ATGBICS® by APPROVED TECHNOLOGY

Technical Datasheet

OSFP-400G-SR4-50-IB

400GBase OSFP SR4 InfiniBand Transceiver

Hot Pluggable, +3.3V, MPO-12, 850nm, MMF, 50m, Commercial Temperature

FEATURES

- Hot-pluggable OSFP form factor
- VCSEL transmitter and PIN PD receiver
- Support 425Gb/s aggregate bit rate
- Support both 4x100G Ethernet and InfiniBand NDR
- Compliant with IEEE 802.3-2022:
  - 4x100GBASE-VR1 optical interface
- Compliant with IEEE 802.3ck-2022:
  - 4x100GAUI-1 C2M electrical interface
- Compliant with InfiniBand Trade Association (IBTA)Specification 1.6
  - InfiniBand NDR electrical and optical interface
- Compliant with OSFP MSA Specification Rev 5.0 RHS housing (with the longer body:107.8mm) with MPO-12/APC receptacle
- Compliant with CMIS Rev 5.0
- Commercial Operating Temperature Range: 0°C to 70°C
- Power dissipation < 9W
- Two wire serial Interface with digital diagnostic monitoring
- Complies with EU Directive 2011/65/EU (RoHS compliant)
- Class 1 Laser

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T_S	-40	85	ºC
Supply Voltage	V_{CC}	-0.5	3.6	V
Relative Humidity (non-condensing)	RH	5	85	%
Data Input Voltage Differential	$\lvert V_{DIP}-V_{DIN}\rvert$	-	1	V
Control Input Voltage	V_I	-0.3	VCC+0.5	V
Control Output Current	I_O	-20	20	mA

ATGBICS.com | Approved-Technology.com | +44 (0) 1202 424 518 | sales@approved-technology.com

RECOMMENDED OPERATING ENVIRONMENT

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Operating Case Temperature	T_{OPR}	0	-	70	ºC	
Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V	
Instantaneous peak current at hot plug	I_{CC_IP}	-	-	3600	mA	
Sustained peak current at hot plug	I_{CC_SP}	-	-	2997	mA	
Maximum Power Dissipation	P_D	-	-	9	W	
Maximum Power Dissipation, Low Power Mode	P_{DLP}	-	-	2	W	
Signalling Speed per Lane	DRL	-	53.125	-	GBd	
Control Input Voltage High	V_{IH}	Vcc*0.7	-	Vcc+0.3	V	
Control Input Voltage Low	V_{IL}	-0.3	-	Vcc*0.3	V	
Two Wire Serial Interface Clock Rate	-	-	-	400	kHz	
Power Supply Noise 1 kHz - 1 MHz (p-p)	-	-	-	66	mVpp	
Operating Distance	-	2	-	50	m	1

Note:

1. 0.5 m to 30 m for OM3, 0.5 m to 50 m for OM4 and OM5, with FEC.

OPTICAL PARAMETERS

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
TRANSMISTTER						
Signaling rate, each lane (range)	-	53.125 ± 100 ppm			GBd	
Wavelength	λC	844	-	860	nm	
RMS spectral width	RMS	-	-	0.65	dB	1
Average Launch Power, each lane	AOPL	-4.6	-	4	dBm	
Outer Optical Modulation Amplitude (OMAouter), each lane for max (TECQ, TDECQ) <= 1.8 dB for 1.8 < max (TECQ, TDECQ) <= 4.4 dB	OMAouter	-2.6 -4.4+max(TECQ, TDECQ)	-	3.5	dBm	
Transmitter and Dispersion Eye Closure for PAM4 (TDECQ), each lane	TDECQ	-	-	4.4	dB	
Transmitter eye closure for PAM4 (TECQ), each lane	TECQ	-	-	4.4	dB	
Over/under-shoot	-	-	-	29	%	
Transmitter power excursion, each lane	-	-	-	2.3	dBm	
Average Launch Power of OFF Transmitter, each lane	TOFF	-	-	-30	dBm	
Extinction Ratio, each lane	ER	2.5	-	-	dB	
Transmitter transition time, each lane	Tr	-	-	17	ps	
RIN14OMA	RIN	-	-	-132	dB/Hz	
Optical return loss tolerance	ORL	-	-	14	dB	
Encircled flux	-	>=86% at 19μm <=30% at 4.5μm				
RECEIVER						
Signaling rate, each lane (range)	-	53.125 ± 100 ppm			GBd	
Wavelength	λC	840	-	860	nm	
Damage Threshold, each Lane	AOPD	5	-	-	dBm	

Average Receive Power, each Lane	AOPR	-6.3	-	4	dBm	
Receive Power (OMAouter), each Lane	OMAR	-	-	3.5	dBm	
Receiver Reflectance	RR	-	-	-15	dB	
Receiver sensitivity (OMAouter) for TECQ < 1.4 dB for 1.4 dB <=TECQ<=3.4 dB	SOMA	-	-	-4.4 -6.2 +TECQ	dBm	
Stressed Receiver Sensitivity (OMAouter), each Lane	SRS	-	-	-1.8	dBm	2
CONDITIONS OF STRESSED RECEIVER SENSITIVITY TEST						
Stressed eye closure for PAM4 (SECQ), lane under test	SECQ	-	4.4	-	dB	
OMAouter of each aggressor lane		-	3.5	-	dBm	

Note:

1. RMS spectral width is the standard deviation of the spectrum
2. Measured with conformance test signal at TP3 for the BER = $2.4x10^{-4}$

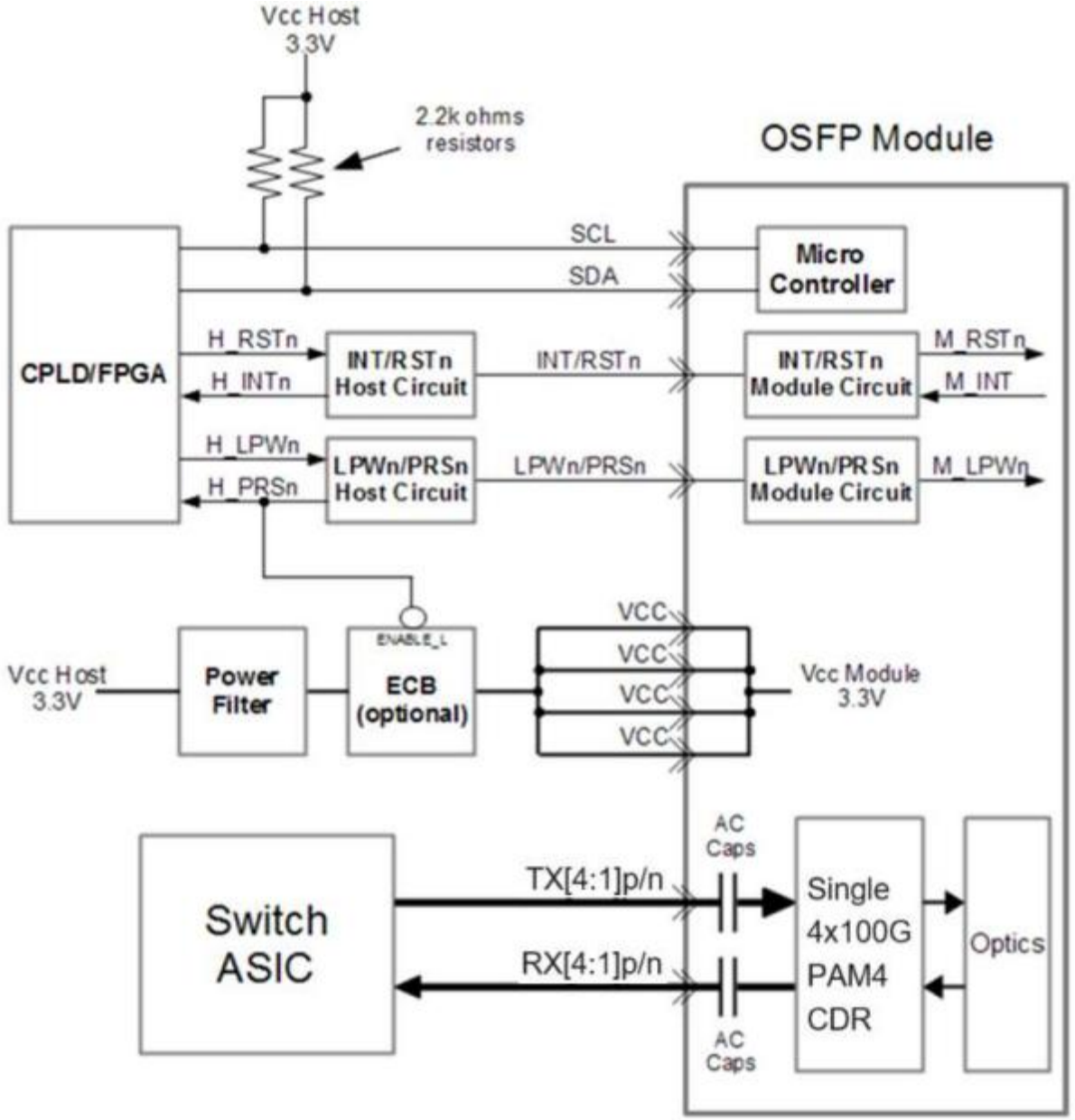
ELECTRICAL CHARACTERISTICS (HIGH SPEED SIGNAL)

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
TRANSMITTER (Module Input, TP1)						
Differential pk-pk input Voltage tolerance (TP1a)	-	750	-	-	mV	
Peak-to-peak AC common-mode voltage tolerance Low-frequency, VCMLF Full-band, VCMFB	-	32 80	-	-	mV	
Differential-mode to common-mode return loss	RLcd	802.3ck 120G-2			dB	
Effective return loss	ERL	8.5	-	-	dB	
Differential termination mismatch	-	-	-	10	%	
Single-ended voltage tolerance range	-	-0.4	-	3.3	V	
DC common-mode voltage tolerance	-	-0.35	-	2.85	V	
RECEIVER (Module Output, TP4)						
Peak-to-peak AC common-mode voltage Low-frequency, VCMLF Full-band, VCMFB	-	-	-	32 80	mV	
Differential peak-to-peak output voltage Short mode Long mode	-	-	-	600 845	mV	
Eye height	EH	15	-	-	mV	
Vertical eye closure	VEC	-	-	12	dB	
Common-mode to differential-mode return loss	RLDc	802.3ck 120G-1			dB	
Effective return loss	ERL	8.5	-	-	dB	
Differential termination mismatch	-	-	-	10	%	
Transition time	-	8.5	-	-	ps	
DC common-mode voltage tolerance	-	-0.35	-	2.85	V	

ELECTRICAL CHARACTERISTICS (LOW SPEED CONTROL & SENSE SIGNALS)

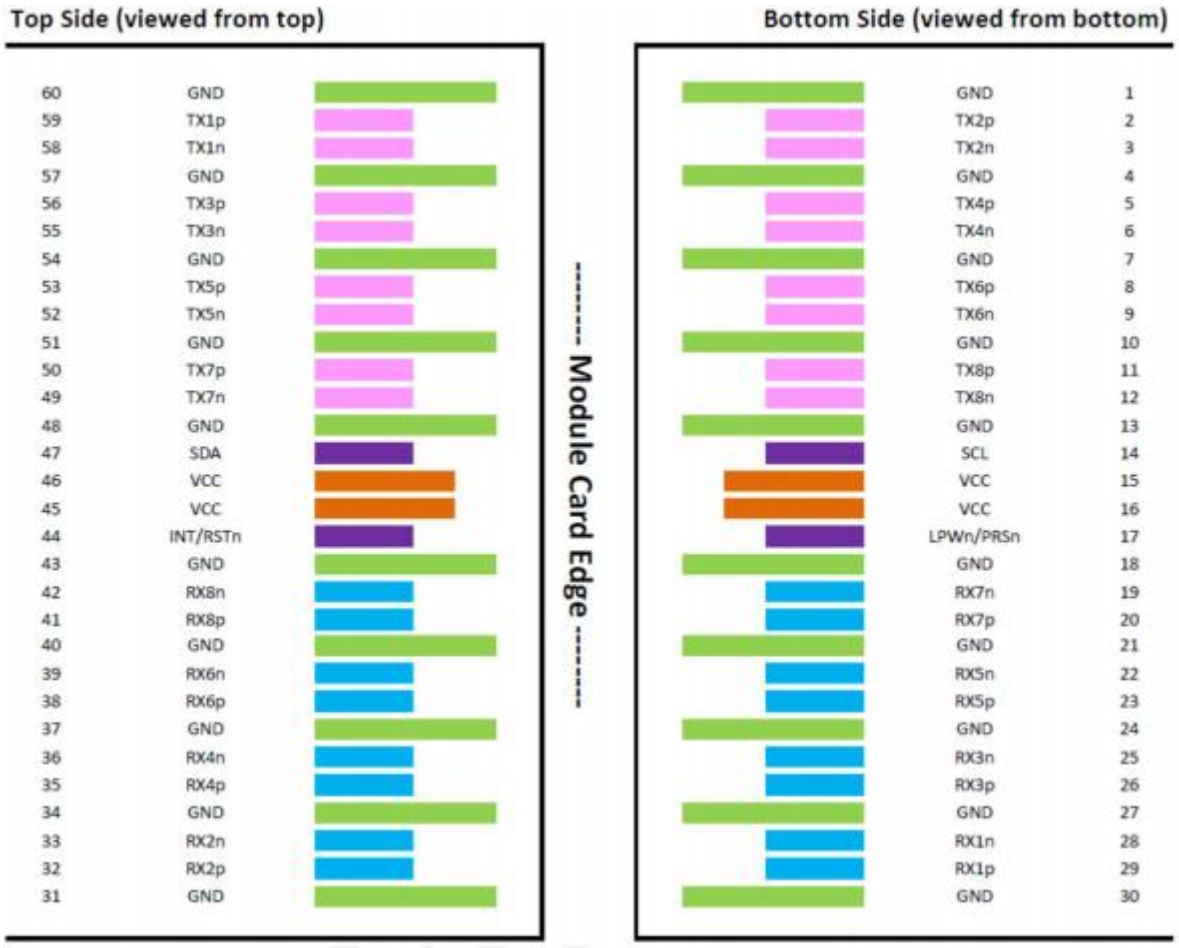
Parameter	Symbol	Min.	Max.	Unit
Module output SCL and SDA	VOL	0	0.4	V
Module Input SCL and SDA	VIL	-0.3	VCC*0.3	V
	VIH	VCC*0.7	VCC+0.5	V
INT/RSTn	Compliant with OSFP MSA 5.0 Table 13-4			

RECOMMENDED CIRCUIT



Recommended Host Board Schematic

PIN ASSIGNMENT



Pinout Definitions of OSFP Module Inputs/Outputs

Pin	Symbol	Description	Logic	Notes	Pin	Symbol	Description	Logic	Note
1	GND	Ground			**31**	GND	Ground		
2	TX2p	Transmitter Data Non-Inverted	CML-I		**32**	RX2p	Receiver Data Non-Inverted	CML-O	
3	TX2n	Transmitter Data Inverted	CML-I		**33**	RX2n	Receiver Data Inverted	CML-O	
4	GND	Ground			**34**	GND	Ground		
5	TX4p	Transmitter Data Non-Inverted	CML-I		**35**	RX4p	Receiver Data Non-Inverted	CML-O	
6	TX4n	Transmitter Data Inverted	CML-I		**36**	RX4n	Receiver Data Inverted	CML-O	
7	GND	Ground			**37**	GND	Ground		
8	TX6p	Transmitter Data Non-Inverted	CML-I	1	**38**	RX6p	Receiver Data Non-Inverted	CML-O	1
9	TX6n	Transmitter Data Inverted	CML-I	1	**39**	RX6n	Receiver Data Inverted	CML-O	1
10	GND	Ground			**40**	GND	Ground		
11	TX8p	Transmitter Data Non-Inverted	CML-I	1	**41**	RX8p	Receiver Data Non-Inverted	CML-O	1
12	TX8n	Transmitter Data Inverted	CML-I	1	**42**	RX8n	Receiver Data Inverted	CML-O	1
13	GND	Ground			**43**	GND	Ground		
14	SCL	2-wire Serial interface clock	LVCMOS- I/O		**44**	INT/RST n	Module Interrupt / Module Reset	Multi-Level	
15	VCC	+3.3V Power			**45**	VCC	+3.3V Power		
16	VCC	+3.3V Power			**46**	VCC	+3.3V Power		
17	LPWn/P RSn	Low-Power Mode / Module Present	Multi-Level		**47**	SDA	2-wire Serial interface data	LVCMOS-I/O	
18	GND	Ground			**48**	GND	Ground		
19	RX7n	Receiver Data Inverted	CML-O	1	**49**	TX7n	Transmitter Data Inverted	CML-I	1
20	RX7p	Receiver Data Non-Inverted	CML-O	1	**50**	TX7p	Transmitter Data Non-Inverted	CML-I	1
21	GND	Ground			**51**	GND	Ground		
22	RX5n	Receiver Data Inverted	CML-O	1	**52**	TX5n	Transmitter Data Inverted	CML-I	1
23	RX5p	Receiver Data Non-Inverted	CML-O	1	**53**	TX5p	Transmitter Data Non-Inverted	CML-I	1
24	GND	Ground			**54**	GND	Ground		
25	RX3n	Receiver Data Inverted	CML-O		**55**	TX3n	Transmitter Data Inverted	CML-I	
26	RX3p	Receiver Data Non-Inverted	CML-O		**56**	TX3p	Transmitter Data Non-Inverted	CML-I	
27	GND	Ground			**57**	GND	Ground		
28	RX1n	Receiver Data Inverted	CML-O		**58**	TX1n	Transmitter Data Inverted	CML-I	
29	RX1p	Receiver Data Non-Inverted	CML-O		**59**	TX1p	Transmitter Data Non-Inverted	CML-I	
30	GND	Ground			**60**	GND	Ground		

Module Pin Definitions

Note:

1. Not used

DIGITAL DIAGNOSTICS

Parameter	Range	Accuracy	Unit	Calibration
Temperature	0 to 70	±3	ºC	Internal
Voltage	3.135 to 3.465	±3%	V	Internal
Tx Bias Current (Each Lane)	0 to 15	10%	mA	Internal
Tx Output Power (Each Lane)	-4.6 to +4	±3	dB	Internal
Rx Receive Power (Each Lane)	-6.3 to +4	±3	dB	Internal

MECHANICAL DIMENSIONS (UNIT: mm)