

## Multimedia Extender Demo Kit

The Multimedia Extender Kit is designed to demonstrate the combined transmission of video, data and audio using the GigaSTAR<sup>®</sup> Digital Display Link technology through only one small-size STP-cable. It transmits digital high resolution graphics, USB and S/P-DIF audio over just one standard STP cable across distances of up to 40m. Interfacing to DVI, LVDS and TTL RGB as well as USB and a variety of audio interfaces is demonstrated.

## GigaSTAR<sup>®</sup> Digital Display Link

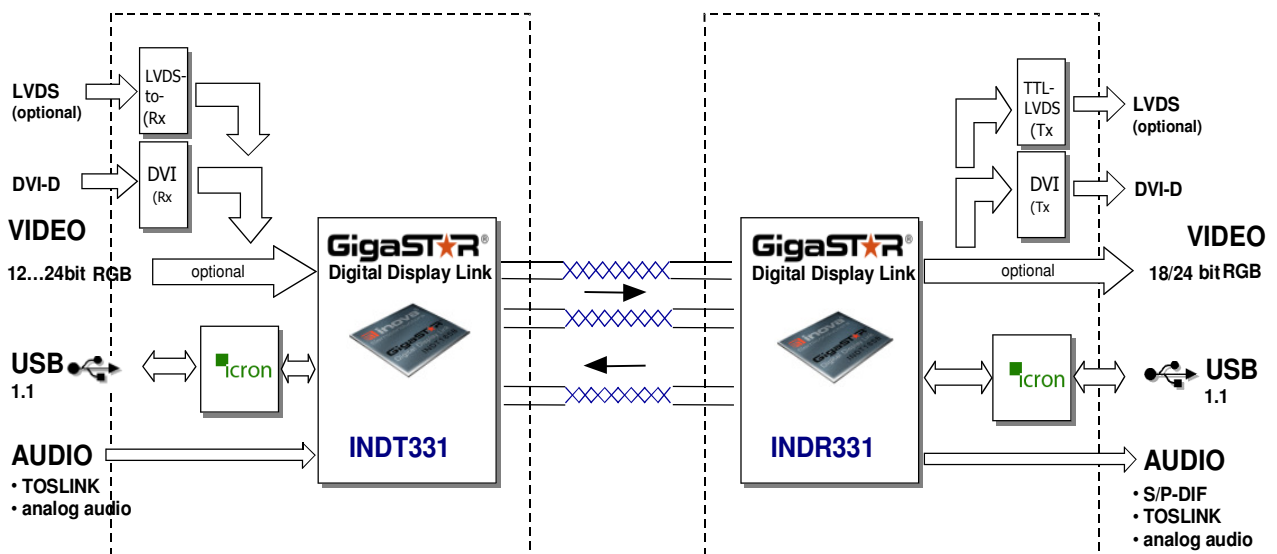
### Features:

- Supports DVI, LVDS and parallel video
- Resolutions up to 720p / 1080i
- Supports DDC / HDCP / HTPL
- Supports TOSLINK<sup>®</sup>, S/P-DIF<sup>®</sup> & analog audio
- USB1.1 support
- Up to 40m distance
- Single +5V power supply

### Applications:

- Long-distance multimedia consoles
- Industrial remote terminals
- Video broadcast systems
- Long-distance camera links
- Machine vision systems
- Car navigation & telematics systems
- Digital TV equipment
- Video projectors
- Home cinemas

### Multimedia Demo Kit Overview:



## **1 Overview**

The Multimedia Extender Demo Kit comprises two boards, one transmitter and one receiver board, (also referred to as MMTX and MMRX) as well as one CAT5e cable. The cable bridges distances up to 10 m. Longer distances are possible using other available cables.

The INOVA Semiconductors' GigaSTaR<sup>®</sup> DDL chipset technology supports video data transmission ranging from VGA to SXGA and 480p to 1080i video resolution at true color quality (16.7 million colors). The Multimedia Extender Kit features DVI, LVDS or TTL video interfaces. Monitor detection (DDC) and transmission of content protection (HDCP) are implemented.

The ExtremeUSB<sup>®</sup> technology of ICRON facilitates the extension of USB (Universal Serial Bus) beyond the 5 meter limit as defined in USB specifications. The ExtremeUSB<sup>®</sup> protocol fully compliant with the USB specification. In addition, TOSLINK<sup>®</sup>, S/P-DIF<sup>®</sup> and analog interfaces are implemented for audio data transmission.

## **2 Kit Contents**

- Multimedia Transmitter board (MMTX)
- Multimedia Receiver board (MMRX)
- 10 m link cable (optional: 40m)
- Two powers supplies 100-240V~ / 5V=
- User manual
- CD with schematics and layout documentation

### 3 Hardware

#### 3.1 Multimedia Extender Transmitter (MMTX)

##### a.) Overview

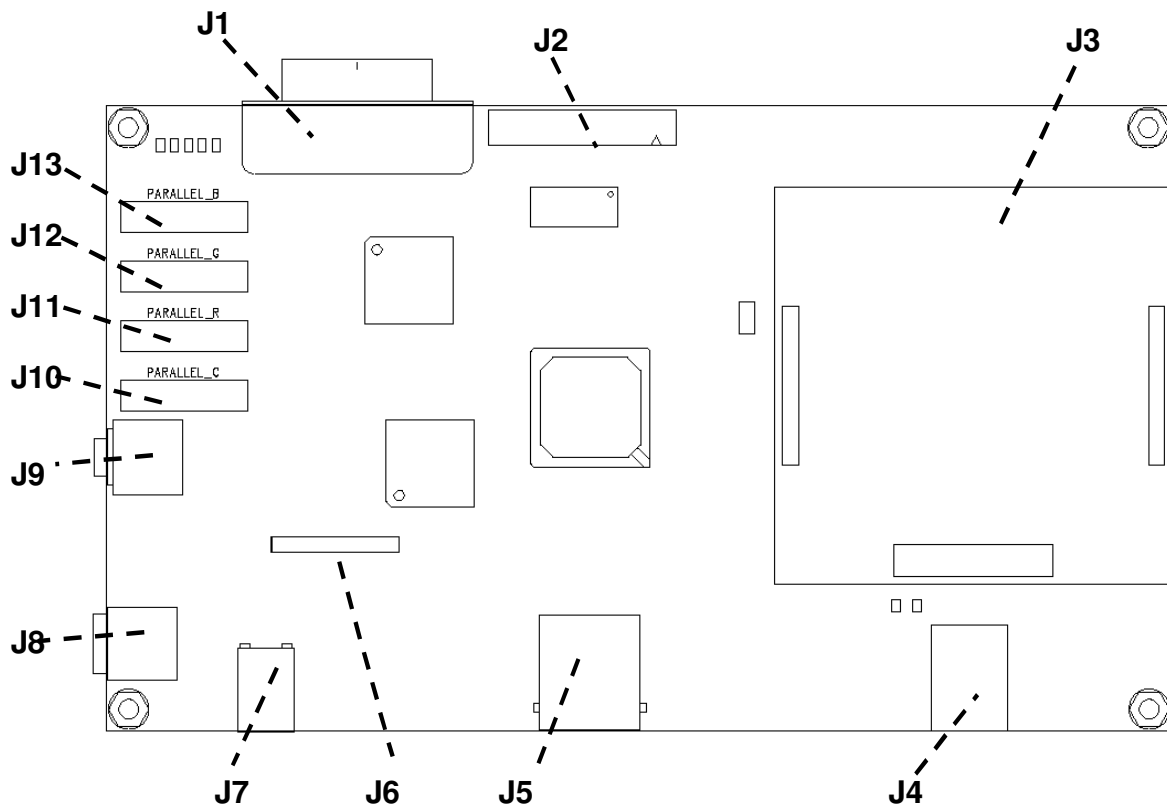


Figure 1: Multimedia Extender MMTX top view

##### b.) Connectors and Interfaces

- J1 - DVI input connector
- J2 - LVDS single link input connector (optional)
- J3 - ICRON ExtremeUSB1.1 LEX daughter board
- J4 - USB type B connector
- J5 - RJ45 GigaSTaR Digital Display Link connector
- J6 - LATTICE JTAG programming connector
- J7 - +5V power plug
- J8 - TOSLINK audio input connector
- J9 - Audio analog input connector
- J10 - TTL parallel video control data (optional)
- J11 - TTL parallel video RED input data (optional)
- J12 - TTL parallel video GREEN input data (optional)
- J13 - TTL parallel video BLUE input data (optional)

**c.) Pin Assignment**

Connector J1 (DVI-D video input):

Pin	Signal Assignment	Pin	Signal Assignment	Pin	Signal Assignment
1	T.M.D.S. Data2-	9	T.M.D.S. Data1-	17	T.M.D.S. Data0-
2	T.M.D.S. Data2+	10	T.M.D.S. Data1+	18	T.M.D.S. Data0+
3	T.M.D.S. Data2 Shield	11	T.M.D.S. Data1 Shield	19	T.M.D.S. Data0 Shield
4	n.c.	12	n.c.	20	n.c.
5	n.c.	13	n.c.	21	n.c.
6	DDC Clock	14	+5V Power	22	T.M.D.S. Clock Shield
7	DDC Data	15	GND	23	T.M.D.S. Clock+
8	n.c.	16	Hot Plug Detect	24	T.M.D.S. Clock-

**Table 1: DVI input connector pin assignment (MMTX)**

Connector J2 (LVDS single link video input):

Pin	Signal Assignment	Pin	Signal Assignment
1	n.c.	11	LVDS_TX2-
2	n.c.	12	LVDS_TX2+
3	GND	13	GND
4	GND	14	LVDS_CLK-
5	LVDS_TX0-	15	LVDS_CLK+
6	LVDS_TX0+	16	GND
7	GND	17	LVDS_TX3-
8	LVDS_TX1-	18	LVDS_TX3+
9	LVDS_TX1+	19	GND
10	GND	20	GND

**Table 2: LVDS single link input connector (HIROSE DF-14-20p) pin assignment (MMTX)**

Connector J4 (USB type B host connector):

Pin	Signal Assignment
1	+5V
2	USB_D-
3	USB_D+
4	GND

**Table 4: USB type B Host connector pin assignment (MMTX)**

Connector J5 (GigaSTaR Digital Display Link RJ45 connector):

Pin	Signal Assignment	Pin	Signal Assignment
1	DDL TX0-	7	DDL_RX0-
2	DDL_TX0+	8	SDA
3	SCL	9	DDL TX1+
4	DDL_RX0+	10	DDL_TX1-

Table 4: DDL RJ45 connector pin assignment (MMTX)

Connector J6 (Lattice JTAG programming connector):

Pin	Signal Assignment
1	+ 3.3 V
2	TDO
3	TDI
4	ENABLE
5	N.C.
6	TMS
7	GND
8	TCK

Table 5: Lattice JTAG programming connector pin assignment (MMTX)

Connector J7 (supply power connector):

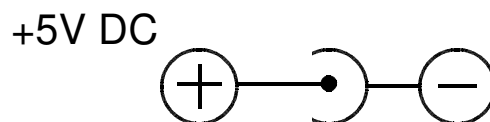


Figure 2: Power plug pin assignment (MMTX)

Connector J9 (analog audio stereo input connector):

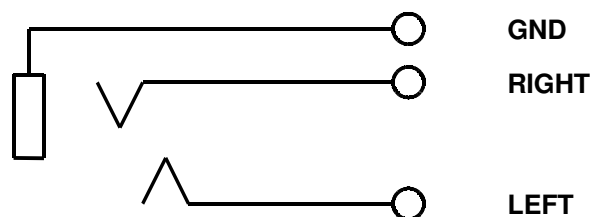


Figure 3: 3,5mm Audio -stereo jack pin assignment (MMTX)

Connector J10 (TTL video control connector):

Pin	Signal Assignment	Pin	Signal Assignment
1	PXCLK+	9	n.c.
2	GND	10	GND
3	DE	11	n.c.
4	GND	12	GND
5	VSYNC	13	n.c.
6	GND	14	GND
7	HSYNC	15	n.c.
8	GND	16	GND

Table 6: TTL video CONTROL input connector pin assignment (MMTX)

Connector J11 (TTL video RED input connector):

Pin	Signal Assignment	Pin	Signal Assignment
1	RED0	9	RED4
2	GND	10	GND
3	RED1	11	RED5
4	GND	12	GND
5	RED2	13	RED6
6	GND	14	GND
7	RED3	15	RED7
8	GND	16	GND

Table 7: TTL video RED input connector pin assignment (MMTX)

Connector J12 (TTL video GREEN input connector):

Pin	Signal Assignment	Pin	Signal Assignment
1	GREEN0	9	GREEN4
2	GND	10	GND
3	GREEN1	11	GREEN5
4	GND	12	GND
5	GREEN2	13	GREEN6
6	GND	14	GND
7	GREEN3	15	GREEN7
8	GND	16	GND

Table 8: TTL video GREEN input connector pin assignment (MMTX)

Connector J13 (TTL video BLUE input connector):

Pin	Signal Assignment	Pin	Signal Assignment
1	BLUE0	9	BLUE4
2	GND	10	GND
3	BLUE1	11	BLUE5
4	GND	12	GND
5	BLUE2	13	BLUE6
6	GND	14	GND
7	BLUE3	15	BLUE7
8	GND	16	GND

Table 9: TTL video BLUE input connector pin assignment (MMTX)

### 3.2 Multimedia Extender Receiver (MMRX)

**a.) Overview**

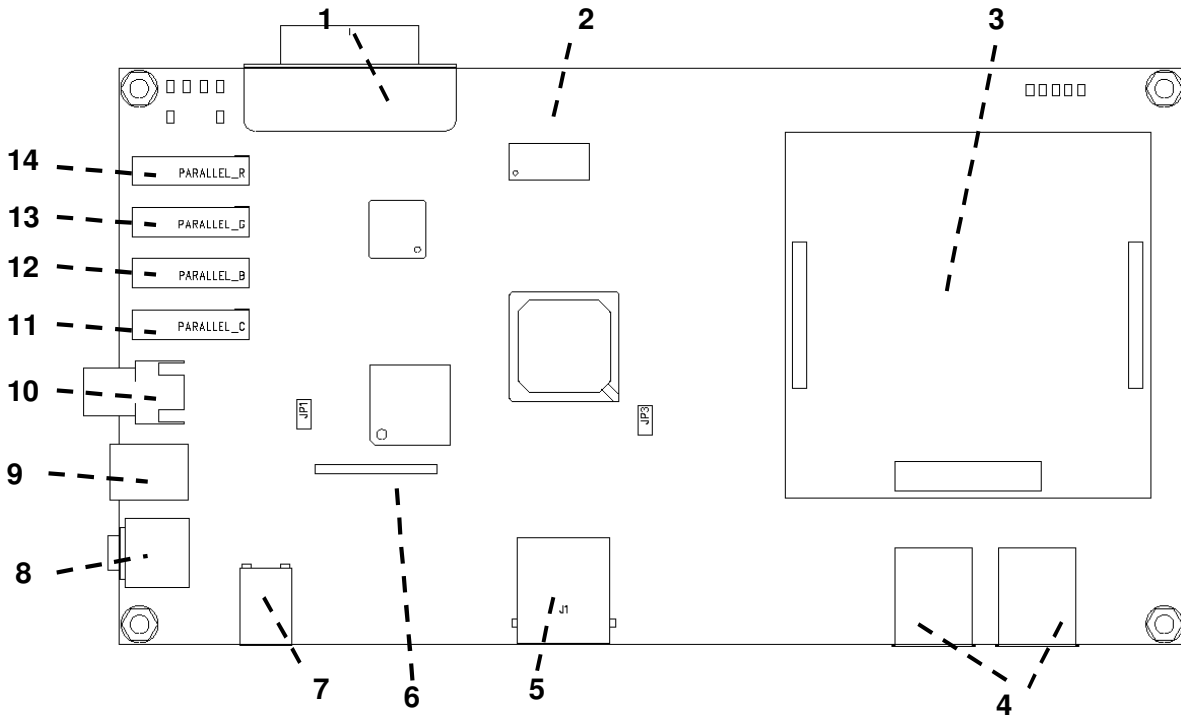


Figure 4.: Multimedia Extender MMRX top view

**b.) Connectors and Interfaces**

- 1 - DVI output connector
- 2 - LVDS single link output connector (optional) bottom
- 3 - ICRON ExtremeUSB1.1 REX daughter board (optional)
- 4 - 4 x USB type A connector
- 5 - RJ45 GigaSTaR Digital Display Link connector
- 6 - LATTICE JTAG programming connector
- 7 - +5V power plug
- 8 - Audio analog output connector
- 9 - TOSLINK ® audio output connector
- 10 - S/P-DIF ® audio output connector
- 11 - TTL video CONTROL output (optional)
- 12 - TTL video RED output connector (optional)
- 13 - TTL video GREEN output connector (optional)
- 14 - TTL video BLUE output connector (optional)

**c.) Pin Assignment**

Connector J1 (DVI-D video output):

Pin	Signal Assignment	Pin	Signal Assignment	Pin	Signal Assignment
1	T.M.D.S. Data2-	9	T.M.D.S. Data1-	17	T.M.D.S. Data0-
2	T.M.D.S. Data2+	10	T.M.D.S. Data1+	18	T.M.D.S. Data0+
3	T.M.D.S. Data2 Shield	11	T.M.D.S. Data1 Shield	19	T.M.D.S. Data0 Shield
4	n.c.	12	n.c.	20	n.c.
5	n.c.	13	n.c.	21	n.c.
6	DDC Clock	14	5+V Power	22	T.M.D.S. Clock Shield
7	DDC Data	15	GND	23	T.M.D.S. Clock+
8	n.c.	16	Hot Plug Detect	24	T.M.D.S. Clock-

**Table 10: DVI output connector pin assignment (MMRX)**

Connector J2 (LVDS single link video output):

Pin	Signal Assignment	Pin	Signal Assignment
1	3.3V	11	LVDS_TX2-
2	3.3V	12	LVDS_TX2+
3	GND	13	GND
4	GND	14	LVDS_CLK-
5	LVDS_TX0-	15	LVDS_CLK+
6	LVDS_TX0+	16	GND
7	GND	17	LVDS_TX3-
8	LVDS_TX1-	18	LVDS_TX3+
9	LVDS_TX1+	19	GND
10	GND	20	GND

**Table 11: LVDS single link output connector (HIROSE DF-14-20p) pin assignment (MMRX)**

Connector J4 (4 x USB type A connector):

Pin	Signal Assignment
1	+5V
2	USB_D-
3	USB_D+
4	GND

**Table 12: USB type A host connector pin assignment (MMRX)**

Connector J5 (GigaSTaR Digital Display Link RJ45 connector):

Pin	Signal Assignment	Pin	Signal Assignment
1	DDL TX0-	7	DDL_RX0-
2	DDL_TX0+	8	SDA
3	SCL	9	DDL TX1+
4	DDL_RX0+	10	DDL_TX1-

Table 14: DDL RJ45 connector pin assignment (MMRX)

Connector J6 (Lattice JTAG programming connector):

Pin	Signal Assignment
1	+ 3.3 V
2	TDO
3	TDI
4	ENABLE
5	N.C.
6	TMS
7	GND
8	TCK

Table 15: Lattice JTAG programming connector pin assignment (MMRX)

Connector J7 (supply power connector):

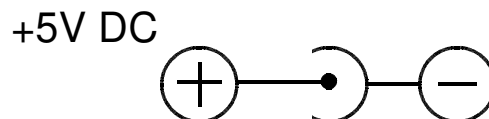


Figure 5: Power plug pin assignment (MMRX)

Connector J8 (analog audio-stereo output connector):

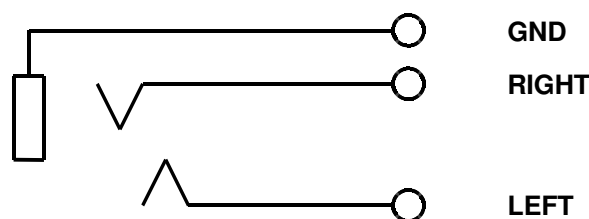


Figure 6: 3,5mm Audio-stereo jack pin assignment (MMRX)

Connector J9 (S/P-DIF @ cinch output connector):

Pin	Signal Assignment	Pin	Signal Assignment
RING	GND	TIP	S/P-DIF in

Table 16: S/P-DIF chinc output connector pin assignment (MMRX)

Connector J11 (TTL parallel control output connector):

Pin	Signal Assignment	Pin	Signal Assignment
1	PXCLK+	9	DDL LOCK0
2	GND	10	DDL ERROR
3	DE	11	DDL LOCK1
4	GND	12	MASTERRESET#
5	VSYNC	13	DDL SYNC0
6	GND	14	DDL CFGCYC
7	HSYNC	15	DDL SYNC1
8	GND	16	n.c

Table 17: TTL video CONTROL output connector pin assignment (MMRX)

Connector J12 (TTL parallel RED output connector):

Pin	Signal Assignment	Pin	Signal Assignment
1	RED0	9	RED4
2	GND	10	GND
3	RED1	11	RED5
4	GND	12	GND
5	RED2	13	RED6
6	GND	14	GND
7	RED3	15	RED7
8	GND	16	GND

Table 18: TTL video RED output connector pin assignment (MMRX)

Connector J13 (TTL parallel GREEN output connector):

Pin	Signal Assignment	Pin	Signal Assignment
1	GREEN0	9	GREEN4
2	GND	10	GND
3	GREEN1	11	GREEN5
4	GND	12	GND
5	GREEN2	13	GREEN6
6	GND	14	GND
7	GREEN3	15	GREEN7
8	GND	16	GND

Table 19: TTL video GREEN output connector pin assignment (MMRX)

Connector J14 (TTL parallel BLUE output connector):

Pin	Signal Assignment	Pin	Signal Assignment
1	BLUE0	9	BLUE4
2	GND	10	GND
3	BLUE1	11	BLUE5
4	GND	12	GND
5	BLUE2	13	BLUE6
6	GND	14	GND
7	BLUE3	15	BLUE7
8	GND	16	GND

**Table 20: TTL video BLUE output connector pin assignment (MMRX)**

## 4 Quick Start

The Multimedia Extender Kit comprises two boards, Transmitter and Receiver, marked with MMTX\*\* and MMRX\*\*. Both require one single +5V supply each through the attached power supplies.

- Connect the MMTX and MMRX boards with the included CAT5 STP cable.
- Connect all desired video, USB and audio sources and sinks to the MMTX and MMRX boards.
- Power up the MMTX and MMRX boards.

It is recommended to plug in all connections prior powering up the boards.

For correct monitor detection (DDC), the Multimedia Extender link has to be powered up before the host PC (DVI video source) is turned on.

### **Transmitter board MMTX:**

The video source on the MMTX board (DVI, LVDS, TTL) can be selected through parallel resistor arrays. Please refer to the Multimedia Extender Kit schematics. Only one video source can be transmitted at a time.

The analog audio path is separated from digital S/P-DIF® / TOSLINK®. Thus, the Multimedia Extension Kit provides for the transmission of two independent audio paths.

### **Receiver board MMRX:**

The video output on the MMRX board (DVI, LVDS, TTL) can be selected through parallel resistor arrays. Please refer to the Multimedia Extender Kit schematics. It is not recommended to use more than 2 output sinks simultaneously due to a limited output driving capability of the parallel video bus.

Digital audio information on S/P-DIF® and TOSLINK® output on MMRX is equal to TOSLINK ® input on MMTX.

Both the MMTX and MMRX boards feature several LEDs. These LEDs make it easy to identify the status of the boards' power supplies and the link synchronization.

LED	Status
LED 1	+3V3 power ok
LED 2	+5V power ok
LED 3	Video input error
LED 4	Uplink synchronous
LED 5	Board reset

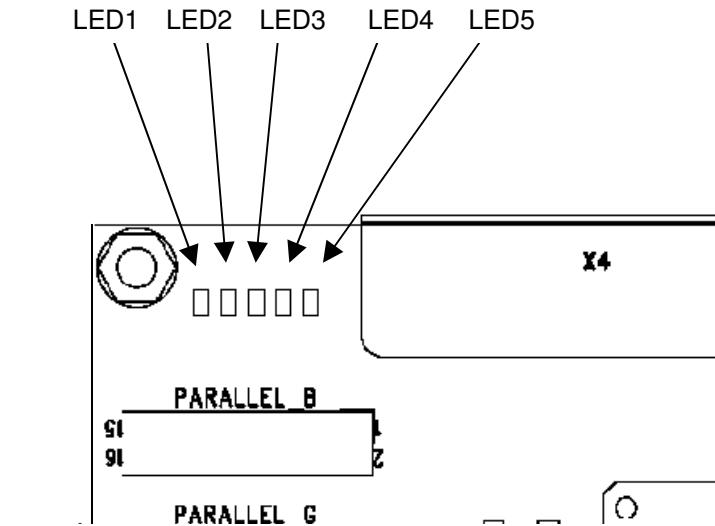
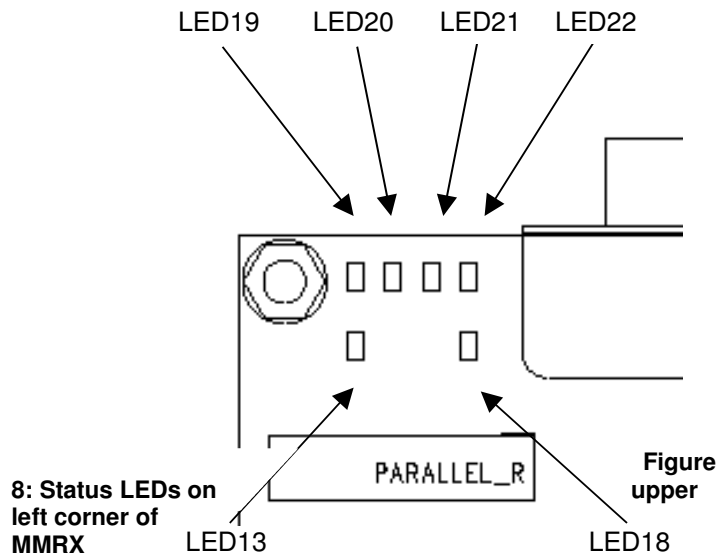


Figure 7: Status LEDs on upper left corner of MMTX

Note : A video input error occurs if the video timing fed into the MMTX board exceeds the bandwidth limits of the Digital Display Link devices, or no valid video input is available.

LED	Status
LED 13	+3V3 power ok
LED 19	Video error
LED 20	Downlink synchronous
LED 21	Board reset
LED 22	Audio error
LED 18	+5V power ok



Note: Video error means that there is no valid video input on the transmitter board. This is not to be mixed up with missing link synchronization or the like.

## 5 Characteristics

Parameter	min	typ	max	
Supply voltage	4.75	5.0	5.25	V
Current consumption MMTX	-	1200	1300	mA
Current consumption MMRX	-	1200	3200(*)	mA

**Table 21: DC characteristics**

(\*) The maximum current consumption of the MMRX board depends on the number of USB devices connected. Each USB device can consume a maximum current of 500mA (as stated in USB spec. 1.1)

- The Multimedia Extender Kit handles video resolutions of up to SXGA and 1080i. The maximum pixel clock frequency is 120MHz (one pixel per clock mode).
- The TTL pixel bus handles 3.3V LVCMOS signals.
- TOSLINK® and S/P-DIF® interfaces of the Multimedia Extender Kit handles sample frequencies of 44,1kHz and 48kHz.
- Analog audio input handles line levels of +/- 2.5Vpp.



## 7 Ordering Information

Ordering Code	Status
IND331_Mmedia_USB1.1	Full production
IND331_Mmedia_USB2.0	Full production

Table 22: Ordering information


The Multimedia Demo Kit contains one 10 m STP link cable. A 40 m cable is available on request.


## 8 Revision History

Rev.1.0	- Initial version
Rev.1.1	- Added mechanical dimensions
Rev 1.2	- Ordering info / separation regarding USB1.1/2.0 implemented
Rev 1.3	- Added LED status description

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