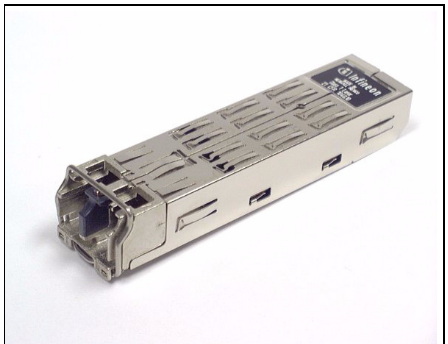
Fiber Optics

iSFP™ - Intelligent Small Form-factor Pluggable V23849-R3x-C55
1.25 Gigabit Ethernet (1000 Base-SX)
4.25/2.125/1.0625 Gbit/s Fibre Channel (400/200/100-M5/M6-SN-I)
Multimode 850 nm Transceiver with LC™ Connector

Preliminary Data Sheet

Features



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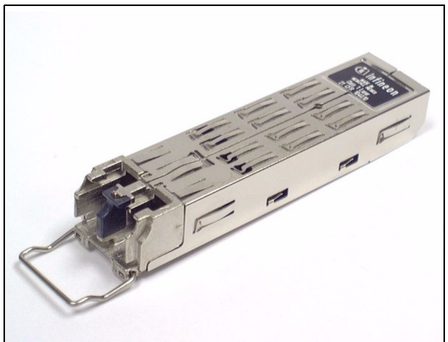

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- Small Form-factor Pluggable (SFP) MSA compatible transceiver[1)]
- Fully SFF-8472 compatible
- Incorporating Intelligent – Digital Diagnostic Monitoring Interface
- Internal calibration implementation
- Advanced release mechanism
- Easy access, even in belly to belly applications
- Wire handle release for simplicity
- Color coded black tab (multimode)
- PCI height compatible
- Excellent EMI performance
- Separate and common chassis/signal ground module concepts available
- RJ-45 style LC™ connector system
- Single power supply (3.3 V)
- Extremely low power consumption of 530 mW typical
- Small size for high channel density
- UL-94 V-0 certified
- ESD Class 1C per JESD22-A114-B (MIL-STD 883D Method 3015.7)
- According to FCC (Class B) and EN 55022
- For distances of up to 860 m (50 µm fiber)
- Laser safety according to Class 1 FDA and IEC
- AC/AC Coupling according to MSA
- Extended operating temperature range of –20°C to 85°C
- SFP evaluation kit V23848-S5-V4 available upon request
- A press fit cage and cage plugs are available as accessory products from Infineon (see **SFP Accessories**)

1) MSA documentation can be found at www.infineon.com/fiberoptics under Transceivers, SFP Transceivers.

For ordering information see next page.

Ordering Information

Part Number	Chassis/Signal Grounding Concept	Temperature Range
V23849-R35-C55	Common	–20°C to 85°C
V23849-R36-C55	Separated	–20°C to 85°C

Pin Configuration

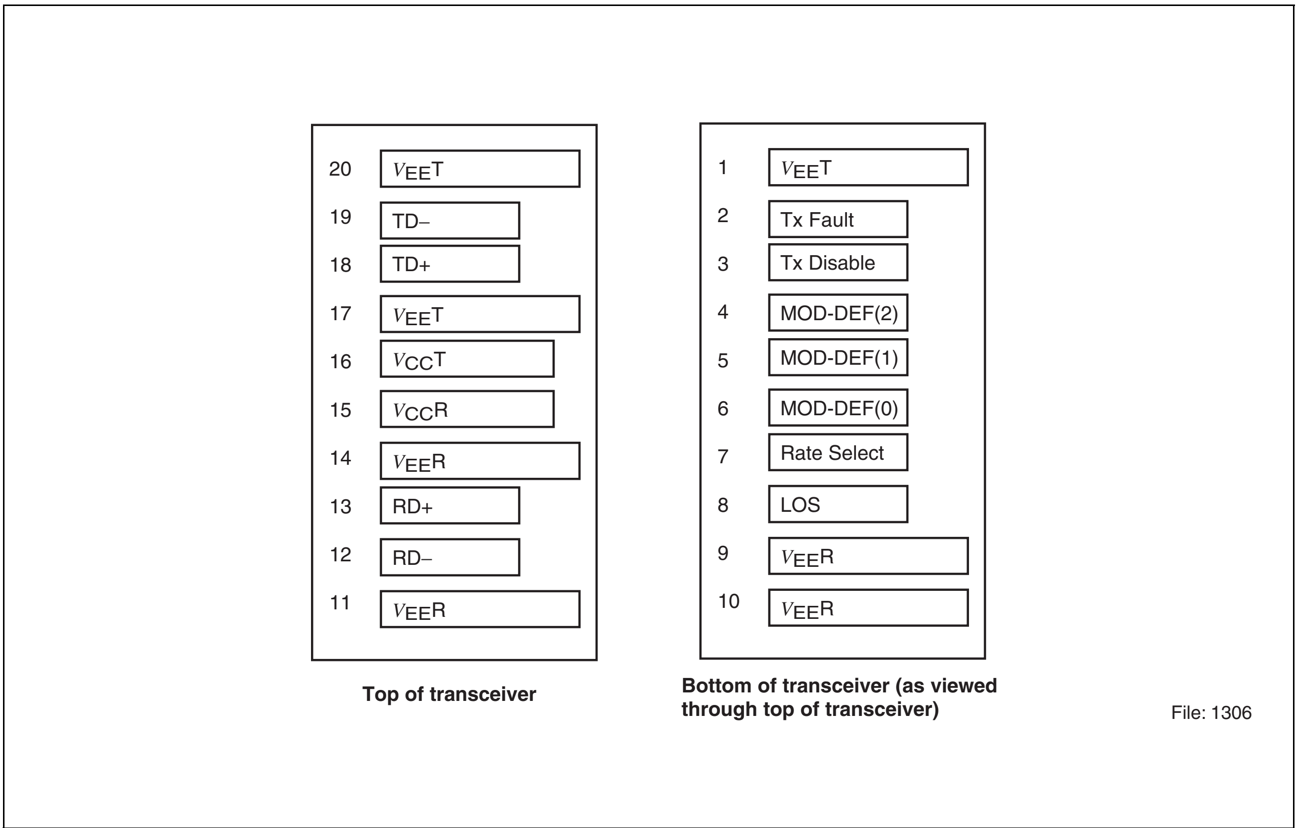


Figure 1 iSFP™ Transceiver Electrical Pad Layout

Pin Description

Pin No.	Name	Logic Level	Function
1	V_{EE}T	N/A	Transmitter Ground[1)]
2	Tx Fault	LVTTL	Transmitter Fault Indication[2) 9)]
3	Tx Disable	LVTTL	Transmitter Disable[3)]
4	MOD-DEF(2)	LVTTL	Module Definition 2[4) 9)]
5	MOD-DEF(1)	LVTTL	Module Definition 1[5) 9)]
6	MOD-DEF(0)	N/A	Module Definition 0[6) 9)]
7	Rate Select	LVTTL	1 & 2 or 2 & 4 Gbit/s[7)]
8	LOS	LVTTL	Loss Of Signal[8) 9)]
9	V_{EE}R	N/A	Receiver Ground[1)]
10	V_{EE}R	N/A	Receiver Ground[1)]
11	V_{EE}R	N/A	Receiver Ground[1)]
12	RD–	LVPECL	Inv. Received Data Out[10)]
13	RD+	LVPECL	Received Data Out[10)]
14	V_{EE}R	N/A	Receiver Ground[1)]
15	V_{CC}R	N/A	Receiver Power[11)]
16	V_{CC}T	N/A	Transmitter Power[11)]
17	V_{EE}T	N/A	Transmitter Ground[1)]
18	TD+	LVPECL	Transmit Data In[12)]
19	TD–	LVPECL	Inv. Transmit Data In[12)]
20	V_{EE}T	N/A	Transmitter Ground[1)]

1) Common transmitter and receiver ground within the module.
2) A high signal indicates a laser fault of some kind and that laser is switched off.
3) A low signal switches the transmitter on. A high signal or when not connected switches the transmitter off.
4) MOD-DEF(2) is the data line of two wire serial interface for serial ID.
5) MOD-DEF(1) is the clock line of two wire serial interface for serial ID.
6) MOD-DEF(0) is grounded by the module to indicate that the module is present.
7) In accordance to SFF Committee SFF-8079 Draft.
8) A low signal indicates normal operation, light is present at receiver input. A high signal indicates the received optical power is below the worst case receiver sensitivity.
9) Should be pulled up on host board to V_{CC} by 4.7 - 10 kΩ.
10) AC coupled inside the transceiver. Must be terminated with 100 Ω differential at the user SERDES.
11) Common transmitter and receiver V_{CC} within the module.
12) AC coupled and 100 Ω differential termination inside the transceiver.

Description

The Infineon Fibre Channel multimode transceiver – part of Infineon iSFP™ family – is compatible to the Physical Medium Depend (PMD) sublayer and baseband medium, type 1000 Base-SX (short wavelength) as specified in IEEE Std 802.3 and Fibre Channel
FC-PI-2 (Rev. 4) 400-M5-SN-I, 400-M6-SN-I for 4.25 Gbit/s,
FC-PI-2 (Rev. 4) 200-M5-SN-I, 200-M6-SN-I for 2.125 Gbit/s, and
FC-PI-2 (Rev. 4) 100-M5-SN-I, 100-M6-SN-I for 1.0625 Gbit/s.

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

Link Length as Defined by IEEE and Fibre Channel Standards

Fiber Type	Reach		Unit
	min.[1]	max.[2]	
at 1.0625 Gbit/s			
50 µm, 2000 MHz*km	0.5	860	meters
50 µm, 500 MHz*km	0.5	500	
50 µm, 400 MHz*km	0.5	450	
62.5 µm, 200 MHz*km	0.5	300	
62.5 µm, 160 MHz*km	0.5	250	
at 1.25 Gbit/s			
50 µm, 500 MHz*km	2	550	meters
50 µm, 400 MHz*km	2	500	
62.5 µm, 200 MHz*km	2	275	
62.5 µm, 160 MHz*km	2	220	
at 2.125 Gbit/s			
50 µm, 2000 MHz*km	0.5	500	meters
50 µm, 500 MHz*km	0.5	300	
50 µm, 400 MHz*km	0.5	260	
62.5 µm, 200 MHz*km	0.5	150	
62.5 µm, 160 MHz*km	0.5	120	
at 4.25 Gbit/s			
50 µm, 2000 MHz*km	0.5	270	meters
50 µm, 500 MHz*km	0.5	150	
50 µm, 400 MHz*km	0.5	130	
62.5 µm, 200 MHz*km	0.5	70	
62.5 µm, 160 MHz*km	0.5	55	

1) Minimum reach as defined by IEEE and Fibre Channel Standards. A 0 m link length (loop-back connector) is supported.

2) Maximum reach as defined by IEEE and Fibre Channel Standards. Longer reach possible depending upon link implementation.

The Infineon iSFP™ multimode 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 datacom and telecom applications while providing the advantages of fiber optic technology.

The module is designed for low cost SAN, LAN, 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 1.0625 Gbit/s / 1.25 Gbit/s / 2.125 Gbit/s / 4.25 Gbit/s from a single power supply (+3.3 V). The 100 Ω differential data inputs and outputs are LVPECL and CML compatible.

Functional Description of iSFP™ Transceiver

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

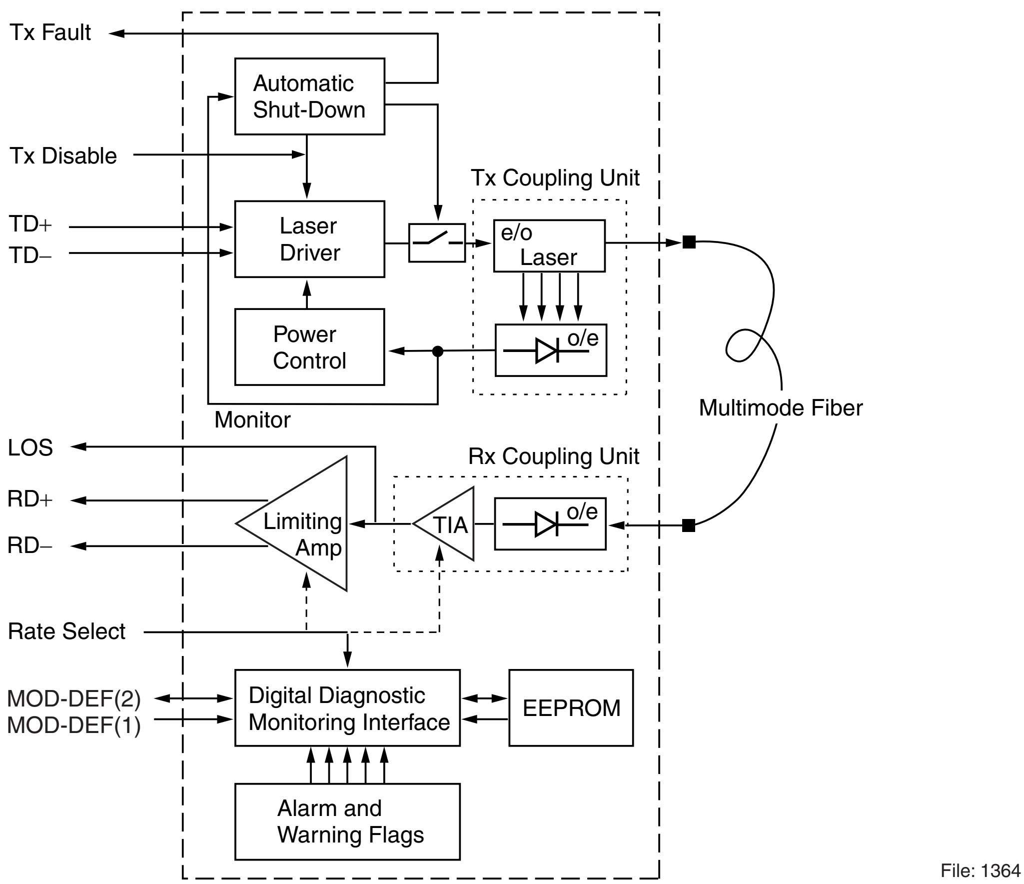


Figure 2 Functional Diagram

The receiver component converts the optical serial data into LVPECL (CML compatible) electrical data (RD+ and RD–). The Loss Of Signal (LOS) shows whether an optical signal is present.

The transmitter converts LVPECL (CML 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.

An enhanced Digital Diagnostic Monitoring Interface (Intelligent) has been incorporated into the Infineon Small Form-factor Pluggable (SFP) transceiver. This allows real time access to transceiver operating parameters, based on the SFF-8472.

This transceiver features Internal Calibration. Measurements are calibrated over operating temperature and voltage and must be interpreted as defined in SFF-8472.

The transceiver generates this diagnostic data by digitization of internal analog signals monitored by a new diagnostic Integrated Circuit (IC).

This diagnostic IC has inbuilt sensors to include alarm and warning thresholds. These threshold values are set during device manufacture and therefore allow the user to determine when a particular value is outside of its operating range.

Alarm and Warning Flags are given. Alarm Flags indicate conditions likely to be associated with an inoperational link and cause for immediate action. Warning Flags indicate conditions outside the normally guaranteed bounds but not necessarily causes of immediate link failures.

These enhanced features are in addition to the existing SFP features provided by the manufacturer i.e. serial number and other vendor specific data.

The serial ID interface defines a 256 byte memory map in EEPROM, accessible over a 2 wire, serial interface at the 8 bit address 1010000X (A0h).

The Digital Diagnostic Monitoring Interface makes use of the 8 bit address 1010001X (A2h), so the originally defined serial ID memory map remains unchanged and is therefore backward compatible.

Digital Diagnostic Monitoring Parameters

Parameter	Accuracy SFF-8472	Accuracy Actual
Tx Optical Power	±3 dB	±3 dB
Rx Optical Power	±3 dB	±3 dB
Bias Current	±10%	±10%
Power Supply Voltage	±3%	±3%
Transceiver Temperature	±3°C	±3°C

Regulatory Compliance (EMI)

Feature	Standard	Comments
ESD: Electrostatic Discharge to the Electrical Pins	EIA/JESD22-A114-B (MIL-STD 883D method 3015.7)	Class 1C
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 10 V/m, noise frequency ranges from 10 MHz to 2 GHz. No effect on transceiver performance between the specification limits.
Emission: Radiated Field Strength	FCC 47 CFR Part 15, Class B CISPR 22 EN 55022 Class B	Noise frequency range: 30 MHz to 18 GHz

Technical Data

Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Data Input Voltage	$V_{ID\ max}$		V_{CC}+0.5	V
Differential Data Input Voltage Swing	V_{ID}pk-pk		5	V
Storage Ambient Temperature	T_S	–40	85	°C
Operating Case Temperature[1)]	T_C	–20	85	°C
Storage Relative Humidity	RH_s	5	95	%
Operating Relative Humidity	RH_o	5	85	%
Supply Voltage	$V_{CC\ max}$		4	V
Data Output Current	I_{data}		50	mA
Receiver Optical Input Power	$Rx_{P\ max}$		3	dBm

[1)] Operating case temperature measured at transceiver reference point (in cage through 2nd centre hole from rear, see **Figure 10**).

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

Electrical Characteristics (V_{CC} = 2.97 V to 3.63 V, T_C = –20°C to 85°C)

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Common					
Supply Voltage	$V_{CC}-V_{EE}$	2.97	3.3	3.63	V
In-rush Current[1)]	$I_{IR\ max}$			30	mA
Power Dissipation	P	400		900	mW
Transmitter					
Differential Data Input Voltage Swing[2)]	V_{ID}pk-pk	500		3200	mV
Tx Disable Voltage	Tx_{Dis}	2		V_{CC}	V
Tx Enable Voltage	Tx_{En}	V_{EE}		0.8	V
Tx Fault High Voltage	Tx_{FH}	2.4		V_{CC}	V
Tx Fault Low Voltage	Tx_{FL}	V_{EE}		0.5	V
Reset Threshold[3)]	V_{TH}	2.5	2.75	2.85	V
Reset Time Out[3)]	t_{RES}	140	240	300	ms
Supply Current[4)]	I_{Tx}		100	150	mA
Receiver					
Differential Data Output Voltage Swing[5)]	V_{OD}pk-pk	370		1000	mV
LOS Active	LOS_A	2.4		V_{CC}	V
LOS Normal	LOS_N	V_{EE}		0.5	V
Rate Select 1 / 2 Gbit/s[6)]	RS_{LOW}	2		V_{CC}	V
Rate Select 2 / 4 Gbit/s[6)]	RS_{HIGH}	V_{EE}		0.8	V
Rise Time[7)]	t_{R-Rx}		t.b.d.		ps
Fall Time[7)]	t_{F-Rx}		t.b.d.		ps
Deterministic Jitter[8)]	DJ_{Rx}			t.b.d.	ps
Total Jitter[9)]	TJ_{Rx}			t.b.d.	ps
Jitter (pk-pk)[10)]	J_{Rx}			t.b.d.	ps
Power Supply Noise Rejection[11)]	PSNR		100		mV_{pp}
Supply Current[4) 12)]	I_{Rx}		80	90	mA

1) Measured with MSA recommended supply filter network (**Figure 7**). Maximum value above that of the steady state value.

2) Internally AC coupled. Typical 100 Ω differential input impedance.

3) 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}.

4) MSA defines maximum current at 300 mA.

5) Internally AC coupled. Load 50 Ω to GND or 100 Ω differential. For dynamic measurement a tolerance of 50 mV should be added.

6) In accordance to SFF Committee SFF-8079 Draft.

7) Measured values are 20% - 80%.

8) Deterministic Jitter is that jitter measured by a bathtub scan, using a $2^7–1$ NRZ PRBS, and extrapolating to 1 BER.

9) Total Jitter is that jitter measured by a bathtub scan, using a $2^7–1$ NRZ PRBS, and extrapolating to $1x10^{-12}$ BER.

10) Jitter (pk-pk) is measured using a $2^7–1$ NRZ PRBS and a Digital Communications Analyzer.

11) Measured using a 20 Hz to 1 MHz sinusoidal modulation with the MSA recommended power supply filter network (**Figure 7**) in place. A change in sensitivity of less than 1 dB can be typically expected.

12) Supply current excluding Rx output load.

Optical Characteristics (V_{CC} = 2.97 V to 3.63 V, T_C = –20°C to 85°C)

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Transmitter					
Optical Modulation Amplitude[1] @ 4.25 Gbit/s @ 2.125 Gbit/s @ 1.0625 Gbit/s	OMA	 247 196 156			µW
Launched Power (Average)[2]	P_O	–8.5		–4	dBm
Extinction Ratio (Dynamic)[3]	ER	9			dB
Center Wavelength	λ_C	830	850	860	nm
Spectral Width (rms)	σ_l			0.85	nm
Relative Intensity Noise	RIN			–118	dB/Hz
Deterministic Jitter[4]	DJ_{Tx}			t.b.d.	ps
Total Jitter[5]	TJ_{Tx}			t.b.d.	ps
Jitter (pk-pk)[6]	J_{Tx}			t.b.d.	ps
Rise Time[7]	t_{R-Tx}			90	ps
Fall Time[7]	t_{F-Tx}			90	ps
Receiver[8]					
Min. Optical Modulation Amplitude[9] @ 4.25 Gbit/s @ 2.125 Gbit/s @ 1.0625 Gbit/s	OMA			 61 49 31	µW
Average Received Power	P_R			0	dBm
Sensitivity (Average Power)[10] @ 1.25 Gbit/s	P_{IN}			–19	dBm
Stressed Receiver Sensitivity 50 µm Fiber[11] @ 4.25 Gbit/s @ 2.125 Gbit/s @ 1.0625 Gbit/s	SPIN 50 µm			 138 96 55	µW
@ 1.25 Gbit/s[12]				–13.5	dBm

Optical Characteristics (V_{CC} = 2.97 V to 3.63 V, T_C = –20°C to 85°C) (cont'd)

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Stressed Receiver Sensitivity 62.5 µm Fiber[11)] @ 4.25 Gbit/s @ 2.125 Gbit/s @ 1.0625 Gbit/s	SPIN 62.5 µm			 148 109 67	µW
LOS Assert Level[13)]	P_{LOSA}	–30			dBm
LOS Deassert Level[13)]	P_{LOSD}			–23	dBm
LOS Hysteresis[13)]	$P_{LOSA} - P_{LOSD}$	1			dB
Input Center Wavelength	λ_C	770	850	860	nm
Optical Return Loss	ORL	12			dB

1) Fibre Channel PI Standard. Typical OMA values based on –6 dBm launched power (average) and 15 dB extinction ratio.
2) Into multimode fiber, 62.5 µm or 50 µm diameter.
3) For GbE applications only.
4) Deterministic Jitter is that jitter measured by a bathtub scan, using a 2^7–1 NRZ PRBS, and extrapolating to 1 BER.
5) Total Jitter is that jitter measured by a bathtub scan, using a 2^7–1 NRZ PRBS, and extrapolating to $1x10^{-12}$ BER.
6) Jitter (pk-pk) is measured using a 2^7–1 NRZ PRBS and a Digital Communications Analyzer.
7) Measured at nominal data rate. These are unfiltered 20% - 80% values.
8) Receiver characteristics are measured with a worst case reference laser.
9) Fibre Channel PI Standard.
10) Average optical power at which the BER is $1x10^{-12}$. Measured with a 2^7–1 NRZ PRBS and ER = 9 dB.
11) Measured at the given Stressed Receiver Eye Closure Penalty and DCD component given in Fibre Channel PI Standard (2.03/2.18 dB & 40/80 ps).
12) 50 µm MMF, tested at ER = 9 dB.
13) See **Figure 3**.

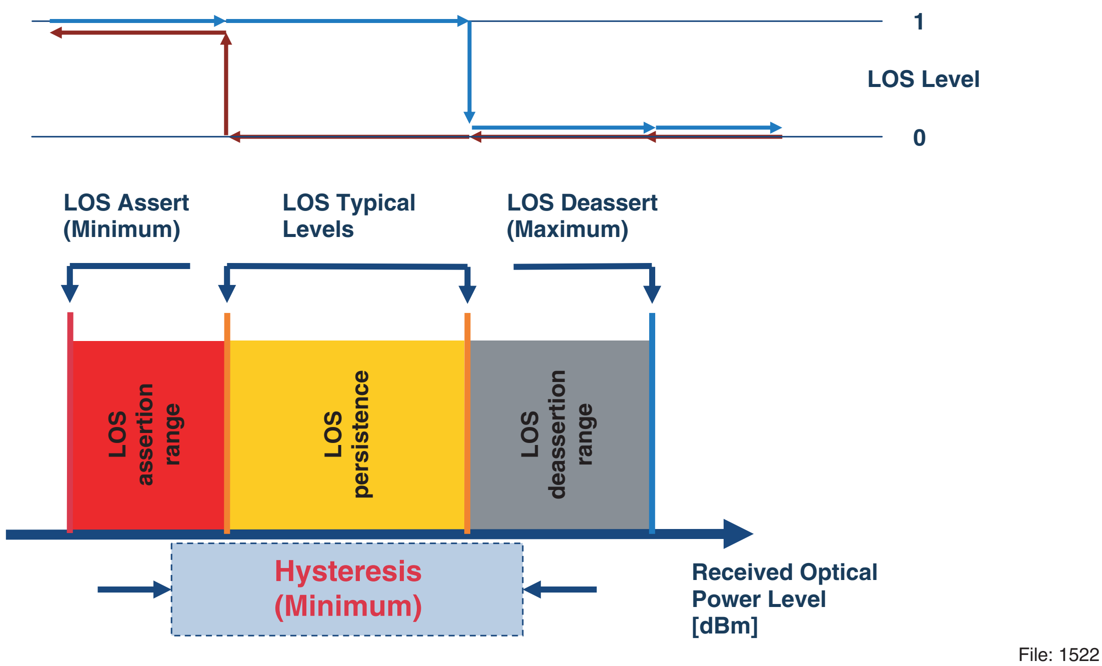

1
LOS Level
0
LOS Assert (Minimum)
LOS Typical Levels
LOS Deassert (Maximum)
LOS assertion range
LOS persistence
LOS deassertion range
Hysteresis (Minimum)
Received Optical Power Level [dBm]
File: 1522

Figure 3

Timing of Control and Status I/O

Parameter	Symbol	Values		Unit	Condition
		min.	max.		
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	ms	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		µs	Time Tx Disable must be held high to reset Tx Fault
LOS Assert Time	t_loss_on		100	µs	Time from LOS state to Rx LOS assert
LOS Deassert Time	t_loss_off		100	µs	Time from non-LOS state to Rx LOS deassert

I/O Timing of Soft Control and Status Functions

Parameter	Symbol	Max. Value	Unit	Condition
Tx Disable assert time	t_off	100	ms	Time from Tx Disable bit set[1)] until optical output falls below 10% of nominal
Tx Disable deassert time	t_on	100	ms	Time from Tx Disable bit cleared until optical output rises above 90% of nominal
Time to initialize, including reset of Tx Fault	t_init	300	ms	Time from power on or negation of Tx Fault using Tx Disable until transmitter output is stable[2)]
Tx Fault assert time	t_fault	100	ms	Time from fault to Tx Fault bit set
LOS assert time	t_loss_on	100	ms	Time from LOS state to Rx LOS bit set
LOS deassert time	t_loss_off	100	ms	Time from non-LOS state to Rx LOS bit cleared
Rate select change time	t_rate_sel	100	ms	Time from change of state of Rate Select bit[1)] until receiver bandwidth is in conformance with appropriate specification
Serial ID clock rate[3)]	f_serial_clock	400	kHz	N/A
Analog parameter data ready	t_data	1000	ms	From power on to data ready, bit 0 of byte 110 set
Serial bus hardware ready	t_serial	300	ms	Time from power on until module is ready for data transmission

1) Measured from falling clock edge after stop bit of write transaction.
2) See Gigabit Interface Converter (GBIC). SFF-0053, Rev. 5.5, September 27, 2000.
3) The maximum clock rate of the serial interface is defined by the I^2C bus interface standard.

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 except for deviations pursuant to Laser Notice 50, dated July 26, 2001.

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

Attention: 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
Accessible Emission Limit (as defined by IEC: 7 mm aperture at 14 mm distance)	709 µW

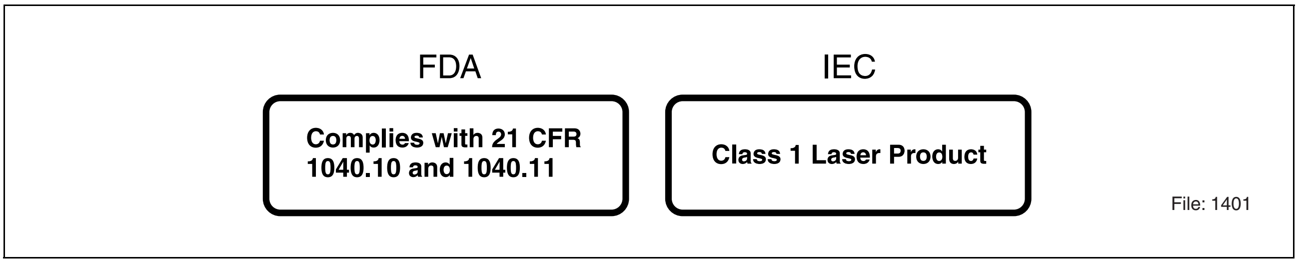


Figure 4 Required Labels

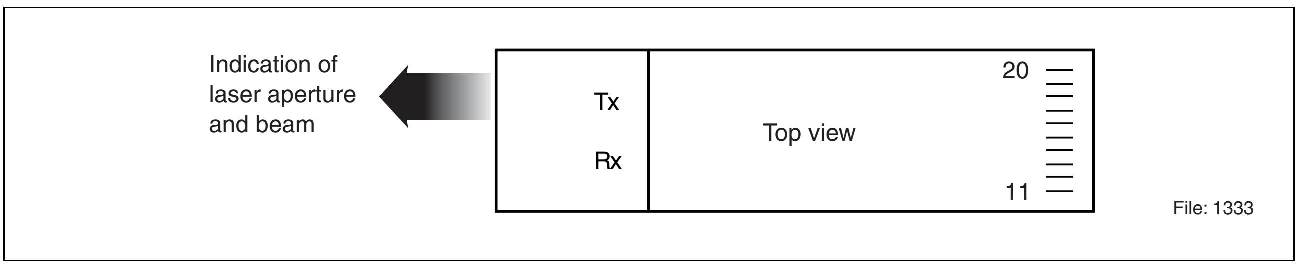


Figure 5 Laser Emission

Application Notes

EMI Recommendations

To avoid electromagnetic radiation exceeding the required limits set by the standards, please take note of the following recommendations.

When Gigabit switching components are found on a PCB (e.g. multiplexer, serializer-deserializer, clock data recovery, etc.), any opening of the chassis may leak radiation; this may also occur at chassis slots other than that of the device itself. Thus every mechanical opening or aperture should be as small as feasible and its length carefully considered.

On the board itself, every data connection should be an impedance matched line (e.g. strip line or coplanar strip line). Data (D) and Data-not (Dn) should be routed symmetrically. Vias should be avoided. Where internal termination inside an IC or a transceiver is not present, a line terminating resistor must be provided. The decision of how best to establish a ground depends on many boundary conditions. This decision may turn out to be critical for achieving lowest EMI performance. At RF frequencies the ground plane will always carry some amount of RF noise. Thus the ground and V_{CC} planes are often major radiators inside an enclosure. As a general rule, for small systems such as PCI cards placed inside poorly shielded enclosures, the common ground scheme has often proven to be most effective in reducing RF emissions. In a common ground scheme, the PCI card becomes more equipotential with the chassis ground. As a result, the overall radiation will decrease. In a common ground scheme, it is strongly recommended to provide a proper contact between signal ground and chassis ground at every location where possible. This concept is designed to avoid hotspots which are places of highest radiation, caused when only a few connections between chassis and signal grounds exist. Compensation currents would concentrate at these connections, causing radiation. However, as signal ground may be the main cause for parasitic radiation, connecting chassis ground and signal ground at the wrong place may result in enhanced RF emissions.

For example, connecting chassis ground and signal ground at a front panel/bezel/chassis by means of a fiber optic transceiver/cage may result in a large amount of radiation especially where combined with an inadequate number of grounding points between signal ground and chassis ground. Thus the transceiver becomes a single contact point increasing radiation emissions. Even a capacitive coupling between signal ground and chassis ground may be harmful if it is too close to an opening or an aperture. For a number of systems, enforcing a strict separation of signal ground from chassis ground may be advantageous, providing the housing does not present any slots or other discontinuities. This separate ground concept seems to be more suitable in large systems where appropriate shielding measures have also been implemented.

In many situations the question on which ground concept to implement in the design cannot be easily decided prior to the receipt of first EMI measurement results. Infineon thus offers both module versions; V23849-Xx5-Xxx for common ground and V23849-Xx6-Xxx for separate ground concept.

The return path of RF current must also be considered. Thus a split ground plane between Tx and Rx paths may result in severe EMI problems irrespective of which module ground concept has been applied.

The bezel opening for a transceiver should be sized so that all contact springs of the transceiver cage make good electrical contact with the face plate. Please consider that the PCB may behave like a dielectric waveguide. With a dielectric constant of 4, the wavelength of the harmonics inside the PCB will be half of that in free space. Thus even the smallest PCBs may have unexpected resonances.

Large systems can have many openings in the front panel for SFP transceivers. In typical applications, not all of these ports will hold transceivers; some may be intentionally left empty. These empty slots may emit significant amounts of radiation. Thus it is recommended that empty ports be plugged with an EMI plug as shown in **Figure 6**. Infineon offers an EMI/dust plug, P/N V23818-S5-B1.

SFP Accessories

Cage:
Infineon Technologies
Part Number: V23838-S5-N1/V23838-S5-N1-BB

Host Board Connector:
Tyco Electronics
Part Number: 1367073-1

Cage EMI/Dust Plug:
Infineon Technologies
Part Number: V23818-S5-B1

Cage Dust Plug:
Infineon Technologies
Part Number: V23818-S5-B2

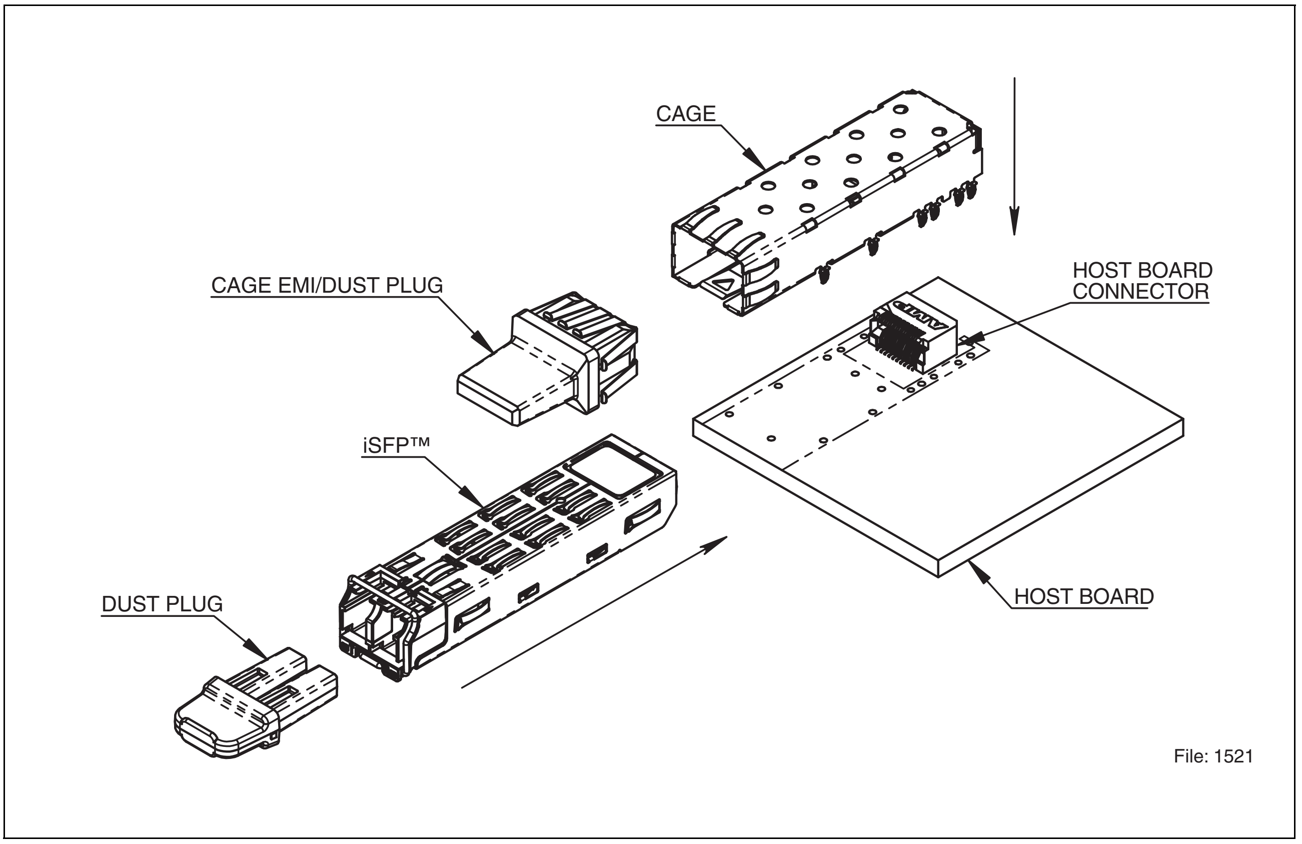


Figure 6

EEPROM Serial ID Memory Contents (A0h)

Addr.	Hex	ASCII	Name/Description
0	03		Identifier
1	04		Extended identifier
2	07		Connector
3	00		Transceiver optical compatibility
4	00		
5	00		
6	01		
7	40		
8	40		
9	0C		
10	15		
11	01		Encoding
12	2B		BR, nominal
13	00		Reserved
14	00		Length (9 µm) - km
15	00		Length (9 µm)
16	0F		Length (50 µm)
17	07		Length (62.5 µm)
18	00		Length (copper)
19	00		Reserved
20	49	I	Vendor name
21	6E	n	
22	66	f	
23	69	i	
24	6E	n	
25	65	e	
26	6F	o	
27	6E	n	
28	20		
29	41	A	
30	47	G	
31	20		

Addr.	Hex	ASCII	Name/Description
32	20		Vendor name
33	20		
34	20		
35	20		
36	00		Reserved
37	00		Vendor OUI
38	03		
39	19		
40	56	V	Vendor part number
41	32	2	
42	33	3	
43	38	8	
44	34	4	
45	39	9	
46	2D	-	
47	52	R	
48	33	3	
49	[1]	[1]	
50	2D	-	
51	43	C	
52	35	5	
53	35	5	
54	20		
55	20		
56	30	0	Vendor revision, product status dependent
57	31	1	
58	2E	.	
59	30	0	
60	03		Wavelength
61	52		
62	00		Reserved
63			Check sum of bytes 0 - 62

Addr.	Hex	ASCII	Name/Description
64	00		Transceiver signal options
65	3A		
66	00		BR, maximum
67	19		BR, minimum
68			Vendor serial number
69			
70			
71			
72			
73			
74			
75			
76			
77			
78			
79			
80			
81			
82			
83			
84			Vendor manufacturing date code
85			
86			
87			
88			
89			
90			
91			
92	68		Diagnostic monitoring type
93	B0		Enhanced options
94	01		SFF-8472 compliance
95			Check sum of bytes 64 - 94

Addr.	Hex	ASCII	Name/Description
96	20		Vendor specific EEPROM
97	20		
98	20		
99	20		
100	20		
101	20		
102	20		
103	20		
104	20		
105	20		
106	20		
107	20		
108	20		
109	20		
110	20		
111	20		
112	20		
113	20		
114	20		
115	20		
116	20		
117	20		
118	20		
119	20		
120	20		
121	20		
122	20		
123	20		
124	20		
125	20		
126	20		
127	20		
128 - 255			Vendor specific. Reserved for future use.

[1] V23849-R35-C55: Hex = 35, ASCII = 5,
V23849-R36-C55: Hex = 36, ASCII = 6.

Digital Diagnostic Monitoring Interface – Intelligent

Alarm and Warning Thresholds (2-Wire Address A2h)

Address	# Bytes	Name	Description	Value
00 - 01	2	Temp High Alarm	MSB at low address	105°C[1]
02 - 03	2	Temp Low Alarm	MSB at low address	–20°C
04 - 05	2	Temp High Warning	MSB at low address	100°C[1]
06 - 07	2	Temp Low Warning	MSB at low address	–10°C
08 - 09	2	Voltage High Alarm	MSB at low address	3.7 V
10 - 11	2	Voltage Low Alarm	MSB at low address	2.9 V
12 - 13	2	Voltage High Warning	MSB at low address	3.63 V
14 - 15	2	Voltage Low Warning	MSB at low address	3 V
16 - 17	2	Bias High Alarm	MSB at low address	12 mA
18 - 19	2	Bias Low Alarm	MSB at low address	0 mA
20 - 21	2	Bias High Warning	MSB at low address	11 mA
22 - 23	2	Bias Low Warning	MSB at low address	1 mA
24 - 25	2	Tx Power High Alarm	MSB at low address	–3 dBm
26 - 27	2	Tx Power Low Alarm	MSB at low address	–10.5 dBm
28 - 29	2	Tx Power High Warning	MSB at low address	–4 dBm
30 - 31	2	Tx Power Low Warning	MSB at low address	–9.5 dBm
32 - 33	2	Rx Power High Alarm	MSB at low address	1 dBm
34 - 35	2	Rx Power Low Alarm	MSB at low address	–19.5 dBm
36 - 37	2	Rx Power High Warning	MSB at low address	0 dBm
38 - 39	2	Rx Power Low Warning	MSB at low address	–18.5 dBm
40 - 55	16	Reserved	Reserved for future monitored quantities	

[1] A delta exists between actual transceiver temperature and value shown as measurement is taken internal to an IC located on the underside of the iSFP™ PCB.

Calibration Constants for External Calibration Option (2-Wire Address A2h)

Address	# Bytes	Name	Description	Value
56 - 59	4	Rx_PWR (4)	Single precision floating point calibration data, Rx optical power.	0
60 - 63	4	Rx_PWR (3)		0
64 - 67	4	Rx_PWR (2)		0
68 - 71	4	Rx_PWR (1)		1
72 - 75	4	Rx_PWR (0)		0
76 - 77	2	Tx_I(Slope)	Fixed decimal (unsigned) calibration data, laser bias current.	1
78 - 79	2	Tx_I (Offset)	Fixed decimal (signed two's complement) calibration data, laser bias current.	0
80 - 81	2	Tx_PWR (Slope)	Fixed decimal (unsigned) calibration data, transmitter coupled output power.	1
82 - 83	2	Tx_PWR (Offset)	Fixed decimal (signed two's complement) calibration data, transmitter coupled output power.	0
84 - 85	2	T (Slope)	Fixed decimal (unsigned) calibration data, internal module temperature.	1
86 - 87	2	T (Offset)	Fixed decimal (signed two's complement) calibration data, internal module temperature.	0
88 - 89	2	V (Slope)	Fixed decimal (unsigned) calibration data, internal module supply voltage.	1
90 - 91	2	V (Offset)	Fixed decimal (signed two's complement) calibration data, internal module supply voltage.	0
92 - 94	3	Reserved	Reserved	
95	1	Check sum	Byte 95 contains the low order 8 bits of the sum of bytes 0 - 94.	

A/D Values and Status Bits (2-Wire Address A2h)

Byte	Bit	Name	Description
Converted analog values. Calibrated 16 bit data.			
96	All	Temperature MSB	Internally measured module temperature[1)]
97	All	Temperature LSB	
98	All	V_{CC} MSB	Internally measured supply voltage in transceiver[2)]
99	All	V_{CC} LSB	
100	All	Tx Bias MSB	Internally measured Tx Bias Current[3)]
101	All	Tx Bias LSB	
102	All	Tx Power MSB	Measured Tx output power[4)]
103	All	Tx Power LSB	
104	All	Rx Power MSB	Measured Rx input power[5)]
105	All	Rx Power LSB	
106	All	Reserved MSB	Reserved for 1st future definition of digitized analog input
107	All	Reserved LSB	Reserved for 1st future definition of digitized analog input
108	All	Reserved MSB	Reserved for 2nd future definition of digitized analog input
109	All	Reserved LSB	Reserved for 2nd future definition of digitized analog input
Optional Status/Control Bits			
110	7	Tx Disable State	Digital state of the Tx Disable Input Pin
110	6	Soft Tx Disable	Read/write bit that allows software disable of laser. Writing 1 disables laser. Not implemented.
110	5	Reserved	
110	4	Rx Rate Select State	Digital state of the SFP Rx Rate Select Input Pin
110	3	Soft Rx Rate Select	Read/write bit that allows software Rx rate select. Writing 1 selects full bandwidth operation[6)]

A/D Values and Status Bits (2-Wire Address A2h) (cont'd)

Byte	Bit	Name	Description
110	2	Tx Fault	Digital state of the Tx Fault Output Pin
110	1	LOS	Digital state of the LOS Output Pin
110	0	Data_Ready_Bar	Indicates transceiver has achieved power up and data is ready
111	7 - 0	Soft Rx Rate Select	Rate Select[6]

1) Temperature measurement is performed on an IC located on the underside of the iSFP™ PCB. The accuracy is ±3°C.
2) The Tx voltage V_{CC}T is monitored, with accuracy of ±3%.
3) The accuracy of bias current measurement is ±10%.
4) The accuracy of the Tx optical power measurement is ±3 dB.
5) The accuracy of the Rx optical power measurement is ±3 dB.
6) In accordance to SFF Committee SFF-8079 Draft.

Alarm and Warning Flags (2-Wire Address A2h)

Byte	Bit	Name	Description
112	7	Temp High Alarm	Set when internal temperature exceeds high alarm level
112	6	Temp Low Alarm	Set when internal temperature is below low alarm level
112	5	V_{CC} High Alarm	Set when internal supply voltage exceeds high alarm level
112	4	V_{CC} Low Alarm	Set when internal supply voltage is below low alarm level
112	3	Tx Bias High Alarm	Set when Tx Bias current exceeds high alarm level
112	2	Tx Bias Low Alarm	Set when Tx Bias current is below low alarm level
112	1	Tx Power High Alarm	Set when Tx output power exceeds high alarm level
112	0	Tx Power Low Alarm	Set when Tx output power is below low alarm level
113	7	Rx Power High Alarm	Set when received power exceeds high alarm level
113	6	Rx Power Low Alarm	Set when received power is below low alarm level
113	5	Reserved Alarm	
113	4	Reserved Alarm	
113	3	Reserved Alarm	
113	2	Reserved Alarm	
113	1	Reserved Alarm	
113	0	Reserved Alarm	
114	All	Reserved	
115	All	Reserved	
116	7	Temp High Warning	Set when internal temperature exceeds high warning level
116	6	Temp Low Warning	Set when internal temperature is below low warning level
116	5	V_{CC} High Warning	Set when internal supply voltage exceeds high warning level

Alarm and Warning Flags (2-Wire Address A2h) (cont'd)

Byte	Bit	Name	Description
116	4	V_{CC} Low Warning	Set when internal supply voltage is below low warning level
116	3	Tx Bias High Warning	Set when Tx bias current exceeds high warning level
116	2	Tx Bias Low Warning	Set when Tx bias current is below low warning level
116	1	Tx Power High Warning	Set when Tx output power exceeds high warning level
116	0	Tx Power Low Warning	Set when Tx output power is below low warning level
117	7	Rx Power High Warning	Set when received power exceeds high warning level
117	6	Rx Power Low Warning	Set when received power is below low warning level
117	5	Reserved Warning	
117	4	Reserved Warning	
117	3	Reserved Warning	
117	2	Reserved Warning	
117	1	Reserved Warning	
117	0	Reserved Warning	
118	All	Reserved	
119	All	Reserved	

Vendor Specific Memory Addresses (2-Wire Address A2h)

Address	# Bytes	Name	Description
120 -127	8	Vendor Specific	Vendor specific

User EEPROM (2-Wire Address A2h)

Address	# Bytes	Name	Description
128 - 247	120	User EEPROM	User writable EEPROM
248 - 255	8	Vendor Specific	Vendor specific control functions

Multimode 850 nm iSFP™ Transceiver, AC/AC TTL

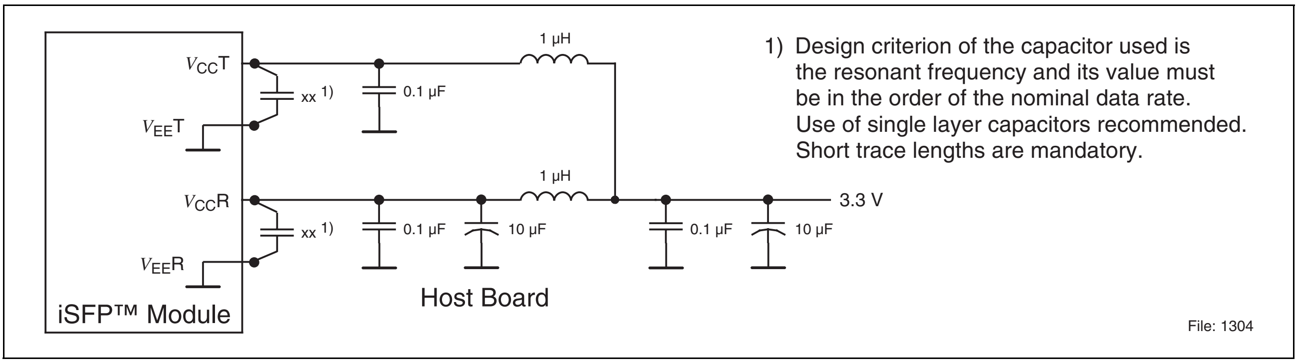


Figure 7 Recommended Host Board Supply Filtering Network

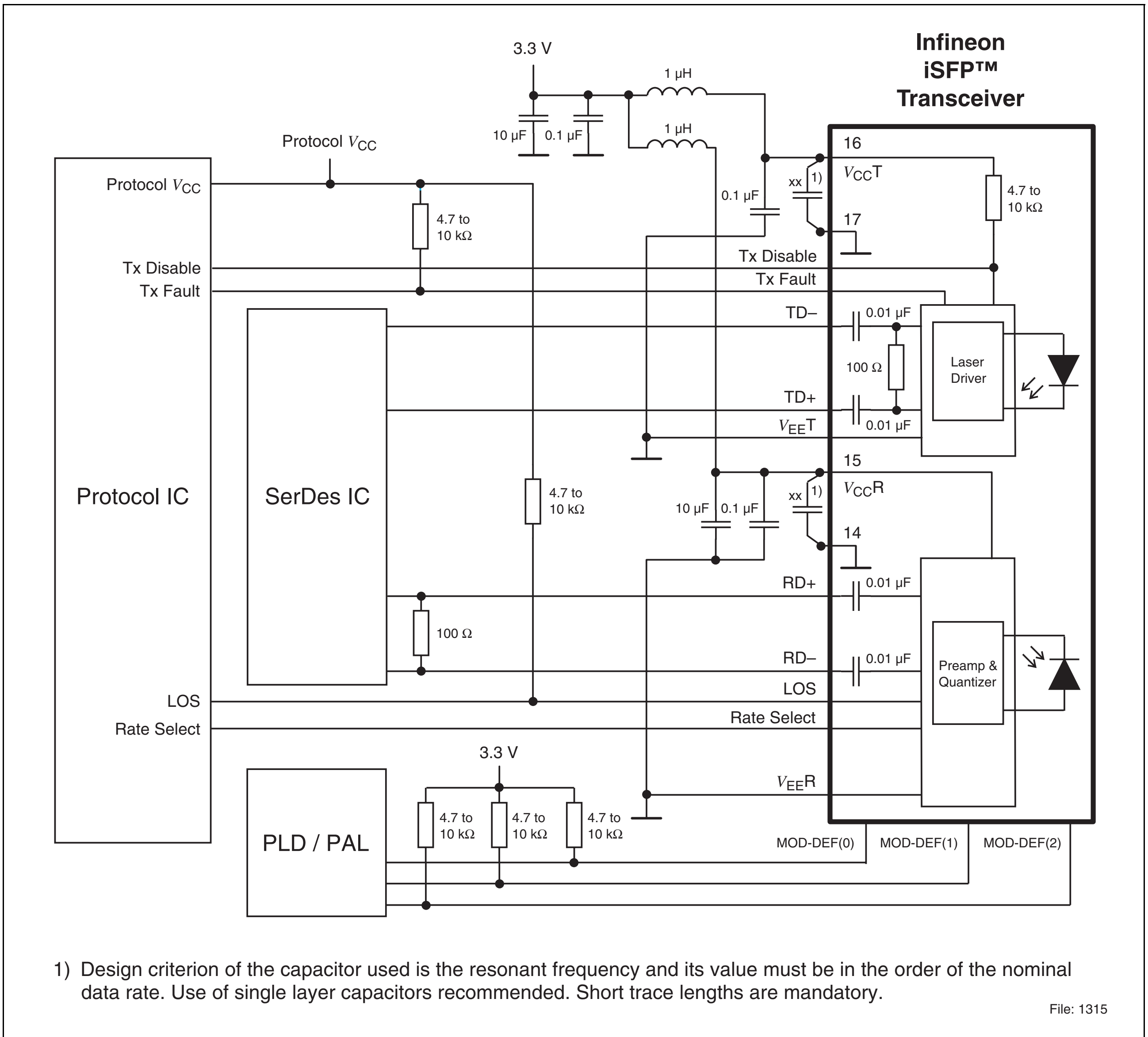
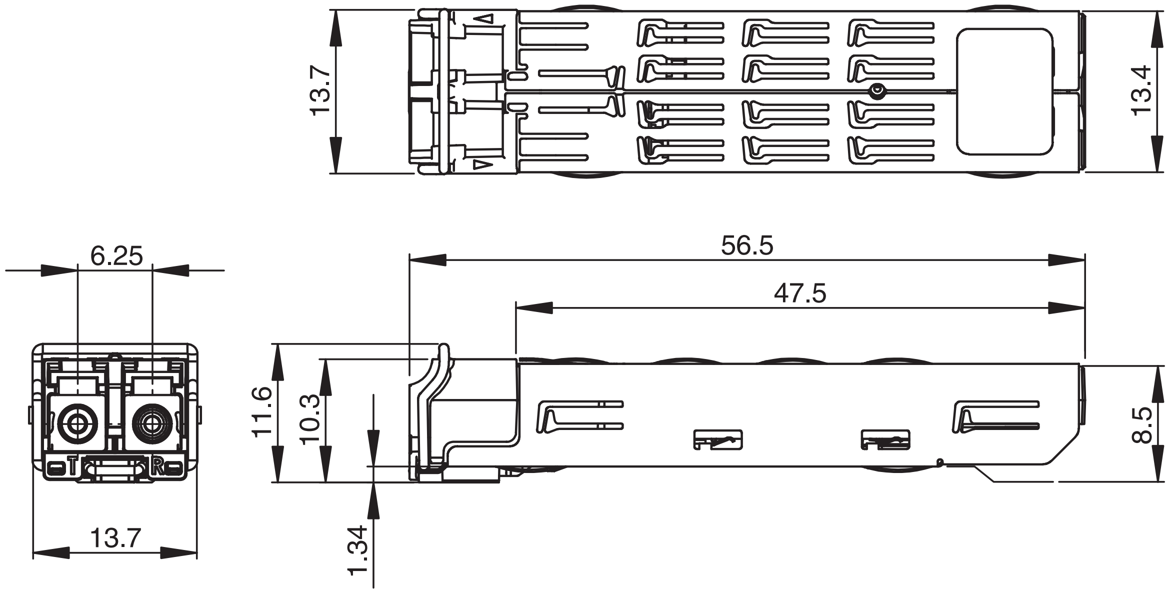


Figure 8 Example iSFP™ Host Board Schematic

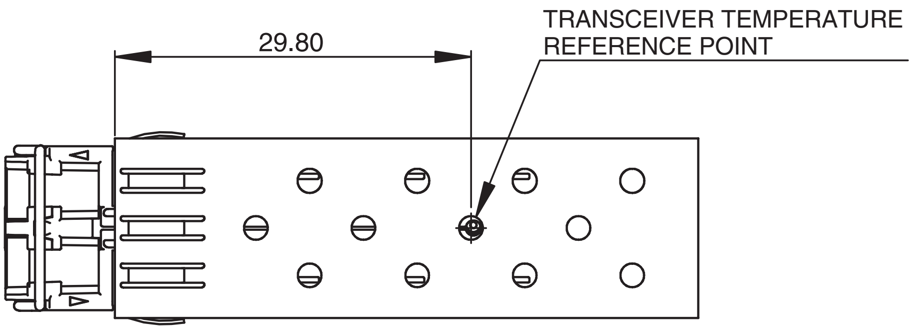
Package Outlines



Dimensions in mm

File: 1215

Figure 9



Dimensions in mm

File: 1224

Figure 10

Revision History:	2003-12-15	DS0
Previous Version:	none	

Page	Subjects (major changes since last revision)

Edition 2003-12-15

Published by Infineon Technologies AG,
St.-Martin-Strasse 53,
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