155Mbps SFP Transceiver

With Digital Diagnostic Function

MXPD-03XX

Features

- Operating data rate 155Mbps
- Industry standard Small Form Pluggable (SFP) package
- Digital diagnostic monitor interface compliant with SFF-8472
- Duplex LC connector
- Single +3.3V power supply
- Differential LVPECL inputs and outputs
- TTL signal detect indicator
- Hot-pluggable capability
- RoHS compliant

Applications

- SDH STM-1/SONET OC-3
- Fast Ethernet
- Other optical links

Compliance

- SFP MSA
- SFF-8472
- ITU-T G.957
- RoHS

Description

The MXPD-03XX transceiver is a high performance, cost effective module that supports data-rate up to 155Mbps.

The transmitter section and the receiver section work independently in the transceiver. The receiver section contains an InGaAs PIN photo diode, a transimpedance amplifier and a post amplifier (with working data rate up to 155Mbps), functionally transmit received optical power to steady electrical data.

This transceiver meets the Small Form Pluggable (SFP) industry standard package utilizing an integral LC-Duplex optical interface connector. An enhanced Digital Diagnostic Monitoring Interface compliant with SFF-8472 has been incorporated into the transceiver. It allows real time access to the transceiver operating parameters such as transceiver temperature, laser bias current, transmitted optical power, received optical power and transceiver supply voltage by reading a built-in memory with I^2C interface.

Specification

Absolute Maximum Ratings

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Storage Temperature	TSTG	-40	-	85	ºC	
Operating Relative Humidity	RH	5	-	95	%	
Supply Voltage	Vcc	-0.5	-	3.7	V	

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Ambient temperature	Ta	0	-	70	℃	Note1
		−40	-	85	℃	Note2
Supply Voltage	Vcc	3.135	3.3	3.465	V	
Data Rate		-	155	-	Mbps	

Notes:

[1] Commercial Temperature:0℃~ +70 ℃;

[2] Industrial Temperature: -40℃~ +85℃.

Transmitter Operating Characteristic-Optical，Electrical

Parameter	Symbol	Min	Typical	Max	Units	Notes
Differential Input Voltage	$V_{in\ p\text{-}p}$	500	-	2000	mV	
Output Optical Power	Po	-15	-	-8	dBm	Note1
		-5	-	0	dBm	Note2
		-5		0		Note3
Extinction Ratio	ER	9	-		dB	
Center Wavelength Range	λc	1260	1310	1360	nm	
		1480	1550	1580	nm	DFB-LD
Spectral Width	Δλ	-	-	7.7	nm	FP (RMS)
		-	-	1	nm	DFB @-20dB
Side Mode Suppression Ratio	SMSR	30	-	-	dB	DFB-LD
Total Jitter	T_J	-	-	1	ns	
Output Optical Eye	Complies with ITU-T G.957 eye masks when filtered					
Tx_Disable Voltage	V_{OH}	2.0	-	Vcc	V	LVTTL
	V_{OL}	0	-	0.8	V	LVTTL
Tx_Fault Voltage	V_{OH}	2.0	-	Vcc	V	LVTTL
	V_{OL}	0	-	0.8	V	LVTTL

Notes:

[1] 1310nm FP and PIN,15Km;

[2] 1310nm FP and PIN,40Km;

[3] 1550nm DFB and PIN, 80Km;

Receiver Operating Characteristic-Optical，Electrical

Parameter	Symbol	Min	Typical	Max	Units	Notes
Differential Output Voltage	$V_{out\ p-p}$	370		2000	mV	50Ω load to Vcc-2V
Receiver Sensitivity	Sen			-28	dBm	Note1
				-34	dBm	Note2
				-34	dBm	Note3
Overload Input Power	So	-8			dBm	
Los of Signal Voltage	V_{OH}	2.0		Vcc	V	LVTTL
	V_{OL}	0		0.8	V	LVTTL
Los Asserted	P_A	-45			dBm	
Los De-asserted	P_D			-29	dBm	15Km
	P_D			-35	dBm	40Km/80Km
Los Hysteresis	P_D- P_A	0.5		6	dB	

Notes:

[1]1310nm FP and PIN,15Km. Measured with a PRBS2^{23}-1 test pattern@155Mb/s, ER=9dB, BER=10^{-10}.

[2]1310nm FP and PIN,40Km. Measured with a PRBS2^{23}-1 test pattern@155Mb/s, ER=9dB, BER=10^{-10}.

[3]1550nm DFB and PIN,80Km, Measured with a PRBS2^{23}-1 test pattern@155Mb/s, ER=9dB, BER=10^{-10}.

Reliability Test Definitions and Distributions

Group	Test	Reference	Condition	SS[1]	C[2]
Mechanical Integrity	Mechanical shock	MIL-STD-883 Method 2002.3	5 times/axis, 1500G, 0.5ms	11	0
	Vibration	MIL-STD-883 Method 2007.2	20G, 20~2000Hz, 4min/cys,4cys/axis	11	0
Endurance	Accelerated Aging	GR-468-CORE	85℃, 2000 hrs	25	-
	High temperature Storage	GR-468-CORE	85℃, 2000 hrs	11	0
	Low temperature Storage	GR-468-CORE	-40℃, 2000 hrs	11	0
	Temperature Cycles	MIL-STD-883 Method 1010.7 GR-468-CORE	-40℃~85℃ 500 cycles	11	0
	Damp Heat	MIL-STD-202 Method 103 GR-468-CORE	85 ℃, 85%RH 1000 hrs	11	0
	Cyclic moisture resistance	MIL-STD-883 Method 1004.7 GR-468-CORE	20 cycles	11	0
Special Test	ESD threshold	MIL-STD-883E Method 3015.7	2000V HBM	6	0

Note: [1] SS: Sample Size; [2] C: Maximum number of failure allowed in the test.

Pin Diagram

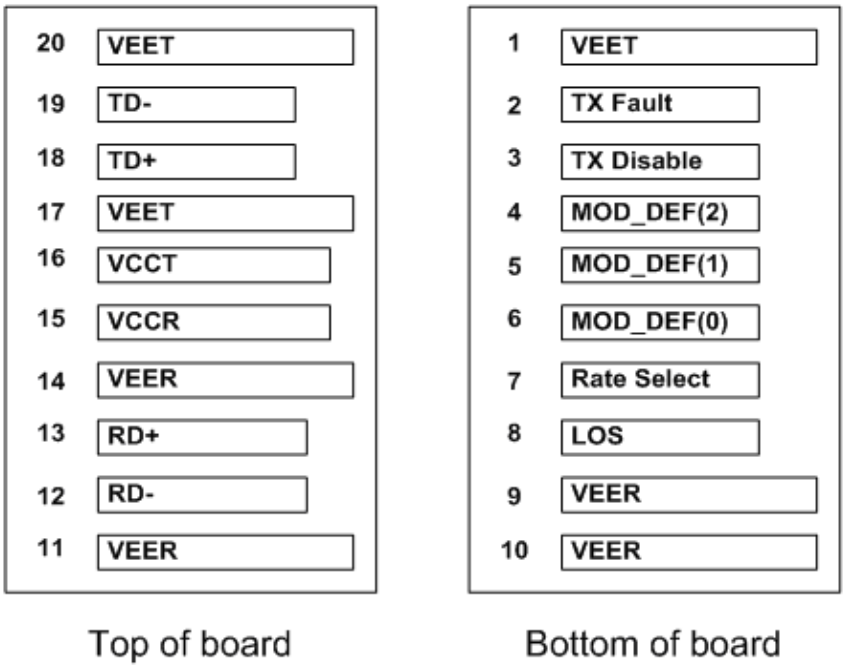

Figure1

Pin Assignment

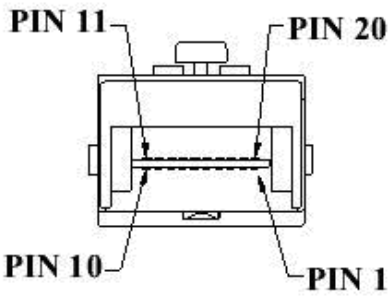

Figure2

Pin-out Definition

Pin	Name	Description
1	VEET	Transmitter Ground
2	TXFAULT	Transmitter Fault. (LVTTL)
3	TXDIS	Transmitter Disable. (LVTTL)
4	MOD_DEF(2)	SDA Serial Data Signal
5	MOD_DEF(1)	SCL Serial Clock Signal
6	MOD_DEF(0)	Grounded within the module.
7	Rate Select	No connection required
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation. (LVTTL)

9	VEER	Receiver Ground
10	VEER	Receiver Ground
11	VEER	Receiver Ground
12	RD-	Receiver Inverted DATA out. (LVPECL)
13	RD+	Receiver Non-inverted DATA out. (LVPECL)
14	VEER	Receiver Ground
15	VCCR	Receiver Power Supply
16	VCCT	Transmitter Power Supply
17	VEET	Transmitter Ground
18	TD+	Transmitter Non-Inverted DATA in. (LVPECL)
19	TD-	Transmitter Inverted DATA in. (LVPECL)
20	VEET	Transmitter Ground

Block Diagram of Transceiver

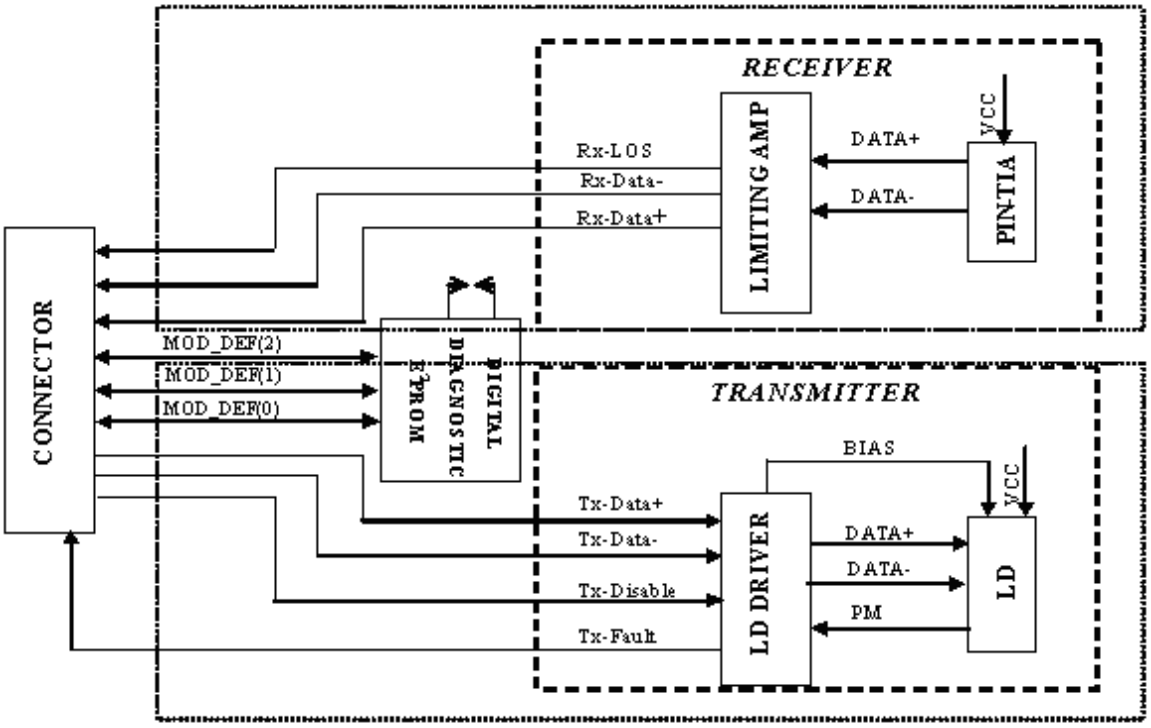

Figure3

Transmitter Section

TX-FAULT

TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V. When sensing an improper power level in the laser driver, the SFP sets this signal high and turns off the laser. TX-FAULT can be reset with the TX-DISABLE line. The signal is in TTL level.

TX-DISABLE

TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7 – 10 KΩ resistor. Its states are: Low (0 – 0.8V): Transmitter on; (>0.8, < 2.0V): Undefined; High (2.0 – 3.465V): Transmitter Disabled; Open: Transmitter Disabled. The TX-DISABLE signal is high (TTL logic “1”) to turn off the laser output. The laser will turn on when TX-DISABLE is low (TTL logic “0”).

TD-/+

These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential terminationinside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputswill accept differential swings of 500 – 2400 mV (250 – 1200 mV single-ended), though it is recommended that values between 500 and 1200 mV differential (250 – 600 mV single-ended) be used for best EMI performance.

Receiver Section

RX-LOS

LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

The RX-LOS is high (TTL logic “1”) when there is no incoming light from the companion transceiver. This signal is normally used by the system for the diagnostic purpose. The signal is operated in TTL level.

RD-/+

These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100 Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 370 and 2000 mV differential (185 – 1000 mV single ended) when properly terminated.

Mod-Def 0, 1, 2.

Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7 - 10K resistor on the host board to supply less than VccT+0.3V or VccR+0.3V.

Mod-Def 0 is grounded by the module to indicate that the module is present.

Mod-Def 1 is clock line of two wire serial interface for optional serial ID.

Mod-Def 2 is data line of two wire serial interface for optional serial ID.

Recommended Interface Circuit

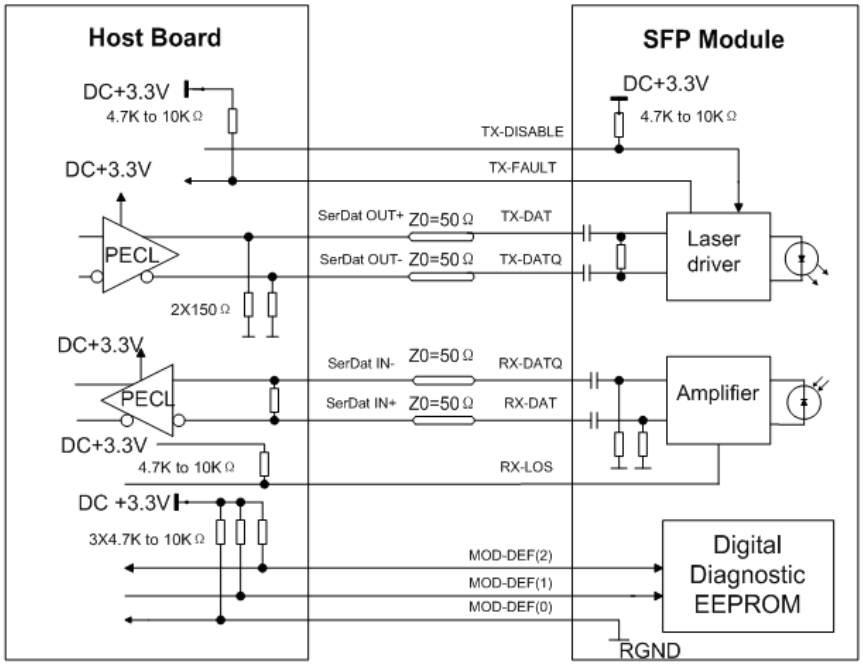

Figure4

Dimensions

(Unit: mm)

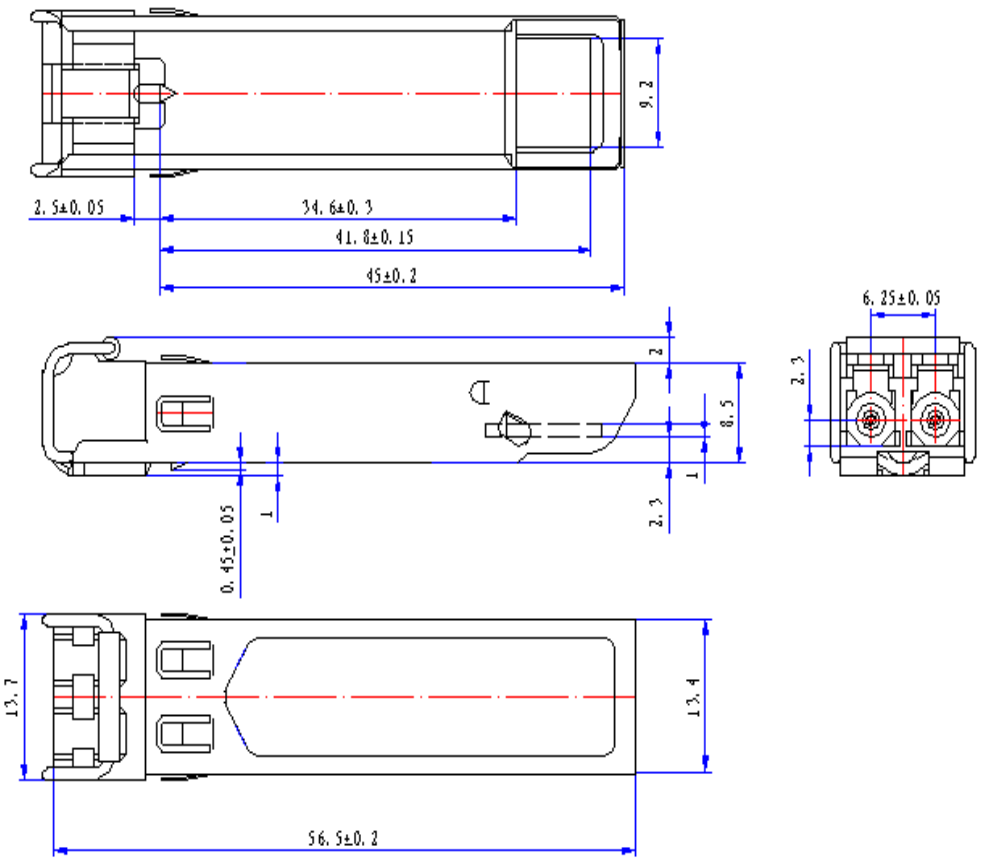

Figure5

Digital Diagnostic Memory Map

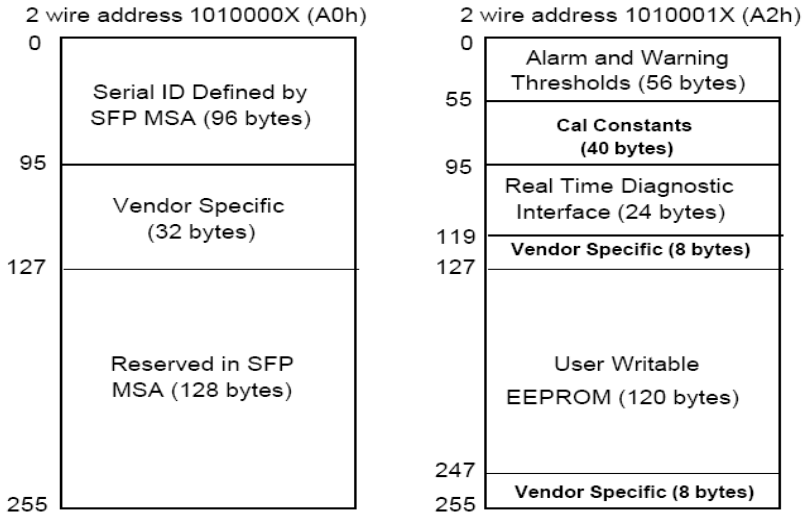

Figure6

EEPROM Information

Addr.	Field Size (Bytes)	Name of Field	Hex	Description
0	1	Identifer	03	SFP
1	1	Ext. Identifier	04	SFP function is defined by serial ID only
2	1	Connector	07	LC Connector
3-10	8	Transceiver		Transceiver Codes
11	1	Encoding	05	SONET Scrambled
12	1	BR, Nominal	01	100Mb/s
13	1	Reserved	00	
14	1	Length (9um) km		Transceiver transmit distance
15	1	Length (9um) 100m		Transceiver transmit distance
16	1	Length (50um)10m		Transceiver transmit distance
17	1	Length (62.5um) 10m		Transceiver transmit distance
18	1	Length (Copper)	00	Not compliant
19	1	Reserved	00	
20-35	16	Vendor name	48 47 20 47 45 4E 55 49 4E 45 20 20 20 20 20 20	“HG GENUINE” (ASCII)
36	1	Reserved	00	
37-39	3	Vendor OUI	00 00 00	
40-55	16	Vendor PN		Part No.(ASCII)
56-59	4	Vendor rev	00 00 00	
60-61	2	Wavelength		Transceiver wavelength
62	1	Reserved	00	
63	1	CC_BASE	CheckSum(Variable)	Check code for Base ID Fields

64-65	2	Options	00 1A	TX_DISABLE, TX_FAULT and Loss of Signal implemented.
66	1	BR,MAX	00	
67	1	BR,MIN	00	
68-83	16	Vendor SN	4D 41 30 39 30 31 30 30 33 30 30 31 33 20 20 20	Serial Number of transceiver(ASCII). For example “MA09010030013”
84-91	8	Date code	30 39 30 37 32 30 00 00	Manufactory date code. For example “090720”
92	1	Diagnostic Monitoring Type	58	Digital diagnostic monitoring implemented, “ externally calibrated” is implemented
93	1	Enhanced Options	F0	Optional Alarm/Warning flags implemented for all monitored quantities, Optional Soft TX_FAULT monitoring implemented, Optional Soft RX_LOS monitoring implemented
94	1	SFF_8472 Compliance	01	Includes functionality described in Rev9.3 SFF-8472
95	1	CC_EXT	CheckSum(Variable)	Check sum for Extended ID Field.
96-127	32	Vendor Specific	Read only	Depends on customer information
128-255	128	Reserved	Read only	Filled by zero

Digital Diagnostic Monitoring Information

Parameter	Unit	Accuracy
Temperature	℃	±3
Supply Voltage	V	±0.1
Tx Bias Current	mA	±10%
Tx Optical Power	dB	±3
Rx Optical Power	dB	±3

Regulatory Compliance

Feature	Reference	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 2(>2000 Volts)
Electrostatic Discharge (ESD)to the Duplex LC Receptacle	IEC 61000-4-2	Compatible with standards
Electromagnetic Interference (EMI)	FCC Class B; (CISPR22:1997 /EN55022: 1998)	Compatible with standards
Immunity	IEC 61000-4-3	Compatible with standards
Laser Eye Safety	FDA 21CFR 1002.10 and 1002.13 EN (IEC) 60825-1,2	Compatible with Class I laser Product

Ordering Information

Part No.	Specification									Application
	Pack	Rate	Tx	Pout	Rx	S	Top	Reach	Others	
MXPD-033S	SFP	155M	1310nm FP	-15~-8dBm	PIN	＜-28dBm	0～70℃	15Km	DDM,RoHS	STM-1/OC3
MXPD-033SI	SFP	155M	1310nm FP	-15~-8dBm	PIN	＜-28dBm	-40~85℃	15Km	DDM,RoHS	STM-1/OC3
MXPD-033M	SFP	155M	1310nm FP	-5~0dBm	PIN	＜-34dBm	0～70℃	40Km	DDM,RoHS	STM-1/OC3
MXPD-033MI	SFP	155M	1310nm FP	-5~0dBm	PIN	＜-34dBm	-40~85℃	40Km	DDM,RoHS	STM-1/OC3
MXPD-035LD	SFP	155M	1550nm DFB	-5~0dBm	PIN	＜-34dBm	0～70℃	80Km	DDM,RoHS	STM-1/OC3
MXPD-035LDI	SFP	155M	1550nm DFB	-5~0dBm	PIN	＜-34dBm	-40~85℃	80Km	DDM,RoHS	STM-1/OC3

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