

SPB-9110LVW-T5R3G

(RoHS Compliant)

1550 nm TX / 1310 nm RX / 3 Gb/s Medium Power 1-Fiber SM Video Digital Diagnostic SFP Transceiver

FEATURES

- SMPTE 297-2006 Compatible
- **1-Fibre Bi-Directional SFP Optical Transceiver**
- Speed from 50 Mbps to 3Gbps with up to 30 km Single-mode Fiber
- Distance up to 10 km for 3G-SDI
- **Support Video Pathological Patterns for SD-SDI, HD-SDI and 3G-SDI**
- 1550 nm Transmitter
- 1310 nm Receiver
- SFF-8472 Digital Diagnostic Function
- Simplex LC Connector
- Single +3.3 V Power Supply
- RoHS Compliant
- 0 to 70°C Operation
- Hot Pluggable
- Class 1 Laser International Safety Standard IEC-60825 Compliant

APPLICATIONS

- SMPTE 297-2006 Compliant Electrical-to-Optical Interfaces
- High-density Video Routers

DESCRIPTION

The SPB-9110LVW-T5R3G is a 1-fibre BIDI single mode transceiver module designed to transmit/receive optical serial digital signals as defined in SMPTE 297-2006. It supports from 50 Mbps to 3 Gbps and is specifically designed for transmitted the SMPTE 259M, SMPTE 344M, SMPTE 292M and SMPTE 424M SDI pathological patterns. It is with the SFP 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I²C. It is with a 1550 nm DFB laser transmitter. The receiver section uses an integrated 1310 nm detector preamplifier mounted in an optical header and a limiting post-amplifier IC. The transmitter can transmit signal from 50 Mbps to 3 Gbps with up to 30 km of single-mode fiber. A maximum distance of 10 km is achievable with 3Gbps pathological signals.

LASER SAFETY

This single mode transceiver is a Class 1 laser product. It complies with IEC-60825 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated within the specified temperature and voltage limits. The optical ports of the module shall be terminated with an optical connector or with a dust plug.

ORDER INFORMATION

| P/No. | Type | Bit Rate (Mb/s) | TX | | RX | | Package | Temp (°C) | RoHS Compliant |
|--------------------------|-----------|-----------------|----------|-------------|--------|------------|-----------------|-----------|----------------|
| | | | λ (nm) | Power (dBm) | λ (nm) | Sen. (dBm) | | | |
| SPB-9110LVW-T5R3G | 1-TX+1-RX | 50 to 3000 | 1550 DFB | -3 to -8 | 1310 | 0 to -20 | LC SFP with DMI | 0 to 70 | Yes |
| SPB-9110LVW-T3R5G | 1-TX+1-RX | 50 to 3000 | 1310 | 0 to -5 | 1550 | 0 to -20 | LC SFP with DMI | 0 to 70 | Yes |

LINK DISTANCE

| SDI | Bit Rate | Max. Link Distance (km) |
|--------|-----------|-------------------------|
| 3G-SDI | 2.97Gbps | 10 |
| HD-SDI | 1.485Gbps | 21 |
| SD-SDI | 270Mbps | 30 |

ABSOLUTE MAXIMUM RATINGS

Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

| Absolute Maximum Ratings | | | | | |
|----------------------------|--------|-----|-----|--------|----------------|
| Parameter | Symbol | Min | Max | Units | Notes |
| Storage Temperature | Tstg | -40 | 85 | °C | |
| Operating Case Temperature | Tc | 0 | 70 | °C | |
| Power Supply Voltage | Vcc | 0 | 4 | V | |
| ESD Tolerance on all pins | | | 1 | KV HBM | |
| Relative Humidity | --- | 5 | 95 | % RH | non-condensing |

| Recommended Operating Conditions | | | | | |
|----------------------------------|--------|------|-----|------|---------------|
| Parameter | Symbol | Min | Typ | Max | Units / Notes |
| Power Supply Voltage | Vcc | 3.13 | 3.3 | 3.47 | V |
| Operating Case Temperature | Tc | 0 | | 70 | °C |
| Baud Rate | | 50 | | 3000 | Mb/s |
| Power Supply Current | Icc | | 200 | 300 | mA |

| Transmitter Specifications (0°C < Tc < 70°C, 3.13V < Vcc < 3.47V) | | | | | | |
|---|-----------------------------------|------|-----|---------|-------|--------------------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes |
| Optical | | | | | | |
| Optical Transmit Power | Po | -8 | | -3 | dBm | 1 |
| Output Center Wavelength | λ | 1480 | | 1580 | nm | |
| Output Spectrum Width | $\Delta\lambda$ | --- | | 1 | nm | -20 dB width |
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Extinction Ratio | ER | 5 | 7.5 | | dB | |
| Relative Intensity Noise | RIN | | | -120 | dB/Hz | |
| Optical Rise Time / Fall Time | tr / tf | | | 135 | ps | 2, SMPTE 424M |
| | | | | 270 | ps | 2, SMPTE 292M |
| | | | | 800 | ps | 2, SMPTE 344M |
| | | | | 1.5 | ns | 2, SMPTE 259M |
| Electrical | | | | | | |
| Differential Input Voltage | V _{IH} - V _{IL} | 200 | | 1200 | mVp-p | AC coupled input |
| Disable Input Voltage -- Low | V _{TDIS,L} | 0 | | 0.8 | V | TX Output Enabled |
| Disable Input Voltage -- High | V _{TDIS,H} | 2.0 | | Vcc+0.3 | V | TX Output Disabled |
| SCL, SDA | V _{OH} | 2.5 | | Vcc+0.3 | V | |
| | V _{OL} | 0 | | 0.5 | V | |

- Output power is power coupled into a 9/125 μ m single mode fiber.
- 20% to 80%, unfiltered.

| Receiver Specifications (0°C < Tc < 70°C, 3.13V < Vcc < 3.47V) | | | | | | |
|--|--------|------|-----|------|-------|------------------------------------|
| Parameter | Symbol | Min | Typ | Max | Units | Notes |
| Optical | | | | | | |
| Wavelength of Operation | | 1260 | --- | 1360 | nm | 3 |
| Sensitivity for SMPTE 424M 2.97 Gb/s | Sen | 0 | --- | -18 | dBm | Pathological |
| | | 0 | | -20 | dBm | PRBS 2 ²³ -1, BER=1E-12 |
| Sensitivity for SMPTE 292M 1.485 Gb/s | Sen | 0 | --- | -20 | dBm | Pathological |
| | | 0 | | -21 | dBm | PRBS 2 ²³ -1, BER=1E-12 |
| Signal Detect -- Asserted | Pa | --- | --- | -20 | dBm | Transition: low to high |
| Signal Detect -- Deasserted | Pd | -29 | --- | --- | dBm | Transition: high to low |
| Signal detect -- Hysteresis | | 1 | | 6 | dB | |
| Optical Return Loss | | | -27 | | dB | |
| Electrical | | | | | | |

| CML Output (Differential) | | 550 | 660 | 850 | mVp-p | AC coupled output |
|-------------------------------|-----------------|-----|-----|----------------------|-------|--|
| Optical Rise Time / Fall Time | tr / tf | | | 135 | ps | 4, SMPTE 424M |
| | | | | 270 | ps | 4, SMPTE 292M |
| | | | | 800 | ps | 4, SMPTE 344M |
| | | | | 1.5 | ns | 4, SMPTE 259M |
| Output LOS Voltage -- Low | V _{OL} | 0 | | 0.5 | V | I _{OL} =-1.6mA, 1 TTL unit load |
| Output LOS Voltage -- High | V _{OH} | 2.5 | | V _{CC} +0.3 | V | I _{OH} =40μA, 1 TTL unit load |
| SCL, SDA | V _{OH} | 2.5 | | V _{CC} +0.3 | V | |
| | V _{OL} | 0 | | 0.5 | V | |

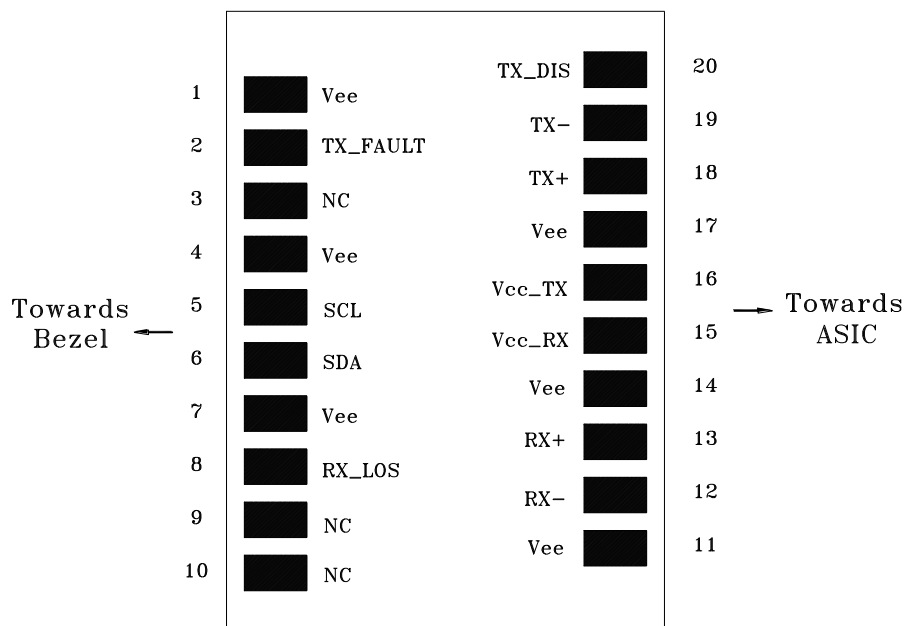
3. At least 30 dB optical isolation for the wavelength 1480 to 1580 nm.
4. 20% to 80%, unfiltered.

MODULE DEFINITION

| Module Definition | PIN 5 | PIN 6 | Interpretation by Host |
|-------------------|-------|-------|-----------------------------------|
| 4 | SCL | SDA | Serial module definition protocol |

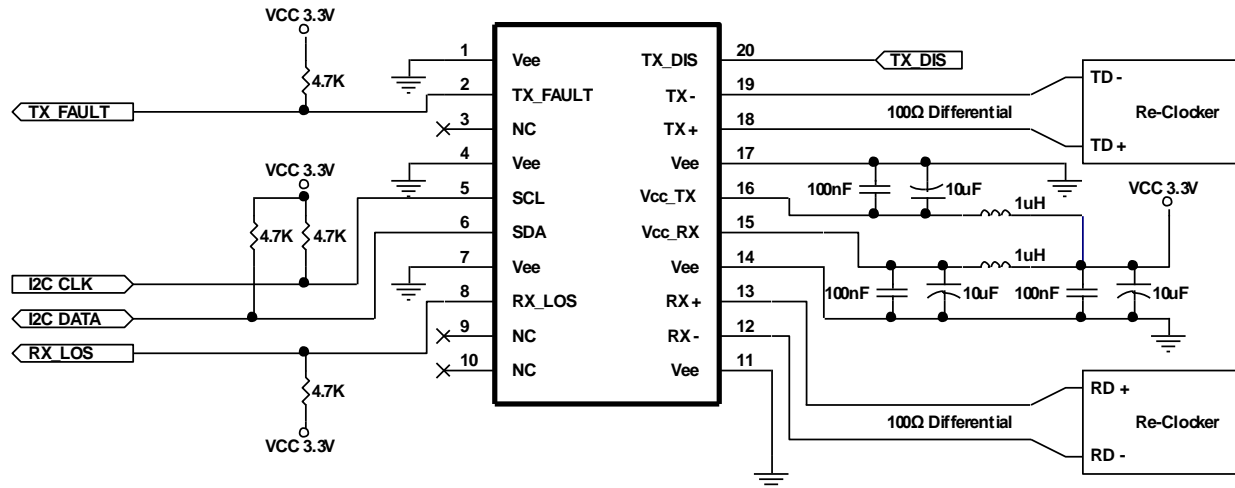
Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, SCL and SDA appear as no connector (NC). When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E²PROM protocol of the ATMEL AT24C01A/02/04 family of components.

CONNECTION DIAGRAM



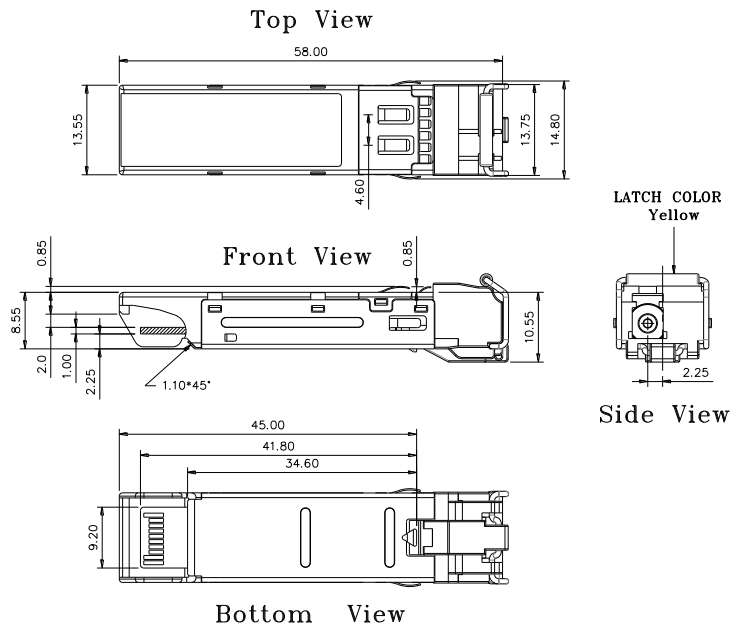
| PIN | Name | Function | Notes |
|-----|----------|---|--|
| 1 | Vee | Signal Ground | |
| 2 | TX_Fault | Transmitter Fault Indicator (Active high, open-drain) | |
| 3 | NC | No Connection | |
| 4 | Vee | Signal Ground | |
| 5 | SCL | Serial I ² C Clock | |
| 6 | SDA | Serial I ² C Data | |
| 7 | Vee | Signal Ground | |
| 8 | RX_LOS | Receiver Loss of Signal Indicator (Active high, open-drain) | |
| 9 | NC | No Connection | |
| 10 | NC | No Connection | |
| 11 | Vee | Signal Ground | |
| 12 | RX- | Negative Differential Output | |
| 13 | RX+ | Positive Differential Output | |
| 14 | Vee | Signal Ground | |
| 15 | Vcc RX | Power Supply | +3.3V±5% |
| 16 | Vcc TX | Power Supply | +3.3V±5% |
| 17 | Vee | Signal Ground | |
| 18 | TX+ | Positive Transmitter Data In | AC coupled differential lines with 100 ohm differential termination inside the module |
| 19 | TX- | Negative Transmitter Data In | |
| 20 | TX_DIS | Transmitter Disable | Internal 4.7 kΩ pull-up. The bias current and modulation current are turned off if TX1_DIS = HIGH. |

RECOMMENDED CIRCUIT SCHEMATIC



1. Consult the Chipset manufacturer's applications information for biasing required for TX outputs. Some chipset outputs are internally biased and may not need external bias resistor.

PACKAGE DIAGRAM (Units in mm)



Note: Specifications subject to change without notice.

REVISION HISTORY

| Version | Subject | Release Date |
|---------|------------------------|--------------|
| 1.0 | Initial datasheet | 2009/3/1 |
| 2.0 | Change package diagram | 2015/12/1 |
| | | |
| | | |