Features

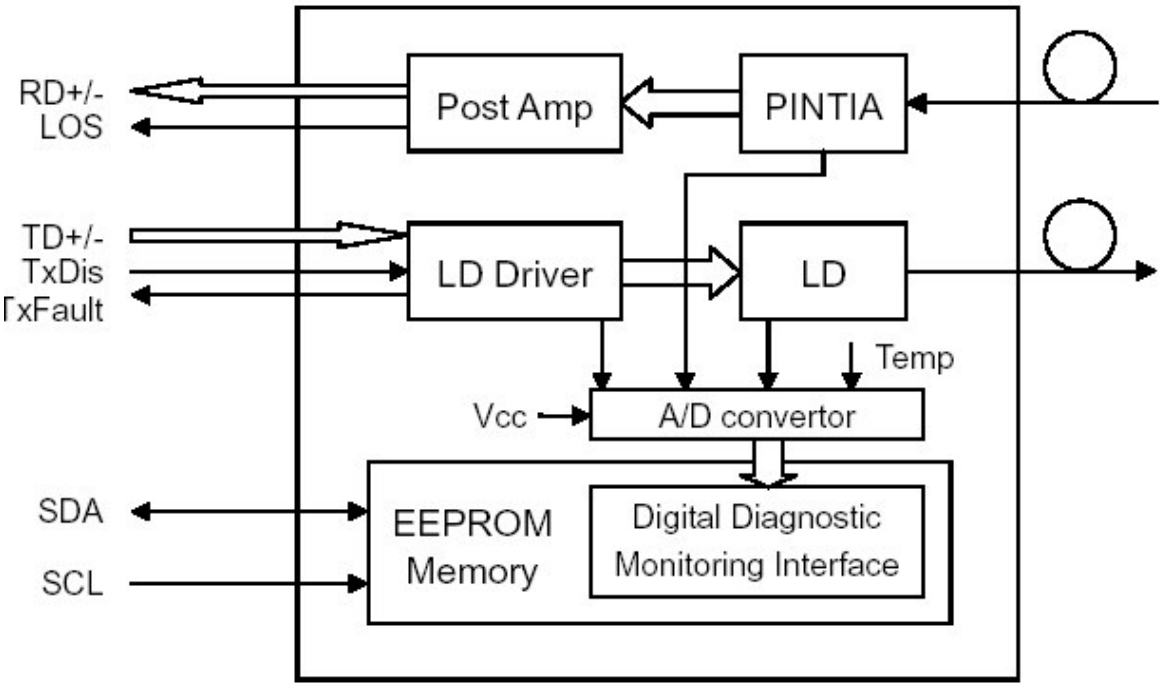
- Transceiver unit with independent
  - 1550nm DFB Laser diode transmitter
  - InGaAs PIN photodiode receiver
- Meet SFF MSA and SFF-8472 with duplex LC receptacle
- Digital diagnostic monitoring
- Hot-pluggable
- Metal enclosure for lower EMI
- +3.3V Single power supply
- Qualified to meet the intent of Bellcore reliability practices
- LVPECL logic interface simplifies interface to external circuitry
- LVTTL logic Signal level RX LOS
- With pull de-latch
- Links of 100km with 9/125 μm single mode fiber (SMF)

Application

- ATM
- SONET/SDH
- Ethernet
- Switches
- Routers
- Hubs

General

The optical transceiver is compliant with the Small Form- Factor Pluggable (SFP)Multi-Source Agreement (MSA) and SFF-8472. It offers previously unavailable system cost, upgrade, and reliability benefits by virtue of being hot-pluggable.



Transmitter Section

Transmitter is designed for single mode fiber and operates at a nominal wavelength of 1550nm. The transmitter module uses a DFB laser diode and full IEC825 and CDRH class 1 eye safety. The output power can be disabled via the single TxDis pin. Logic LVTTL HIGH level disables the transmitter. It contains APC function, temperature compensation circuit, PECL data inputs, LVTTL Txdis input and Tx fault Output interface.

Receiver Section

The receiver section uses a hermetic packaged front end receiver (InGaAs PIN and preamplifier). The postamplifier is ac coupled to preamplifier through a capacitor and a low pass filter. The capacitor and LPF are enough to pass the signal from 5Mb/s to 200Mb/s without significant distortion or performance penalty. The LPF limits the preamplifier bandwidth to improve receiver sensitivity. As the input optical is decreased, LOS will switch from low to high. As the input optical power is increased from very low levels, LOS will switch back from high to low.

EEPROM Section

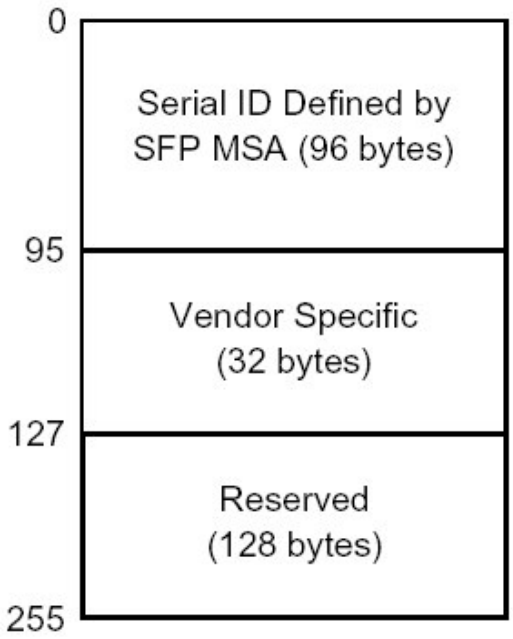
The optical transceiver contains an EEPROM. It provides access to sophisticated identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C01A/02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL, Mod Def 1). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

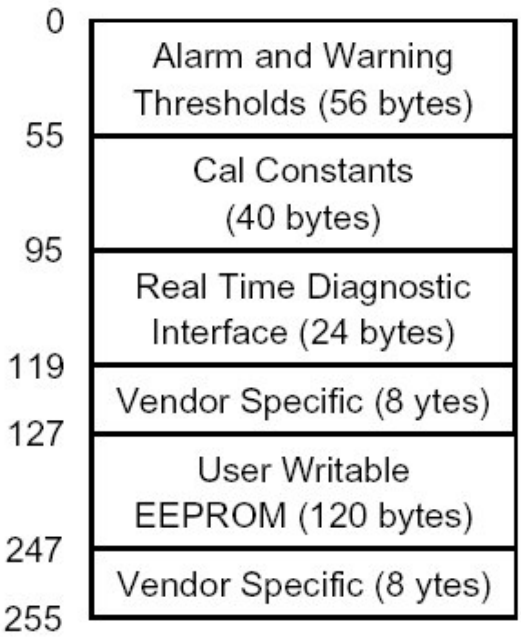
The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power

monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. The diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data field define as following.

Memory Map:



2 wire address 1010000x (A0h)



2 wire address 1010001x (A2h)

EEPROM Serial ID Memory Content (Address A0h):

Data Address	Value (HEX)	Data Address	Value (HEX)	Data Address	Value (HEX)	Data Address	Value (HEX)
0	03	32	20	64	00	96	Note5
1	04	33	20	65	1A	97	Note5
2	07	34	20	66	00	98	Note5
3	00	35	20	67	00	99	Note5
4	08	36	00	68	Note2	100	Note5
5	04	37	00	69	Note2	101	Note5
6	00	38	00	70	Note2	102	Note5
7	00	39	00	71	Note2	103	Note5
8	00	40	50	72	Note2	104	Note5
9	00	41	54	73	Note2	105	Note5
10	00	42	37	74	Note2	106	Note5
11	03	43	36	75	Note2	107	Note5
12	01	44	32	76	Note2	108	Note5
13	00	45	30	77	Note2	109	Note5
14	64	46	2D	78	Note2	110	Note5
15	FF	47	33	79	Note2	111	Note5
16	00	48	31	80	Note2	112	Note5
17	00	49	2D	81	Note2	113	Note5
18	00	50	34	82	Note2	114	Note5
19	00	51	54	83	Note2	115	Note5
20	50	52	44	84	Note2	116	Note5
21	48	53	20	85	Note 3	117	Note5
22	4F	54	20	86	Note 3	118	Note5
23	54	55	20	87	Note 3	119	Note5
24	4F	56	31	88	Note 3	120	Note5
25	4E	57	2E	89	Note 3	121	Note5
26	20	58	31	90	Note 3	122	Note5
27	20	59	20	91	Note 3	123	Note5
28	20	60	06	92	58	124	Note5
29	20	61	0E	93	B0	125	Note5
30	20	62	00	94	1	126	Note5
31	20	63	Note 1	95	Note 1	127	Note5

Note:

1.Byte Addresses 63 and 95 are Check Sums which may vary from module to module.

2.These addresses are reserved for serial number information and will vary from module to module.

3.These addresses are reserved for date code information and may vary from lot to lot.

4.These fields are reserved for use by SHENZHEN PHOTON.

Performance Specifications

Table1. Absolute Maximum Ratings

Parameter	Symbol		Min	Max	Unit
Storage Temperature	Tst		-40	+85	℃
Operating Temperature	To	SSFP5231-43-125	0	40	℃
		SSFP5231-43-225	-40	+85	
Input Voltage	-		GND	Vcc	V
Power Supply Voltage	Vcc-Vee		-0.5	+3.6	V

Note: Stress in excess of maximum absolute ratings can cause permanent damage to the module

Tabel 2. Operating Environment

Parameter	Symbol		Min	Max	Unit
Power Supply Voltage	Vcc		+3.1	+3.5	V
Operating Temperature	Tc	SSFP5231-43-125	0	+70	℃
		SSFP5231-43-225	-40	+85	

Tabel 3. Transmitter electrical and optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Note
Center Wavelength	λ_p	1480	1550	1580	nm	-
Spectral Width	$\Delta\lambda$	-	-	1.0	nm	-
Average Optical Output Power	Po	-5	-	0	dBm	-
Side Mode Suppression Ratio	SMSR	30	-	-	dB	-
Extinction Ratio	EXT	10	-	-	dB	-
Transmitter disable Voltage	V_D	2.0	-	Vcc	V	-
Transmitter Enable Voltage	V_{EN}	0	-	0.8	V	-
Power supply Current	Icc	-	70	180	mA	1
Data Eye Diagram	V_{pp}	300	-	1600	mV	-
Output Eye	Compliant with ITU recommendation G.957					

Table 4.Receiver optical-electrical characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Note
Operate Wavelength	-	1260	-	1580	nm	-
Sensitivity	Pr	-	-37	-34	dBm	2
Saturation	Ps	-10	-	-	dBm	2
LOS Asserted	-	-55	-	-	dBm	Low Level: Alarm
LOS De-Assert	-	-	-	-37	dBm	
LOS Hysteresis	-	-	1.5	-	dB	
LOS LOW voltage	VLout	-	-	0.8	V	-
LOS HIGH voltage	VHout	2.0	-	-	V	-
Power Supply Current	Icc	-	70	180	mA	1
Data Outputs Voltage		400	800	1000	mV	-

Notes:

1. **The current excludes the output load current.**
2. **Minimum Sensitivity and saturation levels for a $2^{23}-1$ PRBS with 72 ones and 72 zeros inserted (ITU recommendation G958).**
3. **RL=50R connected to a level of VCC-2V**

Pin Definition

Pin Out Diagram

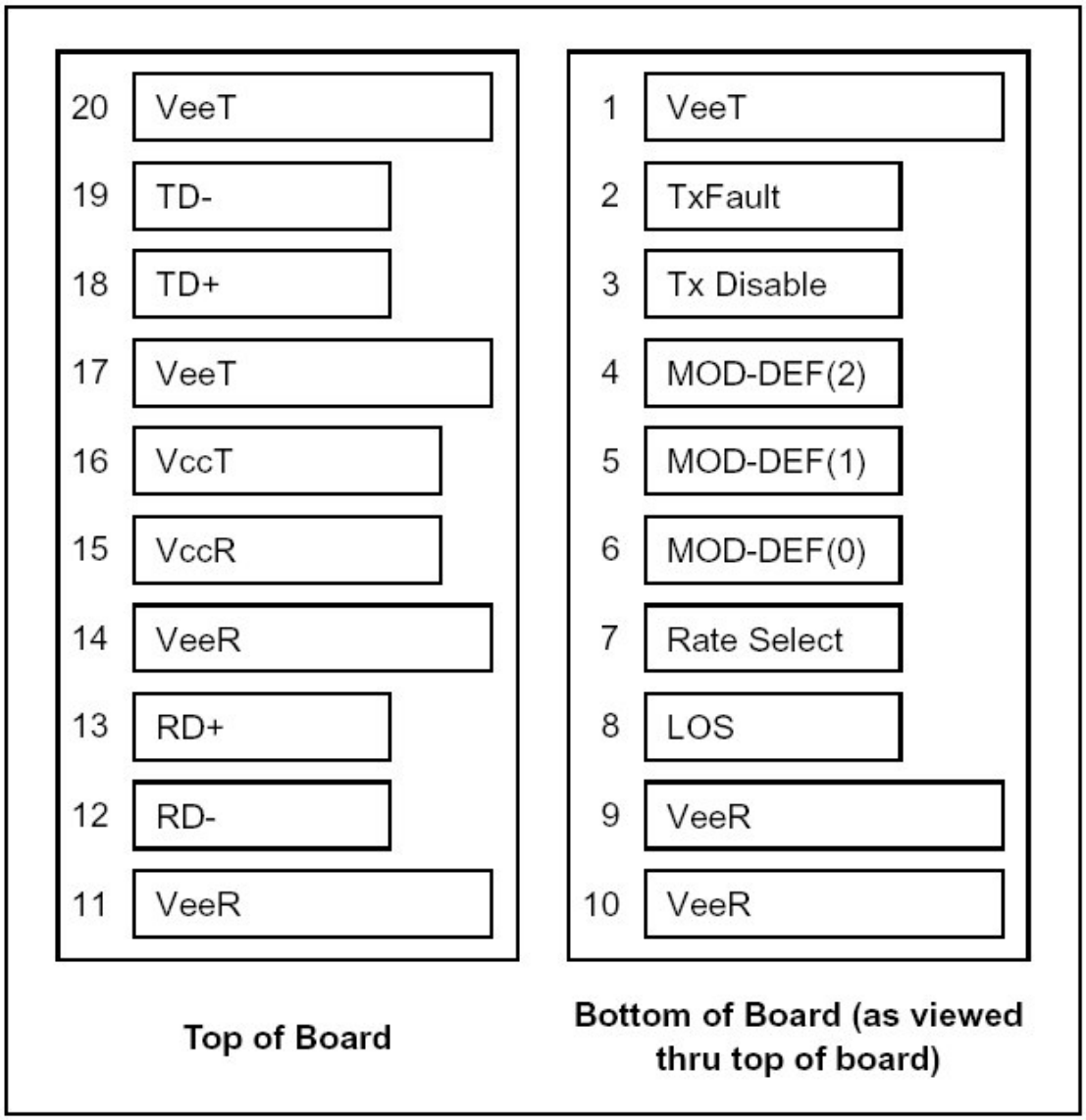


Table 6.Pin Function Definitions

Pin#	Pin Name	Description	Notes
1	VeeT	Transmitter Ground	-
2	TX Fault	Transmitter Fault Indication	Note 1
3	TX Disable	Transmitter Disable	Note 2, Module disables on high or open
4	MOD-DEF2	Module Definition 2	Note3, 2 wire serial ID interface
5	MOD-DEF1	Module Definition 1	Note 3, 2 wire serial ID interface
6	MOD-DEF0	Module Definition 0	Note 3, Grounded in Module
7	Rate Select	Not use	-
8	LOS	Loss of Signal	Note 4
9	VeeR	Receiver Ground	Note 5
10	VeeR	Receiver Ground	Note 5
11	VeeR	Receiver Ground	Note 5
12	RD-	Inv. Received Data Out	Note 6
13	RD+	Receiver Data out	Note 6
14	VeeR	Receiver Ground	Note 5
15	VccR	Receiver Power	Note 7, 3.3V± 5%
16	VccT	Transmitter Power	Note 7, 3.3V± 5%
17	VeeT	Transmitter Ground	Note 5
18	TD+	Transmit Data In	Note 8
19	TD-	Inv. Transmit Data In	Note 8
20	VeeT	Transmitter Ground	Note 5

Note:

1. **TX Fault is an open collector/drain output, which should be pulled up with a 4.7K–10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, 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 is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7–10 KΩ resistor. Its states are:**

   Low (0 – 0.8V): Transmitter on

   (>0.8, < 2.0V): Undefined

   High (2.0 – 3.465V): Transmitter Disabled

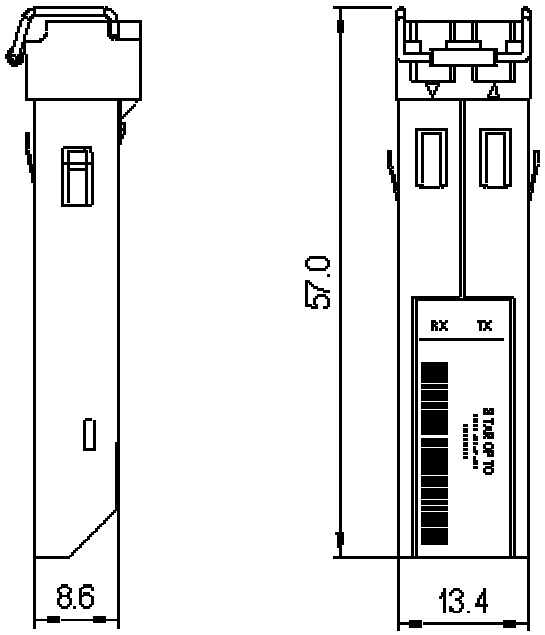
   Open: Transmitter Disabled

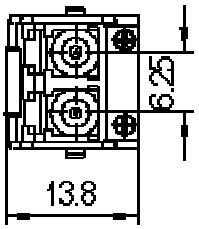
3. **Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K – 10KΩ resistor on the host board. The pull-up voltage shall be VccT or VccR. Mod-Def 0 is grounded by the module to indicate that the module is present Mod-Def 1 is the clock line of two wire serial interface for serial ID Mod-Def 2 is the data line of two wire serial interface for serial ID**
4. **LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+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.

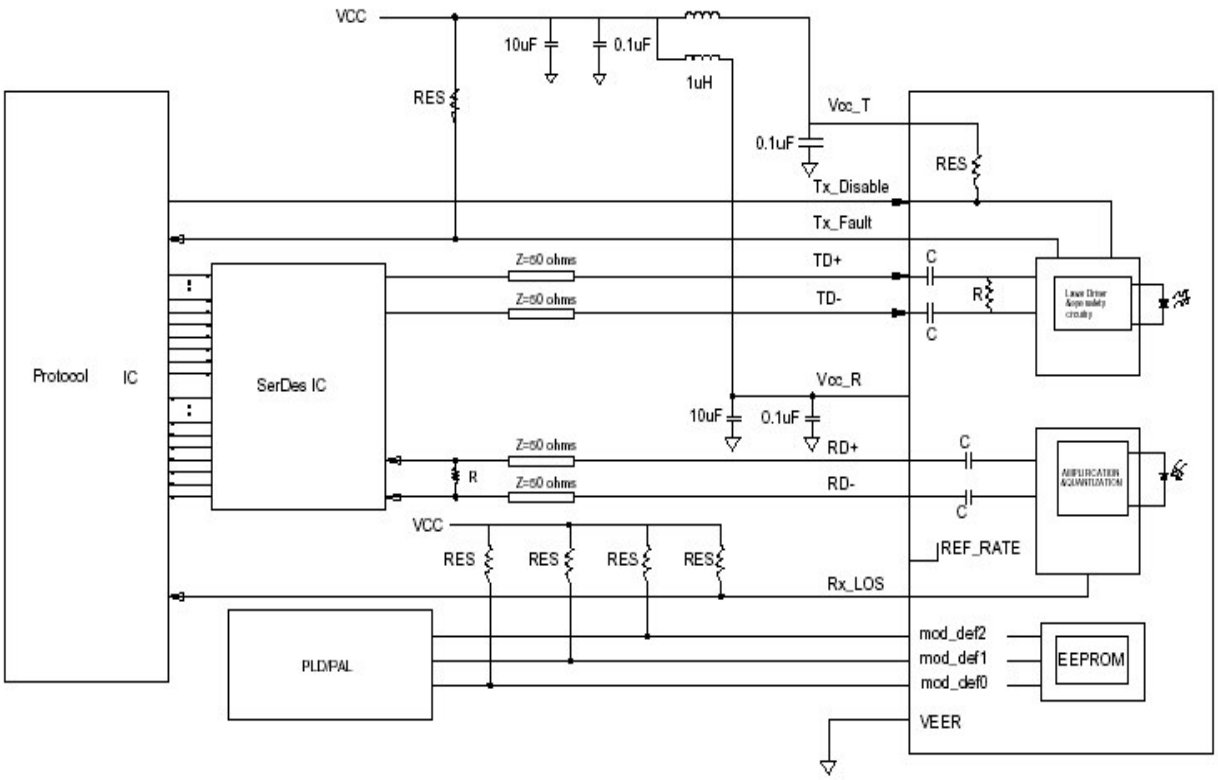
5. **VeeR and VeeT may be internally connected within the SFP module.**
6. **RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.**
7. **VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1Ω should be used in order to maintain the required voltage at the SFP input pin with3.3V supply voltage. When the recommended supply filtering network is used, hotplugging of the SFP transceiver module will result in an inrush current of no more than 30 mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.**
8. **TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.**

Package information



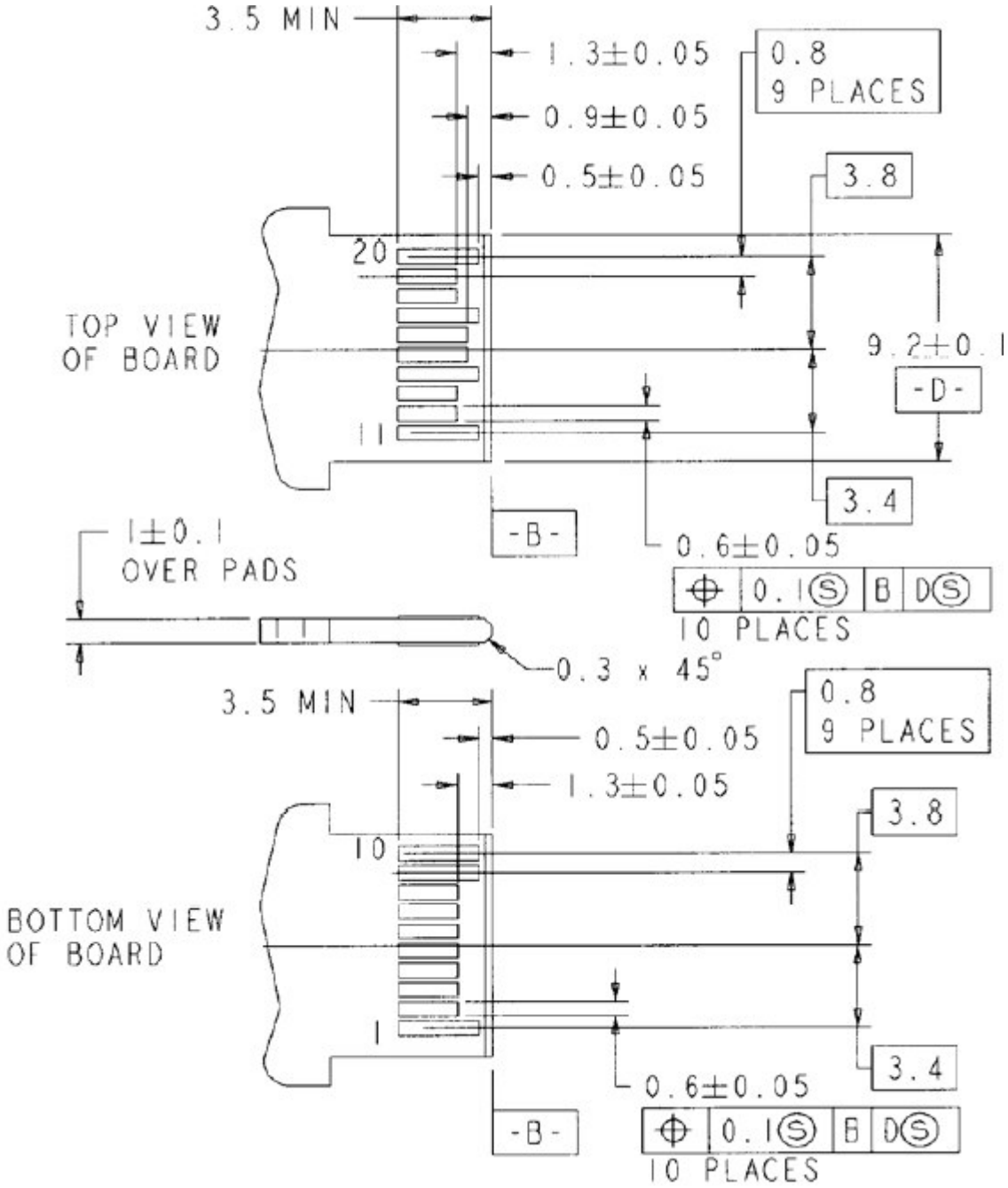


Recommended Circuit



Note:4.7K ohms＜RES＜10k ohms

Recommended Board Layout Hole Pattern



Obtaining Document

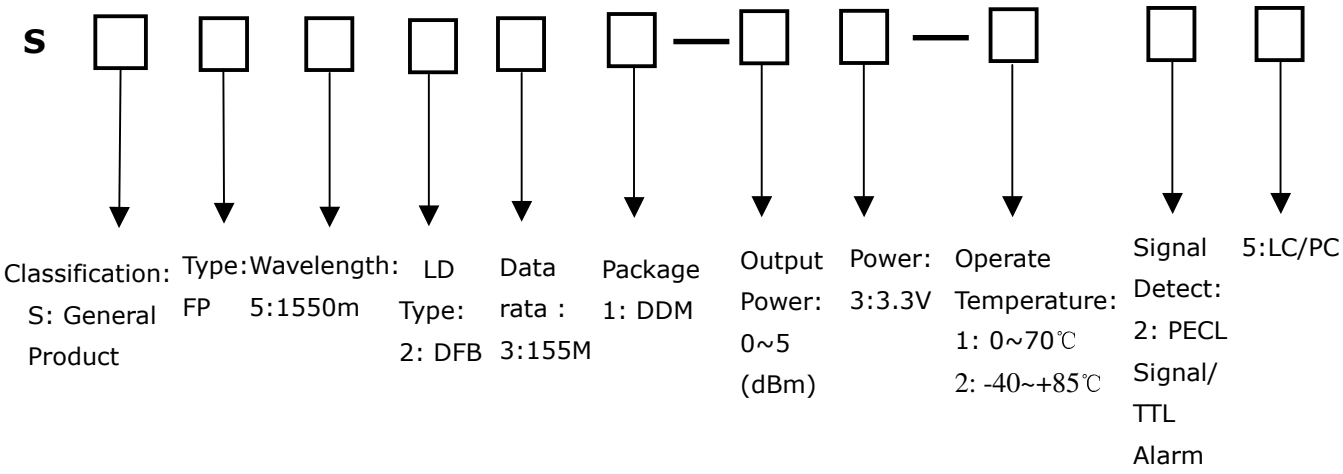
Please visit our website:

Htttp://www.staropto.com

The information contained in this document dose not affect or change Star's product specifications or warranties. Nothing in this document shall operate as an express or implied license or indemnity under the intellectual property rights of Star or third parties. All information contained in this document was obtained in the specific environments, and is presented as an illustration. The results obtained in other operating environment may vary.

THE INFORMATION CONTAINED IN THIS DOCUMENT IS PROVIDED ON AN "AS IS" BASIS. In no event will Star be liable for the damages arising directly from any use of the information contained in this document.

Ordering Information



Part Number	Product Information
SSFP5231-43-125	SFP 1550nm 155Mb/s 0~70℃
SSFP5231-43-225	SFP 1550nm 155Mb/s -40~+85℃