



## SFP+ Direct Attach Cable Small Form Pluggable (SFP+), 3.3V 10Gb/s Link Speed



### Features

- Up to 10 Gb/s bi-directional data links
- Data rates backward compatible to 1Gbps
- Hot-pluggable SFP 20PIN footprint
- I/O Connector designed for high speed differential signal applications
- Improved Pluggable Form-Factor (IPF) compliant for enhanced EMI/EMC performance
- Compatible to SFP+ MSA
- Temperature Range: -20 ~ 85 °C
- RoHS Compatible

### Application

- 10G Ethernet and 10G Fiber Channel
- High capacity I/O in Storage Area Networks, Network Attached Storage, and Storage Servers
- Switched fabric I/O such as ultra high bandwidth switches and routers
- Data center cabling infrastructure
- High density connections between networking equipment

### Description

APAC SFP+ direct attach cable (DAC) is high performance, cost effective I/O solutions for 10G Ethernet and fiber channel applications. The product is compliant with 10G Ethernet standards and SFP+ Multi-Source Agreement (MSA) standards, supports 10G transmission rates, and is backward compatible with low-rate applications, such as 1G. Its biggest feature is the use of thinner cables and longer transmission distances. Low power consumption, low cost and high reliability are the preferred solutions for 10G rate short-range applications. They are commonly used for data transmission between data centers and cabinets or adjacent cabinets. The high speed cable assemblies meet and exceed Gigabit Ethernet and fiber channel industry standard requirements for performance and reliability.



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### Ordering Information

	PART NUMBER	Product Description
Passive	SFPM-PEC-10G-01	SFP+ Direct Attach Passive Cable, 30AWG 1m
	SFPM-PEC-10G-02	SFP+ Direct Attach Passive Cable, 30AWG 2m
	SFPM-PEC-10G-03S	SFP+ Direct Attach Passive Cable, 30AWG 3m
	SFPM-PEC-10G-03	SFP+ Direct Attach Passive Cable, 24AWG 3m
	SFPM-PEC-10G-05	SFP+ Direct Attach Passive Cable, 24AWG 5m
Active	SFPM-AEC-10G-03	SFP+ Direct Attach Active Cable, 30AWG 3m
	SFPM-AEC-10G-05	SFP+ Direct Attach Active Cable, 30AWG 5m
	SFPM-AEC-10G-07	SFP+ Direct Attach Active Cable, 30AWG 7m
	SFPM-AEC-10G-10	SFP+ Direct Attach Active Cable, 24AWG 10m

### Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTE
Operating Current	$I_{OP}$			400	mA	
Maximum Voltage	$V_S$	-0.5		6	V	1

#### Notes:

- 1) For electrical interface

### Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Data Rate	DR	10.3125			Gb/s	Passive
		0.155		11	Gb/s	Active
Bit Error Rate	BER			$10^{-12}$		
Operating Temperature	$T_{OP}$	-20		85	°C	2
Storage Temperature	$T_{STO}$	-40		85	°C	3
Input Voltage	$V_{CC}$	3.14	3.3	3.46	V	4
Supply Current	$I_{CC}$		100	300	mA	4

#### Note:

- 1) IEEE 802.3ae.
- 2) Case temperature
- 3) Ambient temperature
- 4) For electrical power interface



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### 10Gb/s Link Speed

#### Cable Mechanical Specifications

PARAMETER	SYMBOL	MIN	TYP.	MAX	UNITS	NOTE
Wire Gauge		30		24	AWG	
Cable Impedance	Z	90	100	110	Ohm	

#### I2C Memory Map

A0h

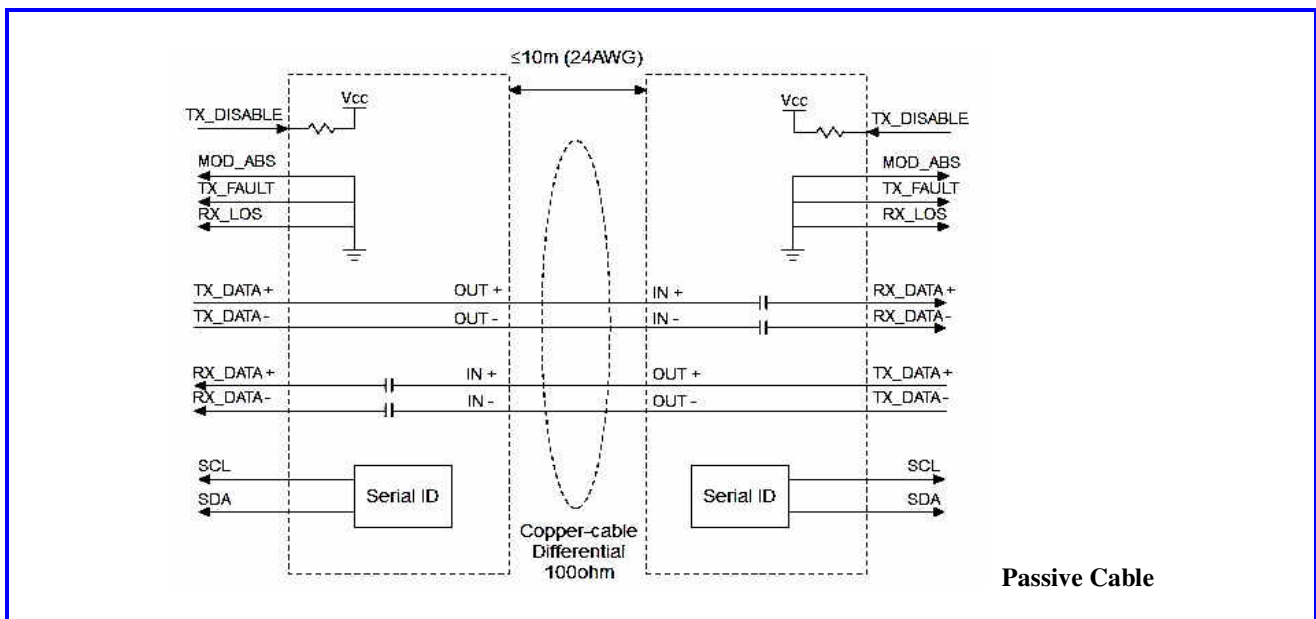
ADDR.	SIZE	NAME	DESCRIPTION	VALES (HEX)	REMARKS
0	1	Identifier	SFP or SFP+	03	
1	1	Ext. Identifier	GBIC/SFP function is defined by two-wire interface ID only	04	
2	1	Connector	Copper pigtail	21	
3-10	8	Transceiver	Passive Cable	00 00 00 00 00 04 00 00	
11	1	Encoding	Code for high speed serial encoding algorithm	00	
12	1	BR, Nominal	Nominal Bit Rate 10.3GB/s	67	
13	1	Rate Identifier	Type of rate select functionality	00	
14	1	Length(SMF,km)	Link length supported for single mode fiber, units of km	00	
15	1	Length (SMF)	Link length supported for single mode fiber, units of 100 m	00 00	
16	1	Length (50um)	Link length supported for 50 um OM2 fiber, units of 10 m	00 00	
17	1	Length (62.5um)	Link length supported for 62.5 um OM1 fiber, units of 10 m	00	
18	1	Length (OM4 or copper cable)	Link length supported for 50um OM4 fiber, units of 10m. Alternatively copper or direct attach cable, units of m	01	
19	1	Length (OM3)	Link length supported for 50 um OM3 fiber, units of 10 m	00	
20-35	16	Vendor name	APAC	41 50 41 43 20 20 20 20 20 20 20 20 20 20 20 20	
36	1	Transceiver	Code for electro nic or optical compatibility	00	
37-39	3	Vendor OUI	SFP vendor IEEE company ID	00 0F 99	
40-55	16	Vendor PN	Part number in Order information	-	
56-59	4	Vendor rev	Revision level for part number provided by vendor (ASCII)	00 00	
60-61	2	Wavelength	Laser wavelength (Passive/Active Cable Specification Compliance)	00 00	
62	1	Unallocated		00	



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63	1	CC BASE	Check code for Base ID Fields (addresses 0 to 62)	-
64-65	2	Options	Indicates which optional transceiver signals are implemented	00 00
66	1	BR, max	Upper bit rate margin	64
67	1	BR, min	Lower bit rate margin	00
68-83	16	Vendor SN	Serial number provided by vendor	Programmed by Factory
84-91	8	Date code	Year, Month, Day	Programmed by Factory
92	1	Diagnostic Monitoring Type	Indicates which type of diagnostic monitoring is implemented (if any) in the transceiver	00
93	1	Enhanced Options	Indicates which optional enhanced features are implemented (if any) in the transceiver	00
94	1	SFF-8472 Compliance	Indicates which revision of SFF-8472 the transceiver complies with	00
95	1	CC EXT	Check code for the Extended ID Fields (addresses 64 to 94)	-
96-127	32	Vendor Specific	Vendor Specific EEPROM	-
128-255	128	Vendor Specific	Vendor Specific EEPROM	-

### Block Diagram of Transceiver







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ITEM	NAME	DESCRIPTION	Q'TY
1	RAW CABLE	2PAIRS BLACK, ROTH2.0	A/R
2	PULL TAB	PA66, BLUE 300C	2
3	PLASTIC BOOT	PVC, BLACK	2
4	COPPER RING	COPPER	2
5	ALUMINUM RING	ALUMNINUM ALLOY	2
6	SCREW	MILD STEEL	4
7	GROUNDING SPRINGS	SUS303	2
8	BOTTOM SHELL	Zn ALLOY, PLATED Ni OVER Cu	2
9	TOP SHELL	Zn ALLOY, PLATED Ni OVER Cu	2
10	PCB ASSEMBLY	SFP PCB, 20P, Au 30u"MIN	2
11	SPRING	HANDED ROTATION, SWPB	4
12	PULL ROD	SUS316	4

### Length Tolerance

No	Nominal length (m)	Tolerance range $\pm$ (cm)
1	Length $\leq 2$	2
2	$2 < \text{Length} \leq 4$	4
3	$4 < \text{Length} \leq 6$	6
4	$6 < \text{Length}$	8

### Weight

PARAMETER	SYMBOL	TYP.	UNIT	NOTE
30AWG Product Weight	G <sub>D30</sub>	72	g/PCS	1
28AWG Product Weight	G <sub>D28</sub>	88	g/PCS	1
24AWG Product Weight	G <sub>D26</sub>	96	g/PCS	1
30AWG Cable Weight	G <sub>C30</sub>	26	g/M	
28AWG Cable Weight	G <sub>C28</sub>	42	g/M	
24AWG Cable Weight	G <sub>C26</sub>	50	g/M	
Dust Cap Weight	G <sub>Q</sub>	0.80	g/PCS	

#### Notes:

1. For example: The weight of SFPM-AEC-10G-10 is:  $96+50*(10-1)+0.80*2=547.6\text{g}$

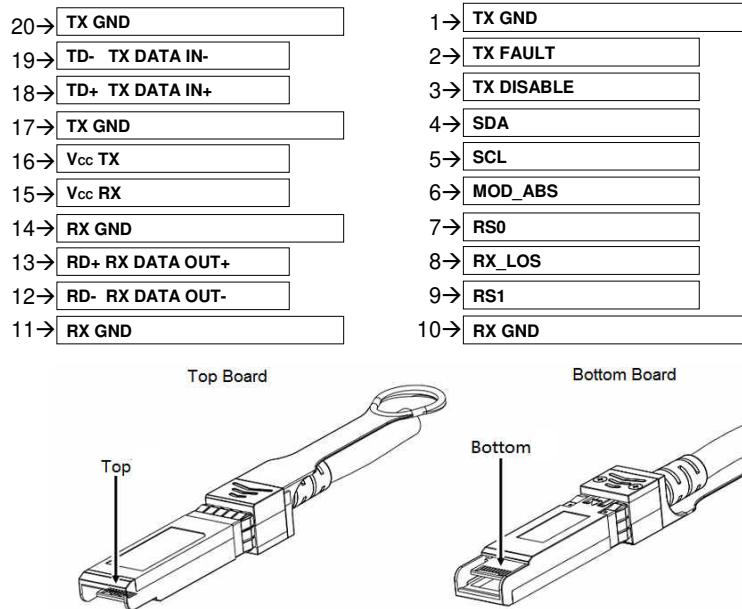


# SFP+ Direct Attach Cable

## Small Form Pluggable (SFP+), 3.3V

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#### Electrical Pad Layout



#### Pin Assignment

Pin#	Signal Name	Function	NOTES
1	V <sub>EET</sub>	Transmitter ground (common with receiver ground)	
2	T <sub>FAULT</sub>	Transmitter Fault	
3	T <sub>DIS</sub>	Transmitter Disable. Laser output disabled on high or open	
4	SDA	Data line for serial ID	
5	SCL	Clock line for serial ID	
6	MOD_ABS	Module Absent. Grounded within the module	
7	RS0	No connection required	
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation	
9	RS1	No connection required	
10	V <sub>EER</sub>	Receiver ground (common with transmitter ground)	
11	V <sub>EER</sub>	Receiver ground (common with transmitter ground)	
12	RD-	Receiver Inverted DATA out. AC coupled	
13	RD+	Receiver Non-inverted DATA out. AC coupled	
14	V <sub>EER</sub>	Receiver ground (common with transmitter ground)	
15	V <sub>CCR</sub>	Receiver power supply	
16	V <sub>CCT</sub>	Transmitter power supply	
17	V <sub>EET</sub>	Transmitter ground (common with receiver ground)	
18	TD+	Transmitter Non-Inverted DATA in. AC coupled	
19	TD-	Transmitter Inverted DATA in. AC coupled	
20	V <sub>EET</sub>	Transmitter ground (common with receiver ground)	



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### **Mating of SFP Transceiver to SFP Host Board Connector**

The pads on the PCB of the SFP transceiver shall be designed for a sequenced mating as follows: First mate: Ground contacts. Second mate: Power contacts. Third mate: Signal contacts The SFP MSA specification for a typical contact pad plating for the PCB is 0.38 micrometers minimum hard gold over 1.27 micrometers minimum thick nickel. To ensure the long term reliability performance after a minimum of 500 insertion removal cycles, the contact plating of the transceiver is 0.762 micron (30 micro-inches) over 3.81 micron (150 micro-inches) of Ni on Cu contact pads.