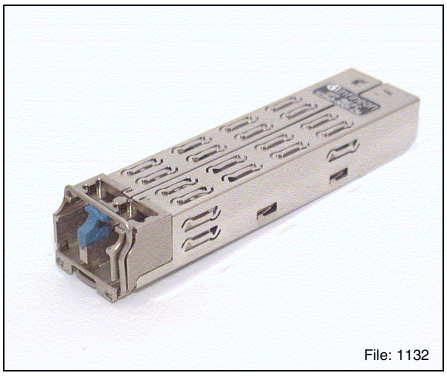
iSFP - Intelligent Small Form-factor Pluggable Single Mode 1300 nm 20 km 2.125/1.0625 Gbit/s Fibre Channel 1.25 Gigabit Ethernet Transceiver with LC™ Connector

V23848-M15-C656

Preliminary Data Sheet

Features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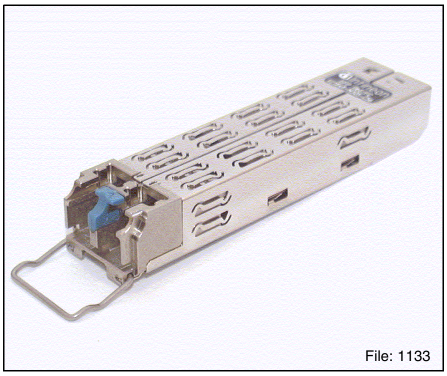
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- Small Form-factor Pluggable (SFP) MSA compliant transceiver[1)]
- Fully SFF-8472 MSA compliant[1)]
- Incorporating Intelligent – Digital Diagnostic Monitoring Interface
  - Internal calibration implementation
- Advanced release mechanisms
  - Easy access, even in belly to belly applications
  - Wire handle release for simplicity
- Color coded blue tab (single mode)
- PCI height compliant
- Excellent EMI performance
  - Common ground concept
- 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 1C per JESD22-A114-B (MIL-STD 883D Method 3015.7)
- Compliant with FCC (Class B) and EN 55022
- For distances of up to 20 km
- DFB laser, PIN photo diode
- Class 1 FDA and IEC laser safety compliant
- AC/AC Coupling according to MSA
- Extended operating temperature range of –20°C to 80°C
- SFP evaluation kit V23848-S5-V4 available upon request
- Recommendation: Infineon Cage one-piece design V23838-S5-N1 for press fit and/or solderable or V23838-S5-N1-BB for belly to belly applications

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

For ordering information see next page.
LC™ is a trademark of Lucent.

Ordering Information

Part Number	Extraction Method
V23848-M15-C656	Wire handle

Pin Configuration

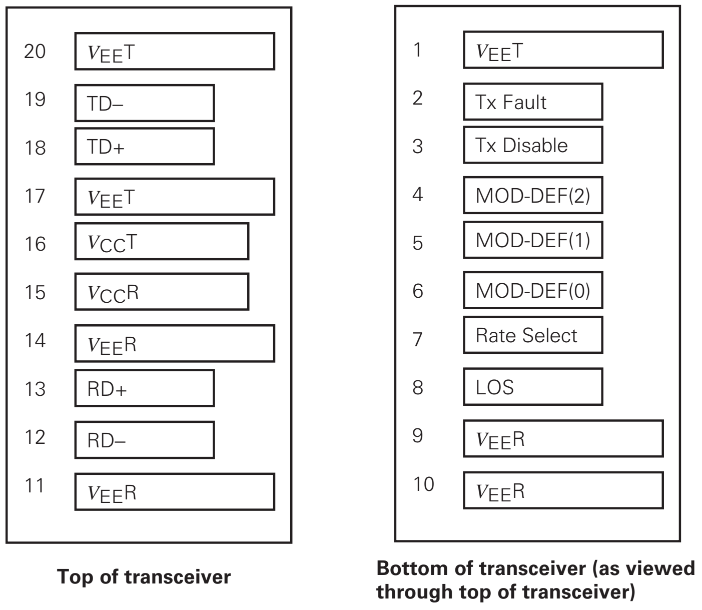

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Figure 1 iSFP Transceiver Electrical Pad Layout

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] [8]
3	Tx Disable	LVTTL	Transmitter Disable[3]
4	MOD-DEF(2)	LVTTL	Module Definition 2[4] [8]
5	MOD-DEF(1)	LVTTL	Module Definition 1[5] [8]
6	MOD-DEF(0)	N/A	Module Definition 0[6] [8]
7	Rate Select	N/A	Not connected
8	LOS	LVTTL	Loss Of Signal[7] [8]
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[9]
13	RD+	LVPECL	Received Data Out[9]
14	V_{EE}R	N/A	Receiver Ground[1]
15	V_{CC}R	N/A	Receiver Power
16	V_{CC}T	N/A	Transmitter Power
17	V_{EE}T	N/A	Transmitter Ground[1]
18	TD+	LVPECL	Transmit Data In[10]
19	TD–	LVPECL	Inv. Transmit Data In[10]
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] 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.

[8] Should be pulled up on host board to V_{CC} by 4.7 - 10 kΩ.

[9] AC coupled inside the transceiver. Must be terminated with 100 Ω differential at the user SERDES.

[10] AC coupled and 100 Ω differential termination inside the transceiver.

Description

The Infineon Fibre Channel / Gigabit Ethernet single mode transceiver – part of Infineon iSFP family – is based on the Physical Medium Depend (PMD) sublayer and baseband medium, type 1000 Base-LX (long wavelength) as specified in IEEE Std 802.3 and Fibre Channel FC-PI (Rev. 13) 100-SM-LC-L for 1.0625 Gbit/s, and 200-SM-LC-L for 2.125 Gbit/s.

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

Link Length as Defined by IEEE and Fibre Channel Standards

Fiber Type	**Reach**			**Unit**
	min.[1]	**typ.**	**max.**[2]	
at 1.0625 Gbit/s				
9 µm, SMF	2		20,000	meters
50 µm, 500 MHz*km	0.5	550		
62.5 µm, 200 MHz*km	0.5	550		
at 1.25 Gbit/s				
9 µm, SMF	2		5,000	meters
50 µm, 400/500 MHz*km	2		550	
62.5 µm, 500 MHz*km	2		550	
at 2.125 Gbit/s				
9 µm, SMF	2		20,000	meters
50 µm, 500 MHz*km	0.5	300		
62.5 µm, 200 MHz*km	0.5	150		

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

[2] Longer reach possible depending upon link implementation.

The Infineon iSFP 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 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 2.125, 1.0625 and 1.25 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 single mode cable.

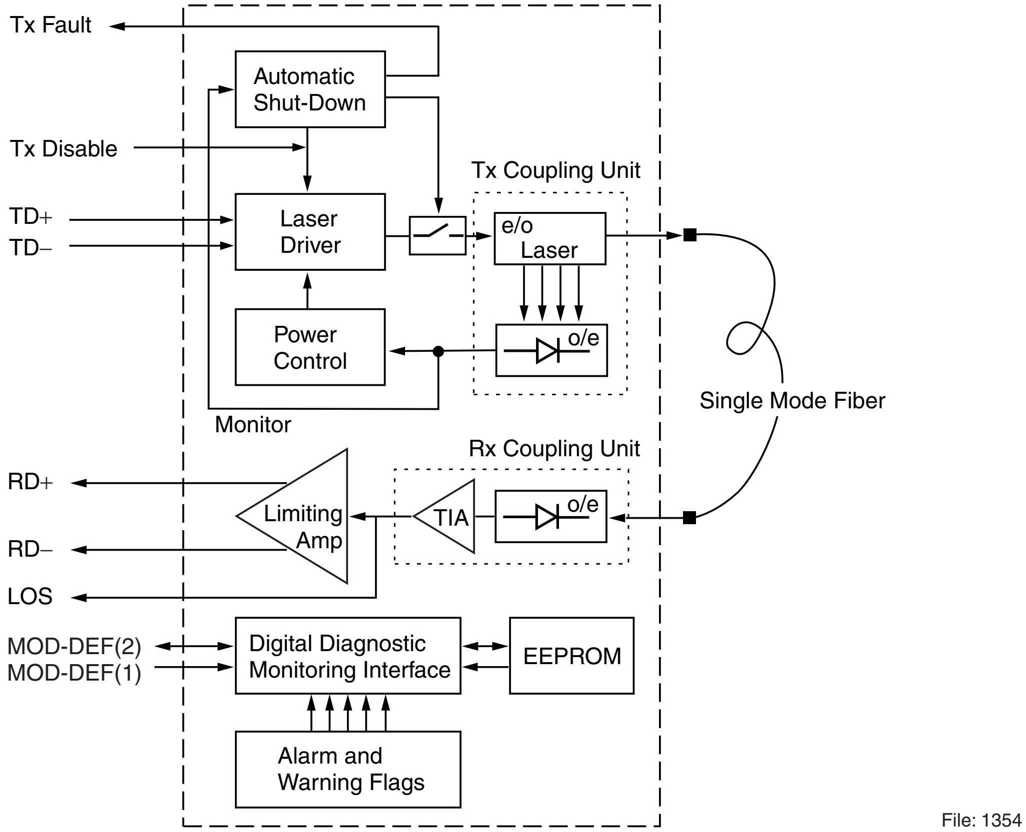

Figure 2 **Functional Diagram**

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

The transmitter converts LVPECL 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	±1 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

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: Electromagnetic Interference (EMI)	FCC 47 CFR Part 15, Class B EN 55022 Class B CISPR 22	Noise frequency range: 30 MHz to 18 GHz

Technical Data

Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Data Input Voltage	$V_{\text{ID max}}$		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_{A}	–40	85	°C
Storage Relative Humidity	RH_{s}	5	95	%
Operating Relative Humidity	RH_{o}	5	85	%
Supply Voltage	$V_{\text{CC max}}$		4	V
Data Output Current	I_{data}		50	mA
Receiver Optical Input Power	$\text{Rx}_{\text{P max}}$		3	dBm

1) Operating case temperature measured at transceiver hottest point.

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

Electrical Characteristics

Parameter	Symbol	Limit 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			1	W
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}		80	150	mA
Receiver					
Differential Data Output Voltage Swing[5]	V_{OD}pk-pk	370	900	2000	mV
LOS Active	LOS_A	2.4		V_{CC}	V
LOS Normal	LOS_N	V_{EE}		0.5	V
Receiver 3 dB Cut-off Frequency[6]				1.5	GHz
Receiver 10 dB Cut-off Frequency[6]				3	GHz
Rise Time[7]	t_{R-Rx}			t.b.d.	ps
Fall Time[7]	t_{F-Rx}			t.b.d.	ps
Power Supply Noise Rejection[8]	PSNR		100		mV_{pp}
Supply Current[4] [9]	I_{Rx}		100	130	mA

[1] Measured with MSA recommended supply filter network (**Figure 6**). 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] Fibre Channel PI Standard.

[7] Measured values are 20% - 80%.

[8] Measured using a 20 Hz to 1 MHz sinusoidal modulation with the MSA recommended power supply filter network (**Figure 6**) in place. A change in sensitivity of less than 1 dB can be typically expected.

[9] Supply current excluding Rx output load.

Optical Characteristics

Parameter	Symbol	Limit Values			Unit
		min.	typ.	max.	
Transmitter					
Optical Modulation Amplitude 1)	OMA	310			µW
Launched Power (Average)2)	P_O	–7		0	dBm
Extinction Ratio (Dynamic)3)	ER	9			dB
Center Wavelength1)	λ_C	1300		1320	nm
Spectral Width (rms)1)	σ_l			1	nm
Relative Intensity Noise	RIN			–120	dB/Hz
Tx Disable Laser Output Power	$P_{O\text{-}TxDis}$			t.b.d.	dBm
Data Deterministic Jitter	DDJ_{Tx}			t.b.d.	ps
Total Jitter	TJ_{Tx}			80	ps
Rise Time4)	$t_{R\text{-}Tx}$			t.b.d.	ps
Fall Time4)	$t_{F\text{-}Tx}$			t.b.d.	ps
Receiver5)					
Min. Optical Modulation Amplitude 6)	OMA			15	µW
Average Received Power	P_R			0	dBm
Sensitivity (Average Power)7)	P_{IN}				dBm
@ 2.125 Gbit/s				–21	
@ 1.25 Gbit/s				–21	
@ 1.0625 Gbit/s				–21	
LOS Assert Level 8)	P_{LOSA}	–37			dBm
LOS Deassert Level 9)	P_{LOSD}			–22	dBm
LOS Hysteresis	P_{LOSA} $-P_{LOSD}$	0.5	1	6	dB
Input Center Wavelength	λ_C	1260		1580	nm
Optical Return Loss	ORL	12			dB
Data Deterministic Jitter	DDJ_{Rx}			t.b.d.	ps
Total Jitter	TJ_{Rx}			t.b.d.	ps

1) FC-PI Rev. 13 defines triple trade off curves.
2) Into single mode fiber, 9 µm diameter.
3) For Gigabit Ethernet only.
4) Measured at nominal data rate. These are unfiltered 20% - 80% values.

[5] Receiver characteristics are measured with a worst case reference laser.

[6] Fibre Channel PI Standard.

[7] Average optical power at which the BER is 1×10^{-12}. Measured with a 2^7-1 NRZ PRBS and ER = 9 dB.

[8] An increase in optical power above the specified level will cause the LOS output to switch from a high state to a low state.

[9] A decrease in optical power below the specified level will cause the LOS to change from a low state to a high state.

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^{2}C bus interface standard.

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.

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	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 µW
Beam Divergence	6°

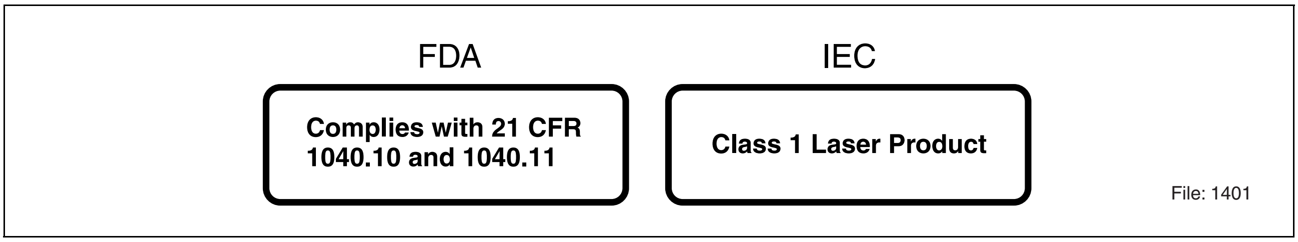

Figure 3 **Required Labels**

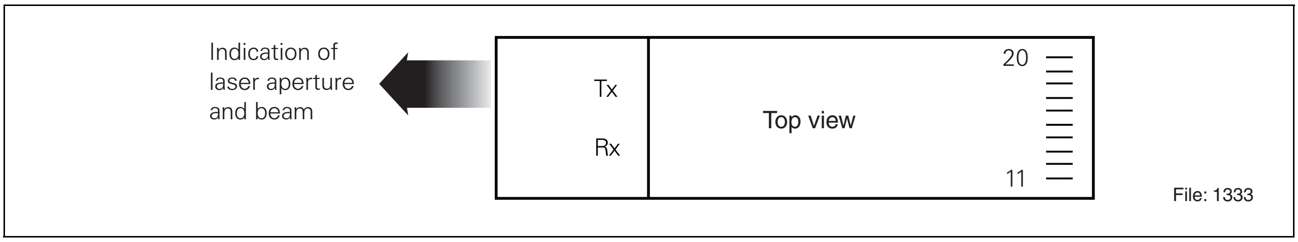

Figure 4 **Laser Emission**

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.

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.

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 can emit significant amounts of radiation. Thus it is strongly recommended that empty ports be plugged with an EMI plug as shown in **Figure 5**. Infineon offers an EMI/dust plug, P/N V23818-S5-B1.

Infineon Proposes

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

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

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

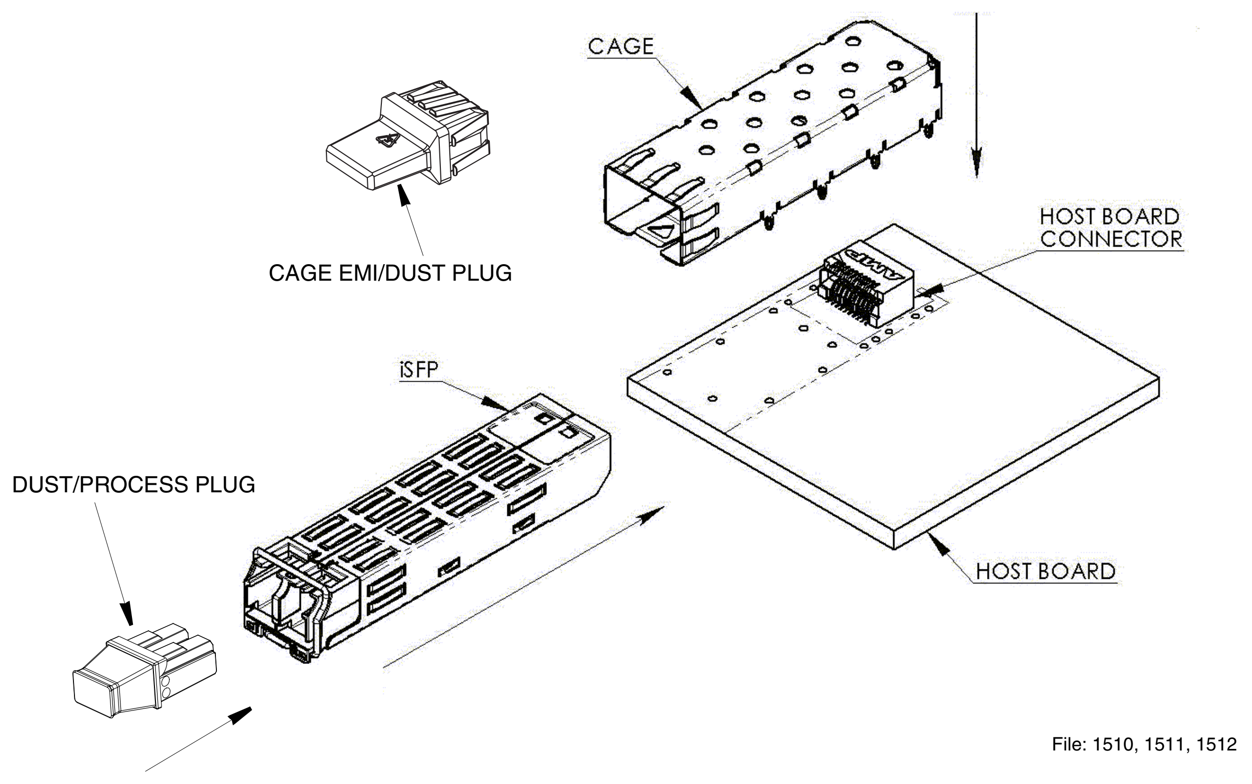

Figure 5

EEPROM Serial ID Memory Contents (A0h)

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

Addr.	Hex	ASCII
0	03	
1	04	
2	07	
3	00	
4	00	
5	00	
6	02	
7	80	
8	10	
9	01	
10	05	
11	01	
12	15	
13	00	
14	14	
15	C8	
16	1E	
17	0F	
18	00	
19	00	
20	49	I
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	
32	20	
33	20	
34	20	
35	20	
36	00	
37	00	
38	03	
39	19	
40	56	V
41	32	2
42	33	3
43	38	8
44	34	4
45	38	8
46	2D	-
47	4D	M
48	31	1
49	35	5
50	2D	-
51	43	C
52	36	6
53	35	5
54	36	6
55	20	
56	30	0[2]
57	31	1[2]
58	2E	.
59	30	0[2]
60	05	
61	1E	
62	00	
63[1]		
64	00	
65	1A	
66	00	
67	32	
68[3]		
69[3]		
70[3]		
71[3]		
72[3]		
73[3]		
74[3]		
75[3]		
76[3]		
77[3]		
78[3]		
79[3]		
80[3]		
81[3]		
82[3]		
83[3]		
84[4]		
85[4]		
86[4]		
87[4]		
88[4]		
89[4]		
90[4]		
91[4]		
92[5]	68	
93[6]	B0	
94	01	
95[7]		
96	20	
97	20	
98	20	
99	20	
100	20	
101	20	
102	20	
103	20	
104	20	
105	20	
106	20	
107	20	
108	20	
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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	

[1] Address 63 is check sum of bytes 0 - 62.

[2] Version number will vary depending on product status.

[3] Address 68 - 83 Vendor Serial Number.

[4] Date code.

[5] Diagnostic Monitoring Type, if and how implemented.

[6] Enhanced Options, if any implemented.

[7] Address 95 is check sum of bytes 64 - 94.

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	90°C[1]
02 - 03	2	Temp Low Alarm	MSB at low address	–30°C
04 - 05	2	Temp High Warning	MSB at low address	85°C[1]
06 - 07	2	Temp Low Warning	MSB at low address	–20°C
08 - 09	2	Voltage High Alarm	MSB at low address	3.7 V
10 - 11	2	Voltage Low Alarm	MSB at low address	2.95 V
12 - 13	2	Voltage High Warning	MSB at low address	3.63 V
14 - 15	2	Voltage Low Warning	MSB at low address	2.97 V
16 - 17	2	Bias High Alarm	MSB at low address	t.b.d.
18 - 19	2	Bias Low Alarm	MSB at low address	t.b.d.
20 - 21	2	Bias High Warning	MSB at low address	t.b.d.
22 - 23	2	Bias Low Warning	MSB at low address	t.b.d.
24 - 25	2	Tx Power High Alarm	MSB at low address	1 dBm
26 - 27	2	Tx Power Low Alarm	MSB at low address	–8 dBm
28 - 29	2	Tx Power High Warning	MSB at low address	0 dBm
30 - 31	2	Tx Power Low Warning	MSB at low address	–7 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	–22 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	–21 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.

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	

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

[1] Temperature measurement is performed on an IC located on the underside of the iSFP PCB. The accuracy is ±3°C.

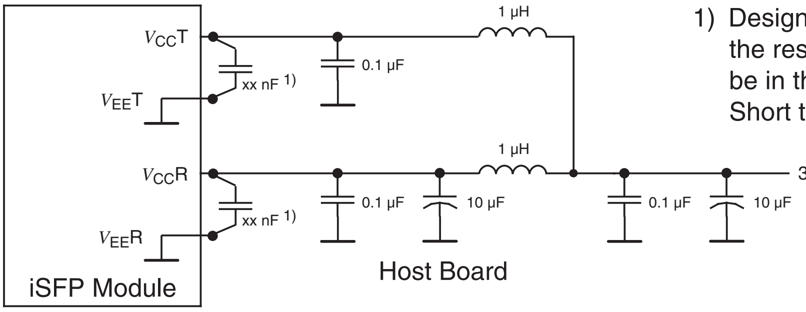
[2] The Tx voltage V_{CC}T is monitored, with accuracy of ±3%.

[3] The accuracy of bias current measurement is ±10%.

[4] The accuracy of the Tx optical power measurement is ±1 dB.

[5] The accuracy of the Rx optical power measurement is ±3 dB.

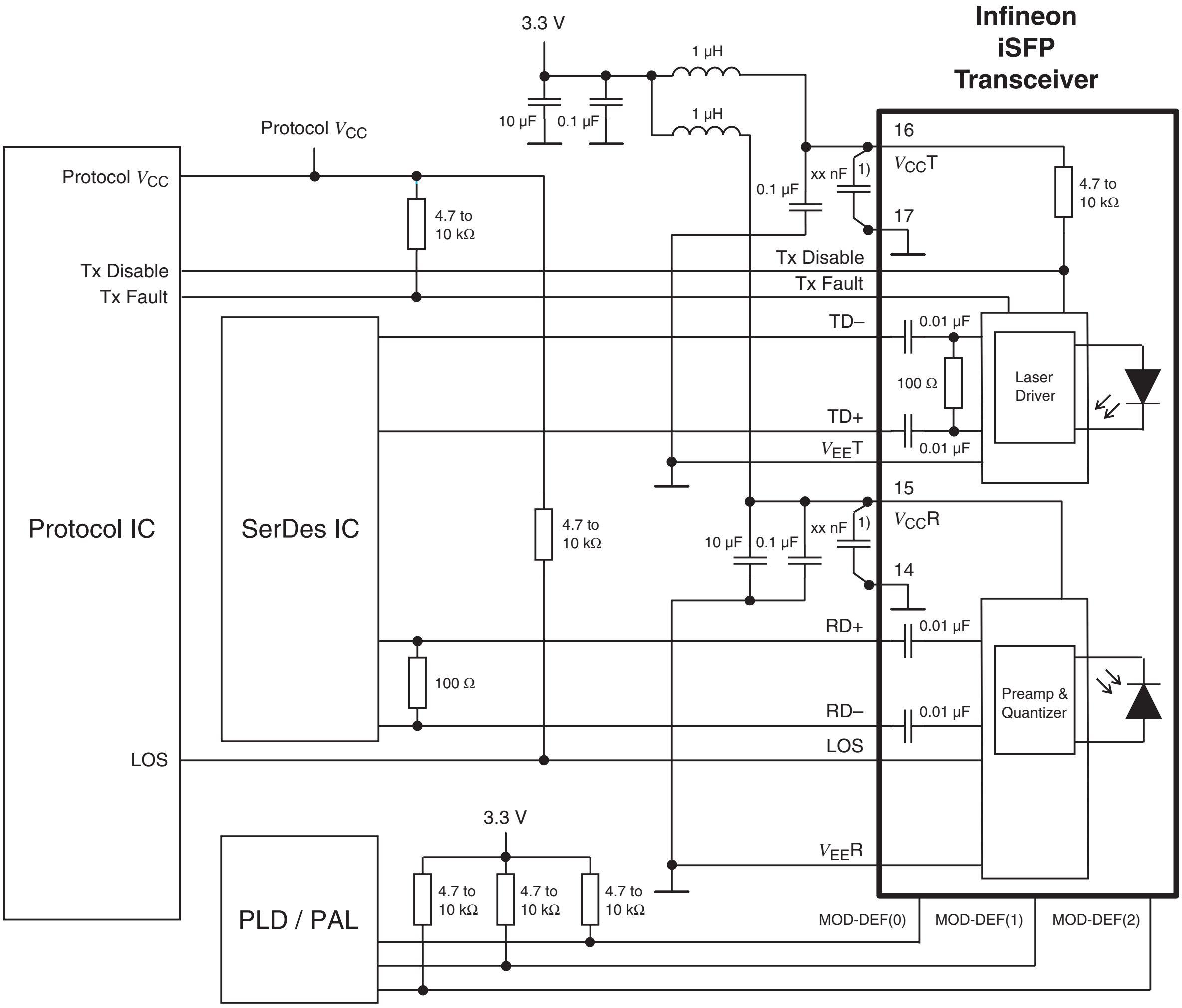
Single Mode 1300 nm iSFP Transceiver, AC/AC TTL



1) Design criterion of the capacitor used is the resonant frequency and its value must be in the order of the nominal data rate. Short trace lengths are mandatory.

File: 1304

Figure 6 Recommended Host Board Supply Filtering Network

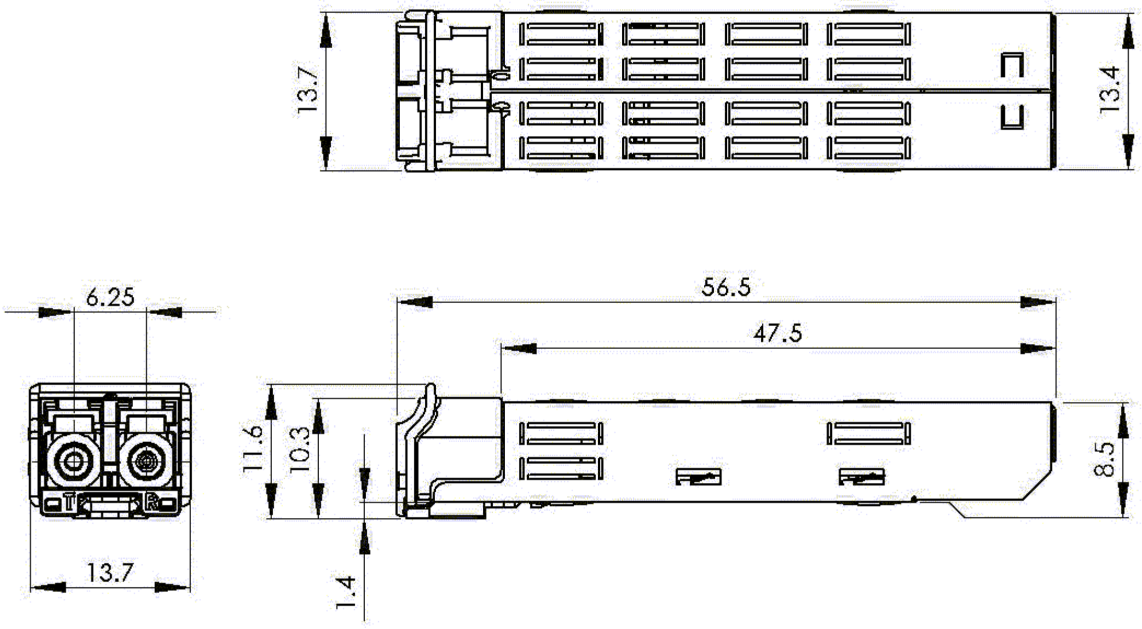


1) Design criterion of the capacitor used is the resonant frequency and its value must be in the order of the nominal data rate. Short trace lengths are mandatory.

File: 1303

Figure 7 Example iSFP Host Board Schematic

Package Outlines



Dimensions in mm

File: 1215

Figure 8

Revision History:	**2003-04-09**	DS0
Previous Version:	2003-04-09	

Page	Subjects (major changes since last revision)

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