

## FEATURES AND SPECIFICATIONS

The 1000Base-T RJ-45 Gigabit Ethernet SFP copper transceiver module is a high performance integrated duplex data link for bi-directional communication over Category 5 copper cable. The hot pluggable feature allows changing to and from another SFP compatible module without having to remove system power. Serial ID is included.

Molex's RJ-45 SFP module provides multiple customer friendly features. A link monitor detects loss of signals. The Serial ID allows individual identification of each SFP transceiver. An auto-power saving mode conserves energy. The centered RJ-45 modular jack conforms to a 1U rack for ease of installation. Design allows stacking side by side for increased density.

### Features and Benefits

- 1000Base-T compliant module meets IEEE802.3z, ab, u specifications and is SFP MSA compliant
- Less than 1 Watt power requirement provides low heat output
- Zinc back shells provide improved EMI performance
- Auto-negotiation feature allows networking equipment to automatically determine and adjust to the required settings
- Automatic MDI crossover eliminates the need for crossover cables or cross-wired (MDIX) ports
- Bail latch provides ease of extraction

### Applications

- Networking
- Switches
- Routers

### Specifications

#### Reference Information

Packaging: Box  
 Mates With: SFP Cage 73927 series  
 SFP Connector 74441 series

#### Electrical

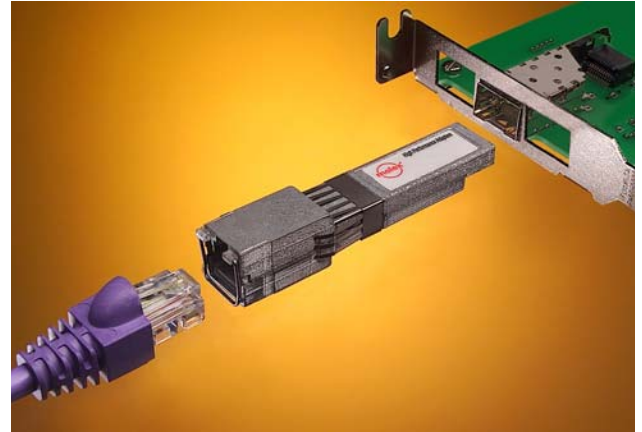
Voltage: 3.3V  
 Current: 285mA  
 Power: 1 W max.

#### Physical

Diecast Backshell: Zinc  
 PCB Thickness: .039"  
 Operating Temperature: 0 to +70°C

# molex® 1000Base-T RJ-45 Gigabit Ethernet SFP Copper Transceiver

## 74741



## ORDERING INFORMATION

Order No.	Description
74741-0001	1000Base-T RJ-45 Gigabit Ethernet SFP Copper Transceiver, LOS Toggle
74741-0002	1000Base-T RJ-45 Gigabit Ethernet SFP Copper Transceiver, LOS GND

## SFP 1000BASE-T RJ-45 OVERVIEW

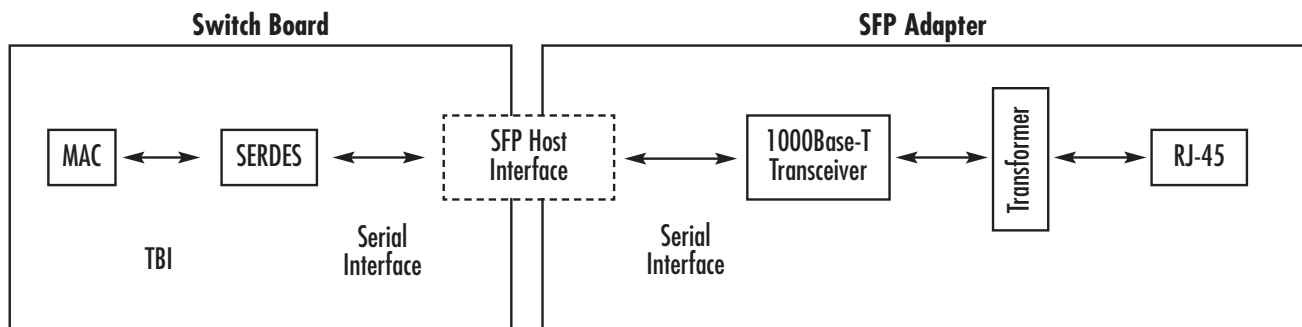


Figure 1. RJ-45 SFP 1000Base-T Application



### **SFP Mode**

When the internal Gigabit Ethernet transceiver (PHY) is configured to SFP mode, the PHY interfaces directly with the host serial/deserial (SERDES) interface. The host interface transmits and receives serial data differentially at 1.25Gbps. The copper interface is full featured and advertises full/half duplex, and 1000Base-T wire speed.

### **Auto-Negotiation**

The CAT-5 copper link negotiates according to the IEEE 802.3 Clause 28, and the SERDES interface negotiates using Clause 37. The two interfaces advertise 1000Base-T full-duplex, and master/slave relationships. The master establishes the time control from its local clock source. The slave however recovers the clock from the received data stream. The SFP application is limited to 1000Base-T wire speed only. Auto-Negotiation on the SERDES link is always restarted when a change is detected on copper link.

The SFP 1000Base-T features a Serial Interface (SerDes) Auto-Negotiation Bypass mode. This mode disables auto-negotiation after 200ms of unsuccessful attempts with the host, without the need for manually configuring the auto-negotiation parameters. The Molex SFP 1000Base-T module will transmit data with auto-negotiation disabled.

### **Automatic MDI Crossover**

The SFP 1000Base-T transceiver performs a MDI crossover during Auto-Negotiation eliminating the need for crossover cables or cross-wired (MDIX) ports.

### **Automatic Polarity Correction**

Should the polarity of receive signals inadvertently become reversed, the SFP 1000Base-T will automatically correct them based on the sequence of idle signals received

### **Auto Power Savings Mode**

When the copper link is lost, the SFP automatically enters a low power mode reducing the chip power requirements. Full power mode resumes once the copper link is re-established.

### **Serial ID**

Serial identification is implemented on the SFP 1000Base-T transceiver. The serial protocol uses a two-wire I2C interface.

### **Software Reconfigurable**

The SFP 1000Base-T is hardware configured on power-up. The configuration can be changed by a register write via a two-wire bus (I2C) at any time. For further detail, refer to the Molex SFP 1000Base-T software configuration application note.

## AUTO-NEGOTIATION SUMMARY

### **Auto-Negotiation Features Implemented:**

#### **General:**

- SERDES Auto-Negotiation is restarted when a change is detected on the copper link
- Auto power savings mode when copper link is lost

#### **Copper RJ-45 Interface:**

- Auto-Negotiation
- Copper SFP speed 1000Base-T
- Full duplex
- Automatic MDI Crossover
- Master/slave relationships
- Pause flow control
- Software reconfigurable

#### **Host SERDES Interface:**

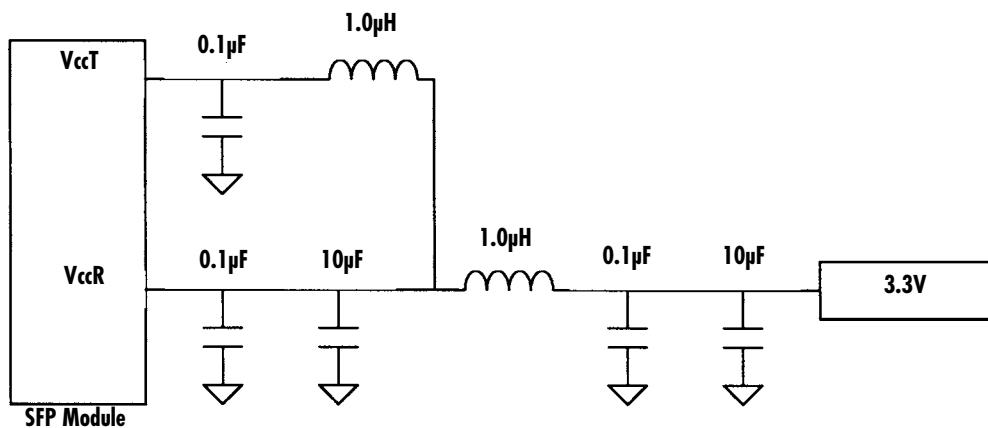
- Differential SERDES interface at 1.25Gpbs
- Master/slave relationships
- SERDES recovers the clock from the received data stream
- Pause flow control

**74741****Module Specifications - Recommended Operating Conditions**

PARAMETERS	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Storage Temperature	T <sub>stg</sub>	-40		85	°C	
Ambient Operating Temperature	T <sub>a</sub>	0		70	°C	
Supply Voltage	V <sub>DDR</sub> , V <sub>DDT</sub>	3.13	3.3	3.47	V <sub>dc</sub>	V <sub>cc</sub> -ground
Supply Current	I <sub>cc</sub>		285	300	mA	
Surge Current	I <sub>surge</sub>			TBD	mA	Surge above steady state value
<b>SFP Host Serial Interface (TX/RX)</b>						
Data Input/Output Type						LVDS, AC coupled
Impedance (SERDES Interface)			100		ohms	Differential
<b>Transmitter (Input to SFP)</b>						
Input Voltage		400		2400	mV <sub>pp</sub>	
<b>Receiver (Output to SERDES)</b>						
Output Voltage		875		1525	mV <sub>pp</sub>	
Max Off Voltage				170	mV <sub>pp</sub>	
Rise Time, 20%–80%		100		200	ps	
Total Jitter			80	120	ps	
Skew			15	30	ps	

**IMPEDANCE MATCHING AND POWER SUPPLY FILTERING**

The SFP transceiver module's signal inputs/outputs are AC coupled and internally terminated to 100 ohms (TD+, TD-, RD+, RD-). Each leg of the differential pair is equally matched in length to reduce signal skew.



**Figure 2. Recommended Host Board Supply Filtering Network**

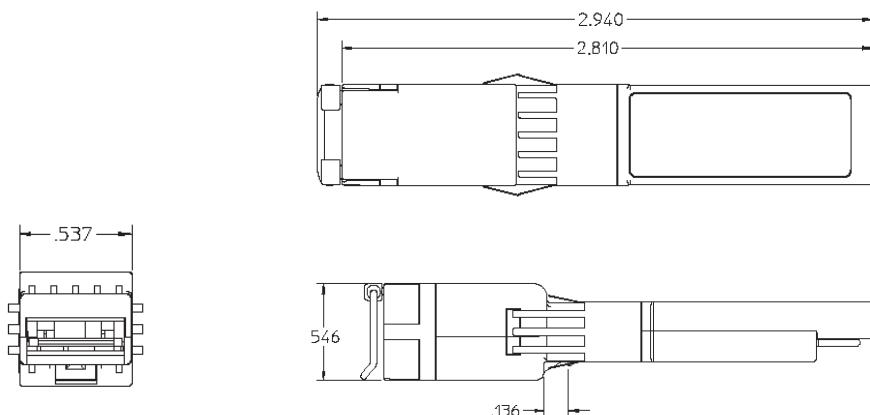
## SFP Host Connect Electrical Interface, Pin Descriptions

**74741**

PIN	NAME	DESCRIPTION
PIN 1	GND	Ground
PIN 2	TX_FAULT	This pin is internally tied to transmit ground. TX_Fault is not implemented.
PIN 3	TX_DISABLE	Low for normal operation. Active high input which disables the transmitter output. 5.1K pull-up on module.
PIN 4	MOD_DEF(2)	Signal SDA (Data) of the two-wire serial ID interface.
PIN 5	MOD_DEF(1)	Signal SCL (Clock) of the two-wire serial ID interface.
PIN 6	MOD_DEF(0)	This pin is internally tied to transmit ground.
PIN 7	Rate select	This pin is floating. Rate select is not implemented.
PIN 8	LOS	See part description for details (below)
PIN 9	GND	Ground
PIN 10	GND	Ground
PIN 11	GND	Ground
PIN 12	RD-	Differential receiver outputs. User to terminate to 100 ohms differential at host. (AC coupled)
PIN 13	RD+	Differential receiver outputs. User to terminate to 100 ohms differential at host. (AC coupled)
PIN 14	GND	Ground
PIN 15	VCC	3.3V Power
PIN 16	VCC	3.3V Power
PIN 17	GND	Ground
PIN 18	TD+	Differential transmitter inputs. Internally terminated to 100 ohms differential at host. (AC coupled)
PIN 19	TD-	Differential transmitter inputs. Internally terminated to 100 ohms differential at host. (AC coupled)
PIN 20	GND	Ground

Part No.	Options	Part No.	Options
74741-0001	<ul style="list-style-type: none"> <li>■ Auto Negotiation On</li> <li>■ Auto Negotiation Bypass</li> <li>■ LOS Toggle</li> </ul>	74741-0002	<ul style="list-style-type: none"> <li>■ Auto Negotiation On</li> <li>■ Auto Negotiation Bypass</li> <li>■ LOS GND</li> </ul>

## SFP 1000BASE-T DIMENSIONS

**Americas Headquarters**

Lisle, Illinois 60532 U.S.A.  
1-800-78MOLEX  
amerinfo@molex.com

**Far East North Headquarters**

Yamato, Kanagawa, Japan  
81-462-65-2324  
feninfo@molex.com

**Far East South Headquarters**

Jurong, Singapore  
65-6-268-6868  
fesinfo@molex.com

**European Headquarters**

Munich, Germany  
49-89-413092-0  
eurinfo@molex.com

**Corporate Headquarters**

2222 Wellington Ct.  
Lisle, IL 60532 U.S.A.  
630-969-4550  
Fax: 630-969-1352

Visit our Web site at [www.molex.com/product/io/sfp1000.html](http://www.molex.com/product/io/sfp1000.html)