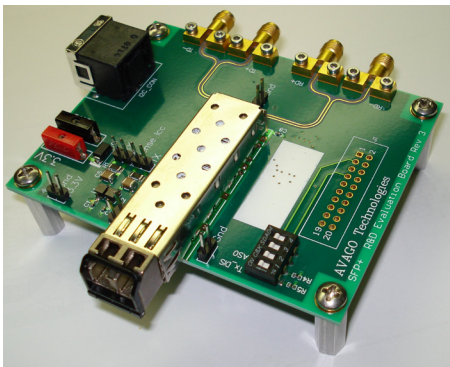


Application Note 5360

SFP+ Evaluation Board

The purpose of this SFP+ evaluation board is to provide the designer with a convenient means for evaluating SFP+ fiber optic transceiver such as AFBR-700SDZ and AFBR-57D5APZ compliant with MSA SFF-8074i or SFF-8472. This document describes the details of the evaluation printed circuit board and the test methods for evaluating SFP+ modules.



I. Equipment included in the evaluation board kit AFCT-5016Z

1. SFP+ Evaluation PCB
2. DC Power supply cable assembly

II. Equipment not included in this kit

1. 3.3 V DC power supply
2. Fiber optic cables
3. DCA-J 86100C
4. DCA-J plug in 86105C, 86112A
5. Error Performance Analyzer, Pattern Generator 70843B
6. Fiber optic attenuator
7. EEPROM Reader(i-Port or similar), RJ-45 cable
8. PC

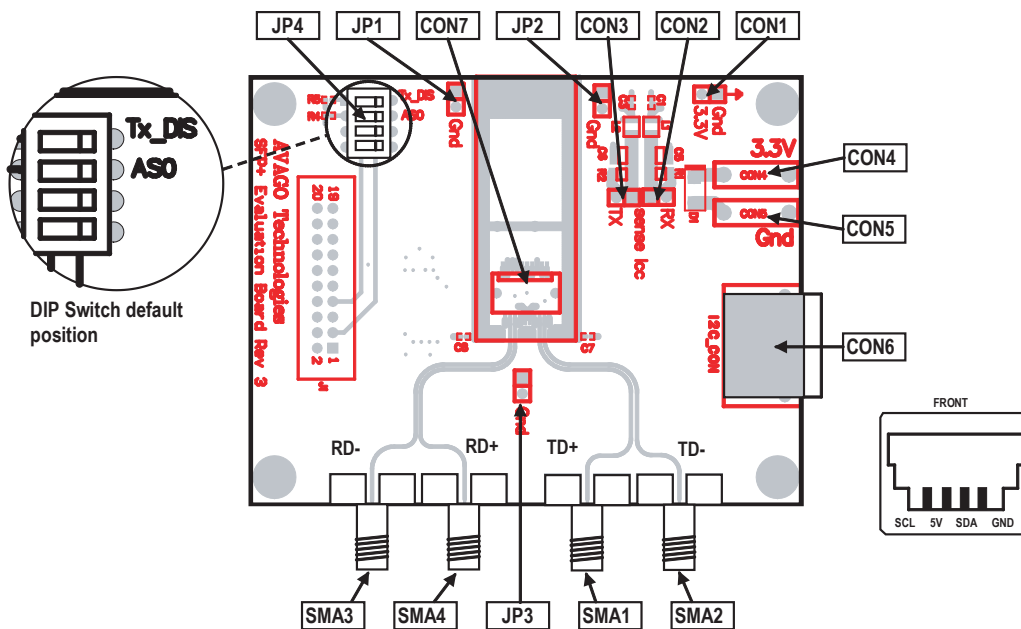


Figure 1. SFP+ Evaluation Board Top Views

III. SFP+ Evaluation board description

The top view of the evaluation PCB is shown in Figure 1. TX_Disable and ASO pins should be grounded by default using DIP switch (JP4) setting as shown in the diagram. Apply 3.3 V power supply to CON4 with CON5 GND. CON2 and CON3 can be used to monitor the current to the SFP+ module's RXVCC and TXVCC supplies respectively. Measure the voltages and divide by 0.05 Ω sensing resistors. Use CON6 to access the SFP+ module's two-wire serial signals, SCL and SDA. JP1, JP2 and JP3 are all tied to the evaluation board's common circuit GND.

A description of all of the I/O interfaces on the PCB is shown in Table 1. The evaluation board is a 6-layer design with Nelco N4000-13 core material.

Table 1. I/O Description

Reference Designator	Name	Description	Signal Level
SMA1	TD+	Differential Transmitter Input	Note 1
SMA2	TD-		
SMA3	RD-	Differential Receiver Output	Note 1
SMA4	RD+		
CON1	EXT_SUPPLY	3.3 V External Power supply	Note 1
CON2	RX sense	RX ICC current sense	$R_{sense} = 50\text{ m}\Omega$
CON3	TX sense	TX ICC current sense	$R_{sense} = 50\text{ m}\Omega$
CON4	EXT_SUPPLY	3.3 V External Power supply	Note 1
CON5	GND	GND	GND
CON6	I2C_CON	2-wire serial interface, SCL & SDA	LVTTL *
CON7	SFP+ 20-pin connector	SFP+ Module plugs here	
JP1	GND	TX and RX common GND	GND
JP2	GND		
JP3	GND		
JP4	DIP SWITCH	TX_Disable and ASO GNDed when switch is at 'ON' position, pulled up to TX VCC when in 'OFF' position.	LVTTL *

Notes

1. See the specific transceiver data sheet for recommended operating voltages and further information
2. * LVTTL defines a 3.3 V level with transitions at 0.8 and 2.0 V

IV. Electro-Optical Test Configurations

A basic test configuration for evaluating the SFP+ module is shown in Figure 2. The SFP+ module TX & RX optical/electrical characteristics such as eye diagram, rise/fall time, jitter can be tested. It is recommended that low loss, low dispersion and matched equal length RF cables be used to connect TD+/- and RD+/- signals to the test equipment. Representative TX and RX eye diagrams for a SFP+ module are shown in Figures 3 and 4.

V. EEPROM Test Configuration

The SFP+ MSA specifies an EEPROM internal to the transceiver. The standard two-wire serial protocol can be implemented to allow the user to read/write the user accessible area in the EEPROM by using the MOD_DEF(1), MOD_DEF(2) and GND connections on the Evaluation board. MOD_DEF(1) and MOD_DEF(2) are equal to SCL and SDA respectively as shown in the Figure 1 connector illustration.

For more information about Avago Technologies SFP+ transceiver products, please contact your local sales representative or visit us at www.avagotech.com

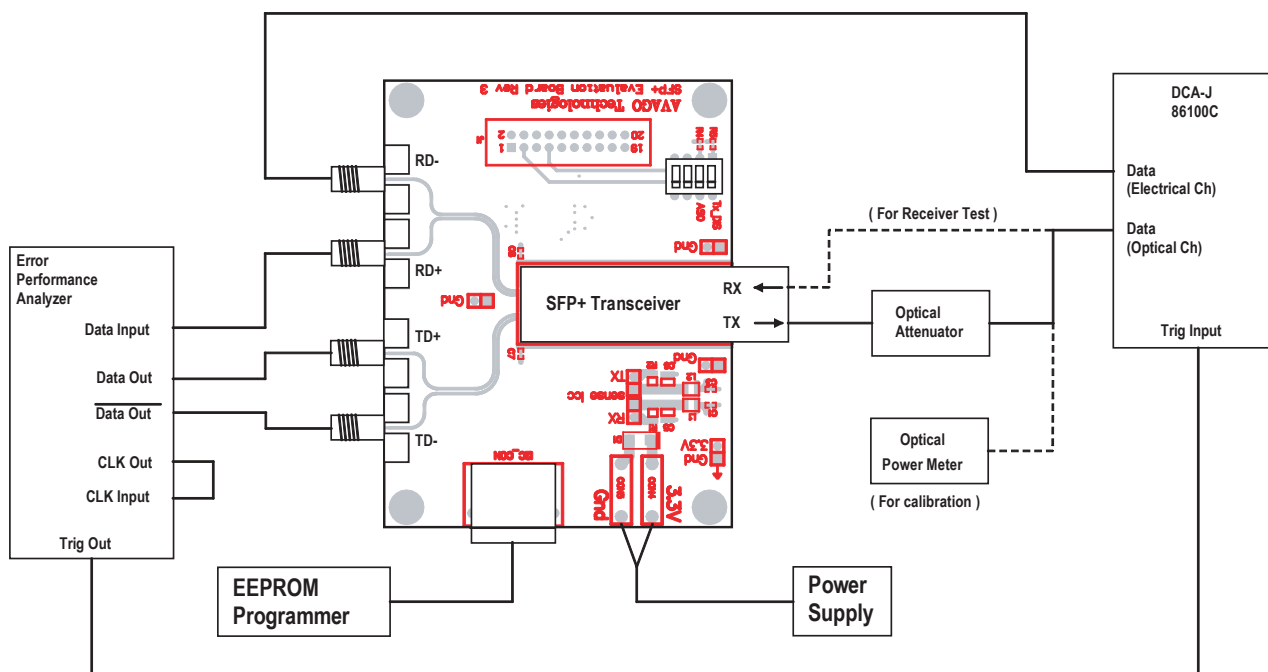


Figure 2. Basic Test Configuration of SFP+ Module

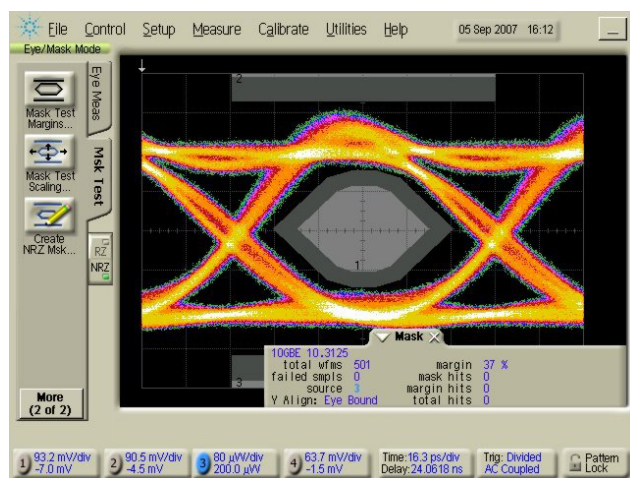


Figure 3. TX Eye Diagram

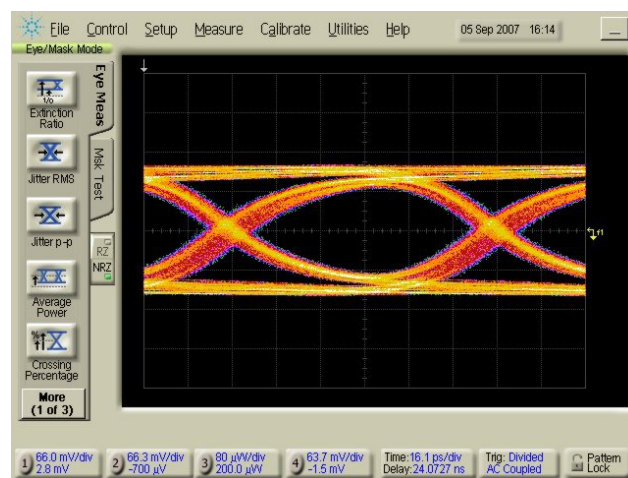


Figure 4. RX Eye Diagram

VI. Evaluation Board Schematic and Bill of Materials

The SFP+ evaluation board schematic is shown in Figure 3. Not all components in the schematic are fitted on the evaluation board. They are for optional functionality of the board. Table 2 shows the bill of materials.

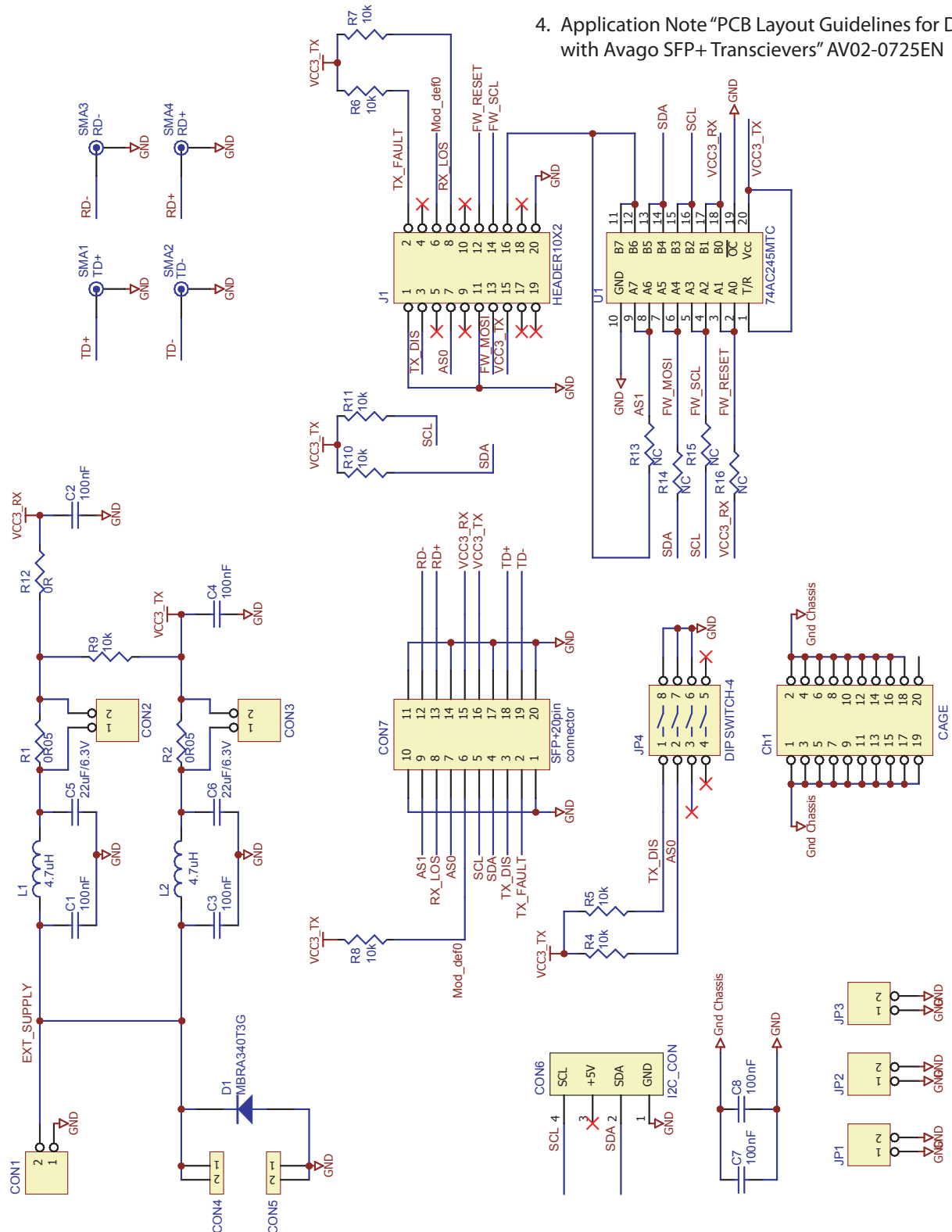


Figure 5. SFP+ Evaluation Board Schematics

VII. References

1. AFBR-700SDZ, AFBR-57D5APZ Product Datasheets
2. SFF Committee SFF-8431, SFF-8472
3. AFBR-700SDZ(SR), AFBR-707SDZ(LRM), AFCT-701SDZ(LR) Product datasheets
4. Application Note "PCB Layout Guidelines for Designing with Avago SFP+ Transceivers" AV02-0725EN

Table 2. SFP+ Evaluation Board Bill of Materials

Part Type	Designator	Footprint	Description
OR05	R2	1206PCB	
OR05	R1	1206PCB	
OR	R12	0402-2	
4.7 μ H	L2	LQH32	Inductor
4.7 μ H	L1	LQH32	Inductor
10 k Ω	R9	0402-2	
10 k Ω	R11	0402-2	
10 k Ω	R5	0402-2	
10 k Ω	R4	0402-2	
10 k Ω	R7	0402-2	
10 k Ω	R8	0402-2	
10 k Ω	R10	0402-2	
10 k Ω	R6	0402-2	
22 μ F-6.3 V	C5	1210PCB	Capacitor
22 μ F-6.3 V	C6	1210PCB	Capacitor
100 nF	C7	0402-2	Capacitor
100 nF	C8	0402-2	Capacitor
100 nF	C2	0402-2	Capacitor
100 nF	C3	0402-2	Capacitor
100 nF	C1	0402-2	Capacitor
100 nF	C4	0402-2	Capacitor
Banana BLACK	CON5	TESTP	
Banana RED	CON4	TESTP	
CHASSIS	Ch1	SFP+ CHASSIS	
DIP SWITCH-4	JP4	DIP8	DIP switch
HEADER	CON3	SIP2	
HEADER	CON1	SIP2	
HEADER	CON2	SIP2	
HEADER	JP3	SIP2	
HEADER	JP2	SIP2	
HEADER	JP1	SIP2	
I2C_CON	CON6	I2C_CON	I2C connector, Tyco P/N 4-1761206-1, Molex P/N 15-83-0064
MBRA340T3G	D1	SOD-106	
RD+	SMA4	SMA_ROSENBERGER	SMA Connector 32K243-40ME3
RD-	SMA3	SMA_ROSENBERGER	SMA Connector 32K243-40ME3
SFP+ 20pin connector	CON7	SFF CONN	Molex, SFP Plus connector, P/N/ 7441-0010
TD+	SMA1	SMA_ROSENBERGER	SMA Connector 32K243-40ME3
TD-	SMA2	SMA_ROSENBERGER	SMA Connector 32K243-40ME3

For product information and a complete list of distributors, please go to our web site: www.avagotech.com

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