SFP28 25G-LR, I-TEMP

SFP28, 25G/10G Ethernet LR, 1310nm, SM, 10km, 7.0dB, I-temp, LC

TS2009-S31I-SO

The TS2009-S31I-SO is an SFP+ form-factor transceiver for 25 Gbps Ethernet applications. Since the transmission rate can reach up to 28Gbps, the engineering and industry name is SFP28. It is intended for use in interconnect applications between data centers with switches, routers, storage equipment etc. The optical performance supports distances up to 10km over a SingleMode (SM) fiber. TS2009-S31I-SO also supports the high data rate CPRI option 10 having a bit rate of 24.33024 Gbps. With the Clock and Data Recovery (CDR) functionality disabled, the transceiver can also be used for 10GbE-LAN and 10GbE-WAN services.

TS2009-S31I-SO uses a single 1310nm channel @ 25.78 Gbps to transport a 25G Ethernet signal. As stipulated by the 25G Ethernet standards, Forward Error Correction (FEC) is required to be implemented by the host equipment to ensure reliable system operation. The optical parameters below will provide a bit error ratio (BER) of 5 x 10^{-5} for 25G Ethernet. FEC will provide the required quality for secure service.

Digital diagnostics functions are available via an I2C interface, as specified by the MSA.

The transceiver operates in the Industrial temperature range (I-temp) -40°C to 85°C (-40°F to 185°F).

TECHNICAL DATA

Parameter	Value
Technology	Grey SFP28
Transmission media	SM (2x LC)
Typical reach	10km
Nominal wavelength	1x 1310nm
Bit rate support	24.33 / 25.78 Gbps [1]
	9.953 / 10.312 Gbps [2]
Protocol support	25GE [1]
	10GE LAN/WAN [2]
	CPRI opt 10 [1]
Power budget	0 – 7.0dB
Dispersion penalty	Max 2.7dB
Power consumption	< 1.5W
Operating temperature	-40°C to +85°C
Storage temperature	-40°C to +85°C

Parameter	Value
Transmitter data:	
Output power	Min: -5.0dBm [3]
	Max: +2.0dBm [3]
Transmit wavelength	1295 – 1325nm
Receiver data:	
Minimum input power	-12.0dBm [3] [4]
Overload (max power)	+2.0dBm [3] [4]
Wavelength range	1260 – 1325nm
LOS De-assert	Max -16dBm
LOS Assert	Min -30dBm
LOS Hysteresis	Min 0.5dB
DDM	Yes
MSA compliance	SFF-8402

[1] CDR engaged

[2] CDR disengaged

[3] Average power

[4] at 25.78 Gbps (25GE) and BER 5E^{-5}

Safety/regulatory compliance:
TUV/UL/FDA (contact Smartoptics for latest certification information)
RoHS compliance

Note: The 25GbE specification states that a 25GbE interface can operate with or without FEC. The optical data above is defined at a BER of $5x10^{-5}$, implying that FEC shall be enabled on the host equipment to provide required quality at specified distance.

ORDERING INFORMATION

Ordering number	Description
TS2009-S31I-SO	SFP28, 25G/10G Ethernet LR, 1310nm, SM, 10km, 7.0dB, I-temp, LC

CDR RATE SELECT LOGIC

Logic OR of RS0 Pin and Bit 110.3 of A2H	Logic OR of RS1 Pin and Bit 118.3 of A2H	RX Data Rate	TX Data Rate	Status of RX CDR	Status of TX CDR
High / 1	High / 1	24.33G/25.78G	24.33G/25.78G	CDR Engaged	CDR Engaged
Low / 0	Low / 0	9.95G/10.31G	9.95G/10.31G	CDR Bypassed	CDR Bypassed

GENERAL DEFINITIONS

Parameter	Description
Technology	Grey; Transceiver type for non-WDM applications. Electrical or optical. CWDM; Transceiver type for CWDM applications using G.694.2 channel grid. DWDM; Transceiver type for DWDM applications using G.694.1 channel grid. BiDi; Transceiver pair using two different wavelength channels operating on a single-fiber. DAC: Direct Attach Cable. Electrical cable with attached connectors. AOC: Active Optical Cable. Optical cable with attached connectors.
Transmission Media	Type of fiber, e.g. Multimode (MM) or Singlemode (SM). Number of and connector type within brackets (e.g. 2x LC, 1x MPO).
Typical reach	Nominal distance performance based on typical fiber dispersion, fiber loss and power budget properties, i.e. w/o dispersion compensation and optical amplification. Actual distance is dependent on actual optical path loss and dispersion properties.
Bit rate range	Supported bit rate range in Gigabit or Megabit per second (Gbps or Mbps).
Protocols	Protocols within supported bit rate range.
Nominal wavelength	Typical wavelength(s) from transmitter.
Interface standards	Referenced interface standards or MSA's, e.g. IEEE 802.3 standard for 10GbE services or 100G 4WDM-10 etc.
Power budget	Min and max power budget between Transmitter and Receiver w/o optical path penalties.
Dispersion tolerance/penalty	Maximum amount of tolerated dispersion and required reduction of power budget to maintain stipulated Bit Error Rate (BER) and at a given bit rate.
Temperature range	Max operating case temperature range. Standard temperature range (C-temp): 0°C to +70°C (32°F to +158°F) Extended temperature range (E-temp): typically -20°C to +75°C (-4°F to +167°F) Industrial temperature range (I-temp): -40°C to +85°C (-40°F to +185°F)
Power consumption	Worst case power consumption. Will vary over temperature.
Transmitter Output power	Average output power. Provided in min and max values.
Receiver minimum input power	Minimum average input power at specified BER, normally $1E^{-12}$. Note that some protocols require FEC to achieve sufficient BER.
Receiver max input power	Maximum average input power giving a BER, normally $1E^{-12}$.
DDM	Digital Diagnostic Monitoring functionality as defined in e.g. SFF-8472 MSA.