

## Product Features

- Specifications according to DWDM SFP MSA, revision 1.0
- Enhanced digital diagnostic monitoring available
- DWDM with 100GHz ITU grid
- C-band coverage
- Up to 1.25Gb/s bi-directional data links
- Duplex LC connector compliant
- Single +3.3V DC power supply
- Hot-pluggable SFP footprint
- Class 1 laser safety certified
- Operating temperature Option
  - (Commercial) 0°C to +70°C
- Up to 40km transmission
- RoHS Compliant



## Applications

- Amplified DWDM networks
- Ethernet over WDM
- Fiber Channel over WDM

## Descriptions

LX14xxCDS SFP transceivers, according to SFP Multi-Sourcing Agreement (MSA) SFF-8074i and DWDM SFP MSA revision 1.0, are designed for Gigabit Ethernet Dense Wavelength Division Multiplexing (DWDM) networking systems. The operating wavelengths can cover C-band.

LX14xxCDS feature an enhanced Digital Diagnostic Monitoring (DDM) function.

## Ordering Information

**Table 1. Ordering Information**

Part Number	Transmitter	Output Power	Receiver	Sensitivity	Reach	Temp	DDM	RoHS
LX14xxCDS	DWDM DFB	0~ +4dBm	PIN	< -20dBm	40km	0 ~ 70 °C	Available	Compliant

**Notes:** See Table 2 – Wavelength Guide for “xx” value.

**Table 2. Wavelength Guide for “xx” value (100GHz ITU-T channel)**

Channel #	Product Part Number	Frequency (THz)	Center Wavelength (nm)
17	LX1417CDS	191.7	1563.86
18	LX1418CDS	191.8	1563.05
19	LX1419CDS	191.9	1562.23
20	LX1420CDS	192.0	1561.42
21	LX1421CDS	192.1	1560.61
22	LX1422CDS	192.2	1559.79
23	LX1423CDS	192.3	1558.98
24	LX1424CDS	192.4	1558.17
25	LX1425CDS	192.5	1557.36
26	LX1426CDS	192.6	1556.55
27	LX1427CDS	192.7	1555.75
28	LX1428CDS	192.8	1554.94
29	LX1429CDS	192.9	1554.13
30	LX1430CDS	193.0	1553.33
31	LX1431CDS	193.1	1552.52
32	LX1432CDS	193.2	1551.72
33	LX1433CDS	193.3	1550.92
34	LX1434CDS	193.4	1550.12
35	LX1435CDS	193.5	1549.32
36	LX1436CDS	193.6	1548.51
37	LX1437CDS	193.7	1547.72
38	LX1438CDS	193.8	1546.92
39	LX1439CDS	193.9	1546.12
40	LX1440CDS	194.0	1545.32
41	LX1441CDS	194.1	1544.53
42	LX1442CDS	194.2	1543.73
43	LX1443CDS	194.3	1542.94
44	LX1444CDS	194.4	1542.14
45	LX1445CDS	194.5	1541.35
46	LX1446CDS	194.6	1540.56
47	LX1447CDS	194.7	1539.77
48	LX1448CDS	194.8	1538.98
49	LX1449CDS	194.9	1538.19
50	LX1450CDS	195.0	1537.40
51	LX1451CDS	195.1	1536.61

52	LX1452CDS	195.2	1535.82
53	LX1453CDS	195.3	1535.04
54	LX1454CDS	195.4	1534.25
55	LX1455CDS	195.5	1533.47
56	LX1456CDS	195.6	1532.68
57	LX1457CDS	195.7	1531.90
58	LX1458CDS	195.8	1531.12
59	LX1459CDS	195.9	1530.33
60	LX1460CDS	196.0	1529.55
61	LX1461CDS	196.1	1528.77

## Pin Description

**Table 2. Pin Description**

Pin	Name	Function/Description	Engagement order (Insertion)	Notes
1	VeeT	Transmitter Ground	1	-
2	TX Fault	Transmitter Fault Indication	3	1
3	TX Disable	Transmitter Disable-Module disables on high or open	3	2
4	MOD-DEF2	Module Definition 2-Two wire serial ID interface	3	3
5	MOD-DEF1	Module Definition 1-Two wire serial ID interface	3	3
6	MOD-DEF0	Module Definition 0-Grounded in module	3	3
7	Rate Select	Not Connected	3	-
8	LOS	Loss of Signal	3	4
9	VeeR	Receiver Ground	1	-
10	VeeR	Receiver Ground	1	-
11	Veer	Receiver Ground	1	-
12	RD-	Inverse Received Data out	3	5
13	RD+	Received Data out	3	5
14	VeeR	Receiver Ground	1	-
15	VccR	Receiver Power - +3.3V±5%	2	6
16	VccT	Transmitter Power - +3.3 V±5%	2	6
17	VeeT	Transmitter Ground	1	-
18	TD+	Transmitter Data In	3	7
19	TD-	Inverse Transmitter Data In	3	7
20	VeeT	Transmitter Ground	1	-

**Notes:**

1. TX Fault is open collector/drain output which should be pulled up externally with a 4.7K -10K resistor on the host board to supply < VccT +0.3V or VccR + 0.3V. When high, this output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to <0.8V.

2. TX Disable input is used to shut down the laser output per the state table below. It is pulled up within the module with a 4.7K -10K resistor.
 

Low (0 – 0.8V):	Transmitter on
Between (0.8V and 2V):	Undefined
High (2.0 – VccT):	Transmitter Disabled
Open :	Transmitter Disabled
3. Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7K -10K resistor on the host board to supply less than VccT+0.3V or VccR+0.3V.
 

Mod-Def 0 is grounded by the module to indicate that the module is present.

Mod-Def 1 is clock line of two wire serial interface for optional serial ID.

Mod-Def 2 is data line of two wire serial interface for optional serial ID.
4. LOS (Loss of signal) is an open collector/drain output which should be pulled up externally with a 4.7K -10K resistor on the host board to supply <VccT+0.3V or VccR+0.3V. When high, this output indicates the received optical power is below the worst case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to <0.8V.
5. RD-/+ : These are the differential receiver outputs. They are AC coupled 100 differential lines which should be terminated with 100 differential at the user SERDES. The AC coupling is done inside the module and thus not required on the host board.
6. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V±5% at the SFP connector pin. The in-rush current will typically be no more than 30mA above steady state supply current after 500ns.
7. TD-/+ : These are the differential transmitter inputs. They are AC coupled differential lines with 100 differential termination inside the module. The AC coupling is done inside the module and is thus not required on host board.

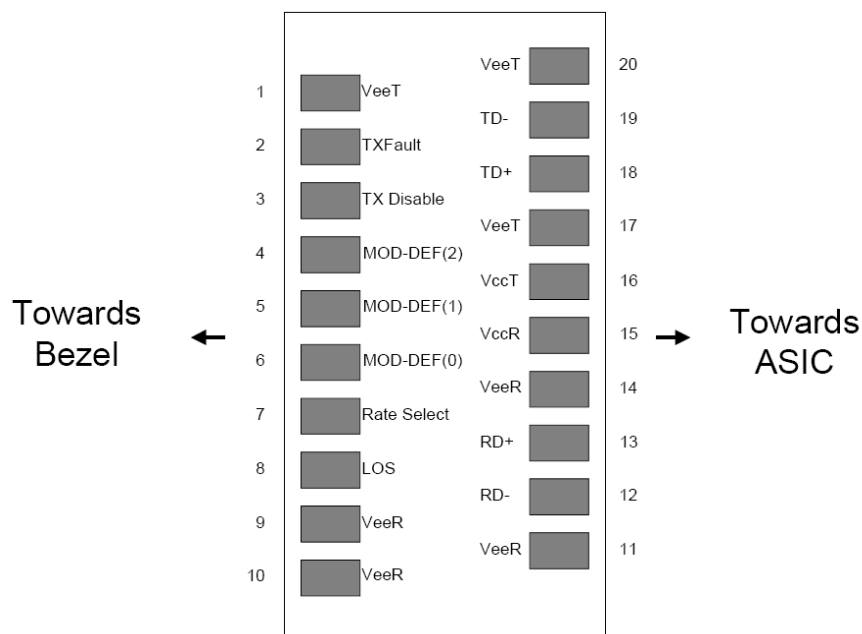


Figure 1. Diagram of Host Board Connector Block Pin Numbers and Names

## Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

**Table 3. Absolute Maximum Ratings**

Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	T <sub>S</sub>	-40	85	°C
Relative Humidity	RH	5	95	%
Supply Voltage	V <sub>CC</sub>	-0.5	4.0	V

## Recommended Operating Conditions

**Table 4. Recommended Operating Conditions**

Parameter	Symbol	Min	Typ	Max	Unit
Operating Case Temperature	T <sub>C</sub>	0	25	70	°C
Supply Voltage	V <sub>CC</sub>	3.135	3.3	3.465	V
Data Rate	-	-	1.25	-	Gb/s

## Transceiver Electrical Characteristics

**Table 5. Transceiver Electrical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Module Supply Current	I <sub>CC</sub>	-	-	450	mA	-
Transmitter Differential Input Voltage (TD +/-)	-	200	-	2400	mV <sub>P-P</sub>	1
Receiver Differential Output Voltage (RD +/-)	-	600	-	1200	mV <sub>P-P</sub>	2
Low speed output: Transmitter Fault(TX_FAULT) / Loss of Signal (LOS)	VOH	2.0	-	V <sub>CC</sub>	V	3
	VOL	0	-	0.8	V	-
Low speed output: Transmitter Disable (TX_DISABLE), MOD_DEF 1, MOD_DEF 2	VOH	2.0	-	V <sub>CC</sub>	V	4
	VOL	0	-	0.8	V	-

**Notes:**

1. Internally AC coupled and terminated to 100 differential load.
2. Internally AC coupled, but requires a 100 differential termination or internal to Serializer/Deserializer.
3. Pulled up externally with a 4.7K -10K resistor on the host board to V<sub>CCT,R</sub>.
4. Mod\_Def1 and Mod\_Def2 must be pulled up externally with a 4.7K -10K resistor on the host board to V<sub>CCT,R</sub>.

## Transmitter Optical Characteristics

**Table 6. Transmitter Optical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Launch Optical Power	P <sub>o</sub>	0	-	+4	dBm	-
Center Wavelength Spacing	-	-	100	-	GHz	-
Wavelength Stability	Δλ <sub>c</sub>	-0.1		+0.1	nm	-
Extinction Ratio	EX	8.0	-	-	dB	-
Spectral Width (-20dB)	Δλ	-	-	0.3	nm	-
Side Mode Suppression Ratio	SMSR	30	-	-	dB	-
Total Jitter	TJ	-	-	0.075	UI	-
Dispersion Penalty	-	-	-	3	dB	-
Optical Rise/Fall Time	T <sub>rise</sub> /T <sub>fall</sub>	-	-	260	ps	-
Pout @TX-Disable Asserted	P <sub>off</sub>	-	-	-30	dBm	-
Eye Diagram	IEEE Std 802.3-2005 Gigabit Ethernet 1000BASE compatible					

## Receiver Optical Characteristics

**Table 7. Receiver Optical Characteristics**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Notes
Receiver Sensitivity	S	-	-	-20	dBm	1
Receiver Overload	P <sub>OL</sub>	-1	-	-	dBm	1
Optical Return Loss	ORL	27	-	-	dB	
LOS De-Assert	LOS <sub>D</sub>	-	-	-22	dBm	-
LOS Assert	LOS <sub>A</sub>	-35	-	-	dBm	-
LOS Hysteresis	-	0.5	3	5	dB	-

**Notes:**

1. Measured with PRBS 2<sup>7</sup>-1 test pattern, 1.25Gb/s, EX=8dB, BER<10<sup>-12</sup>.

## Digital Diagnostic Memory Map

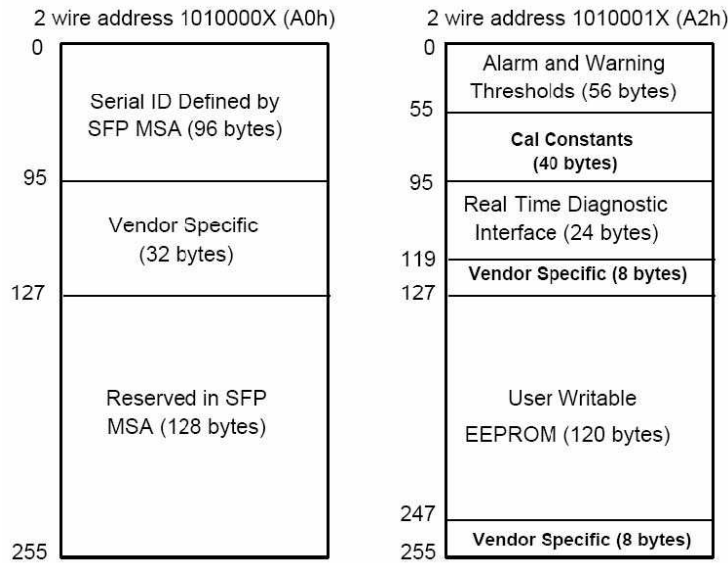


Figure 2. Digital Diagnostic Memory Map Specific Data Field Descriptions

## Diagnostic Monitor Specifications

The digital diagnostic monitoring interface also defines another 256-byte memory map in EEPROM, which makes use of the 8 bit address 1010001X (A2h). Please see Figure 2. For detail EEPROM information, please refer to the related document of SFF-8472 Rev 9.5. The monitoring specification of this product is described in Table 8.

**Table 8. Diagnostic Monitor Specifications**

Parameter	Range	Accuracy	Calibration
Temperature	-10 to +80 C	±3 C	Internal
Voltage	3.0 to 3.6V	±3%	Internal
Bias Current	0 to 100mA	±10%	Internal
TX Power	-2 to +5dBm	±3dB	Internal
RX Power	-22 to 0dBm	±3dB	Internal

## Required Host Board Components

The MSA power supply noise rejection filter is required on the host PCB to meet data sheet performance. The MSA filter incorporates an inductor which should be rated 400mA DC and 1 serial resistance or better. It should not be replaced with a ferrite. The required filter is illustrated in Figure 3. The MSA also specifies that 4.7K to 10K pull-up resistors for TX\_FAULT, LOS, and MOD\_DEF0,1,2 are required on the host PCB. Figure is the suggested transceiver/host interface.

Figure 3 shows the recommended host board power supply circuit.

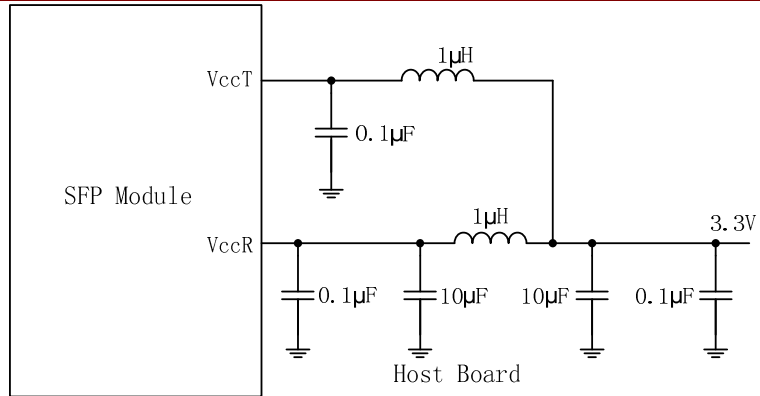


Figure 3. Recommended Host Board Power Supply Circuit

## Recommended Application Interface Circuit

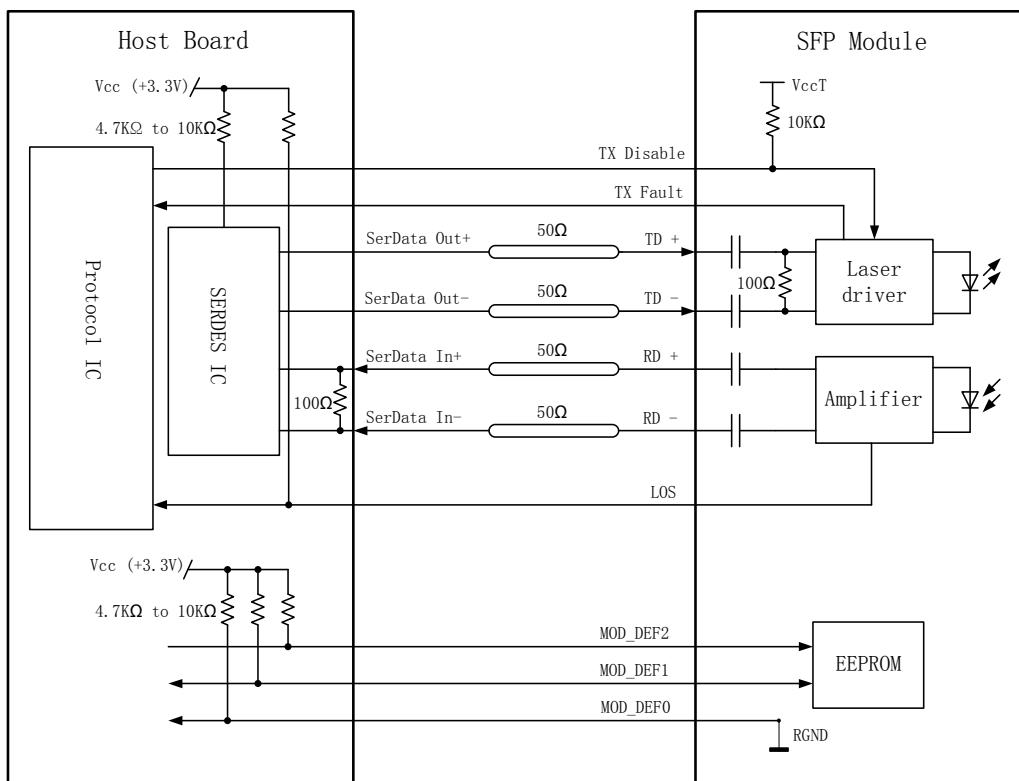


Figure 4. Recommended Application Interface Circuit



## Mechanical specifications

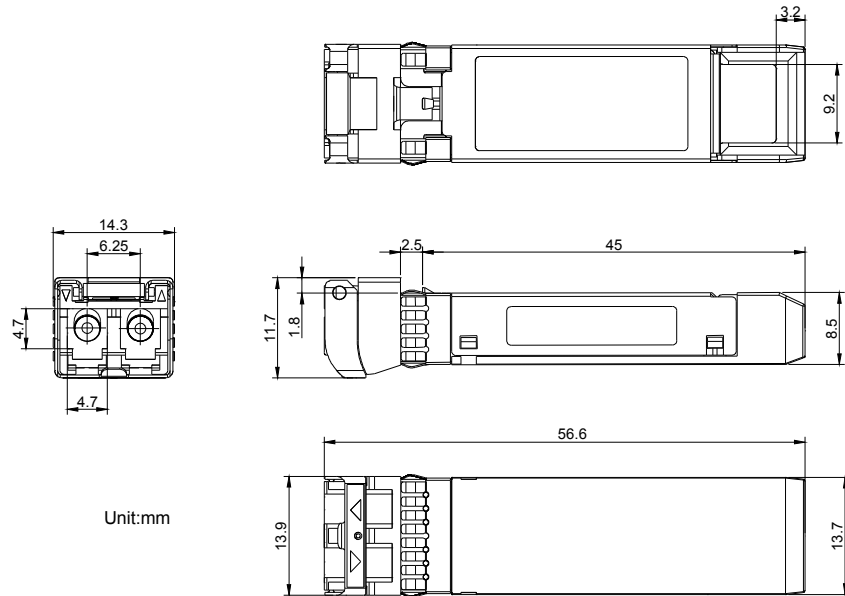
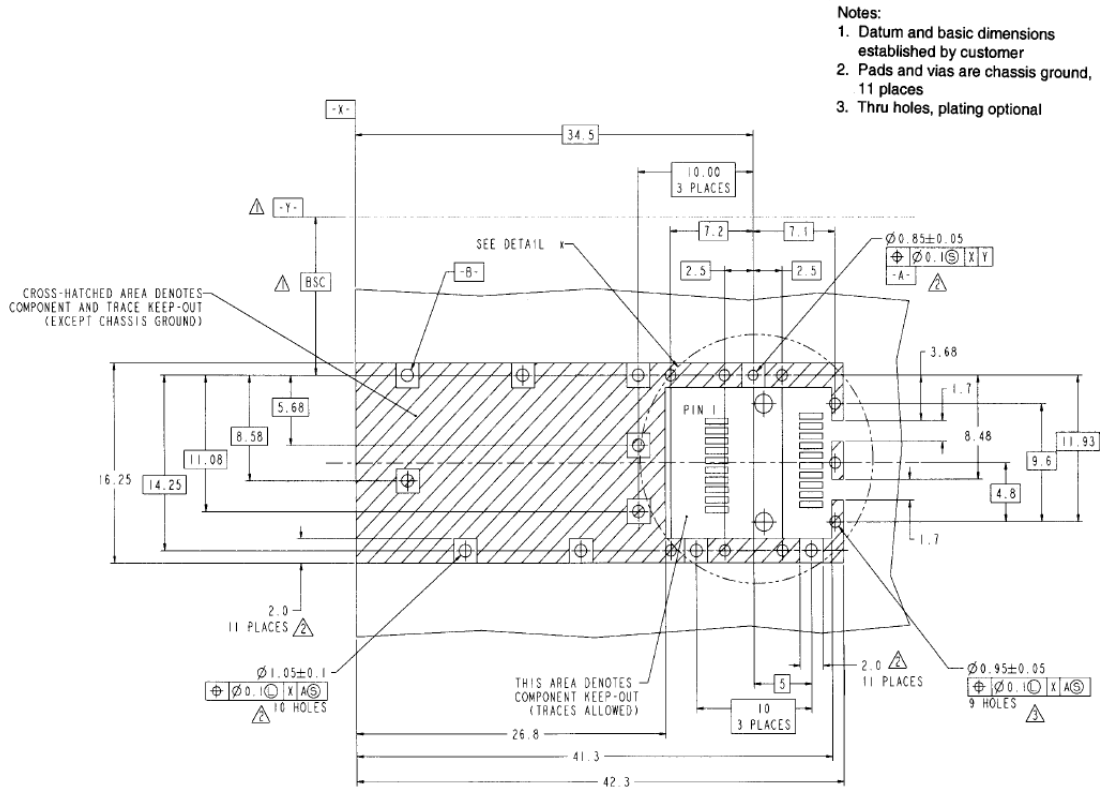


Figure 5. Outline Drawing

## PCB layout recommendation



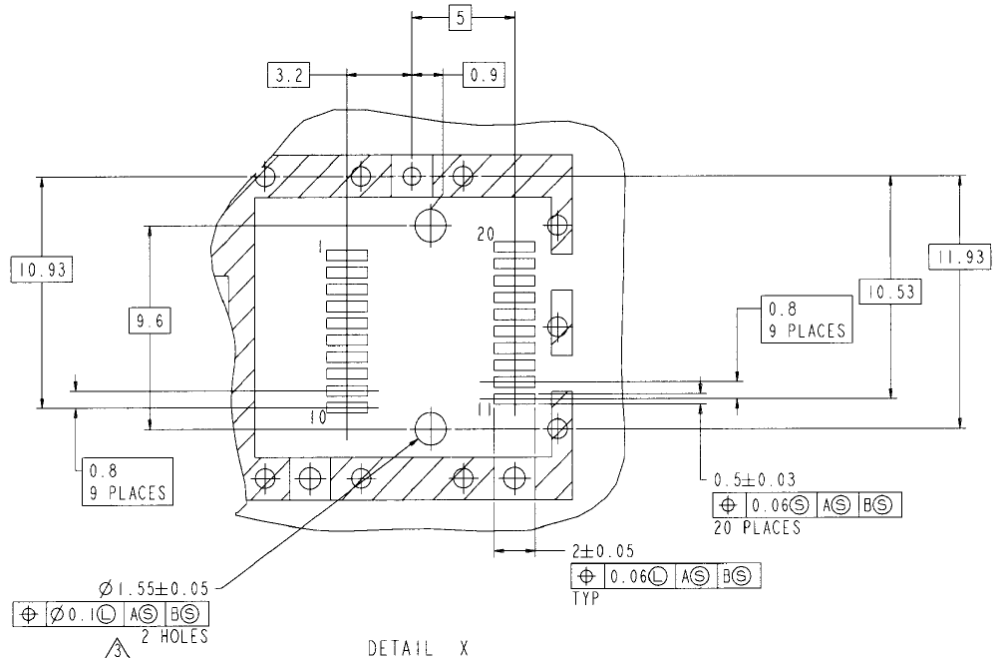


Figure 6. PCB layout recommendation

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