

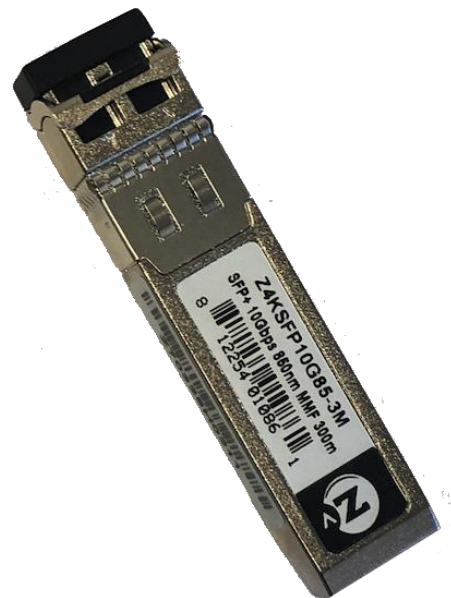
## Datasheet

### 10GBASE-SR SFP+ 1310nm 10km DOM Transceiver

ZeeVee Part #: Z4KSFP10G31-10K

#### Features:

- Hot-pluggable SFP+ footprint
- Supports 9.95 to 10.5 Gb/s bit rates
- Power dissipation < 1W
- RoHS-6 compliant (lead-free)
- Industrial temperature range - 40°C to 85°C
- Single 3.3V power supply
- Maximum link length of 10km
- Uncooled 1310nm DFB laser
- Receiver limiting electrical interface
- Duplex LC connector
- Built-in digital diagnostic functions



#### Description

10Gb/s SFP+ transceivers are designed for use in 10-Gigabit Ethernet links over Single Mode fiber. They are compliant with SFF-8431, SFF-8432, IEEE 802.3ae 10GBASE-LR/LW and 10G Fibre Channel 1200-SM-LL-L. Digital diagnostics functions are available via a 2-wire serial interface.

The transceiver is a “limiting module”, i.e., it employs a limiting receiver. Host board designers using an EDC PHY IC should follow the IC manufacturer's recommended settings for interoperating the host-board EDC PHY with a limiting receiver SFP+ module. The optical transceivers are compliant per the RoHS Directive 2011/65/EU.

## Product Specifications

### I. General Specifications

Parameter	Symbol	Min	Typ.	Max	Unit	Note
Bit Rate	BR	9.95		10.5	Gb/s	1
Bit Error Ratio	BER			10 <sup>-12</sup>		2
Max. Supported Link Length	L <sub>MAX</sub>		10		km	1

Notes:

1. 10GBASE-LR, 10GBASE-LW, 1200-SM-LL-L 10GFC.
2. Tested with a 2<sup>31</sup> – 1 PRBS.

### II. Absolute Maximum Ratings

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Maximum Supply Voltage	V <sub>CC</sub>	-0.5		4.0	V	
Storage Temperature	T <sub>S</sub>	-40		85	° C	
Case Operating Temperature	T <sub>OP</sub>	-40		85	° C	
Relative Humidity	RH	0		85	%	1
Receiver Optical Damage Threshold	RxDamage	5			dBm	

Note: 1. Non-condensing

### III. Electrical Characteristics ( $T_{OP} = 0$ to $70^{\circ}C$ , $V_{CC} = 3.14$ to $3.46V$ )

Parameter	Symbol	Min	Typ.	Max	Unit	Ref.
Supply Voltage	$V_{CC}$	3.14	3.30	3.46	V	
Supply Current	$I_{CC}$		200	285	mA	
<b>Transmitter (Tx)</b>						
Input differential impedance	$R_{in}$		100	120	$\Omega$	1
Differential data input swing	$V_{in,pp}$	180		850	mV	
Transmit Disable Voltage	$V_D$	2		$V_{CC}$	V	
Transmit Enable Voltage	$V_{EN}$	$V_{ee}$		0.8	V	
<b>Receiver (Rx)</b>						
Differential data output swing	$V_{out,pp}$	300		850	mV	2,5
Output rise time and fall time	$T_r, T_f$	28			ps	3
LOS Fault	$V_{LOS\ fault}$	2		$V_{CC}$	V	4
LOS Normal	$V_{LOS\ norm}$	$V_{ee}$		0.8	V	4
Power Supply Noise Tolerance	$V_{CC1}/V_{CCR}$	Per SFF-8431 Rev 4.1			mVpp	

#### Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Into  $100\Omega$  differential termination.
3. 20 – 80%. Measured with Module Compliance Test Board and OMA test pattern. Use of four 1's and four 0's in sequence in the PRBS9 is an acceptable alternative. SFF-8431 Rev 4.1
4. LOS is an open collector output. Should be pulled up with  $4.7k\Omega$  –  $10k\Omega$  on the host board. Normal operation is logic 0; loss of signal is logic 1.
5. The transceiver is a "limiting module", i.e., it employs a limiting receiver. Host board designers using an EDC PHY IC should follow the IC manufacturer's recommended settings for interoperating the host-board EDC PHY with a limiting receiver SFP+ module.

IV. Optical Characteristics (T<sub>OP</sub> = 0 to 70C, V<sub>CC</sub> = 3.14 to 3.46V)

Parameter	Symbol	Min	Typ.	Max	Unit	Note	
<b>Transmitter</b>							
Optical Modulation Amplitude (OMA)	P <sub>OMA</sub>	-5.2			dBm		
Average Launch Power	P <sub>AVE</sub>	-8.2		+0.5	dBm	1	
Optical Wavelength	λ	1260		1355	nm		
Side-Mode Suppression Ratio	SMSR	30			dB		
Optical Extinction Ratio	ER	3.5			dB		
Transmitter and Dispersion Penalty	TDP			3.2	dB		
Average Launch power when Tx is OFF	P <sub>OFF</sub>			-30	dBm		
Tx Jitter	Txj	Per 802.3ae requirements					
Relative Intensity Noise	RIN			-128	dB/Hz		
<b>Receiver</b>							
Receiver Sensitivity (OMA) @ 10.3Gb/s	R <sub>SENS1</sub>			-12.6	dBm	2	
Receiver Sensitivity (OMA) @ 10.3Gb/s	R <sub>SENS2</sub>			-10.3	dBm	3	
Average Receive Power	P <sub>AVE</sub>	-14.2		+0.5	dBm		
Optical Center Wavelength	λ <sub>C</sub>	1260		1600	nm		
Receiver Reflectance	Rrx			-12	dB		

LOS De-Assert LOS De-Assert  $LOS_D$  -17 dBm

LOS Assert  $LOS_A$  -30 dBm

LOS Hysteresis 0.5 dB

**Notes:**

1. Average Power figures are informative only, per IEEE802.3ae.
2. Valid between 1260 and 1355nm. Measured with worst ER; BER<10-12; 231 – 1 PRBS.
3. Valid between 1260 and 1355nm. Per IEEE 802.3ae.

V. Digital Diagnostic Specifications

10GBASE-LR SFP+ transceivers can be used in host systems that require either internally or externally calibrated digital diagnostics.

Parameter	Symbol	Min	Typ.	Max	Units	Ref.
Accuracy						
Internally measured transceiver temperature	$\Delta DD_{Temperature}$			3	°C	
Internally measured transceiver supply voltage	$\Delta DD_{Voltage}$			3	%	
Measured TX bias current	$\Delta DD_{Bias}$			10	%	1
Measured TX output power	$\Delta DD_{Tx-Power}$			2	dB	
Measured RX received average optical power	$\Delta DD_{Rx-Powe}$			2	dB	

Dynamic Range for Rated Accuracy					
Internally measured transceiver temperature	DD <sub>Temperature</sub>	-40		85	°C
Internally measured transceiver temperature	DD <sub>Voltage</sub>	3.1		3.5	V
Measured TX bias current	DD <sub>Bias</sub>	10		90	mA
Measured TX output power	DD <sub>Tx-Power</sub>	-8.2		+0.5	dBm
Measured RX received average optical power	DD <sub>Rx-Powe</sub>	-14.2		+0.5	dBm
Max Reporting Range					
Internally measured transceiver temperature	DD <sub>Temperature</sub>	-40		125	°C
Internally measured transceiver supply voltage	DD <sub>Voltage</sub>	2.8		4.0	V
Measured TX bias current	DD <sub>Bias</sub>	0		20	mA
Measured TX output power	DD <sub>Tx-Power</sub>	-10		+2	dBm
Measured RX received average optical power	DD <sub>Rx-Power</sub>	-22		+2	dBm

**Notes:**

1. Accuracy of Measured Tx Bias Current is 10% of the actual bias current from the laser driver to the laser.

## VI. Pin Description

Pin	Symbol	Name/Description	Ref.
1	$V_{EET}$	Transmitter Ground	1
2	$T_{FAULT}$	Transmitter Fault	2
3	$T_{DIS}$	Transmitter Disable. Laser output disabled on high or open.	3
4	SDA	2-wire Serial Interface Data Line	2
5	SCL	2-wire Serial Interface Clock Line	2
6	MOD_ABS	Module Absent. Grounded within the module	2
7	RS0	Rate Select 0.	4
8	RX_LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	RS1	Rate Select 1.	4
10	$V_{EER}$	Receiver Ground	1
11	$V_{EER}$	Receiver Ground	1
12	RD-	Receiver Inverted DATA out. AC Coupled.	
13	RD+	Receiver Non-inverted DATA out. AC Coupled.	
14	$V_{EER}$	Receiver Ground	1
15	$V_{CCR}$	Receiver Power Supply	
16	$V_{CCT}$	Transmitter Power Supply	
17	$V_{EET}$	Transmitter Ground	1

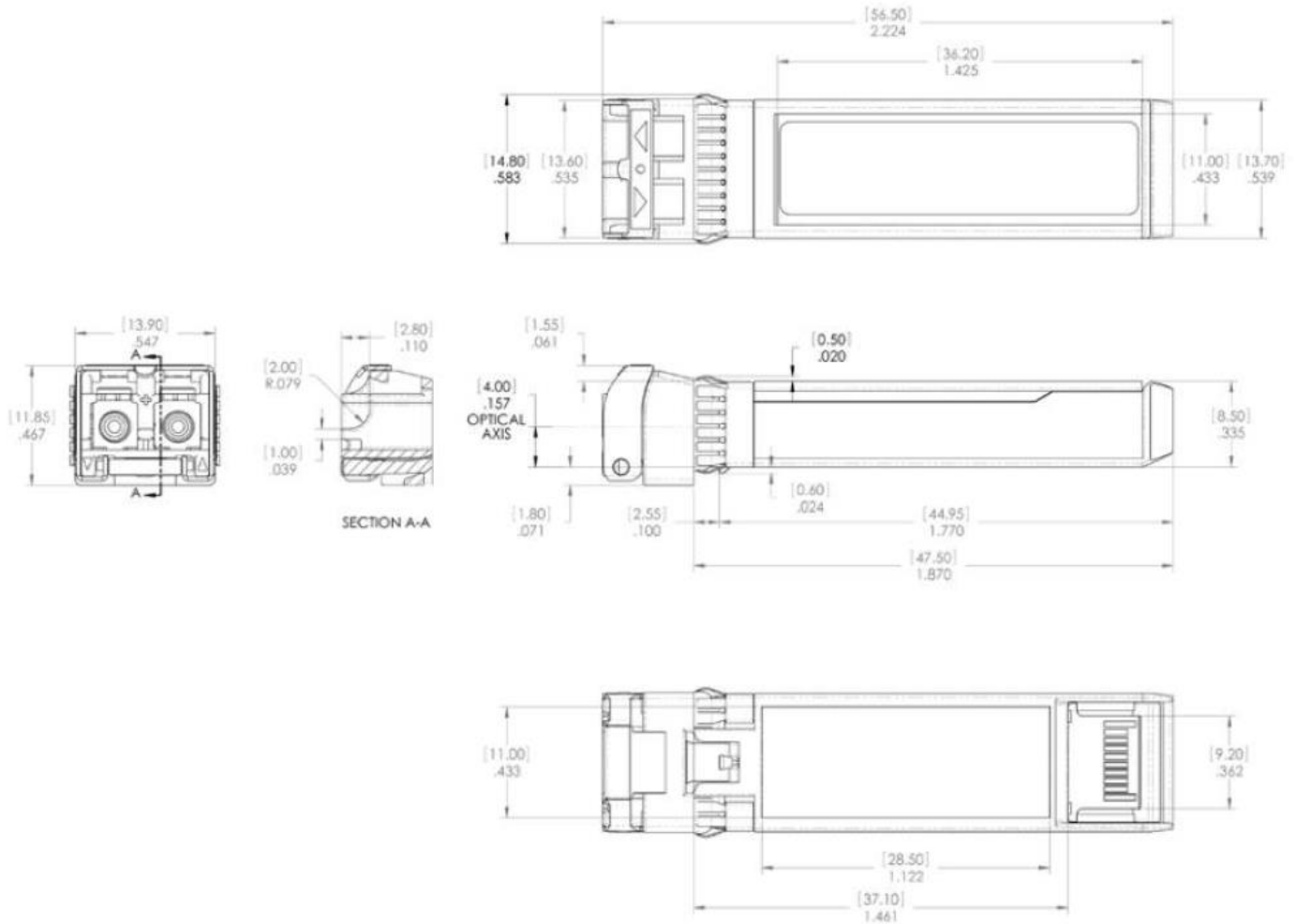
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	V <sub>EET</sub>	Transmitter Ground	1

**Notes:**

1. Circuit ground is internally isolated from chassis ground.
2. T FAULT is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to V<sub>CC</sub> + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on T<sub>DIS</sub> >2.0V or open, enabled on T<sub>DIS</sub> <0.8V.
4. Internally pulled down per SFF-8431 Rev 2.0. See Sec. X for the logic table to use for the internal CDRs locking modes.
5. LOS is open collector output. Should be pulled up with 4.7kΩ – 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.



## VII. Mechanical Specifications



### Order Information

Part Number	Description	Distance
Z4KSFP10G85-3M	Fiber Optic Transceiver, SFP+ 10Gbps 850nm MMF	300m
Z4KSFP10G31-10K	Fiber Optic Transceiver, SFP+ 10Gbps 1310nm SMF	10km