Fiber optic Switch

eol 1x2 • 1x4 • 2x2

eol 1x8 • 1x12 • 1x16

OPERATION MANUAL

Germany and other countries: LASER COMPONENTS GmbH, Phone: +49 8142 2864 0, Fax: +49 8142 2864 11, info@lasercomponents.com
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FEATURES

- excellent repeatability
- ultra low back reflection
- low insertion loss and PDL
- high optical isolation
- broad spectral range
- polarization maintaining option
- short switching time
- small dimensions

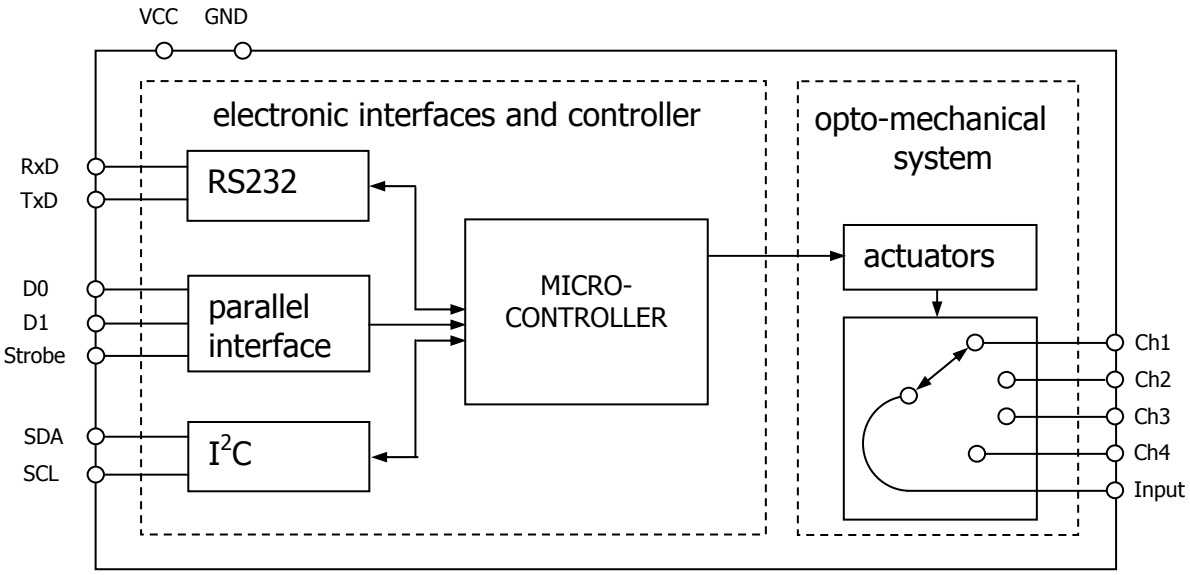
APPLICATIONS

- testing and measurement
- fiber optic sensing
- add/ drop multiplex system
- network fault protection
- signal protection
- laser scanning microscopy
- fiber bragg sensors
- multi channel optical power monitoring

TECHNOLOGY

eol series switches were developed to serve for the most demanding applications in testing and measurement. Its optomechanical design (MOEMS) ensures an excellent optical performance combined with short switching time due to refractive microoptical components and industry proofed high resonant actuators. The small package size and unilateral fiber location simplify the switch accomodation on printed circuit boards. The implemented microcontroller provides versatility in interface programming and controlling.

FUNCTIONAL BLOCK DIAGRAM



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OPTICAL CHARACTERISTICS

parameter		unit	test conditions / comments
insertion loss	0.7	dB typ.	@ 1.55µm and 1,31µm
	1.0	dB max.	
	1.4	dB max.	@ 0.80µm and 0,65µm
	2.0	dB max	@ 0.46µm … 0.60 µm
back reflection	<-65	dB	@ 1,55µm
crosstalk	<-55	dB	
repeatability	0.005	dB	5000 cycles @ 1Hz, constant temperature
standard wavelength range	400…670	nm	other wavelengths on request
	600...850	nm	
	900…1200	nm	
	1260 - 1360 1480 - 1650	nm	
polarization depending loss	< 0.1	dB	
switching time switching frequency	≤2 50	ms Hz max.	
reliability	> 10^8	cycles	
power consumption	< 300	mW	

ELECTRICAL CHARACTERISTICS

parameter		unit	test conditions / comments
operating voltage	5	V	
switching current	50	mA min.	switching frequency = 0Hz
	100	mA typ.	
	300	mA max.	switching frequency = 50Hz

ENVIRONMENTAL CHARACTERISTICS

parameter		unit	test conditions/comments
storage temperature	-40 to +80	°C	
operating temperature	0 to +60	°C	
vibration stability	Up to 10 g		no influence on optical characteristics

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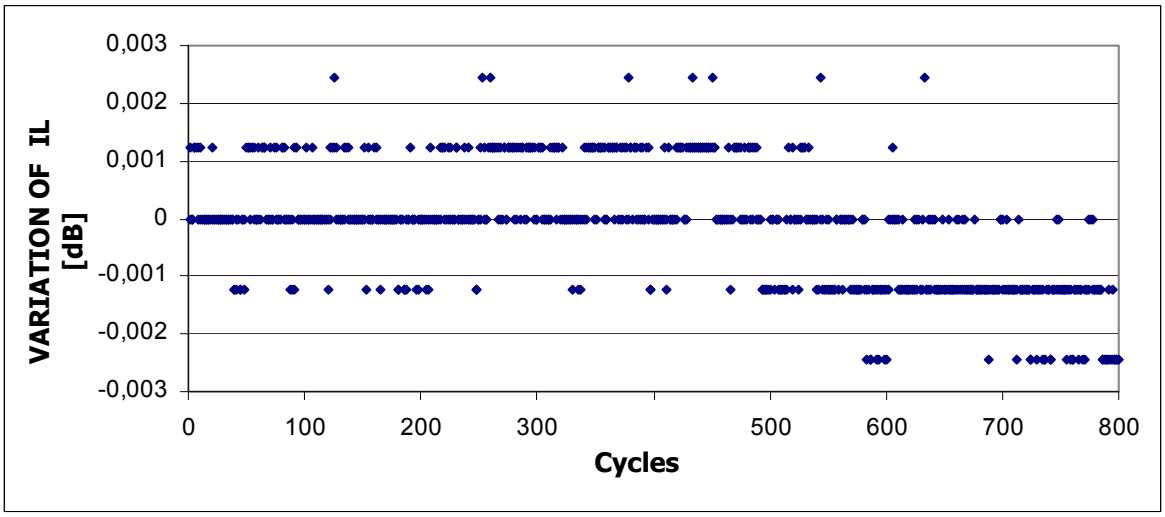
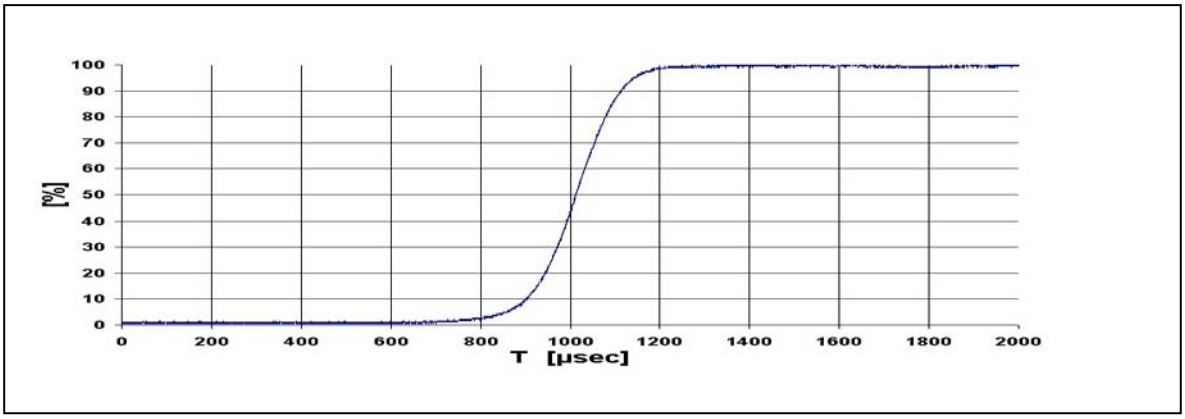
PERFORMANCE CURVES

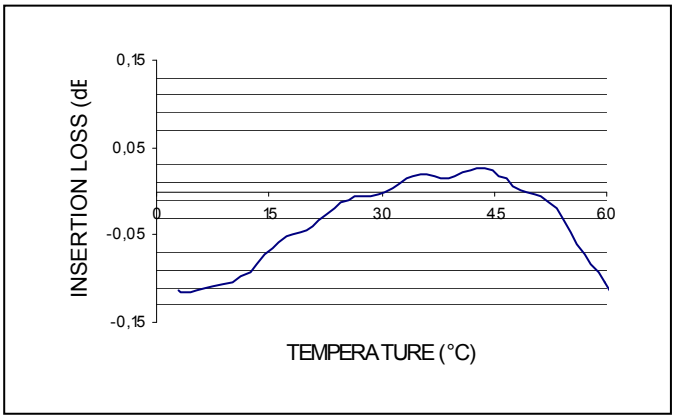
REPEATABILITY



SWITCHING CHARACTERISTICS



THERMAL CHARACTERISTICS



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PIN CONFIGURATION 1x2; 2x2; 1x4

# PIN	PIN name	type*)	function test
1	V_{CC}	P	positive voltage 5V
2	GND	P	ground, (reference point for interfaces)
3	TxD	O	transmitter data output of serial port
4	RxD	I	receiver data input of serial port
5	SDA	I/O	I^2C-compatible input/output pin
6	SCL	I/O	serial clock pin for I^2C interface
7	-	not used	**never** connect this pin to GND or V_{cc}
8	D0	I	address bit 0 for the TTL/parallel interface
9	D1	I	address bit 1 for the TTL/parallel interface
10	strobe	I	clock pin for parallel interface

*) notes:
- P power supply
- I input
- O output
- I/O input and output simultaneously

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PIN CONFIGURATION 1x8; 1x12; 1x16

# PIN	PIN name	type*)	function test
1	V_{CC}	P	positive voltage 5V
2	GND	P	ground, (reference point for interfaces)
3	TxD	O	transmitter data output of serial port
4	RxD	I	receiver data input of serial port
5	SDA	I/O	I^2C-compatible input/output pin
6	SCL	I/O	serial clock pin for I^2C interface
7	-	not used	**never** connect this pin to GND or V_{cc}
8	D0	I	address bit 0 for the TTL/parallel interface
9	D1	I	address bit 1 for the TTL/parallel interface
10	D2	I	address bit 2 for the TTL/parallel interface
11	D3	I	Address bit 3 for the TTL/parallel interface
12	strobe	I	clock pin for parallel interface

*) notes:
- P power supply
- I input
- O output
- I/O input and output simultaneously

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SERIAL INTERFACE

The RS232 interface allows to control the switch from your PC or laptop directly. The interface is protected for short circuits by GND.

SPECIFICATIONS

- T_{out} = ±9V (typ.)
- R_{in} = ±25V (max.)
- RS232 input threshold low = 1.3V (typ.)
- RS232 input threshold high = 1.8V(typ.)

SETTINGS

- 57600 Baud (standard)
- 8 data bit
- no parity
- 1 stop bit

CABLE CONNECTIONS

eol 1x4 - pin	code	Computer DB-9 pin	Computer DB-25 pin
2	GND	5	7
3	TxD	2	3
4	RxD	3	2

COMMANDS

All commands must be sent in ASCII code. A command is not executed until terminated by a carriage return (ASCII decimal code 13) **and** a new line (ASCII decimal code 10).

COMMAND SUMMARY

command name	parameter	response	function
type?	none	*"eol1x4"* [1]	response of the switch type
firmware?	none	*"ver3.27"*	response of the firmware version number
ch?	none	*"2"*	indicates the current switch position
ch	*"1".."4"* [2]	none	sets into the specified position *example: "ch3" -> enables channel 3*
i2c?		Actual i2c adress	Response for the set i2c adress
i2c	*"10"…"99"*		Setting the i2c adress

Note: [1] response for eol1x2: *"eol 1x2"* and for eol 2x2: *"eol 2x2"*
[2] for the eol1x2 and eol2x2 switch use "1" and "2"

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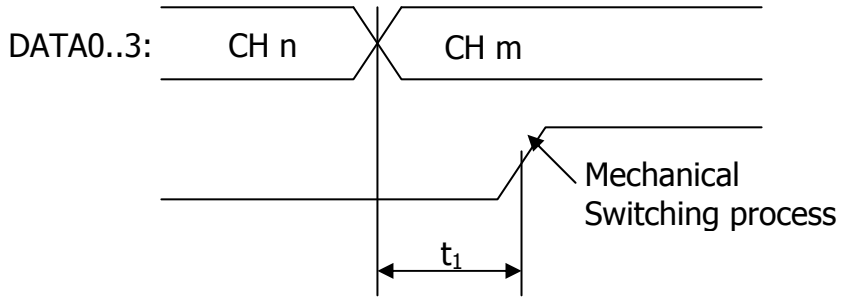
Parallel Interface

- Switch can only receive data, not transmit
- Switch can be programmed either with or without a chipselection signal (strobe)
- Interface operates with standard TTL levels

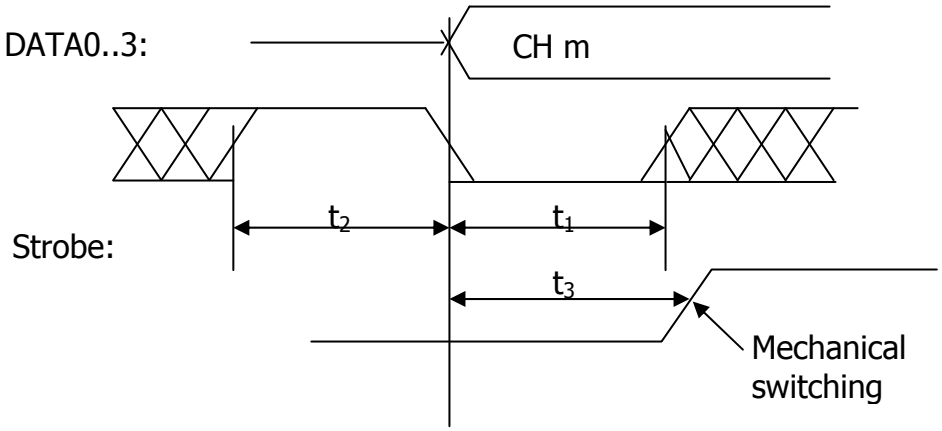
- Case1: without strobe



After detecting a new switching state (binary code) at the data input port, the switches moves to the corresponding channel after time delay t_1. In order to avoid problems this code must be kept constant for this period.

t_1 > 40µsek

- Case 2: with Strobe (standard interface operation)



By a HIGH– LOW slope, data at the parallel interface ports are transferred into the switch and stored there (latch). The LOW level for the strobe input must be constant for a time period t_1. Before the HIGH – LOW slope the strobe signal has to be at HIGH level at least for a time duration t_2 . Switching occures after a duration t_3.

t_1	>45µsek
t_2	>45µsek
t_3	t_1+20µsek

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Please note:

After each switching process the switch will not accept signals for the next 6 ms. Other values are possible on costumers request.
(See the following table for the necessary binary code corresponding to the required switch channels.
Please note that data pins D3 and D2 are not used for switch configurations 1x2; 2x2; 1x4).

D3	D2	D1	D0	Channel
0	0	0	0	**1**
0	0	0	1	**2**
0	0	1	0	**3**
0	0	1	1	**4**
0	1	0	0	**5**
0	1	0	1	**6**
0	1	1	0	**7**
0	1	1	1	**8**
1	0	0	0	**9**
1	0	0	1	**10**
1	0	1	0	**11**
1	0	1	1	**12**
1	1	0	0	**13**
1	1	0	1	**14**
1	1	1	0	**15**
1	1	1	1	**16**

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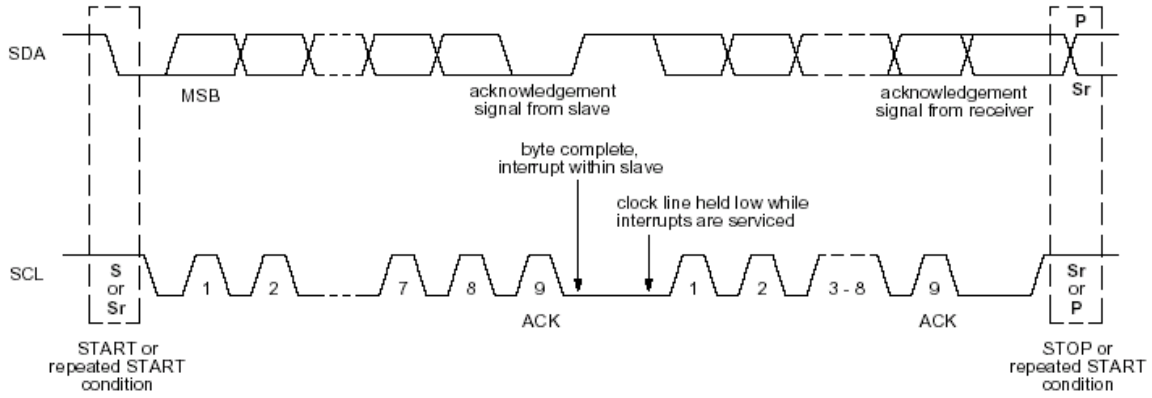
I2C INTERFACE

- Fiber switch operates as “Slave“
- Interface corresponds to PhilipsSpecs – standard mode (see Philips-Homepage)
    - Deviations from standard:
        - Switch does not respond to the common adress 0000000b
        - (this is even not a stringent requirement)
        - switch does not support a 10Bit adressing
- Switch can only receive data, not transmit
- In correspondence to the specifications of the standard mode only bitrates up to 100kBit are accepted. Higher bitrates will lead to noncorrect function of the switch.
- After a switching operation is initiated through an interface (also valid for parallel interface and RS232) it will be blocked for a 20 ms period in order to avoid overload of the high-voltage electronics (this is also valid for parallel and RS232)
- The following figure (taken from the Philips Dokumentation) shows the typical Timing for the I²C-Bus:



Adress: 68 (1000.100 + 0b)

Adress R/W-Bit

Data byte:
for channel 1: 0000.0001b
for channel 2: 0000.0010b
for channel 3: 0000.0011b
.
.
.
for channel 12 : 0000.1100b

The initial adress (set at works) is 68.
This initial adress can be changed by an appropriate command through the RS232 interface.
For this purpose additional to the existing commands of the RS232 interface:

- ch?
- ch
- firmware?
- type?

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Two additional commands have been added for the support of the I2C interface:

- i2c? this allows to query the actual I2C adress
- i2c this allows to set the I2C adress to any fixed value between 10 and 99 (for example i2c15 sets the adress 15

After a new adress has been set, it remains unchanged even after switch off the power supply, as this adress is stored in the flash memory of the controller.
Important: Please write the commands in small letters!! The commands must be activated by a carriage return!!

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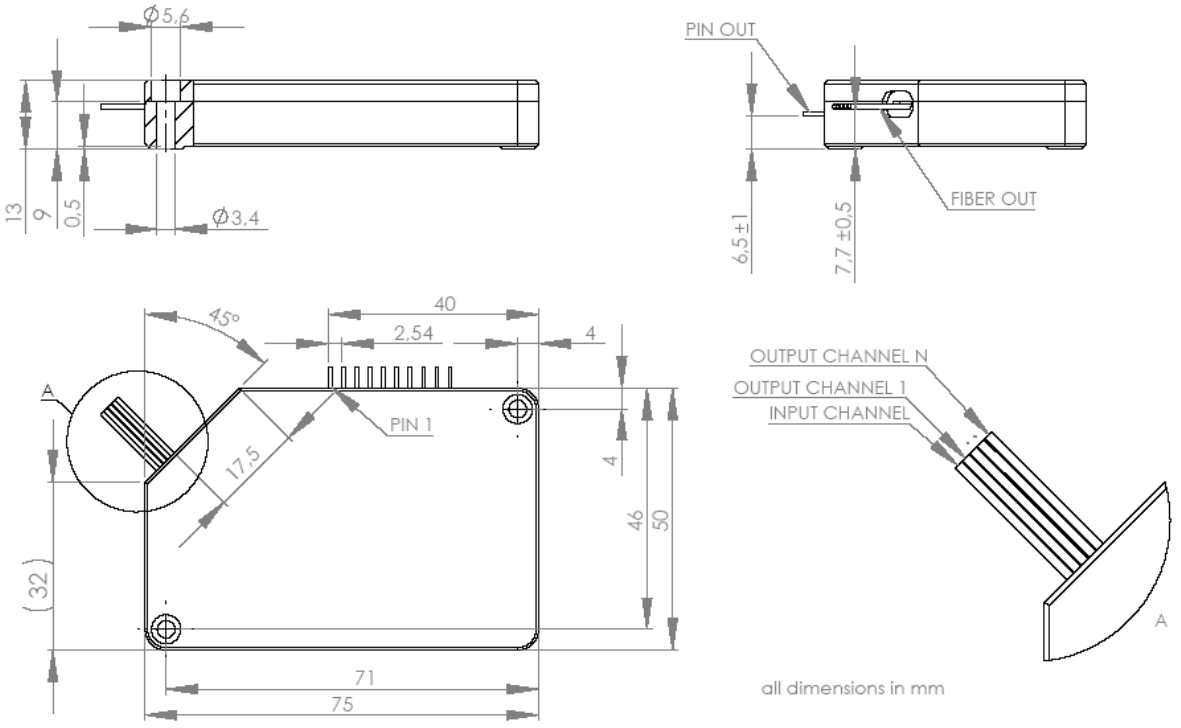
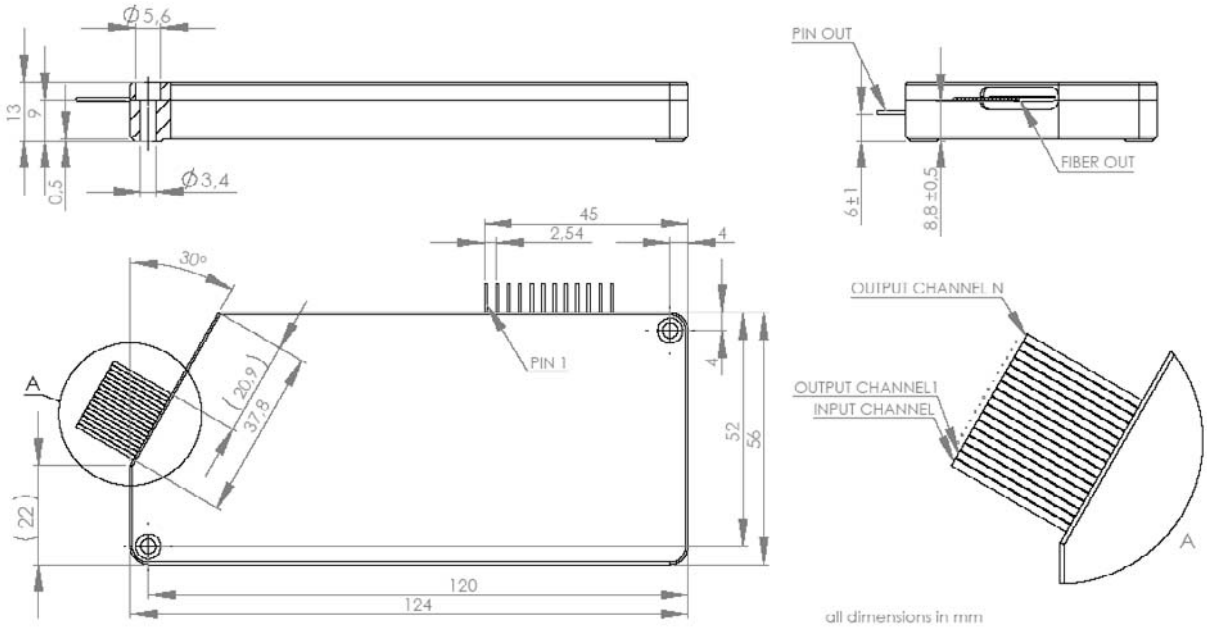
DEVICE HOUSING (small)



DEVICE HOUSING (large)



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Handling Instructions for Fiberoptic Components

CAUTION! **Any extreme stresses onto the optical cable could degrade the optical performance or damage the fiber.**

- Do not pull on the fibers !
- Never bend an optical cable more sharply than a 35mm radius!
- Bending over any sharp edges may damage or break the fiber!
- Avoid excessive heat near cables!
- All optical connectors should remain covered with dust cups in place when not in use.

Cleaning & Mating Instructions for Optical Connectors

- Clean both connectors prior to mating by using a high-grade isopropyl alcohol and a cotton swab.
- Allow connectors have to dry before mating.
- Insert the connector ferrule into the appropriate adapter smoothly.
- Do not over-tighten the connectors.
- Specifications for the eol series switches are based on an optimal connection. If the resulting values are unacceptable, please repeat the cleaning procedure and start again.

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