

DATA SHEET

Digital Video/Audio and Serial I/O Extender

M5-2A2



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Digital Video/Audio and Serial I/O Extender

Description

The reality of gigabit high-speed digital graphic interconnections mandates products that maintain front-of-screen video quality. Optical technology enables extending digital graphic data beyond the physical limits of copper wires by, i) providing pure signal integrity over long distances for the optimum visual experience, ii) no EMI/RFI transmission or reception, iii) light weight, rugged cabling and connectors, iv) very cost effective per foot/metre, v) low power consumption, and vi) ease of installation to plug and run – no software requirements.

M5-2A2-TR offers integrated extension of digital video, audio and RS-232 interface up to 200m (656ft) for HDMI and up to 2km (6,600 ft) for 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 altogether. The 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 4 LC fibers. It gives benefits of all-glass fiber transmission medium, data security, long distance extension up to 2km, easy plug-and-go installation and no RFI/EMI effects. In addition, a non-trivial feature is that both of Single and Multimode optical fibers are applicable.

The M5-2A2 consists of an Uplink (or transmitter; Tx) and a Downlink (or receiver; Rx), connected by two duplex LC terminated single or multi-mode patch cords between them, which offers electrical perfect isolation. 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) Two +12V/3A power adaptors
- 3) User Manual

Features

- ◆ Extends DVI, Audio and RS232 up to 2 km over single mode fiber or 500m over multimode fiber if Select Video-In on front panel is set to DVI.
- ◆ Extends HDMI, Audio and RS232 up to 200 m over single or multimode fiber with DDC/HDC P, if Select Video-In- is set to HDMI.
- ◆ Audio interface: Selectable one of three types, RCA, SPDIF (Optic) or SPDIF (Coaxial) in the transmitter and all three together in the receiver.
- ◆ 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 at 60Hz refresh rate for DVI and 1080p for HDMI.
- ◆ Interconnection between transmitter and receiver: Two (2) duplex LC patch cords of single or multi mode fiber.
- ◆ Without any change of optical components, applicable of both single and multi-mode fiber.
- ◆ +12 V DC power supply to each box.
- ◆ Complies with DDC2B for DVI and HDCP for HDMI.
- ◆ No software to install; just plug and go.
- ◆ Data security with negligible RFI/EMI emissions

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

($T_A = 0\text{ °C}$ to $+50\text{ °C}$, unless otherwise noted)

Parameter	Symbol	Minimum	Typical	Maximum	Units	
Supply Voltage	V_{CC}	11.4	12	12.6	V	
Supply Current	TX	I_{TCC}	350	380	400	mA
	RX	I_{RCC}	370	390	420	mA
Power Dissipation	TX	P_{TX}	3.99	4.56	5.04	W
	RX	P_{RX}	4.22	4.68	5.3	W

Audio Electrical Characteristics

Parameters	Symbol	Condition	Unit	Min.	Typ.	Max.
Audio (Analog)						
Analog Sample Rate	$F_{\text{audio_a}}$		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	Δtw	Pulse Width = 67ns Pulse Cycle = 134ns $C_L = 10\text{pF}$	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	

Optical & Electrical Characteristics ($T_{op} = 25^\circ\text{C}$)

Parameters	Symbol	Condition	Unit	Min.	Typ.	Max.	Remark
Data Bit Rate	1310 Tx	PRBS 2^7-1 ,NRZ	Mbps		1250	1650	
	1550 Rx				155.52		
	1550 Tx	PRBS 2^7-1 ,NRZ	Mbps		155.52		
	1310 Rx				1250	1650	
Fiber Length 9 μm core SMF		10^{-10} BER, 155Mbps /1.25Gbps	km	2			
TRANSMITTER							
Average Launched Power	P_{OUT}	$I_f = I_{\text{BIAS}} + I_{\text{mod}}/2$	dBm	-10		0	
Extinction Ratio	ER		dB	5			
Center Wavelength	c	CW, @ P_{OUT}	nm	1260 1480	1310 1550	1360 1580	@1.31 μm @1.55 μm
Spectral Width		RMS Width	nm			2.1	
RIN			dB/Hz			-120	
Data Input Differential Voltage	V_{IN}		mV	200		1600	
Optical Rise/Fall Time	t_r/t_f	20 – 80%	nsec			0.26 2.0	

RECEIVER							
Maximum Input Power		Pin		dBm	0		
Sensitivity		Ps		dBm			155M Rx 1.65G Rx
Wavelength	1310			nm	1260	1310	1360
	1550				1500	1550	1600
Receiver Overload		P _{IN,MAX}		dBm	-3.0		
Signal Detect Threshold		P _D P _A		dBm dBm		P _{IN,MIN} -3 P _{IN,MIN} -2	
Decreasing light input Increasing light input							
LOS Hysteresis				dB	1		

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 \leftrightarrow Downlink
3	TD	Data Transmit: Uplink \leftrightarrow 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 = 70 °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 Hz * 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