



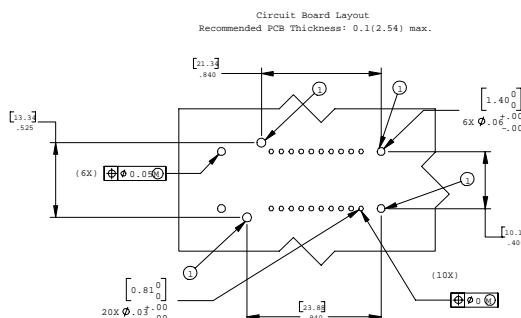
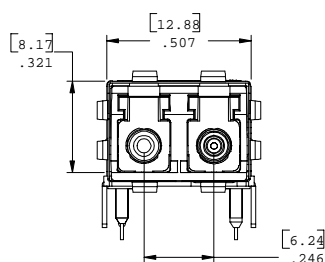
# V23818-K305-L56(\*)

Small Form Factor

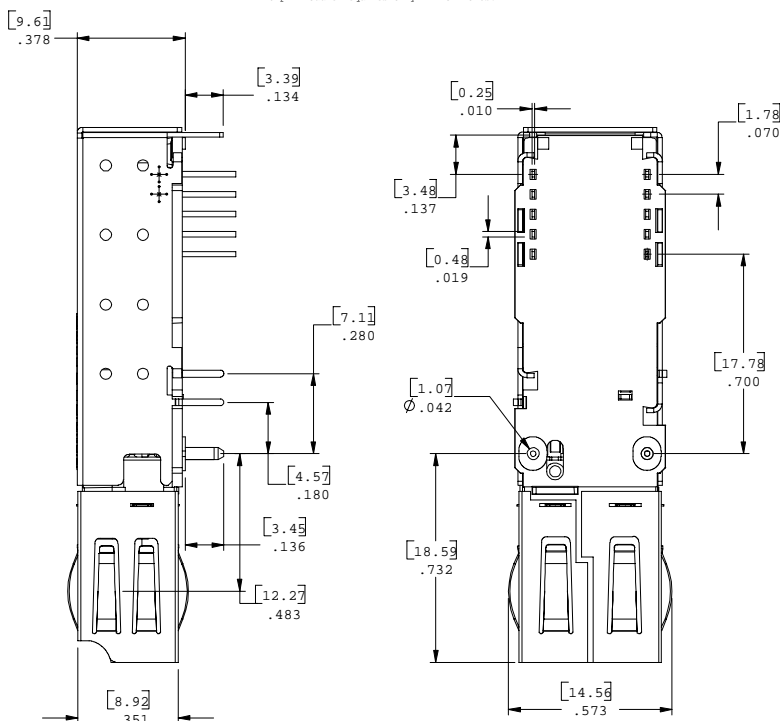
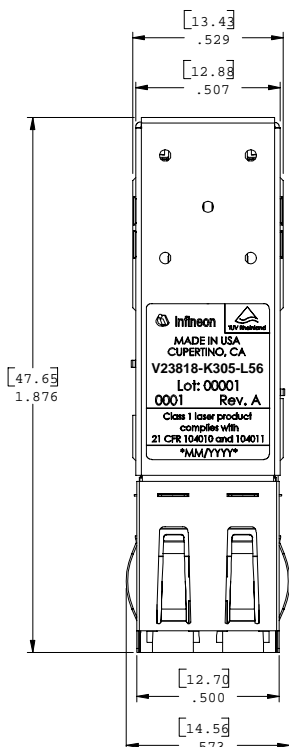
Multimode 850 nm 1.0625 GBd Fibre Channel  
1.3 Gigabit Ethernet 2x5 Transceiver with LC™ Connector  
Extended Temperature Range (-40°C to 85°C)

Preliminary

Dimensions in [mm] inches



1. 4 optional package grounding tabs  
10 pin module requires only 12 PCB holes.



## \*) Ordering Information

Input	Output	Signal detect	Voltage	Part number
AC	AC	TTL	3.3 V	V23818-K305-L56



## FEATURES

- Small Form Factor transceiver
- RJ-45 style LC™ connector system
- Half the size of SC Duplex 1x9 transceiver
- Single power supply (3.3 V)
- Extremely low power consumption
- PECL and LVPECL differential inputs and outputs
- System optimized for 62.5/50 µm graded index fiber
- Multisource footprint
- Small footprint for high channel 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 550 m
- Class 1 FDA and IEC laser safety compliant
- Extended Temperature Range -40°C to 85°C

## 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.....	-40°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 Gigabit Ethernet multimode transceiver – part of Infineon Small Form Factor transceiver family – is based on the Physical Medium Depend (PMD) sublayer and baseband medium, type 1000BASE-SX (short wavelength), Fibre Channel 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 for over each optical fiber type

Fiber type	Minimum range (meters)	Typ.
62.5 micron MFF	2 to 260	400
50.0 micron MFF	2 to 550	700
10 micron SFF	Not supported	

The Infineon Gigabit Ethernet 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.

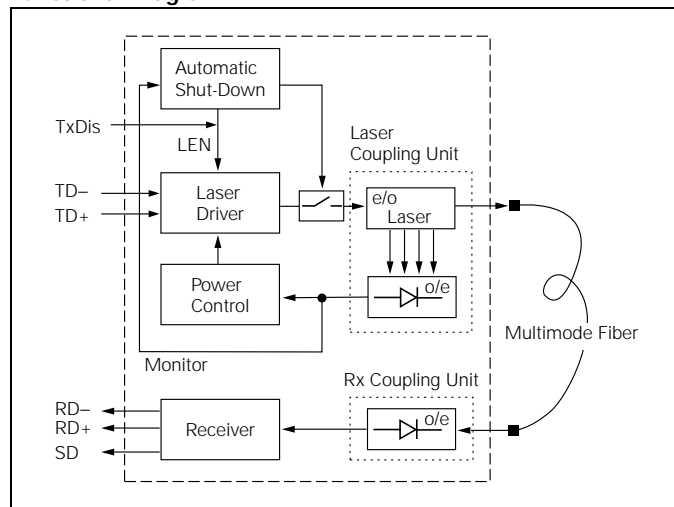
The module is designed for low cost SAN, LAN, WAN, Fibre Channel and Gigabit Ethernet applications. It can be used as the network end device interface in mainframes, workstations, servers, and storage devices, and in a broad range of network devices such as bridges, routers, hubs, and local and wide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

This transceiver operates at 1 and 1.25 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.

The laser can be disabled by the TxDis input.

## 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	$T_C$	-40		85	°C
Power Supply Voltage	$V_{CC}-V_{EE}$	3.1	3.3	3.5	V
<b>Transmitter</b>					
Data Input Differential Voltage	$V_{DIFF}$	250		1600	mV
<b>Receiver</b>					
Input Center Wavelength	$\lambda_C$	770		860	nm

### Transmitter Electro-Optical Characteristics

Transmitter	Symbol	Min.	Typ.	Max.	Units
Launched Power (Average) <sup>(1)</sup>	$P_O$	-9.5		-4	dBm
Center Wavelength	$\lambda_C$	830	850	860	nm
Spectral Width (RMS)	$\sigma_I$			0.85	
Relative Intensity Noise	RIN			-117	dB/Hz
Extinction Ratio (Dynamic)	ER	8			dB
Reset Threshold <sup>(2)</sup>	$V_{TH}$	2.2	2.7	2.99	V
Reset Time Out <sup>(2)</sup>	$t_{RES}$	140	240	560	ms
Rise Time, 20%–80%	$t_R$			0.26	ns
Supply Current			75		mA

#### Notes

1. Into multimode fiber, 62.5  $\mu\text{m}$  or 50  $\mu\text{m}$  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  $t_{RES}$ .

### Receiver Electro-Optical Characteristics

Receiver	Symbol	Min.	Typ.	Max.	Units
Sensitivity (Average Power) <sup>(1)</sup>	$P_{IN}$		-19	-16.5	dBm
Saturation (Average Power)	$P_{SAT}$	0			
Signal Detect Assert Level <sup>(2)</sup>	$P_{SDA}$		-24	-18	
Signal Detect Deassert Level <sup>(3)</sup>	$P_{SDD}$	-30	-27		
Signal Detect Hysteresis	$P_{SDA}-P_{SDD}$		3		dB
Signal Detect Assert Time	$t_{ASS}$			100	$\mu\text{s}$
Signal Detect Deassert Time	$t_{DAS}$			350	
Data Output Differential Voltage <sup>(4)</sup>	$V_{DIFF}$	0.5	0.8	1.23	V
Return Loss of Receiver	$A_{RL}$	12			dB
Supply current <sup>(5)</sup>			60		mA

#### Notes

1. Average optical power at which the BER is  $1 \times 10^{-12}$ . 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  $\Omega$  to GND or 100  $\Omega$  differential. For dynamic measurement a tolerance of 50 mV should be added.
5. Supply current excluding Rx output load.

## Pin Description

Pin Name		Level/ Logic	Pin#	Description
V <sub>EEr</sub>	Receiver Signal Ground	N/A	1	
V <sub>CCr</sub>	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 <sub>CCt</sub>		N/A	6	Transmitter Power Supply
V <sub>EEt</sub>		N/A	7	Transmitter Signal Ground
TxDs	Transmitter Disable/Enable	TTL- Input	8	A low signal switches the laser on. A high signal switches the laser off.
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
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD 883D Method 3015.7	Class 1 (>1000 V)
Immunity: Electrostatic Discharge (ESD) to the Duplex SC Receptacle	EN 61000-4-2 IEC 61000-4-2	Discharges of ±15 kV with an air discharge probe on the receptacle cause no damage.
Immunity: 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 1 GHz. No effect on transceiver performance between the specification limits.
Emission: Electromagnetic Interference (EMI)	FCC Class B EN 55022 Class B CISPR 22	Noise frequency range: 30 MHz to 6 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 maximum operating limits.

### 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

FDA	IEC
<b>Complies with 21 CFR 1040.10 and 1040.11</b>	<b>Class 1 Laser Product</b>

## Laser Emission

Indication of laser aperture and beam		

## 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  $100\ \Omega$  should be placed at the end of each matched line. An alternative termination can be provided with a  $50\ \Omega$  resistor at each (D, Dn). In DC coupled systems an artificial  $50\ \Omega$  resistance can be achieved as follows: For 3.3 V:  $125\ \Omega$  to  $V_{CC}$  and  $82\ \Omega$  to  $V_{EE}$ , for 5 V:  $82\ \Omega$  to  $V_{CC}$  and  $125\ \Omega$  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 hous-

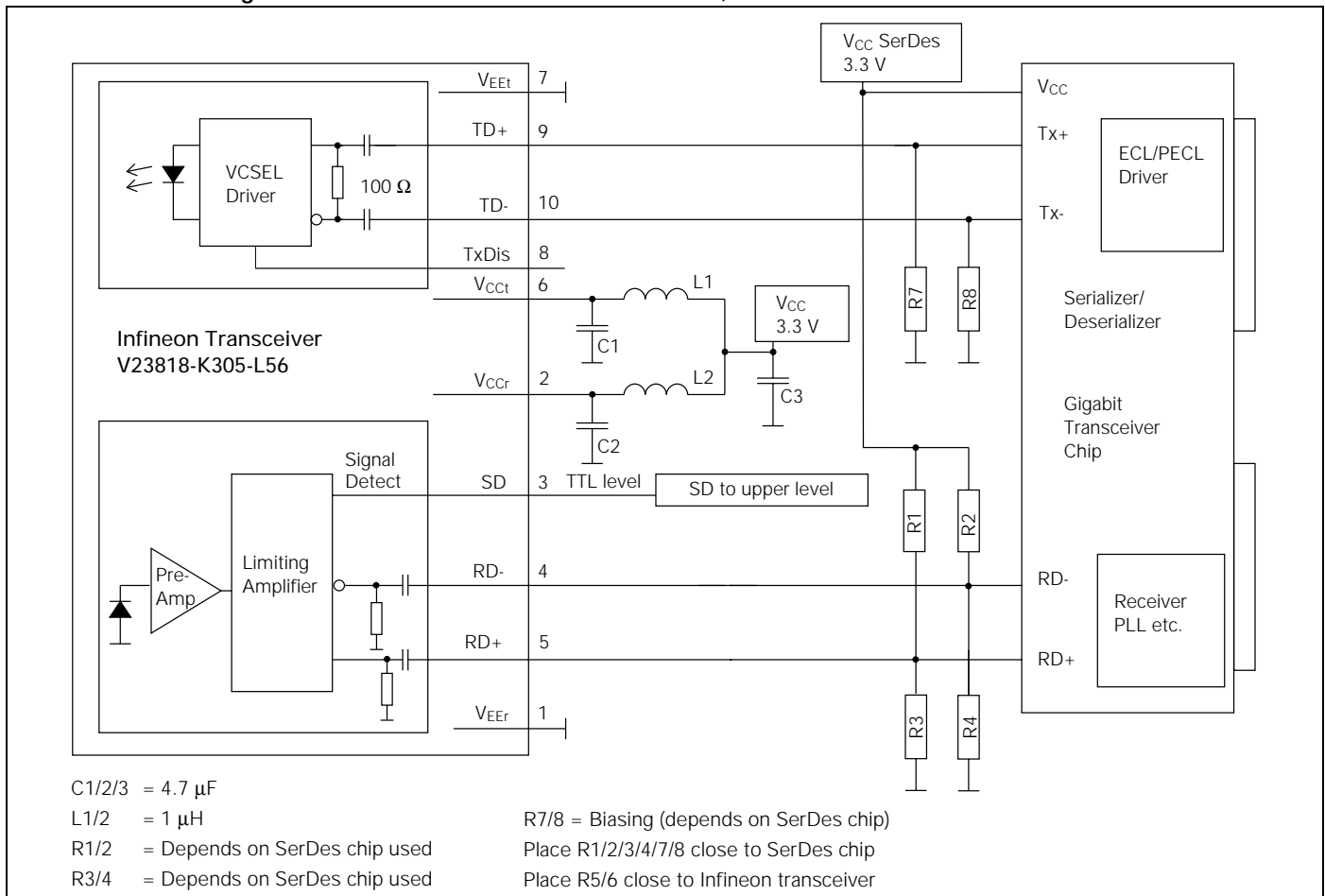
ing nearby. Sometimes signal GND is the most harmful source of radiation. Connecting chassis GND and signal GND at the plate/ bezel/ backside wall e.g. by means of a fiber optic transceiver may result in a huge amount of radiation. Even a capacitive coupling between signal GND and chassis may be harmful if it is too 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  $\epsilon_r$  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 Gigabit Ethernet/Fibre Channel 2x5 Transceiver, AC/AC



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

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

Application Board available on request.

Dimensions in (mm) inches

The drawing includes three main views: a top view, a side view, and a circuit board layout. The top view shows a rectangular module with dimensions (13.59) Max. (.535) in height and (12) (.472) in width. It features 10 pins (5 on each side) with dimensions (7.11) (.28) and (4.57) (.18) for pin spacing. The side view shows a height of (9.8) Max. (.386) and a width of (3.1) (.12). The circuit board layout shows a recommended PCB thickness of max. (2.54) (0.1) and dimensions (10.16) (.400) and (13.34) (.53) for the board. It also shows dimensions (10.78) (.425) and (7.11) (.28) for the board layout. The module is labeled with MS2, T4, T3, T2, T1, MS1, Tx, and Rx. The 2x5 Pin Module Top View shows the pin arrangement: MS2, T4, T3, T2, T1, MS1, Tx, and Rx. The 10 pin module requires only 12 PCB holes.

Circuit Board Layout  
Recommended PCB thickness: max. (2.54) 0.1

(6x)  $\varnothing 0.05$  (1.4  $\pm 0.1$ )  
6x  $\varnothing 0.055 \pm 0.04$

Holes for housing leads

10x  $\varnothing 0.081 \pm 0.1$   
10x  $\varnothing 0.032 \pm 0.04$

(10x)  $\varnothing 0$

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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