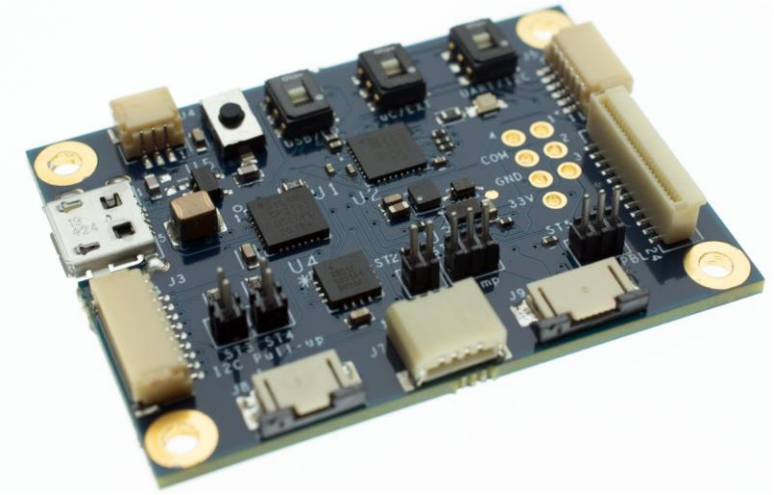
CORNING

Varioptic® Lenses

User Guide

USB-M Universal User Guide



Introduction

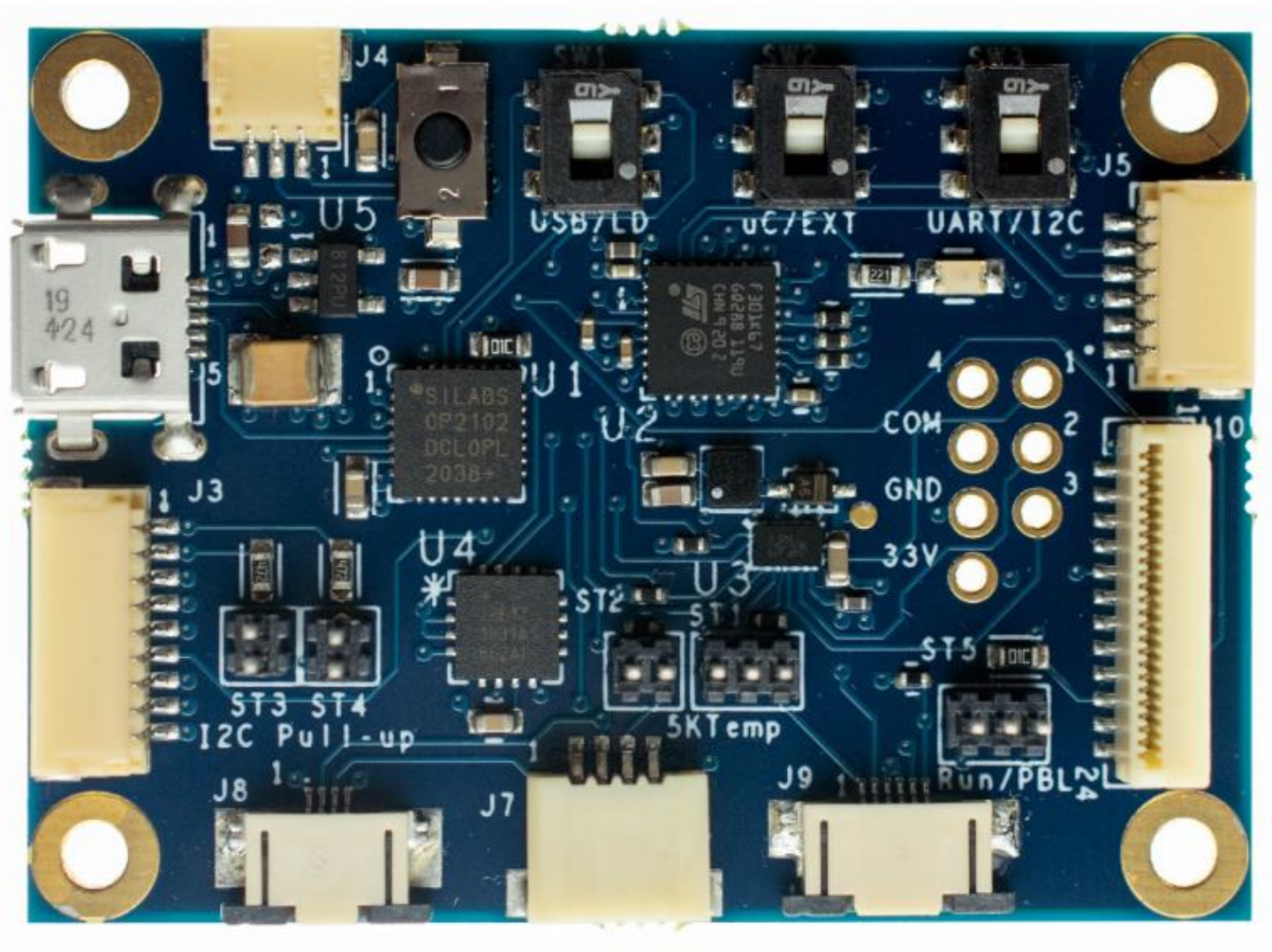
The USB-M Universal is a compact and versatile development board that allows to control from a computer A-Series, C-S-Series lenses using various FPCs or to drive A-PE lens series boards, C-C series board and perform long distance transmission. It features a USB connector, an onboard 32 bits microcontroller and MAX14574 driver. It also features different switches allowing to reconfigure it from one functionality to another. This document explains how to use the USB-M Universal.

Contents

ESD

1. Hardware description

1.1. General description of the board



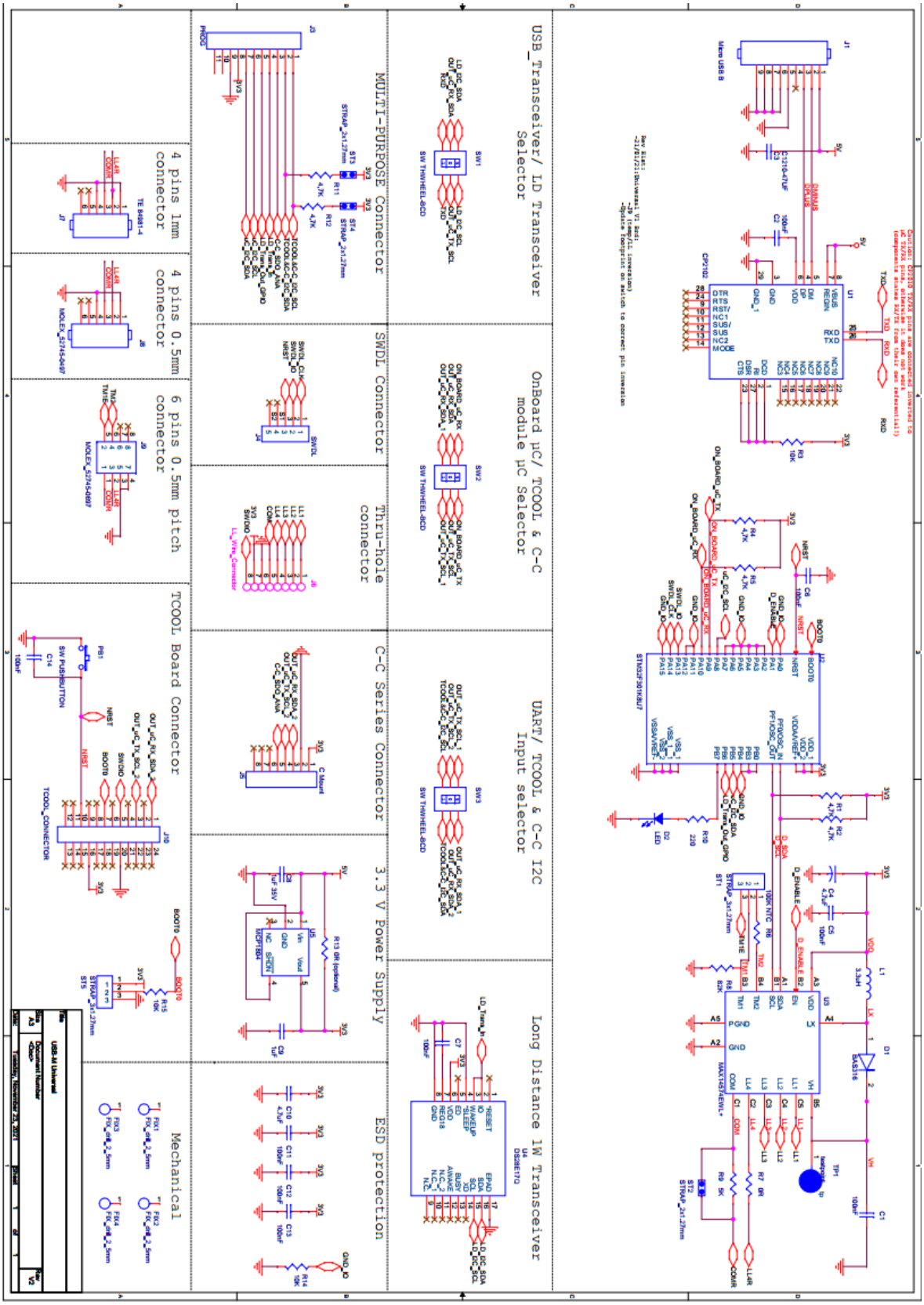
Board dimensions: 48 x 35 x 8 mm

Weight: 7.7 gr

Important note:

Electronic components and more specifically MAX14574 are sensitive to electrostatic discharge (ESD). Use caution when handling the board.

1.2. Board schematic



1.3. Jumpers Description

- ST1: Jumper located in ST1 allows customer to use either the thermistor populated 6 pin FPC (i.e FPC-A-33, etc…) or the thermistor located on the board
  1-2= On-board thermistor / 2-3: External thermistor (FPC).

- ST2: Jumper located in ST2 allows customer to use or bypass serial 5kΩ resistor on the COM output of the Maxim driver. When the jumper is plugged in, the resistor is bypassed.

As a reminder this resistor is mandatory when driving A-39N lens.

- ST3: Adding a jumper allows to pull-up I2C line SDA to 3.3V when using external I2C driving for A-PE or C-C series device.

- ST4: Adding a jumper allows to pull-up I2C line SCL to 3.3V when using external I2C driving for A-PE or C-C series device.

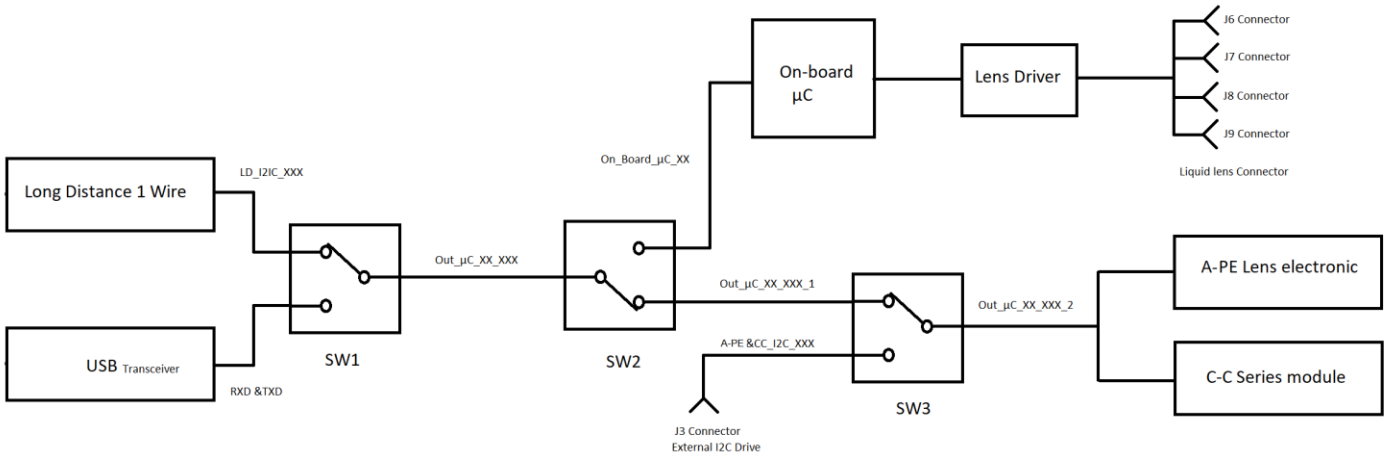
- ST5: Microcontroller starting mode selector:

  1-2= BOOT mode/ 2-3= Running mode

The jumper is mandatory for the board to work

1.4. Switches Description

3 switches allow to select the different board functionalities below chart details them.



1.5. Connectors Pinout Description

- J1: Micro-USB connector
- J3: Multipurpose connector

Pin Number	PCB I/O name
1	A-PE&C-C_I2C_SCL
2	A-PE&C-C_I2C_SDA
3	C-C_SDO_ANA
4	LD_Trans_In
5	LD_Trans_Out_GPIO
6	uC_I2C_SCL
7	uC_I2C_SDA
8	3.3V
9	GND

- J4: Software Download connector

Pin Number	PCB I/O name
1	SWDL_CLK
2	SWDL_IO
3	NRST

- J5: C-C Series connector

Pin Number	PCB I/O name
1	3.3V
2	GND
3	OUT_uC_RX_SDA_2
4	OUT_uC_RX_SCL_2
5	C-C_SDO_ANA
6	GND

- J6: Thru-hole connector

Pin Number	PCB I/O name
1	LL1
2	LL2
3	LL3
4	LL4
5	COM
6	GND
7	3.3V

- J7: 4-pin 1mm pitch FPC connector

Pin Number	PCB I/O name
1	GND
2	LL4R
3	COMR
4	GND

- J8: 4-pin 0.5 mm pitch FPC connector

Pin Number	PCB I/O name
1	GND
2	LL4R
3	COMR
4	GND

- J9: 6-pin 0.5 mm pitch FPC connector

Pin Number	PCB I/O name
1	COMR
2	LL4R
3	GND
4	GND
5	TM1E
6	TM2

- J10: A-PE lenses connector

Pin Number	PCB I/O name
1	OUT_I2C_RS232_SDA_RX
2	NC
3	OUT_I2C_RS232_SCL_TX
4	NC
5	SWDIO
6	NC
7	BOOT0
8	NC
9	NC
10	NRST
11	NC
12	NC
13	NC
14	NC
15	NC
16	3,3V
17	NC
18	NC
19	NC
20	GND
21	NC
22	NC
23	NC
24	NC

2. Bill of material

Item	Quantity	Reference	Part	Footprint	Tolerance	Manufacturer	COMP_PACKAGE/ Full_Reference
1	1	C1	100nF 100V	smd_cap_0603_compact	5% X7R	Murata	0603/ GRM188R72A104K
2	2	C2,C14	100nF	603	5% X7R		
3	1	C3	C1210-47UF	1210	10% X7R		
4	1	C4	4.7uF	smd_cap_0603_compact	10% X7R		
5	2	C5,C7	100nF	smd_cap_0603_compact	5% X7R		
6	4	C6,C11,C12,C13	100nF	smd_cap_0402_compact	5% X7R		
7	1	C8	1uF 35V	603	5% X7R		
8	1	C9	1uF	603	5% X7R		
9	1	C10	4.7uF	smd_cap_0402_compact	5% X7R		
10	1	D1	BAS316	SOD323			BAS316
11	1	D2	LED	805			LED 0805 GREEN
13	1	J1	Micro USB B	USB2-B_MIC_MTH			USB2-B_MIC_MTH/47642-0001
14	1	J3	PROG	JST_SM09B-SRSS-TBLFSN			JST_SM09B-SRSS-TBLFSN
15	1	J4	SWDL	JST_SM03B-SRSS-TBLFSN			JST_SM03B-SRSS-TBLFSN
16	1	J5	C Mount	SM06B-SRSS-TB			SM06B-SRSS-TB
17	1	J6	LL_Wire_Connector	LL_wire_connector			24-FLT-SM2-TB
18	1	J7	TE 84981-4	TE_84981			TE 84981-4
19	1	J8	MOLEX_52745-0497	527450497			MOLEX_52745-0497
20	1	J9	MOLEX_52745-0697	CONN_ZIF_6PIN			MOLEX_52745-0697
21	1	J10	A-PE CONNECTOR	CONN24_ZIF_ST			24-FLT-SM2-TB
22	1	L1	3.3uH	XLP2010			XPL2010-332MLB
23	1	PB1	SW PUSHBUTTON	KSR_Push_BTTN			KSR221G LFS
24	4	R1,R2,R4,R5	4,7K	smd_res_0402_compact	5%		
25	2	R3,R15	10K	603	5%		

26	1	R6	100K NTC	smd_res_0402_compact	1%		ERTJ0ES104F
27	1	R7	0R	smd_res_0402_compact	5%		
28	1	R8	82K	smd_res_0402_compact	0.10%		
29	1	R9	5K	smd_res_0402_compact	5%		
30	1	R10	220	603	5%		
31	2	R11,R12	4,7K	603	5%		
32	1	R13	0R (optional)	603	5%		
33	1	R14	10K	smd_res_0402_compact	5%		
34	2	ST1,ST5	STRAP_3x1.27mm	TMS-103-02-L-S			TMS-103-02-L-S
35	1	ST2	STRAP_2x1.27mm	TMS-102-02-L-S			TMS-102-02-L-S
36	2	ST3,ST4	STRAP_2x1.27mm	TMS-102-02-L-S			TMS-102-02-L-S
37	3	SW1,SW2,SW3	SW THWHEEL-BCD	CAS_A1_SWITCH			CAS220A1
39	1	U1	CP2102	QFN28_5x5_EP3-3			CP2102-GM
40	1	U2	STM32F301K8U7	QFN50P500X500X60-33N			STM32F301K8U7
41	1	U3	MAX14574EWL+	WLP_15_05			MAX14574EWL+
42	1	U4	DS28E17Q	21-0139I_T1644-4			DS28E17Q Maxim
43	1	U5	MCP1804	SOT23-5			MCP1804T-3302I/OT

3. Use of the USB-M Universal to drive the lens

3.1. In a windows environment

A very simple way to use the USB-M Universal is to install the FocusLab v3 software. When installing FocusLab v3 software ComCasp.dll is copied on your computer. This library sends commands to the board via a virtual com port. This note is not taking care of USB<->UART conversion which is done via Silicon Labs driver Virtual COM port:

http://www.silabs.com/products/mcu/pages/usbtouartbridgevcpdrivers.aspx

3.2. In non-windows environment

In non-windows environment, for example Linux, either the user can use a virtual COM port driver (if any available); either it can build a complete link, thanks to below register map and protocol definition.

4. Register definition

Field name	Bit	Description
Focus		*address: 0x0000*
Foc [15:0]	[15:0]	The focus value is a 16 bit integer corresponding to the following V_{rms} value : Code 0x0000 = 24Vrms ... Code 0xB3B0 = 70Vrms V_{rms} = N x 0.001 + 24 (in Volts) where N = code from 0x0000 to 0xB3B0
SW Version		*address: 0x0004*
VER [7..0]	[7..0]	Software version: this register indicates the version of the USB-M firmware.

5. UART protocol (RS232)

5.1. Hardware settings

Baud rate	57 600 Bds
Parity	No parity
Data length	32 bits
Number of stop bits	1 bit

5.2. Writing frame

STX	0x37	Add_LSB	Add_MSB	Nb_data	Data_1_1	Data_1_2	…	Data_2_1	…	Data_n	CRC

STX = 0x02

0x37 = Write command

Add_LSB

& Add_MSB = Address from first register to be written (if there are several data to write, the address will be automatically incremented).

Nb_data = number of 32-bits words to be written

Data_1 to n = registers value

CRC = 1 control byte calculated as follow:

Sum of all bytes (STX, CDE, ADD, NB_DATA, DATA)

Ex :

0x02	0x37	0x03	0x00	0x01	0x12	0x34	0x56	0x78	0xCA

Response of the board if transmission is successful:

STX	0x37	ACK	CRC

With ACK = 0x06

Response of the board if transmission is not successful:

STX	0x37	NACK	CRC

With NACK = 0x15

In this case the application should send again the same frame.

5.3. Reading frame

STX	0x38	Add_LSB	Add_MSB	Nb_data	CRC

STX = 0x02

0x38 = Read command

Add_MSB

& Add_LSB = Address of the first register to be read (if more than one register, the address will be automatically incremented).

Nb_data = number of 32-bits word to be read

CRC = 1 control byte calculated as follow:

Sum of all bytes (STX, CDE, ADD, NB_DATA, DATA)

Ex:

0x02	0x38	0x03	0x00	0x01	0xB5

Response if transmission is successful:

STX	0x38	Data_1	Data_2	Data_3	Data_4	CRC

Response if transmission is not successful:

STX	0x38	NACK	0x15