

| Rev | Date | Modified by | Description |
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| A0 | 2023 | | |

Product Specifications

2.5Gbps SFP Transceiver, Single Mode, 40km Reach

PN: ESP5524-40D

Features

- Supports up to 2.5Gbps bit rates
- Hot-pluggable SFP footprint
- 1550nm DFB laser and PIN photo detector, Up to 40km for SMF transmission
- Compliant with SFP MSA and SFF-8472 with duplex LC receptacle
- Compatible with RoHS
- Single +3.3V power supply
- Real Time Digital Diagnostic Monitoring
- Operating case temperature:
Standard: 0 to +70°C
Industrial: -40 to +85°C

Applications

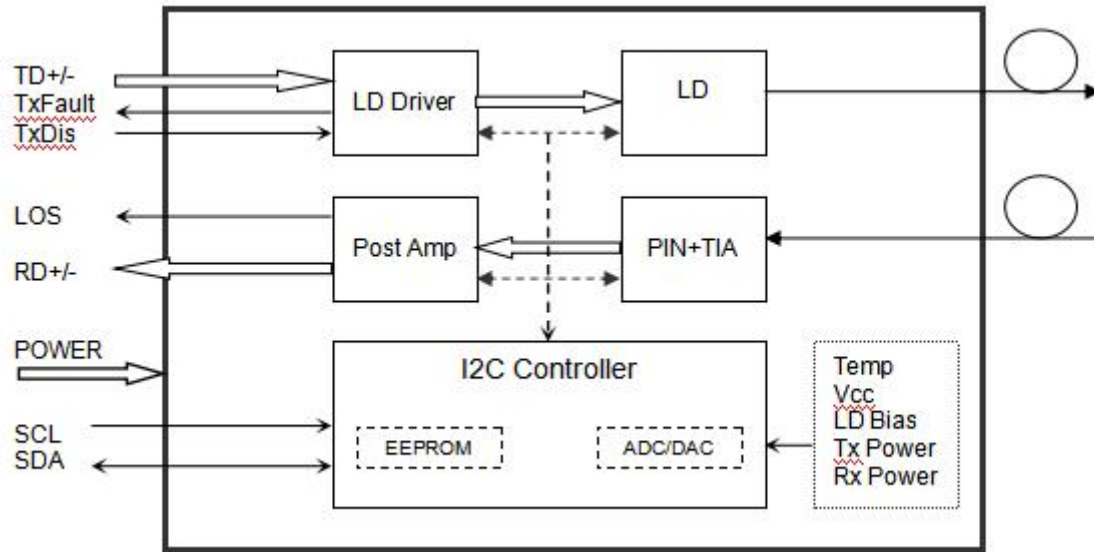
- 2.5Gbps Optical systems
- Fiber Channel
- Other Optical links

Description

The SFP transceivers are high performance, cost effective modules supporting data rate of 2.5Gbps and 40km transmission distance with SMF.

The transceiver consists of three sections: a DFB laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement and SFF-8472 digital diagnostics functions.



Transceiver functional diagram

Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit |
|---------------------|--------|------|-----|------|
| Supply Voltage | Vcc | -0.5 | 4.5 | V |
| Storage Temperature | Ts | -40 | +85 | °C |
| Operating Humidity | - | 5 | 85 | % |

Recommended Operating Conditions

| Parameter | Symbol | Min | Typical | Max | Unit |
|----------------------------|--------|-------|---------|-------|------|
| Operating Case Temperature | Tc | 0 | | +70 | °C |
| | | -20 | | +80 | °C |
| | | -40 | | +85 | °C |
| Power Supply Voltage | Vcc | 3.135 | 3.30 | 3.465 | V |
| Power Supply Current | Icc | | | 300 | mA |
| Data Rate | | | 2.5 | | Gbps |

Optical and Electrical Characteristics

| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
|------------------------|-----------------|------|---------|------|------|-------|
| Transmitter | | | | | | |
| Centre Wavelength | λ_c | 1530 | 1550 | 1570 | nm | |
| Spectral Width (-20dB) | $\Delta\lambda$ | | | 1 | nm | |

| | | | | | | |
|--------------------------------|------------------|------|-----|------|-----------------|---|
| Side-Mode Suppression Ratio | SMSR | 30 | - | - | dB | |
| Average Output Power | P _{out} | -2 | | +3 | dBm | 1 |
| Extinction Ratio | ER | 9.0 | | | dB | |
| Data Input Swing Differential | V _{IN} | 180 | | 1200 | mV | 2 |
| Input Differential Impedance | Z _{IN} | 90 | 100 | 110 | Ω | |
| TX Disable | Disable | | 2.0 | | V _{cc} | V |
| | Enable | | 0 | | 0.8 | V |
| TX Fault | Fault | | 2.0 | | V _{cc} | V |
| | Normal | | 0 | | 0.8 | V |
| Receiver | | | | | | |
| Centre Wavelength | λ _c | 1260 | | 1610 | nm | |
| Receiver Sensitivity | | | | -20 | dBm | 3 |
| Receiver Overload | | -1 | | | dBm | 3 |
| LOS De-Assert | LOS _D | | | -21 | dBm | |
| LOS Assert | LOS _A | -35 | | | dBm | |
| LOS Hysteresis | | 0.5 | | 4 | dB | |
| Data Output Swing Differential | V _{out} | 600 | 800 | 1000 | mV | 4 |
| LOS | High | | 2.0 | | V _{cc} | V |
| | Low | | | 0.8 | V | |

Notes:

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS 2²³-1 test pattern @2500Mbps, BER ≤1×10⁻¹².
4. Internally AC-coupled.

Timing and Electrical

| Parameter | Symbol | Min | Typical | Max | Unit |
|---|----------------------|-----|---------|-----|------|
| Tx Disable Negate Time | t _{on} | | | 1 | ms |
| Tx Disable Assert Time | t _{off} | | | 10 | μs |
| Time To Initialize, including Reset of Tx Fault | t _{init} | | | 300 | ms |
| Tx Fault Assert Time | t _{fault} | | | 100 | μs |
| Tx Disable To Reset | t _{reset} | 10 | | | μs |
| LOS Assert Time | t _{loss_on} | | | 100 | μs |

| | | | | | |
|----------------------|----------------|---|-----|-----------------|-----|
| LOS De-assert Time | t_loss_off | | | 100 | μs |
| Serial ID Clock Rate | f_serial_clock | | 100 | 400 | KHz |
| MOD_DEF (0:2)-High | V _H | 2 | | V _{cc} | V |
| MOD_DEF (0:2)-Low | V _L | | | 0.8 | V |

Diagnostics

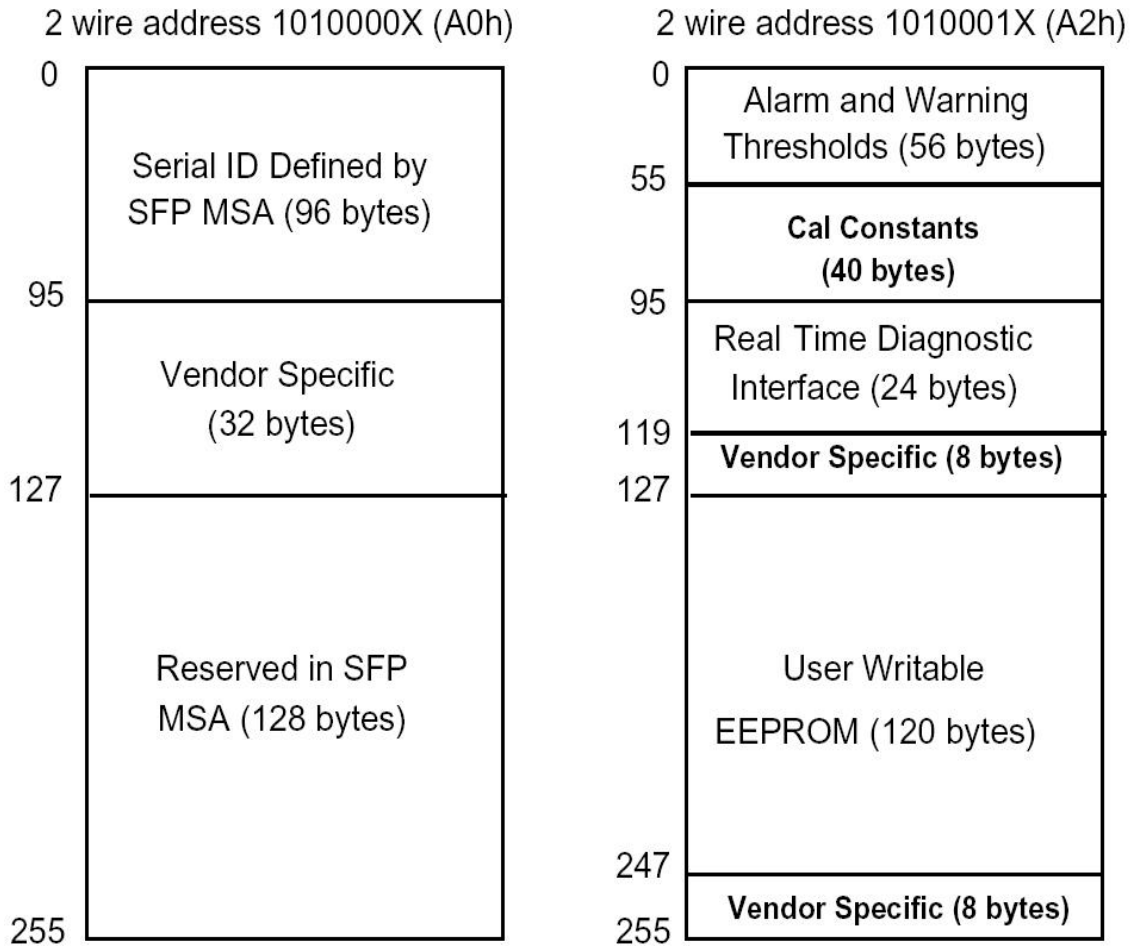
| Parameter | Range | Unit | Accuracy | Calibration |
|--------------|------------|------|----------|-------------|
| Temperature | 0 to +70 | °C | ±3°C | Internal |
| | -20 to +80 | | | |
| | -40 to +85 | | | |
| Voltage | 3.0 to 3.6 | V | ±3% | Internal |
| Bias Current | 0 to 100 | mA | ±10% | Internal |
| TX Power | -2 to +3 | dBm | ±3dB | Internal |
| RX Power | -20 to -1 | dBm | ±3dB | Internal |

Digital Diagnostic Memory Map

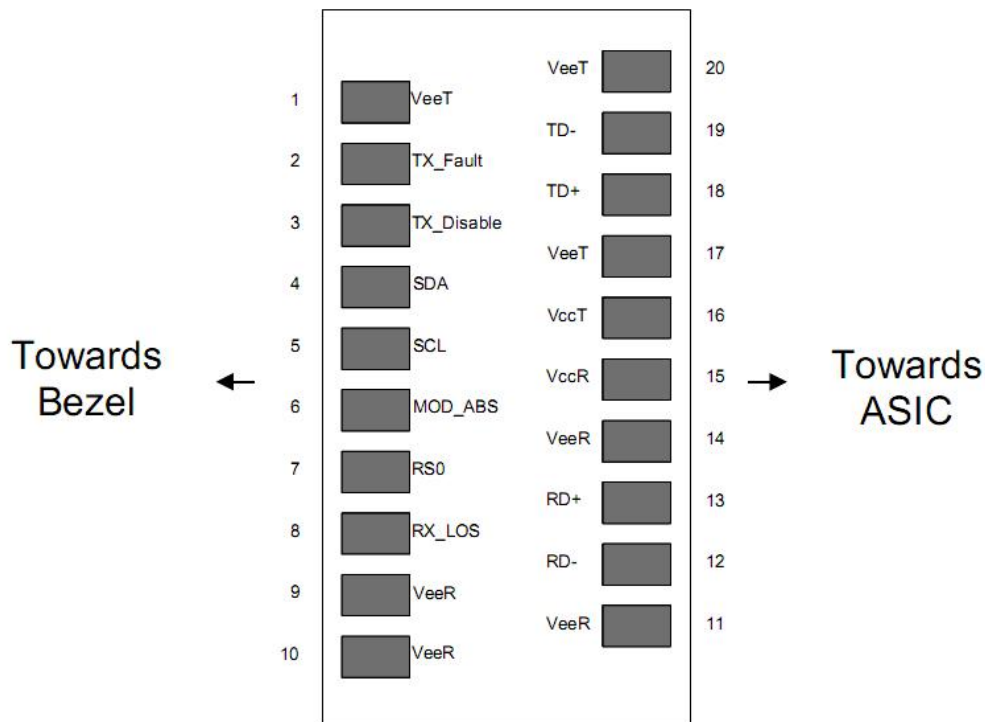
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.



Pin Descriptions



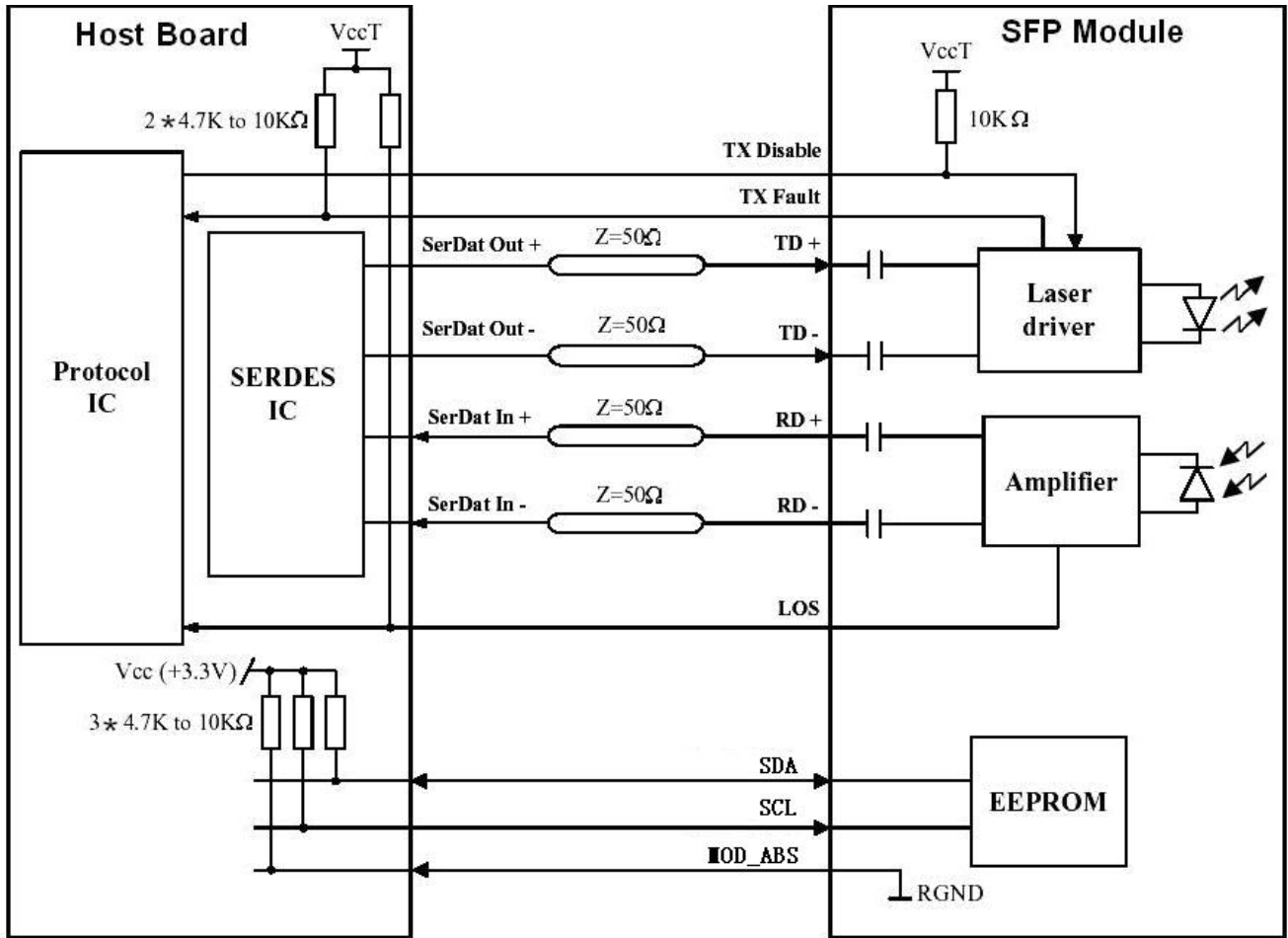
| Pin | Signal Name | Description | Plug Seq. | Notes |
|-----|------------------|---|-----------|--------|
| 1 | V _{EET} | Transmitter Ground | 1 | |
| 2 | TX FAULT | Transmitter Fault Indication | 3 | Note 1 |
| 3 | TX DISABLE | Transmitter Disable | 3 | Note 2 |
| 4 | SDA | SDA Serial Data Signal | 3 | |
| 5 | SCL | SCL Serial Clock Signal | 3 | |
| 6 | MOD_ABS | Module Absent. Grounded within the module | 3 | |
| 7 | RS0 | Not Connected | 3 | |
| 8 | LOS | Loss of Signal | 3 | Note 3 |
| 9 | V _{EER} | Receiver ground | 1 | |
| 10 | V _{EER} | Receiver ground | 1 | |
| 11 | V _{EER} | Receiver ground | 1 | |
| 12 | RD- | Inv. Received Data Out | 3 | Note 4 |
| 13 | RD+ | Received Data Out | 3 | Note 4 |
| 14 | V _{EER} | Receiver ground | 1 | |
| 15 | V _{CCR} | Receiver Power Supply | 2 | |
| 16 | V _{CCT} | Transmitter Power Supply | 2 | |
| 17 | V _{EET} | Transmitter Ground | 1 | |
| 18 | TD+ | Transmit Data In | 3 | Note 5 |
| 19 | TD- | Inv. Transmit Data In | 3 | Note 5 |
| 20 | V _{EET} | Transmitter Ground | 1 | |

Notes:

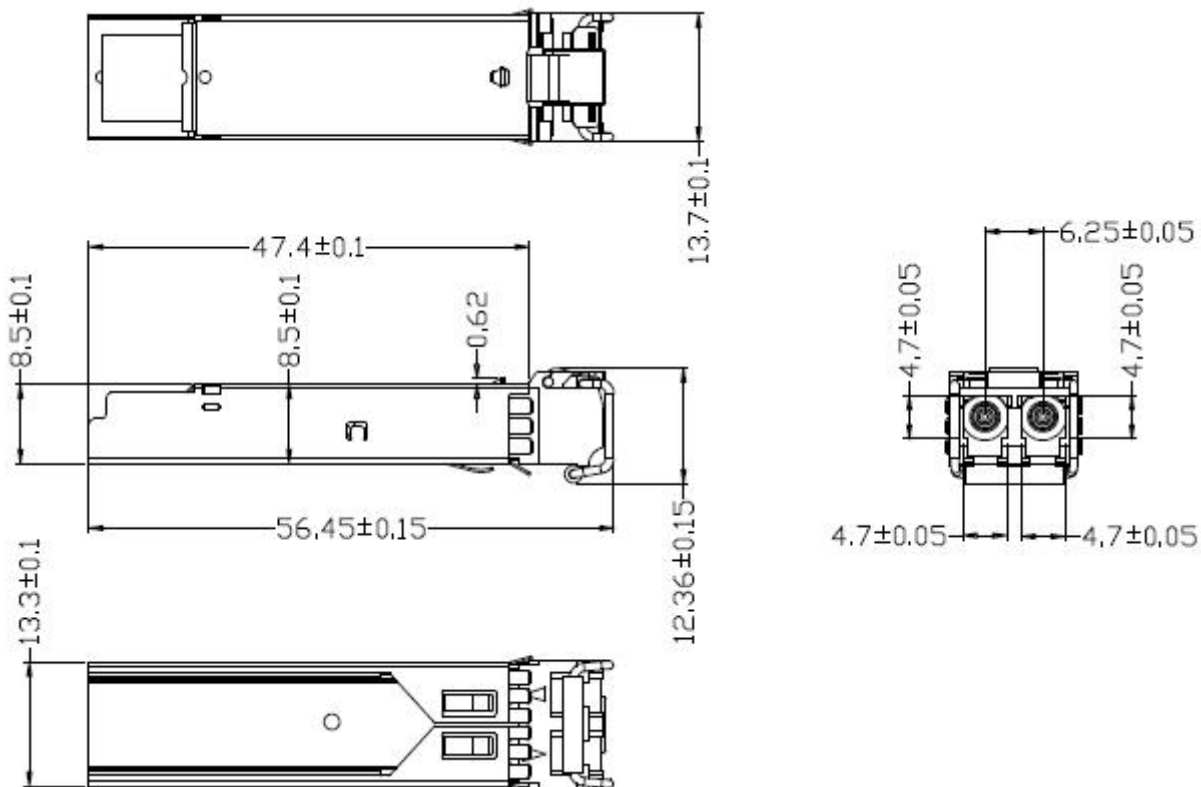
Plug Seq.: Pin engagement sequence during hot plugging.

- 1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V_{cc}+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- 2) Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
- 3) LOS is open collector output. Should be pulled up with 4.7k~10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
- 4) RD-/+ : These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
- 5) TD-/+ : These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

Recommended Interface Circuit



Mechanical Dimensions



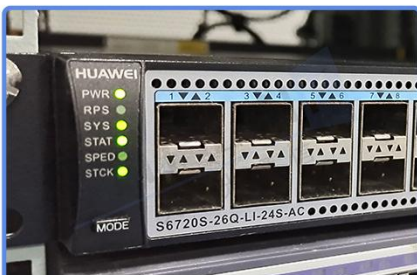
Ordering information

| Part Number | Product Description |
|--------------|--|
| ESP5524-40D | 1550nm, 2.5Gbps, LC, 40km, 0°C~+70°C, with DDM |
| ESP5524-40DI | 1550nm, 2.5Gbps, LC, 40km, -40°C~+85°C, with DDM |

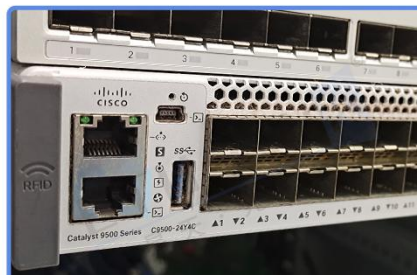
Compatibility Test

In order to ensure the product compatibility, our products will be tested on the switch before shipment. Our modules can compatible with many mainstream brand switches, such as Cisco, Juniper, Extreme, Brocade, IBM, H3C, HP, Huawei, D-Link, Mikrotik, ZTE, TP-Link...

Our test equipment: VOLKTEK MEN-4110, HP 2530-8G, CRS226-24G-25+RM, Catalyst 2960G Series, Catalyst 3850 XS 10G SFP+, Catalyst 3750-E Series, HUAWEI S5700Series, H3C S3100V2 Series, Juniper-EX4200, etc.



HUAWEI S6720S



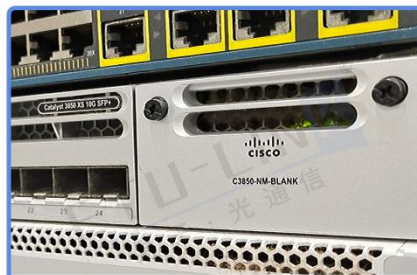
CISCO Catalyst 9500



DELL S5048F



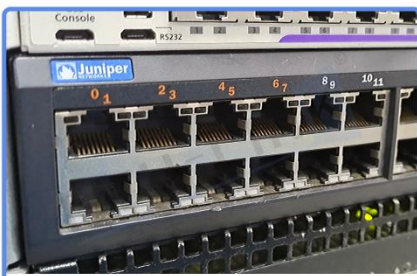
H3C S3100V2



CISCO C3850



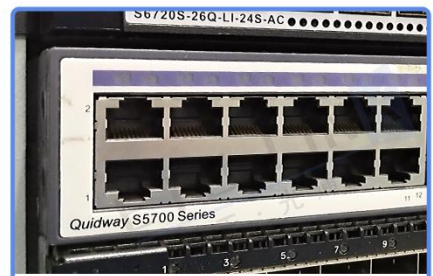
Aruba 2930F



Juniper EX 4200



HP J9264A

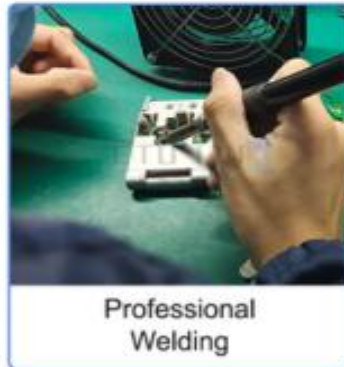


Quidway S5700

Product Production Process

Quality Assurance

Continuous introduction of new equipment,
produced by strict standards, strict quality inspection,
to guarantee the high quality, standard of each product.



Packaging

ETU-Link provides two kinds of packaging, 10pcs/Tray and individual package.



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