FL3X Switch 1000BASE-T1

Instructions for Use

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Any semiconductor devices have an inherent chance of failure. You must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of over-current levels and other abnormal operating conditions.
The safety and handling instructions in this document must be followed strictly.

EC Conformity

The FL3X Switch 1000BASE-T1 complies with the essential requirements of the following applicable European Community Directive(s) including current amendments, and carries the CE marking accordingly:

> 2014/30/EU   EMC Directive

The following standard(s) have been used to assess the product:

> EN 61000-4-2:2009
> EN 61000-4-3:2006 + A1:2008 + A2:2010
> EN 61000-4-4:2012
> EN 61000-4-5:2014 + A1:2017
> EN 61000-4-6:2014
> EN IEC 61000-6-2:2019
> EN 61000-6-3:2007 + A1:2011
> EN 61326-1:2013
> EN 55011:2016 + A1:2017

This product is compliant with the European Community Directive 2011/65/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).

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UK Conformity

The FL3X Switch 1000BASE-T1 complies with the essential requirements of the following applicable UK Regulations including current amendments, and carries the UK marking accordingly:

➢ 2016   Electromagnetic Compatibility Regulations

The following standard(s) have been used to assess the product:

➢ EN 61000-4-2:2009
➢ EN 61000-4-3:2006 + A1:2008 + A2:2010
➢ EN 61000-4-4:2012
➢ EN 61000-4-5:2014 + A1:2017
➢ EN 61000-4-6:2014
➢ EN IEC 61000-6-2:2019
➢ EN 61000-6-3:2007 + A1:2011
➢ EN 61326-1:2013
➢ EN 55011:2016 + A1:2017

This product is compliant with "the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012".

Revision History

Document number: 3-0103-0A01-D11

Version	Date	Description
D1V0-5	23.03.2021	Preliminary Release
D1V0-F	21.10.2021	First Release
D1V1-F	16.02.2022	Updated chapter EC Conformity Added chapter UK Conformity
D1V2-F	10.06.2022	First steps added
D1V3-F	15.07.2022	First steps updated
D1V4-F	07.11.2022	FirmwareUpdate added, hint Harting T1 Rev1 only
D1V5-F	20.02.2023	Product renaming

Related Hardware / Software Versions

Product	Reference No.	Version	Remarks
FL3X Switch 1000BASE-T1	3-0103-0A01	01	Old product name: FlexSwitch 1000BASE-T1

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1 General

1.1 Intended User Group

This document is written for expert technicians and/or engineers who are familiar with electronic components and systems.

Each person involved with setup or operation of the product must

> ➢ be a qualified technician or engineer
> ➢ strictly adhere to this manual
> ➢ receive a briefing by an authorized person

ⓘ	**NOTICE**
	If you are unsure of how to use the product as intended or have any questions about the use of the product, please discontinue use of the product immediately and contact the STAR ELECTRONICS GmbH & Co. KG Support.

⚠	**⚠WARNING**
	The product may only be used by expert technicians and/or engineers who are qualified and familiar with electronic components and systems! The use of the product by non-professionals is not permitted and strictly forbidden!

1.2 Intended Use

The FL3X Switch1000BASE-T1 is a testing equipment. It was developed to test the communication behavior of automotive bus systems and Ethernet together with Electronics Control Units and sensors in a fully controlled testing and/or laboratory environment.
For this intended use, the FL3X Switch1000BASE-T1 offers the following options:

- Transmit and receive data (e.g. Use Case "Switch").
- Exchange of data traffic between two or more bus systems (e.g. Use Case "Switch between 100 and 1000BASE-T1")

Any deviation from the intended use and/or installation in a testing vehicle is only permitted with specific **prior written approval** of STAR ELECTRONICS GmbH & Co. KG.

⚠	**⚠WARNING**
	The FL3X Switch1000BASE-T1 may be used to communicate with networked electronic systems. E.g. Ethernet. Any use of the product outside a fully controlled testing and/or laboratory environment may result in death or serious injury due to unpredictable behavior of a vehicle and/or potentially missing, deactivated, or malfunctioning safety devices on a vehicle! The user is responsible to ensure the safety of the entire system. This includes amongst other things a safety shutdown.

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	NOTICE
ⓘ	The device is not a calibrated measurement device. STAR ELECTRONICS GmbH & Co. KG accepts no liability whatsoever for the correctness of any measurement results.

	⚠ **WARNING**
⚠	The FL3X Switch 1000BASE-T1 is **NOT** designed, intended, or authorized and may **NOT** be used for or in connection with the following purposes and/or devices:
	- use as part of medical systems
	- life support applications
	- aviation, space, nuclear, or military applications
	- use in areas where combustible or explosive gas mixtures are likely to occur
	- any other purposes/devices deviating from the intended use of the product specified by STAR ELECTRONICS GmbH & Co. KG.

	⚠ **WARNING**
⚠	The product may only be used by expert technicians and/or engineers who are qualified and familiar with electronic components and systems!
	The use of the product by non-professionals is not permitted and strictly forbidden!

1.3 Used Pictograms

The meaning of used pictograms is shortly described below.

Follow the specific instructions in the document where these pictograms are placed.

	⚠ **WARNING**
⚠	Used to indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.

	NOTICE
ⓘ	Used to indicate a situation which may result in an operating failure.
	Damage of the product may occur, but there is no hazard of injury if not avoided.
🗑	Product marking which shows the compliance of the product with the European Waste Electrical and Electronic Equipment Directive 2012/19/EU.

1.4 Safety and Handling Instructions

Please read the instructions for use carefully. To protect the device or the application against damage, or to avoid personal injury the FL3X Switch 1000BASE-T1 have to be handled as described herein.

Changes or modifications of the FL3X Switch 1000BASE-T1 are not allowed for safety and warranty reasons!

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*STAR ELECTRONICS GmbH & Co. KG i*s not liable for any damages arising from non-observance of the product information.

Follow the
a) specific safety and handling instructions placed at dedicated document positions
b) general safety and handling instructions below:

	NOTICE
⚠	To prevent damage to the FL3X Switch 1000BASE-T1, or consequential damages:
	Do not connect any other signals to the interfaces as described in the chapter **3.4** Interfaces. Ensure that all signals are within the specified range.
	Use only adapter cables from *STAR ELECTRONICS GmbH & Co. KG* for connecting the FL3X Switch 1000BASE-T1.
	High temperatures can damage the FL3X Switch 1000BASE-T1. Keep the FL3X Switch 1000BASE-T1 away from heaters, stoves, fireplaces, and other sources of heat.
	Do not expose the FL3X Switch 1000BASE-T1 to rain or use it near water.
	Do not use the FL3X Switch 1000BASE-T1 in areas of explosion hazard.

1.5 Meaning of Text Styles

In this document *filenames* are marked with a different text format.

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2 Product Description

2.1 FL3X Switch 1000BASE-T1 at a glance

The FL3X Switch 1000BASE-T1 is a Ethernet switch with 7 x 100/1000BASE-T1 ports and 2 x SFP(+) 1000/10GBASE-T port. With the FL3X Switch 1000BASE-T1, it is possible to connect an automotive Ethernet network to a standard PC for testing or diagnostic purposes. It supports up to 1000 MBit/s in full duplex mode on both sides.

- Marvell 88Q6113 switch chip

- 7x Marvell 88Q2112-A2 transceiver

- 7x SPE connector for 1000BASE-T1 (Harting Tw1ster, IEC 63171-6)

  o 100 MBit/s and 1000 MBit/s mode

- 2x SFP(+) connector for 1000/10GBASE-T (RMU Port)

- Supply voltage: 8 – 48 V DC

- Status LEDs

- IP20

- Temperature range -40°C to +85°C

2.2 Accessory Parts

For further information about accessories for the FL3X Switch 1000BASE-T1 see chapter 7.2 Accessory Parts.

	NOTICE
ⓘ	Use only accessory parts from STAR ELECTRONICS GmbH & Co. KG listed in chapter 7.2 Accessory Parts to ensure proper function and for warranty reasons! Other accessories without prior written consent of STAR ELECTRONICS GmbH & Co. KG must not be used.

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3   First steps

The FL3X Switch 1000BASE-T1 comes with a default configuration. Ports 1-7 configured as 1000BASE-T1 in Slave mode, Port 9 as 1000BASE-Tx and Port 10 as 10GBASE-T uplink.

Port 9 is configured as default configuration port.

Our FL3X Switch 1000BASE-T1 uses "Automotive Switch Configuration Tool" by Marvell to get configured. The Switch is designed as layer 2 switch on MAC layer, so it does not own an IP address. Therefore, it does not use a webpage for configuration.
The Switch can be recognized by the tool automatically if connected to the computer.
For using "Automotive Switch Configuration Tool" an NDA with Marvell is necessary.

Do you already have an NDA with Marvell in place as mentioned in our quotation for doing the configuration?
- If yes, you can configure the switch by using their configuration tool.
- If no, then please send us contact data of a person that would sign a 3-party-NDA with Marvell and STAR.

For your access to Marvell Extranet please register at:
https://www.marvell.com/support/extranets.html
Then contact Marvell Support and ask for access to 88Q11x and 88Q6113.
https://www.marvell.com/portal/registration.html

Please keep in mind that NDA process might take a few days.

Afterwards download the "Automotive Switch Configuration Tool" from the Extranet and start with the configuration.
If the tool is still not visible, please contact our support team:
Support-ee@star-cooperation.com

In case of further questions, feel free to contact our support (support-ee@star-cooperation.com) for details.

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4 Technical Data

4.1 Electrical Characteristics

Supply voltage			
	Min.	**Typ.**	**Max.**
Operating	+8.0 V	-	+48.0 V
Absolute maximum (non-operating)	–60.0 V	-	+60.0 V
Latency between 1000BASE-T1 and 10GBASE-T	Up to 10 µs		
1000BASE-T1 and 1000BASE-T1	Up to 10 µs		
Supply current - operating	typical 670 mA without SFP(+) modules SFP Module with 1G -> + 100 mA @ 12 V SFP+ Module with 10G -> + 150 mA @ 12 V		

Table 1: Electrical characteristics

4.2 Physical Characteristics

Connectors	
- Power	Binder Series 711 2 Pin
- Ethernet (BASE-T)	SFP(+) (Con 9 and Con 10)
- Ethernet (BASE-T1)	SPE (Con 1 to Con 7) (T1 IEC 63171-6)
Weight approx.	625 g
Dimensions approx. L x W x H	166mm * 124mm * 36mm

Table 2: Physical characteristics

4.3 Environmental Conditions

Temperature	Operating: -40°C – +85°C Non-operating: -40°C – +85°C Storage: -40°C – +85°C
Relative Humidity	0% – 90% r. H., non-condensing

Table 3: Environmental conditions

4.4 Interfaces

The FL3X Switch 1000BASE-T1 has a Binder series 711 power connector, two SFP(+) connectors for the 1000/10GBASE-T (Ethernet), see the following figure.

Figure 1: Side with Power and two SFP(+) Ethernet (10G/1000BASE-T)

The other side has seven SPE T1 connectors for 100/1000BASE-T1 ethernet and two LED's for each connector. The following figure shows the position of the seven connectors.

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Figure 2: Side with 1000BASE-T1

4.4.1 Power connector (Binder) and LED

The valid range of the power supply for the FL3X Switch 1000BASE-T1 is within 8 - 48 V DC. The power supply input of the FL3X Switch 1000BASE-T1 is reverse protected.

The green LED near the power cable shows the power supply status, if the LED is on, the power is OK.
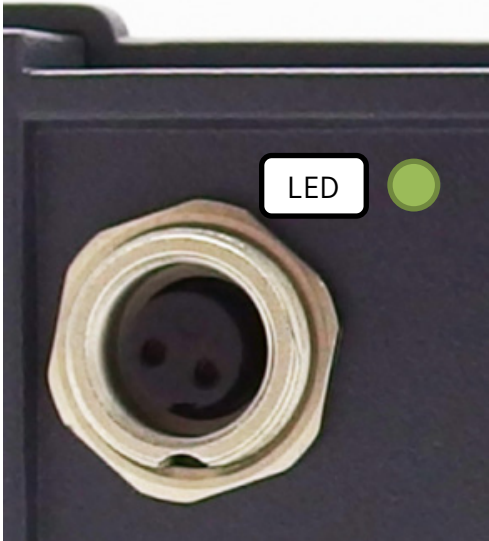
Figure 3: Power connector Binder 2pol with LED

Power LED	Description
On	The device is powered on

Table 4: Description of the Power LED

The following table describes the connector assignment.

Power connector		
Pin	Signal Name	Description
1	GND	Ground signal
2	Uin	Power in allowed in the range from 8 – 48 V

Table 5: Description of the Power connector

4.4.2 Ethernet Con 1 – 7 (SPE T1 IEC 63171-6) and LEDs

	NOTICE
ⓘ	Only the **revision 1 of Harting T1 SPE** connectors are compatible to the FL3X Switch 1000BASE-T1

The FL3X Switch 1000BASE-T1 supports seven 1000BASE-T1 SPE connectors marked Con 1 to Con 7. These connectors support 100/1000MBit/s in full-duplex mode. The 1000BASE-T1 connectors supports both A0 (legacy) and A2 (IEEE-compliant) mode.

Figure 4: 1000BASE-T1 SPE connector side with LEDs

	NOTICE
ⓘ	The maximum allowed length of the 1000BASE-T1 cable is 30m.
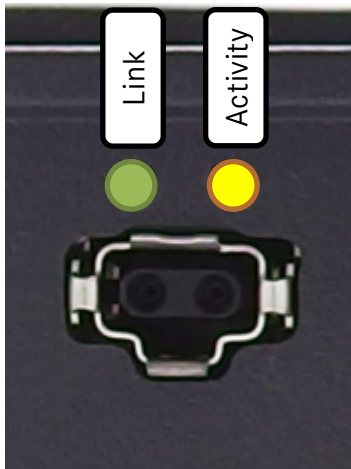
Figure 5: SPE-T1 Ethernet connectors Con 1 to Con 7 with yellow and green LED

The following table describes the LED color and blinking scheme.

1000BASE-T1 SPE LEDs		
Green LED (Link)	**Yellow LED (Active)**	**Description**
On	Off	The link is established, no data exchange occurring
On	Blinking	Data exchange is in progress
Off	Off	No link is established, the data exchange is not possible

Table 6: Description of the 1000BASE-T1 SPE LEDs

The following table shows the SPE connector assignment.

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Connector SPE (1000BASE-T1 2-wire ethernet)		
Pin	Signal Name	Description
1	ETH_BP	1000BASE-T1 bus plus signal
2	ETH_BM	1000BASE-T1 bus minus signal

Table 7: Connector assignment for SPE (2-wire ethernet)

4.4.3 Ethernet Con 9 and 10 (SFP+ module)

The FL3X Switch 1000BASE-T1 supports a 1000BASE-Tx interface at the SFP+ connector Con 9. These connector supports 1 GBit/s in full-duplex mode. Also, a 10GBASE-Tx interface at the SFP+ connector Con 10. These connector supports 10 GBit/s in full-duplex mode.

	NOTICE
	The maximum allowed length of the Ethernet cable is 30m.

	NOTICE
	Con 9 is configured during hardware to 1Gbit/s and Con 10 to 10GBit/s. This can be changed with software configuration.

The standard SFP(+) connector assignment is used.

4.4.4 RMU Port (Remote Management Unit)

The FL3X Switch 1000BASE-T1 can be configured with the RMU. The port which is selected during hardware is port 9. The software running on 88Q6113 in the FL3X Switch 1000BASE-T1 allows configuration over all ports which are not down.

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5 Getting Started

5.1 Assembly and Line-up

Read and follow these instructions when connecting and using the FL3X Switch 1000BASE-T1:

	NOTICE
⊙	Ensure that all signal lines connected to the FL3X Switch 1000BASE-T1 are in the allowed range.
	Be sure to connect all cables as described in this manual.
	Never insert anything metallic into the openings of the FL3X Switch 1000BASE-T1.
	Ensure to grasp the plug and not the cable when disconnecting the FL3X Switch 1000BASE-T1.

5.2 Configuration and Operation

Use the power connector of the FL3X Switch 1000BASE-T1 to connect with a power-supply within the correct voltage range.

Connect the 1000BASE-T1 and Ethernet (1000BASE-T) with their networks. Check the pinouts.

Check the state of the LEDs.

For change settings from the FL3X Switch 1000BASE-T1 use the configuration software from Marvell.

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6　Firmware Update

To update or upgrade the firmware of FL3X Switch 1000BASE-T1 it is important to have a stable network connection between the used PC and FL3X Switch.

Connect the FL3X Switch with RMU port (default port 9) to the PC and check communication via AutomotiveSwitchConfigurationTool. Read out the MAC address and target ID of the used FL3X Switch and note it.
Afterwards start the delivered batch file "start_fwdownload.bat" and follow the instructions. The local ETH adapter of your PC, MAC address and target id of the FL3X Switch has to be chosen.
If there is no error, the batch file will close automatically.

For flashing binary config files an additional tool, our FL3X Switch Configurator is available. Please ask our support team for more information.

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7   Shipping, Maintenance and Disposal

	Dispose off properly per regulations of the country where end-of-life occurs.

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8   Troubleshooting

This chapter contains some frequently asked questions about the FL3X Switch 1000BASE-T1.

1	Effect	
	Solution	

2	Effect	
	Solution	

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9 Ordering Information

9.1 FL3X Switch 1000BASE-T1

Product	Description	Ordering number
FL3X Switch 1000BASE-T1	Ethernet Switch to connect 100/1000BASE-T1 and 1G/10GBASE-Tx	3-V1030A01

9.2 Accessory Parts

Product	Description	Ordering number
Power cable binder to banana 2.0 m	2.0 m Binder male 2pol to banana male connector power cable	3-00341D02
1G SFP module with RJ45 connector	1GBASE-T IEEE 802.3-2002 SFP module with RJ45 female connector	10020431
10G SFP+ module with RJ45 connector	10GBASE-T IEEE 802.3-2008 SFP+ module with RJ45 female connector (0 – +70°C!)	10020420
10G SFP+ fibre module	10GBASE-T IEEE 802.3-2012 SFP+ fiber module with 850nm	10020432
SPE bus cable (2m)	2 pole SPE male to 2 pole SPE male, 2m	10020364
SPE bus cable (5m)	2 pole SPE male to 2 pole SPE male, 5m	10020363
Bus cable SPE to Sub-D 2.5 m	2.5 m SPE to Sub-D male 9pol bus cable	3-00343G01
Customer specific parts		*Please contact* STAR ELECTRONICS GmbH & Co. KG
Customer specific switch configuration		*Please contact* STAR ELECTRONICS GmbH & Co. KG

9.3 Related Documents

Document	Description	document number
–		

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10 Appendix

10.1 Appendix A: Guideline for handling ESD sensitive Products

- Any tester, equipment, or tool used at any production step or for any manipulation of semi-conductor devices must have its shield connected to ground.

- The product itself and the carrier system of the product respectively must be placed on a conductive table top or covered by an antistatic surface (superficial resistivity equal to or higher than 0.5MΩ/cm^2), grounded through a ground cable (conductive cable from protected equipment to ground isolated through a 1MΩ resistor placed in series).

- All manipulation of finished goods has to be made at such a grounded worktable.

- The worktable must be free of all non-antistatic objects.

- An antistatic floor covering grounded through a conductive ground cable (with serial resistor between 0.9MΩ and 1.5MΩ) should be used.

- It is recommended that you wear an antistatic wrist or ankle strap, connected to the antistatic floor covering or to the grounded equipment.

- If no antistatic wrist or ankle strap is worn, touch the surface of the grounded worktable before each manipulation of the ESD sensitive product.

- It is recommended that antistatic gloves or finger coats be worn.

- It is recommended that nylon clothing be avoided while performing any manipulation of parts.

10.2 Appendix B:

10.2.1 Acronyms and Abbreviations

Item	Definition
BD	Bus driver
BP	Bus plus
BM	Bus minus
ECU	Electronic Control Unit
EMC	Electromagnetic Compatibility
ESD	Electro Static Discharge
NC	Not Connected
PCB	Printed Circuit Board
PL	Physical Layer
SFP	Small form-factor pluggable transceiver (1 Gbit)
SFP+	Small form-factor pluggable transceiver (10 Gbit)

10.2.2 List of Tables

10.2.3 List of Figures

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