

**SPB-4820RLWG / SPB-4820BRLWG / SPB-4820ARLWG (RoHS Compliant)**  
**6.144 Gbps / 1270 nm TX / 1330 nm RX / 20 km Digital Diagnostic Multi-Rate CPRI SM SFP+**

**FEATURES**

- | 1-Fiber Bi-Directional SFP Optical Transceiver
- | CPRI / OBSAI Compatible Optical Interface
- | 1 G to 6.25 G Multi-rate Specification
- | Compliant with SFP+ MSA
- | SFF-8472 Digital Diagnostic Function
- | Simplex LC Connector
- | 1270 nm DFB LD Transmitter
- | 1330 nm Receiver
- | **Distance Up to 20 km**
- | AC/AC Coupling according to MSA
- | Single +3.3 V Power Supply
- | RoHS Compliant
- | 0 to 70°C Operating: SPB-4820RLWG
- | -10 to 85°C Operating: SPB-4820BRLWG
- | -40 to 85°C Operating: SPB-4820ARLWG
- | Class 1 Laser International Safety Standard IEC 60825 Compliant

**DESCRIPTION**

The SPB-4820RLWG is a 1 to 6.25 Gb/s single-mode transceiver module for serial optical communication applications for a radio base station system by using 1270 nm transmitter and 1330 nm receiver. It is with the SFP 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I<sup>2</sup>C series bus specified in the SFP MSA SFF-8472. The transmitter section uses a multiple quantum well 1270 nm DFB laser and is a class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated 1330 nm detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

**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.

**APPLICATIONS**

- | Radio Base Station
- | OBSAI rates 6.144 Gb/s, 3.072 Gb/s, and 1.563 Gb/s
- | CPRI rates 4.9152 Gb/s, 2.4576 Gb/s, and 1.2288 Gb/s

**ORDER INFORMATION**

| P/No.                | Bit Rate (Gb/s) | Distance (km) | TX (nm)  | RX (nm) | Package          | Temp (°C)        | RoHS Compliant |
|----------------------|-----------------|---------------|----------|---------|------------------|------------------|----------------|
| <b>SPB-4820RLWG</b>  | 1 to 6.25       | <b>20</b>     | 1270 DFB | 1330    | LC SFP+ with DMI | 0 to 70          | Yes            |
| <b>SPB-4820BRLWG</b> | 1 to 6.25       | <b>20</b>     | 1270 DFB | 1330    | LC SFP+ with DMI | <b>-10 to 85</b> | Yes            |
| <b>SPB-4820ARLWG</b> | 1 to 6.25       | <b>20</b>     | 1270 DFB | 1330    | LC SFP+ with DMI | <b>-40 to 85</b> | Yes            |

| Absolute Maximum Ratings   |        |     |     |       |                |  |
|----------------------------|--------|-----|-----|-------|----------------|--|
| Parameter                  | Symbol | Min | Max | Units | Notes          |  |
| Storage Temperature        | Tstg   | -40 | 85  | °C    |                |  |
| Operating Case Temperature | Topr   | 0   | 70  | °C    | SPB-4820RLWG   |  |
|                            |        | -10 | 85  |       | SPB-4820BRLWG  |  |
|                            |        | -40 | 85  |       | SPB-4820ARLWG  |  |
| Relative Humidity          | RH     | 0   | 85  | %     | Non condensing |  |
| Power Supply Voltage       | Vcc    | 0   | 3.6 | V     |                |  |
| Input Voltage              | ---    | GND | Vcc | V     |                |  |
| Output Current             | Iout   | 0   | 30  | mA    |                |  |

| Recommended Operating Conditions |                        |      |     |      |                   |
|----------------------------------|------------------------|------|-----|------|-------------------|
| Parameter                        | Symbol                 | Min  | Typ | Max  | Units / Notes     |
| Power Supply Voltage             | Vcc                    | 3.13 | 3.3 | 3.47 | V                 |
| Power Supply Current             | I <sub>CC(TX+RX)</sub> |      | 270 | 320  | mA                |
| Operating Case Temperature       | Topr                   | 0    |     | 70   | °C / SPB-4820LWG  |
|                                  |                        | -10  |     | 85   | °C / SPB-4820BLWG |
|                                  |                        | -40  |     | 85   | °C / SPB-4820ALWG |
| Data Rate                        |                        | 1    |     | 6.25 | Gb/s              |

| Transmitter Optical Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V) |                  |      |      |      |       |              |
|---|------------------|------|------|------|-------|--------------|
| Parameter   | Symbol           | Min  | Typ  | Max  | Units | Notes        |
| Average Launch Power  | $P_{O, Avg}$     | -2   |      | 2    | dBm   | 1            |
| Output Center Wavelength  | $\lambda_c$      | 1260 | 1270 | 1280 | nm    |              |
| Output Spectrum Width   | $\sigma_\lambda$ |      |      | 1    | nm    | -20 dB width |
| Side Mode Suppression Ratio   | SMSR             | 30   |      |      | dB    |              |
| Relative Intensity Noise  | RIN              |      |      | -128 | dB/Hz |              |
| Average Launch Power of OFF Transmitter                                     |                  |      |      | -30  | dBm   |              |

1. Output power is power coupled into a 9/125  $\mu\text{m}$  single-mode fiber.

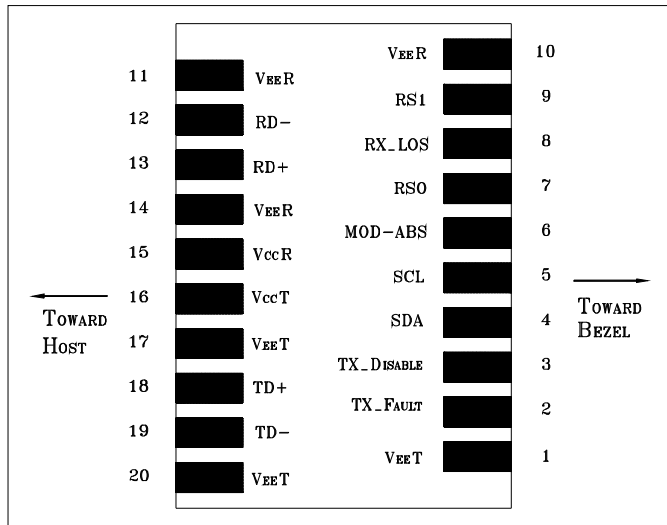
| Receiver Optical Specifications (0°C < Topr < 70°C, 3.13V < Vcc < 3.47V) |             |      |     |      |       |                         |
|--|-------------|------|-----|------|-------|-------------------------|
| Parameter  | Symbol      | Min  | Typ | Max  | Units | Notes                   |
| Sensitivity  |             |      |     | -14  | dBm   | 2, Average Power        |
| Receiver Overload  | $P_{MAX}$   | 0.5  | --- |      | dBm   |                         |
| LOS -- Deasserted  | $LOS_D$     | ---  | --- | -18  | dBm   | Transition: low to high |
| LOS -- Asserted  | $LOS_A$     | -30  | --- | ---  | dBm   | Transition: high to low |
| Wavelength of Operation  | $\lambda_c$ | 1320 |     | 1340 | nm    | 3                       |

2. A valid 8B/10B encoded input is required for receiver sensitivity specification.

3. At least 30 dB optical isolation for the wavelength 1260 to 1280 nm.

| Electrical Characteristics                              |           |     |     |              |          |                       |
|---|-----------|-----|-----|--------------|----------|-----------------------|
| Parameter   | Symbol    | Min | Typ | Max          | Units    | Notes                 |
| <b>High-Speed Signal (CML) Interface Specification</b>  |           |     |     |              |          |                       |
| Input Data Rate   |           | 1   |     | 6.25         | Gb/s     |                       |
| Differential Input Impedance                            | $R_{in}$  |     | 100 |              | $\Omega$ |                       |
| Differential Data Input Amplitude                       |           | 150 |     | 1200         | mVpp     | Internally AC coupled |
| Output Data Rate  |           | 1   |     | 6.25         | Gb/s     |                       |
| Differential Output Impedance                           | $R_{out}$ |     | 100 |              | $\Omega$ |                       |
| Differential Data Output Amplitude                      |           | 350 | 600 | 700          | mVpp     | Internally AC coupled |
| <b>Low-Speed Signal (LVTTL) Interface Specification</b> |           |     |     |              |          |                       |
| Input High Voltage                                      |           | 2.0 |     | $V_{cc}+0.3$ | V        |                       |
| Input Low Voltage                                       |           | GND |     | 0.8          | V        |                       |
| Output High Voltage                                     |           | 2.4 |     | $V_{cc}$     | V        |                       |
| Output Low Voltage                                      |           | GND |     | 0.5          | V        |                       |

CONNECTION DIAGRAM



| PIN | Signal Name | Description   | PIN | Signal Name | Description                 |
|-----|-------------|---|-----|-------------|-----------------------------|
| 1   | VEET        | Transmitter Signal Ground   | 11  | VEER        | Receiver Signal Ground      |
| 2   | TX_Fault    | Transmitter Fault Indication. Logic "1" Output = Laser Fault. Logic "0" Output = Normal Operation                                 | 12  | RD-         | Inverse Receiver Data Out   |
| 3   | TX_Disable  | Logic "1" Input (or no connection) = Laser off, Logic "0" = Laser on.   | 13  | RD+         | Receiver Data Out           |
| 4   | SDA         | Modulation Definition 2 – Two wires serial ID Interface   | 14  | VEER        | Receiver Signal Ground      |
| 5   | SDL         | Modulation Definition 1 – Two wires serial ID Interface   | 15  | VccR        | Receiver Power – 3.3V±5%    |
| 6   | MOD-ABS     | Modulation Definition 0 – Ground in Module  | 16  | VccT        | Transmitter Power – 3.3V±5% |
| 7   | RS0         | RX Rate Select (LVTTL). This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance. | 17  | VEET        | Transmitter Signal Ground   |
| 8   | RX_LOS      | Loss of Signal Out (OC).  | 18  | TD+         | Transmitter Data In         |
| 9   | RS1         | TX Rate Select (LVTTL). This pin has an internal 30k pulldown to ground. A signal on this pin will not affect module performance. | 19  | TD-         | Inverse Transmitter Data In |
| 10  | VEER        | Receiver Signal Ground  | 20  | VEET        | Transmitter Signal Ground   |

MODULE DEFINITION

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

Module Definition 4 specifies a serial definition protocol. For this definition, upon power up, SDA and SDL appear as no connector (NC) and MOD-ABS is TTL LOW. When the host system detects this condition, it activates the serial protocol. The protocol uses the 2-wire serial CMOS E<sup>2</sup>PROM protocol of the ATMEL AT24C01A/02/04 family of components.

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**OPTOWAY TECHNOLOGY INC.** No.38, Kuang Fu S. Road, Hu Kou, Hsin Chu Industrial Park, Hsin Chu, Taiwan 303  
 Tel: 886-3-5979798 Fax: 886-3-5979737  
 E-mail: [sales@optoway.com.tw](mailto:sales@optoway.com.tw) <http://www.optoway.com.tw> 2010/9/1 V2.0



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REVISION HISTORY

| Version | Subject                                   | Release Date |
|---------|---|--------------|
| 1.0     | Initial datasheet                         | 2010/1/1     |
| 2.0     | Extend data rate: from 1 Gb/s to 6.25Gb/s | 2010/9/1     |
|         |   |              |
|         |   |              |
|         |   |              |

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**OPTOWAY TECHNOLOGY INC.** No.38, Kuang Fu S. Road, Hu Kou, Hsin Chu Industrial Park, Hsin Chu, Taiwan 303  
Tel: 886-3-5979798 Fax: 886-3-5979737  
E-mail: [sales@optoway.com.tw](mailto:sales@optoway.com.tw) <http://www.optoway.com.tw> 2010/9/1 V2.0