Driving the future of datacenters

Making Fast Faster

Product Catalog
Company Profile

ColorChip brings high speed data transmission to the world’s top mega datacenters and enterprises. We are the pioneering global leader of hyperscale single-mode solutions, leveraging our patented SystemOnGlass™ platform to deliver robust yet compact optical transceivers that support immense rates of data-intensive applications.

Headquartered in Israel, a privately held company founded in 2001, ColorChip boasts an impressive track record of first releases. We are committed to a unique blueprint-to-scale delivery approach, fully controlled from our wholly owned fab in Israel, through to our very own packaging and testing facility in Thailand. ColorChip is reinventing datacenter dynamics, making fast data flows much, much faster.
Making Fast Faster

Scalability roadmap for ColorChip High Speed Transceivers

Moving data into the future, faster

40G → 400G @ QSFPx Form Factor

<table>
<thead>
<tr>
<th>Form Factor</th>
<th>Type</th>
<th>Reach</th>
<th>Modulation</th>
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</thead>
<tbody>
<tr>
<td>QSFP+</td>
<td>CWDM</td>
<td>2km/10km</td>
<td>NRZ</td>
</tr>
<tr>
<td>GA</td>
<td></td>
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<tr>
<td>Demo '15</td>
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<tr>
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<td>CWDM4/CWDM4</td>
<td>2km</td>
<td>NRZ</td>
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<td>GA '15</td>
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<tr>
<td>QSFP28</td>
<td>PAM4</td>
<td>0.5km/1km</td>
<td>NRZ</td>
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<td>GA '16</td>
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<td>QSFP28</td>
<td>4WDM-10/10km</td>
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<td>NRZ</td>
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<td>Demo '18</td>
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<td>QSFP-DD</td>
<td>Dual CWDM4</td>
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<td>NRZ</td>
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<tr>
<td>QSFP56</td>
<td>FR4 Lite/FR4</td>
<td>0.5km/2km</td>
<td>PAM4</td>
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<td>Demo '16</td>
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<tr>
<td>QSFP-DD</td>
<td>Dual 200G FR4</td>
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<td>PAM4</td>
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<td>Demo '18</td>
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40G

40G

56G

100G

100G

100G

100G

200G

200G

400G

400G
40G QSFP+ LR4 Lite Transceiver

Overview

- 40Gbps hot pluggable transceiver in QSFP+ form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine combining uncooled 4 × 10Gbps CWDM DFB lasers with integrated MUX/DeMUX
- Built in digital diagnostics
- XLPPi electrical interface
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- 40GBASE Ethernet links
- OTN, OTU-3
- QDR/DDR Infiniband links
- 40G Telecom connections
- Data Center interconnections

40GBASE QSFP+ LRL4

- Hot pluggable electrical interface based on IEEE 802.3ba standard and SFF-8436
- Supports 40Gb/s data rate links up to 2km over SMF
- Typical Power dissipation: 2.7W
- Single 3.3V power supply

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<tr>
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<tbody>
<tr>
<td></td>
<td>Wavelength (nm)</td>
<td>Data Rate per Lane (Gb/s)</td>
<td>Supply Voltage (V)</td>
</tr>
<tr>
<td>40GBASE QSFP+ LRL4 Lite</td>
<td>1270 / 1290 / 1310 / 1330</td>
<td>2.5 to 10.7</td>
<td>3.3 ± 5%</td>
</tr>
</tbody>
</table>

* Receiver OMA Sensitivity per lane (@ 10.3125Gb/s, PRBS 231-1, BER = 10⁻¹²)
40G QSFP+ LR4 Transceiver

Overview

- 40Gbps hot pluggable transceiver in QSFP+ form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine combining uncooled 4 × 10Gbps CWDM DFB lasers with integrated MUX/DeMUX
- Built in digital diagnostics
- XLPPI electrical interface
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- 40GBASE Ethernet links
- OTN, OTU-3
- QDR/DDR Infiniband links
- 40G Telecom connections
- Data Center interconnections

40GBASE QSFP+ LR4

- Hot pluggable electrical interface based on IEEE 802.3ba standard and SFF-8436
- Supports 40Gb/s data rate links up to 10km over SMF
- Typical power dissipation: 2.7W
- Single 3.3V power supply

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<td>3.3 ± 5%</td>
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* Receiver OMA Sensitivity per lane (@ 10.3125Gb/s, PRBS 2^23-1, BER = 10^-12)
100G QSFP28 CWDM4 Lite Transceiver

Overview

- 100Gbps hot pluggable transceiver in QSFP28 form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine combining uncooled 4 × 25Gbps CWDM DFB lasers with integrated MUX/DeMUX
- Built in digital diagnostics – Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 15 to 55°C

Applications

- 100G Ethernet links
- 100GE Enterprise switch and routers
- Carrier grade 100GE core routers
- Point-to-point and ring applications

100G QSFP28 CWDM4 Lite

- Supports up to 100Gb/s data rate links
- Based on QSFP28 baseline specifications
- Typical power dissipation: 2.6W
- Single 3.3V power supply

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<tr>
<td>100G QSFP28 CWDM4 Lite</td>
<td>Wavelength (nm)</td>
<td>Data Rate per Lane (Gb/s)</td>
<td>Supply Voltage (V)</td>
</tr>
<tr>
<td>1270 / 1290 / 1310 / 1330</td>
<td>25.78125</td>
<td>3.3 ± 5%</td>
<td>2.6</td>
</tr>
</tbody>
</table>

*Receiver Sensitivity (OMA), each lane (max) for BER = 5 × 10^−5
100G QSFP28 CWDM4 Transceiver

Overview

- 100Gbps hot pluggable transceiver in QSFP28 form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine combining uncooled 4 × 25Gbps CWDM DFB lasers with integrated MUX/DeMUX
- Built in digital diagnostics – Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- 100G Ethernet links
- 100GE Enterprise switch and routers
- Carrier grade 100GE core routers
- Point-to-point and ring applications

100G QSFP28 CWDM4

- Supports up to 100Gb/s data rate links
- Based on 100G CWDM4 MSA baseline requirement and QSFP28 baseline specifications
- Typical power dissipation: 2.7W
- Single 3.3V power supply

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</tr>
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<td>100G QSFP28 CWDM4</td>
<td>1270 / 1290 / 1310 / 1330</td>
<td>25.78125</td>
<td>3.3 ± 5%</td>
</tr>
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*Receiver Sensitivity (OMA), each lane (max) for BER = 5 × 10⁻⁵
100G QSFP28 CLR4 Transceiver

Overview

- 100Gbps hot pluggable transceiver in QSFP28 form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine combining uncooled 4 × 25Gbps CWDM DFB lasers with integrated MUX/DeMUX
- Built in digital diagnostics – Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- 100G Ethernet links
- 100GE Enterprise switch and routers
- Carrier grade 100GE core routers
- Point-to-point and ring applications

100G QSFP28 CLR4

- Supports up to 100Gb/s data rate links
- Based on CLR4 MSA baseline requirement and QSFP28 baseline specification
- Typical power dissipation: 2.7W
- Single 3.3V power supply

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<td>Data Rate per Lane (Gb/s)</td>
<td>Supply Voltage (V)</td>
</tr>
<tr>
<td>100G QSFP28 CLR4</td>
<td>1270 / 1290 / 1310 / 1330</td>
<td>25.78125</td>
<td>3.3 ± 5%</td>
</tr>
</tbody>
</table>

*Receiver Sensitivity (OMA), each lane (max) for BER = 1 × 10⁻¹²
100G QSFP28 4WDM-10 10KM Transceiver

Overview

- 100Gbps hot pluggable transceiver in QSFP28 form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine combining uncooled 4 × 25Gbps CWDM DFB lasers with integrated MUX/DeMUX
- Built in digital diagnostics – Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- 100G Ethernet links with up to 10km reach
- 100GE Enterprise switch and routers
- Carrier grade 100GE core routers
- Point-to-point and ring applications

100G QSFP28 4WDM-10

- Supports up to 100Gb/s data rate links
- Based on 100G 4WDM-10 MSA baseline requirement and QSFP28 baseline specification
- Typical power dissipation: 2.7W
- Single 3.3V power supply

<table>
<thead>
<tr>
<th>Code</th>
<th>Wavelength (nm)</th>
<th>Data Rate per Lane (Gb/s)</th>
<th>Supply Voltage (V)</th>
<th>Typical Power Consumption (W)</th>
<th>Operating Case Temperature (°C)</th>
<th>Reach (km)</th>
<th>Optical Modulation Amplitude (OMA) per Lane (dBm)</th>
<th>Extinction Ratio (dB)</th>
<th>Sensitivity (OMA) per Lane (dBm*)</th>
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<tbody>
<tr>
<td>100G QSFP28 4WDM-10</td>
<td>1270 / 1290 / 1310 / 1330</td>
<td>25.78125</td>
<td>3.3 ± 5%</td>
<td>2.7</td>
<td>0 to 70</td>
<td>≤10</td>
<td>-4.0 to 2.5</td>
<td>&gt;3.5</td>
<td>-115 (*)</td>
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</tbody>
</table>

*Receiver Sensitivity (OMA), each lane (max) for BER = 5 × 10⁻⁵
100G QSFP28 PSM4 Transceiver

Overview

- 100Gbps hot pluggable transceiver in QSFP28 form factor
- Optical connectivity based on integrated MPO connector
- Optical engine using uncooled 4 × 25Gbps DFB lasers
- Built in digital diagnostics – Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- Data Center Interconnections
- 100G Ethernet links
- 100GE Enterprise switch and routers
- Carrier grade 100GE core routers
- Point-to-point and ring applications

100G QSFP28 PSM4

- Supports up to 100Gb/s data rate links
- Based on 100G PSM4 MSA baseline requirement and QSFP28 baseline specifications
- Typical power dissipation: 2.7W
- Single 3.3V power supply

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<tr>
<th>Code</th>
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<tr>
<td></td>
<td>Wavelength (nm)</td>
<td>Data Rate per Lane (Gb/s)</td>
<td>Supply Voltage (V)</td>
</tr>
<tr>
<td>100G QSFP28 PSM4</td>
<td>1304.5 - 1317.5</td>
<td>25.78125</td>
<td>3.3 ± 5%</td>
</tr>
</tbody>
</table>

*Receiver Sensitivity (OMA), each lane (max) for BER = 5 × 10⁻⁵
100G QSFP28 DR Transceiver (Roadmap)

Overview

- 100Gbps hot pluggable transceiver in QSFP28 form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine using uncooled 100 Gbps EML
- Built in digital diagnostics – Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- Data Center Interconnections
- 100GBASE Ethernet links

100G QSFP28 DR

- Supports up to 100Gb/s data rate links over 500m on Single Mode Fiber (SMF)
- Based on QSFP28 baseline specifications
- Typical power dissipation: <3.5W
- Single 3.3V power supply

<table>
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<tr>
<th>Code</th>
<th>General Specifications</th>
<th>Transmitter</th>
<th>Receiver</th>
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<td>3.3 ± 5%</td>
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(*) Average receive power, each lane (min) is informative
100G QSFP28 FR Transceiver (Roadmap)

Overview

- 100Gbps hot pluggable transceiver in QSFP28 form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine using uncooled 100 Gbps EML
- Built in digital diagnostics – Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- Data Center Interconnections
- 100GBASE Ethernet links

100G QSFP28 FR

- Supports up to 100Gb/s data rate links over 2km Single Mode Fiber (SMF)
- Based on 100G Single Lambda MSA specification for 100G FR
- Typical power dissipation: <3.5W
- Single 3.3V power supply

<table>
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<tr>
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<th>General Specifications</th>
<th>Transmitter</th>
<th>Receiver</th>
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<td>5.3125</td>
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(*) Average receive power, each lane (min) is informative
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100G QSFP28 LR Transceiver (Roadmap)

Overview

- 100Gbps hot pluggable transceiver in QSFP28 form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine using uncooled 100 Gbps EML
- Built in digital diagnostics
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- Data Center Interconnections
- 100GBASE Ethernet links

100G QSFP28 LR4

- Supports up to 100Gb/s data rate links over 10km on Single Mode Fiber (SMF)
- Based on 100G single lambda MSA specification for 100G LR and on QSFP28 baseline specification
- Typical power dissipation: <3.5W
- Single 3.3V power supply

<table>
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<td>(Gbaud)</td>
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<td>Supply Voltage (V)</td>
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<td>Typical Power</td>
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<td></td>
<td>(dBm)</td>
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<td></td>
<td>Extinction Ratio (dB)</td>
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<tr>
<td></td>
<td>Average Receive Power</td>
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<tr>
<td></td>
<td>(min) (dBm) (*)</td>
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(*) Average receive power, each lane (min) is informative
200G QSFP56 FR4-Lite Transceiver (Roadmap)

Overview

- 200Gbps hot pluggable transceiver in QSFP56 form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine combining uncooled 4 × 25Gbps CWDM DFB’s with integrated MUX/DeMUX
- Built in digital diagnostics – Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- 200G Ethernet links

200G QSFP56 FR4-Lite

- Supports up to 200Gb/s data rate links over 500m SMF
- Based on QSFP56 baseline specifications
- Typical power dissipation: 5W
- Single 3.3V power supply

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<td>Wavelength (nm)</td>
<td>Data Rate per Lane (Gbaud)</td>
<td>Supply Voltage (V)</td>
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<tr>
<td>200G QSFP56 FR4 Lite</td>
<td>1270 / 1290 / 1310 / 1330</td>
<td>26.5625</td>
<td>3.3 ± 5%</td>
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</tbody>
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(*) Average receive power, each lane (min) is informative
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200G QSFP56 FR4 Transceiver (Roadmap)

Overview

- 200Gbps hot pluggable transceiver in QSFP56 form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine combining uncooled 4 x 25Gbps CWDM EMLs with integrated MUX/DeMUX
- Built in digital diagnostics – Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- 200G Ethernet links

200G QSFP56 FR4

- Supports up to 200Gb/s data rate links over 2km SMF
- Based on IEEE P802.3bs standard for 200G FR4 and on QSFP656 baseline specification
- Typical power dissipation: 3.5W
- Single 3.3V power supply

### 200G QSFP56 FR4 Transceiver Typical Optical Eye

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<td>26.5625</td>
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(*) Average receive power, each lane (min) is informative
200G QSFP56 LR4 Transceiver (Roadmap)

Overview

- 200Gbps hot pluggable transceiver in QSFP56 form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine combining uncooled 4 × 25Gbps CWDM EMLs with integrated MUX/DeMUX
- Built in digital diagnostics – Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- 200G Ethernet links

200G QSFP56 LR4

- Supports up to 200Gb/s data rate links over 10km SMF
- Based on CWDM wavelength grid and on QSFP56 baseline specifications
- Typical power dissipation: 3.5W
- Single 3.3V power supply

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<td>TBD</td>
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<tr>
<td></td>
<td>Data Rate per Lane (Gbaud)</td>
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<td>&gt;35</td>
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<td>Supply Voltage (V)</td>
<td>3.5</td>
<td>TBD</td>
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<td></td>
<td>Typical Power Consumption (W)</td>
<td>0 to 70 °C</td>
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<td></td>
<td>Operating Case Temperature (°C)</td>
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<td>TBD</td>
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<tr>
<td></td>
<td>Reach (km)</td>
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<td>Extinction Ratio (dB)</td>
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<td></td>
<td>Average Receive Power (min) (dBm) (*)</td>
<td>TBD</td>
<td>TBD</td>
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(*) Average receive power, each lane (min) is informative
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400G QSFP-DD DR4 Transceiver (Roadmap)

Overview

- 400Gbps hot pluggable transceiver in QSFP-DD form factor
- Optical connectivity based on integrated MPO connector
- Optical engine use 4 uncooled 100 Gbps EML’s
- Built in digital diagnostics - Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- 400G Ethernet links

400G QSFP-DD DR4

- Supports up to 400Gb/s data rate links over 500m SMF
- Based on QSFP-DD baseline specifications
- Typical power dissipation: 10W (Gen1), 7W (Gen2)
- Single 3.3V power supply

<table>
<thead>
<tr>
<th>Code</th>
<th>General Specifications</th>
<th>Transmitter</th>
<th>Receiver</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Wavelength (nm)</td>
<td>Data Rate per Lane (Gbaud)</td>
<td>Supply Voltage (V)</td>
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<tr>
<td>400G QSFP-DD DR4 (Gen1)</td>
<td>1304.5 – 1317.5</td>
<td>53.125</td>
<td>3.3 ± 5%</td>
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(*) Average receive power; each lane (min) is informative
400G QSFP-DD FR4 Transceiver (Roadmap)

Overview

- 400Gbps hot pluggable transceiver in QSFP-DD form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine combining uncooled 4 x 100 Gbps CWDM EMLs with integrated MUX/DeMUX
- Built in digital diagnostics – Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- 400G Ethernet links

400G QSFP-DD FR4

- Supports up to 400Gb/s data rate links over 2km SMF
- Based on 100G Single Lambda MSA specification for 400G FR4 and on QSFP-DD baseline specification
- Typical power dissipation: 10W (Gen1), 7W (Gen2)
- Single 3.3V power supply

<table>
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<tr>
<th>Code</th>
<th>Wavelength (nm)</th>
<th>Data Rate per Lane (Gbaud)</th>
<th>Supply Voltage (V)</th>
<th>Typical Power Consumption (W)</th>
<th>Operating Case Temperature (°C)</th>
<th>Reach (km)</th>
<th>Outer Optical Modulation Amplitude (OMAouter) per Lane (dBm)</th>
<th>Extinction Ratio (dB)</th>
<th>Average Receive Power (min) (dBm) (*)</th>
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<td>≤2.0</td>
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(*) Average receive power, each lane (min) is informative
400G QSFP-DD LR4 Transceiver (Roadmap)

Overview

- 400Gbps hot pluggable transceiver in QSFP-DD form factor
- Optical connectivity based on two SMF LC connectors
- Optical engine combining uncooled 4 × 100 Gbps CWDM EMLs with integrated MUX/DeMUX
- Built in digital diagnostics – Transmitter Power Monitoring (TPM) and Receive Signal Strength Indicator (RSSI)
- RoHS-6 compliant
- Operating case temperature range of 0 to 70°C

Applications

- 400G Ethernet links

400G QSFP-DD LR4

- Supports up to 400Gb/s data rate links over 10km SMF
- Based on 100G Single-Lambda MSA proposal and on QSFP-DD baseline specification
- Typical power dissipation: 10W (Gen1), 7W (Gen2)
- Single 3.3V power supply

<table>
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(*) Average receive power, each lane (min) is informative
## Product offering

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</tbody>
</table>

(*) ColorChip’s 200G LR4 and 400G LR4 offerings are based on the CWDM4 grid.
Making Fast Faster

Technology

Wafer Scale Ion Exchange Process
Wiring ideal waveguides, quickly, effortlessly

ColorChip’s Planar-Lightwave-Circuit technology is based on the Ion-Exchange in glass fabrication method to generate Single Mode Fiber-like optical waveguides inside a proprietary glass substrate. To generate a specific geometric structure, a photolithography mask is used to create the waveguide on the glass surface, where the region that remains exposed defines the waveguide structure. The waveguides are then created due to the unique behavior of the glass substrate at very high temperatures. Some ions diffuse into the substrate and replace the glass sodium ions. Thus the name, Ion Exchange.

SystemOnGlass™: Photonic Integration, Perfected
Hybrid, multilane optical heads

SystemOnGlass™ is ColorChip’s patented hybrid photonic integrated circuit, fusing both active and passive components together.

In an automated process, our advanced proprietary placement machines are used to mount active optical components onto the unique glass substrate that has embedded circular waveguides. The result is a compact optical head that has multiple benefits, featuring an excellent integration with best of breed components and ultimate scalability across data rates. The same platform has been at the heart of ColorChip’s entire line of high performance transceivers.

Automated Industrialized Optics
Fully controlled production ecosystem

Running unique manufacturing methods, ColorChip not only develops advanced optical communication solutions but also vertically integrates and fabricates our core PLC technology in our wholly owned and operated fab center. We built automated assembly lines based on proprietary scalable machines, for our full control of the entire production phase, including cutting edge optical engine and transceiver integration, as well robust automated test stations.

With hundreds of thousands of optical transceivers produced in the same production lines, ColorChip boasts limitless manufacturability that addresses the pressing need for high speed data flow.

Photography: Dudi Moskowitz
Making Fast Faster