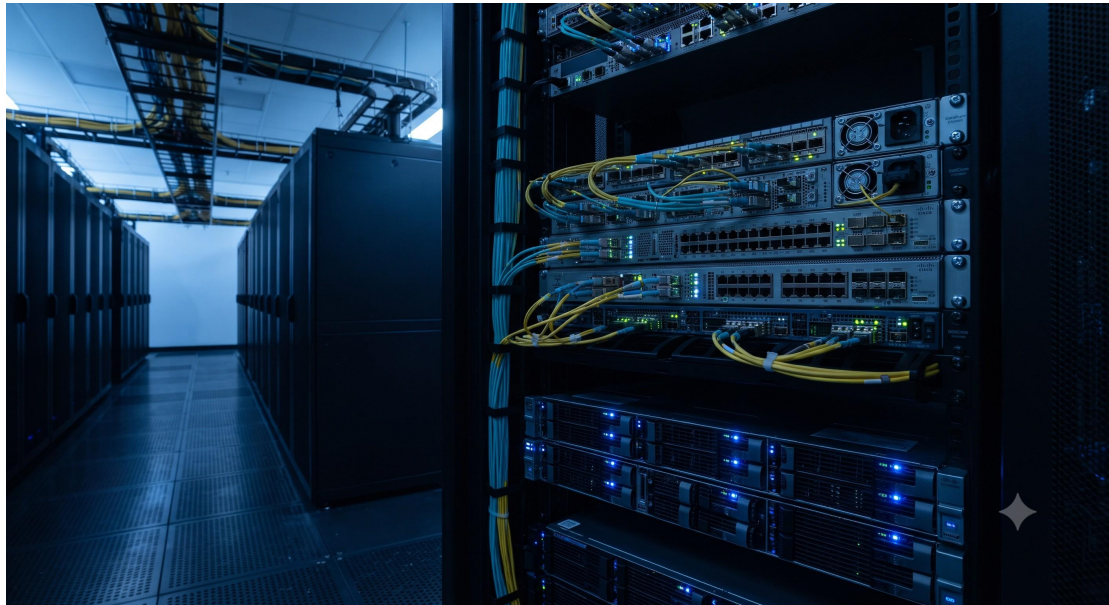


Optical Transceiver Digital Diagnostic Monitoring (DDMI) - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

This document provides a comprehensive technical overview and hardware datasheet for the Optical Transceiver Digital Diagnostic Monitoring (DDMI) feature set, as implemented across our family of SFP, SFP+, QSFP, and QSFP-DD form-factor optical transceivers. DDMI represents a critical evolution in optical network management, transforming standard optical interfaces into intelligent, telemetry-capable nodes that provide real-time insight into the health, performance, and operational status of the physical layer. By enabling proactive fault detection, performance trending, and predictive maintenance, DDMI is an indispensable tool for modern network operators striving for carrier-grade reliability and operational efficiency. This datasheet details the architecture, functionality, specifications, and compliance standards of our DDMI-enabled transceiver portfolio.



ARCHITECTURE & CHASSIS DESIGN

The DDMI functionality is integrated at the transceiver level, utilizing a dedicated microcontroller and analog-to-digital converters (ADCs) within each optical module. This architecture enables the continuous monitoring of five key analog parameters without impacting the primary data path. The monitored parameters are:

1. **Temperature:** Internal case temperature of the transceiver, measured in degrees Celsius.
2. **Supply Voltage:** The operating voltage supplied to the transceiver, measured in Volts.
3. **Tx Bias Current:** The bias current applied to the laser diode, measured in milliamperes (mA). This is a primary indicator of laser health.

4. ****Tx Output Power:**** The optical output power of the transmitter, measured in dBm.
5. ****Rx Input Power:**** The optical input power received by the photodetector, measured in dBm.

This data is made available to the host system via the 2-wire serial interface (I2C), as defined by the SFF-8472 (for SFP) and SFF-8636 (for QSFP) multi-source agreements (MSAs). The host system can poll this data on demand or set software-defined thresholds to generate alerts. The physical design ensures that the monitoring circuitry is electrically isolated from the high-speed data path, guaranteeing that DDMI operation has zero impact on signal integrity.

HARDWARE FEATURES

Our DDMI-enabled transceivers are engineered with a focus on precision, reliability, and interoperability. Key hardware features include:

- ****Real-Time Monitoring:**** Continuous, concurrent monitoring of all five critical parameters.
- ****Predictive Failure Alarms:**** Factory-programmed and user-configurable high and low alarm and warning thresholds for each parameter. Alarms (latched)

indicate a severe out-of-bounds condition, while warnings (unlatched) provide an early indication of performance degradation.

- **Digital Calibration:** All transceivers undergo rigorous factory calibration to ensure high accuracy of the monitored data. Both internal and external calibration methods are supported for maximum flexibility.
- **Enhanced Diagnostic Interface:** Compliant with SFF-8472 Rev 12.2 and SFF-8636 Rev 2.10a for seamless integration with standard network management platforms.
- **Diagnostic Software Tools:** Optional host-side software libraries and APIs are available to facilitate the integration of DDMI data into higher-level network management and orchestration (NMO) systems.

COMPLIANCE & STANDARDS

Our DDMI optical transceivers are designed to meet or exceed the following industry standards and regulatory requirements:

- **MSA Compliance:** SFF-8472, SFF-8636, SFF-8691, and QSFP-DD MSA.
- **IEEE Standards:** Compliant with relevant IEEE 802.3 Ethernet standards (e.g., 10GBASE-SR/LR, 40GBASE-SR4/LR4, 100GBASE-SR4/LR4).
- **RoHS:** Compliant with the Restriction of Hazardous Substances Directive for environmental safety.

- ****EMC:**** Meets FCC Part 15, CE EMC Directive, and VCCI requirements.
- ****Laser Safety:**** Certified as Class 1 Laser Products per IEC 60825-1.
- ****Environmental:**** Designed to operate within the temperature ranges specified for commercial (0°C to 70°C), extended (-5°C to 85°C), and industrial (-40°C to 85°C) applications.

TECHNICAL SPECIFICATIONS

The following table provides a comprehensive overview of the performance and operational specifications for our DDMI optical transceivers. Values are typical and subject to change based on specific part numbers, form factors, and data rates.

Parameter	Specification
Form Factor	SFP, SFP+, SFP28, QSFP+, QSFP28, QSFP-DD
Monitoring Parameters	Temperature, Supply Voltage, Tx Bias Current, Tx Output Power, Rx Input Power
Data Interface	2-Wire Serial (I2C) per SFF-8472/SFF-8636
Alarm/Warning Thresholds	User-Configurable per MSA

Accuracy (Tx/Rx Power)	±2 dBm (Typical)
Accuracy (Temperature)	±3°C (Typical)
Accuracy (Voltage)	±3% (Typical)
Calibration Method	Internally/Externally Calibrated
Power Consumption	Varies by form factor (e.g., <1W for SFP+, <3.5W for QSFP+)

ORDERING OPTIONS

Our DDMI-enabled optical transceivers are available in a wide variety of form factors, data rates, and reach options to suit diverse network architectures. Please contact your regional sales representative or authorized distributor for assistance in selecting the optimal part number for your specific application.

- ****Form Factors:**** SFP, SFP+, SFP28, QSFP+, QSFP28, QSFP-DD
- ****Data Rates:**** 1G, 10G, 25G, 40G, 100G, 400G
- ****Fiber Type:**** Multimode (OM3, OM4, OM5), Singlemode (OS2)
- ****Reach:**** Short Reach (SR), Long Reach (LR), Extended Reach (ER), ZR
- ****Connector Type:**** Duplex LC, MTP/MPO-12
- ****Operating Temperature:**** Commercial (C-temp), Extended (E-temp), Industrial (I-temp)

- **Digital Diagnostic Functions:** Standard DDMI

