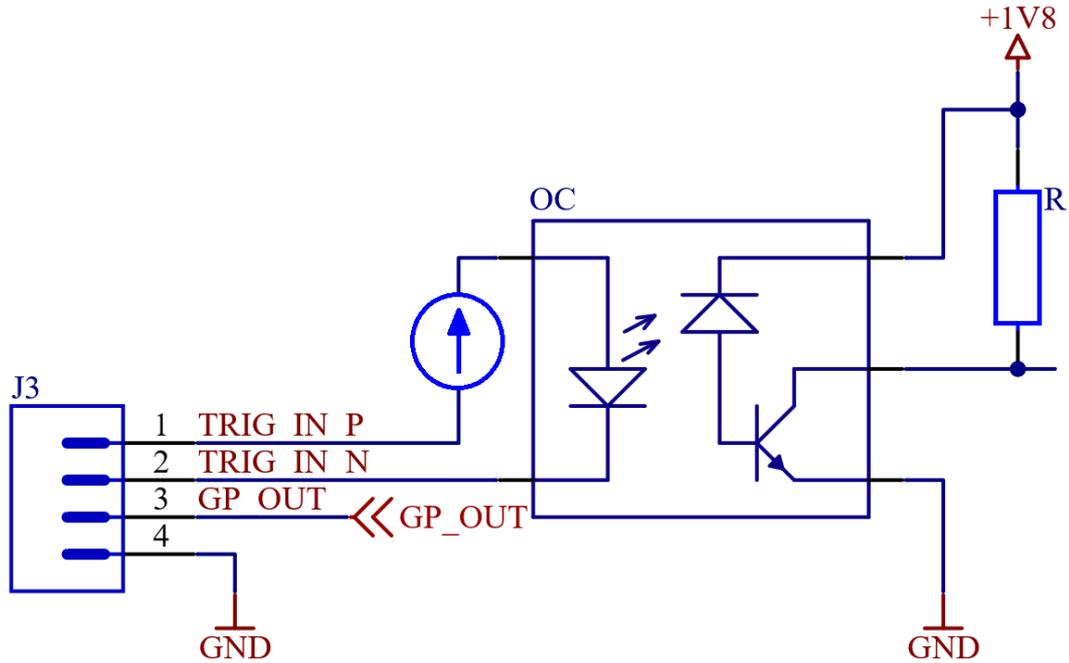
The I/O expander TCA6408A has the 7-bit I2C-address 0x20. The table below depicts which signals can be controlled through this expander:

I/O Pin	Name	Dir	Description
P0	CAM_PWR	O	Enable CMOS sensor power supply 0: Sensor power disabled 1: Sensor power enabled
P1	RESET	O	CMOS sensor reset signal 0: Sensor is in reset state 1: Sensor is in operational state
P2	GPOUT_LEVEL	O	If GPOUT_SELECT = 0: --->0: LED1 off --->1: LED1 on If GPOUT_SELECT = 1: --->0: GPOUT is low/0 V --->1: GPOUT is tri-stated or high/+5V (depends on the setting of GPIO3)
P3	GPOUT_PUSHPULL	O	GPOUT (PicoBlade) type selection 0: GPOUT is configured as open-drain-output 1: GPOUT is configured as TTL/push-pull-output
P4	GPOUT_SELECT	O	Function of GPOUT (PicoBlade) Pin 0: STROBE from CMOS sensor board 1: GPOUT_LEVEL from serializer board
P5	TRIGGER_LEVEL	O	Controls the polarity of the trigger input on the PicoBlade connector. 0: Trigger source level polarity is not inverted 1: Trigger source level polarity is inverted
P6	TRIGGER_SOURCE	O	Controls the source of the trigger signal that is forwarded to the sensor. 0: Sensor is triggered by the trigger signal coming from the FPD-Link / deserializer chip. 1: Sensor is triggered by the trigger signal that is applied to the PicoBlade I/O connector.
P7	RESERVED_2	O	Reserved



2.5 I/O Connector

The serializer also has a user GPIO I/O connector with the following pinout:



Pin	Name	Description
1	TRIGGER_IN_P	Opto-decoupled trigger input, anode of IR-LED
2	TRIGGER_IN_N	Opto-decoupled trigger input, cathode of IR-LED
3	GP_OUT	General purpose output, referenced to GND
4	GND	System ground

The trigger input is opto-decoupled. To drive the trigger input, a voltage must be applied to pins 1 and 2. Note: pin 1 is the positive input; pin 2 is the negative input.

Pin 3 is a general-purpose output pin that can be controlled with software. The pin can be configured for TTL mode output or open drain output. LED2 indicates a possible overcurrent.

The recommended operating conditions of the user GPIO connector J3 are displayed in the following tables. CAUTION: Functional operation beyond the recommended operating conditions is not assumed.

Parameter	Min	Max
Trigger input voltage	3.3V ± 5%	24V ± 5%



Parameter	Min	Max
TTL-mode high voltage	-	250mA @ 4V
TTL-mode low voltage	-	250mA @ 0.05V

Parameter	Min	Max
Open-drain-mode voltage	-	24V
Open-drain-mode current	-	250mA

Please make sure that enough additional power is provided via the embedded system to operate the connected devices at the user GPIO connector (J3).

2.6 On-board LEDs

There are two, status LEDs on the serializer board:

Name	Color	Description
LED1	Green	Controlled through GPOUT_LEVEL on the I/O expander
LED2	Red	Indicates overcurrent flowing out of GP_OUT in TTL/push-pull mode.



MSER-FPD 1.30

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All weights and dimensions are approximate. Unless otherwise specified, the lenses shown in the context of cameras are not shipped with these cameras.

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