

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
- Loss of optical signal indicator
- Laser disable input
- PECL differential inputs and outputs
- Distance up to 15 km / 40 km on Single Mode Fiber
- Class 1 FDA and IEC laser safety compliant
- Multisource footprint
- Small footprint for high channel density
- UL 94 V-0 certified
- Compliant with FCC (Class B) and EN 55022

Absolute Maximum Ratings

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

Package Power Dissipation

V23818-C18-L37/47/737/747/35/45/735/745/736	1.5 W
V23818-C18-L36/46/39/49/436/L79	0.9 W

Supply Voltage ($V_{CC}-V_{EE}$)	4 V
Data Input Levels	$V_{CC}+0.5$ to $V_{CC}-0.5$
Differential Data Input Voltage	2.5 V
Operating Case Temperature	
V23818-C18-L37/47/737/747/35/45/735/745	0°C to 70°C
V23818-C18-L36/46/39/49/436/736/79	-40°C to 85°C
Storage Ambient Temperature	-40°C to 85°C
Soldering Conditions Temp/Time	250°C/ 5.5 s

DESCRIPTION

This data sheet describes the Infineon single mode ATM transceiver, which complies with the ATM Forum's *Network Compatible ATM for Local Network Applications* document and ANSI's *Broadband ISDN—Customer Installation Interfaces, Physical Media Dependent Specification, T1E1.2, Bellcore - SONET OC-3/IR-1 and ITU-T G.957 STM1/S1.1*.

ATM was developed to facilitate solutions in multimedia applications and real time transmission. The data rate is scalable, and the ATM protocol is the basis of the broadband public networks being standardized in the International Telecommunications Union (ITU), the former International Telegraph and Telephone Consultative Committee (CCITT). ATM can also be used in local private applications.

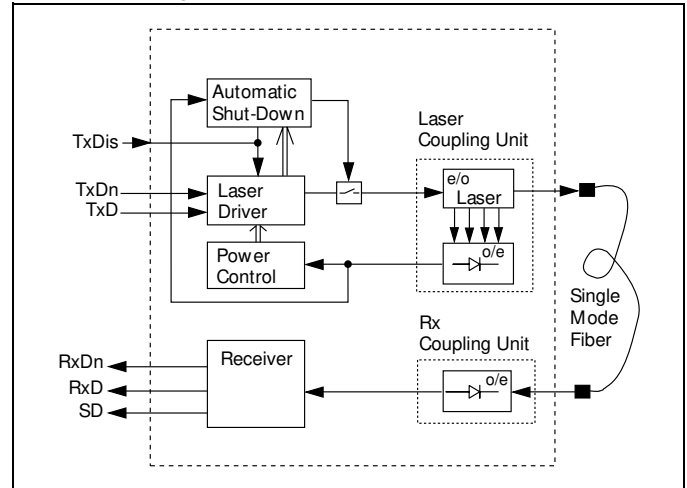
The Infineon single mode ATM transceiver is a single unit comprised of a transmitter, a receiver, and an LC receptacle. This design frees the customer from many alignment and PC board layout concerns. The module is designed for low cost LAN and WAN applications. It can be used as the network end device interface in workstations, servers, and storage devices, and in a broad range of network devices such as bridges, routers, and intelligent hubs, as well as local and wide area ATM switches.

This transceiver operates at 155.520 Mbit/s from a single power supply (+3.3 V). The full differential data inputs and outputs are PECL compatible.

Functional Description of SFF 2x5 Pin Row Transceiver

This transceiver is designed to transmit serial data via single mode fiber.

Functional Diagram



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

The transmitter converts PECL compatible electrical serial data (TD+ and TD-) into optical serial data.

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 (V_{CCTx}) drops below the reset threshold (V_{TH}). 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
Ambient Temperature	-L37/L47/ L737/L747/ L35/L45/ L735/L745 -L36/L46/ L39/L49/ L436/L736/ L79	T_{AMB}	0	70	°C
Power Supply Voltage	$V_{CC}-V_{EE}$	3.15	3.3	3.45	V
Supply Current ⁽¹⁾	-L37/L47/ L737/L747/ L35/L45/ L735/L745 -L36/L46/ L39/L49/ L436/L736/ L79	I_{CC}		230	mA
				250	
Transmitter					
Data Input High Voltage	$V_{IH}-V_{CC}$	-1165		-880	mV
Data Input Low Voltage	$V_{IL}-V_{CC}$	-1810		-1475	
Input Data Rise/Fall, 10%–90%	t_R, t_F	0.4		1.3	ns
Receiver					
Output Current	I_O			25	mA
Input Center Wavelength	λ_C	1260		1360	nm

Note

- For $V_{CC}-V_{EE}$ (min., max.). 50% duty cycle. The supply current does not include the load drive current of the receiver output. Add max. 45 mA for the three outputs. Load is 50 Ω to $V_{CC}-2$ V.

Transmitter Electro-Optical Characteristics V23818-C18-L36/L46/L37/L47/L35/L45/L39/L49/L436/L79

Transmitter	Symbol	Min.	Typ.	Max.	Units
Output Power (Average)	P_O	-15.0		-8.0	dBm
Center Wavelength	λ_C	1260		1360	nm
Spectral Width (FWHM)	D_I			7.7	
Output Rise Time	t_R	0.6		2.5	ns
Output Fall Time	t_F			3.0	
Extinction Ratio (Dynamic)	ER	8.2			dB
Reset Threshold for Tx V_{CC} ⁽²⁾	V_{TH}		2.7		V
Power on Delay ⁽²⁾	t_{RES}		30		ms
Eye Diagram ⁽³⁾	ED	ITU-T G.957 mask pattern			
Jitter Generation	J_{GEP-P}				UI
	J_{GERMS}				

Transmitter Electro-Optical Characteristics V23818-C18-L737/L747/L735/L745/L736

Transmitter	Symbol	Min.	Typ.	Max.	Units
Output Power (Average) ⁽¹⁾	P_O	-5		-0	dBm
Center Wavelength	λ_C	1280		1335	nm
Spectral Width (FWHM)	D_I		2.4	3	
Extinction Ratio (Dynamic)	ER	10			dB
Reset Threshold for Tx V_{CC} ⁽²⁾	V_{TH}		2.7		V
Power on Delay ⁽²⁾	t_{RES}		30		ms
Eye Diagram ⁽³⁾	ED	ITU-T G.957 mask pattern			
Jitter Generation	J_{GEP-P}				UI
	J_{GERMS}				

Notes

- Into single mode fiber, 9 μ m diameter
- 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} .
- Transmitter meets ANSI T1E1.2, SONET OC-3, and ITU-T G.957 mask patterns.

Receiver Electro-Optical Characteristics V23818-C18-L37/L47/L35/L45

Receiver	Symbol	Min.	Typ.	Max.	Units
Sensitivity (Average Power) ⁽¹⁾	P_{IN}			-29.0	dBm
Saturation (Average Power)	P_{SAT}	-8.0			
Signal Detect Assert Level ⁽²⁾	P_{SDA}			-31	
Signal Detect Deassert Level ⁽³⁾	P_{SDD}	-45			
Signal Detect Hysteresis	$P_{SDA}-P_{SDD}$		3.0		dB
Signal Detect Assert Time ⁽⁴⁾	t_{ASS}	10		100	ns
Signal Detect Deassert Time ⁽⁵⁾	t_{DAS}	30		350	
Output Low Voltage ⁽⁶⁾	$V_{OL}-V_{CC}$	-1800		-1300	mV
Output High Voltage ⁽⁶⁾	$V_{OH}-V_{CC}$	-1110		-650	
Output Data Rise/Fall Time, 10%–90%	t_R, t_F			1	ns
Output SD Rise/Fall Time ⁽⁷⁾				40	ns

Notes

- Minimum average optical power at which the BER is less than 1×10^{-10} . Measured with a 2²³-1 NRZ PRBS as recommended by ANSI T1E1.2, SONET OC-3, and ITU-T G.957.
- An increase in optical power above the specified level will cause the SIGNAL DETECT to switch from a Low state to a High state.
- A decrease in optical power below the specified level will cause the SIGNAL DETECT to switch from a High state to a Low state.
- Measured by switching the light from <-40 dBm to -25 dBm.

- Measured by switching the light from -25 dBm to <-40 dBm. Switching from higher power levels increases this time.
- PECL compatible. Load is $50\ \Omega$ into $V_{CC}-2$ V. Measured under DC conditions at 25°C . For dynamic measurements a tolerance of 50 mV should be added. $V_{CC}=3.3$ V.
- PECL compatible. A high level on this output shows that an optical signal is applied to the optical input.

Receiver Electro-Optical Characteristics V23818-C18-L36/L46/L39/L49/L436L79

Receiver	Symbol	Min.	Typ.	Max.	Units
Sensitivity (Average Power) ⁽¹⁾	P_{IN}			-29	dBm
Saturation (Average Power)	P_{SAT}	-8			
Signal Detect Assert Level ⁽²⁾	P_{SDA}			-31	
Signal Detect Deassert Level ⁽³⁾	P_{SDD}	-45			
Signal Detect Hysteresis	$P_{SDA}-P_{SDD}$		3		dB
Signal Detect Assert Time	t_{ASS}			100	μs
Signal Detect Deassert Time	t_{DAS}			350	
Output Low Voltage ⁽⁴⁾	$V_{OL}-V_{CC}$	-1800		-1300	mV
Output High Voltage ⁽⁴⁾	$V_{OH}-V_{CC}$	-1110		-650	
Output Data Rise/Fall Time, 20%–80%	t_R, t_F			1	ns
Output SD Rise/Fall Time ⁽⁵⁾				40	ns

Notes

- Minimum average optical power at which the BER is less than 1×10^{-10} or lower. Measured with a $2^{23}-1$ NRZ PRBS as recommended by ANSI T1E1.2, SONET OC-3 and ITU-T G.957.
- An increase in optical power of data signal above the specified level will cause the SIGNAL DETECT to switch from a Low state to a High state.
- A decrease in optical power of data signal below the specified level will cause the SIGNAL DETECT to switch from a High state to a Low state.
- DC/DC, PECL for Signal Detect
PECL compatible. Load is $50\ \Omega$ into $V_{CC}-2$ V for data, $500\ \Omega$ to V_{EE} for Signal Detect. Measured under DC conditions. For dynamic measurements a tolerance of 50 mV should be added. $V_{CC}=3.3$ V. $T_{AMB}=25^{\circ}\text{C}$.
- PECL compatible. A high level on this output shows that an optical signal is applied to the optical input.

Receiver Electro-Optical Characteristics V23818-C18-L737/L747/L735/L745/L736

Receiver	Symbol	Min.	Typ.	Max.	Units
Sensitivity (Average Power) ⁽¹⁾	P_{IN}			-34	dBm
Saturation (Average Power)	P_{SAT}	-2			
Signal Detect Assert Level ⁽²⁾	P_{SDA}			-34	
Signal Detect Deassert Level ⁽³⁾	P_{SDD}	-45			
Signal Detect Hysteresis	$P_{SDA}-P_{SDD}$		3		dB
Signal Detect Assert Time	t_{ASS}			100	μs
Signal Detect Deassert Time	t_{DAS}			350	
Output Low Voltage ⁽⁴⁾	$V_{OL}-V_{CC}$	-1800		-1300	mV
Output High Voltage ⁽⁴⁾	$V_{OH}-V_{CC}$	-1110		-650	
Output Data, Rise/Fall Time, 20%–80%	t_R, t_F			1	ns
Output SD Rise/Fall Time ⁽⁵⁾				40	ns

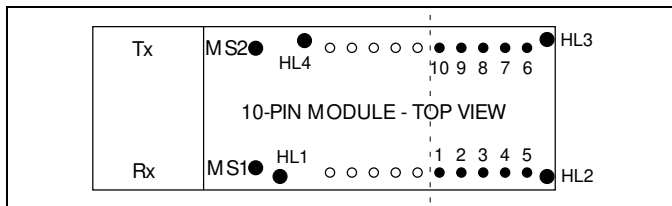
Notes

- Minimum average optical power at which the BER is less than 1×10^{-10} . Measured with a $2^{23}-1$ NRZ PRBS as recommended by ANSI T1E1.2, SONET OC-3, and ITU-T G.957.
- An increase in optical power of data signal above the specified level will cause the SIGNAL DETECT to switch from a Low state to a High state.
- A decrease in optical power of data signal below the specified level will cause the SIGNAL DETECT to switch from a High state to a Low state.
- DC/DC for data, DC/DC PECL for Signal Detect, PECL compatible. Load is $50\ \Omega$ into $V_{CC}-2$ V for data, $500\ \Omega$ to V_{EE} for Signal Detect. Measured under DC conditions. For dynamic measurements a tolerance of 50 mV should be added. $V_{CC}=3.3$ V/5 V. $T_{AMB}=25^{\circ}\text{C}$.
- PECL compatible. A high level on this output shows that an optical signal is applied to the optical input.

Pin Description

Pin Name	Level	Pin#	Description	
RxV _{EE}	Rx Ground	Power Supply	1	Negative power supply, normally ground.
RxV _{CC}	Rx +3.3 V	Power Supply	2	Positive power supply, +3.3 V.
SD	Rx Signal Detect	PECL Output active high	3	A high level on this output shows that optical data is applied to the optical input.
RxDn	Rx Output Data	PECL Output	4	Inverted receiver output data.
RxD			5	Receiver output data
TxV _{CC}	Tx +3.3 V	Power Supply	6	Positive power supply, +3.3 V.
TxV _{EE}	Tx Ground	Power Supply	7	Negative power supply, normally ground.
TxDis	Tx Disable/Enable	TTL Input	8	A low signal switches the laser on. A high signal switches the laser off.
TxD	Tx Input Data	PECL Input	9	Transmitter input data
TxDn			10	Inverted transmitter input data.
MS	Mounting Studs	N/A	MS1 MS2	Mounting Studs are provided for transceiver mechanical attachment to the circuit board. They also provide an optional connection of the transceiver to the equipment chassis ground.
HL	Housing Leads	N/A	HL1 HL2 HL3 HL4	The transceiver Housing Leads are provided for additional signal grounding. The holes in the circuit board must be included and be tied to signal ground. (See Application Notes).

Pin Information



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).

Feature	Standard	Comments
Immunity: Against Radio Frequency Electro-magnetic 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 single mode 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.

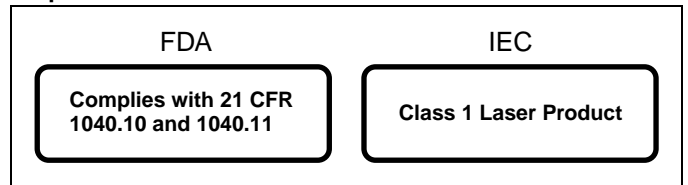
Note

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)).

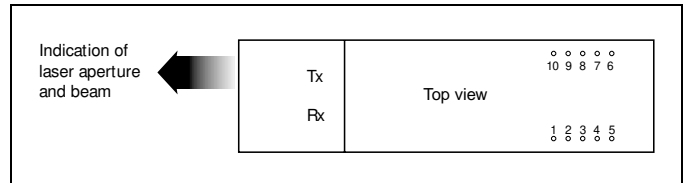
Laser Data

Wavelength	1300 nm
Total output power (as defined by IEC: 7 mm aperture at 14 mm distance)	2 mW
Total output power (as defined by FDA: 7 mm aperture at 20 cm distance)	180 μ W
Beam divergence	4°

Required Labels



Laser Emission



APPLICATION NOTES

EMI-Recommendation

To avoid electromagnetic radiation exceeding the required limits please take note of the following recommendations.

When Gigabit switching components are found on a PCB (multiplexers, clock recoveries etc.) any opening of the chassis may produce radiation also at chassis slots other than that of the device itself. 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, vias should be avoided. A terminating 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 a thevenin equivalent $50\ \Omega$ 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.

In certain cases signal GND is the most harmful source of radiation. Connecting chassis GND and signal GND at the plate/bezel/ chassis rear e.g. by means of a fiber optic transceiver may result in a large 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 every location where possible. This concept is designed to avoid hotspots. Hotspots are places of highest radiation which could be generated if only a few connections between signal and chassis GND exist. Compensation currents would concentrate at these connections, causing radiation.

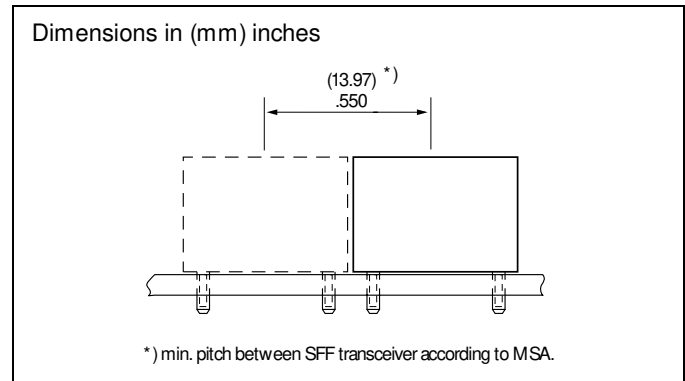
By use of Gigabit switching components in a design, the return path of the RF current must also be considered. Thus a split GND plane of Tx and Rx portion may result in severe EMI problems.

A recommendation is to connect the housing leads to signal GND. However, in certain applications it may improve EMI performance by connecting them to chassis GND.

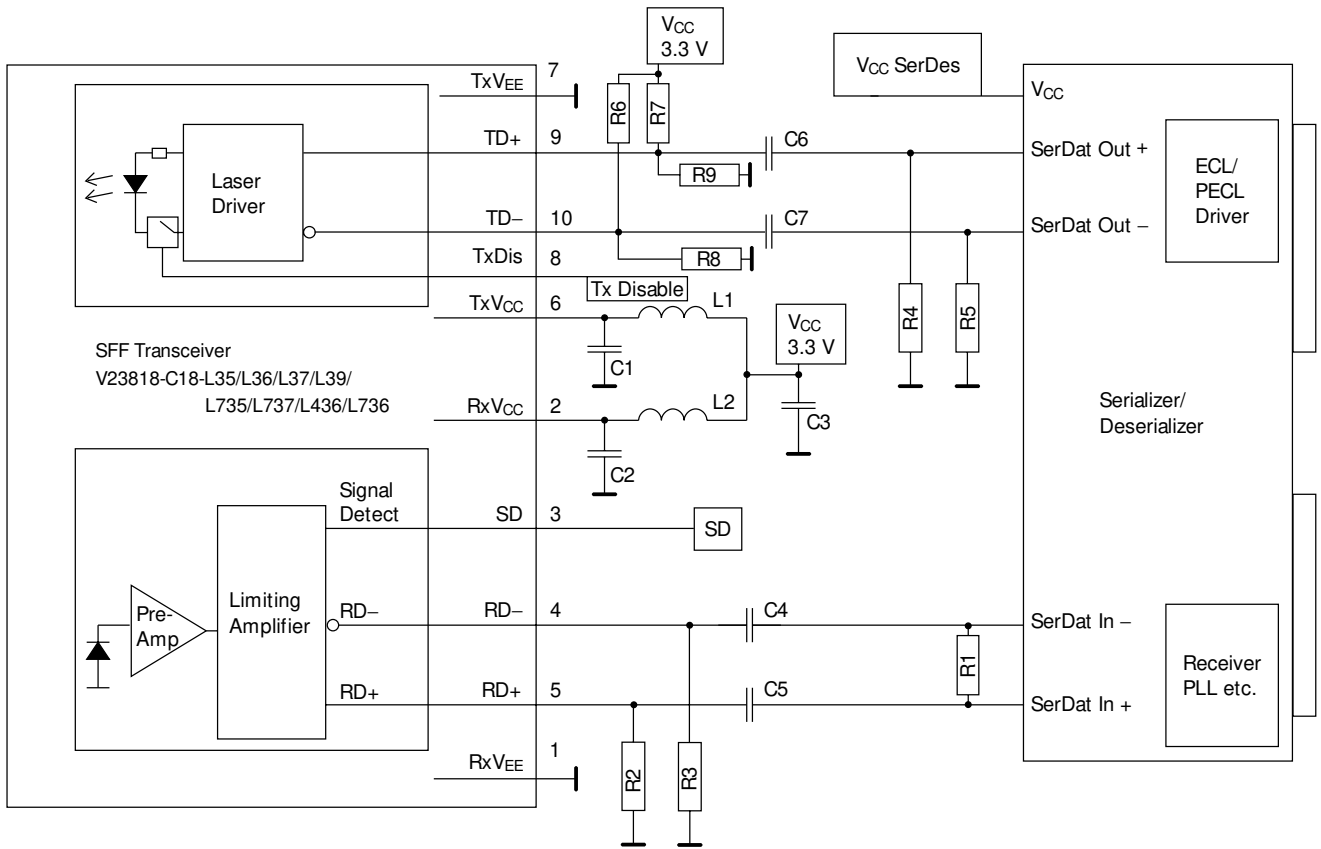
The cutout should be sized so that all contact springs make good contact with the face plate.

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 scenario even the smallest PCBs may have unexpected resonances.

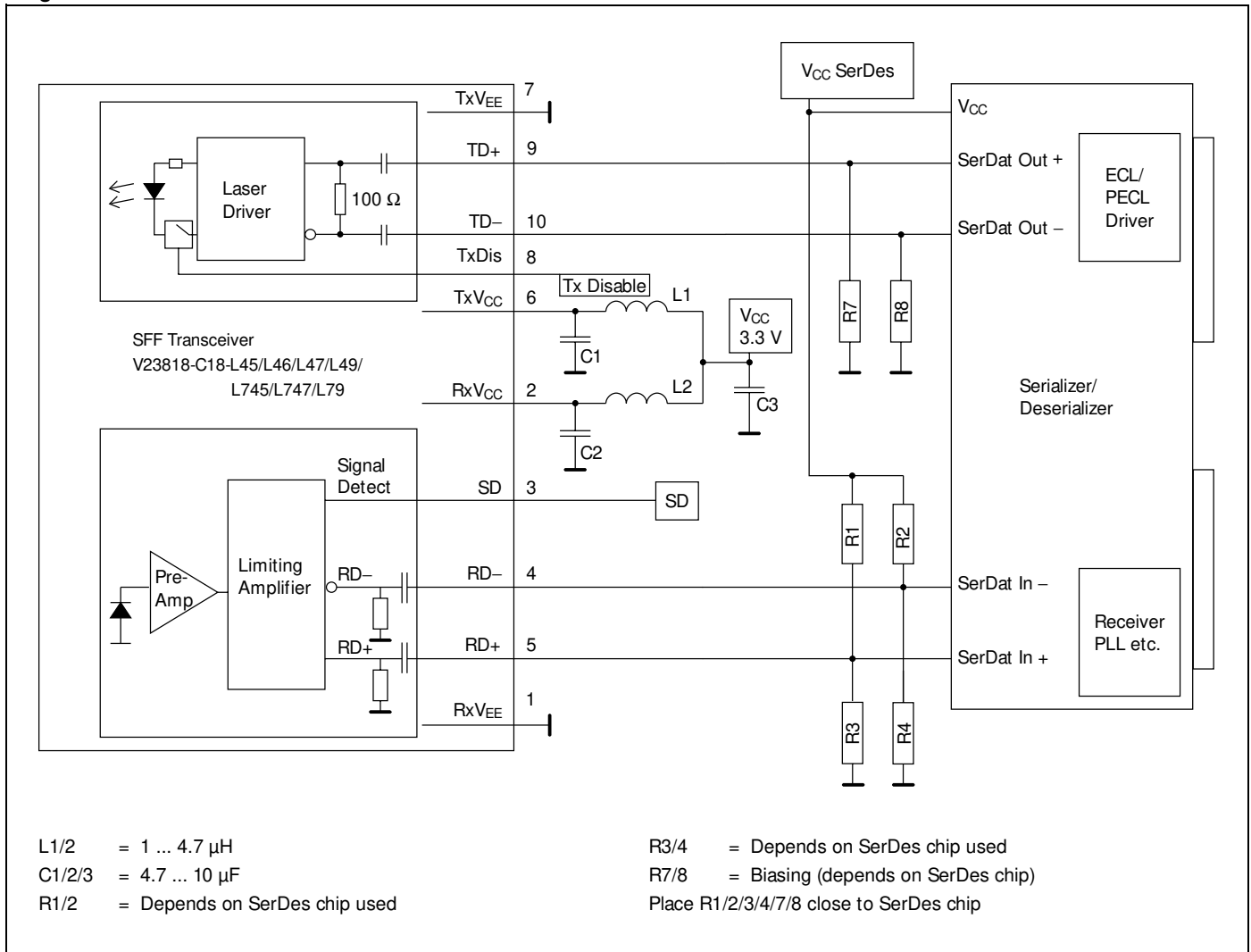
Transceiver Pitch



Single Mode 155 MBd 2x5 Transceiver DC/DC



Single Mode 155 MBd 2x5 Transceiver AC/AC



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 filter-

ing is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module V_{CCRx}/V_{CCTx} .

Published by Infineon Technologies AG

© Infineon Technologies AG 2002
All Rights Reserved

Attention please!

The information herein is given to describe certain components and shall not be considered as warranted characteristics. Terms of delivery and rights to technical change reserved. We hereby disclaim any and all warranties, including but not limited to warranties of non-infringement, regarding circuits, descriptions and charts stated herein. Infineon Technologies is an approved CECC manufacturer.

Information

For further information on technology, delivery terms and conditions and prices please contact the Infineon Technologies offices or our Infineon Technologies Representatives worldwide - see our webpage at www.infineon.com/fiberoptics

Warnings

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your Infineon Technologies offices.

Infineon Technologies Components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.