

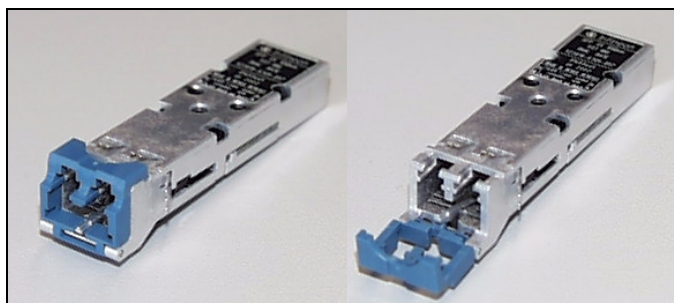
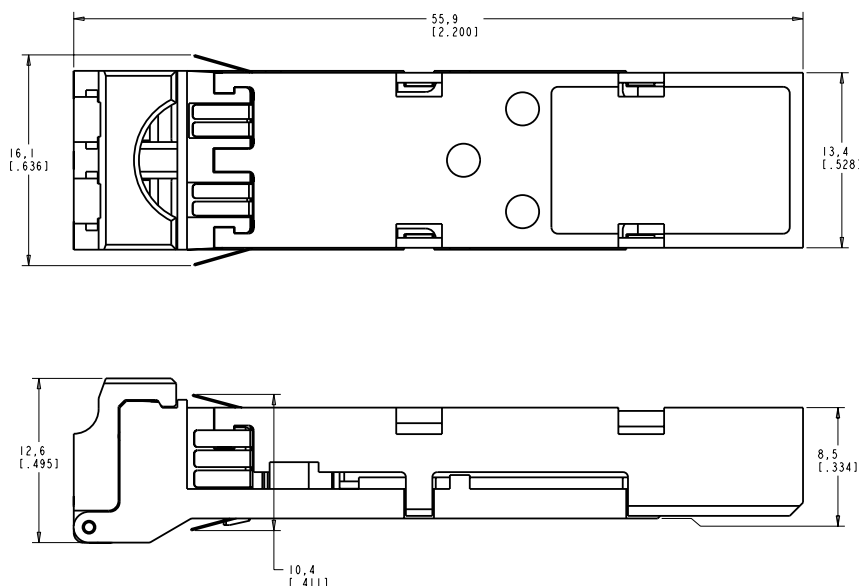
V23818-N15-B657

Small Form Factor Pluggable SFP

Single Mode 1300 nm 2.5 Gbit/s OC-48 Transceiver with LC™ Connector

Preliminary

Dimensions in mm [inches]



FEATURES

- Small Form Factor Pluggable transceiver
- Fully SFP MSA compliant⁽¹⁾
- Advanced release mechanism
 - easy access, even in belly to belly applications
 - grip for easy access – no tool is needed
 - color coded release mechanism
- SM: blue color coding
- Excellent EMI performance
- RJ-45 style LC™ connector system
- Single power supply (3.3 V)
- Low power consumption

- Small size 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 15 km
- Class 1 FDA and IEC laser safety compliant
- AC/AC Coupling according to SFP MSA
- Recommendation: Infineon Cage one-piece design V23818-S5-N1 for press fit and/or solderable
- Suitable for multi rate applications up to 2.5 Gbit/s

Note

1. The SFP MSA can be found at www.infineon.com/fiberoptics next to the transceiver datasheets.

Absolute Maximum Ratings

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

Package Power Dissipation.....	0.9 W
Data Input Levels (PECL)	$V_{CC}+0.5$ V
Differential Data Input Voltage Swing $V_{IDpk-pk}$	5 V
Operating Ambient Temperature	0°C to 70°C
Storage Ambient Temperature	-40°C to 85°C
V_{CC} max.....	5.5 V
ECL-Output current data	50 mA

DESCRIPTION

The Infineon OC-48 SFP transceiver – part of Infineon Small Form Factor transceiver family – is based on the Physical Medium Depend (PMD) sublayer and baseband medium.

The appropriate fiber optic cable is 9 µm single mode fiber with LC™ connector.

Operating range

Fiber type	Minimum range (meters)
9 micron SMF	2 to 15,000

The Infineon SFP single mode transceiver is a single unit comprised of a transmitter, a receiver, and an LC™ receptacle.

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.

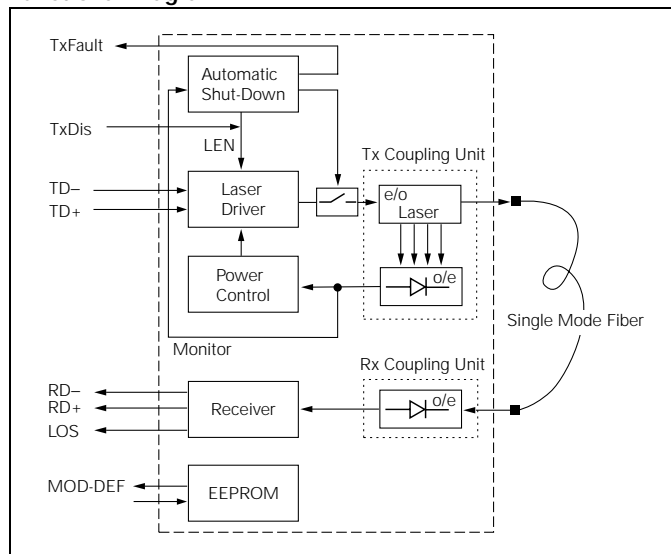
The Infineon single mode OC-48 transceiver is a single unit comprised of a transmitter, a receiver, and an LC receptacle. This design frees the customer from many alignment and PC board layout concerns. The module is designed for low cost LAN, WAN and up to 2.5 Gbit/s applications. It can be used as 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 OC-48 speed from a single power supply (+3.3 V). The full differential data inputs and outputs are PECL and LVPECL compatible.

Functional Description of SFP Transceiver

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

Functional Diagram



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

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

The information which kind of SFP module has been plugged into an SFP port can be read through the MOD-DEF interface. The information is stored in an I²C-EEPROM inside the SFP Transceiver.

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	T _{AMB}	0		70	°C
Power Supply Voltage	V _{CC} -V _{EE}	3.1	3.3	3.5	V
Transmitter					
Differential Data Input Voltage Swing	V _{ID} pk-pk	500		3200	mV
Receiver					
Input Center Wavelength	λ _C	1260		1580	nm

Transmitter Electro-Optical Characteristics

Transmitter	Symbol	Min.	Typ.	Max.	Units
Launched Power (Average) ⁽¹⁾	P _O	-5		0	dBm
Center Wavelength	λ _C	1300		1320	nm
Spectral Width (RMS)	σ _I			1	
Extinction Ratio (Dynamic)	ER	9			dB
Optical Eye Mask	Compliant with ITU-T G.957				
Reset Threshold ⁽²⁾	V _{TH}	2.5	2.75	2.99	V
Reset Time Out ⁽²⁾	t _{RES}	140	240	560	ms
Supply Current			100	150	mA
SONET Jitter	p-p		30		mUI
	rms		3		

Notes

1. Into single mode fiber, 9 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}.

Receiver Electro-Optical Characteristics

Receiver	Symbol	Min.	Typ.	Max.	Units
Sensitivity (Average Power) ⁽¹⁾	P _{IN}			-21	dBm
Saturation (Average Power) ⁽⁶⁾	P _{SAT}	0			
LOS of Signal Assert Level ⁽²⁾	P _{LOSA}			-21	
LOS of Signal Deassert Level ⁽³⁾	P _{LOSD}	-37			
LOS of Signal Hysteresis	P _{LOSA} -P _{LOSD}	0.5	1		dB
LOS of Signal Assert Time	t _{ASS}			100	μs
LOS of Signal Deassert Time	t _{DAS}			350	
Differential Data Output Voltage Swing ⁽⁴⁾	V _{OD} pk-pk	500		1230	mV
Supply current ⁽⁵⁾			100	130	mA

Notes

1. Minimum average optical power at which the BER is less than 1x10⁻¹². Measured with a 2²³-1 NRZ PRBS as recommended by ANSI T1E1.2, SONET OC-48, and ITU-T G.957 S-16.1.
2. An increase in optical power above the specified level will cause the LOS of Signal output to switch from a High state to a Low state.
3. A decrease in optical power below the specified level will cause the LOS of Signal to change from a Low state to a High 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. At 9 dB Extinction Ratio of the incoming signal.

Timing of Control and Status I/O

Parameter	Symbol	Min.	Max.	Units	Condition
Tx Disable Assert Time	t _{off}		10	μs	Time from rising edge of Tx Disable to when the optical output falls below 10% of nominal.
Tx Disable Negate Time	t _{on}		1	ms	Time from falling edge of Tx Disable to when the modulated optical output rises above 90% of nominal.
Time to initialize, including reset of Tx_Fault	t _{init}		300		From power on or negation of Tx Fault using Tx Disable.
Tx Fault Assert Time	t _{fault}		100	μs	Time from fault to Tx fault on.
Tx Disable to reset	t _{reset}	10			Time Tx Disable must be held high to reset Tx_fault.
LOS As-assert Time	t _{loss_on}		100		Time from LOS state to Rx LOS assert.
LOS Deassert Time	t _{loss_off}		100		Time from non-LOS state to Rx LOS deassert.
Serial ID Clock Rate	f _{serial_clock}		100	kHz	

Pin Description

Pin Name	Level/Logic	Pin#	Description
V _{EE} T	Transmitter Ground	N/A	1
Tx Fault	Transmitter Fault Indication	TTL	2
Tx Disable	Transmitter Disable	TTL	3
MOD-DEF2	Module Definition 2	TTL	4
MOD-DEF1	Module Definition 1	TTL	5
MOD-DEF0	Module Definition 0	N/A	6
Rate Select	Not connected	N/A	7
LOS	Loss of Signal	TTL	8

Pin Name	Level/Logic	Pin#	Description
V _{EE} R	Receiver Ground	N/A	9
V _{EE} R	Receiver Ground	N/A	10
V _{EE} R	Receiver Ground	N/A	11
RD-	Inv. Received Data Out	LV PECL	12
RD+	Received Data Out	LV PECL	13
V _{EE} R	Receiver Ground	N/A	14
V _{CC} R	Receiver Power	N/A	15
V _{CC} T	Transmitter Power	N/A	16
V _{EE} T	Transmitter Ground	N/A	17
TD+	Transmit Data In	LV PECL	18
TD-	Inv. Transmit Data In	LV PECL	19
V _{EE} T	Transmitter Ground	N/A	20

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, 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.

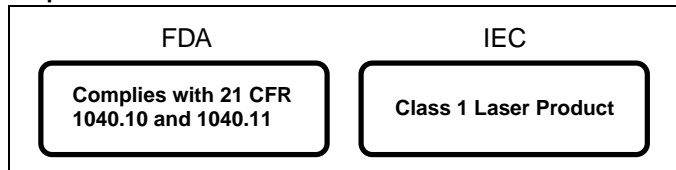
Note

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)).

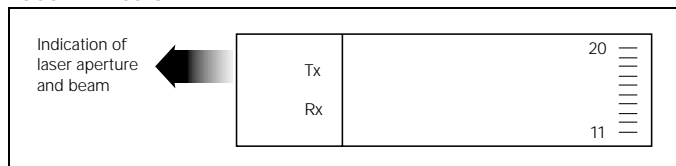
Laser Data

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)	<195 μ W
Beam divergence	t.b.d.

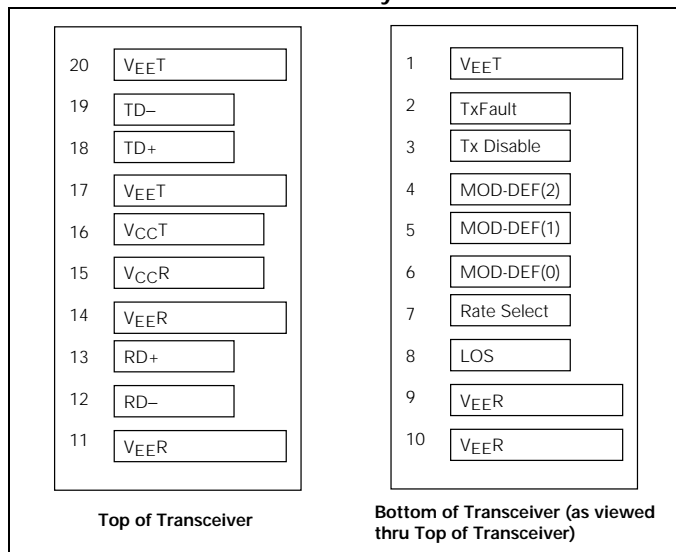
Required Labels



Laser Emission



SFP Transceiver Electrical Pad Layout



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 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 a thevenin equivalent 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.

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.

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

For the SFP transceiver a connection of the SFP cage 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 scenario even the smallest PCBs may have unexpected resonances.

The SFP transceiver can be assembled onto the host board together with all cages and host board connectors complying with the SFP multi source agreement.

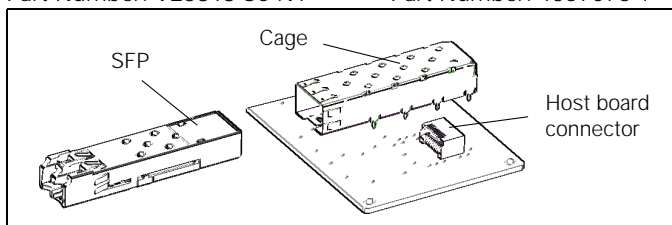
Infineon Proposes

Cage:

Infineon Technologies
Part Number: V23818-S5-N1

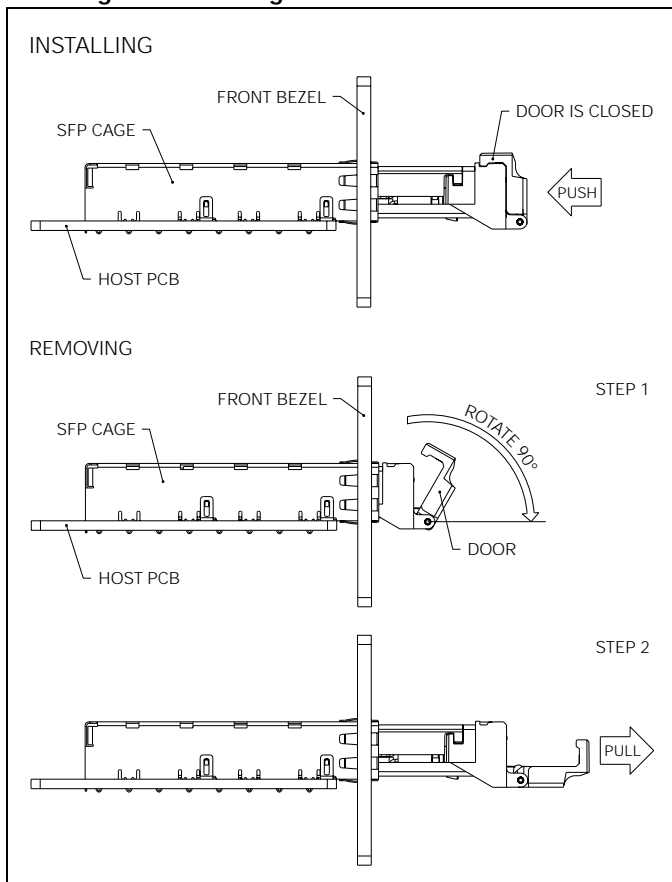
Host board connector:

Tyco Electronics
Part Number: 1367073-1



HANDLING NOTES

Installing and Removing of SFP-Transceiver



APPLICATION NOTES

EEPROM Serial ID Memory Contents

The data can be read using the 2-wire serial CMOS E2PROM protocol of the Atmel AT24C01A or equivalent.

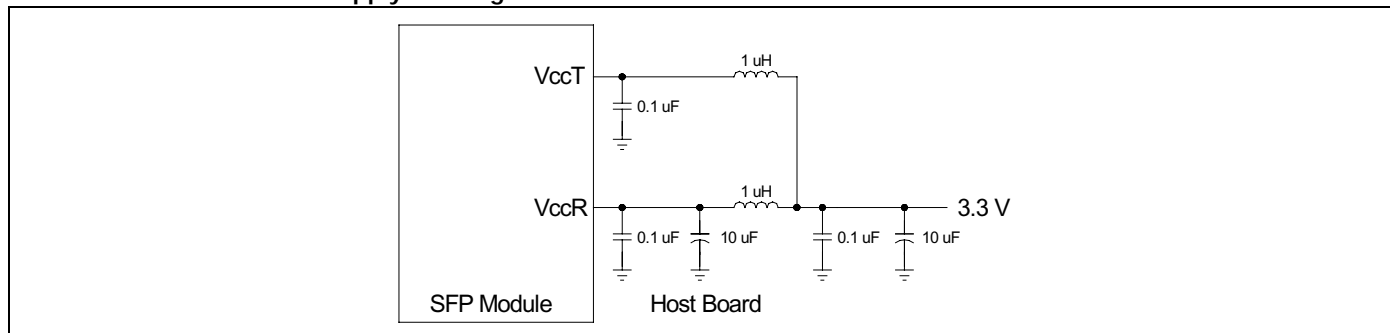
Address	Hex	ASCII	Address	Hex	ASCII	Address	Hex	ASCII	Address	Hex	ASCII
0	03		32	20		64	00		96	20	
1	04		33	20		65	1A		97	20	
2	07		34	20		66	69		98	20	
3	00		35	20		67	5F		99	20	
4	01		36	00		68 ⁽²⁾			100	20	
5	00		37	00		69 ⁽²⁾			101	20	
6	00		38	03		70 ⁽²⁾			102	20	
7	00		39	19		71 ⁽²⁾			103	20	
8	00		40	56	V	72 ⁽²⁾			104	20	
9	00		41	32	2	73 ⁽²⁾			105	20	
10	00		42	33	3	74 ⁽²⁾			106	20	
11	00		43	38	8	75 ⁽²⁾			107	20	
12	19		44	31	1	76 ⁽²⁾			108	20	
13	00		45	38	8	77 ⁽²⁾			109	20	
14	02		46	2D	-	78 ⁽²⁾			110	20	
15	14		47	4E	N	79 ⁽²⁾			111	20	
16	00		48	31	1	80 ⁽²⁾			112	20	
17	00		49	35	5	81 ⁽²⁾			113	20	
18	00		50	2D	-	82 ⁽²⁾			114	20	
19	00		51	42	B	83 ⁽²⁾			115	20	
20	49	l	52	36	6	84 ⁽³⁾			116	20	
21	6E	n	53	35	5	85 ⁽³⁾			117	20	
22	66	f	54	37	7	86 ⁽³⁾			118	20	
23	69	i	55	20		87 ⁽³⁾			119	20	
24	6E	n	56	00		88 ⁽³⁾			120	20	
25	65	e	57	00		89 ⁽³⁾			121	20	
26	6F	o	58	00		90 ⁽³⁾			122	20	
27	6E	n	59	00		91 ⁽³⁾			123	20	
28	20		60	00		92	00		124	20	
29	41	A	61	00		93	00		125	20	
30	47	G	62	00		94	00		126	20	
31	20		63 ⁽¹⁾	30		95 ⁽⁴⁾			127	20	

Notes

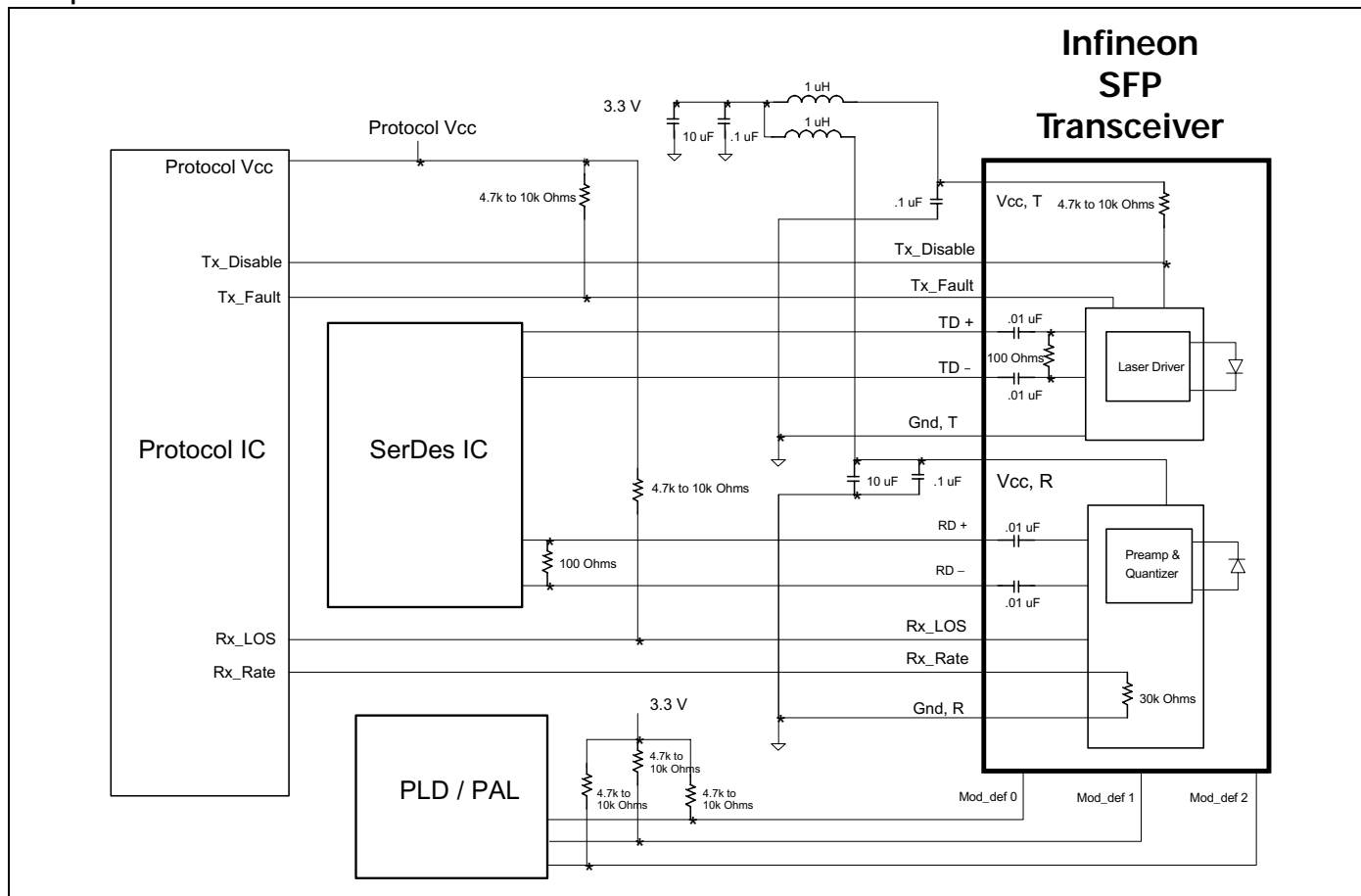
1. Address 63 is check sum of bytes 0–63
2. Address 61–83 Vendor Serial Number
3. Date code
4. Address 95 is check sum of bytes 64–94

Single Mode 1300 nm SFP Transceiver, AC/AC TTL

Recommended Host Board Supply Filtering Network



Example SFP Host Board Schematic



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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

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