Features

- Single 3.3 V supply
- Up to 500m on 50/125μm MMF, 300m on 62.5/125μm MMF
- Supports 1.0625/2.125/4.25Gb/s Fiber Channel Operation
- Gigabit Ethernet compatible
- 850nm VCSEL laser transmitter
- SFP MSA SFF-8074i compliant
- Digital Diagnostic SFF-8472 compliant
- Compatible with RoHS
- Operating case temperature:
- Standard : 0 to +70°C

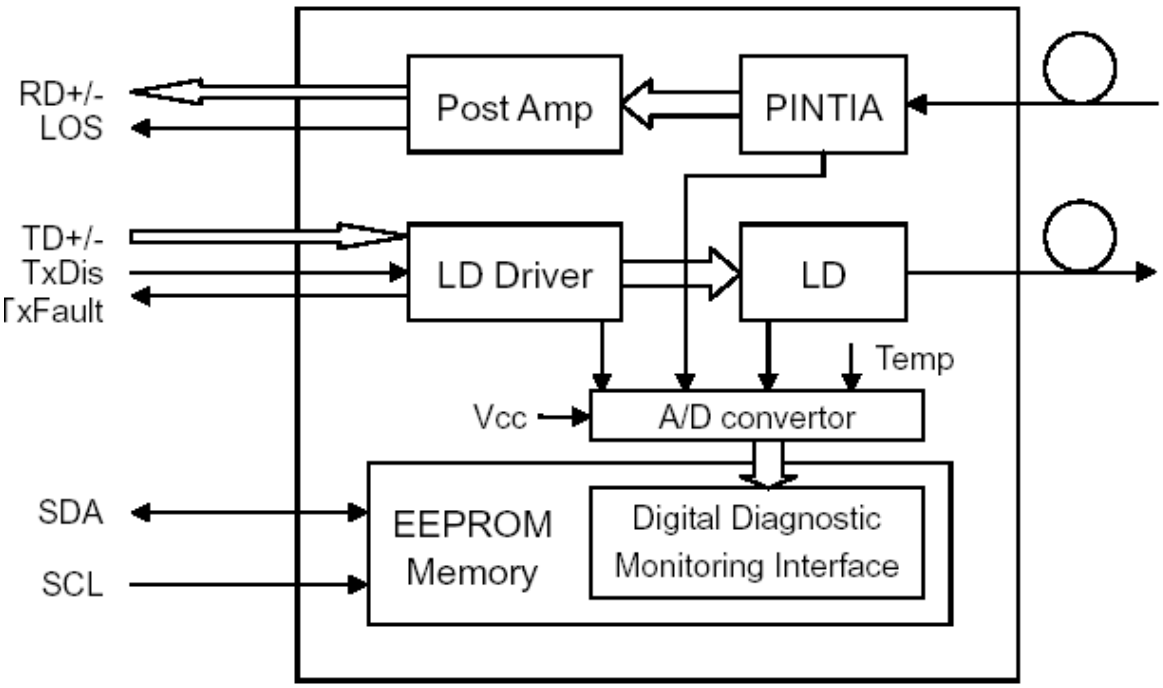
Applications

Tri Rate 1.0625 / 2.125 / 4.25Gbp/s Fiber Channel

1.25Gbp/s 1000Base-LX Ethernet and 1000Base-LX10

Description

The transceiver consists of three sections: a 850nm VCSEL laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I lasersafety requirements.The transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement(MSA)1. They are compatible with Fiber Channel per FC-PI-2 Rev. 10.0. also simultaneously compatiblewith Gigabit Ethernet as specified in IEEE Std 802.3.



Transmitter Section

Transmitter is designed for single mode fiber and operates at a nominal wavelength of 850nm. The transmitter module uses a VCSEL 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, CML 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 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.

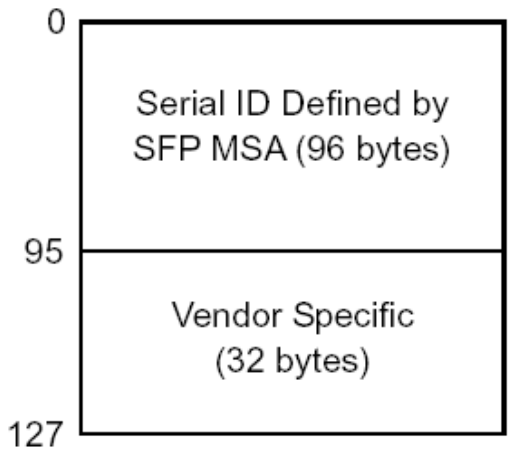
EEPROM Section

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.

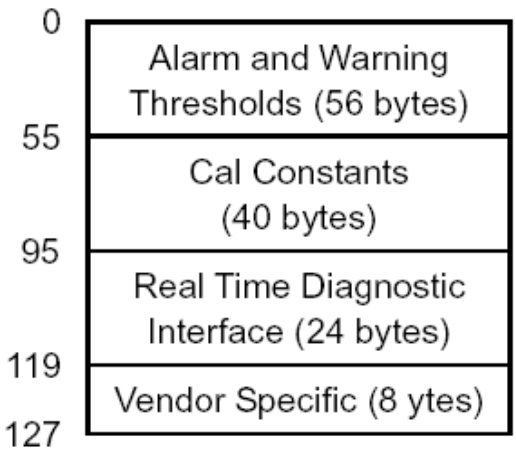
The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C01A/02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL, Mod Def 1). The positive edge clocks data into those segments of the EEPROM that are not 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)

Performance Specifications

Table1 Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	TST	-40	+85	℃
Operating Temperature	To	0	+70	℃
Input Voltage	-	GND	VCC	V
Power Supply Voltage	VCC-VEE	-0.5	+3.6	V

Table2 Operating Environment

Parameter	Symbol	Min.	Max.	Unit
Power Supply Voltage	VCC	+3.1	+3.5	V
Ambient Operating Temperature	TA	0	+70	℃
Power supply current	Icc		240	mA

Table3 Transmitter E-O characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Data Rate				4.25		Gb/S	
Centre Wavelength		λc	830		860	nm	
Spectral Width		Δλ			1	nm	
Average Output Power(BOL)		Pout	-9		-2.5	dBm	1
Extinction Ratio		ER	5			dB	
Average Launch Power-OFF Transmitter		Pout			-45	dBm	
Optical Eye Diagram		Fiber Channel Compliant					
Optical Rise/Fall Time(20%~80%)		tr/tf			120	ns	
Data Input Swing Differential		V_{IN}	300		1800	mV	2
Input Differential Impedance		Z_{IN}	90	100	110	Ω	
TX Disable	Disable		2.0		Vcc	V	
	Enable		0		0.8	V	
TX Fault	Fault		2.0		Vcc	V	
	Normal		0		0.8	V	

Table4 Receiver O-E characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Centre Wavelength	λc	830		860	nm	
Receiver Sensitivity(BOL)	Sen			-15	dBm	3
Receiver Overload	Sat	0			dBm	3
LOS De-Assert	LOS_D			-20	dBm	
LOS Assert	LOS_A	-25			dBm	
LOS Hysteresis		0.5		6	dB	
Receiver Reflectance				-20	dB	
Data Output Swing Differential	V_{out}	350		1800	mV	4
Loss of Signal (LOS) Assert Time	TAssert			500	nS	
Loss of Signal (LOS) DeassertTime	TDeassert			500	nS	
LOS	High	2.0		Vcc	V	
	Low			0.8	V	

Notes:

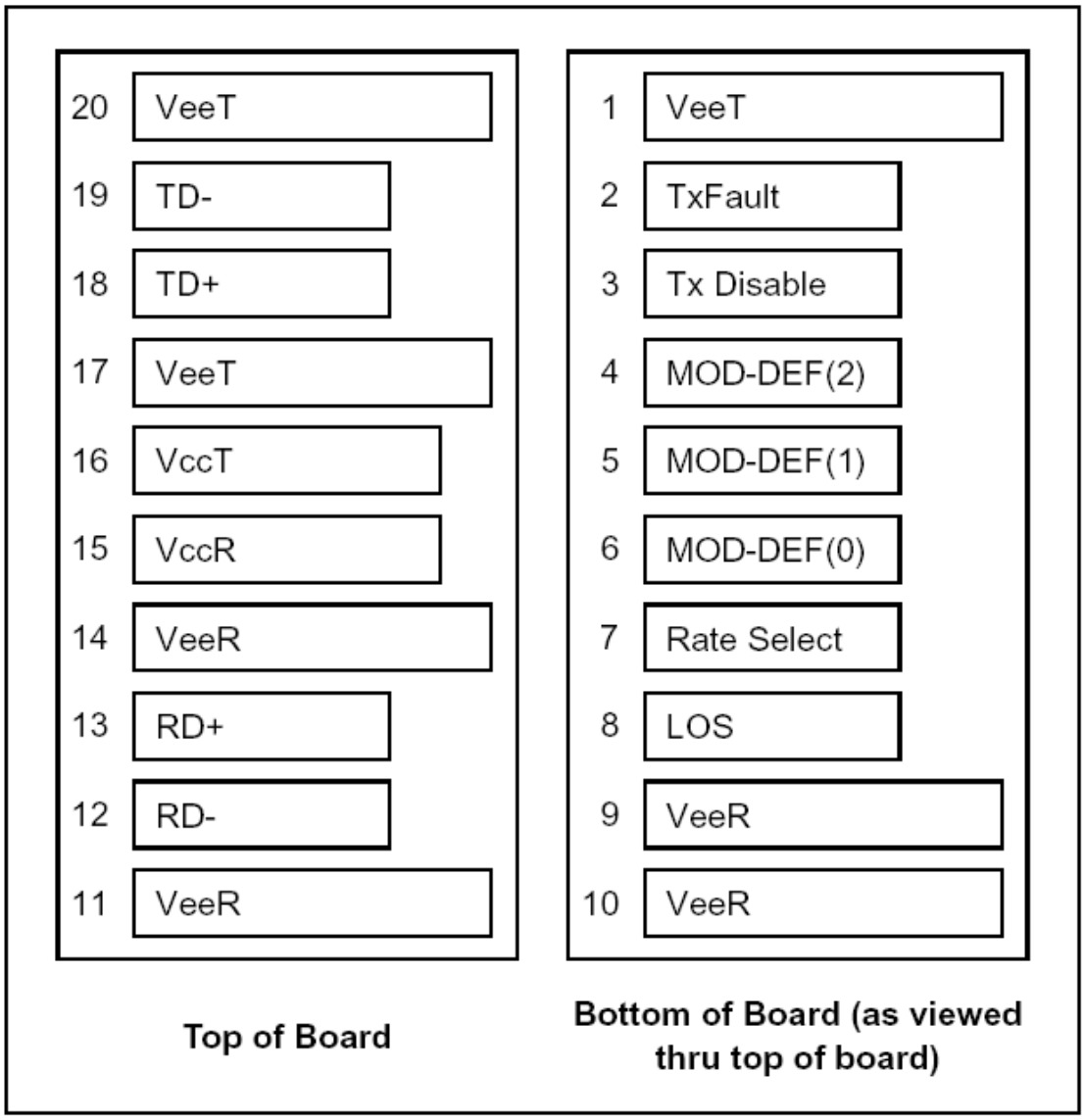
1. The current excludes the output load current

2. Measured with PRBS 2^{7-1} at 10^{-12} BER

3. Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ And ΔDJ.

Pin Description

Pin Out Diagram



Pin Function Definitions

Pin#	Name	Description	Notes
1	VeeT	Transmitter Ground	-
2	TX Fault	Transmitter Fault Indication	Notes 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	-
Pin#	Name	Description	Notes
8	LOS	Loss of Signal	Notes 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	Notes 6
13	RD+	Receiver Data out	Notes 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	Notes 8
20	VeeT	Transmitter Ground	Notes 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

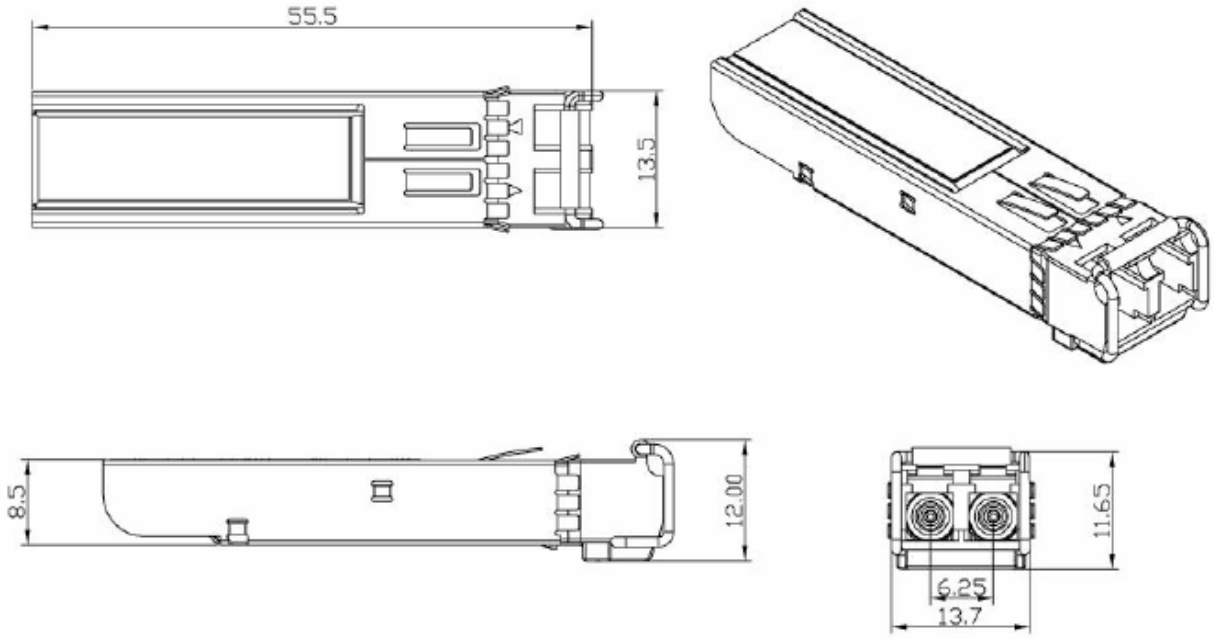
   Open: Transmitter Disabled
3. **Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K – 10KΩ resistor on the host**

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.

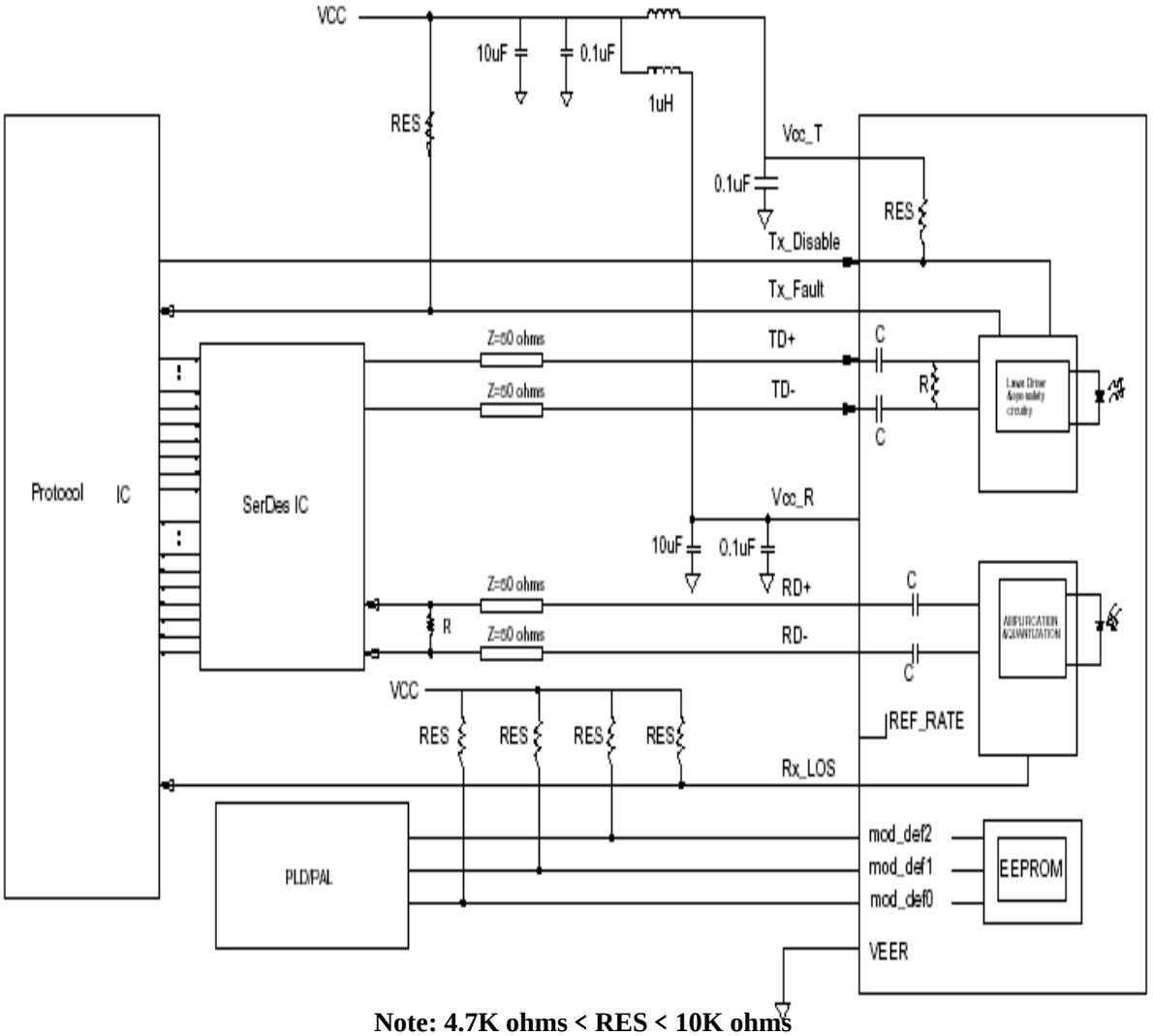
7. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1Ω should be used in order to maintain the 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



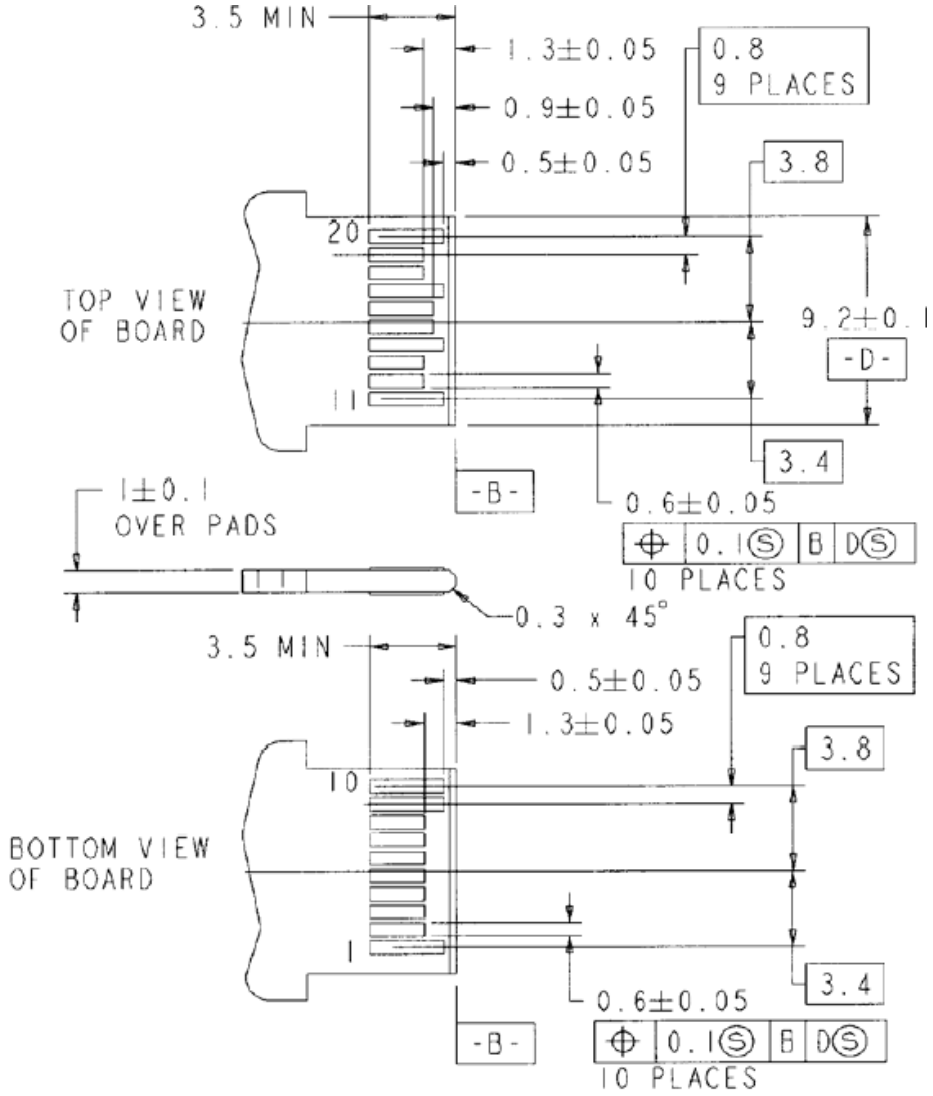
Unit: mm

Recommended Circuit



Note: 4.7K ohms < RES < 10K ohms

Recommended Board Layout Hole Pattern



For More Information

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Ordering Information