

1. I350/I210 supports the following network interfaces and protocols:

Connection Type	Network Interface	Protocols	
		I210	I350
RJ45 (Internal Copper PHY)	MDI	10BASE-T half/full, 100BASE-TX half/full, 1000BASE-T full	10BASE-T half/full 100BASE-TX half/full 1000BASE-T full
SFP (optical fiber)	Serdes	1000BASE-SX full 1000BASE-LX full	1000BASE-SX full 1000BASE-LX full
Backplane	Serdes	1000BASE-KX(802.3ap),	1000BASE-KX(802.3ap)
Backplane	Serdes	1000BASE-BX (PICMIG 3.1)	1000BASE-BX (PICMIG 3.1)
External PHY (on board or SFP MSA INF-8074i)	SGMII	10BASE-T half/full, 100BASE-TX half/full, 1000BASE-T full	10BASE-T half/full, 100BASE-TX half/full, 1000BASE-T full

Note: There are two types of SFP modules, SFP BASE-T module and SFP optical module. SFP optical modules (1000BASE-LX and 1000BASE-SX) can be supported through the SerDes interface, while SFP BASE-T modules via the SGMII Interface.

When you select a SFP module to use on a product, you need to confirm from the following two aspects

- Which protocol does the host SFP connector support?
- The module you used is Base-T (SGMII) or Optical (Serdes).

The following picture is captured from a Copper SFP module.

**1000BASE-T Copper SFP Transceiver**  
**FCLF-8520/8521-3**

**Product Features**

- Up to 1.25Gb/s bi-directional data links
- Hot-pluggable SFP footprint
- Extended case temperature range (0°C to +85°C )
- Fully metallic enclosure for low EMI
- Low power dissipation (1.05 W typical)
- Compact RJ-45 connector assembly
- RoHS compliant and Lead Free
- Access to physical layer IC via 2-wire serial bus
- 10/100/1000 BASE-T operation in host systems with SGMII interface



**Applications**

- 1.25 Gigabit Ethernet over Cat 5 cable

## 2、I350 support the following SFP types.

Note: Intel I350 driver only supports the SFP copper module which contains a Marvell SGMII PHY. If need to support other PHYs, custom driver is needed.

Supported module types require the following characteristics:

- Optical SFP — 1000BASE-SX or 1000BASE-LX
  - The Intel driver reads some EEPROM data from the SFP. The device is accepted if Byte 0 contains 0x02 (SFF) or 0x03 (SFP) and Byte 6 has either Bit 0 (SX) or Bit 1 (LX) set.
- Optical SFP — 100BASE-FX
  - Only supported if the SFP contains an SGMII PHY.
  - The Intel driver reads some EEPROM data from the SFP. The device is accepted if Byte 0 contains 0x02 (SFF) or 0x03 (SFP) and Byte 6 has Bit 5 (FX) set.
  - The Intel driver does not attempt to configure the SGMII PHY in the SFP. The default configuration is used.
- Copper (RJ-45) SFP — 1000BASE-T
  - Only supported if the SFP contains a Marvell SGMII PHY.
  - The Intel driver reads some EEPROM data from the SFP. The device is accepted if Byte 0 contains 0x02 (SFF) or 0x03 (SFP) and Byte 6 has Bit 3 (BASE-T) set.
  - The Intel driver reads the PHY\_ID (PHYREG 0x02) from the SFP PHY using I2C. The device is rejected unless the value is 0x0141, indicating a Marvell PHY.
  - The Intel driver is able to configure and control the SFP PHY according to user settings as necessary.

## 3、SFP modules have been verified in previous designs.

### 1.3 SFP Modules

While Intel does not make recommendations regarding these devices, the following devices have been used successfully in previous designs.

- Agilent HBCU-5710R (1000BASE-T)
- Avago ABCU-5700RZ (1000BASE-T)
- Avago AFBR 5710PZ (1000Base-SX Fiber-optic)
- Cisco GCL-T, 30-1410-02, MTC, AGM (1000BASE-T)
- Cisco GLC-SX-MM (1000Base-SX Fiber-optic)
- Extreme Networks 4050-00010 SX (1000Base-SX Fiber-optic)
- Finisar FCMJ-8520-3 (1000BASE-T)
- Finisar FTLf8524P2BNV (1000Base-SX Fiber-optic)
- Intel 859091 (1000Base-SX Fiber-optic)
- Netgear AGM731F (1000Base-SX Fiber-optic)
- Source-Photonics 5213-FX, SPG-FE-FX-CNFB (100-FX)<sup>1</sup>

## 4、HW design differences and EEPROM selections for Serdes/SGMII connections.

Network Interface	Pin Define	HW Design	EEPROM
SerdesFiber (1000Base-LX/SX)	SER* P/N	Direct connected to SFP connector	I350_2-4port_SerdesFiber
	SET* P/N	Direct connected to SFP connector	
	SRDS_* SIG_DET	Connected to pin 8 of SFP connector (LOS) and pull up	
	SFP*_ I2C_CLK/DATA	Connected to pin 4/5 of SFP connector (I2C_CLK/DATA) and pull up	
	SDP*_ 0	Connected to pin 6 of SFP connector (MOD_ABS) and pull up	
	SDP*_ 1	Connected to pin 3 of SFP connector (TX_DISABLE) and pull down	
	SDP*_ 2	Connected to pin 2 of SFP connector (TX_FAULT) and pull up	
	SDP*_ 3	Control the power of SFP module	
SGMII	SER* P/N	Connected to receiver using 4.7nF series capacitors near receiver ( If link partner is SFP module, series capacitors are not needed, because SFP module has built-in series capacitors)	I350_2-4port_Sgmii
	SET* P/N	Connected to receiver using 4.7nF series capacitors near receiver ( If link partner is SFP module, series capacitors are not needed, because SFP module has built-in series capacitors)	
	SRDS_* SIG_DET	Connected to pin 8 of SFP connector (LOS) and pull up	
	SFP*_ I2C_CLK/DATA	Connected to SGMII device (on board PHY or SFP connector)	
	SDP*_ 0/1/2/3	NC	
Serdes (1000Base-BX)	SER* P/N	Connected to backplane using 4.7nF series capacitors	I350_2-4port_SerdesBX
	SET* P/N	Direct connected to backplane	
	SRDS_* SIG_DET	Pull up through 3.3kohm resistor	
	SFP*_ I2C_CLK/DATA	NC	
	SDP*_ 0/1/2/3	NC	
Serdes (1000Base-KX)	SER* P/N	Connected to backplane using 4.7nF series capacitors	I350_2-4port_SerdesKX
	SET* P/N	Direct connected to backplane	
	SRDS_* SIG_DET	Pull up through 3.3kohm resistor	
	SFP*_ I2C_CLK/DATA	NC	
	SDP*_ 0/1/2/3	NC	

From the information given above, we can get the following conclusion

**a. For ENPD products (SFP application)**

Because the HW design and EEPROM for SFP connector is following the design guide of SerdesFiber, so we suggest customer to use SFP optical modules on SFP products. Although some copper modules also can work sometimes, this is not recommended, because there may be some limitations we not known.

If customer needs to support copper modules, we should discuss with PD whether the .

**b. For CPCI/VPX products (backplane application)**

1000Base-BX and 1000Base-KX: because 1000Base-BX and 1000Base-KX has the same HW design, the only difference is EEPROM, so if need to support 1000Base-BX on 1000Base-KX LAN port, or 1000Base-KX function needed on 1000Base-BX LAN port, the only thing to do is flashing the correct EEPROM.

1000Base-LX/SX and SGMII: because the HW design for 1000Base-LX/SX/SGMII is different form 1000Base-BX/KX, so 1000Base-LX/SX/SGMII cannot be supported on 1000Base-BX/KX LAN port by only changing the EEPROM.

Referenced Documents:

ethernet-controller-i350-datasheet.pdf

ethernet-controller-i350-reference-design.pdf

597705-i350-a-design-checklists-v2-18.xlsx

555617-sfp-suppot-1gbe-device-appnote-rev1-0.pdf

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