DATA SHEET

Digital Video/Audio and Serial I/O Extender

M5-2C2

Contents

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Digital Video/Audio and Serial I/O Extender

Description

M5-2C2-TR offers integrated extension of digital video, audio and RS-232 interface up to 50m (160ft) for HDMI/DVI. It maintains HD video signals up to WUXGA (1920x1200) at 60Hz refresh rate for PC and 1080p for HDTV. It is compatible with full DDC2B and HDCP. It supports connecting one of 3 different audio types in the transmitter; RCA, SPDIF (Optic) or SPDIF (Coaxial) and outputting all 3 audio types. RS232 serial interface offers device-to-device and device-to-controller connections to build up control system for A/V integration.

It is designed to multiplex and de-multiplex the DVI/HDMI video, digital/analog audio, Display Data Channel (DDC) command interface, High Definition Copy Protection (HDCP) and serial protocol so as to be linked over two CAT5 cables. It gives benefits of easy plug-and-go installation and offers you a cost effective solution for pro A/V system.

The M5-2C2 consists of an Uplink (or transmitter; Tx) and a Downlink (or receiver; Rx), connected by two CAT5 or CAT6 cables. Each link module is driven by +12V/3A DC power adaptor.

The shipping group is as follows;

1) One pair of the uplink and the downlink
2) One +12V/3A power adaptors
3) User Manual

Feature

- Extends DVI, Audio and RS232 up to 50m.
- Extends HDMI, Audio and RS232 up to 50 m with DDC/HDCP.
- Audio interface: Selectable RCA, SPDIF (Optic) or SPDIF (Coaxial).
- Serial control data: RS232 with 9 pin D-sub female connector in the transmitter and male connector in the receiver.
- Video data: WUXGA (1920X1200), 24bit color and 60Hz refresh rate for DVI and 1080p for HDMI.
- Interconnection between transmitter and receiver: Two(2) CAT5 or CAT6 cables.
- +12 V DC power supply to one of the module.
- Complies with DDC2B/HDCP.
- No software to install; just plug and go.

Applications

- Digital display system integration for medical, military, aerospace, factory automation, and traffic control platforms.
- Digital FPD, PDP and projector installation in conference rooms, auditoriums and for kiosk systems
- LED signboards for large scale information display and stadiums

Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	T_{stg}	- 10	+ 70	°C
Supply Voltage	V_{CC}	10	16	V
Transmitter Differential Input Voltage	V_d	-	1	V
Relative Humidity	RH	10	85	%
Lead Soldering Temperature & Time	-	-		260°C, 10 sec

Recommended Operating Conditions

Parameter	Symbol	Minimum	Typical	Maximum	Units
Ambient Operating Temperature	T_A	0		+ 50	°C
Data Output Load	R_{LD}		50		Ω
Power Supply Rejection (Note1)	PSR		50		mV_{p-p}
Supply Voltage	V_{CC}	+ 11.4	+ 12.0	+ 12.6	V

Note1. Tested with a $50mV_{p-p}$ sinusoidal signal in the frequency range from 500 Hz to 500 MHz on the V_{CC} supply with the recommended power supply filter in place. Typically less than a 0.25 dB change in sensitivity is experienced.

Electrical Power Supply Characteristics

(T_A = 0 °C to +50 °C, unless otherwise noted)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Voltage	V_{CC}	11.4	12	12.6	V
Supply Current	Imodule	220	240	270	mA
Power Dissipation	P_{module}	2.5	2.88	3.4	W

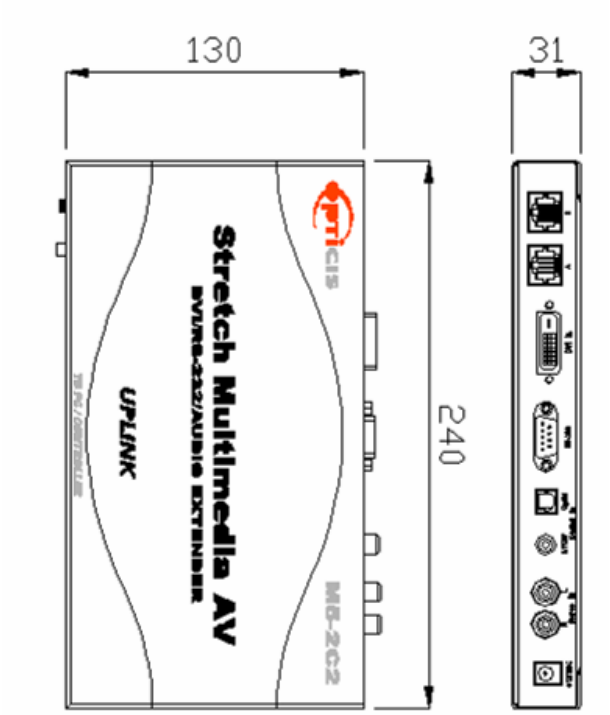
Electrical Characteristics

(T_{op} = 25℃)

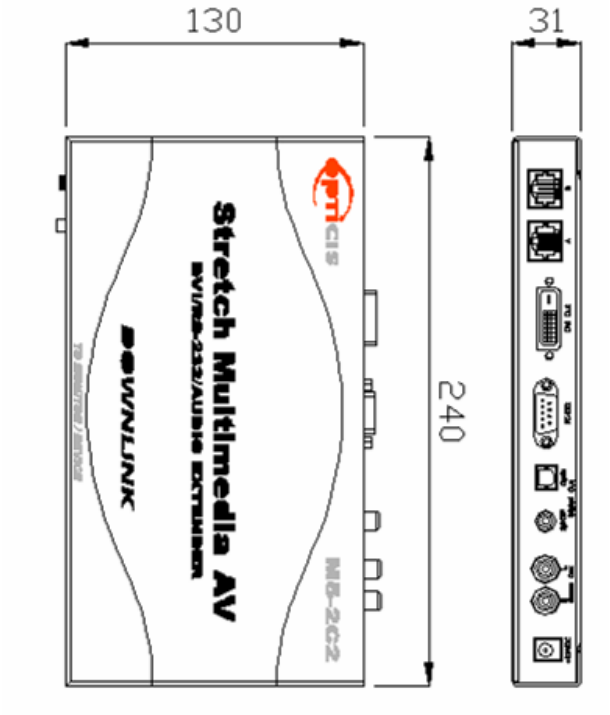
Parameters		Symbol	Condition	Unit	Min.	Typ.	Max.	Remark
DVI/HDMI								
Data Bit Rate	TX		TMDS	Mbps		1250	1650	
	RX		TMDS	Mbps		155.52	1650	
Supporting Distance			CAT5/UXGA	m		30	50	
Data Input Level		Din(p-p)	TMDS	mV		680	1000	
Data Output Level		Dout(p-p)	TMDS	mV		1000		
Data Output Load		Rout		ohm		100		
Audio (Analog)								
Analog Sample Rate		F_{audio_a}		kHz	32		192	
Analog output level		Aout	Vpp=3.3V/Analog	Vpp		0.65		
Audio(SPDIF)								
Data Rate	TX		NRZ	Mbps	0.1		15	
	RX		NRZ	Mbps	DC		15	
Pulse Width Distortion		Δ tw	Pulse Width = 67ns Pulse Cycle = 134ns C_L = 10pF	ns	-15		15	
Maximum Receivable Power		Pmax	15Mbps	dBm	-14.5			
Minimum Receivable Power		Pmin	15Mbps	dBm			-24	
Fiber Output Power		Pf		dBm	-21		-15	
Center Emission Wavelength		λ_c		nm		650		

Drawing of transmitter and receiver modules

Dimension [mm]



Transmitter



Receiver

DVI Pin Description

Pin	Symbol	Functional Description
1	**CH2-**	TMDS Data Signal Channel 2 Negative
2	**CH2+**	TMDS Data Signal Channel 2 Positive
3	**GND**	TMDS Data Signal Channel 2 Shield
4		
5		
6	**DDC Clock**	DDC Clock line for DDC2B communication
7	**DDC Data**	DDC Data line for DDC2B communication
8	**N.C.**	
9	**CH1-**	TMDS Data Signal Channel 1 Negative
10	**CH1+**	TMDS Data Signal Channel 1 Positive
11	**GND**	TMDS Data Signal Channel 1 Shield
12		
13		
14	**5 V**	5 V Input for Transmitter from Host 5 V Output for Monitor from Receiver
15	**GND**	Ground
16	**Hot plug Detect**	Signal is driven by monitor to enable the system to identify the presence of a monitor
17	**CH0-**	TMDS Data Signal Channel 0 Negative
18	**CH0+**	TMDS Data Signal Channel 0 Positive
19	**GND**	TMDS Data Signal Channel 0 Shield
20		
21		
22	**GND**	TMDS Clock Signal Shield
23	**CLK+**	TMDS Clock Channel Positive
24	**CLK-**	TMDS Clock Channel Negative

Note: Channels 3, 4 and 5 dual-link data signal pins are not used

RS232C Pin Description

Pin	Symbol	Functional Description
1	Received Line Signal Detector	Connected with Pin4 & Pin6 in module
2	**RD**	Data Receive: Uplink ←→ Downlink
3	**TD**	Data Transmit: Uplink ←→ Downlink
4	Data Terminal Ready	Connected with Pin1 & Pin6 in module
5	**GND**	Signal Ground
6	Data Set Ready	Connected with Pin1 & Pin4 in module
7	Request To Send	Connected with Pin8 in module
8	Clear To Send	Connected with Pin7 in module
9	NC	

Connection tips:

1) Connection of PC-to-PC: Cross connection of pins 2 and 3 between two PCs.
2) Connection of PC-to-Device: Straight connection of pin 2:2 and pin 3:3

Reliability Test

Opticis utilizes three types of test criteria for a reduction of variability and a continuous improvement of the process by its FEMA (Failure Mode and Effective Analysis) program.

1) Mechanical test (vibration, shock)
2) Temperature & humidity tests
3) EMC test (*FCC class A and CE Verification*)

Mechanical and Temperature & Humidity Test Data

Heading	Test	Conditions	Duration	Sample Size	Failure	Remarks
Operating Test	Operating at each Temperature (See Note)	* 0 ~ 50 ˚C (Interval: 10 ˚C)	30 Min (Each Temperature)	n =3	0	**Note:** Visual Test on the Display
Storage Test	**Low Temperature**	* T_S = -30 ˚C	96 HR	n=3	0	1. TS: Storage Temperature
	High Temperature	* T_S = 85 ˚C	96 HR	n=3	0	2. RH: Relative Humidity
	High Humidity High Temperature	* T_S: 60 ˚C * RH: 90%	96 HR	n=3	0	
Mechanical Test	**Mechanical Shock**	* Pulse: 11 ms * Peak level: 30 g * Shock pulse: 3 times/Axis	-	n=2	0	
	Mechanical Vibration	* Peak acceleration: 20 g * Frequency: 20~2000 ㎐ * Sweep time: 30 Minutes * 4 Times/Axis	-	n=2	0	

EMC Test Data

1) EMI: Meet *FCC class A* (ICES-003) and *CE class A*

STANDARDS		*CONDITIONS*
EN 55 022 (CISPR22) FCC; PART 15 SUBPART B	CE (Conducted Emission) & RE (Radiated Emission)	Meet Class A
EN 61000-3-2 (IEC 61000-3-2)	Harmonics	Meet Class A
EN 61000-3-3 (IEC 61000-3-3)	Flickers	Meet Class A

2) EMS: Meet *CE standards (EN 55024) and CISPR24 equivalents*

STANDARDS		*CONDITIONS*
EN 61 000-4-2:1995	Electrostatic Discharge Immunity (Air: 8kv, Contact: 4kv)	Meet Criterion A
EN 61 000-4-3:1996	Radiated RF E-Field (80~1000 MHz) 3V/m (AM 80%, 1kHz)	Meet Criterion A
EN 61 000-4-4:1995	Fast Transients (5kHz, 60Seconds)	Meet Criterion A
EN 61 000-4-5:1995	Surge Transients	Meet Criterion A
EN 61 000-4-6:1996	Conducted Susceptibility (CS) Radiated Susceptibility (RS)	Meet Criterion A
EN 61 000-4-11:1994	Voltage Dips, Interruption & Variation	Meet Criterion A and C