

100BASE-T1 SFP MODULE

USER MANUAL

April 2019

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1 GENERAL INFORMATION

1.1 Functionality and Features of the 100BASE-T1 SFP MODULE

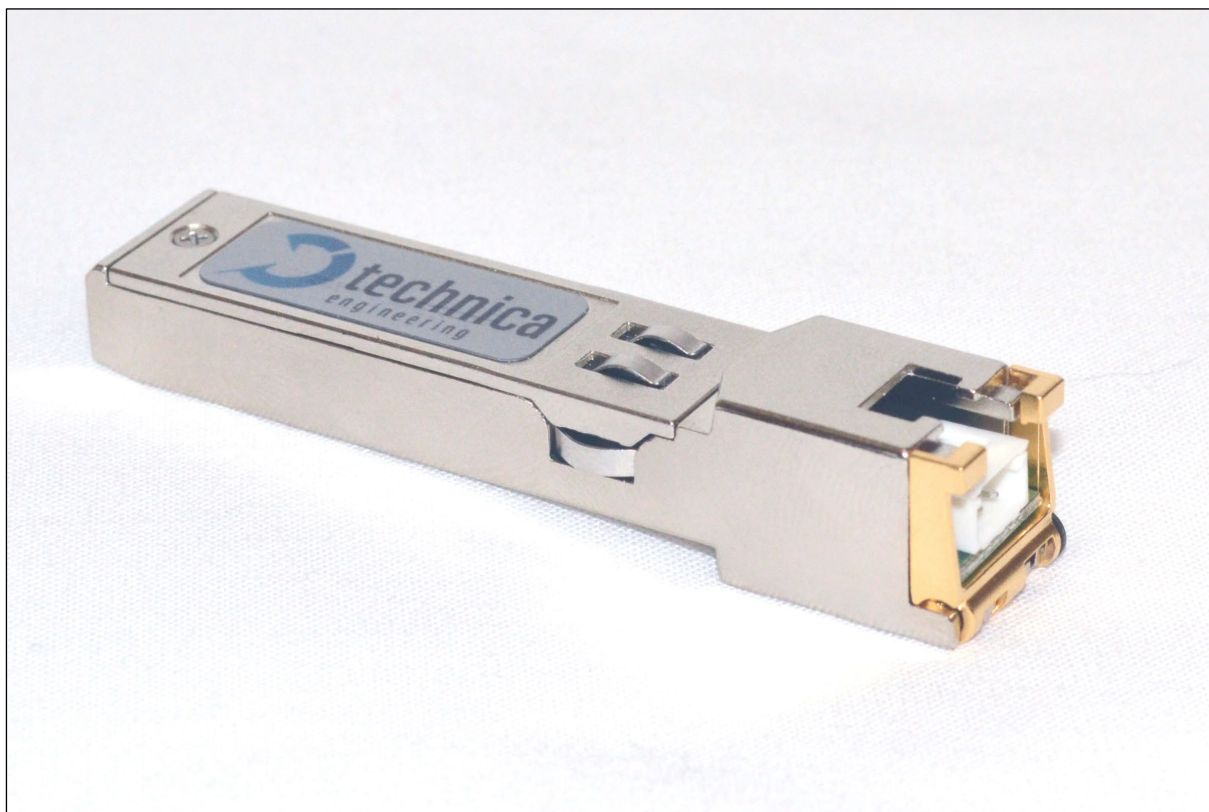


Figure 1-1: 100BASE-T1 SFP MODULE

The **Technica Engineering 100Base-T1 SFP module** fits into a standard Small Form-factor Pluggable slot.

It uses the SGMII and generates 100 Mbit/s full-duplex 100BASE-T1.

It is self-configuring after powerup to Automotive 100BASE-T1.

Note: SERDES interface is not supported!

Registers of the integrated transceiver are accessible via I2C interface for diagnosis and reconfiguration.

General Information:

Power requirement:	3.3 Volt DC +/- 0.03 Volt
Size:	68 x 14 x 14 mm
Weight:	0,1 kg
International Protection:	IP 2 0
Operating temperature:	0 to +70 °Celsius

LINKS:

The User can download the latest firmware and documentation for the 100BASE-T1 SFP MODULE here:

<https://technica-engineering.de/en/produkt/100base-t1-sfp-module/>

1.2 Warranty and Safety Information



Before operating the device, read this manual thoroughly and retain it for your reference.

The latest documentation for the 100BASE-T1 SFP MODULE can be downloaded here:

<https://technica-engineering.de/en/produkt/100base-t1-sfp-module/>



Use the device only as described in this manual.

Use only in dry conditions.

Do not apply power to a damaged device.



Do not open the device. Otherwise warranty will be lost.



This device is designed for engineering purpose only.

Special care has to be taken for operation.

Do not use this device in a series production car.

As this device is likely to be used under rough conditions, warranty is limited to 1 year.

Manufacturer liability for damage caused by using the device is excluded.

1.3 Declaration of conformity

<u>EG-Konformitätserklärung</u>	
gemäß der EG-Richtlinie 2004/108/EG (elektromagnetische Verträglichkeit) vom 15. Dezember 2004	
Hiermit erklären wir, dass das ⁺ nachstehend bezeichnete Gerät in seiner Konzeption und Bauart sowie in der von uns in Verkehr gebrachten Ausführung den grundlegenden Sicherheits- und Gesundheitsanforderungen der EG-Richtlinie 2004/108/EG entspricht. Bei einer mit uns nicht abgestimmten Änderung des Gerätes verliert diese Erklärung ihre Gültigkeit.	
Hersteller:	Technica Engineering Leopoldstr. 236 80807 München
Bevollmächtigter:	Joseba Rodriguez
Beschreibung des Gerätes:	100BASE-T1 SFP Module
Datum der Erklärung:	04.08.2017
Name des Unterzeichners:	Joseba Rodriguez
Unterschrift:	

Figure 1-2: Declaration of conformity

2 HARDWARE INTERFACES

2.1 Molex Connector

The 100BASE-T1 line is connected by a Molex connector.

Hardware Versions 2.7 and higher use:

- Molex 0533250260 Header 2.0mm
- Molex 510900200 Housing
- Molex 50212-8000 Crimp Contact

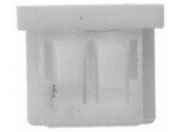
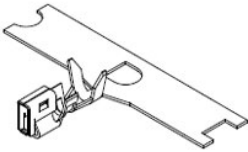
Name	Picture	Part Number
Molex Header 2.0mm		0533250260
Molex Housing		51090-0200
Molex 50212-8000 Crimp Contact		50212-8000

Table 2-1: Parts Molex Connector

Pinning:

Pin	Function	Pin	Function
1	100BASE-T1 Plus	2	100BASE-T1 Minus

Table 2-2: Pinning of Molex Connector

2.2 SFP Socket Connector

Pinning:

Pin	Function	Pin	Function
1	GND	11	GND
2	GND	12	SGMII_RXD_N
3	n.c.	13	SGMII_RXD_P
4	I2C_DAT	14	GND
5	I2C_CLK	15	3.3. Volt
6	GND	16	3.3. Volt
7	n.c.	17	GND
8	GND	18	SGMII_TXD_P
9	n.c.	19	SGMII_TXD_N
10	GND	20	GND

Table 2-3: Pinning of SFP Socket Connector

3 STARTUP AND CONFIGURATION

3.1 Startup

After 3.3 Volt power is applied, the SFP module starts up and self-configures the BCM54811S transceiver by I2C interface. This lasts 100ms. In the first 100ms the processor on the module acts as I2C master. Do not apply any master activity on the bus during this time!

3.2 Self-Configuration

The SFP Module configures itself to 100BASE-T1 after power up. Master-/Slave Configuration is done according to the DIP switch on the bottom of the device.

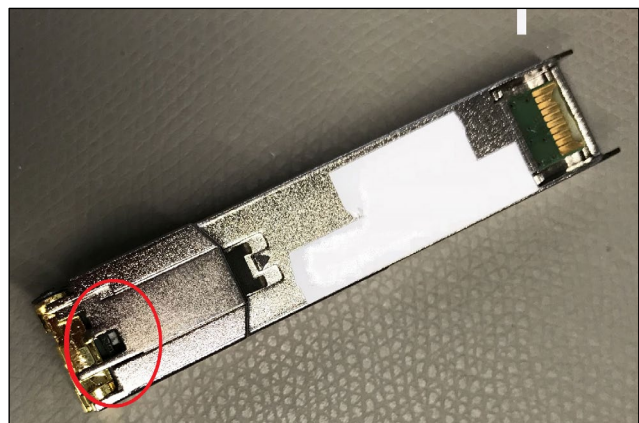


Figure 3-1: DIP-Switch

To reconfigure the DIP switch the lock has to be opened (see pictures).

ON/right = as Master

OFF/ left = as Slave

3.3 I2C Interface

3.3.1 I2C configuration

100ms after power up of the module it can be configured by I2C.

The module operates with f_{SCL} up to 100kHz without requiring clock stretching.
The module may clock stretch with f_{SCL} greater than 100kHz and up to 400 kHz.

The module processor listens as slave on the 7-bit address 0x50.

Note: b1010 000X = 0xA0

Read access beyond address 95 will return 0x00.

The BCM54811S transceiver can be accessed at I2C slave 7-bit address 0x40.

Note: b1000 000X = 0x80

Read access to register 0x02 will always return 0x03, 0x62 (Device ID).

Write access to register 0x00 with value 0x02, 0x00 will configure the module to BR Slave.

Write access to register 0x00 with value 0x02, 0x08 will configure the module to BR Master.

For a complete register map please have a look at the BCM54811S datasheet (Broadcom NDA required).

3.3.2 I2C map register

Memory Map (read only registers):

Data Bytes	Byte Number	Comment
0x03	0	Identifier SFP
0x04	1	Ext. Identifier
0x80	2	Connector
0x00, 0x00, 0x00, 0x00	3-6	Transceiver high
0x00, 0x00, 0x00, 0x00	7-10	Transceiver low
0x00	11	Encoding
0x01	12	Bitrate Nominal in 100 MBit
0x00	13	Reserved
0x00	14	Link Length Fiber
0x00	15	Link Length Fiber
0x00	16	Link Length Fiber
0x00	17	Link Length Fiber
0x0A	18	Link Length Copper in meter
0x00	19	Reserved
'T','e','c','h','n','i','c','a',' ','E','n','g','.',' ',' ',' ',' '	20-35	Vendor Name
0x00	36	Reserved
0x00, 0x00, 0x00	37-39	Vendor ID
'1','0','0','B','A','S','E','-','T','1',' ',' ',' ',' '	40-55	PartNumber
0x00, 0x00, 0x00, 0x00	56-59	Revision Number
0x00, 0x00, 0x00	60-62	Reserved
0xBC	63	Check Code for Field 0-62
0x00, 0x00	64-65	Options
0x00	66	Bitrate max
0x00	67	Bitrate min
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00	68-83	Serial Number String
0x00, 0x00, 0x00, 0x00	84-87	Date Code high
0x00, 0x00, 0x00, 0x00	88-91	Date Code low
0x00, 0x00, 0x00	92-94	Reserved
0x42	95	Check Code Extended for Field 64-94

Table 3-1: Memory map

3.3.3 I2C Device addressing and operation

3.3.3.1 I2C Current address read

The current read operation only requires the device address read word to be sent. When the acknowledge is received from the SFP module, the current address data word is serially clocked out.

Example: Read the current address of the SFP module (b1010000X).

H O S T	S T A R T	<-I2C device ->							R E A D									N A C K	S T O P
		M S B						L S B											
		1	0	1	0	0	0	0	1	0	X	X	X	X	X	X	X	1	
S F P										A C K	M S B						L S B		
											<- DATA WORD ->								

3.3.3.2 Random address read

The random address read requires two operations to perform the read.

Example: Read a random address of the SFP module (b1010000X)

First a write operation to specify the address desired to read:

H O S T	S T A R T	<-I2C device ->							W R I T E		<-I2C Memory address ->							L S B	
		M S B						L S B			M S B							L S B	
		1	0	1	0	0	0	0	0	0	X	X	X	X	X	X	X	X	0
S F P										A C K									A C K

Then a read operation to read the previous address specified:

		<-I2C device ->																	
H O S T	S T A R T	M S B							L S B	R E A D								N A C K	S T O P
		1	0	1	0	0	0	0		1	0	X	X	X	X	X	X	X	1
S F P											A C K	M S B						L S B	
												<- DATA WORD ->							

3.3.3.3 Sequential read

The sequential reads are started by either a current word address read or a random address read. To specify a sequential read, the host responds with an acknowledge instead of a stop after each data word.

First a write operation to specify the address desired to read:

		<-I2C device ->								<-I2C Memory address->									
H O S T	S T A R T	M S B							L S B	W R I T E		M S B						L S B	
		1	0	1	0	0	0	0		0	0	X	X	X	X	X	X	X	0
S F P											A C K								A C K

Then the read operations:

		<-I2C device ->																																			
H O S T	S T A R T	M S B						L S B	R E A D																									N A C K	S T O P		
		1	0	1	0	0	0	0	1	0	X	X	X	X	X	X	X	X	X	X	1	X	X	X	X	X	X	X	X	X	X	1					
S F P										A C K	M S B										L S B		M S B									L S B					
											<-DATA WORD n->													<-DATA WORD n+1->													

3.3.3.4 Byte write

The write operation requires 8-bits of data word address following the device address write word and acknowledgement.

Example: Byte write operation into the SFP module (b1010000X)

		<-I2C device ->										<-MEMORY ADDRESS->										<-DATA WORD->											
H O S T	S T A R T	M S B						L S B	W R I T E		M S B						L S B		M S B							L S B		S T O P					
		1	0	1	0	0	0	0	0	0	X	X	X	X	X	X	X	0	X	X	X	X	X	X	X	X	0						
S P F										A C K								A C K									A C K						

3.3.3.5 Sequential write

The sequential write is started in the same way as a single byte write, but the host master does not send a stop condition after the first word is clocked in.

H O S T	S T A R T	<-I2C device ->								W R I T E	<-MEMORY ADDRESS->								<-DATA WORD 1->								<-DATA WORD 2->								S T O P
		M S B							L S B		M S B							L S B	M S B								L S B	M S B							
		1	0	1	0	0	0	0	0	0	X	X	X	X	X	X	X	0	X	X	X	X	X	X	X	X	0	X	X	X	X	X	X	X	0
S P F										A C K								A C K									A C K								A C K

4 ADDITIONAL INFORMATION

- The 100BASE-T1 SFP MODULE is optimized for automotive use. The maximum cable length for 100BASE-T1 segments is limited to 15 meters
- A Bug in the used 100BASE-T1 PHY shows a linkup on slave-side (LED is lit), even if the plus and minus PINs are swapped. Data transmission is not possible

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6 CHANGELOG

Version	Chapter	Description	Date
1.0	All	First release	
2.0	All	Complete rework of all chapters	25.04.2019

7 CONTACT

If you have any questions regarding this product, please feel free to contact us:

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General information:
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Most current user manuals and product information:
<https://technica-engineering.de/>