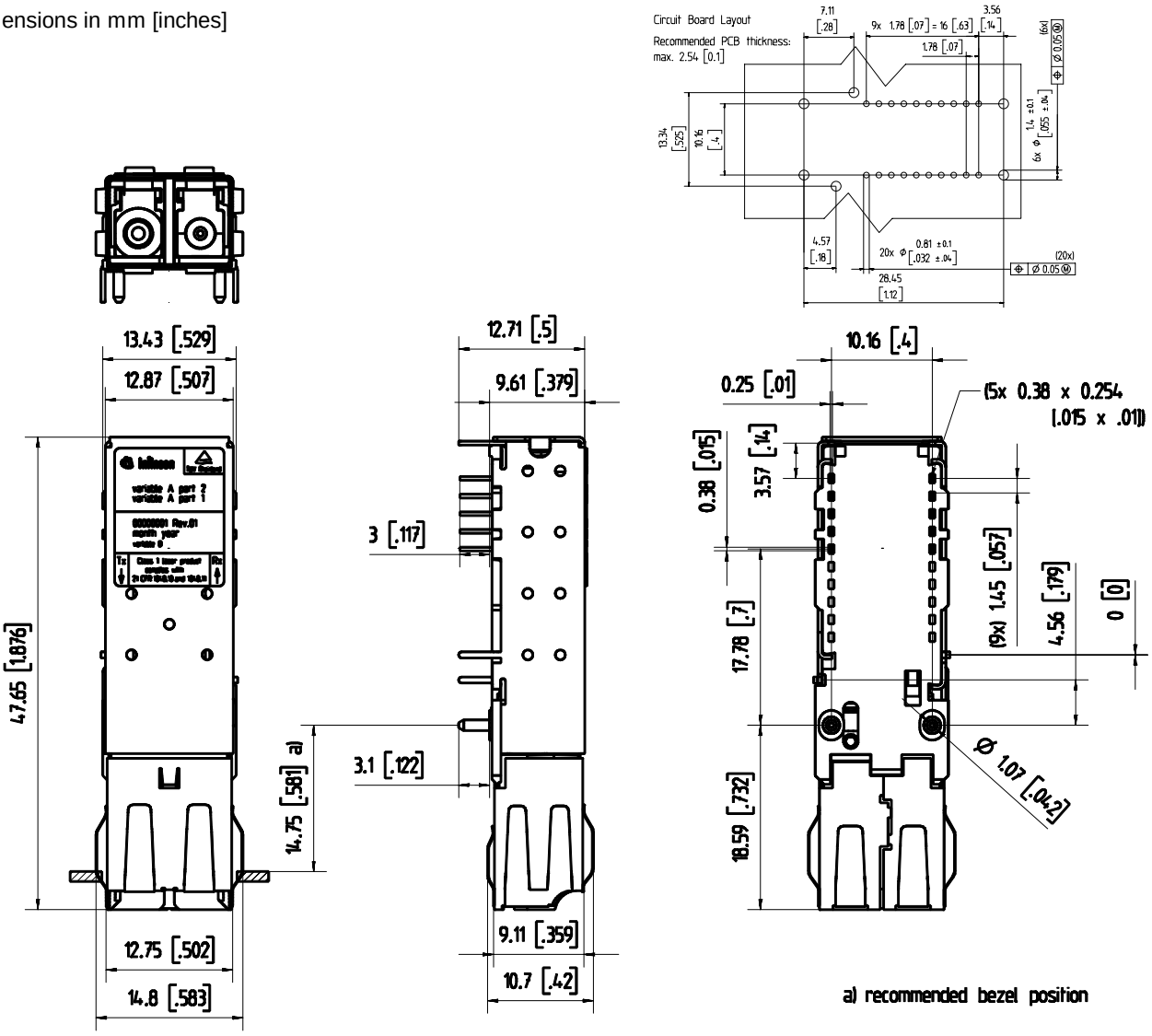
V23818-M305-L57(*)

Small Form Factor
Multimode 850 nm 2.125 and 1.0625 GBd Fibre Channel
2x5 Transceiver
with LC™ Connector

Dimensions in mm [inches]





***) Ordering Information**

Input	Output	Signal detect	Voltage	Part number
AC	AC	TTL	3.3 V	V23818-M305-L57

LC™ is a trademark of Lucent

FEATURES

- **Small Form Factor transceiver**
- **Full compliant with Fibre Channel**
- **Data rate autonegotiation between 1.0625 and 2.125 GBd**
- **Excellent EMI performance**
- **RJ-45 style LC™ connector system**
- **Half the size of SC Duplex 1x9 transceiver**
- **Single power supply (3.3 V)**
- **Extremely low power consumption of 445 mW typical**
- **PECL and LVPECL differential inputs and outputs**
- **System optimized for 62.5/50 µm graded index fiber**
- **Multisource 2x5 footprint**
- **Small size for high port density**
- **UL-94 V-0 certified**
- **ESD Class 1 per MIL-STD 883D Method 3015.7**
- **Compliant with FCC (Class B) and EN 55022**
- **For distances of up to 300 m**
- **Class 1 FDA and IEC laser safety compliant**
- **AC/AC coupling in accordance to SFF MSA**

Absolute Maximum Ratings

Exceeding any one of these values may destroy the device immediately.

Package Power Dissipation..... 1.5 W
Data Input Levels (PECL) .....V_{CC}+0.5 V
Differential Data Input Voltage .....1.6 V
Operating Case Temperature.....–10°C to 85°C
Storage Ambient Temperature.....–40°C to 85°C
Soldering Conditions, Temp/Time
(MIL-STD 883C, Method 2003) ..... 250°C/ 5.5 s
V_{CC} max..... 5.5 V
ECL-Output current data .....50 mA

DESCRIPTION

The Infineon Fibre Channel multimode transceiver – part of Infineon Small Form Factor transceiver family – is based on the Physical Medium Depend (PMD) sublayer and baseband medium, type (short wavelength), Fibre Channel
DC 200-M5-SN-I and 200-M6-SN-I,
DC 100-M5-SN-I and 100-M6-SN-I.

The appropriate fiber optic cable is 62.5 µm or 50 µm multimode fiber with LC™ connector.

Operating range over each optical fiber type at 2.125 GBd

Fiber type	Minimum range (meters)	Typ.
62.5 micron MMF	0.5 to 150	300
50.0 micron MMF	0.5 to 300	500

Operating range over each optical fiber type at 1.0625 GBd

Fiber type	Minimum range (meters)	Typ.
62.5 micron MMF	0.5 to 300	400
50.0 micron MMF	0.5 to 550	700

The Infineon Fibre Channel multimode transceiver is a single unit comprised of a transmitter, a receiver, and an LC™ receptacle. This design frees the customer from many alignment and PC board layout concerns.

This transceiver supports the LC™ connectorization concept. It is compatible with RJ-45 style backpanels for high end Data Com and Telecom applications while providing the advantages of fiber optic technology.

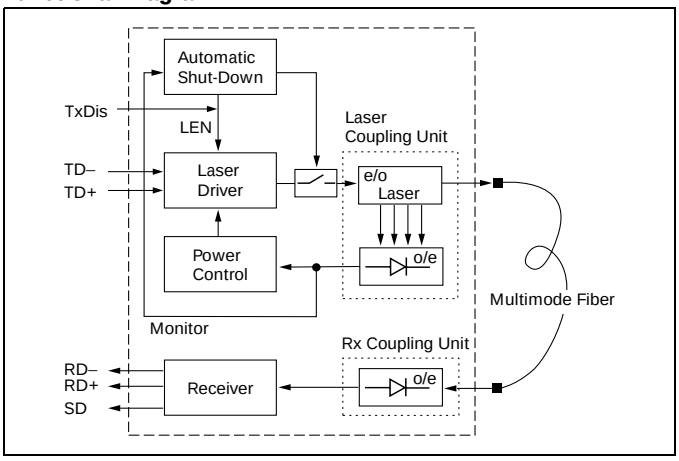
The module is designed for low cost SAN, LAN, WAN, Fibre Channel applications. It can be used as the network end device interface in mainframes, workstations, servers, and storage devices, and in a broad range of network devices such as bridges, routers, hubs, and local and wide area switches.

This transceiver operates at 1.0625 / 2.125 Gbit/s from a single power supply (+3.3 V). The full differential data inputs and outputs are PECL and LVPECL compatible.

Functional Description of 2x5 Pin Row Transceiver

This transceiver is designed to transmit serial data via multimode cable.

Functional Diagram



The receiver component converts the optical serial data into PECL compatible electrical data (RD and RDnot). The Signal Detect (SD, active high) shows whether an optical signal is present.

The transmitter converts PECL compatible electrical serial data (TD and TDnot) into optical serial data. Data lines are differentially 100 Ω terminated.

The transmitter contains a laser driver circuit that drives the modulation and bias current of the laser diode. The currents are controlled by a power control circuit to guarantee constant output power of the laser over temperature and aging.

The power control uses the output of the monitor PIN diode (mechanically built into the laser coupling unit) as a controlling signal, to prevent the laser power from exceeding the operating limits.

Single fault condition is ensured by means of an integrated automatic shutdown circuit that disables the laser when it detects laser fault to guarantee the laser Eye Safety.

The transceiver contains a supervisory circuit to control the power supply. This circuit makes an internal reset signal whenever the supply voltage drops below the reset threshold. It keeps the reset signal active for at least 140 milliseconds after the voltage has risen above the reset threshold. During this time the laser is inactive.

A low signal on TxDis enables transmitter. If TxDis is high or not connected the transmitter is disabled.

TECHNICAL DATA

The electro-optical characteristics described in the following tables are valid only for use under the recommended operating conditions.

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Units
Case Temperature	T_c	–10		85	°C
Power Supply Voltage	V_{CC}–V_{EE}	3.1	3.3	3.5	V
Transmitter					
Data Input Differential Voltage	V_{DIFF}	250		1600	mV
Receiver					
Input Center Wavelength	λ_C	770		860	nm

Transmitter Electro-Optical Characteristics

Transmitter		Symbol	Min.	Typ.	Max.	Units
Launched Power (Average)(1)		P_O	–10	–6	–4	dBm
Optical Modulation Amplitude(3)	2.125 Gbit/s	OMA	196	450		µW
	1.0625 Gbit/s		156	450		
Center Wavelength		λ_C	830	850	860	nm
Spectral Width (RMS)		σ_I			0.85	
Relative Intensity Noise		RIN			–117	dB/Hz
Extinction Ratio (Dynamic)		ER	9	13		dB
Reset Threshold(2)		V_{TH}	2.5	2.75	2.99	V
Reset Time Out(2)		t_{RES}	140	240	560	ms
Rise Time, 20%–80%		t_R		130	150	ps
Supply Current				45	65	mA

Notes

1. Into multimode fiber, 62.5 µm or 50 µm diameter.
2. Laser power is shut down if power supply is below V_{TH} and switched on if power supply is above V_{TH} after t_{RES}.
3. Fibre Channel PI Standard.

Receiver Electro-Optical Characteristics

Receiver		Symbol	Min.	Typ.	Max.	Units
Sensitivity (Average Power)(1)	2.125 Gbit/s	P_{IN}		–18.5	–16	dBm
	1.0625 Gbit/s			–19	–17	
Saturation (Average Power)		P_{SAT}	0			
Min. Optical Modulation Amplitude(6)	2.125 Gbit/s	OMA		24	49	µW
	1.0625 Gbit/s			19	31	
Stressed Receiver Sensitivity 50 µm Fiber(7)	2.125 Gbit/s	S_{PIN}		29	96	
	1.0625 Gbit/s			24	55	
Stressed Receiver Sensitivity 62.5 µm Fiber(7)	2.125 Gbit/s	S_{PIN}		34	109	
	1.0625 Gbit/s			32	67	
Signal Detect Assert Level(2)		P_{SDA}		–21	–18	dBm
Signal Detect Deassert Level(3)		P_{SDD}	–30	–22		
Signal Detect Hysteresis		P_{SDA}–P_{SDD}	0.5	1		dB
Signal Detect Assert Time		t_{ASS}			100	µs
Signal Detect Deassert Time		t_{DAS}			350	
Receiver 3 dB cut-off Frequency(6)				1.3	1.5	GHz
Receiver 10 dB cut-off Frequency(6)				1.6	3	
Data Output Differential Voltage(4)		V_{DIFF}	0.5	0.7	1.23	V
Return Loss of Receiver		A_{RL}	12			dB
Supply current(5)				80	90	mA

Notes

1. Average optical power at which the BER is 1 x 10E–12. Measured with a 2^7–1 NRZ PRBS and ER=9 dB.
2. An increase in optical power above the specified level will cause the SIGNAL DETECT output to switch from a Low state to a High state.
3. A decrease in optical power below the specified level will cause the SIGNAL DETECT to change from a High state to a Low state.
4. AC/AC for data. Load 50 Ω to GND or 100 Ω differential. For dynamic measurement a tolerance of 50 mV should be added.
5. Supply current excluding Rx output load.
6. Fibre Channel PI Standard.
7. Measured at the given Stressed Receiver Eyeclosure Penalty and DCD component given in Fibre Channel PI Standard (2.03/2.18 dB & 40/80 ps).

Pin Description

Pin Name		Level/ Logic	Pin#	Description
V_{EEr}	Receiver Signal Ground	N/A	1	
V_{CCr}	Receiver Power Supply	N/A	2	
SD	Signal Detect	TTL	3	Normal Operation: Logic "1" Output, represents that light is present at receiver input Fault Condition: Logic "0" Output
RD–	Received Data Out Not	PECL	4	
RD+	Received Data Out	PECL	5	
V_{CCt}		N/A	6	Transmitter Power Supply
V_{EEt}		N/A	7	Transmitter Signal Ground
TxDis	Transmitter Disable/Enable	TTL Input	8	A low signal switches the laser on. A high signal switches the laser off. If not connected the Tx is disabled.
TD+	Transmit Data	PECL	9	Transmitter Data In
TD–	Transmit Data Not	PECL	10	Transmitter Data In
MS	MS Package Grounding Tabs	N/A	MS1 MS2 T1 T2 T3 T4	Mounting Studs and grounding Tabs are provided for transceiver mechanical attachment to the circuit board. They also provide an optional connection of the transceiver to the equipment chassis ground. The holes in the circuit board must be tied to chassis ground.

Regulatory Compliance

Feature	Standard	Comments
ESD: Electrostatic Discharge to the Electrical Pins	EIA/JESD22-A114-A (MIL-STD 883D Method 3015.7)	Class 1 (>1000 V)
Immunity: Against Electrostatic Discharge (ESD) to the Duplex LC Receptacle	EN 61000-4-2 IEC 61000-4-2	Discharges ranging from ±2 kV to ±15 kV on the receptacle cause no damage to transceiver (under recommended conditions).
Immunity: Against Radio Frequency Electromagnetic Field	EN 61000-4-3 IEC 61000-4-3	With a field strength of 3 V/m rms, noise frequency ranges from 10 MHz to 2 GHz. No effect on transceiver performance between the specification limits.
Emission: Electromagnetic Interference (EMI)	FCC 47 CFR Part 15, Class B EN 55022 Class B CISPR 22	Noise frequency range: 30 MHz to 18 GHz

EYE SAFETY

This laser based multimode transceiver is a Class 1 product. It complies with IEC 60825-1 and FDA 21 CFR 1040.10 and 1040.11.

To meet laser safety requirements the transceiver shall be operated within the Absolute Maximum Ratings.

Caution

All adjustments have been made at the factory prior to shipment of the devices. No maintenance or alteration to the device is required.
Tampering with or modifying the performance of the device will result in voided product warranty.

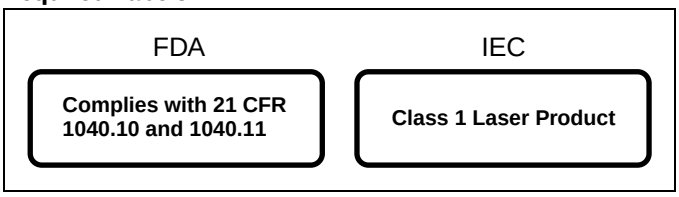
Note

Failure to adhere to the above restrictions could result in a modification that is considered an act of "manufacturing", and will require, under law, recertification of the modified product with the U.S. Food and Drug Administration (ref. 21 CFR 1040.10 (i)).

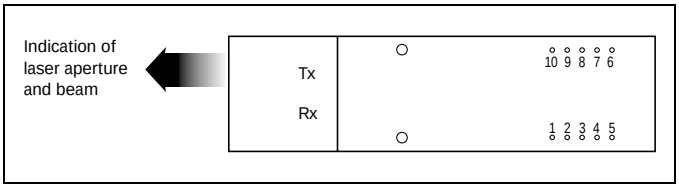
Laser Data

Wavelength	850 nm
Total output power (as defined by IEC: 7 mm aperture at 1.4 cm distance)	<675 µW
Total output power (as defined by FDA: 7 mm aperture at 20 cm distance)	<70 µW
Beam divergence	12°

Required Labels



Laser Emission



APPLICATION NOTES

EMI-Recommendation

To avoid electromagnetic radiation exceeding the required limits please read the following recommendations:

Whenever high speed Gigabit switching components are located on the PCB (also multiplexers, clock recoveries ...) any opening of the machine may generate radiation even at different locations. Thus every mechanical opening or aperture should be as small as possible.

On the board itself every data connection should be an impedance matched line (e.g. strip line, coplanar strip line). Data, Datanot should be routed symmetrically, via's should be avoided. A symmetrically matching resistor of 100 Ω should be placed at the end of each matched line. An alternative termination can be provided with a 50 Ω resistor at each (D, Dn). In DC coupled systems an artificial 50 Ω resistance can be achieved as follows: For 3.3 V: 125 Ω to V_{CC} and 82 Ω to V_{EE}, for 5 V: 82 Ω to V_{CC} and 125 Ω to V_{EE} at Data and Datanot. Please consider whether there is an internal termination inside an IC or a transceiver.

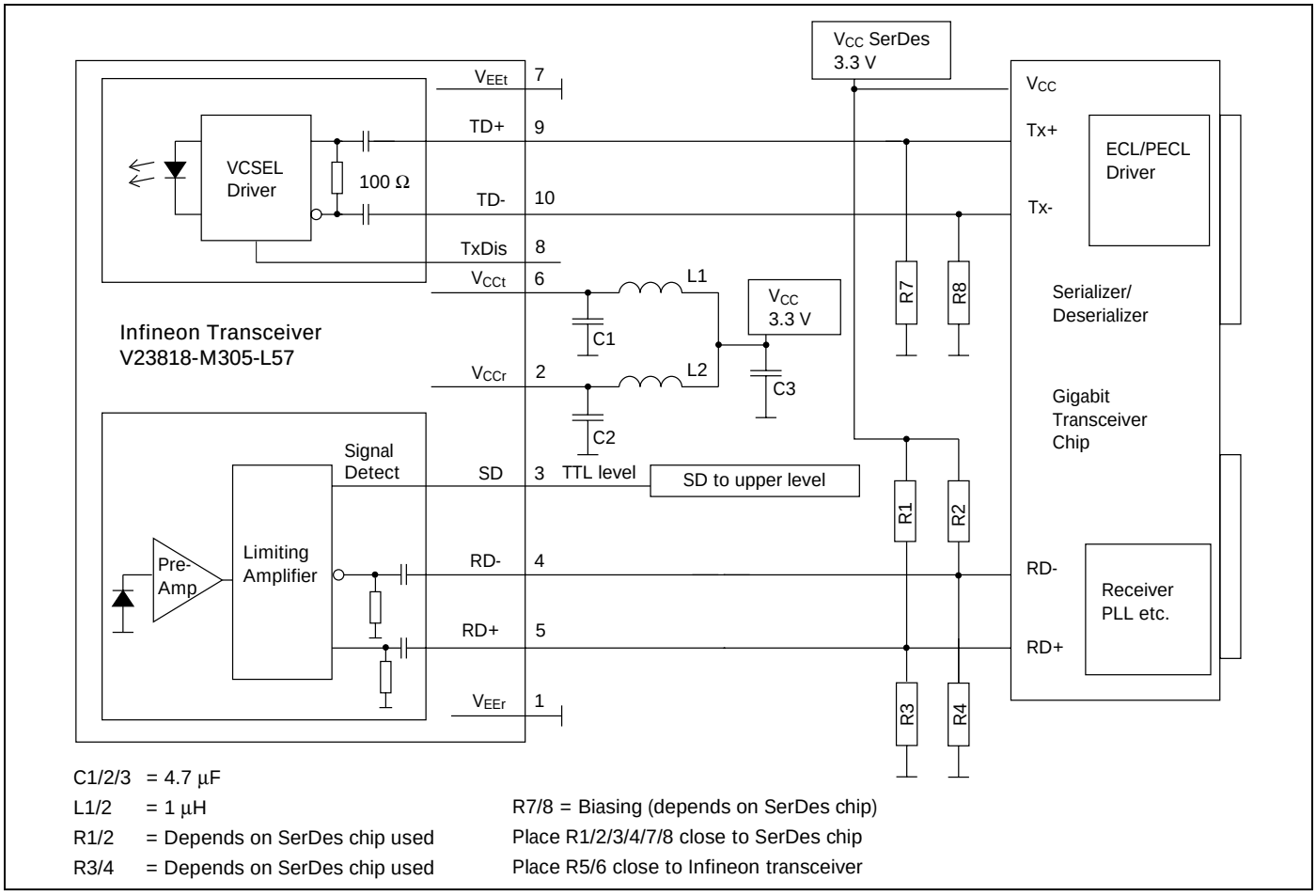
It is recommended that chassis GND and signal GND should remain separate if there are openings or apertures of the housing nearby. Sometimes signal GND is the most harmful source of radiation. Connecting chassis GND and signal GND at the plate/ bezel/ backside wall e.g. by means of a fiber optic transceiver may result in a huge amount of radiation. Even a capacitive coupling between signal GND and chassis may be harmful if it is to close to an opening or an aperture.

If a separation of signal GND and chassis GND is not possible, it is strongly recommended to provide a proper contact between signal GND and chassis GND at almost every location. This concept is suitable to avoid hotspots. Hotspots are places of highest radiation which could be generated if only a few connections between signal and chassis GND are available. Compensation currents would concentrate at these connections, causing radiation.

For the SFF transceiver a connection of the 4 housing pins to chassis GND is recommended. If no separate chassis GND is available on the users PCB the pins should be connected to signal GND. In this case take care of the notes above.

Please consider that the PCB may behave like a waveguide. With an ε_r of 4, the wavelength of the harmonics inside the PCB will be half of that in free space. In this case even small PCBs may have unexpected resonances.

Multimode 850 nm Fibre Channel 2x5 Transceiver, AC/AC TTL



C1/2/3 = 4.7 µF
L1/2 = 1 µH
R1/2 = Depends on SerDes chip used
R3/4 = Depends on SerDes chip used
R7/8 = Biasing (depends on SerDes chip)
Place R1/2/3/4/7/8 close to SerDes chip
Place R5/6 close to Infineon transceiver

Values of R1/2/3/4 may vary as long as proper 50 Ω termination to V_{EE} or 100 Ω differential is provided. The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module V_{CC}Rx/V_{CC}Tx.

The transceiver contains an automatic shutdown circuit. Reset is only possible if the power is turned off, and then on again. (V_{CC}Tx switched below V_{TH}).

Application Board available on request.

Notes

Drawings

The drawing below gives you a comparison between the different pinnings 2x5, 2x6, 2x10. Dimension for diameter and distance of additional pins is similar to the existing dimensions of the other pins.

Pin Description

The numbering of the pins in the table Pin Description (page 4) is according to the 2x6 pinning.

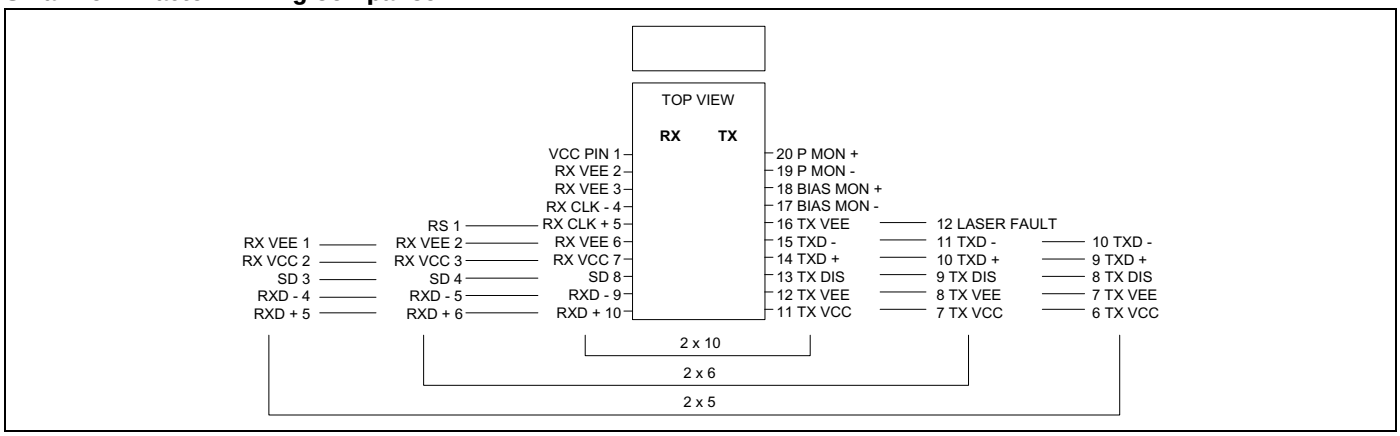
RS pin

The RS Rate Select: is not connected.

LF pin

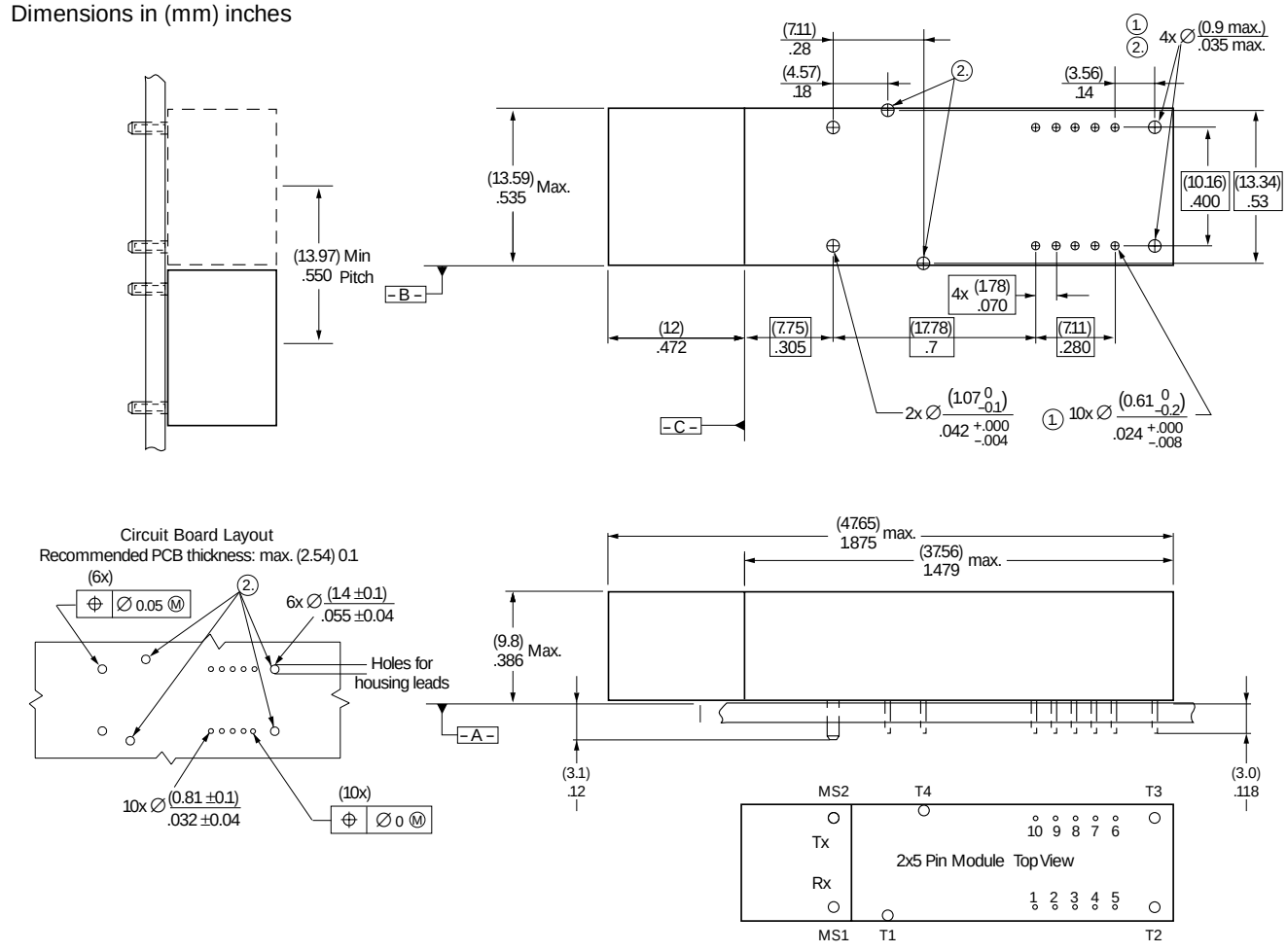
The LF pin (Laser Fault) is a TTL output of the Laser Driver Supervisor Circuit. A Logic “1” level can be measured in case of a laser fault. It will not show a fault if the laser is being disabled using the TxDis input, since this is not a fault condition.

Small Form Factor Pinning Comparison



Small Form Factor multisourcing footprint and dimensions

Dimensions in (mm) inches



1. Toleranced to accommodate round or rectangular leads
2. 4 optional package grounding tabs

10 pin module requires only 12 PCB holes.

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