# GO2953

## CWDM DUAL OPTICAL TRANSMITTER MODULE

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# GO2953 CWDM Dual Optical Transmitter

## Features

- Robust error free transmission of signals from 50Mbps to 3Gbps
- Up to 50km reach in a 3Gbps CWDM installation
- Available wavelengths: 1270nm ~ 1610nm, 20nm spacing
- Supports video pathological patterns for SD-SDI, HD-SDI and 3G-SDI
- Hot-pluggable
- Two independent laser disable pins
- Digital diagnostics and control via $I^2C$ interface including:
  - Monitoring laser bias current, average output power, supply voltage and temperature
  - Alarm reporting with self shut down when transmitter is at fault
  - Module ID polling
- Single +3.3V power supply
- Low power consumption — typically 680mW
- RoHS compliant
- Operating temperature range: 0°C to 70°C
- 56.5mm x 13.4mm x 8.6mm SFP Package
- SMPTE 297-2006 compatible

## Applications

- SMPTE 297-2006 compatible electrical-to-optical interfaces
- High-density video routers

## Description

The GO2953 is a dual channel CWDM optical transmitter module designed to transmit optical serial digital signals as defined in SMPTE 297-2006. The GO2953 is specifically designed for robust performance in the presence of SDI pathological patterns for SMPTE 259M, SMPTE 344M, SMPTE 292M and SMPTE 424M serial rates.

The GO2953 contains two independent DFB laser transmitters, each designed to provide error-free transmission of signals from 50Mbps to 3Gbps. The GO2953 is hot-pluggable with typical power consumption of 680mW using a single power supply of +3.3V.

The GO2953 provides extensive operational status monitoring through an $I^2C$ interface. For each transmitter channel, output optical power and bias current are monitored. Other operating conditions such as supply voltage and operating temperature are also monitored. If a parameter monitored is outside the pre-defined range, the alarm flag associated with the parameter will be raised.

## Revision History

| Version | ECR | Date | Changes and/or Modifications |
|---|---|---|---|
| 0 | 157039 | November 2011 | New document. |
| 1 | 157987 | April 2012 | Updated extinction ratio in Table 3-2. |

# Contents

# 1. Functional Block Diagram

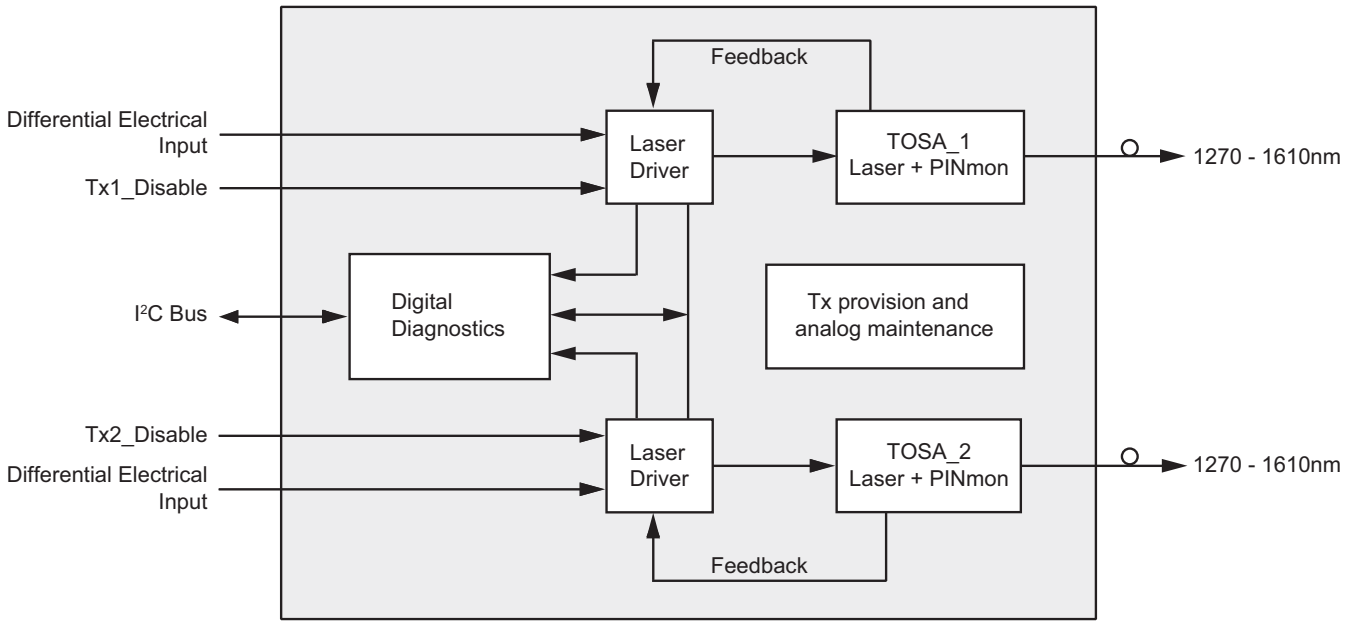


Figure 1-1: GO2953 Functional Block Diagram

# 2. Pin Specifications

## 2.1 Pin Configuration

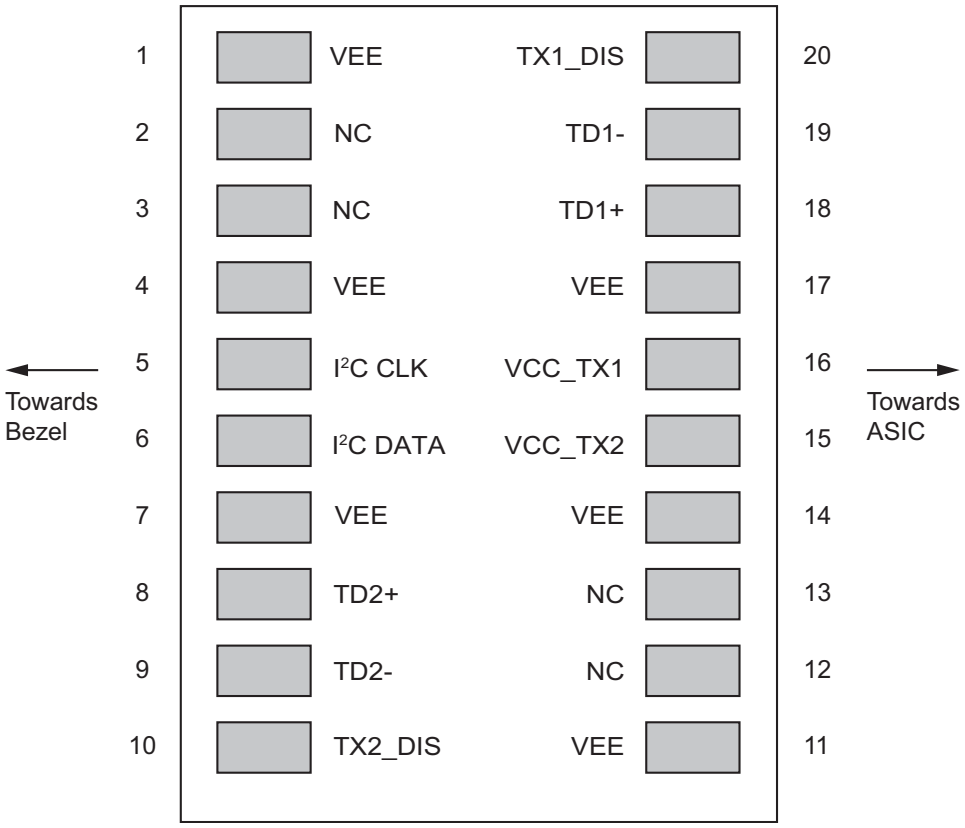


Figure 2-1: Pin Configuration for GO2953

## 2.2 Pin Descriptions

**Table 2-1: Pin Descriptions**

| Number | Name | Type | Description |
|---|---|---|---|
| 1 | VEE | Ground | Ground connection |
| 2 | NC | No Connect | No Connection |
| 3 | NC | No Connect | No Connection |
| 4 | VEE | Ground | Ground connection |
| 5 | $I^2C$ CLK | Digital (Input) | $I^2C$ Clock |
| 6 | $I^2C$ DATA | Digital (Bi-Directional) | $I^2C$ Data |

**Table 2-1: Pin Descriptions (Continued)**

| Number | Name | Type | Description |
|---|---|---|---|
| 7 | VEE | Ground | Ground connection |
| 8 | TD2+ | Input | Positive Differential Input. Internally AC-coupled. |
| 9 | TD2- | Input | Negative Differential Input. Internally AC-coupled. |
| 10 | TX2_Dis | Digital (Input) | Transmitter Disable. The bias current and modulation current are turned off if TX2_DIS = HIGH. Internal 4.7kΩ pull-up. |
| 11 | VEE | Ground | Ground connection |
| 12 | NC | No Connect | No Connection |
| 13 | NC | No Connect | No Connection |
| 14 | VEE | Ground | Ground connection |
| 15 | VCC_TX2 | Power | Transmitter Power Supply |
| 16 | VCC_TX1 | Power | Transmitter Power Supply |
| 17 | VEE | Ground | Ground connection |
| 18 | TD1+ | Input | Positive Differential Input. Internally AC-coupled. |
| 19 | TD1- | Input | Negative Differential Input. Internally AC-coupled. |
| 20 | TX1_Dis | Digital (Input) | Transmitter Disable. The bias current and modulation current are turned off if TX1_DIS = HIGH. Internal 4.7kΩ pull-up. |

## 2.3 Host Board Power Supply Requirements

The host board is required to provide a regulated and filtered power supply of 3.3V +/- 5% V for the GO2953 via the on board SFP connector. The host board is required to filter the VCC_TX power supply as recommended by the SFP MSA. Figure 2-2 shows the recommended board supply filtering. When the host board is loaded with a resistive load in place of the SFP module and sourcing the maximum rated current, the peak-to-peak power supply noise measured on the SFP connector should comply to Table 2-2.

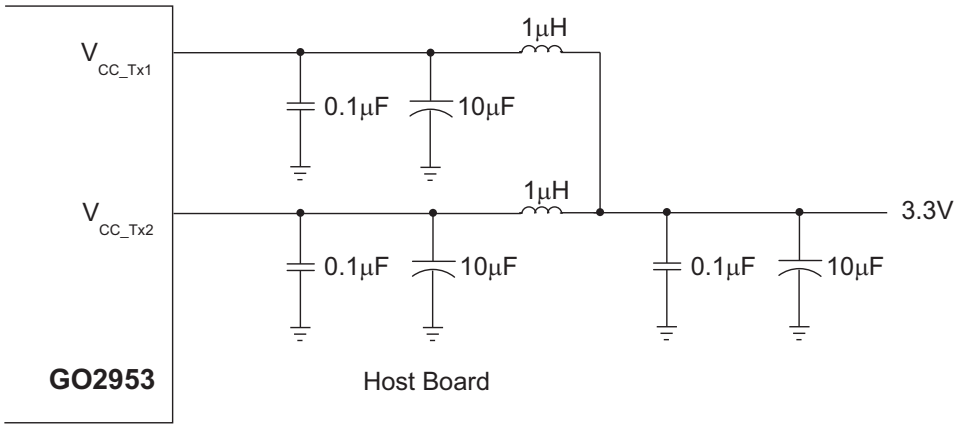


Figure 2-2: Recommended Host Board Supply Filtering

**Table 2-2: Host Board Power Supply Noise Requirement at $V_{CC}R$**

| Frequency (MHz) | Peak-to-Peak Noise Amplitude (%) |
|---|---|
| 0.02-1 | 2 |
| 1-10 | 3 |

## 2.4 Optical Connector Requirements

An LC connector with PC/UPC polish is required for each port.

# 3. Product Specifications

## 3.1 Absolute Maximum Ratings

Table 3-1 lists the absolute maximum ratings for the GO2953. Conditions exceeding the limits listed may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those listed in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**Table 3-1: Absolute Maximum Ratings**

| Parameter | Conditions | Value/Units |
|---|---|---|
| Supply Voltage | – | 4V |
| Operating Case Temperature | – | $-20°C \leq T_{CASE} \leq 80°C$ |
| Storage Temperature | – | $-40°C \leq T_{STG} \leq 100°C$ |
| ESD tolerance on all pins | – | 1 kV HBM |
| Relative Humidity (non-condensing) | – | 5% - 95% RH |

## 3.2 Optical Performance Specifications

Table 3-2 lists the optical performance specifications for the GO2953.

**Table 3-2: Optical Performance Specifications**

| Parameter | Symbol | Condition | Min | Typ | Max | Units | Notes |
|---|---|---|---|---|---|---|---|
| **System** | | | | | | | |
| Wavelength | λ | – | X-6.5 | X | X+6.5 | nm | 2 |
| Spectral Line Width | – | – | – | 0.2 | 1 | nm | – |
| Average Optical Output Power | $P_{OUT}$ | – | 0 | +2.5 | +5 | dBm | – |
| Extinction Ratio | ER | – | 8 | – | – | dB | – |

**Table 3-2: Optical Performance Specifications (Continued)**

| Parameter | Symbol | Condition | Min | Typ | Max | Units | Notes |
|---|---|---|---|---|---|---|---|
| Optical Signal Intrinsic Jitter | – | Measured with PRBS $2^{23}$-1 and colour bar test signal at 2.97Gbps, 1.485Gbps, 270Mbps | – | 40 | 60 | ps | 3 |
| | | SMPTE 424M 2.97Gbps Pathological | – | 50 | 90 | ps | 3 |
| | | SMPTE 292M 1.485Gbps Pathological | – | 60 | 120 | ps | 3 |
| | | SMPTE 259M 270Mbps Pathological | – | 110 | 200 | ps | 3 |
| Optical Signal Rise Time (20% to 80%) | $t_r$ | SMPTE 424M 2.97Gbps | – | 130 | 180 | ps | 3 |
| | | SMPTE 292M 1.485Gbps | – | 175 | 270 | ps | 3 |
| | | SMPTE 259M 270Mbps | – | 300 | 800 | ps | 3 |
| Optical Signal Fall Time (20% to 80%) | $t_f$ | SMPTE 424M 2.97Gbps | – | 130 | 180 | ps | 3 |
| | | SMPTE 292M 1.485Gbps | – | 175 | 270 | ps | 3 |
| | | SMPTE 259M 270Mbps | – | 300 | 800 | ps | 3 |

NOTES:

1. Outside the specified range, performance is not guaranteed.
2. X = Centre Wavelength: 1271, 1291, 1311, 1331, 1351, 1371, 1391, 1411, 1431, 1451, 1471, 1491, 1511, 1531, 1551, 1571, 1591 & 1611nm
3. Measured following a fourth-order Bessel-Thompson filter with a bandwidth of 0.75 x clock frequency corresponding to the serial data rate.

## 3.3 DC Electrical Specifications

Table 3-3 lists the DC electrical specifications for the GO2953.

**Table 3-3: DC Electrical Specifications**

| Parameter | Symbol | Condition | Min | Typ | Max | Units | Notes |
|---|---|---|---|---|---|---|---|
| **System** | | | | | | | |
| Operating Temperature Range | $T_{CASE}$ | – | 0 | – | 70 | °C | 1,3 |
| Power Supply Voltage | $V_{CC}$ | – | 3.13 | 3.3 | 3.47 | V | 1,3 |
| Total Power Consumption | – | – | – | 650 | 1000 | mW | 3 |
| Input Data Amplitude | – | – | 0.2 | – | 1.2 | Vpp | 2,3 |
| **Laser** | | | | | | | |
| Laser Bias Current Monitoring Accuracy | – | – | -1 | – | +1 | dB | 3 |
| Laser Power Monitoring Accuracy | – | – | -1 | – | +1 | dB | 3 |

NOTES:

1. Outside the specified range, performance is not guaranteed.
2. AC coupled 50Ω single-ended termination.
3. Specifications apply at the beginning of life.

## 3.4 AC Electrical Specifications

Table 3-4 lists the AC electrical specifications for the GO2953.

**Table 3-4: AC Electrical Specifications**

| Parameter | Symbol | Condition | Min | Max | Units |
|---|---|---|---|---|---|
| Bit Rate | BR | – | 50 | 3000 | Mbps |
| Tx_Disable Assert Time | t_off | Time from rising edge of TX_DIS to when the optical output falls below 10% of nominal | – | 10 | µs |
| Tx_Disable Negate Time | t_on | Time from falling edge of TX_DIS to when the modulated optical output rises above 90% of nominal | – | 1 | ms |
| Time to Initialize | t_init | From power on | – | 300 | ms |
| Serial ID Clock Rate | f_serial_clock | – | – | 400 | kHz |

# 3.5 Supporting Circuit Specifications

## 3.5.1 In-Rush Current Control Circuit

Due to the hot-pluggable requirement, the GO2953 has built-in circuits to limit the in-rush current upon hot insertion. The specifications of the in-rush limiting circuits are summarized in Table 3-5.

**Table 3-5: In-rush Current Limiting Circuits Specifications**

| Parameter | Value |
|---|---|
| Max. In-rush current ramp rate | 50mA/ms |
| Max. In-rush current | 30mA over steady state |

## 3.5.2 Digital Diagnosis

### 3.5.2.1 $I^2C$ Bus Interface

The $I^2C$ bus interface uses the 2-wire serial CMOS $E^2$PROM protocol. The serial interface meets the following specifications:

1. Support a maximum clock rate of 400kHz.
2. Input/Output levels comply with LVCMOS/LVTTL or compatible logics.
   - Low: 0 – 0.8V
   - High: 2.0 – 3.3V
   - Undefined: 0.8 – 2.0V

### 3.5.2.2 Serial Interface Memory Map

Module identification and diagnostic information is accessible through the address map shown in Table 3-6. Block addresses starting with the letter 'A' refer to Channel 1 and block addresses starting with the letter 'B' refer to Channel 2.

**Table 3-6: Serial Interface Memory Map**

| Address | Size | Name | Description and Value of the Field |
|---|---|---|---|
| **Base ID Fields (Block Address: A0h)** | | | |
| 0 | 1 | Identifier | Type of serial transceiver. 81h |
| 1 | 1 | Ext. Identifier | Extended identifier of type of serial transceiver. 04h |
| 2 | 1 | Connector | Code for connector type. 07h for LC connectors. |

**Table 3-6: Serial Interface Memory Map (Continued)**

| Address | Size | Name | Description and Value of the Field |
|---|---|---|---|
| 3 | 1 | Standards Compliance | 41h, for SMPTE259M/344M/292M/424M and SMPTE 297. |
| 4-10 | 8 | Transceiver Code | Code for electronic compatibility or optical compatibility. Not applicable for GO2953. |
| 11 | 1 | Encoding | Code for serial encoding algorithm. Value: 03H for NRZ. |
| 12 | 1 | BR, Nominal | Nominal bit rate, units of 100Mbps, 1Eh for 3Gbps. |
| 13 | 1 | Reserved | Xxh |
| 14 | 1 | Length(9mm) - km | Link length supported for standard SMF, units of km, 32h for 50km. |
| 15 | 1 | Length(9mm) | Link length supported for standard SMF, units of 100 m, 00h |
| 16 | 1 | Length (50mm) | Link length supported for 50/125mm fiber, units of 10m. 00h |
| 17 | 1 | Length (62.5mm) | Link length supported for 62.5/125mm fiber, units of 10m. 00h |
| 18 | 1 | Length (Copper) | Link length supported for copper, units of meters. 00h |
| 19 | 1 | Reserved | Xxh |
| 20-35 | 16 | Vendor name | SFP with OM transceiver vendor name (ASCII). G E N N U M |
| 20 | 1 | G | 47h |
| 21 | 1 | E | 45h |
| 22 | 1 | N | 4Eh |
| 23 | 1 | N | 4Eh |
| 24 | 1 | U | 55h |
| 25 | 1 | M | 4Dh |
| 26-35 | 10 | – | 20h for each byte |
| 36 | 1 | Reserved | – |
| 37-39 | 3 | Vendor OUI | SFP with OM transceiver vendor IEEE company ID. 00 0A DF |
| 40-55 | 16 | Vendor PN | Part number provided by SFP with OM transceiver vendor. G O 2 9 5 3. |
| 40 | 1 | G | 47h |
| 41 | 1 | O | 4Fh |
| 42 | 1 | 2 | 32h |
| 43 | 1 | 9 | 39h |

**Table 3-6: Serial Interface Memory Map (Continued)**

| Address | Size | Name | Description and Value of the Field |
|---|---|---|---|
| 44 | 1 | 5 | 35h |
| 45 | 1 | 3 | 33h |
| 46 | 1 | X | Model dependent. |
| 47 | 1 | X | Model dependent. |
| 48 | 1 | Y | Model dependent. |
| 49 | 1 | Y | Model dependent. |
| 50 | 1 | C | 43h |
| 51 | 1 | H | 48h |
| 52-55 | 4 | – | 20h for each byte. |
| 56-58 | 3 | – | Reserved |
| 59 | 1 | Vendor Rev | Revision level for part number provided by vendor. |
| 60 | 1 | Wavelength1 | XX for the middle two digits of the wavelength of Channel #1. |
| 61 | 1 | Wavelength2 | YY for the middle two digits of the wavelength of Channel #2. |
| 62 | 1 | Reserved | Xxh |
| 63 | 1 | CC_BASE | Check code for Base ID Fields (The value of the lower 8 bits of the sum of the contents from address 0 to 62). |
| 64-65 | 2 | Options | Indicates which optional SFP with OM signals are implemented. |
| 64 | 1 | – | Xxh |
| 65 | 1 | – | x001100xh |
| 66 | 1 | BR, max | Upper bit rate margin, units of %, 5h. |
| 67 | 1 | BR, min | Lower bit rate margin, units of %, 5Fh. |
| 68-83 | 16 | Vendor SN | Serial number provided by vendor (ASCII) |
| 84-85 | 2 | Year | Manufacturing date code (ASCII). |
| 86-87 | 2 | Month | Manufacturing date code (ASCII). |
| 88-89 | 2 | Day | Manufacturing date code (ASCII). |
| 90-91 | 2 | Blank | – |
| 92 | 1 | Calibration flag | 20h for calibrated average output power |
| 93 | 1 | – | E0h, Enhanced alarm/warning flags. |
| 94 | 1 | Reserved | Xxh |

**Table 3-6: Serial Interface Memory Map (Continued)**

| Address | Size | Name | Description and Value of the Field |
|---|---|---|---|
| 95 | 1 | CC_EXT | Check code for the Extended ID Fields (The value of the lower 8 bits of the sum of the contents from address 64 to 94) |
| 96-255 | 160 | Reserved | – |
| **Alarm and Warning Thresholds (Block Address: A2h and B2h)** | | | |
| 0-1 | 2 | Temp High Alarm | MSB at lower address. 70°C ambient |
| 2-3 | 2 | Temp Low Alarm | MSB at lower address. 0°C ambient |
| 4-5 | 2 | Temp High Warning | MSB at lower address. 65°C ambient |
| 6-7 | 2 | Temp Low Warning | MSB at lower address. 5°C ambient |
| 8-9 | 2 | Supply Voltage High Alarm | MSB at lower address. 3.6V |
| 10-11 | 2 | Supply Voltage Low Alarm | MSB at lower address. 3.0V |
| 12-13 | 2 | Supply Voltage High Warning | MSB at lower address. 3.47V |
| 14-15 | 2 | Supply Voltage Low Warning | MSB at lower address. 3.14V |
| 16-17 | 2 | Laser Bias High Alarm | MSB at lower address. 100mA. |
| 18-19 | 2 | Laser Bias Low Alarm | MSB at lower address. 5mA. |
| 20-21 | 2 | Laser Bias High Warning | MSB at lower address. 90mA. |
| 22-23 | 2 | Laser Bias Low Warning | MSB at lower address. 10mA |
| 24-25 | 2 | Tx Power High Alarm | MSB at lower address. 5.5dBm |
| 26-27 | 2 | Tx Power Low Alarm | MSB at lower address. 0dBm |
| 28-29 | 2 | Tx Power High Warning | MSB at lower address. 5dBm |
| 30-31 | 2 | Tx Power Low Warning | MSB at lower address. 0.5dBm |
| 32-95 | 65 | Reserved. | – |
| 96 | 1 | Temperature MSB | Internally measured module temperature |
| 97 | 1 | Temperature LSB | Internally measured module temperature |

**Table 3-6: Serial Interface Memory Map (Continued)**

| Address | Size | Name | Description and Value of the Field |
|---|---|---|---|
| 98 | 1 | Vcc MSB | Internally measured module supply voltage |
| 99 | 1 | Vcc LSB | Internally measured module supply voltage |
| 100 | 1 | Laser Bias MSB | Internally measured laser bias current. |
| 101 | 1 | Laser Bias LSB | Internally measured laser bias current. |
| 102 | 1 | Tx Power MSB | Internally measured Tx Power. |
| 103 | 1 | Tx Power LSB | Internally measured Tx Power. |
| 104-109 | 11 | Reserved | – |
| 110 | 1 | Tx Disable State | Bit 7: State of TX_DIS input pin |
| | | Tx Disable Select | Bit 6: Read/write bit that allows software disable of laser. Writing “1” disables laser |
| | | Reserved | Bit 5 |
| | | Reserved | Bit 4 |
| | | Reserved | Bit 3 |
| | | Tx Fault | Bit 2: State of TX_FAULT |
| | | N/A | Bit 1 |
| | | Data_Ready | Bit 0 |
| 111 | 1 | Conversion Update | – |
| | | Temp Update | Bit 7 goes to high after a temperature update |
| | | Vcc Update | Bit 6 goes to high after a Vcc update |
| | | Mon1 Update | Bit 5 goes to high after a Tx bias current update |
| | | Mon2 Update | Bit 4 goes to high after a Tx power update |
| | | Mon3 Update | Bit 3 goes to high after a Tx modulation current update. |
| | | Reserved | Bit 0 to Bit 2. |

**Table 3-6: Serial Interface Memory Map (Continued)**

| Address | Size | Name | Description and Value of the Field |
|---|---|---|---|
| 112 | 1 | Temp High Alarm Flag | Bit 7, set when the internal temperature exceeds the high temp alarm threshold. |
| | | Temp Low Alarm Flag | Bit 6, set when the internal temperature goes below the low temp alarm threshold. |
| | | Supply Voltage High Alarm Flag | Bit 5, set when the internal Vcc exceeds the supply voltage high alarm threshold. |
| | | Supply Voltage Low Alarm Flag | Bit 4, set when the internal Vcc goes below the supply voltage low alarm threshold. |
| | | Laser Bias High Alarm Flag | Bit 3, set when the monitored laser bias current exceeds the laser bias high alarm threshold. |
| | | Laser Bias Low Alarm Flag | Bit 2, set when monitored laser bias current goes below the laser bias low alarm threshold. |
| | | Tx Power High Alarm Flag | Bit 1, set when the monitored Tx power exceeds the Tx power high alarm threshold. |
| | | Tx Power Low Alarm Flag | Bit 0, set when monitored Tx power current goes below the Tx power low alarm threshold. |
| 113 | 1 | Mod Current High Alarm Flag | Bit 7, set when the monitored laser modulation current exceeds the laser bias high alarm threshold. |
| | | Mod Current Low Alarm Flat | Bit 6, set when monitored laser bias current goes below the laser modulation low alarm threshold. |
| | | Reserved | Bit 0 - 5. |
| 114-115 | 2 | Reserved | – |

**Table 3-6: Serial Interface Memory Map (Continued)**

| Address | Size | Name | Description and Value of the Field |
|---|---|---|---|
| 116 | 1 | Temp High Warning Flag | Bit 7, set when the internal temperature exceeds the high temp warning threshold. |
| | | Temp Low Warning Flag | Bit 6, set when the internal temperature goes below the low temp warning threshold. |
| | | Supply Voltage High Warning Flag | Bit 5, set when the internal Vcc exceeds the supply voltage high warning threshold. |
| | | Supply Voltage Low Warning Flag | Bit 4, set when the internal Vcc goes below the supply voltage low warning threshold. |
| | | Laser Bias High Warning Flag | Bit 3, set when the monitored laser bias current exceeds the laser bias high warning threshold. |
| | | Laser Bias Low Warning Flag | Bit 2, set when monitored laser bias current goes below the laser bias low warning threshold. |
| | | Tx Power High Warning Flag | Bit 1, set when the monitored Tx power exceeds the Tx power high warning threshold. |
| | | Tx Power Low Warning Flag | Bit 0, set when monitored Tx power current goes below the Tx power low warning threshold. |
| 117 | 1 | Mod Current High Warning Flag | Bit 7, set when the monitored laser modulation current exceeds the laser bias high alarm threshold. |
| | | Mod Current Low Warning Flag | Bit 6, set when monitored laser bias current goes below the laser modulation low alarm threshold. |
| | | Reserved | Bit 0 - 5 |
| 118-127 | 10 | Reserved | – |
| **Vendor Specific ID Fields** | | | |
| 128-247 | 120 | User Writeable Area | – |
| 248-255 | 8 | Reserved | – |

# 4. Application Reference Design

## 4.1 Typical Application Circuit

Figure 4-1 shows a typical application circuit for the GO2953.

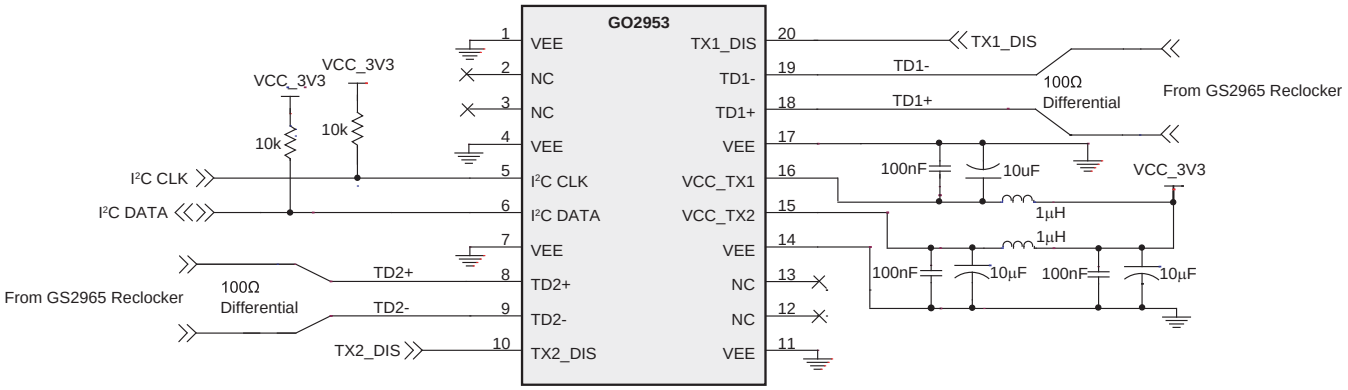


Figure 4-1: Typical Application Circuit

# 5. References and Relevant Standards

**Table 5-1: References and Relevant Standards**

| | |
|---|---|
| INF-8074i Rev 1.0 | SFP (Small Formfactor Pluggable) Transceiver |
| SMPTE 259M-2008 | SDTV Digital Signal/Data – Serial Digital Interface |
| SMPTE 292M-2008 | 1.5 Gb/s Signal / Data Serial Interface |
| SMPTE 297-2006 | Serial Digital Fiber Transmission System for SMPTE 259M, SMPTE 344M, SMPTE 292 and SMPTE 424M Signals |
| SMPTE 344M-2000 | 540 Mb/s Serial Digital Interface |
| SMPTE 424M-2006 | 3 Gb/s Signal/Data Serial Interface |
| ITU-T G.694.2 | Spectral grids for WDM applications: CWDM wavelength grid |

# 6. Package Information

## 6.1 Package Dimensions

A common mechanical outline, as shown in Figure 6-1, is used for all SFP modules.

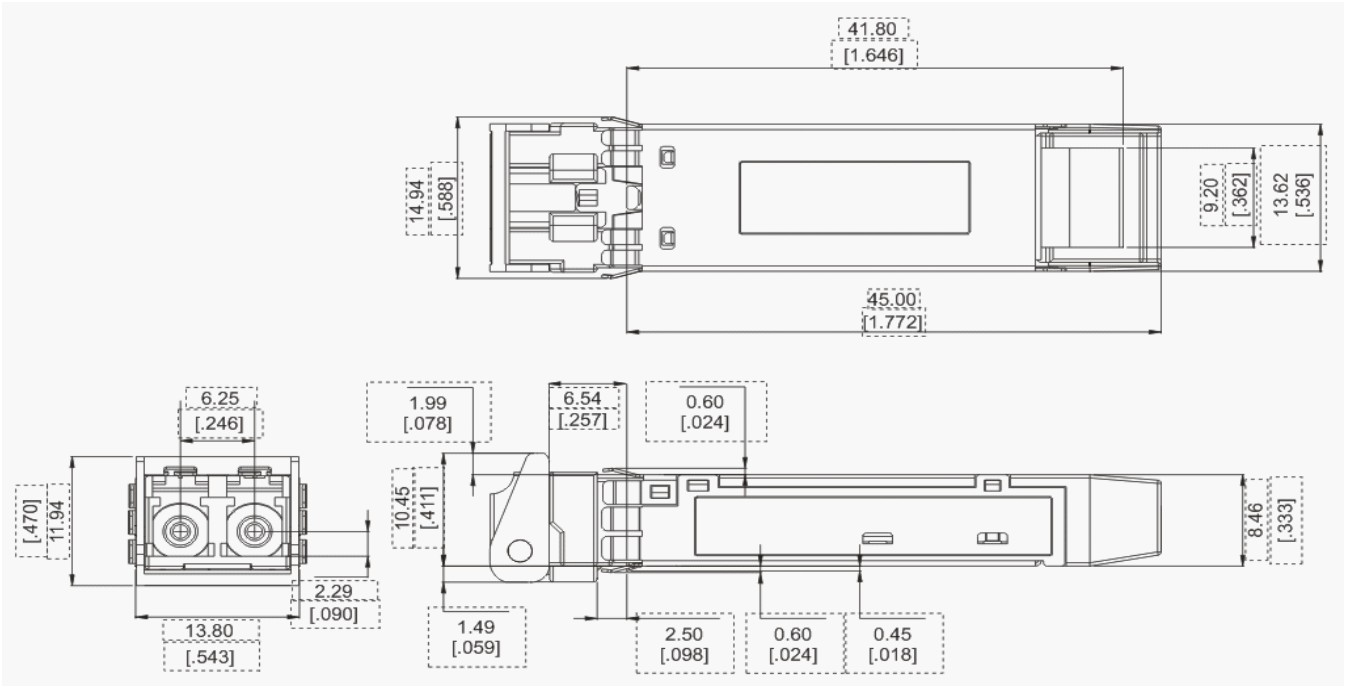


Figure 6-1: Common SFP Package Outline

## 6.2 PCB Layout Recommendations

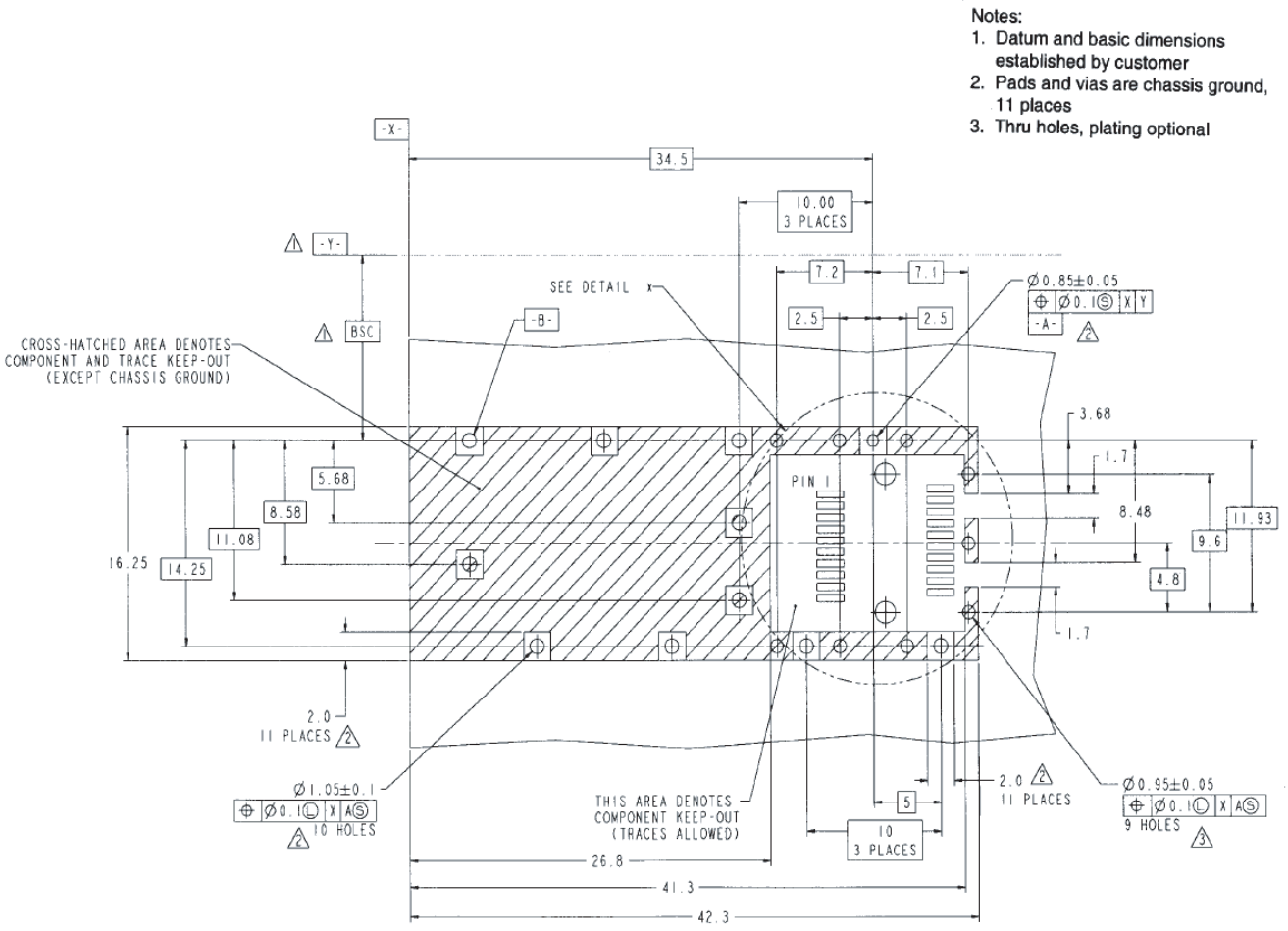


Figure 6-2: Host PCB Layout – Part 1

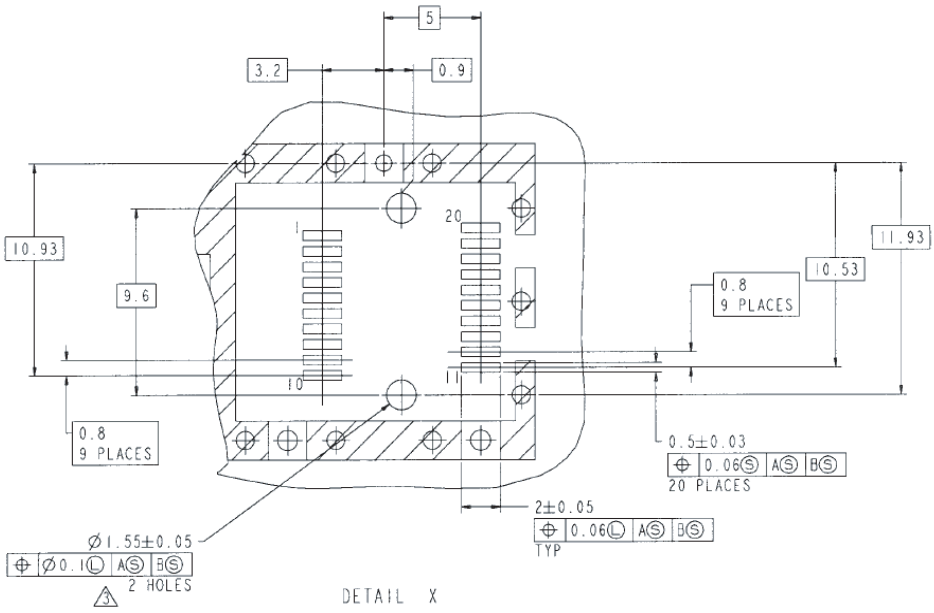


Figure 6-3: Host PCB Layout – Part 2

## 6.3 Marking Information

**Table 6-1: Marking Information**

| Label Code | Description |
|---|---|
| XXYY | 4-digit wavelength code - see Table 6-2: Ordering Information. |
| ZZZZZZZ | 7-digit serial number |
| UUUU | Channel 1 wavelength in nanometers |
| VVVV | Channel 2 wavelength in nanometers |
| YYYY | Year of manufacture |
| WW | Week of manufacture |

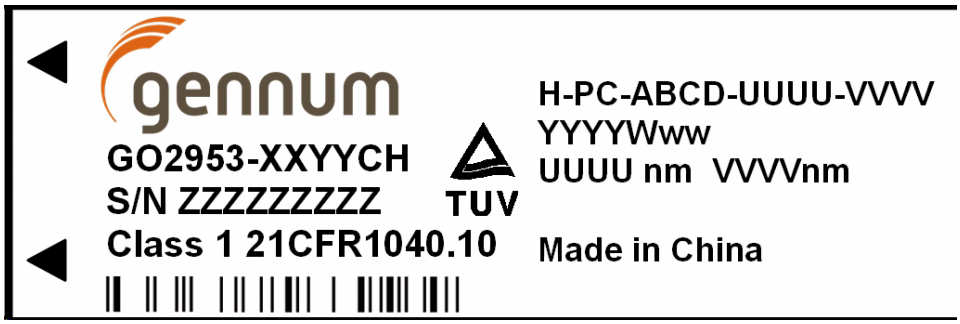


Figure 6-4: GO2953 Marking Information

## 6.4 Ordering Information

**Table 6-2: Ordering Information**

| Part Number | Package | Wavelength | Temperature Range |
|---|---|---|---|
| GO2953-2729CH | SFP | Ch1: 1271nm<br>Ch2: 1291nm | 0°C to 70°C |
| GO2953-3133CH | SFP | Ch1: 1311nm<br>Ch2: 1331nm | 0°C to 70°C |
| GO2953-3537CH | SFP | Ch1: 1351nm<br>Ch2: 1371nm | 0°C to 70°C |
| GO2953-3941CH | SFP | Ch1: 1391nm<br>Ch2: 1411nm | 0°C to 70°C |
| GO2953-4345CH | SFP | Ch1: 1431nm<br>Ch2: 1451nm | 0°C to 70°C |
| GO2953-4749CH | SFP | Ch1: 1471nm<br>Ch2: 1491nm | 0°C to 70°C |
| GO2953-5153CH | SFP | Ch1: 1511nm<br>Ch2: 1531nm | 0°C to 70°C |
| GO2953-5557CH | SFP | Ch1: 1551nm<br>Ch2: 1571nm | 0°C to 70°C |
| GO2953-5961CH | SFP | Ch1: 1591nm<br>Ch2: 1611nm | 0°C to 70°C |
| GO2953-3155CH | SFP | Ch1: 1310nm<br>Ch2: 1550nm | 0°C to 70°C |

**DOCUMENT IDENTIFICATION**
**APPLICATION NOTE**

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